W912DQ-04-R-0015

US Army Corps
of Engineers
Kansas City District
You Matter - We Care

Family Housing Replacement
New Construction
PN 60301 and 60320

Fort Riley, Kansas

This is a Site Adapt/
Design-Build Procurement

Construction Solicitation and Specifications

May 2004

DEPARTMENT OF THE ARMY
Kansas City District, Corps of Engineers
757 Federal Building
Kansas City, Missouri 64106

SPECIFICATIONS FOR CONSTRUCTION OF
FAMILY HOUSING REPLACEMENT
NEW CONSTRUCTION, PN 60301 AND 60320
FORT RILEY, KANSAS

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SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	1. SOLICITATION NO.	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF	PAGES
	W912DQ-04-R-0015	☐ SEALED BID (IFB) ☒ NEGOTIATED (RFP)	5/28/2004	1	211

IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.

4.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.
	W58XUW-2311-0552	

7. ISSUED BY CODE	8. ADDRESS OFFER TO
U.S. Army Engineer District, Kansas City 760 Federal Building, 601 E. 12th Street Kansas City, Missouri 64106-2896 Tel: (816) 983-3845 Fax: (816) 426-5169	See Item 7 Bid Opening Room: 748

9. FOR INFORMATION CALL:	A. NAME	B. TELEPHONE NO. (Include area code)	
	Earl V. Smith	816-983-3846	Ext. (NO COLLECT CALLS)

SOLICITATION

NOTE: In sealed bid solicitation "offer" and "offeror" mean "bid" and "Bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS *(Title, identifying no., date):*

Family Housing Replacement
New Construction, PN 60301 and 60320
Fort Riley, Kansas

This project is a "Site Adapt/Design Build" RFP and consists of site adapting existing family housing floor plans, completing the design and executing construction of sixty-two (62) new family housing units in two separate noncontiguous sites. The housing units consist of thirty (30) duplexes and two(2) single story detached units, supportive infrastructure and landscaping. The housing units will be a mix of 3- and 4-bedroom two-story structures and 4 single-story handicap accessible units. Each unit incorporates 2-car garages, driveways, covered porches, patios, landscaping, streets, utilities and other site development as specified in the RFP. This work also includes the demolition of seventy-two (72) existing family housing units, consisting of four-plex structures. Demolition will not be scheduled to begin until completion and acceptance of all new family housing units constructed under this contract.

11. The Contractor shall begin performance within 10 calendar days and complete it within 940 calendar days after receiving ☐ award ☒ notice to proceed. This performance period is ☒ mandatory, ☐ negotiable. (See Section 00800, FFAR 52.211-10) _____

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? *(If "YES", indicate within how many calendar days after award in Item 12B.)*	12B. CALENDAR DAYS
☒ YES ☐ NO	10 10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and two copies to perform the work required are due at the place specified in Item 8 by 4:30 p.m. local time 6/29/2004 *(date).* If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee ☒ is, ☐ is not required. NOT TO EXCEED 20% OF TOTAL BID AMOUNT

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D. Offers providing less than 90 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

OFFER *(Must be fully completed by offeror)*

14. NAME AND ADDRESS OF OFFEROR *(Include ZIP Code)*

15. TELEPHONE NO. *(Include area code)*

(FAX #)

16. REMITTANCE ADDRESS (Include only if different from Item 14)

DUNS NO:

CODE FACILITY CODE

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. *(Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.*

AMOUNTS:	See attached Proposal Schedule

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS

(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.								
DATE								

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*	20B. SIGNATURE	20C. OFFER DATE

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN *(4 copies unless otherwise specified)* ITEM

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO

26. ADMINISTERED BY CODE

☐ 10 U.S.C. 2304(c) ( ) ☐ 41 U.S.C. 253(c) ( )

27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return _____ copies to issuing office.)* Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contact shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29. AWARD *(Contractor is not required to sign this document)* Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN *(Type of print)*

31A. NAME OF CONTRATING OFFICER *(Type or print)*

30B. SIGNATURE	31b. UNITED STATED OF AMERICA	31C. AWARD DATE

STANDARD FORM 1442 BACK (REV. 4-85)

SECTION 00010 – SOLICITATION CONTRACT FORM

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lump Sum		

SITE WORK – Base

All work outside the 5 ft line, excluding Demolition and any items listed in the Betterments Schedule.
PURCHASE REQUEST NUMBER: 258XUW-4030-6935

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		1	Lump Sum		

DEMOLITION – Base

Demolition of seventy-two (72) Existing Housing Units, associated Infrastructure and Site Restoration.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003			Each		

CONSTRUCT (62) DWELLING UNITS – Base

Three Bedroom Dwelling Units – Twenty (20)
Four Bedroom Dwelling Units – Thirty-eight (38)
Four Bedroom Handicap Accessible Dwelling Units – Four (4)

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		1	Lump Sum		

DESIGN COSTS – Base

All Design Costs for Line Items 1 thru 3

NET AMT _____

BASE TOTAL (Line Items 1 thru 4)_____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		1	Lump Sum		

SOD UPGRADE – Betterment
FFP
As a Betterment to the Base Offer, install sod in the backyard and side yards as indicated on the Landscape Site Plans. Provide with the Request for Proposal (RFP), including all Design Costs and incidental work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0006		1	Lump Sum		

CEILING FANS – Betterment

Provide Ceiling Fans and Light Kit in lieu of Light Fixtures specified in the Base Offer where indicated on the drawings for all housing units. Price shall include all Design Costs and Incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0007		1	Lump Sum		

WHOLE HOUSE ATTIC FAN – Betterment

Provide Whole House Attic Fan and Wiring Complete for all housing units, including all Design Costs and Incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0008		1	Lump Sum		

FLOORING – Betterment

As a Betterment, in lieu of installing Sheet Vinyl as required by the Base Offer, the Contractor shall provide Hardwood Flooring in Dining Rooms and Family Rooms, and provide Ceramic Tile in all Entries, Bathrooms, Kitchens and Laundry Rooms of all housing units, including all Design Costs and Incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0009		1	Lump Sum		

BRICK VENEER – Betterment

In addition to the Vinyl Siding in the Base Offer, provide Brick Veneer for each Dwelling Unit as indicated on the drawings provided with the RFP, including all Design Costs and Incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0010		1	Lump Sum		

CEILING HEIGHT – Betterment

Provide a Nine-foot (9') Ceiling Height throughout the First Floor for all Units, including all Design Costs and Incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0011		1	Lump Sum		

WATER LOOP – Betterment

Provide a Water Loop Connection from O'Donnell Heights in the location indicated on the Plans provided with this RFP, including all Design Costs and incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0012		1	Lump Sum		

GROUND SOURCE HEAT PUMPS – Betterment

Provide Geothermal Heat Pumps in lieu of Standard Furnace and Air Conditioning Systems, including all Design Costs and Incidental Work as required by the STATEMENT OF WORK.

NET AMT _____

FFP: Firm Fixed Price

BETTERMENT TOTAL (Line Items 5 thru 12) _____

BASE and BETTERMENT TOTAL (Line Items 1 thru 12) _____

NOTICE TO OFFERORS: For your bid to be responsive, you must declare below the <u>single</u> accounting practice that you apply to contracts to calculate field office overhead for all change orders, modifications and requests for equitable adjustment. Pursuant to Federal Acquisition Regulations (FAR) Parts 31.105(d)(3) and 31.203(d)(1), an accounting practice that varies from modification to modification is not allowable. Select one of the following:

1. TIME DISTRIBUTION BASE FOR A PER DIEM RATE
If you use this practice, see Special Clause
"Field Office Overhead Per Diem Rate". _____

2. DIRECT COST DISTRIBUTION BASE FOR A PERCENTAGE MARKUP
If you use this practice, see Special Clause
"Field Office Overhead Percentage Markup". _____

3. OTHER ACCOUNTING PRACTICE THAT IS ALLOWABLE UNDER THE FAR AND THAT USES A <u>SINGLE</u> DISTRIBUTION BASE _____

YOU MUST DESCRIBE THE ACCOUNTING PRACTICE IN SUFFICIENT DETAIL BELOW TO ALLOW THE CONTRACTING OFFICER TO DETERMINE WHAT ACCOUNTING PRACTICE IS BEING UTILIZED BY YOUR COMPANY AND THAT IT COMPLIES WITH THE FAR.

_____
_____
_____
_____

FAILURE TO FULLY COMPLY WITH THE ABOVE REQUIREMENT OR, IF ALTERNATE 3 IS DECLARED, FAILURE TO PROVIDE A DESCRIPTION WHICH CLEARLY STATES OR DESCRIBES A CONSISTENT ACCOUNTING PRACTICE USING A SINGLE DISTRIBUTION BASE, WILL BE CAUSE FOR YOUR BID TO BE REJECTED.

Notes:

(1) If a modification to an offer is submitted which provides for a lump sum adjustment to the total cost, the application of the lump sum adjustment to each price in the Proposal Schedule must be stated. If it is not stated, the Offeror agrees that the lump sum adjustment shall be applied on a pro rata bases to every price in the Proposal Schedule.

(2) Offeror's attention is directed to SECTION 00100, paragraph titled "Arithmetic Discrepancies" wherein are procedures for correction of errors.

(3) Offeror's attention is directed to SECTION 01100 GENERAL for special provisions pertaining to this Solicitation.

(4) Offeror's attention is direct to SECTION 01100 GENERAL, paragraph titled "Kansas Sales and Use Tax".

(5) The general outline of the principal features of each item as listed does not in any way limit the responsibility of the Offeror for making a thorough investigation of the drawings and specifications to determine the scope of work included in each item.

(6) Offeror's attention is directed to the Contract Clauses wherein the apparent low offeror is required to submit a subcontracting small business and small disadvantaged business subcontracting plan. Award will not be made under this solicitation before the plan is approved by the Contracting Officer.

(7) The amount of the Betterment offered should be that amount that is over and above the amount included in the base price for the standard item.

(8) Determination of the Offeror's total price for the proposed work will be based on the TOTAL of the BASE SCHEDULE and BETTERMENT SCHEDULE. Immediate award will be made of the BASE SCHEDULE and the BETTERMENT SCHEDULE, if the cost is less than or equal to the Cost Limitation – Target Ceiling as stated below.

(9) Proposal prices must be entered for all items (CLINS) in the Base Schedule. Offerors shall enter prices for those CLINS in the Betterment Schedule only if they can provide the betterments without exceeding the Cost Limitation identified below at clause titled "COST LIMITATION – TARGET CEILING". Do not submit an offer for any Betterment if the total Base Offer and the Betterment combined exceed the COST LIMITATION. Any Offeror doing so may be judged as non-responsive to this RFP.

(10) If the Base Offer exceeds the Target Ceiling, Offerors will leave all Betterments blank. Once the total of the Base Offer and the Betterment Schedule exceeds the Target Ceiling, the Offeror shall leave the remaining Betterments blank. An award will be made based on the Best Value Price/Quality tradeoff process, which allows the Government the ability to consider factors it values other than price. The Offeror's attention is directed to SECTION 00120 PROPOSAL EVALUATION AND CONTRACT AWARD for further details.

(11) Proposal Item No. 0003, Construct (62) Dwelling Units – Base: Included in this item are the following:

Three Bedroom Dwelling Units – Twenty (20)
Four Bedroom Dwelling Units – Thirty-eight (38)
Four Bedroom Handicap Accessible Dwelling Units – Four (4)

SCR-DB-017 COST LIMITATION – TARGET CEILING – JUNE 1999

The target ceiling for contract award for design and construction is **$14,969,000**, based on the funds made available for this project. The Government cannot guarantee that additional funds will be made available for award. Offerors are under no obligation to approach this ceiling.

(End of Clause)

NWK-00100-001 FIELD OFFICE OVERHEAD PERCENTAGE MARKUP

If any change to the contract, issued pursuant to the Changes Clause or otherwise, for which the Government is responsible, causes an increase or decrease in the Contractor's cost of, or the time required for, performance under the contract, the Contracting Officer shall make an equitable adjustment and modify the contract in writing.

Under such equitable adjustment, no per diem rate for field office overhead shall be allowed if the Contractor has elected a percentage markup in keeping with its standard accounting practices. In such a case, payment of field office overhead shall be allowed for any change on a percentage markup basis regardless of whether the completion of the contract is or is not extended by reason of the change, except for modifications issued pursuant to the Default Clause. The Contractor shall provide a detailed breakdown of its proposed increase or decrease of costs as required by Contract Clause DFAR 252.236-7000 MODIFICATION OF PROPOSALS - PRICE BREAKDOWN.

NWK-00100-002 FIELD OFFICE OVERHEAD PER DIEM RATE

If any change to the contract, issued pursuant to the Changes Clause or otherwise, for which the Government is responsible, causes an increase or decrease in the Contractor's cost of, or the time required for, performance under the contract, the Contracting Officer shall make an equitable adjustment and modify the contract in writing.

Under such equitable adjustment, no payment of field office overhead shall be allowed for any changes when the completion of the contract is not extended by reason of the change, except the Contractor may be reimbursed any variable expense it incurs due to the change, provided it can substantiate the variables. The Contractor shall be reimbursed for field office overhead on a per diem basis when the completion of the contract is extended by reason of the change issued under any clause except the Default Clause. Equitable adjustment shall be made for the costs which are incurred or are to be incurred due to the change. The Contractor shall provide a detailed breakdown of its proposed increase or decrease of costs as required by Contract Clause DFAR 252.236-7000 MODIFICATION OF PROPOSALS - PRICE BREAKDOWN.

CAUTION!

BEFORE SIGNING AND MAILING THIS PROPOSAL, please take note of the following, as failure to perform any one of these actions may cause your offer to be rejected.

1. AMENDMENTS: Have you acknowledged receipt of ALL Amendments? If in doubt as to number of amendments issued, please contact our office.

2. SEALED PROPOSALS: Sealed envelopes containing proposals shall be marked to show the offeror's name and address, the solicitation number, amendments received, and the date and time proposals are due.

3. AMENDED PROPOSAL PAGES: If any of the Amendments furnished amended proposal pages, the amended proposal pages must be used in submitting your proposal.

4. LATE PROPOSALS: In order for a late mailed proposal to be considered, generally it must have been sent by either registered or certified mail not later than 5 calendar days before the receipt of proposals date.

5. PROPOSAL GUARANTEE: Sufficient proposal guarantee in proper form must be furnished with your proposal, if your proposal exceeds $50,000.

6. MISTAKE IN PROPOSAL: Have you reviewed your proposal prices for possible errors in calculations or work left out?

7. TELEGRAPHIC MODIFICATIONS: If you modify your proposal by telegram, be sure to allow sufficient time for the telegram to reach us prior to the time set for receipt of proposals. Any doubt should be resolved in favor of allowing Extra Time.

8. FACSIMILE PROPOSALS OR MODIFICATIONS: Will not be considered. Facsimile withdrawals will be considered.

9. SECTION 00110: Certifications must be completed and submitted with your proposal. Small Business and Small Disadvantaged Business Subcontracting Plan must be submitted prior to award.

10. HAND-DELIVERED PROPOSAL: If proposals are hand-delivered, you must be aware of security requirements in effect in the Federal Building. No additional time will be allowed due to security requirements.

11. BUY AMERICAN ACT: All offerors are cautioned that, prior Government conduct notwithstanding, the Contractor's selection of a domestic construction material (as defined in SECTION 00700) which would require the subsequent selection of a foreign construction material for compatibility is not a justification for waiver of the Buy American Act. It is the Contractor's responsibility to verify, prior to submitting the materials for approval that each system can be built to meet the contract specifications without the use of foreign construction materials.

12. BONDS – Matter of All Seasons Construction, Inc. GAO Decision B-291166.2
Bid Bonds must be accompanied by a Power of Attorney containing an original signature from the surety, which must be affixed to the Power of Attorney after the Power of Attorney has been generated. Computer generated and signed Power’s of Attorney will only be accepted if accompanied by an original certification from a current officer of the surety attesting to its authenticity and continuing validity.

SECTION 00100 – INSTRUCTIONS, CONDITIONS and NOTICES TO OFFEROR

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SECTION 00100 - INSTRUCTIONS TO BIDDERS

CLAUSES INCORPORATED BY FULL TEXT

52.204-6 -- DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER. (OCT 2003)

(a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" or "DUNS+4" followed by the DUNS number or "DUNS+4" that identifies the offeror's name and address exactly as stated in the offer. The DUNS number is a nine-digit number assigned by Dun and Bradstreet, Inc. The DUNS+4 is the DUNS number plus a 4-character suffix that may be assigned at the discretion of the offeror to establish additional CCR records for identifying alternative Electronic Funds Transfer (EFT) accounts (see Subpart 32.11) for the same parent concern.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one.

(1) An offeror may obtain a DUNS number—

(i) If located within the United States, by calling Dun and Bradstreet at 1-866-705-5711 or via the Internet at http://www.dnb.com or

(ii) If located outside the United States, by contacting the local Dun and Bradstreet office.

(2) The offeror should be prepared to provide the following information:

(i) Company legal business name.

(ii) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(iii) Company physical street address, city, state and Zip Code.

(iv) Company mailing address, city, state and Zip Code (if separate from physical).

(v) Company telephone number.

(vi) Date the company was started.

(vii) Number of employees at your location.

(viii) Chief executive officer/key manager.

(ix) Line of business (industry).

(x) Company Headquarters name and address (reporting relationship within your entity).

(End of Provision)

252.204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION ALTERNATE A (NOV 2003)

(a) Definitions. As used in this clause--

"Central Contractor Registration (CCR) database" means the primary Government repository for contractor information required for the conduct of business with the Government.

"Commercial and Government Entity (CAGE) code" means--

(1) A code assigned by the Defense Logistics Information Service (DLIS) to identify a commercial or Government entity; or

(2) A code assigned by a member of the North Atlantic Treaty Organization that DLIS records and maintains in the CAGE master file. This type of code is known as an "NCAGE code."

"Data Universal Numbering System (DUNS) number" means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

"Data Universal Numbering System +4 (DUNS+4) number" means the DUNS number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional CCR records

for identifying alternative Electronic Funds Transfer (EFT) accounts (see Subpart 32.11 of the Federal Acquisition Regulation) for the same parent concern.

“Registered in the CCR database” means that--

(1) The Contractor has entered all mandatory information, including the DUNS number or the DUNS+4 number, into the CCR database;

(2) The Contractor's CAGE code is in the CCR database; and

(3) The Government has validated all mandatory data fields and has marked the records “Active.”

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee shall be registered in the CCR database prior to award, during performance, and through final payment of any contract, basic agreement, basic ordering agreement, or blanket purchasing agreement resulting from this solicitation.

(2) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation “DUNS” or “DUNS +4” followed by the DUNS or DUNS +4 number that identifies the offeror's name and address exactly as stated in the offer. The DUNS number will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.

(c) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one.

(1) An offeror may obtain a DUNS number--

(i) If located within the United States, by calling Dun and Bradstreet at 1-866-705-5711 or via the Internet at http://www.dnb.com; or

(ii) If located outside the United States, by contacting the local Dun and Bradstreet office.

(2) The offeror should be prepared to provide the following information:

(i) Company legal business.

(ii) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(iii) Company Physical Street Address, City, State, and Zip Code.

(iv) Company Mailing Address, City, State and Zip Code (if separate from physical).

(v) Company Telephone Number.

(vi) Date the company was started.

(vii) Number of employees at your location.

(viii) Chief executive officer/key manager.

(ix) Line of business (industry).

(x) Company Headquarters name and address (reporting relationship within your entity).

(d) If the Offeror does not become registered in the CCR database in the time prescribed by the Contracting Officer, the Contracting Officer will proceed to award to the next otherwise successful registered Offeror.

(e) Processing time, which normally takes 48 hours, should be taken into consideration when registering. Offerors who are not registered should consider applying for registration immediately upon receipt of this solicitation.

(f) The Contractor is responsible for the accuracy and completeness of the data within the CCR database, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to review and update on an annual basis from the date of initial registration or subsequent updates its information in the CCR database to ensure it is current, accurate and complete. Updating information in the CCR does not alter the terms and conditions of this contract and is not a substitute for a properly executed contractual document.

(g)(1)(i) If a Contractor has legally changed its business name, “doing business as” name, or division name (whichever is shown on the contract), or has transferred the assets used in performing the contract, but has not completed the necessary requirements regarding novation and change-of-name agreements in Subpart 42.12, the Contractor shall provide the responsible Contracting Officer a minimum of one business day's written notification of its intention to (A) change the name in the CCR database; (B) comply with the requirements of Subpart 42.12 of the FAR; and (C) agree in writing to the timeline and procedures specified by the responsible Contracting Officer. The Contractor must provide with the notification sufficient documentation to support the legally changed name.

(ii) If the Contractor fails to comply with the requirements of paragraph (g)(1)(i) of this clause, or fails to perform the agreement at paragraph (g)(1)(i)(C) of this clause, and, in the absence of a properly executed novation or change-of-name agreement, the CCR information that shows the Contractor to be other than the Contractor indicated in the contract will be considered to be incorrect information within the meaning of the “Suspension of Payment” paragraph of the electronic funds transfer (EFT) clause of this contract.

(2) The Contractor shall not change the name or address for EFT payments or manual payments, as appropriate, in the CCR record to reflect an assignee for the purpose of assignment of claims (see FAR Subpart 32.8, Assignment of Claims). Assignees shall be separately registered in the CCR database. Information provided to the Contractor's CCR record that indicates payments, including those made by EFT, to an ultimate recipient other than that Contractor will be considered to be incorrect information within the meaning of the “Suspension of payment” paragraph of the EFT clause of this contract.

(h) Offerors and Contractors may obtain information on registration and annual confirmation requirements via the internet at http://www.ccr.gov or by calling 1-888-227-2423, or 269-961-5757.

(End of clause)

52.211-2 -- AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L. (DEC 2003**)**

Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained –
(a) From the ASSIST database via the Internet at http://assist.daps.dla.mil/; or
(b) By submitting a request to the --

Department of Defense Single Stock Point (DoDSSP)
Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Telephone (215) 697-2179
Facsimile (215) 697-1462.

(End of Provision)

52.211-14 -- NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE. (SEP 1990)

Any contract awarded as a result of this solicitation will be a DO-rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation. *[Contracting Officer check appropriate box.]*

(End of Provision)

52.214-5000 ARITHMETIC DISCREPANCIES (MAR 1995)

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by the bidder:

(1) Obviously misplaced decimal points will be corrected;
(2) Discrepancy between unit price and extended price, the unit price will govern;
(3) Apparent errors in extension of unit prices will be corrected;
(4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purpose of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

(End of Statement)

52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

(End of provision)

52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

(End of provision)

52.215-1 INSTRUCTIONS TO OFFERORS--COMPETITIVE ACQUISITION (JAN 2004)—ALTERNATE I (OCT 1997)

(a) Definitions. As used in this provision--

“Discussions” are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer's discretion, result in the offeror being allowed to revise its proposal.

In writing, writing, or written” means any worded or numbered expression which can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.

“Proposal modification” is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.

“Proposal revision” is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.

“Time”, if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.

(b) Amendments to solicitations. If this solicitation is amended, all terms and conditions that are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) Submission, modification, revision, and withdrawal of proposals. (1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (i) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show--

(i) The solicitation number;

(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic address if available);

(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;

(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror's behalf with the Government in connection with this solicitation; and

(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(3) Submission, modification, or revisions of proposals. (i) Offerors are responsible for submitting proposals, and any modifications, revisions, or withdrawals, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is “late” and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.

(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) Offer expiration date. Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) Restriction on disclosure and use of data. Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall--

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed--in whole or in part--for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of--or in connection with-- the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend: Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

(f) Contract award. (1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government's interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract after conducting discussions with offerors whose proposals have been determined to be within the competitive range. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals. Therefore, the offeror's initial proposal should contain the offeror's best terms from a price and technical standpoint.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government's best interest to do so.

7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) If a post-award debriefing is given to requesting offerors, the Government shall disclose the following information, if applicable:

(i) The agency's evaluation of the significant weak or deficient factors in the debriefed offeror's offer.

(ii) The overall evaluated cost or price and technical rating of the successful and the debriefed offeror and past performance information on the debriefed offeror.

(iii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection.

(iv) A summary of the rationale for award.

(v) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.

(vi) Reasonable responses to relevant questions posed by the debriefed offeror as to whether source-selection procedures set forth in the solicitation, applicable regulations, and other applicable authorities were followed by the agency.

(End of provision)

52.215-20 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (OCT 1997)

(a) Exceptions from cost or pricing data. (1) In lieu of submitting cost or pricing data, offerors may submit a written request for exception by submitting the information described in the following subparagraphs. The Contracting Officer may require additional supporting information, but only to the extent necessary to determine whether an exception should be granted, and whether the price is fair and reasonable.

(i) Identification of the law or regulation establishing the price offered. If the price is controlled under law by periodic rulings, reviews, or similar actions of a governmental body, attach a copy of the controlling document, unless it was previously submitted to the contracting office.

(ii) Commercial item exception. For a commercial item exception, the offeror shall submit, at a minimum, information on prices at which the same item or similar items have previously been sold in the commercial market that is adequate for evaluating the reasonableness of the price for this acquisition. Such information may include--

(A) For catalog items, a copy of or identification of the catalog and its date, or the appropriate pages for the offered items, or a statement that the catalog is on file in the buying office to which the proposal is being submitted. Provide a copy or describe current discount policies and price lists (published or unpublished), e.g., wholesale, original equipment manufacturer, or reseller. Also explain the basis of each offered price and its relationship to the established catalog price, including how the proposed price relates to the price of recent sales in quantities similar to the proposed quantities;

(B) For market-priced items, the source and date or period of the market quotation or other basis for market price, the base amount, and applicable discounts. In addition, describe the nature of the market;

(C) For items included on an active Federal Supply Service Multiple Award Schedule contract, proof that an exception has been granted for the schedule item.

(2) The offeror grants the Contracting Officer or an authorized representative the right to examine, at any time before award, books, records, documents, or other directly pertinent records to verify any request for an exception under this provision, and the reasonableness of price. For items priced using catalog or market prices, or law or regulation , access does not extend to cost or profit information or other data relevant solely to the offeror's determination of the prices to be offered in the catalog or marketplace.

(b) Requirements for cost or pricing data. If the offeror is not granted an exception from the requirement to submit cost or pricing data, the following applies:

(1) The offeror shall prepare and submit cost or pricing data and supporting attachments in accordance with Table 15-2 of FAR 15.408.

As soon as practicable after agreement on price, but before contract award (except for unpriced actions such as letter contracts), the offeror shall submit a Certificate of Current Cost or Pricing Data, as prescribed by FAR 15.406-2.

(End of provision)

52.216-1 -- TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a firm fixed-price construction contract resulting from this solicitation.

52.219-24 SMALL DISADVANTAGED BUSINESS PARTICIPATION PROGRAM--TARGETS (OCT 2000)

(a) This solicitation contains a source selection factor or subfactor related to the participation of small disadvantaged business (SDB) concerns in the contract. Credit under that evaluation factor or subfactor is not available to an SDB concern that qualifies for a price evaluation adjustment under the clause at FAR 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns, unless the SDB concern specifically waives the price evaluation adjustment.

(b) In order to receive credit under the source selection factor or subfactor, the offeror must provide, with its offer, targets, expressed as dollars and percentages of total contract value, for SDB participation in any of the North American Industry Classification System (NAICS Industry Subsectors as determined by the Department of Commerce. The targets may provide for participation by a prime contractor, joint venture partner, teaming arrangement member, or subcontractor; however, the targets for subcontractors must be listed separately.

(End of provision)

52.222-18 CERTIFICATION REGARDING KNOWLEDGE OF CHILD LABOR FOR LISTED END PRODUCTS (FEBRUARY 2001)

(a) Definition.

Forced or indentured child labor means all work or service--

(1) Exacted from any person under the age of 18 under the menace of any penalty for its nonperformance and for which the worker does not offer himself voluntarily; or

(2) Performed by any person under the age of 18 pursuant to a contract the enforcement of which can be accomplished by process or penalties.

(b) Listed end products. The following end product(s) being acquired under this solicitation is (are) included in the List of Products Requiring Contractor Certification as to Forced or Indentured Child Labor, identified by their country of origin. There is a reasonable basis to believe that listed endproducts from the listed countries of origin may have been mined, produced, or manufactured by forced or indentured child labor.

Listed End Product

Listed Countries of Origin

(c) Certification. The Government will not make award to an offeror unless the offeror, by checking the appropriate block, certifies to either paragraph (c)(1) or paragraph (c)(2) of this provision.

( ) (1) The offeror will not supply any end product listed in paragraph (b) of this provision that was mined, produced, or manufactured in a corresponding country as listed for that end product.

( ) (2) The offeror may supply an end product listed in paragraph (b) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product. The offeror certifies that it has made a good

faith effort to determine whether forced or indentured child labor was used to mine, produce, or manufacture such end product. On the basis of those efforts, the offeror certifies that it is not aware of any such use of child labor.

(End of provision)

52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
6.5%	**6.9%**

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

(1) Name, address, and telephone number of the subcontractor;

(2) Employer's identification number of the subcontractor;

(3) Estimated dollar amount of the subcontract;

(4) Estimated starting and completion dates of the subcontract; and

(5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is the state of **Kansas**, **Geary & Riley Counties**, and the city of **Fort Riley**.

(End of provision)

52.225-11 BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (JAN 2004)

(a) Definitions. As used in this clause--

Component means an article, material, or supply incorporated directly into a construction material.

Construction material means an article, material, or supply brought to the construction site by the Contractor or subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means--

(1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

Designated country means any of the following countries: Aruba, Austria, Bangladesh, Belgium, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Canada, Cape Verde, Central African Republic, Chad, Comoros, Denmark.

Djibouti, Equatorial Guinea, Finland, France, Gambia, Germany, Greece, Guinea, Guinea-Bissau, Haiti, Hong Kong, Ireland, Israel, Italy, Japan.

Kiribati, Korea, Republic of, Lesotho, Liechtenstein, Luxembourg, Malawi, Maldives, Mali, Mozambique, Nepal, Netherlands, Niger, Norway, Portugal, Rwanda.

Sao Tome and Principe, Sierra Leone, Singapore, Somalia, Spain, Sweden, Switzerland, Tanzania U.R., Togo, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Yemen.

Designated country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

Domestic construction material means--

(1) An unmanufactured construction material mined or produced in the United States; or

(2) A construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic.

Foreign construction material means a construction material other than a domestic construction material.

Free Trade Agreement country means Canada, Chile, Mexico, or Singapore.

Free Trade Agreement country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a Free Trade Agreement (FTA) country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a FTA country into a new and different construction material distinct from the materials from which it was transformed.

United States means the 50 States, the District of Columbia, and outlying areas.

(b) Construction materials. (1) This clause implements the Buy American Act (41 U.S.C. 10a-10d) by providing a preference for domestic construction material. In addition, the Contracting Officer has determined that the Trade Agreements Act and Free Trade Agreements (FTAs) apply to this acquisition. Therefore, the Buy American Act restrictions are waived for designated country and FTA country construction materials.

(2) The Contractor shall use only domestic, designated country, or NAFTA country construction material in performing this contract, except as provided in paragraphs (b)(3) and (b)(4) of this clause.

(3) The requirement in paragraph (b)(2) of this clause does not apply to the construction materials or components listed by the Government as follows: **None**

(4) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the restrictions of the Buy American Act is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent;

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American Act.

(1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(4) of this clause shall include adequate information for Government evaluation of the request, including--

(A) A description of the foreign and domestic construction materials;

(B) Unit of measure;

(C) Quantity;

(D) Price;

(E) Time of delivery or availability;

(F) Location of the construction project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.

(iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.

(2) If the Government determines after contract award that an exception to the Buy American Act applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(4)(i) of this clause.

(3) Unless the Government determines that an exception to the Buy American Act applies, use of foreign construction material is noncompliant with the Buy American Act.

(d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison

Construction material description	Unit of measure	Quantity	Price (dollars) \1\
Item 1:			
Foreign construction material....	.....	.....	.....
Domestic construction material...	.....	.....	.....
Item 2:			
Foreign construction material....	.....	.....	.....
Domestic construction material...	.....	.....	.....

\1\ Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

(e) United States law will apply to resolve any claim of breach of this contract.

(End of clause)

52.225-12 NOTICE OF BUY AMERICAN ACT REQUIREMENT-- CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (JAN 2004)

(a) Definitions. Construction material, designated country construction material, domestic construction material, foreign construction material, and FTA country construction material, as used in this provision, are defined in the clause of this solicitation entitled “Buy American Act --Construction Materials under Trade Agreements” (Federal Acquisition Regulation (FAR) clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers. (1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers. (1) When an offer includes foreign construction material, other than designated country or FTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or FTA country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or FTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or FTA country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

52.232-14 -- NOTICE OF AVAILABILITY OF PROGRESS PAYMENTS EXCLUSIVELY FOR SMALL BUSINESS CONCERNS (APR 1984)

The Progress Payments clause will be available only to small business concerns. Any bid conditioned upon inclusion of a progress payment clause in the resulting contract will be rejected as nonresponsive if the bidder is not a small business concern.

(End of Provision)

52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from

Perry D. Marks
Department of The Army
Kansas City District, Corps of Engineers
760 Federal Building, Kansas City, Mo. 64106-2896
Office Location: 601 e. 12TH St.

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

52.236-28 PREPARATION OF PROPOSALS--CONSTRUCTION (OCT 1997)

(a) Proposals must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a proposal must initial each erasure or change appearing on any proposal form.

(b) The proposal form may require offerors to submit proposed prices for one or more items on various bases, including--

(1) Lump sum price;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of paragraphs (b)(1) through (b)(3) of this provision.

(c) If the solicitation requires submission of a proposal on all items, failure to do so may result in the proposal being rejected without further consideration. If a proposal on all items is not required, offerors should insert the words “no proposal” in the space provided for any item on which no price is submitted.

(d) Alternate proposals will not be considered unless this solicitation authorizes their submission.

(End of provision)

NWK-00100-003 BID BOND REQUIREMENTS (DEC 1989) (FAR 28.101-2)

If your bid exceed $50,000.00, the bid bond shall be in the amount of 20% of the bid price or $3,000,000, whichever is the lesser amount. (See CONTRACT CLAUSE titled “Bid Guarantee.”)

NWK-00100-004 PLANS AND SPECIFICATIONS

Plans and specifications will be available only on CD-ROM, and will be free of charge. A street address must be provided when requesting a CD-ROM. Requests for the CD-ROM must be made via the Internet at http://www.nwk.usace.army.mil/contract/contract.html.

SECTION 00110 - PROPOSAL SUBMISSION REQUIREMENTS AND INSTRUCTIONS

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SAMPLE TRANSMITTAL LETTER AND PAST PERFORMANCE EVALUATION QUESTIONNAIRE

SECTION 00110 - PROPOSAL SUBMISSION REQUIREMENTS AND INSTRUCTIONS

1.00 GENERAL PROPOSAL INFORMATION.

General. The proposal should be prepared simply and economically, providing straightforward, concise delineation of capabilities to perform the contract. The proposal should be practical, legible, clear and coherent.

2.00 GENERAL PROPOSAL SUBMISSION INSTRUCTIONS

a. Who May Submit.

(1) Proposals may be submitted by firms formally organized as design/build entities, or by design firms and construction contractors that have associated specifically for this project. In the latter case, a single design firm or construction contractor may offer more than one proposal by entering into more than one such association. For the purpose of this solicitation, no distinction is made between formally organized design/build entities and project-specific design/build associations. Both are referred to as the design/build offeror, (or simply "offeror"), or the design/build contractor, (or simply "Contractor"), after award of a contract.

(2) Any legally organized offeror may submit a proposal, provided that the offeror, or offeror's subcontractor, has on its permanent staff professional architects and engineers registered in the appropriate technical disciplines and provided that the requirements specified in the solicitation are met. All designs must be accomplished under the direct supervision of appropriately licensed professionals.

b. General Requirements.

(1) All offerors shall be required to submit a proposal with the minimum content as specified herein. Proposals without the minimum content may be rejected. Proposals will be received until the date and time indicated on Standard form 1442 at the following address:

U.S. Army Engineer District, Kansas City
757 Federal Building
ATTN: CENWK-CT-M/Earl Smith
601 East 12th Street
Kansas City, Missouri 64106-2896

(2) PREPROPOSAL CONFERENCE

There will be a preproposal conference held at the, on 17 June 2004 at Ft. Riley, Kansas. Written questions need to be submitted to Mr. Earl Smith at the address above NLT 1 June to ensure that they can be answered at the preproposal conference.

(3) PROPOSAL FORMAT AND SUBMITTAL REQUIREMENTS

a. In order to be considered for award of a contract for the requirements of this solicitation, the offeror must submit a proposal with its offer. Failure to submit a complete proposal will result in the entire offer being rejected. The proposal shall consist of 2 parts:

(1) TECHNICAL/MANAGEMENT PROPOSAL.

(2) PRICE PROPOSAL consists of the original signed Standard Form 1442 "solicitation, Offer, and Award"; providing a price for all line items in the bid schedule; and acknowledgment of all amendments to the solicitation.

b. Proposal Characteristics

(1) All text must be legible and easily read. The page size of the offeror's proposal shall not exceed 8-1/2 by 11 inches. Diagrams, charts and tables shall conform to the paper size. All text shall be typed single-spaced. Margins (1-inch) shall be clean and clear. If fold-out charts are unavoidable, and are to be utilized, all sheets shall be reproduced on 11 by 17 inch, and folded to 8-1/2 by 11 inch size with the title clearly visible at the bottom right corner. Volume I shall be contained within a 3-ring loose leaf binder and submitted in the following quantities (no heat or spiral bound volumes). Limit the technical/management portion of the proposal to a maximum of 100 pages.

VOLUME I – Technical/management proposal	Original & 6 copies
VOLUME II – Price Proposal	Original & 6 copies

(2) The Offeror's name, address, signature and telephone number shall appear on any document submitted to be evaluated. Each Volume of the proposal shall be identified by the Solicitation number, Volume number, name, address, and telephone number of the offeror on the cover page. Each Volume shall also contain a table of contents, list of tables, list of figures, list of appendices, list of acronyms and at the bottom left side of each page the volume number shall be included. The list of acronyms should include all acronyms appearing in that volume. The cover page of each part shall be properly printed with: i) the solicitation number; ii) the project title - **"FAMILY HOUSING REPLACEMENT – NEW CONSTRUCTION, FORT RILEY, KANSAS",** iii) the name, address, and telephone number of the firm submitting the proposal, and the name of the firm's point of contact; and one of the following on each volume in bold letters:

VOLUME I: TECHNICAL/MANAGEMENT PROPOSAL

VOLUME II: PRICE PROPOSAL

(3) The Proposal's clarity, organization and cross referencing is mandatory. No material shall be incorporated by reference. General cross-references or cross referencing guides will not be considered appropriate cross-references.

(4) The Proposal shall be organized by factors and subfactors. They shall be described in separate sections, appropriately tabbed in a report form. All pages of each factor/subfactor shall be sequentially numbered. Elaborate or lengthy presentations are not necessary or desirable.

(5) The Technical/Management narrative shall be written in a way to demonstrate a clear understanding of the requirements, but should not parrot the specifications. The Technical/Management proposal shall not refer the reviewer to information contained in the Price proposal.

3.00 PART I - TECHNICAL /MANAGEMENT PROPOSAL SUBMISSION INSTRUCTIONS:

a. The Technical/Management proposal shall address the offeror's proposed approach to fully perform the requirements of the RFP. Offerors are discouraged from providing information not required by the solicitation.

b. The offeror shall address each of the following Factors and Sub factors, in sufficient detail to permit a complete and comprehensive evaluation: The Offeror must submit a written statement certifying that all items of his proposal complies with the requirements of this solicitation. The compliance statement will be signed by the Offeror and provided with the contractual/financial information as required in paragraph 4.00.

c. Any deviation from the solicitation requirements may result in non-consideration of its proposal. If deviations are included, they must be clearly indicated in the Offeror's Statement of Compliance. After award, the

solicitation requirements will govern in the event of a conflict between these requirements and the Offeror's proposal.

Factor 1 - Project Management Plan, and sub factors: The Offeror will provide a project management plan that addresses sub factor items a thru-e below.

Subfactor a - Quality Control Plan: The Offeror must provide a complete and comprehensive Quality Control Plan to support the performance requirements of Section 01451 of this RFP. Describe the process by which the QC staff will monitor work in the field and how action is to be taken to correct deficiencies. Describe the process by which the QC staff will work with government quality assurance personnel and the Contracting Officer to insure timely action is taken on deficiencies or quality problems in the field. The Quality Control Plan shall be a rational, workable plan, and shall stand alone for easy monitoring by the Contracting Officer and the Contracting Officer's Representative. It shall not be dependent on the contractor's other internal management plans. The Offeror must indicate how it intends to incorporate the Corps Three Phase Inspection process to provide seamless integration with the Quality Assurance Operations performed by the Government.

Subfactor b - Proposed Staffing: The Offeror will provide a Project Management-Staffing Plan. This Plan will include an organizational chart indicating the positions of all key personnel, their primary duties, and state whether the person is an employee, a subcontractor, or a consultant. At a minimum the Offer shall provide a resume, including level of authority, for the Project Manager, Project Architect, Landscape Architect, Civil Engineer, Mechanical Engineer, Electrical Engineer, QC Manager and the Job Superintendent and should reflect each individual's involvement, if any, in the project examples provided. If it's possible these people may be reassigned, the names and resumes of the alternative professionals for each should be submitted. Additionally, each resume must list at least two professional references. The Government has a right to rereview the Contractor's key personnel if they should change or be replaced for any reason once the contract has been awarded. The organizational chart must also indicate whether key personnel are full or part time, and the geographic location where they are currently based.

Subfactor c - Subcontracting: All large businesses are required to submit a Subcontracting Plan before the contractor's proposal will be considered complete. Guidance in preparing an acceptable plan is provided at the end this section. However, the Subcontracting Plan will be rated as pass or fail as part of the evaluation process.

Subfactor d - Design & Construction Scheduling: The Offeror will provide a Project Management Plan for Integrated Design and Construction Scheduling from contract award thru contract closeout to support the requirements of Section 01320. This schedule will be graphically represented, and must indicate specific dates for completion of all critical tasks and major milestones activities and their duration. The initial schedule submitted shall indicate compliance with the contract specifications and the delivery and completion times required by the RFP. The Offeror must clearly indicate any activities that are being "Fast Tracked." For this submittal the offeror should use a contract award date of 1 Aug 2004. After the Contract is award the schedule will be adjusted to reflect the actual date of award. This schedule will be the considered the Contractor's initial baseline schedule. As a minimum the schedule must include the following milestones:

Contract Award
Notice to Proceed with Design
Design Start
50% Design Submittal
90% Design Submittal
100% Design Submittal
Design Approval

Notice to Proceed with Construction (for Each Phase)
Clearing and grubbing
Rough Grading and Drainage Complete
Site Utilities Complete
Curbs, gutters and pavement Complete
Foundations Complete
Framing
Mechanical & Electrical
Interior finishes
Exterior trim
Final Grade and Topsoil
Seeding, Sodding and Landscaping
Construction complete (BOD date)
Closeout procedures (O&M, As-Built drawings)

Notice to Proceed with Demolition
Utility Demo
Unit and foundation Demo
Final Grading
Seeding
Demolition Complete
Contract Closeout

Subfactor e - Construction Closeout: The Offeror will provide a plan specifically developed for project closeout activities for individual residences or groups of residences, and how he will incorporate this system to complete the project. The project closeout schedule will be graphically represented, and must indicate the number of calendar days required for completion of required closeout tasks. These elements include:

1) Testing of equipment and systems with schedules and reports
2) Prefinal inspection date
3) Time required for correction of deficiencies
4) Anticipated transfer to the Government The plan must indicate specific dates for final project closeout tasks. These include:

a) Completion of personnel training requirements
b) Date O&M manuals and as-builts will be provided
c) Date Offeror intends to move off-site

Factor 2 - Offeror Relevant Experience. The Offeror shall provide a list of a minimum of three (3) project examples that are similar in terms of contract dollar value, and residential type projects. These examples must have been completed or be 70% complete at the time of this solicitation in the five (5) year period preceding the date of this solicitation. If the Offeror represents the combining of two or more companies, state if this project represents a joint venture of the listed parties. The offeror should address relevant experience for each project individually, as general contractor and as Architect/Engineer. Each example of a similar project will provide a general description of the project scope, location, construction cost, date of completion, solicitation (Government or private) and contract type (Design build or Design Bid build), and Owner/Architect references (names and telephone numbers). In addition, the Offeror will also provide a list of all projects, other than family housing that he has completed within the five (5) year period preceding the date of this solicitation, including Owner/Architect references.

Factor 3 - Offeror Past Performance Information: The Offer must submit a list of the five most resent projects that exceed $5 Million dollars, that were completed within the last 5 years. The Offeror will provide a "Past Performance Evaluation Questionnaire" to the point of contact and/or the person that represents the owner's opinion of the offeror's past performance for each of the five (5) projects listed. The project point of contact for the listed

references must complete the questionnaire and mail, fax, or email it directly to Mr. Earl V. Smith, Contract Specialist, at Earl.V.Smith@nwk02.usace.army.mil no later than the closing date for receipt of proposals stated in the RFP. The offeror should address past performance for each project individually, as general contractor and as Architect/Engineer. The Offeror is responsible for ensuring that the completed questionnaires are submitted by the date stated on Standard Form 1442 provided with this RFP. A copy of the questionnaire is included at the end of Section 00110.

Subfactor a. Quality of Product/Service
Subfactor b. Reports and Document submittals
Subfactor c. Problem Solving
Subfactor d. Management Process
Subfactor e. Customer Satisfaction
Subfactor f. Recommend Contractor for future work
Subfactor g. Timeliness of Performance

Factor 4 - Government Requested Betterments: The Offeror will provide a list of betterments it can provide within the specified target ceiling. The Offeror can offer choose any combination of betterments, in any order. The Offeror shall not offer any additional betterments once the cumulative dollar value of the base price schedule and the betterments exceeds the target ceiling of this project. A listing of the Government requested betterments can be found in the bid schedule provided with this RFP.

4.00 PART II - PRICE PROPOSAL AND CONTRACTUAL/FINANCIAL PROPOSAL SUBMISSION INSTRUCTIONS

The Offeror's pricing shall be provided on the bid schedule only, do not provide a list of prices with the technical portion of the proposal.

The Price Proposal for the base bid will not be scored but will be evaluated subjectively. In selecting the best overall proposal, the Government will consider the value of each proposal in terms of the quality offered for the price. The price proposal section of the proposal shall refer directly to items of the proposal schedule and shall be identified as such. The price proposal shall be evaluated for realism, reasonableness, and completeness as described in Section 00120

The Offeror shall enter a price for each item listed in the base price schedule. Betterments offered will be awarded along with the base bid provided they are within the specified target ceiling for the funds available. No additional betterments will be awarded once the cumulative dollar value of the base bid and the betterments exceed the target ceiling of this project. A listing of base bid and Government requested betterments can be found in the bid schedule provided with this RFP.

a. Pro Forma requirements. This information should be submitted in an envelope labeled "Pro Forma Requirements." Provide original and (1) copy. This category consists of the following

1) Representations and Certifications
2) Subcontracting plan
3) Proposal bonds
4) Completed Standard Form 1442.
5) Statement of Compliance

b. Price Proposal Information. Offeror shall complete all portions of the Price Proposal Schedule and furnish in a separate envelope, one original and six (6) copies.

5.00 JOINT VENTURES

Joint Ventures shall submit the following additional documentation regarding their business entities:

(a) A certified copy of their Joint Venture agreement.

(b) A detailed statement outlining the following in terms of percentages, where appropriate.

1) The relationship of the joint venture parties in terms of business ownership, capital contribution, and profit distribution or loss sharing.

2) The management approach of the joint venture in terms of who will conduct, direct, supervise and control the project and have custody and control of the assets of the joint venture and perform the duties necessary to complete the work.

3) The structure of the joint venture and decision-making responsibilities of the joint venture parties in terms of who will control the manner and method of performance of the work.

4) The bonding responsibilities of the joint venture parties.

5) Identification of the key personnel having authority to legally bind the joint venture to subcontracts and state who will provide or contract for the labor and materials for the joint venture.

6) Identification of party maintaining the joint venture bank accounts for the payment of all expenses and the deposits of all receipts, keep the books and records, and pay applicable taxes for the joint venture.

7) Identification of party furnishing the facilities, such as office supplies and telephone service.

8) Identification of party having overall control of the joint venture.

Other sections of the proposal shall identify, where appropriate, whether key personnel are employees of the individual joint venture parties and identify the party, or hired as employees of the joint venture.

If one of the joint venture parties possesses experience and/or past performance as a Federal Government contractor or as a Corps of Engineers contractor, that experience and/or past performance will be included as the experience and/or past performance of the joint venture.

SAMPLE TRANSMITTAL LETTER
AND
PAST PERFORMANCE EVALUATION QUESTIONNAIRE
FAMILY HOUSING REPLACEMENT - NEW CONSTRUCTION – W912DQ-04-R-0015

Date: _____

To: _____
_____
_____

We have listed your firm as a reference for work we have performed for you as listed below. Our firm has submitted a proposal under a project advertised by the U.S. Army Corps of Engineers, Kansas City District. In accordance with Federal Acquisition Regulations (FAR), an evaluation of our firm's past performance will be completed by the Corps of Engineers. Your candid response to the attached questionnaire will assist the evaluation team in this process.

We understand that you have a busy schedule and your participation in this evaluation is greatly appreciated. Please complete the enclosed questionnaire as thoroughly as possible. Space is provided for comments. Understand that while the responses to this questionnaire may be released to the offeror, FAR 15.306 (e)(4) prohibits the release of the names of the persons providing the responses. Complete confidentiality will be maintained. Furthermore, a questionnaire has also been sent to _____ of your organization. Only one response from each office is required. If at all possible, we suggest that you individually answer this questionnaire and then coordinate your responses with that of _____, to forge a consensus on one overall response from your organization.

Please send your completed questionnaire to the following address:

U.S. Army Engineer District, Kansas City
ATTN: CENWK-CT-C/Earl Smith
760 Federal Building
601 East 12th Street
Kansas City, Missouri 640106-2896

The questionnaires can also be e-mailed to Earl.V.Smith@nwk02.usace.army.mil or faxed to 816-426-5169

If you have questions regarding the attached questionnaire, or require assistance, please contact Mr. Earl Smith at (816) 983-3850.

PAST PERFORMANCE EVALUATION QUESTIONNAIRE

Upon completion of this form please send directly to the U.S. Army Corps of Engineers in the enclosed addressed envelope or fax to 815-426-5169, ATTN: Earl V. Smith. Do not return this form to our offices. Thank you.

1. Contractor/Name & Address (City and State):

2. Type of Contract: Fixed Price _____ Cost Reimbursement _____
Other (Specify) _____

3. Title of Project/Contract Number:
_____
_____
_____

4. Description of Work: (Attach additional pages as necessary)

5. Complexity of Work: High _____ Mid _____ Routine _____

6. Location of Work:_____

7. Date of Award: _____

8. Status: Active _____ (provide percent complete)
Complete _____ (provide completion date)

9. Name, address and telephone number of Contracting Officer's Technical Representative:

QUALITY OF PRODUCT/SERVICE:

10. Evaluate the contractor's performance in complying with contract requirements, quality achieved and overall technical expertise demonstrated.

Excellent Quality	
Above Average Quality	
Average Quality	
Below Average Quality	
Unsuccessful or Experienced Significant Quality Problems	

Remarks: _____
_____
_____
_____

11. REPORTS & DOCUMENT SUMBITTALS: To what extent were the contractor's reports and documentation accurate, complete and submitted in a timely manner?

Excellent Quality	
Above Average Quality	
Average Quality	
Below Average Quality	
Unsuccessful or Experienced Significant Quality Problems	

Remarks: _____
_____
_____
_____
_____
_____
_____
_____

12. PROBLEM SOLVING:
To what extent was the contractor able to solve contract performance problems without extensive guidance from government/owner counterparts?

Excellent	
Above Average	
Average	
Below Average	
Unsuccessful	

Remarks: _____
_____
_____
_____

13. MANAGEMENT PROCESSES:
How well did the contractor manage and coordinate subcontractors, suppliers, and the labor force?

Excellent	
Above Average	
Average	
Below Average	
Unsuccessful	

Remarks:
_____
_____
_____
_____
_____
_____
_____

CUSTOMER SATISFACTION:
14. To what extent were the end users satisfied with:

	Quality?	Cost?	Schedule?
Exceptionally Satisfied			
Highly Satisfied			
Satisfied			
Somewhat Dissatisfied			
Highly Dissatisfied			

Remarks:
_____
_____
_____
_____

RECOMMEND CONTRACTOR FOR FUTURE WORK
15. If given the opportunity, would you work with this contractor again?

Yes _____ No _____ Not Sure _____

TIMELINESS OF PERFORMANCE:
16. Adherence to schedules. To what extent did the contractor meet the task order schedules?

Completed Substantially Ahead of Schedule	
Completed on Schedule with no Time Delays	
Completed on Schedule with Minor Delays Under Extenuating Circumstances	
Experienced Significant Delays without Justification	

Remarks: _____
_____
_____
_____

OTHER REMARKS:
17. Use the space below to provide other information related to the contractor's performance. This may include the contractor's selection and management of subcontractors, flexibility in dealing with contract challenges, their overall concern for the Government's interest (if applicable), project awards received, etc.

_____
_____
_____
_____

SECTION 00120 - PROPOSAL EVALUATION AND CONTRACT AWARD

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SECTION 00120

PROPOSAL EVALUATION AND CONTRACT AWARD

1.00 INFORMAL SOURCE SELECTION PROCESS

All offers received in response to this solicitation will be evaluated in accordance with informal source selection procedures. The principal objective of this process is to select responsible offerors to be the overall Best Value to the Government, price and other factors considered (the Best Value). The Government reserves the right to consider and evaluate information regarding past performance from sources outside the proposal. The right is reserved to accept other than the lowest price offer and to reject any or all offers. Award may be made to the superior proposals, regardless of cost or price, provided that the price coefficient is determined to be reasonable. The process is designed to ensure the impartial, equitable, and comprehensive evaluation of all technically acceptable, responsible proposals received in response to this particular solicitation.

a. Source Selection Organization

The source selection organization is established as a separate organization and management chain of command whose only purpose is to accomplish the objective above. The organization consists of a Source Selection Authority (SSA) and a Source Evaluation Board (SSEB). The SSEB is comprised of separate Technical Evaluation and Price Evaluation teams. The organization is designed to ensure active ongoing involvement of appropriate contracting, technical, logistics, legal, price analysis, small business and other functional staff management expertise.

b. Source Selection Procedure

(1) The source selection procedures will begin with an initial review of proposals and continue with a technical and price evaluation conducted by the SSEB. The SSEB shall evaluate the proposals based solely on the evaluation criteria identified below in the paragraph Evaluation Factors. The results of the SSEB evaluations will be presented to the SSA, who will rank the proposals based on the Best Value to the Government, price and other factors considered. The SSA will also either make the final source selection decision or determine whether it is appropriate to engage in clarifications or communication prior to establishment of a competitive range, or to establish a competitive range and conduct discussions with those offerors that are included in the competitive range. The Government intends to award without discussions. All communication leading to establishment of the competitive range will be conducted in accordance with FAR Part 15.306b.

(2) If a competitive range is established, discussion will be conducted with offerors who are included in the competitive range. After conclusion of discussions and receipt of final revised technical proposals, the SSEB will complete the evaluation and establish final weighted technical ratings. Results of the final weighted technical ratings will be presented to the SSA. The SSA shall then rank the proposals based on the Best Value to the Government, price and other factors considered, and make the final source selection decision.

(3) The proposals received in response to this RFP will be evaluated individually to select the most advantageous proposal. To be considered acceptable, each offeror shall specifically address each of the evaluation factors listed below. Sufficient detail shall be provided, citing specific data as may be required, such that the proposal may be adequately evaluated. The proposal must show clearly that the offeror has an understanding of the work tasks required and has the capability and responsibility to accomplish the work.

(4) The Government is not responsible for information overlooked during the evaluation which is not located in the appropriate proposal section. To ensure the evaluation credit is appropriately received for proposal material submitted, do not incorporate by reference documents not contained in the proposal. References to sections of the proposal shall be by specific paragraph number (and name, if applicable), page number and section.

2.00 BASIS FOR AWARD

The Government intends to select, without discussions, the responsible offeror whose proposal conforms to the solicitation and is determined to be the Best Value to the Government in accordance with the following relationship between price and technical merit. The technical evaluation factors, when combined are equal in weight to the price proposal (see paragraphs below that describe the relative Weight of Technical Criteria and Price.) The closer the total technical evaluations are to one another, the greater the importance of the price evaluation in making the Best Value determination. The closer the price evaluations are to one another, the greater the importance of the total technical evaluations in making the Best Value determination.

3.00 EVALUATION FACTORS AND SUBFACTOR CRITERIA

Evaluation of each factor, sub factor along with their relative weighting to one another are described below.

Factor 1. Project Management Plan is twice the value of factor 2: The following sub-factors, when combined, constitute the Offeror's Project Management Plan. The Government will evaluate these sub-factors to determine the Offeror's ability to provide a plan for an integrated design-build process. **Subfactor a is the most important subfactor**. **Subfactor b is slightly more than half the value of a. Subfactor d is slightly little less than half the value of a . Subfactor e is half the value of d. Subfactor c. is rated pass or fail.**

a. Quality Control Plan: The Government will review and evaluate the QC plan for inclusion of specific quality control practices and requirements necessary for the successful completion of all phases of this project. These phases include design stages as well as construction specialties. The personnel and qualifications of the individuals performing in the Quality Control organization will also be evaluated. However, if personnel changes occur after award, these individuals may be evaluated again at the Government's discretion.

b. Proposed Staffing: The Government will evaluate and rate the resumes of Key Personnel identified in the proposal package who will be directly responsible for the day-to-day design and construction activities. Particular attention will be paid to the inclusion of the major construction subcontractors during the design process as well as the definition of the roles and responsibilities of the various subcontractors. This narrative shall not exceed five (5) pages.

c. Subcontracting: This factor is required in order for the proposal to be considered complete. However this sub factor has no relative weight and will only be given an incompliance/non compliance rating. Offerors who are not required to submit a subcontracting plan (i.e. Small Business concerns) will automatically receive an incompliance rating.

d. Design & Construction Scheduling : Adherence to Project Schedule. The Government will evaluate the Offeror's initial schedule to assess how the Offeror intends to comply with the Governments need dates in 00800 and the anticipated construction schedule and requirements of SECTION 01320. Additional consideration will be given to Offeror's who provide "fast tracking" as part of his construction schedule. The Contractor's schedule must reflect a task oriented structure for design, construction and demolition in one consolidated schedule. The schedule will be reviewed for completeness and the inclusion of the Government's required milestones. A schedule that demonstrates it is reasonable, feasible and meets the Government's need dates will be evaluated favorably. A schedule that does not demonstrate compliance with the Government's need dates, is not practical, fails to identify critical milestones, or is incomplete will rated lower or may considered non responsive.

e. Construction Closeout: The Government will review and evaluate the Offeror's closeout plan to determine the Offeror's understanding of the close out requirements of the solicitation. Particular emphasis will be placed on O&M Manual production and the training of Installation Staff and processes described and contained in SECTION 01450.

Factor 2. Offeror Relevant Experience. (is equal in value to factor 3):
Based on the information provided by the Contractor, the Government will evaluate and rate the example projects provided by the Offeror for similar construction and/or design-build projects. Examples of duplex and single-family construction projects, will receive the highest consideration. It is the Government's intention to ensure maximum participation in this solicitation. Therefore, the Government will consider as relevant experience all residential subdivision and multifamily development examples of sufficient size and scope to demonstrate the Offeror's ability to manage the work to be executed in this solicitation. Examples must indicate the Offeror's responsibility for both site development and construction of the residential units. Equal weight will be given for work performed in either the public or private sector. In addition to the three (3) examples of residential construction required, the Offeror must also provide a list of all projects, other than family housing that he has completed within the five (5) year period preceding the date of this solicitation, including Owner/Architect references. This information will be used to evaluate the overall ability of the offeror's general experience and his ability to execute construction projects of similar size and complexity. Contractor and AE relevant experience will be rated separately and combined and be given an overall rating for this factor. The Contractor's relevant experience will be weighted 4 times that of the AE.

Factor 3. Offeror Past Performance Information (is equal in value to factor 2):
The Government will evaluate the responses from the customers in the example projects identified by the Offeror and from which Past Performance Evaluation Questionnaires have been received. The Government may contact customers identified by Offeror to assure validity of the questionnaires received. The Government may also contact sources other than those provided by the Offeror to obtain information with respect to past performance. Those other sources may include, but are not limited to ACASS (Architect-Engineer Contract Administration Support System), CCASS (Construction Contractor Appraisal Support System), telephone interviews, and personal knowledge of contractor performance capability obtained from Government personnel. The following subfactors will be used by the Government to evaluate the General Contractor and the Architect/Engineer individually. Contractor and AE past performance will be rated separately and combined and be given an overall rating for this factor. The Contractor's past performance will be weighted 4 times that of the AE.

Each of the following sub factors is weighted equally.

a. Quality of Product/Service
b. Reports and Document submittals
c. Problem Solving
d. Management Process
e. Customer Satisfaction
f. Recommend Contractor for future work
g. Timeliness of Performance

Evaluation Methodology. Each individual of the SSEB will consider all information provided in the proposal. Once these individual analyses are completed, the team will meet and determine a rating for each of the evaluation factors for Offeror Performance Capability by consensus decision. After each of the Factors for each of the proposals are rated, the team will develop, again by consensus, a final overall rating for Offeror Performance Capability.

Factor 4. Offeror's Proposed Betterments: Factor 4 is equal to Factor 2. The Government will evaluate the Offeror's proposed betterments that are within the specified target ceiling (see price schedule of this RFP). More betterments will be considered more favorably than fewer betterments. In the event of a tie, betterments with a higher relative weighting will be considered more favorably than betterments with a lower relative weighting. Betterments are listed in the order of their importance.

a. Sod upgrade	**(a. is the most important subfactor)**
b. Ceiling Fans	**(b. is equal to a.)**
c. Whole House attic fan	**(c. is equal to a.)**
d. Flooring upgrades	**(d. is slightly less than c.)**
e. Brick Veneer	**(e. is equal to d.)**
f. Ceiling Height Upgrade	**(f. is equal to d.)**
g. Water Loop	**(g. is half the value of f.)**
h. Ground Source Heat Pumps	**(h. is half the value of f.)**

5.00 Price. The Price Proposal will be evaluated separately from the Technical Proposal and is equal in weight to all items of the Technical Proposal. The following items will be considered in this evaluation.

a. Completeness. All cost information required by the Request for Proposal (RFP) has been submitted.

b. Reasonableness. The Government will review the prices submitted for reasonableness. The price must be reasonable, and must be supported by valid assumptions and estimating techniques.

c. Realism. The price is compatible with the solicitation's scope and is neither excessive nor insufficient for the effort required by this RFP.

6.00 RELATIVE WEIGHTING OF FACTORS AND SUBFACTORS. Technical (Part 1) is Equal to Price (Part 2). Factor 4 is twice as important as Factor 2. Technical Factors 2, 3 and 4 are equal to each other**.**

a. Factor 1 is twice the weight of Factor 2. Subfactor a is the most important subfactor**.** Subfactor b is slightly more than half the value of a. Subfactor d is slightly little less than half the value of a . Subfactor e is half the value of d. Subfactor c. is rated pass or fail.

b. Factor 2 is equal to Factor 3. The Contractor and AE will be rated separately, then the Contractor and AE experience shall be combined. Construction contractor is 4 times as important as AE.

c. Factor 3 is equal to Factor 4 . All subfactors are equal to each other. The Contractor and AE will be rated separately, then the Contractor and AE experience shall be combined. Construction contractor is 4 times as important as the AE

d. Factor 4 is equal to Factor 2. In the event of a tie, betterments with a higher relative weighting will be considered more favorably than betterments with a lower relative weighting. Betterment subfactors are listed in the order of their importance. Each of the subfactors a, b or c are equal to each other and twice as important as d. Each of the Subfactors d, e and f are slightly less important than factor a and equal to each other. Each Subfactor d, e or f is twice as important as g or h.

7.00 DEBRIEFING OFFERORS

In accordance with FAR 15.505 Preaward Debriefing of Offerors, and FAR 15.506 Postaward Debriefing of Offerors, the offer should be aware of the following.

The Offeror may request a preaward debriefing by submitting a written request for debriefing to the Contracting Officer within 3 days after receipt of the notice of exclusion from competition. Offerors will be provided with an opportunity to address any negative past performance information on which the offeror has not previously had such an opportunity.

If the offeror does not submit a timely request the offeror need not be given either a preaward or a postaward debriefing. Offerors are entitled to no more than one debriefing for each proposal.

--- End of Section ---

SECTION 00600 – REPRESENTATIONS & CERTIFICATIONS

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SECTION 00600 - REPRESENTATIONS & CERTIFICATIONS

52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

(a) The offeror certifies that --

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to –

(i) Those prices,

(ii) The intention to submit an offer, or

(iii) The methods of factors used to calculate the prices offered:

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory --

(1) Is the person in the offeror's organization responsible for determining the prices offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provison _____ (insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of clause)

52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this Certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after

December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(iv) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(End of provision)

52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)

(a) Definitions.

“Common parent,” as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

“Taxpayer Identification Number (TIN),” as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) Taxpayer Identification Number (TIN).

___ TIN:._____

___ TIN has been applied for.

___ TIN is not required because:

___ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

___ Offeror is an agency or instrumentality of a foreign government;

___ Offeror is an agency or instrumentality of the Federal Government.

(e) Type of organization.

___ Sole proprietorship;

___ Partnership;

___ Corporate entity (not tax-exempt);

___ Corporate entity (tax-exempt);

___ Government entity (Federal, State, or local);

___ Foreign government;

___ International organization per 26 CFR 1.6049-4;

___ Other _____

(f) Common parent.

___ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

___ Name and TIN of common parent:

Name _____

TIN _____

(End of provision)

52.204-5 WOMEN-OWNED BUSINESS (OTHER THAN SMALL BUSINESS) (MAY 1999)

(a) Definition. Women-owned business concern, as used in this provision, means a concern that is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) Representation. [Complete only if the offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of this solicitation.] The offeror represents that it ( ) is a women-owned business concern.

(End of provision)

52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (DEC 2001)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that-

(i) The Offeror and/or any of its Principals-

(A) Are ( ) are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have ( ) have not ( ), within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are ( ) are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(ii) The Offeror has ( ) has not ( ), within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

This Certification Concerns a Matter Within the Jurisdiction of an Agency of the United States and the Making of a False, Fictitious, or Fraudulent Certification May Render the Maker Subject to Prosecution Under Section 1001, Title 18, United States Code.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

52.215-6 PLACE OF PERFORMANCE (OCT 1997)

(a) The offeror or respondent, in the performance of any contract resulting from this solicitation, ( ) intends, ( ) does not intend (check applicable block) to use one or more plants or facilities located at a different address from the address of the offeror or respondent as indicated in this proposal or response to request for information.

(b) If the offeror or respondent checks “intends” in paragraph (a) of this provision, it shall insert in the following spaces the required information:

Place of Performance(Street Address, City, State, County, Zip Code)	Name and Address of Owner and Operator of the Plant or Facility if Other Than Offeror or Respondent

(End of provision)

52.219-1 SMALL BUSINESS PROGRAM REPRESENTATIONS (APR 2002) - ALTERNATE I (APR 2002)

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is 23321.

(2) The small business size standard is 28.5 (insert size standard).

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents as part of its offer that it ( ) is, ( ) is not a small business concern.

(2) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, for general statistical purposes, that it ( ) is, ( ) is not a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a women-owned small business concern.

(4) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a veteran-owned small business concern.

(5) (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a service-disabled veteran-owned small business concern.

(6) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents, as part of its offer, that--

(i) It ( ) is, ( ) is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It ( ) is, ( ) is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture:_____.) Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(7) (Complete if offeror represented itself as disadvantaged in paragraph (b)(2) of this provision.) The offeror shall check the category in which its ownership falls:

____ Black American.

____ Hispanic American.

____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians).

____ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).

____ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).

____ Individual/concern, other than one of the preceding.

(c) Definitions. As used in this provision--

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

(1) That is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; or

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (OCT 2000)

(a) Definition. "Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the North American Industry Classification System (NAICS) code assigned to a contracting opportunity.

(b) [Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.] The Offeror * is, * is not an emerging small business.

(c) [Complete only if the Offeror is a small business or an emerging small business, indicating its size range.] Offeror's number of employees for the past 12 months [check this column if size standard stated in solicitation is expressed in terms of number of employees] or Offeror's average annual gross revenue for the last 3 fiscal years [check this column if size standard stated in solicitation is expressed in terms of annual receipts]. [Check one of the following.]

No. of Employees	Avg. Annual Gross Revenues
____ 50 or fewer	____ $1 million or less
____ 51 -- 100	____ $1,000,001 -- $2 million
____ 101 -- 250	____ $2,000,001 -- $3.5 million
____ 251 -- 500	____ $3,500,001 -- $5 million
____ 501 -- 750	____ $5,000,001 -- $10 million
____ 751 -- 1,000	____ $10,000,001 -- $17 million
____ Over 1,000	____ Over $17 million

(End of Provision)

52.219-21 SMALL BUSINESS SIZE REPRESENTATION FOR TARGETED INDUSTRY CATEGORIES UNDER THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (MAY 1999)

[Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.]

Offeror's number of employees for the past 12 months [check this column if size standard stated in solicitation is expressed in terms of number of employees] or Offeror's average annual gross revenue for the last 3 fiscal years [check this column if size standard stated in solicitation is expressed in terms of annual receipts]. [Check one of the following.]

No. of Employees	Avg. Annual Gross Revenues
___ 50 or fewer	___ $1 million or less
___ 51 - 100	___ $1,000,001 - $2 million
___ 101 - 250	___ $2,000,001 - $3.5 million
___ 251 - 500	___ $3,500,001 - $5 million
___ 501 - 750	___ $5,000,001 - $10 million
___ 751 - 1,000	___ $10,000,001 - $17 million
___ Over 1,000	___ Over $17 million

(End of provision)

52.219-22 SMALL DISADVANTAGED BUSINESS STATUS (OCT 1999)

(a) General. This provision is used to assess an offeror's small disadvantaged business status for the purpose of obtaining a benefit on this solicitation. Status as a small business and status as a small disadvantaged business for general statistical purposes is covered by the provision at FAR 52.219-1, Small Business Program Representation.

(b) Representations.

(1) General. The offeror represents, as part of its offer, that it is a small business under the size standard applicable to this acquisition; and either--

___ (i) It has received certification by the Small Business Administration as a small disadvantaged business concern consistent with 13 CFR 124, Subpart B; and

(A) No material change in disadvantaged ownership and control has occurred since its certification;

(B) Where the concern is owned by one or more disadvantaged individuals, the net worth of each individual upon whom the certification is based does not exceed $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(C) It is identified, on the date of this representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration(PRO0Net); or

___ (ii) It has submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a decision on that application is pending, and that no material change in disadvantaged ownership and control has occurred since its application was submitted.

(2)___ For Joint Ventures. The offeror represents, as part of its offer, that it is a joint venture that complies with the requirements at 13 CFR 124.1002(f) and that the representation in paragraph (b)(1) of this provision is accurate for the small disadvantaged business concern that is participating in the joint venture. [The offeror shall enter the name of the small disadvantaged business concern that is participating in the joint venture: _____.]

(c) Penalties and Remedies. Anyone who misrepresents any aspects of the disadvantaged status of a concern for the purposes of securing a contract or subcontract shall:

(1) Be punished by imposition of a fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under the authority of the Small Business Act.

(End of provision)

52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (AUG 2003)

(a) Executive Order 13148, of April 21, 2000, Greening the Government through Leadership in Environmental Management, requires submission of this certification as a prerequisite for contract award.

(b) By signing this offer, the offeror certifies that--

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)

( ) (i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed in 40 CFR 372.65;

( ) (ii) The facility does not have 10 or more full-time employees as specified in section 313.(b)(1)(A) of EPCRA 42 U.S.C. 11023(b)(1)(A);

( ) (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

( ) (iv) The facility does not fall within the following Standard Industrial Classification (SIC) codes or their corresponding North American Industry Classification System sectors:

(A) Major group code 10 (except 1011, 1081, and 1094.

(B) Major group code 12 (except 1241).

(C) Major group codes 20 through 39.

(D) Industry code 4911, 4931, or 4939 (limited to facilities that combust coal and/or oil for the purpose of generating power for distribution in commerce).

(E) Industry code 4953 (limited to facilities regulated under the Resource Conservation and Recovery Act, Subtitle C (42 U.S.C. 6921, et seq.), 5169, 5171, or 7389 (limited to facilities primarily engaged in solvent recovery services on a contract or fee basis); or

( ) (v) The facility is not located within the United States or its outlying areas.

(End of clause)

52.226-2 HISTORICALLY BLACK COLLEGE OR UNIVERSITY AND MINORITY INSTITUTION REPRESENTATION (MAY 2001)

(a) Definitions. As used in this provision--

Historically black college or university means an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. For the Department of Defense, the National Aeronautics and Space Administration, and the Coast Guard, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

Minority institution means an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1067k, including a Hispanic-serving institution of higher education, as defined in Section 316(b)(1) of the Act (20 U.S.C. 1101a)).

(b) Representation. The offeror represents that it--

( ) is ( ) is not a historically black college or university;

( ) is ( ) is not a minority institution.

(End of provision)

52.230-1 COST ACCOUNTING STANDARDS NOTICES AND CERTIFICATION (JUN 2000)

Note: This notice does not apply to small businesses or foreign governments. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I. DISCLOSURE STATEMENT--COST ACCOUNTING PRACTICES AND CERTIFICATION

(a) Any contract in excess of $500,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.

(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

CAUTION: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.

(c) Check the appropriate box below:

(1) Certificate of Concurrent Submission of Disclosure Statement.

The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows: (i) original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable, and (ii) one copy to the cognizant Federal auditor.

(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

(2) Certificate of Previously Submitted Disclosure Statement.

The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

(3) Certificate of Monetary Exemption.

The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling more than $50 million (of which at least one award exceeded $1 million) in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

(4) Certificate of Interim Exemption.

The offeror hereby certifies that (i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and (ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

CAUTION: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of $50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. COST ACCOUNTING STANDARDS--ELIGIBILITY FOR MODIFIED CONTRACT COVERAGE

If the offeror is eligible to use the modified provisions of 48 CFR 9903.201-2(b) and elects to do so, the offeror shall indicate by checking the box below. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

( ) The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than $50 million in awards of CAS-covered prime contracts and subcontracts. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

CAUTION: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of $50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of $25 million or more.

III. ADDITIONAL COST ACCOUNTING STANDARDS APPLICABLE TO EXISTING CONTRACTS

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

( ) YES ( ) NO

(End of clause)

252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) "Definitions."

As used in this provision --

(a) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for such acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means --

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtness of a firm.

(b) "Prohibition on award."

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) "Disclosure."

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclosure such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include --

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)

252.225-7000 BUY AMERICAN ACT--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (APR 2003)
(a) Definitions. Domestic end product, foreign end product, qualifying country, and qualifying country end product have the meanings given in the Buy American Act and Balance of Payments Program clause of this solicitation.

(b) Evaluation. The Government--

(1) Will evaluate offers in accordance with the policies and procedures of Part 225 of the Defense Federal Acquisition Regulation Supplement; and

(2) Will evaluate offers of qualifying country end products without regard to the restrictions of the Buy American Act or the Balance of Payments Program.

(c) Certifications and identification of country of origin.

(1) For all line items subject to the Buy American Act and Balance of Payments Program clause of this solicitation, the offeror certifies that--

(i) Each end product, except those listed in paragraph (c)(2) or (3) of this provision, is a domestic end product; and

(ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.

(2) The offeror certifies that the following end products are qualifying country end products:

(Line Item Number Country of Origin)

(Country of Origin)

(3) The following end products are other foreign end products:

(Line Item Number)

(Country of Origin) (If known)

(End of provision)

252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term supplies is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation. The Offeror represents that it:

____ (1) Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

____ (2) Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

(End of provision)

NOTICE TO OFFERORS

If your firm is a large business and your bid exceeds $500,000 or more for services or $1,000,000 for construction, your attention is directed to the following provisions contained in the solicitation:

52.219-8, Utilization of Small, Small Disadvantaged and Women-Owned Business Concerns (Alternate I)
52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (Alternate I)
52.219-16, Liquidated Damages - Small Business Subcontracting Plan
52.226-1, Utilization of Indian Organizations and Indian-Owned Economic Enterprises

For your information, the United Army Corps of Engineers considers the following goals reasonable and achievable for fiscal year and during the performance of the resultant contract.

a. 61.4% of planned subcontracting dollars will be placed with all small business concerns.

b. 9.1% of planned subcontracting dollars will be placed with those small business concerns owned and controlled by socially and economically disadvantaged individuals.

c. 5% of planned subcontracting dollars will be placed with those small business concerns owned and controlled by women.

d. 3% of planned subcontracting dollars will be placed with those small business concerns owned and controlled by service disabled veterans.

e. There are no established goals for planned subcontracting dollars placed with those small business concerns owned and controlled by certified Hubzone concerns, small business concerns owned and controlled by veterans, and Historic Black Colleges and/or Minority Institutions, however, subcontracting with these concerns is highly encouraged.

Goals included in any proposed subcontracting plan should be at least equal to those indicated above. If lesser goals are proposed, you must substantiate how the proposed plan represents the firm best effort to comply with the terms and conditions of the solicitation. Offerors are highly encouraged to become familiarize with the intent of the solicitation provisions and the elements of the subcontracting plan.

The subcontracting plan must contain, at a minimum, the elements set forth in solicitation provision 52.219-9. Proposed plans will be reviewed to ensure the plan represents the firm's best efforts to maximize subcontracting opportunities for small, small disadvantaged and women-owned businesses. Subcontracting plans require Contracting Officer approval prior to contract award.

Should the selected offeror fail to submit an acceptable subcontracting plan within the time limit prescribed by the Contracting Officer, the offeror will be considered ineligible for award. The approved subcontracting plan (to include goals) will become a material part of the contract. An example of a format of a subcontracting plan is attached for your information. The attached ***plan is an example only*** and should not be construed as the only acceptable subcontracting plan format. Any format will be acceptable provided the plan addresses each element as required by the Federal Acquisition Regulations and its supplements.

Should you have any questions or need assistance in developing your plan, please contact the assigned Contract Specialist or the District's Deputy for Small Business at 816-983-3927 or fax your inquiries to 816-426-2979.

SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED
SMALL BUSINESS SUBCONTRACTING PLAN
EXAMPLE

DATE: _____

CONTRACTOR: _____

ADDRESS: _____

PHONE NO: _____

PROJECT TITLE: _____

SOLICITATION NO: _____

CONTRACT NO: _____

1. In accordance with the contract clauses at 52.219-8 and 52.219-9, *(name of contractor)* submits the following Subcontracting Plan for Small, Small Disadvantaged, and Women-owned Business Concerns.

2. Subcontracting goals for this contract:

a. Total contract amount is $_____.

b. Total dollars planned to be subcontracted (to all types of businesses): $_____.

Type of Subcontractor	Amount Planned to be Subcontracted	Percentage of Subcontracted Dollars
Large Business		%
Small Businesses		%
- Small Disadvantaged*		%
- Small Women-Owned		%
- Small Service Disabled Veterans Owned		%
- Small Veteran Owned		%
HubZone Concern		%
Historical Black College and Minority Institution		%
Total		100%

***NOTE:** <u>Women-owned</u> businesses are not considered a small disadvantaged business. Do not include subcontract awards to women-owned businesses in your calculations unless the firm meets the definition of a small disadvantaged business.*

3. The principal items or areas we will subcontract under this contract are *(NOTE: **Construction contractors remember to include materials/supplies** when developing plan. Also, list each subcontracted task by Division and Section number):*

_____

a. Of the items or areas stated in 3; we plan to subcontract the following to Small Businesses:

_____

b. Of the items or areas stated in 3.a; we plan to subcontract the following to Small Disadvantaged Businesses:

_____

c. Of the items or areas stated in 3.a; we plan to subcontract the following to Small Women-Owned Businesses:

_____

d. Of the items or areas stated in 3.a; we plan to subcontract the following to Small Service Disabled Veterans-Owned Businesses:

_____

e. Of the items or areas stated in 3.a; we plan to subcontract the following to Small Veteran-Owned Businesses:

_____

f. Of the items or areas stated in 3; we plan to subcontract the following to Hub Zone concerns:

_____

g. Of the items or areas stated in 3; we plan to subcontract the following to Historically Black Colleges and Minority Institutions:

_____

*****NOTE: SEE LAST PAGE IF THIS SOLICITATION HAS OPTIONS** (delete this statement from your plan)***

4. Provide a description of the method your firm used to develop the subcontracting goals in paragraph 2:

_____

_____

_____

_____

_____

5. Indirect costs were ( ) were not ( ) used in establishing subcontracting goals. ***If indirect costs are included in your goals, furnish a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns (ii) small disadvantaged business concerns and (iii) women-owned.***

6. The following individual will administer this Subcontracting Plan on behalf of (name of contractor):

Name: Title:

Address:

Telephone:

The aforementioned individual's specific duties will include, but is not limited to:

a. Developing and maintaining source lists of small, small disadvantaged and women-owned small business concerns. Sources used are the Small Business Administration's Procurement Automated Source System (PASS), the National Minority Purchasing Council Vendor Information Service, Minority Business Development Agency, US Department of Commerce, Local Minority Business Development Centers, Economic Development Centers, and National Center for American Indian Enterprise Development.

b. Assuring the inclusion of small, small disadvantaged, and women-owned small business concerns in all solicitations for products or services which they are capable of providing; and ensuring that all solicitations are structured to permit the maximum possible participation by small, small disadvantaged and women-owned small business concerns.

c. Establishing and maintaining records of all subcontract awards to ensure appropriate documentation of non-selection of bids submitted by a small, small disadvantaged business, or women-owned small business concerns.

d. Preparing and submitting the Subcontracting Report for Individual Contracts (SF 294) and the Summary Subcontract Report (SF 295) in accordance with instructions provided, and coordinating and preparing for all compliance reviews by Federal agencies.

e. Promoting activities necessary to further the intent of the subcontracting plan. Activities include motivational training of purchasing personnel; attendance at workshops, seminars and trade fairs conducted by or on behalf of small business and/or small disadvantaged and/or women-owned small business concerns; and general cooperation with members of the small, small disadvantaged and women-owned small business concerns or their representatives.

7. The following steps will be taken to ensure that small, small disadvantaged, and women-owned small business concerns receive notice of and have an equitable opportunity to compete for intended awards of subcontracts and/or purchase orders for the products and/or services describe in paragraph 4 above:

a. Sources will be requested through SBA's PASS system, business development organizations, minority and small business trade associations and at small, minority and women-owned small business procurement conferences; sources will be contacted; and bidding materials will be provided to all responding parties expressing an interest.

b. The firm will conduct and maintain internal motivational training to guide and encourage purchasing personnel to maintain source lists and guides to small, small disadvantaged, and women-owned small business concerns. Purchasing activities will be monitored to ensure sufficient time is allowed for interested offerors to prepare bids and to ensure continuous compliance with the approved Subcontracting Plan.

8. *[Name of contractor]* agrees that the clause entitled "Utilization of Small, Small Disadvantaged and Women-Owned Business Concerns" will be included in all subcontracts that offer further subcontracting opportunities. All subcontractors, except small business concerns, who receive subcontracts in excess of $500,000 ($1,000,000 in the case of construction) will be required to adopt a plan similar to this one. Such plans will be reviewed to assure that all minimum requirements of an acceptable subcontracting plan have been satisfied.

The acceptability of proposed goals shall be determined on a cases-by-case basis depending on the supplies/services involved, the availability of potential small, small disadvantaged, and women-owned subcontractors, and prior experience. Once approved and implemented, plans will be monitored through the submission of periodic reports or, as time and availability of funds permit, periodic visits to subcontractors facilities to review applicable records and subcontracting program progress.

9. The Firm agrees to submit periodic reports and cooperate in any studies or surveys required by the Contracting Activity or Small Business Administration to determine the extent of the firm compliance with the subcontracting plan.

10. *(Name of Contractor)* agrees to maintain at least the following types of records to document compliance with the Subcontracting Plan:

a. The names of all organizations, agencies, and associations contacted for small, small disadvantaged, and women-owned small business sources, along with records of attendance at conference, seminars and trade fairs where additional sources were developed.

b. Source lists, guides, and other data identifying small business concerns, small disadvantaged business concerns and women-owned small business concerns.

c. Records of subcontracts award in excess of $100,000 will demonstrate how small business concerns, small disadvantaged business concerns and women-owned business concerns were solicited or provide an explanation as to why these business concerns were not considered for subcontracting opportunities.

d. Records of subcontract award data to include subcontractor's name and address, to be kept on a contract-by-contract basis.

e. Minutes of internal motivational and training meetings held for the guidance and encouragement of purchasing personnel, and records of all monitoring activities performed for compliance evaluation.

f. Copies of SF 294 and SF 295 showing date and place of filing and copies of all other reports or results of reviews conducted by the contracting agency or other interested agencies of the Federal government to monitor our compliance with this Subcontracting Plan.

11. *(Name of Contractor)* will submit a SF 295, Summary Subcontract Report, on Corps of Engineers projects only. The SF 295 shall be completed and distributed in accordance with the Corps of engineers Supplemental Instructions. *(Name of Contractor)* will not report Corps of Engineers projects through any other Agency unless authorized by the Contracting Officer.

Contractor's Signature:_____

Typed Name:_____

Title:_____

Date:_____

This Plan is Accepted By:

_____
Contracting Officer

Date:_____

NOTE: *If this solicitation has options, the plan must contain separate goals for* ***each*** *option. EXAMPLE:*

1. Option #_____

a. Total contract amount is $_____.

b. Total dollars planned to be subcontracted (to all types of businesses): $_____.

Type of Subcontractor	Amount Planned to be Subcontracted	Percentage of Subcontracted Dollars
Large Business		%
Small Businesses		%
- Small Disadvantaged*		%
- Small Women-Owned		%
- Small Service Disabled Veterans Owned		%
- Small Veteran Owned		%
HubZone Concern		%
Historical Black College and Minority Institution		%
Total		100%

SECTION 00700 – CONTRACT CLAUSES

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252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

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SECTION 00700 - CONTRACT CLAUSES

52.202-1 DEFINITIONS (MAY 2001) --ALTERNATE I (MAR 2001)

(a) Agency head or head of the agency means the Secretary (Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, unless otherwise indicated, including any deputy or assistant chief official of the executive agency.

(b) Commercial component means any component that is a commercial item.

(c) Component means any item supplied to the Government as part of an end item or of another component, except that for use in 52.225-9, and 52.225-11 see the definitions in 52.225-9(a) and 52.225-11(a).

(d) Contracting Officer means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(e) Nondevelopmental item means--

(1) Any previously developed item of supply used exclusively for governmental purposes by a Federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;

(2) Any item described in paragraph (f)(1) of this definition that requires only minor modification or modifications of a type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or

(3) Any item of supply being produced that does not meet the requirements of paragraph (f)(1) or (f)(2) solely because the item is not yet in use.

(f) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(g) Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

(End of clause)

52.203-3 GRATUITIES (APR 1984)

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

(End of clause)

52.203-7 ANTI-KICKBACK PROCEDURES. (JUL 1995)

(a) Definitions.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"Prime Contractor," as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from -

(1) Providing or attempting to provide or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

(c)(1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.

(2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

(3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.

(4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold, from sums owed a subcontractor under the prime contract, the amount of any kickback. The Contracting Officer may order the monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

(5) The Contractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract which exceed $100,000.

52.203-8 CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

(a) If the Government receives information that a contractor or a person has engaged in conduct constituting a violation of subsection (a), (b), (c), or (d) of Section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423) (the Act), as amended by section 4304 of the 1996 National Defense Authorization Act for Fiscal Year 1996 (Pub. L. 104-106), the Government may--

(1) Cancel the solicitation, if the contract has not yet been awarded or issued; or

(2) Rescind the contract with respect to which--

(i) The Contractor or someone acting for the Contractor has been convicted for an offense where the conduct constitutes a violation of subsection 27(a) or (b) of the Act for the purpose of either--

(A) Exchanging the information covered by such subsections for anything of value; or

(B) Obtaining or giving anyone a competitive advantage in the award of a Federal agency procurement contract; or

(ii) The head of the contracting activity has determined, based upon a preponderance of the evidence, that the Contractor or someone acting for the Contractor has engaged in conduct constituting an offense punishable under subsections 27(e)(1) of the Act.

(b) If the Government rescinds the contract under paragraph (a) of this clause, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.

(c) The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law, regulation, or under this contract.

(End of clause)

52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

(a) The Government, at its election, may reduce the price of a fixed-price type contract and the total cost and fee under a cost-type contract by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or designee determines that there was a violation of subsection 27 (a), (b), or (c) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), as implemented in section 3.104 of the Federal Acquisition Regulation.

(b) The price or fee reduction referred to in paragraph (a) of this clause shall be--

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award, notwithstanding any minimum fee or "fee floor" specified in the contract;

(3) For cost-plus-award-fee contracts--

(i) The base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 30 percent of the amount of each award fee otherwise payable to the Contractor for each award fee evaluation period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may--

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award; or

(ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract. The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.

(5) For firm-fixed-price contracts, by 10 percent of the initial contract price or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award.

(c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(d) In addition to the remedies in paragraphs (a) and (c) of this clause, the Government may terminate this contract for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 2003)

(a) Definitions.

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

(1) The awarding of any Federal contract.

(2) The making of any Federal grant.

(3) The making of any Federal loan.

(4) The entering into of any cooperative agreement.

(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

(1) An individual who is appointed to a position in the Government under Title 5, United States Code, including a position under a temporary appointment.

(2) A member of the uniformed services, as defined in subsection 101(3),Title 37, United States Code.

(3) A special Government employee, as defined in section 202, Title 18, United States Code.

(4) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, Title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause, means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

State, as used in this clause, means a State of the United States, the District of Columbia, or an outlying area of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibitions.

(1) Section 1352 of Title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an

employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) Agency and legislative liaison by own employees.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action--

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95-507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) Professional and technical services.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of--

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or

negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(c) Disclosure.

(1) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using non appropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.

(2) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--

(i) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or

(iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

(3) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any subcontract exceeding $100,000 under the Federal contract.

(4) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.

(d) Agreement. The Contractor agrees not to make any payment prohibited by this clause.

(e) Penalties.

(1) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(2) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.

(f) Cost allowability. Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

(End of clause)

52.204-4 PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (AUG 2000)

(a) Definitions. As used in this clause--

“Postconsumer material” means a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. Postconsumer material is a part of the broader category of “recovered material.” For paper and paper products, postconsumer material means “postconsumer fiber” defined by the U.S. Environmental Protection Agency (EPA) as--

(1) Paper, paperboard, and fibrous materials from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards; and used cordage; or

(2) All paper, paperboard, and fibrous materials that enter and are collected from municipal solid waste; but not

(3) Fiber derived from printers' over-runs, converters' scrap, and over-issue publications.

“Printed or copied double-sided” means printing or reproducing a document so that information is on both sides of a sheet of paper.

“Recovered material,” for paper and paper products, is defined by EPA in its Comprehensive Procurement Guideline as “recovered fiber” and means the following materials:

(1) Postconsumer fiber; and

(2) Manufacturing wastes such as--

(i) Dry paper and paperboard waste generated after completion of the papermaking process (that is, those manufacturing operations up to and including the cutting and trimming of the paper machine reel into smaller rolls or rough sheets) including: envelope cuttings, bindery trimmings, and other paper and paperboard waste resulting from printing, cutting, forming, and other converting operations; bag, box, and carton manufacturing wastes; and butt rolls, mill wrappers, and rejected unused stock; and

(ii) Repulped finished paper and paperboard from obsolete inventories of paper and paperboard manufacturers, merchants, wholesalers, dealers, printers, converters, or others.

(b) In accordance with Section 101 of Executive Order 13101 of September 14, 1998, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, the Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed or copied double-sided on recycled paper that meet minimum content standards specified in Section 505 of Executive Order 13101, when not using electronic commerce methods to submit information or data to the Government.

(c) If the Contractor cannot purchase high-speed copier paper, offset paper, forms bond, computer printout paper, carbonless paper, file folders, white wove envelopes, writing and office paper, book paper, cotton fiber paper, and cover stock meeting the 30 percent postconsumer material standard for use in submitting paper documents to the Government, it should use paper containing no less than 20 percent postconsumer material. This lesser standard should be used only when paper meeting the 30 percent postconsumer material standard is not obtainable at a reasonable price or does not meet reasonable performance standards.

(End of clause)

52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995)

(a) The Government suspends or debars Contractors to protect the Government's interests. The Contractor shall not enter into any subcontract in excess of the $25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

(b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed $25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principles, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

(c) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before

entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:

(1) The name of the subcontractor.

(2) The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of clause)

52.211-13 TIME EXTENSIONS (SEP 2000)

Time extensions for contract changes will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements related to the changed work and that the remaining contract completion dates for all other portions of the work will not be altered. The change order also may provide an equitable readjustment of liquidated damages under the new completion schedule.

(End of clause)

52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgement of the Contracting Officer, is justified.

52.215-2 AUDIT AND RECORDS--NEGOTIATION (JUN 1999)

(a) As used in this clause, "records" includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

(b) Examination of costs. If this is a cost-reimbursement, incentive, time-and-materials, labor-hour, or price redeterminable contract, or any combination of these, the Contractor shall maintain and the Contracting Officer, or an authorized representative of the Contracting Officer, shall have the right to examine and audit all records and

other evidence sufficient to reflect properly all costs claimed to have been incurred or anticipated to be incurred directly or indirectly in performance of this contract. This right of examination shall include inspection at all reasonable times of the Contractor's plants, or parts of them, engaged in performing the contract.

(c) Cost or pricing data. If the Contractor has been required to submit cost or pricing data in connection with any pricing action relating to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor's records, including computations and projections, related to--

(1) The proposal for the contract, subcontract, or modification;

(2) The discussions conducted on the proposal(s), including those related to negotiating;

(3) Pricing of the contract, subcontract, or modification; or

(4) Performance of the contract, subcontract or modification.

(d) Comptroller General--(1) The Comptroller General of the United States, or an authorized representative, shall have access to and the right to examine any of the Contractor's directly pertinent records involving transactions related to this contract or a subcontract hereunder.

(2) This paragraph may not be construed to require the Contractor or subcontractor to create or maintain any record that the Contractor or subcontractor does not maintain in the ordinary course of business or pursuant to a provision of law.

(e) Reports. If the Contractor is required to furnish cost, funding, or performance reports, the Contracting Officer or an authorized representative of the Contracting Officer shall have the right to examine and audit the supporting records and materials, for the purpose of evaluating (1) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports and (2) the data reported.

(f) Availability. The Contractor shall make available at its office at all reasonable times the records, materials, and other evidence described in paragraphs (a), (b), (c), (d), and (e) of this clause, for examination, audit, or reproduction, until 3 years after final payment under this contract or for any shorter period specified in Subpart 4.7, Contractor Records Retention, of the Federal Acquisition Regulation (FAR), or for any longer period required by statute or by other clauses of this contract. In addition--

(1) If this contract is completely or partially terminated, the Contractor shall make available the records relating to the work terminated until 3 years after any resulting final termination settlement; and

(2) The Contractor shall make available records relating to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to this contract until such appeals, litigation, or claims are finally resolved.

(g) The Contractor shall insert a clause containing all the terms of this clause, including this paragraph (g), in all subcontracts under this contract that exceed the simplified acquisition threshold, and--

(1) That are cost-reimbursement, incentive, time-and-materials, labor-hour, or price-redeterminable type or any

combination of these;

(2) For which cost or pricing data are required; or

(3) That require the subcontractor to furnish reports as discussed in paragraph (e) of this clause.

The clause may be altered only as necessary to identify properly the contracting parties and the Contracting Officer under the Government prime contract.

(End of clause)

52.215-10 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA (OCT 1997)

(a) If any price, including profit or fee, negotiated in connection with this contract, or any cost reimbursable under this contract, was increased by any significant amount because--

(1) The Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data;

(2) A subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(3) Any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the contract shall be modified to reflect the reduction.

(b) Any reduction in the contract price under paragraph (a) of this clause due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which--

(1) The actual subcontract; or

(2) The actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(c)(1) If the Contracting Officer determines under paragraph (a) of this clause that a price or cost reduction should be made, the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted.

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer.

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract.

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2)(i) Except as prohibited by subdivision (c)(2)(ii) of this clause, an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if--

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the “as of” date specified on its Certificate of Current Cost or Pricing Data, and that the data were not submitted before such date.

(ii) An offset shall not be allowed if--

(A) The understated data were known by the Contractor to be understated before the “as of” date specified on its Certificate of Current Cost or Pricing Data; or

(B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data had been submitted before the “as of” date specified on its Certificate of Current Cost or Pricing Data.

(d) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid--

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621(a)(2); and

A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data that were incomplete, inaccurate, or noncurrent.

(End of clause)

52.215-12 SUBCONTRACTOR COST OR PRICING DATA (OCT 1997)

(a) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4, on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modification involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1 applies.

(b) The Contractor shall require the subcontractor to certify in substantially the form prescribed in FAR 15.406-2 that, to the best of its knowledge and belief, the data submitted under paragraph (a) of this clause were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(c) In each subcontract that exceeds the threshold for submission of cost or pricing data at FAR 15.403-4, when entered into, the Contractor shall insert either--

(1) The substance of this clause, including this paragraph (c), if paragraph (a) of this clause requires submission of cost or pricing data for the subcontract; or

(2) The substance of the clause at FAR 52.215-13, Subcontractor Cost or Pricing Data--Modifications.

52.215-15 PENSION ADJUSTMENTS AND ASSET REVERSIONS (JAN 2004)

(a) The Contractor shall promptly notify the Contracting Officer in writing when it determines that it will terminate a defined-benefit pension plan or otherwise recapture such pension fund assets.

(b) For segment closings, pension plan terminations, or curtailment of benefits, the amount of the adjustment shall be--

(1) For contracts and subcontracts that are subject to full coverage under the Cost Accounting Standards (CAS) Board rules and regulations (48 CFR Chapter 99), the amount measured, assigned, and allocated in accordance with 48 CFR 9904.413-50(c)(12); and

(2) For contracts and subcontracts that are not subject to full coverage under the CAS, the amount measured, assigned, and allocated in accordance with 48 CFR 9904.413-50(c)(12), except the numerator of the fraction at 48 CFR 904.413-50(c)(12)(vi) shall be the sum of the pension plan costs allocated to all non-CAS covered contracts and subcontracts that are subject to Federal Acquisition Regulation (FAR) Subpart 31.2 or for which cost or pricing data were submitted.

(c) For all other situations where assets revert to the Contractor, or such assets are constructively received by it for any reason, the Contractor shall, at the Government's option, make a refund or give a credit to the Government for its equitable share of the gross amount withdrawn. The Government's equitable share shall reflect the Government's participation in pension costs through those contracts for which cost or pricing data were submitted or that are subject to FAR Subpart 31.2.

(d) The Contractor shall include the substance of this clause in all subcontracts under this contract that meet the applicability requirement of FAR 15.408(g).

(End of clause)

52.215-17 WAIVER OF FACILITIES CAPITAL COST OF MONEY (OCT 1997)

The Contractor did not include facilities capital cost of money as a proposed cost of this contract. Therefore, it is an unallowable cost under this contract.

(End of clause)

52.215-19 NOTIFICATION OF OWNERSHIP CHANGES (OCT 1997)

(a) The Contractor shall make the following notifications in writing:

(1) When the Contractor becomes aware that a change in its ownership has occurred, or is certain to occur, that could result in changes in the valuation of its capitalized assets in the accounting records, the Contractor shall notify the Administrative Contracting Officer (ACO) within 30 days.

(2) The Contractor shall also notify the ACO within 30 days whenever changes to asset valuations or any other cost changes have occurred or are certain to occur as a result of a change in ownership.

(b) The Contractor shall--

(1) Maintain current, accurate, and complete inventory records of assets and their costs;

(2) Provide the ACO or designated representative ready access to the records upon request;

(3) Ensure that all individual and grouped assets, their capitalized values, accumulated depreciation or amortization, and remaining useful lives are identified accurately before and after each of the Contractor's ownership changes; and

(4) Retain and continue to maintain depreciation and amortization schedules based on the asset records maintained before each Contractor ownership change.

The Contractor shall include the substance of this clause in all subcontracts under this contract that meet the applicability requirement of FAR 15.408(k).

(End of clause)

52.215-21 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA--MODIFICATIONS (OCT 1997)

(a) Exceptions from cost or pricing data. (1) In lieu of submitting cost or pricing data for modifications under this contract, for price adjustments expected to exceed the threshold set forth at FAR 15.403-4 on the date of the agreement on price or the date of the award, whichever is later, the Contractor may submit a written request for exception by submitting the information described in the following subparagraphs. The Contracting Officer may require additional supporting information, but only to the extent necessary to determine whether an exception should be granted, and whether the price is fair and reasonable--

(i) Identification of the law or regulation establishing the price offered. If the price is controlled under law by periodic rulings, reviews, or similar actions of a governmental body, attach a copy of the controlling document, unless it was previously submitted to the contracting office.

(ii) Information on modifications of contracts or subcontracts for commercial items. (A) If--

(1) The original contract or subcontract was granted an exception from cost or pricing data requirements because the price agreed upon was based on adequate price competition or prices set by law or regulation, or was a contract or subcontract for the acquisition of a commercial item; and

(2) The modification (to the contract or subcontract) is not exempted based on one of these exceptions, then the Contractor may provide information to establish that the modification would not change the contract or subcontract

from a contract or subcontract for the acquisition of a commercial item to a contract or subcontract for the acquisition of an item other than a commercial item.

(B) For a commercial item exception, the Contractor shall provide, at a minimum, information on prices at which the same item or similar items have previously been sold that is adequate for evaluating the reasonableness of the price of the modification. Such information may include--

(1) For catalog items, a copy of or identification of the catalog and its date, or the appropriate pages for the offered items, or a statement that the catalog is on file in the buying office to which the proposal is being submitted. Provide a copy or describe current discount policies and price lists (published or unpublished), e.g., wholesale, original equipment manufacturer, or reseller. Also explain the basis of each offered price and its relationship to the established catalog price, including how the proposed price relates to the price of recent sales in quantities similar to the proposed quantities.

(2) For market-priced items, the source and date or period of the market quotation or other basis for market price, the base amount, and applicable discounts. In addition, describe the nature of the market.

(3) For items included on an active Federal Supply Service Multiple Award Schedule contract, proof that an exception has been granted for the schedule item.

(2) The Contractor grants the Contracting Officer or an authorized representative the right to examine, at any time before award, books, records, documents, or other directly pertinent records to verify any request for an exception under this clause, and the reasonableness of price. For items priced using catalog or market prices, or law or regulation , access does not extend to cost or profit information or other data relevant solely to the Contractor's determination of the prices to be offered in the catalog or marketplace.

(b) Requirements for cost or pricing data. If the Contractor is not granted an exception from the requirement to submit cost or pricing data, the following applies:

(1) The Contractor shall submit cost or pricing data and supporting attachments in accordance with Table 15-2 of FAR 15.408.

As soon as practicable after agreement on price, but before award (except for unpriced actions), the Contractor shall submit a Certificate of Current Cost or Pricing Data, as prescribed by FAR 15.406-2.

(End of clause)

52.216-7 ALLOWABLE COST AND PAYMENT (DEC 2002) -- ALTERNATE I (FEB 1997)

(a) Invoicing.

(1) The Government will make payments to the Contractor when requested as work progresses, but (except for small business concerns) not more often than once every 2 weeks, in amounts determined to be allowable by the Contracting Officer in accordance with Federal Acquisition Regulation (FAR) Subpart 31.2 in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(2) Contract financing payments are not subject to the interest penalty provisions of the Prompt Payment Act. Interim payments made prior to the final payment under the contract are contract financing payments, except interim payments if this contract contains Alternate I to the clause at 52.232-25. (3) The designated payment office will make interim payments for contract financing on the **30th** day after the designated billing office receives a proper payment request. In the event that the Government requires an audit or other review of a specific payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date.

(b) Reimbursing costs.

(1) For the purpose of reimbursing allowable costs (except as provided in paragraph (b)(2) of this clause, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only-

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for-

(A) Supplies and services purchased directly for the contract and associated financing payments to subcontractors, provided payments determined due will be made-

(1) In accordance with the terms and conditions of a subcontract or invoice; and

(2) Ordinarily within 30 days of the submission of the Contractor's payment request to the Government;

(B) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(C) Direct labor;

(D) Direct travel;

(E) Other direct in-house costs; and

(F) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of progress and other payments to the Contractor's subcontractors that either have been paid, or that the Contractor is required to pay pursuant to the clause of this contract entitled "Prompt Payment for Construction Contracts." Payments shall be made by cash, check, or other form of payment to the Contractor's subcontractors under similar cost standards.

(2) Accrued costs of Contractor contributions under employee pension plans shall be excluded until actually paid unless-

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's indirect costs for payment purposes).

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) of this clause, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) of this clause.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(c) Small business concerns. A small business concern may receive more frequent payments than every 2 weeks.

(d) Final indirect cost rates.

(1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2)(i) The Contractor shall submit an adequate final indirect cost rate proposal to the Contracting Officer (or cognizant Federal agency official) and auditor within the 6-month period following the expiration of each of its fiscal years. Reasonable extensions, for exceptional circumstances only, may be requested in writing by the Contractor and granted in writing by the Contracting Officer. The Contractor shall support its proposal with adequate supporting data.

(ii) The proposed rates shall be based on the Contractor's actual cost experience for that period. The appropriate Government representative and the Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agreed-upon final annual indirect cost rates,

(ii) the bases to which the rates apply,

(iii) the periods for which the rates apply,

(iv) any specific indirect cost items treated as direct costs in the settlement, and

(v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(5) Within 120 days (or longer period if approved in writing by the Contracting Officer) after settlement of the final annual indirect cost rates for all years of a physically complete contract, the Contractor shall submit a completion invoice or voucher to reflect the settled amounts and rates.

(6)(i) If the Contractor fails to submit a completion invoice or voucher within the time specified in paragraph (d)(5) of this clause, the Contracting Officer may-

(A) Determine the amounts due to the Contractor under the contract; and

(B) Record this determination in a unilateral modification to the contract.

(ii) This determination constitutes the final decision of the Contracting Officer in accordance with the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates-

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. Quick-closeout procedures are applicable when the conditions in FAR 42.708(a) are satisfied.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be-

(1) Reduced by amounts found by the Contracting Officer not to constitute allowable costs; or

(2) Adjusted for prior overpayments or underpayments.

(h) Final payment.

(1) Upon approval of a completion invoice or voucher submitted by the Contractor in accordance with paragraph (d)(5) of this clause, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts are properly allocable to costs for which the Contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver-

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except-

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided, that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

(End of clause)

52.219-4 NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999)

(a) Definition. HUBZone small business concern, as used in this clause, means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

(b) Evaluation preference. (1) Offers will be evaluated by adding a factor of 10 percent to the price of all offers, except--

(i) Offers from HUBZone small business concerns that have not waived the evaluation preference;

(ii) Otherwise successful offers from small business concerns;

(iii) Otherwise successful offers of eligible products under the Trade Agreements Act when the dollar threshold for application of the Act is exceeded (see 25.402 of the Federal Acquisition Regulation (FAR)); and

(iv) Otherwise successful offers where application of the factor would be inconsistent with a Memorandum of Understanding or other international agreement with a foreign government.

(2) The factor of 10 percent shall be applied on a line item basis or to any group of items on which award may be made. Other evaluation factors described in the solicitation shall be applied before application of the factor.

(3) A concern that is both a HUBZone small business concern and a small disadvantaged business concern will receive the benefit of both the HUBZone small business price evaluation preference and the small disadvantaged business price evaluation adjustment (see FAR clause 52.219-23). Each applicable price evaluation preference or adjustment shall be calculated independently against an offeror's base offer.

These individual preference amounts shall be added together to arrive at the total evaluated price for that offer.

(c) Waiver of evaluation preference. A HUBZone small business concern may elect to waive the evaluation preference, in which case the factor will be added to its offer for evaluation purposes. The agreements in paragraph (d) of this clause do not apply if the offeror has waived the evaluation preference.

___ Offeror elects to waive the evaluation preference.

(d) Agreement. A HUBZone small business concern agrees that in the performance of the contract, in the case of a contract for

(1) Services (except construction), at least 50 percent of the cost of personnel for contract performance will be spent for employees of the concern or employees of other HUBZone small business concerns;

(2) Supplies (other than procurement from a nonmanufacturer of such supplies), at least 50 percent of the cost of manufacturing, excluding the cost of materials, will be performed by the concern or other HUBZone small business concerns;

(3) General construction, at least 15 percent of the cost of the contract performance incurred for personnel will be will be spent on the concern's employees or the employees of other HUBZone small business concerns; or

(4) Construction by special trade contractors, at least 25 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns.

(e) A HUBZone joint venture agrees that in the performance of the contract, the applicable percentage specified in paragraph (d) of this clause will be performed by the HUBZone small business participant or participants.

(f) A HUBZone small business concern nonmanufacturer agrees to furnish in performing this contract only end items manufactured or produced by HUBZone small business manufacturer concerns. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS (OCT 2000)

(a) It is the policy of the United States that small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

Definitions. As used in this contract--

HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

Small business concern means a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

Small disadvantaged business concern means a small business concern that represents, as part of its offer that--

(1) It has received certification as a small disadvantaged business concern consistent with 13 CFR part 124, subpart B;

(2) No material change in disadvantaged ownership and control has occurred since its certification;

(3) Where the concern is owned by one or more individuals, the net worth of each individual upon whom the certification is based does not exceed $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(4) It is identified, on the date of its representation, as a certified small disadvantaged business in the database maintained by the Small Business Administration (PRO-Net).

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

Women-owned small business concern means a small business concern--

(1) That is at least 51 percent owned by one or more women, or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a veteran-owned small business concern, a service-disabled veteran-owned small business concern, a HUBZone small business concern, a small disadvantaged business concern, or a women-owned small business concern.

(End of clause)

52.219-9 SMALL BUSINESS SUBCONTRACTING PLAN (JAN 2002)--ALTERNATE II (OCT 2001).

(a) This clause does not apply to small business concerns.

(b) Definitions. As used in this clause--

Commercial item means a product or service that satisfies the definition of commercial item in section 2.101 of the Federal Acquisition Regulation.

Commercial plan means a subcontracting plan (including goals) that covers the offeror's fiscal year and that applies to the entire production of commercial items sold by either the entire company or a portion thereof (e.g., division, plant, or product line).

Individual contract plan means a subcontracting plan that covers the entire contract period (including option periods), applies to a specific contract, and has goals that are based on the offeror's planned subcontracting in support of the specific contract, except that indirect costs incurred for common or joint purposes may be allocated on a prorated basis to the contract.

Master plan means a subcontracting plan that contains all the required elements of an individual contract plan, except goals, and may be incorporated into individual contract plans, provided the master plan has been approved.

Subcontract means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) Proposals submitted in response to this solicitation shall include a subcontracting plan that separately addresses subcontracting with small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns. If the offeror is submitting an individual contract plan, the plan must separately address subcontracting with small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns, with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate a subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business, veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted for an individual contract plan; or the offeror's total projected sales, expressed in dollars, and the total value of projected subcontracts to support the sales for a commercial plan;

(ii) Total dollars planned to be subcontracted to small business concerns;

(iii) Total dollars planned to be subcontracted to veteran-owned small business concerns;

(iv) Total dollars planned to be subcontracted to HUBZone small business concerns;

(v) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(vi) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to--

(i) Small business concerns;

(ii) Veteran-owned small business concerns;

(iii) HUBZone small business concerns;

(iv) Small disadvantaged business concerns; and

(v) Women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Marketing and Access Network (PRO-Net) of the Small Business Administration (SBA), veterans service organizations, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, HUBZone, small disadvantaged, and women-owned small business trade associations). A firm may rely on the information contained in PRO-Net as an accurate representation of a concern's size and ownership characteristics for the purposes of maintaining a small, veteran-owned small, HUBZone small, small disadvantaged, and women-owned small business source list. Use of PRO-Net as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, or publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror in included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with—

(i) Small business concerns;

(ii) Veteran-owned small business concerns;

(iii) HUBZone small business concerns;

(iv) Small disadvantaged business concerns; and

(v) Women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small business, veteran-owned small business, HUBZone small business, small disadvantaged business and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause of this contract entitled ``Utilization of Small Business Concerns'' in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) that receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility) to adopt a subcontracting plan that complies with the requirements of this clause.

(10) Assurances that the offeror will--

(i) Cooperate in any studies or surveys as may be required;

(ii) Submit periodic reports so that the Government can determine the extent of compliance by the offeror with the subcontracting plan;

(iii) Submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with paragraph (j) of this clause. The reports shall provide information on subcontract awards to small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, small disadvantaged business concerns, women-owned small business concerns, and Historically Black Colleges and Universities and Minority Institutions. Reporting shall be in accordance with the instructions on the forms or as provided in agency regulations.

(iv) Ensure that its subcontractors agree to submit SF 294 and SF 295.

(11) A description of the types of records that will be maintained concerning procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of the offeror's efforts to locate small business, veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated)

(i) Source lists (e.g., PRO-Net), guides, and other data that identify small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small business, veteran-owned small business, HUBZone small business, small disadvantaged business, or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating--

(A) Whether small business concerns were solicited and, if not, why not;

(B) Whether veteran-owned small business concerns were solicited and, if not, why not;

(C) Whether HUBZone small business concerns were solicited and, if not, why not;

(D) Whether small disadvantaged business concerns were solicited and, if not, why not;

(E) Whether women-owned small business concerns were solicited and, if not, why not; and

(F) If applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact--

(A) Trade associations;

(B) Business development organizations;

(C) Conferences and trade fairs to locate small, HUBZone small, small disadvantaged, and women-owned small business sources; and

(D) Veterans service organizations.

(v) Records of internal guidance and encouragement provided to buyers through--

(A) Workshops, seminars, training, etc.; and

(B) Monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having commercial plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns in all ``make-or-buy'' decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, veteran-owner small business, HUBZone small, small disadvantaged, or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master plan on a plant or division-wide basis that contains all the elements required by paragraph (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided--
(1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g) A commercial plan is the preferred type of subcontracting plan for contractors furnishing commercial items. The commercial plan shall relate to the offeror's planned subcontracting generally, for both commercial and Government business, rather than solely to the Government contract. Commercial plans are also preferred for subcontractors that provide commercial items under a prime contract, whether or not the prime contractor is supplying a commercial item.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization Of Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(j) The Contractor shall submit the following reports:

(1) Standard Form 294, Subcontracting Report for Individual Contracts. This report shall be submitted to the Contracting Officer semiannually and at contract completion. The report covers subcontract award data related to this contract. This report is not required for commercial plans.

(2) Standard Form 295, Summary Subcontract Report. This report encompasses all of the contracts with the awarding agency. It must be submitted semi-annually for contracts with the Department of Defense and annually for contracts with civilian agencies. If the reporting activity is covered by a commercial plan, the reporting activity must report annually all subcontract awards under that plan. All reports submitted at the close of each fiscal year (both individual and commercial plans) shall include a breakout, in the Contractor's format, of subcontract awards, in whole dollars, to small disadvantaged business concerns by North American Industry Classification System (NAICS) Industry Subsector. For a commercial plan, the Contractor may obtain from each of its subcontractors a predominant NAICS Industry Subsector and report all awards to that subcontractor under its predominant NAICS Industry Subsector.

(End of clause)

52.219-16 LIQUIDATED DAMAGES-SUBCONTRACTING PLAN (JAN 1999)

(a) Failure to make a good faith effort to comply with the subcontracting plan, as used in this clause, means a willful or intentional failure to perform in accordance with the requirements of the subcontracting plan approved under the clause in this contract entitled "Small Business Subcontracting Plan," or willful or intentional action to frustrate the plan.

(b) Performance shall be measured by applying the percentage goals to the total actual subcontracting dollars or, if a commercial plan is involved, to the pro rata share of actual subcontracting dollars attributable to Government contracts covered by the commercial plan. If, at contract completion or, in the case of a commercial plan, at the close of the fiscal year for which the plan is applicable, the Contractor has failed to meet its subcontracting goals and the Contracting Officer decides in accordance with paragraph (c) of this clause that the Contractor failed to make a good faith effort to comply with its subcontracting plan, established in accordance with the clause in this contract entitled “Small Business Subcontracting Plan,” the Contractor shall pay the Government liquidated damages in an amount stated. The amount of probable damages attributable to the Contractor's failure to comply shall be an amount equal to the actual dollar amount by which the Contractor failed to achieve each subcontract goal.

(c) Before the Contracting Officer makes a final decision that the Contractor has failed to make such good faith effort, the Contracting Officer shall give the Contractor written notice specifying the failure and permitting the Contractor to demonstrate what good faith efforts have been made and to discuss the matter. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all the pertinent data, the Contracting Officer finds that the Contractor failed to make a good faith effort to comply with the subcontracting plan, the Contracting Officer shall issue a final decision to that effect and require that the Contractor pay the Government liquidated damages as provided in paragraph (b) of this clause.

(d) With respect to commercial plans, the Contracting Officer who approved the plan will perform the functions of

the Contracting Officer under this clause on behalf of all agencies with contracts covered by the commercial plan.

(e) The Contractor shall have the right of appeal, under the clause in this contract entitled Disputes, from any final decision of the Contracting Officer.

(f) Liquidated damages shall be in addition to any other remedies that the Government may have.

(End of clause)

52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)

If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

(End of clause)

52.222-3 CONVICT LABOR (JUN 2003)

(a) Except as provided in paragraph (b) of this clause, the Contractor shall not employ in the performance of this contract any person undergoing a sentence of imprisonment imposed by any court of a State, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands.

(b) The Contractor is not prohibited from employing persons--

(1) On parole or probation to work at paid employment during the term of their sentence;

(2) Who have been pardoned or who have served their terms; or

(3) Confined for violation of the laws of any of the States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if--

(i) The worker is paid or is in an approved work training program on a voluntary basis;

(ii) Representatives of local union central bodies or similar labor union organizations have been consulted;

(iii) Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services;

(iv) The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and

(v) The Attorney General of the United States has certified that the work-release laws or **regulations** of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

(End of clause)

52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION. (SEP 2000)

(a) Overtime requirements. No Contractor or subcontractor employing laborers or mechanics (see Federal Acquisition Regulation 22.300) shall require or permit them to work over 40 hours in any workweek unless they are paid at least 1 and 1/2 times the basic rate of pay for each hour worked over 40 hours.

(b) Violation; liability for unpaid wages; liquidated damages. The responsible Contractor and subcontractor are liable for unpaid wages if they violate the terms in paragraph (a) of this clause. In addition, the Contractor and subcontractor are liable for liquidated damages payable to the Government. The Contracting Officer will assess liquidated damages at the rate of $10 per affected employee for each calendar day on which the employer required or permitted the employee to work in excess of the standard workweek of 40 hours without paying overtime wages required by the Contract Work Hours and Safety Standards Act.

(c) Withholding for unpaid wages and liquidated damages. The Contracting Officer will withhold from payments due under the contract sufficient funds required to satisfy any Contractor or subcontractor liabilities for unpaid wages and liquidated damages. If amounts withheld under the contract are insufficient to satisfy Contractor or subcontractor liabilities, the Contracting Officer will withhold payments from other Federal or Federally assisted contracts held by the same Contractor that are subject to the Contract Work Hours and Safety Standards Act.

(d) Payrolls and basic records.

(1) The Contractor and its subcontractors shall maintain payrolls and basic payroll records for all laborers and mechanics working on the contract during the contract and shall make them available to the Government until 3 years after contract completion. The records shall contain the name and address of each employee, social security number, labor classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records need not duplicate those required for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The Contractor and its subcontractors shall allow authorized representatives of the Contracting Officer or the Department of Labor to inspect, copy, or transcribe records maintained under paragraph (d)(1) of this clause. The Contractor or subcontractor also shall allow authorized representatives of the Contracting Officer or Department of Labor to interview employees in the workplace during working hours.

(e) Subcontracts. The Contractor shall insert the provisions set forth in paragraphs (a) through (d) of this clause in subcontracts exceeding $100,000 and require subcontractors to include these provisions in any lower tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower-tier subcontractor with the provisions set forth in paragraphs (a) through (d) of this clause.

(End of clause)

52.222-6 DAVIS-BACON ACT (FEB 1995)

(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part

3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (b)(2) and (b)(3) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the

wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(v) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(End of clause)

52.222-7 WITHHOLDING OF FUNDS (FEB 1988)
The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(End of clause)

52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.

(4) The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(End of clause)

52.222-9 APPRENTICES AND TRAINEES (FEB 1988)

(a) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a

contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(End of clause)

52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)

The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(End of clause)

52.222-11 SUBCONTRACTS (LABOR STANDARDS (FEB 1988)

(a) The Contractor or subcontractor shall insert in any subcontracts the clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act-Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination-Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility, and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

(b)(1) Within 14 days after award of the contract, the Contractor shall deliver to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph (a) of this clause have been included in the subcontract.

(i) Within 14 days after the award of any subsequently awarded subcontract the Contractor shall deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

(End of clause)

52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)

A breach of the contract clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 CFR 5.12.

(End of clause)

52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

(End of clause)

52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(End of clause)

52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(vi) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(End of clause)

52.222-20 WALSH-HEALEY PUBLIC CONTRACTS ACT (DEC 1996)

If this contract is for the manufacture or furnishing of materials, supplies, articles or equipment in an amount that exceeds or may exceed $10,000, and is subject to the Walsh-Healey Public Contracts Act, as amended (41 U.S.C. 35-45), the following terms and conditions apply:

(a) All stipulations required by the Act and regulations issued by the Secretary of Labor (41 CFR Chapter 50) are incorporated by reference. These stipulations are subject to all applicable rulings and interpretations of the Secretary of Labor that are now, or may hereafter, be in effect.

(b) All employees whose work relates to this contract shall be paid not less than the minimum wage prescribed by regulations issued by the Secretary of Labor (41 CFR 50-202.2). Learners, student learners, apprentices, and handicapped workers may be employed at less than the prescribed minimum wage (see 41 CFR 50-202.3) to the same extent that such employment is permitted under Section 14 of the Fair Labor Standards Act (41 U.S.C. 40).

(End of clause)

52.222-21 PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)

(a) Segregated facilities, as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(b) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

(End of clause)

52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)

The offeror represents that --

(a) ( ) It has, ( ) has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(b) ( ) It has, ( ) has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)

52.222-26 EQUAL OPPORTUNITY (APR 2002)

(a) Definition. United States, as used in this clause, means the 50 States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, the U.S. Virgin Islands, and Wake Island.

(b) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with paragraphs (b)(1) through (b)(11) of this clause, except for work performed outside the United States by employees who were not recruited within the United States. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. The Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

(8) The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and complaint investigations. The Contractor shall permit the Government to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended; in the rules, regulations, and orders of the Secretary of Labor; or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraphs (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting officer may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

(End of clause)

52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (FEB 1999)

(a) Definitions. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Deputy Assistant Secretary," as used in this clause, means Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

"Employer's identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means--

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of $10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Deputy Assistant Secretary when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) of this clause.

(6) Disseminate the Contractor's equal employment policy by--

(i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all on-site supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.
(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

(13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user rest rooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16) of this clause. The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16) of this clause, provided the Contractor--

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;

(4) Makes a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required

to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Deputy Assistant Secretary shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to--

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(End of clause)

52.222-35 EQUAL OPPORTUNITY FOR SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA, AND OTHER ELIGIBLE VETERANS (DEC 2001)

(a) Definitions. As used in this clause--

All employment openings means all positions except executive and top management, those positions that will be filled from within the Contractor's organization, and positions lasting 3 days or less. This term includes full-time employment, temporary employment of more than 3 days duration, and part-time employment.

Executive and top management means any employee--

(1) Whose primary duty consists of the management of the enterprise in which the individual is employed or of a customarily recognized department or subdivision thereof;

(2) Who customarily and regularly directs the work of two or more other employees;

(3) Who has the authority to hire or fire other employees or whose suggestions and recommendations as to the hiring or firing and as to the advancement and promotion or any other change of status of other employees will be given particular weight;

(4) Who customarily and regularly exercises discretionary powers; and

(5) Who does not devote more than 20 percent or, in the case of an employee of a retail or service establishment, who does not devote more than 40 percent of total hours of work in the work week to activities that are not directly and closely related to the performance of the work described in paragraphs (1) through (4) of this definition. This paragraph (5) does not apply in the case of an employee who is in sole charge of an establishment or a physically separated branch establishment, or who owns at least a 20 percent interest in the enterprise in which the individual is employed.

Other eligible veteran means any other veteran who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized.

Positions that will be filled from within the Contractor's organization means employment openings for which the Contractor will give no consideration to persons outside the Contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings the Contractor proposes to fill from regularly established “recall” lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of its organization.

Qualified special disabled veteran means a special disabled veteran who satisfies the requisite skill, experience, education, and other job-related requirements of the employment position such veteran holds or desires, and who, with or without reasonable accommodation, can perform the essential functions of such position.

Special disabled veteran means--

(1) A veteran who is entitled to compensation (or who but for the receipt of military retired pay would be entitled to compensation) under laws administered by the Department of Veterans Affairs for a disability--

(i) Rated at 30 percent or more; or

(ii) Rated at 10 or 20 percent in the case of a veteran who has been determined under 38 U.S.C. 3106 to have a serious employment handicap (i.e., a significant impairment of the veteran's ability to prepare for, obtain, or retain employment consistent with the veteran's abilities, aptitudes, and interests); or

(2) A person who was discharged or released from active duty because of a service-connected disability.

Veteran of the Vietnam era means a person who--

(1) Served on active duty for a period of more than 180 days and was discharged or released from active duty with other than a dishonorable discharge, if any part of such active duty occurred--

(i) In the Republic of Vietnam between February 28, 1961, and May 7, 1975; or

(ii) Between August 5, 1964, and May 7, 1975, in all other cases; or

(2) Was discharged or released from active duty for a service-connected disability if any part of the active duty was performed--

(i) In the Republic of Vietnam between February 28, 1961, and May 7, 1975; or

(ii) Between August 5, 1964, and May 7, 1975, in all other cases.

(b) General. (1) The Contractor shall not discriminate against the individual because the individual is a special disabled veteran, a veteran of the Vietnam era, or other eligible veteran, regarding any position for which the employee or applicant for employment is qualified. The Contractor shall take affirmative action to employ, advance in employment, and otherwise treat qualified special disabled veterans, veterans of the Vietnam era, and other eligible veterans without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Recruitment, advertising, and job application procedures;

(ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff and rehiring;

(iii) Rate of pay or any other form of compensation and changes in compensation;

(iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(v) Leaves of absence, sick leave, or any other leave;

(vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;

(vii) Selection and financial support for training, including apprenticeship, and on-the-job training under 38 U.S.C. 3687, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the Contractor including social or recreational programs; and

(ix) Any other term, condition, or privilege of employment.

(2) The Contractor shall comply with the rules, regulations, and relevant orders of the Secretary of Labor issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended (38 U.S.C. 4211 and 4212).

(c) Listing openings. (1) The Contractor shall immediately list all employment openings that exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not

generated by this contract, and including those occurring at an establishment of the Contractor other than the one where the contract is being performed, but excluding those of independently operated corporate affiliates, at an appropriate local public employment service office of the State wherein the opening occurs. Listing employment openings with the U.S. Department of Labor's America's Job Bank shall satisfy the requirement to list jobs with the local employment service office.

(2) The Contractor shall make the listing of employment openings with the local employment service office at least concurrently with using any other recruitment source or effort and shall involve the normal obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing of employment openings does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(3) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State public employment agency in each State where it has establishments of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State agency, it need not advise the State agency of subsequent contracts. The Contractor may advise the State agency when it is no longer bound by this contract clause.

(d) Applicability. This clause does not apply to the listing of employment openings that occur and are filled outside the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, American Samoa, Guam, the Virgin Islands of the United States, and Wake Island.

(e) Postings. (1) The Contractor shall post employment notices in conspicuous places that are available to employees and applicants for employment.

(2) The employment notices shall--

(i) State the rights of applicants and employees as well as the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified employees and applicants who are special disabled veterans, veterans of the Vietnam era, and other eligible veterans; and

(ii) Be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, Department of Labor (Deputy Assistant Secretary of Labor), and provided by or through the Contracting Officer.

(3) The Contractor shall ensure that applicants or employees who are special disabled veterans are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled veteran, or may lower the posted notice so that it can be read by a person in a wheelchair).

(4) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement, or other contract understanding, that the Contractor is bound by the terms of the Act and is committed to take affirmative action to employ, and advance in employment, qualified special disabled veterans, veterans of the Vietnam era, and other eligible veterans.

(f) Noncompliance. If the Contractor does not comply with the requirements of this clause, the Government may take appropriate actions under the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(g) Subcontracts. The Contractor shall insert the terms of this clause in all subcontracts or purchase orders of $25,000 or more unless exempted by rules, regulations, or orders of the Secretary of Labor. The Contractor shall act as specified by the Deputy Assistant Secretary of Labor to enforce the terms, including action for noncompliance.

(End of clause)

52.222-36 AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)

(a) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental disability. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as--

(i) Recruitment, advertising, and job application procedures;

(ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;

(iii) Rates of pay or any other form of compensation and changes in compensation;

(iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(v) Leaves of absence, sick leave, or any other leave;

(vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;

(vii) Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the Contractor, including social or recreational programs; and

(ix) Any other term, condition, or privilege of employment.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) Postings. (1) The Contractor agrees to post employment notices stating--

(i) The Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified individuals with disabilities; and

(ii) The rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of

the Act and is committed to take affirmative action to employ, and advance in employment, qualified individuals with physical or mental disabilities.

(c) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $10,000 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)

52.222-37 EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA, AND OTHER ELIGIBLE VETERANS (DEC 2001)

(a) Unless the Contractor is a State or local government agency, the Contractor shall report at least annually, as required by the Secretary of Labor, on--

(1) The number of disabled veterans and the number of veterans of the Vietnam era in the workforce of the contractor by job category and hiring location; and

(2) The total number of new employees hired during the period covered by the report, and of that total, the number of disabled veterans, and the number of veterans of the Vietnam era.

(b) The above items shall be reported by completing the form entitled "Federal Contractor Veterans' Employment Report VETS-100."

(c) Reports shall be submitted no later than September 30 of each year beginning September 30, 1988.

(d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending date selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date: (1) As of the end of any pay period during the period January through March 1st of the year the report is due, or (2) as of December 31, if the contractor has previous written approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).

(e) The count of veterans reported according to paragraph (a) of this clause shall be based on voluntary disclosure. Each Contractor subject to the reporting requirements at 38 U.S.C. 4212 shall invite all disabled veterans and veterans of the Vietnam era who wish to benefit under the affirmative action program at 38 U.S.C. 4212 to identify themselves to the Contractor. The invitation shall state that the information is voluntarily provided; that the information will be kept confidential; that disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment; and that the information will be used only in accordance with the regulations promulgated under 38 U.S.C. 4212.

(f) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary.

(End of clause)

52.222-38 COMPLIANCE WITH VETERANS' EMPLOYMENT REPORTING REQUIREMENTS (DEC 2001)

By submission of its offer, the offeror represents that, if it is subject to the reporting requirements of 38 U.S.C. 4212(d) (i.e., if it has any contract containing Federal Acquisition Regulation clause 52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans), it has submitted the most recent VETS-100 Report required by that clause.

(End of provision)

52.223-4 Recovered Material Certification (Oct 1997)

As required by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6962(c)(3)(A)(i)), the offeror certifies, by signing this offer, that the percentage of recovered materials to be used in the performance of the contract will be at least the amount required by the applicable contract specifications.

(End of Provision)

52.223-6 DRUG-FREE WORKPLACE (MAY 2001)

(a) Definitions. As used in this clause --

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to deter- mine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession, or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall-- within 30 days after award (unless a longer period is agreed to in writing for contracts of 30 days or more performance duration), or as soon as possible for contracts of less than 30 days performance duration--

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment on this contract, the employee will--

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 days after such conviction.

(5) Notify the Contracting Officer in writing within 10 days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;

(6) Within 30 days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) though (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance while performing this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraph (b) or (c) of this clause may, pursuant to FAR 23.506, render the Contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.

(End of clause)

52.223-14 TOXIC CHEMICAL RELEASE REPORTING (AUG 2003)

(a) Unless otherwise exempt, the Contractor, as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986

(EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.

(b) A Contractor-owned or -operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--

(1) The facility does not manufacture, process, or otherwise use any toxic chemicals listed in 40 CFR 372.65;

(2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

(3) The facility does not meet the reporting thresholds of toxic chemicals established under of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

(4) The facility does not fall within the following Standard Industrial Classification (SIC) codes or their corresponding North American Industry Classification System sectors:

(i) Major group code 10 (except 1011, 1081, and 1094.

(ii) Major group code 12 (except 1241).

(iii) Major group codes 20 through 39.

(iv) Industry code 4911, 4931, or 4939 (limited to facilities that combust coal and/or oil for the purpose of generating power for distribution in commerce).

(v) Industry code 4953 (limited to facilities regulated under the Resource Conservation and Recovery Act, Subtitle C (42 U.S.C. 6921, et seq.)), 5169, 5171, or 7389 (limited to facilities primarily engaged in solvent recovery services on a contract or fee basis); or

(5) The facility is not located in the United States or its outlying areas.

(c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any of its owned or operated facilities used in the performance of this contract is no longer exempt--

(1) The Contractor shall notify the Contracting Officer; and

(2) The Contractor, as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall (i) submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and (ii) continue to file the annual Form R for the life of the contract for such facility.

(d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.

(e) Except for acquisitions of commercial items, as defined in FAR Part 2, the Contractor shall--

(1) For competitive subcontracts expected to exceed $100,000 (including all options), include a solicitation provision substantially the same as the provision at FAR 52.223-13, Certification of Toxic Chemical Release Reporting; and

(2) Include in any resultant subcontract exceeding $100,000 (including all options), the substance of this clause, except this paragraph (e).

(End of clause)

52.225-11 BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (JAN 2004)

(a) Definitions. As used in this clause--

Component means an article, material, or supply incorporated directly into a construction material.

Construction material means an article, material, or supply brought to the construction site by the Contractor or subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means--

(1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

Designated country means any of the following countries: Aruba, Austria, Bangladesh, Belgium, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Canada, Cape Verde, Central African Republic, Chad, Comoros, Denmark.

Djibouti, Equatorial Guinea, Finland, France, Gambia, Germany, Greece, Guinea, Guinea-Bissau, Haiti, Hong Kong, Ireland, Israel, Italy, Japan.

Kiribati, Korea, Republic of, Lesotho, Liechtenstein, Luxembourg, Malawi, Maldives, Mali, Mozambique, Nepal, Netherlands, Niger, Norway, Portugal, Rwanda.

Sao Tome and Principe, Sierra Leone, Singapore, Somalia, Spain, Sweden, Switzerland, Tanzania U.R., Togo, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Yemen.

Designated country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

Domestic construction material means--

(1) An unmanufactured construction material mined or produced in the United States; or

(2) A construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic.

Foreign construction material means a construction material other than a domestic construction material.

Free Trade Agreement country means Canada, Chile, Mexico, or Singapore.

Free Trade Agreement country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a Free Trade Agreement (FTA) country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a FTA country into a new and different construction material distinct from the materials from which it was transformed.

United States means the 50 States, the District of Columbia, and outlying areas.

(b) Construction materials. (1) This clause implements the Buy American Act (41 U.S.C. 10a-10d) by providing a preference for domestic construction material. In addition, the Contracting Officer has determined that the Trade Agreements Act and Free Trade Agreements (FTAs) apply to this acquisition. Therefore, the Buy American Act restrictions are waived for designated country and FTA country construction materials.

(2) The Contractor shall use only domestic, designated country, or NAFTA country construction material in performing this contract, except as provided in paragraphs (b)(3) and (b)(4) of this clause.

(3) The requirement in paragraph (b)(2) of this clause does not apply to the construction materials or components listed by the Government as follows: **None**

(4) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the restrictions of the Buy American Act is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent;

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American Act.

(1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(4) of this clause shall include adequate information for Government evaluation of the request, including--

(A) A description of the foreign and domestic construction materials;

(B) Unit of measure;

(C) Quantity;

(D) Price;

(E) Time of delivery or availability;

(F) Location of the construction project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.

(iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.

(2) If the Government determines after contract award that an exception to the Buy American Act applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(4)(i) of this clause.

(3) Unless the Government determines that an exception to the Buy American Act applies, use of foreign construction material is noncompliant with the Buy American Act.

(d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison

Construction material description	Unit of measure	Quantity	Price (dollars) \1\
Item 1:			
Foreign construction material....	.....	.....	.....
Domestic construction material...	.....	.....	.....
Item 2:			
Foreign construction material....	.....	.....	.....
Domestic construction material...	.....	.....	.....

\1\ Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.
Include other applicable supporting information.

(e) United States law will apply to resolve any claim of breach of this contract.

(End of clause)

52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JAN 2004)

(a) Except as authorized by the Office of Foreign Assets Control (OFAC) in the Department of the Treasury, the Contractor shall not acquire, for use in the performance of this contract, any supplies or services if any proclamation, Executive order, or statute administered by OFAC, or if OFAC's implementing regulations at 31 CFR chapter V, would prohibit such a transaction by a person subject to the jurisdiction of the United States.

(b) Except as authorized by OFAC, most transactions involving Cuba, Iran, Libya, and Sudan are prohibited, as are most imports from North Korea, into the United States or its outlying areas. Lists of entities and individuals subject to economic sanctions are included in OFAC's List of Specially Designated Nationals and Blocked Persons at TerList1.html. More information about these restrictions, as well as updates, is available in the OFAC's regulations at 31 CFR chapter V and/or on OFAC's Web site at http://www.treas.gov/ofac.

(c) The Contractor shall insert this clause, including this paragraph (c), in all subcontracts.

(End of clause)

52.226-1 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (JUN 2000)

(a) Definitions. As used in this clause:

"Indian" means any person who is a member of any Indian tribe, band, group, pueblo or community that is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c) and any ``Native'' as defined in the Alaska Native Claims Settlement Act (43 U.S.C. 1601).

"Indian organization" means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indian tribe for the purposes of 25 U.S.C., chapter 17.

"Indian-owned economic enterprise" means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership constitutea not less than 51 percent of the enterprise.

"Indian tribe" means any Indian tribe, band, group, pueblo or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native

Claims Settlement Act, that is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1542(c).

"Interested party" means a prime contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

(b) The Contractor shall use its best efforts to give Indian organizations and Indian-owned economic enterprises (25 U.S.C. 1544) the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with efficient performance of its contract.

(1) The Contracting Officer and the Contractor, acting in good faith, may rely on the representation of an Indian organization or Indian-owned economic enterprise as to its eligibility, unless an interested party challenges its status or the Contracting Officer has independent reason to question that status. In the event of a challenge to the representation of a subcontractor, the Contracting Officer will refer the matter to the U.S. Department of the Interior, Bureau of Indian Affairs (BIA), Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street, NW., MS 2626-MIB, Washington, DC 20240-4000.

The BIA will determine the eligibility and notify the Contracting Officer. No incentive payment will be made within 50 working days of subcontract award or while a challenge is pending. If a subcontractor is determined to be an ineligible participant, no incentive payment will be made under the Indian Incentive Program.

(2) The Contractor may request an adjustment under the Indian Incentive Program to the following:

(i) The estimated cost of a cost-type contract.

(ii) The target cost of a cost-plus-incentive-fee prime contract.

(iii) The target cost and ceiling price of a fixed-price incentive prime contract.

(iv) The price of a firm-fixed-price prime contract.

(3) The amount of the adjustment to the prime contract is 5 percent of the estimated cost, target cost, or firm-fixed-price included in the subcontract initially awarded to the Indian organization or Indian-owned economic enterprise.

(4) The Contractor has the burden of proving the amount claimed and must assert its request for an adjustment prior to completion of contract performance.

(c) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, will authorize an incentive payment of 5 percent of the amount paid to the subcontractor. The Contracting Officer will seek funding in accordance with agency procedures.

(End of clause)

52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)

(a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold (however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.)

(End of clause)

52.227-2 NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (AUG 1996)

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed under this contract, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(vii) The Contractor agrees to include, and require inclusion of, this clause in all subcontracts at any tier for supplies or services (including construction and architect-engineer subcontracts and those for material, supplies, models, samples, or design or testing services) expected to exceed the simplified acquisition threshold at (FAR) 2.101.to exceed the dollar amount set forth in 13.000 of the Federal Acquisition Regulation (FAR).

(End of clause)

52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

(End of clause)

52.228-1 BID GUARANTEE (SEP 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and

bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.-

(c) The amount of the bid guarantee shall be ___20%__ percent of the bid price or $__3 MIL_, whichever is less.-

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.-

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(End of clause)

52.228-1 BID GUARANTEE (SEP 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.-

(c) The amount of the bid guarantee shall be _____ percent of the bid price or $_____, whichever is less.-

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.-

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(End of clause)

52.228-11 PLEDGES OF ASSETS (FEB 1992)

(a) Offerors shall obtain from each person acting as an individual surety on a bid guarantee, a performance bond, or a payment bond--

(1) Pledge of assets; and

(2) Standard Form 28, Affidavit of Individual Surety.

(b) Pledges of assets from each person acting as an individual surety shall be in the form of--

(1) Evidence of an escrow account containing cash, certificates of deposit, commercial or Government securities, or other assets described in FAR 28.203-2 (except see 28.203-2(b)(2) with respect to Government securities held in

book entry form) and/or;

(2) A recorded lien on real estate. The offeror will be required to provide--

(i) Evidence of title in the form of a certificate of title prepared by a title insurance company approved by the United States Department of Justice. This title evidence must show fee simple title vested in the surety along with any concurrent owners; whether any real estate taxes are due and payable; and any recorded encumbrances against the property, including the lien filed in favor of the Government as required by FAR 28.203-3(d);

(ii) Evidence of the amount due under any encumbrance shown in the evidence of title;

(iii) A copy of the current real estate tax assessment of the property or a current appraisal dated no earlier than 6 months prior to the date of the bond, prepared by a professional appraiser who certifies that the appraisal has been conducted in accordance with the generally accepted appraisal standards as reflected in the Uniform Standards of Professional Appraisal Practice, as promulgated by the Appraisal Foundation.

(End of clause)

52.228-14 IRREVOCABLE LETTER OF CREDIT (DEC 1999)

(a) “Irrevocable letter of credit” (ILC), as used in this clause, means a written commitment by a federally insured financial institution to pay all or part of a stated amount of money, until the expiration date of the letter, upon presentation by the Government (the beneficiary) of a written demand therefor. Neither the financial institution nor the offeror/Contractor can revoke or condition the letter of credit.

(b) If the offeror intends to use an ILC in lieu of a bid bond, or to secure other types of bonds such as performance and payment bonds, the letter of credit and letter of confirmation formats in paragraphs (e) and (f) of this clause shall be used.

(c) The letter of credit shall be irrevocable, shall require presentation of no document other than a written demand and the ILC (including confirming letter, if any), shall be issued/confirmed by an acceptable federally insured financial institution as provided in paragraph (d) of this clause, and--

(1) If used as a bid guarantee, the ILC shall expire no earlier than 60 days after the close of the bid acceptance period;

(2) If used as an alternative to corporate or individual sureties as security for a performance or payment bond, the offeror/Contractor may submit an ILC with an initial expiration date estimated to cover the entire period for which financial security is required or may submit an ILC with an initial expiration date that is a minimum period of one year from the date of issuance. The ILC shall provide that, unless the issuer provides the beneficiary written notice of non-renewal at least 60 days in advance of the current expiration date, the ILC is automatically extended without amendment for one year from the expiration date, or any future expiration date, until the period of required coverage is completed and the Contracting Officer provides the financial institution with a written statement waiving the right to payment. The period of required coverage shall be:

(i) For contracts subject to the Miller Act, the later of--

(A) One year following the expected date of final payment;

(B) For performance bonds only, until completion of any warranty period; or

(C) For payment bonds only, until resolution of all claims filed against the payment bond during the one-year period following final payment.

(ii) For contracts not subject to the Miller Act, the later of--

(A) 90 days following final payment; or

(B) For performance bonds only, until completion of any warranty period.

(d) Only federally insured financial institutions rated investment grade or higher shall issue or confirm the ILC. The offeror/Contractor shall provide the Contracting Officer a credit rating that indicates the financial institution has the required rating(s) as of the date of issuance of the ILC. Unless the financial institution issuing the ILC had letter of credit business of less than $25 million in the past year, ILCs over $5 million must be confirmed by another acceptable financial institution that had letter of credit business of less than $25 million in the past year.

(e) The following format shall be used by the issuing financial institution to create an ILC:

_____

[Issuing Financial Institution's Letterhead or Name and Address]

Issue Date _____

IRREVOCABLE LETTER OF CREDIT NO. _____

Account party's name _____

Account party's address _____

For Solicitation No. _____(for reference only)

TO: [U.S. Government agency]

[U.S. Government agency's address]

1. We hereby establish this irrevocable and transferable Letter of Credit in your favor for one or more drawings up to United States $_____. This Letter of Credit is payable at [issuing financial institution's and, if any, confirming financial institution's] office at [issuing financial institution's address and, if any, confirming financial institution's address] and expires with our close of business on _____, or any automatically extended expiration date.

2. We hereby undertake to honor your or the transferee's sight draft(s) drawn on the issuing or, if any, the confirming financial institution, for all or any part of this credit if presented with this Letter of Credit and

confirmation, if any, at the office specified in paragraph 1 of this Letter of Credit on or before the expiration date or any automatically extended expiration date.

3. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this Letter of Credit that it is deemed to be automatically extended without amendment for one year from the expiration date hereof, or any future expiration date, unless at least 60 days prior to any expiration date, we notify you or the transferee by registered mail, or other receipted means of delivery, that we elect not to consider this Letter of Credit renewed for any such additional period. At the time we notify you, we also agree to notify the account party (and confirming financial institution, if any) by the same means of delivery.

4. This Letter of Credit is transferable. Transfers and assignments of proceeds are to be effected without charge to either the beneficiary or the transferee/assignee of proceeds. Such transfer or assignment shall be only at the written direction of the Government (the beneficiary) in a form satisfactory to the issuing financial institution and the confirming financial institution, if any.

5. This Letter of Credit is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of _____ [state of confirming financial institution, if any, otherwise state of issuing financial institution].

6. If this credit expires during an interruption of business of this financial institution as described in Article 17 of the UCP, the financial institution specifically agrees to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

_____

[Issuing financial institution]

(f) The following format shall be used by the financial institution to confirm an ILC:

_____
[Confirming Financial Institution's Letterhead or Name and Address]

(Date) _____

Our Letter of Credit Advice Number _____

Beneficiary: _____ [U.S. Government agency]

Issuing Financial Institution: _____

Issuing Financial Institution's LC No.: _____

Gentlemen:

1. We hereby confirm the above indicated Letter of Credit, the original of which is attached, issued by _____ [name of issuing financial institution] for drawings of up to United States dollars _____/U.S. $_____ and expiring with our close of business on _____ [the expiration date], or any automatically extended expiration date.

2. Draft(s) drawn under the Letter of Credit and this Confirmation are payable at our office located at _____.

3. We hereby undertake to honor sight draft(s) drawn under and presented with the Letter of Credit and this Confirmation at our offices as specified herein.

4. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this confirmation that it be deemed automatically extended without amendment for one year from the expiration date hereof, or any automatically extended expiration date, unless:

(a) At least 60 days prior to any such expiration date, we shall notify the Contracting Officer, or the transferee and the issuing financial institution, by registered mail or other receipted means of delivery, that we elect not to consider this confirmation extended for any such additional period; or

(b) The issuing financial institution shall have exercised its right to notify you or the transferee, the account party, and ourselves, of its election not to extend the expiration date of the Letter of Credit.

5. This confirmation is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of _____ [state of confirming financial institution].

6. If this confirmation expires during an interruption of business of this financial institution as described in Article 17 of the UCP, we specifically agree to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

_____

[Confirming financial institution]

(g) The following format shall be used by the Contracting Officer for a sight draft to draw on the Letter of Credit:

SIGHT DRAFT

_____

[City, State]

(Date) _____

[Name and address of financial institution]

Pay to the order of _____ [Beneficiary Agency] _____ the sum of United States $_____.
This draft is drawn under Irrevocable Letter of Credit No. _____.

_____

[Beneficiary Agency]

By: _____

(End of clause)

52.228-15 PERFORMANCE AND PAYMENT BONDS--CONSTRUCTION (JUL 2000)-

(a) Definitions. As used in this clause--

Original contract price means the award price of the contract; or, for requirements contracts, the price payable for the estimated total quantity; or, for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

(b) Amount of required bonds. Unless the resulting contract price is $100,000 or less, the successful offeror shall furnish performance and payment bonds to the Contracting Officer as follows:

(1) Performance bonds (Standard Form 25). The penal amount of performance bonds at the time of contract award shall be 100 percent of the original contract price.

(2) Payment Bonds (Standard Form 25-A). The penal amount of payment bonds at the time of contract award shall be 100 percent of the original contract price.

(3) Additional bond protection. (i) The Government may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.

(ii) The Government may secure the additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

(c) Furnishing executed bonds. The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in the Bid Guarantee provision of the solicitation, or otherwise specified by the Contracting Officer, but in any event, before starting work.

(d) Surety or other security for bonds. The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the Federal Register or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW, 2nd Floor, West Wing, Washington, DC 20227.

(e) Notice of subcontractor waiver of protection (40 U.S.C. 270b(c). Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

(End of clause)

52.229-3 FEDERAL, STATE, AND LOCAL TAXES (APR 2003)

(a) As used in this clause--

"Contract date" means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.

"All applicable Federal, State, and local taxes and duties" means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax" means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"After-relieved Federal tax" means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

Local taxes includes taxes imposed by a possession or territory of the United States, Puerto Rico, or the Northern Mariana Islands, if the contract is performed wholly or partly in any of those areas.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $250.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

(End of clause)

52.230-1 COST ACCOUNTING STANDARDS NOTICES AND CERTIFICATION (JUN 2000)

Note: This notice does not apply to small businesses or foreign governments. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I. DISCLOSURE STATEMENT--COST ACCOUNTING PRACTICES AND CERTIFICATION

(a) Any contract in excess of $500,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.

(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

CAUTION: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.

(c) Check the appropriate box below:

(1) Certificate of Concurrent Submission of Disclosure Statement.

The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows: (i) original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable, and (ii) one copy to the cognizant Federal auditor.

(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

(2) Certificate of Previously Submitted Disclosure Statement.

The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

(3) Certificate of Monetary Exemption.

The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling more than $50 million (of which at least one award exceeded $1 million) in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

(4) Certificate of Interim Exemption.

The offeror hereby certifies that (i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and (ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

CAUTION: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of $50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. COST ACCOUNTING STANDARDS--ELIGIBILITY FOR MODIFIED CONTRACT COVERAGE

If the offeror is eligible to use the modified provisions of 48 CFR 9903.201-2(b) and elects to do so, the offeror shall indicate by checking the box below. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

( ) The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than $50 million in awards of CAS-covered prime contracts and subcontracts. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

CAUTION: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of $50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of $25 million or more.

III. ADDITIONAL COST ACCOUNTING STANDARDS APPLICABLE TO EXISTING CONTRACTS

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

( ) YES ( ) NO

(End of clause)

52.230-2 COST ACCOUNTING STANDARDS (APR 1998)

(a) Unless the contract is exempt under 48 CFR 9903.201-1 and 9903.201-2, the provisions of 48 CFR Part 9903 are incorporated herein by reference and the Contractor, in connection with this contract, shall--

(1) (CAS-covered Contracts Only) By submission of a Disclosure Statement, disclose in writing the Contractor's cost accounting practices as required by 48 CFR 9903.202-1 through 9903.202-5, including methods of distinguishing direct costs from indirect costs and the basis used for allocating indirect costs. The practices disclosed for this contract shall be the same as the practices currently disclosed and applied on all other contracts and subcontracts being performed by the Contractor and which contain a Cost Accounting Standards (CAS) clause. If the Contractor has notified the Contracting Officer that the Disclosure Statement contains trade secrets and commercial or financial information which is privileged and confidential, the Disclosure Statement shall be protected and shall not be released outside of the Government.

(2) Follow consistently the Contractor's cost accounting practices in accumulating and reporting contract performance cost data concerning this contract. If any change in cost accounting practices is made for the purposes of any contract or subcontract subject to CAS requirements, the change must be applied prospectively to this contract and the Disclosure Statement must be amended accordingly. If the contract price or cost allowance of this contract is affected by such changes, adjustment shall be made in accordance with subparagraph (a)(4) or (a)(5) of this clause, as appropriate.

(3) Comply with all CAS, including any modifications and interpretations indicated thereto contained in 48 CFR Part 9904, in effect on the date of award of this contract or, if the Contractor has submitted cost or pricing data, on the date of final agreement on price as shown on the Contractor's signed certificate of current cost or pricing data. The Contractor shall also comply with any CAS (or modifications to CAS) which hereafter become applicable to a contract or subcontract of the Contractor. Such compliance shall be required prospectively from the date of applicability to such contract or subcontract.

(4)(i) Agree to an equitable adjustment as provided in the Changes clause of this contract if the contract cost is affected by a change which, pursuant to subparagraph (a)(3) of this clause, the Contractor is required to make to the Contractor's established cost accounting practices.

(ii) Negotiate with the Contracting Officer to determine the terms and conditions under which a change may be made to a cost accounting practice, other than a change made under other provisions of subparagraph (a)(4) of this clause; provided that no agreement may be made under this provision that will increase costs paid by the United States.

(iii) When the parties agree to a change to a cost accounting practice, other than a change under subdivision (a)(4)(i) of this clause, negotiate an equitable adjustment as provided in the Changes clause of this contract.

(5) Agree to an adjustment of the contract price or cost allowance, as appropriate, if the Contractor or a subcontractor fails to comply with an applicable Cost Accounting Standard, or to follow any cost accounting practice consistently and such failure results in any increased costs paid by the United States. Such adjustment shall provide for recovery of the increased costs to the United States, together with interest thereon computed at the annual rate established under section 6621 of the Internal Revenue Code of 1986 (26 U.S.C. 6621) for such period,

from the time the payment by the United States was made to the time the adjustment is effected. In no case shall the Government recover costs greater than the increased cost to the Government, in the aggregate, on the relevant contracts subject to the price adjustment, unless the Contractor made a change in its cost accounting practices of which it was aware or should have been aware at the time of price negotiations and which it failed to disclose to the Government.

(b) If the parties fail to agree whether the Contractor or a subcontractor has complied with an applicable CAS in 48 CFR 9904 or a CAS rule or regulation in 48 CFR 9903 and as to any cost adjustment demanded by the United States, such failure to agree will constitute a dispute under the Contract Disputes Act (41 U.S.C. 601).

(c) The Contractor shall permit any authorized representatives of the Government to examine and make copies of any documents, papers, or records relating to compliance with the requirements of this clause.

(d) The Contractor shall include in all negotiated subcontracts which the Contractor enters into, the substance of this clause, except paragraph (b), and shall require such inclusion in all other subcontracts, of any tier, including the obligation to comply with all CAS in effect on the subcontractor's award date or if the subcontractor has submitted cost or pricing data, on the date of final agreement on price as shown on the subcontractor's signed Certificate of Current Cost or Pricing Data. If the subcontract is awarded to a business unit which pursuant to 48 CFR 9903.201-2 is subject to other types of CAS coverage, the substance of the applicable clause set forth in subsection 30.201-4 of the Federal Acquisition Regulation shall be inserted. This requirement shall apply only to negotiated subcontracts in excess of $500,000, except that the requirement shall not apply to negotiated subcontracts otherwise exempt from the requirement to include a CAS clause as specified in 48 CFR 9903.201-1.

(End of clause)

52.230-3 DISCLOSURE AND CONSISTENCY OF COST ACCOUNTING PRACTICES (APR 1998)

(a) The Contractor, in connection with this contract, shall--

(1) Comply with the requirements of 48 CFR 9904.401, Consistency in Estimating, Accumulating, and Reporting Costs; 48 CFR 9904.402, Consistency in Allocating Costs Incurred for the Same Purpose; 48 CFR 9904.405, Accounting for Unallowable Costs; and 48 CFR 9904.406, Cost Accounting Standard--Cost Accounting Period, in effect on the date of award of this contract as indicated in 48 CFR Part 9904.

(2) (CAS-covered Contracts Only) If it is a business unit of a company required to submit a Disclosure Statement, disclose in writing its cost accounting practices as required by 48 CFR 9903.202-1 through 9903.202-5. If the Contractor has notified the Contracting Officer that the Disclosure Statement contains trade secrets and commercial or financial information which is privileged and confidential, the Disclosure Statement shall be protected and shall not be released outside of the Government.

(3)(i) Follow consistently the Contractor's cost accounting practices. A change to such practices may be proposed, however, by either the Government or the Contractor, and the Contractor agrees to negotiate with the Contracting Officer the terms and conditions under which a change may be made. After the terms and conditions under which the change is to be made have been agreed to, the change must be applied prospectively to this contract, and the Disclosure Statement, if affected, must be amended accordingly.

(ii) The Contractor shall, when the parties agree to a change to a cost accounting practice and the Contracting Officer has made the finding required in 48 CFR 9903.201-6(b), that the change is desirable and not detrimental to the interests of the Government, negotiate an equitable adjustment as provided in the Changes clause of this contract. In the absence of the required finding, no agreement may be made under this contract clause that will increase costs paid by the United States.

(4) Agree to an adjustment of the contract price or cost allowance, as appropriate, if the Contractor or a subcontractor fails to comply with the applicable CAS or to follow any cost accounting practice, and such failure results in any increased costs paid by the United States. Such adjustment shall provide for recovery of the increased costs to the United States together with interest thereon computed at the annual rate of interest established under the

Internal Revenue Code of 1986 (26 U.S.C. 6621), from the time the payment by the United States was made to the time the adjustment is effected.

(b) If the parties fail to agree whether the Contractor has complied with an applicable CAS, rule, or regulation as specified in 48 CFR 9903 and 9904 and as to any cost adjustment demanded by the United States, such failure to agree will constitute a dispute under the Contract Disputes Act (41 U.S.C. 601).

(c) The Contractor shall permit any authorized representatives of the Government to examine and make copies of any documents, papers, and records relating to compliance with the requirements of this clause.

(d) The Contractor shall include in all negotiated subcontracts, which the Contractor enters into, the substance of this clause, except paragraph (b), and shall require such inclusion in all other subcontracts of any tier, except that--

(1) If the subcontract is awarded to a business unit which pursuant to 48 CFR 9903.201-2 is subject to other types of CAS coverage, the substance of the applicable clause set forth in subsection 30.201-4 of the Federal Acquisition Regulation shall be inserted.

(2) This requirement shall apply only to negotiated subcontracts in excess of $500,000.

(3) The requirement shall not apply to negotiated subcontracts otherwise exempt from the requirement to include a CAS clause as specified in 48 CFR 9903.201-1.

(End of clause)

52.230-6 ADMINISTRATION OF COST ACCOUNTING STANDARDS (NOV 1999)

For the purpose of administering the Cost Accounting Standards (CAS) requirements under this contract, the Contractor shall take the steps outlined in paragraphs (a) through (g) of this clause:

(a) Submit to the Contracting Officer a description of any cost accounting practice change, the total potential impact of the change on contracts containing a CAS clause, and a general dollar magnitude of the change which identifies the potential shift of costs between CAS-covered contracts by contract type (i.e., firm-fixed-price, incentive, cost-plus-fixed fee, etc.) and other contractor business activity. As related to CAS-covered contracts, the analysis should identify the potential impact on funds of the various Agencies/Departments (i.e., Department of Energy, National Aeronautics and Space Administration, Army, Navy, Air Force, other Department of Defense, other Government) as follows:

(1) For any change in cost accounting practices required in accordance with subparagraph (a)(3) and subdivision (a)(4)(i) of the clause at FAR 52.230-2, Cost Accounting Standards; or subparagraph (a)(3) and subdivisions (a)(4)(i) or (a)(4)(iv) of the clause at FAR 52.230-5, Cost Accounting Standards-Educational Institution; within 60 days (or such other date as may be mutually agreed to) after award of a contract requiring this change.

(2) For any change in cost accounting practices proposed in accordance with subdivision (a)(4)(ii) or (iii) of the clauses at FAR 52.230-2, Cost Accounting Standards, and FAR 52.230-5, Cost Accounting Standards-Educational Institution; or with subparagraph (a)(3) of the clause at FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices, not less than 60 days (or such other date as may be mutually agreed to) before the effective date of the proposed change.

(3) For any failure to comply with an applicable CAS or to follow a disclosed practice (as contemplated by subparagraph (a)(5) at FAR 52.230-2, Cost Accounting Standards, and FAR 52.230-5, Cost Accounting Standards-Educational Institution; or by subparagraph (a)(4) at FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices):

(i) Within 60 days (or such other date as may be mutually agreed to) after the date of agreement with the initial finding of noncompliance, or

(ii) In the event of Contractor disagreement with the initial finding of noncompliance, within 60 days of the date the Contractor is notified by the Contracting Officer of the determination of noncompliance.

(b) After an ACO, or cognizant Federal agency official, determination of materiality, submit a cost impact proposal in the form and manner specified by the Contracting Officer within 60 days (or such other date as may be mutually agreed to) after the date of determination of the adequacy and compliance of a change submitted pursuant to paragraph (a) of this clause. The cost impact proposal shall be in sufficient detail to permit evaluation, determination, and negotiation of the cost impact upon each separate CAS-covered contract and subcontract.

(1) Cost impact proposals submitted for changes in cost accounting practices required in accordance with subparagraph (a)(3) and subdivision (a)(4)(i) of the clause at FAR 52.230-2, Cost Accounting Standards; or subparagraph (a)(3) and subdivisions (a)(4)(i) or (a)(4)(iv) of the clause at FAR 52.230-5, Cost Accounting Standards-Educational Institution; shall identify the applicable standard or cost principle and all contracts and subcontracts containing the clauses entitled Cost Accounting Standards or Cost Accounting Standards-Educational Institution, which have an award date before the effective date of that standard or cost principle.

(2) Cost impact proposals submitted for any change in cost accounting practices proposed in accordance with subdivisions (a)(4) (ii) or (iii) of the clauses at FAR 52.230-2, Cost Accounting Standards, and FAR 52.230-5, Cost Accounting Standards-Educational Institution; or with subparagraph (a)(3) of the clause at FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices; shall identify all contracts and subcontracts containing the clauses at FAR 52.230-2, Cost Accounting Standards, FAR 52.230-5, Cost Accounting Standards-Educational Institution, and FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices.

(3) Cost impact proposals submitted for failure to comply with an applicable CAS or to follow a disclosed practice as contemplated by subparagraph (a)(5) of the clauses at FAR 52.230-2, Cost Accounting Standards, and FAR 52.230-5, Cost Accounting Standards-Educational Institution; or by subparagraph (a)(4) of the clause at FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices, shall identify the cost impact on each separate CAS covered contract from the date of failure to comply until the noncompliance is corrected.

(c) If the submissions required by paragraphs (a) and (b) of this clause are not submitted within the specified time, or any extension granted by the Contracting Officer, an amount not to exceed 10 percent of each subsequent amount determined payable related to the Contractor's CAS-covered prime contracts, up to the estimated general dollar magnitude of the cost impact, may be withheld until such time as the required submission has been provided in the form and manner specified by the Contracting Officer.

(d) Agree to appropriate contract and subcontract amendments to reflect adjustments established in accordance with subparagraphs (a)(4) and (a)(5) of the clauses at FAR 52.230-2 and 52.230-5 or with subparagraphs (a)(3) or (a)(4) of the Disclosure and Consistency of Cost Accounting Practices clause at FAR 52.230-3.

(e) For all subcontracts subject to the clauses at FAR 52.230-2, 52.230-3, or 52.230-5--

(1) So state in the body of the subcontract, in the letter of award, or in both (self-deleting clauses shall not be used);

(2) Include the substance of this clause in all negotiated subcontracts; and

(3) Within 30 days after award of the subcontract, submit the following information to the Contractor's cognizant contract administration office for transmittal to the contract administration office cognizant of the subcontractor's facility:

(i) Subcontractor's name and subcontract number.

(ii) Dollar amount and date of award.

(iii) Name of Contractor making the award.

(f) Notify the Contracting Officer in writing of any adjustments required to subcontracts under this contract and agree to an adjustment, based on them, to this contract price or estimated cost and fee. This notice is due within 30 days after proposed subcontract adjustments are received and shall include a proposal for adjusting the higher tier subcontract or the prime contract appropriately.

(g) For subcontracts containing the clauses at FAR 52.230-2 or 52.230-5, require the subcontractor to comply with all Standards in effect on the date of award or of final agreement on price, as shown on the subcontractor's signed Certificate of Current Cost or Pricing Data, whichever is earlier.

(End of clause)

52.231-5000 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE
MAR 1995)--EFARS

(a) This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals and FAR Part 49.
(b) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region __**V**__. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.
(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.
(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

(End of clause)

52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (SEP 2002)

(a) Payment of price. The Government shall pay the Contractor the contract price as provided in this contract.

(b) Progress payments. The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

(1) The Contractor's request for progress payments shall include the following substantiation:

(i) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested.

(ii) A listing of the amount included for work performed by each subcontractor under the contract.

(iii) A listing of the total amount of each subcontract under the contract.

(iv) A listing of the amounts previously paid to each such subcontractor under the contract.

(v) Additional supporting data in a form and detail required by the Contracting Officer.

(2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--

(i) Consideration is specifically authorized by this contract; and

(ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) Contractor certification. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph (c)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) All payments due to subcontractors and suppliers from previous payments received under the contract have been made, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code;

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

_____

(Name)

_____

(Title)

_____

(Date)

(d) Refund of unearned amounts. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall--

(1) Notify the Contracting Officer of such performance deficiency; and

(2) Be obligated to pay the Government an amount (computed by the Contracting Officer in the manner provided in paragraph (j) of this clause) equal to interest on the unearned amount from the 8th day after the date of receipt of the unearned amount until--

(i) The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or

(ii) The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.

(e) Retainage. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete, the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the Government and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.

(f) Title, liability, and reservation of rights. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(g) Reimbursement for bond premiums. In making these progress payments, the Government shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (e) of this clause shall not apply to that portion of progress payments attributable to bond premiums.

(h) Final payment. The Government shall pay the amount due the Contractor under this contract after--

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against
the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 3727 and 41 U.S.C. 15).

(i) Limitation because of undefinitized work. Notwithstanding any provision of this contract, progress payments shall not exceed 80 percent on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in FAR Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.

(j) Interest computation on unearned amounts. In accordance with 31 U.S.C. 3903(c)(1), the amount payable under subparagraph (d)(2) of this clause shall be--

(1) Computed at the rate of average bond equivalent rates of 91-day Treasury bills auctioned at the most recent auction of such bills prior to the date the Contractor receives the unearned amount; and

(2) Deducted from the next available payment to the Contractor.

(End of clause)

52.232-17 INTEREST (JUNE 1996)

(a) Except as otherwise provided in this contract under a Price Reduction for Defective Cost or Pricing Data clause or a Cost Accounting Standards clause, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid. reproduce, prepare derivative works, distribute copies to the public, and (b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

(End of clause)

52.232-18 AVAILABILITY OF FUNDS (APR 1984)

Funds are not presently available for this contract. The Government's obligation under this contract is contingent upon the availability of appropriated funds from which payment for contract purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the Contracting Officer for this contract and until the Contractor receives notice of such availability, to be confirmed in writing by the Contracting Officer.

(End of clause)

52.232-23 ASSIGNMENT OF CLAIMS (JAN 1986)

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

(End of clause)

52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (OCT 2003)

Notwithstanding any other payment terms in this contract, the Government will make invoice payments under the terms and conditions specified in this clause. The Government considers payment as being made on the day a check is dated or the date of an electronic funds transfer. Definitions of pertinent terms are set forth in sections 2.101, 32.001, and 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see paragraph (a)(3) concerning payments due on Saturdays, Sundays, and legal holidays.)

(a) Invoice payments--(1) Types of invoice payments. For purposes of this clause, there are several types of invoice payments that may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project.

(A) The due date for making such payments is 14 days after the designated billing office receives a proper payment request. If the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date is the 14th day after the date of the Contractor's payment request, provided the designated billing office receives a proper payment request and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, is as specified in the contract or, if not specified, 30 days after approval by the Contracting Officer for release to the Contractor.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract).

(A) The due date for making such payments is the later of the following two events:

(1) The 30th day after the designated billing office receives a proper invoice from the Contractor.

(2) The 30th day after Government acceptance of the work or services completed by the Contractor. For a final invoice when the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance is deemed to occur on the effective date of the contract settlement.

(B) If the designated billing office fails to annotate the invoice with the date of actual receipt at the time of receipt, the invoice payment due date is the 30th day after the date of the Contractor's invoice, provided the designated billing office receives a proper invoice and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(2) Contractor's invoice. The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in paragraphs (a)(2)(i) through (a)(2)(xi) of this clause. If the invoice does not comply with these requirements, the designated billing office must return it within 7 days after receipt, with the reasons why it is not a proper invoice. When computing any interest penalty owed the Contractor, the Government will take into account if the Government notifies the Contractor of an improper invoice in an untimely manner.

(i) Name and address of the Contractor.

(ii) Invoice date and invoice number. (The Contractor should date invoices as close as possible to the date of mailing or transmission.)

(iii) Contract number or other authorization for work or services performed (including order number and contract line item number).

(iv) Description of work or services performed.

(v) Delivery and payment terms (e.g., discount for prompt payment terms).

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number, and mailing address of person to notify in the event of a defective invoice.

(viii) For payments described in paragraph (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.

(ix) Taxpayer Identification Number (TIN). The Contractor shall include its TIN on the invoice only if required elsewhere in this contract.

(x) Electronic funds transfer (EFT) banking information.

(A) The Contractor shall include EFT banking information on the invoice only if required elsewhere in this contract.

(B) If EFT banking information is not required to be on the invoice, in order for the invoice to be a proper invoice, the Contractor shall have submitted correct EFT banking information in accordance with the applicable solicitation provision (e.g., 52.232-38, Submission of Electronic Funds Transfer Information with Offer), contract clause (e.g., 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration, or 52.232-34, Payment by Electronic Funds Transfer--Other Than Central Contractor Registration), or applicable agency procedures.

(C) EFT banking information is not required if the Government waived the requirement to pay by EFT.

(xi) Any other information or documentation required by the contract.

(3) Interest penalty. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if payment is not made by the due date and the conditions listed in paragraphs (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday, the designated payment office may make payment on the following working day without incurring a late payment interest penalty.

(i) The designated billing office received a proper invoice.

(ii) The Government processed a receiving report or other Government documentation authorizing payment and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.

(iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) Computing penalty amount. The Government will compute the interest penalty in accordance with the Office of Management and Budget prompt payment regulations at 5 CFR part 1315.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in paragraph (a)(1)(ii) of this clause, Government acceptance or approval is deemed to occur constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. If actual acceptance or approval occurs within the constructive acceptance or approval period, the Government will base the determination of an interest penalty on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity,

quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The prompt payment regulations at 5 CFR 1315.10(c) do not require the Government to pay interest penalties if payment delays are due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. The Government and the Contractor shall resolve claims involving disputes, and any interest that may be payable in accordance with the clause at FAR 52.233-1, Disputes.

(5) Discounts for prompt payment. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if the Government takes a discount for prompt payment improperly. The Government will calculate the interest penalty in accordance with the prompt payment regulations at 5 CFR part 1315.

(6) Additional interest penalty. (i) The designated payment office will pay a penalty amount, calculated in accordance with the prompt payment regulations at 5 CFR part 1315 in addition to the interest penalty amount only if--

(A) The Government owes an interest penalty of $1 or more;

(B) The designated payment office does not pay the interest penalty within 10 days after the date the invoice amount is paid; and

(C) The Contractor makes a written demand to the designated payment office for additional penalty payment, in accordance with paragraph (a)(6)(ii) of this clause, postmarked not later than 40 days after the date the invoice amount is paid.

(ii)(A) The Contractor shall support written demands for additional penalty payments with the following data. The Government will not request any additional data. The Contractor shall--

(1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;

(2) Attach a copy of the invoice on which the unpaid late payment interest was due; and

(3) State that payment of the principal has been received, including the date of receipt.

(B) If there is no postmark or the postmark is illegible--

(1) The designated payment office that receives the demand will annotate it with the date of receipt provided the demand is received on or before the 40th day after payment was made; or

(2) If the designated payment office fails to make the required annotation, the Government will determine the demand's validity based on the date the Contractor has placed on the demand, provided such date is no later than the 40th day after payment was made.

(b) Contract financing payments. If this contract provides for contract financing, the Government will make contract financing payments in accordance with the applicable contract financing clause.

(c) Subcontract clause requirements. The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) Prompt payment for subcontractors. A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) Interest for subcontractors. An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) Subcontractor clause flowdown. A clause requiring each subcontractor to use:

(i) Include a payment clause and an interest penalty clause conforming to the standards set forth in paragraphs (c)(1) and (c)(2) of this clause in each of its subcontracts; and

(ii) Require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) Subcontract clause interpretation. The clauses required by paragraph (c) of this clause shall not be construed to impair the right of the Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that--

(1) Retainage permitted. Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

(2) Withholding permitted. Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) Withholding requirements. Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause previously has been furnished to the subcontractor; and

(ii) The Contractor furnishes to the Contracting Officer a copy of any notice issued by a Contractor pursuant to paragraph (d)(3)(i) of this clause.

(e) Subcontractor withholding procedures. If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) Subcontractor notice. Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) Contracting Officer notice. Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to paragraph (e)(1) of this clause;

(3) Subcontractor progress payment reduction. Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (e)(1) of this clause;

(4) Subsequent subcontractor payment. Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under paragraph
(e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notice to Contracting Officer. Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under paragraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) Interest to Government. Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under paragraph (e)(5)(i) of this clause.

(f) Third-party deficiency reports--(1) Withholding from subcontractor. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a “second-tier subcontractor”) a written notice in accordance with section 2 of the Act of August 24, 1935 (40

U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under paragraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (f)(1)(i) of this clause.

(2) Subsequent payment or interest charge. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall--

(i) Pay the amount withheld under paragraph (f)(1)(ii) of this clause to such first-tier subcontractor; or

(ii) Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts DisputesAct of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) Written notice of subcontractor withholding. The Contractor shall issue a written notice of any withholding to a subcontractor (with a copy furnished to the Contracting Officer), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) Subcontractor payment entitlement. The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) Prime-subcontractor disputes. A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the Government is a party. The Government may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) Preservation of prime-subcontractor rights. Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) Non-recourse for prime contractor interest penalty. The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the Government for such interest penalty. A cost-reimbursement claim may not include any amount for reimbursement of such interest penalty.

(l) Overpayments. If the Contractor becomes aware of a duplicate contract financing or invoice payment or that the Government has otherwise overpaid on a contract financing or invoice payment, the Contractor shall immediately notify the Contracting Officer and request instructions for disposition of the overpayment.

(End of clause)

52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER—CENTRAL CONTRACTOR REGISTRATION (OCT 2003)

(a) Method of payment. (1) All payments by the Government under this contract shall be made by electronic funds transfer (EFT), except as provided in paragraph (a)(2) of this clause. As used in this clause, the term “EFT” refers to the funds transfer and may also include the payment information transfer.

(2) In the event the Government is unable to release one or more payments by EFT, the Contractor agrees to either--

(i) Accept payment by check or some other mutually agreeable method of payment; or

(ii) Request the Government to extend the payment due date until such time as the Government can make payment by EFT (but see paragraph (d) of this clause).

(b) Contractor's EFT information. The Government shall make payment to the Contractor using the EFT information contained in the Central Contractor Registration (CCR) database. In the event that the EFT information changes, the Contractor shall be responsible for providing the updated information to the CCR database.

(c) Mechanisms for EFT payment. The Government may make payment by EFT through either the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association, or the Fedwire Transfer System. The rules governing Federal payments through the ACH are contained in 31 CFR part 210.

(d) Suspension of payment. If the Contractor's EFT information in the CCR database is incorrect, then the Government need not make payment to the Contractor under this contract until correct EFT information is entered into the CCR database; and any invoice or contract financing request shall be deemed not to be a proper invoice for the purpose of prompt payment under this contract. The prompt payment terms of the contract regarding notice of an improper invoice and delays in accrual of interest penalties apply.

(e) Liability for uncompleted or erroneous transfers. (1) If an uncompleted or erroneous transfer occurs because the Government used the Contractor's EFT information incorrectly, the Government remains responsible for--

(i) Making a correct payment;

(ii) Paying any prompt payment penalty due; and

(iii) Recovering any erroneously directed funds.

(2) If an uncompleted or erroneous transfer occurs because the Contractor's EFT information was incorrect, or was revised within 30 days of Government release of the EFT payment transaction instruction to the Federal Reserve System, and--

(i) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or

(ii) If the funds remain under the control of the payment office, the Government shall not make payment, and the provisions of paragraph (d) of this clause shall apply.

(f) EFT and prompt payment. A payment shall be deemed to have been made in a timely manner in accordance with the prompt payment terms of this contract if, in the EFT payment transaction instruction released to the Federal Reserve System, the date specified for settlement of the payment is on or before the prompt payment due date, provided the specified payment date is a valid date under the rules of the Federal Reserve System.

(g) EFT and assignment of claims. If the Contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the Contractor shall require as a condition of any such assignment, that the assignee shall register separately in the CCR database and shall be paid by EFT in accordance with the terms of this clause. Notwithstanding any other requirement of this contract, payment to an ultimate recipient other than the Contractor, or a financial institution properly recognized under an assignment of claims pursuant to subpart 32.8, is not permitted. In all respects, the requirements of this clause shall apply to the assignee as if it were the Contractor. EFT information that shows the ultimate recipient of the transfer to be other than the Contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of paragraph (d) of this clause.

(h) Liability for change of EFT information by financial agent. The Government is not liable for errors resulting from changes to EFT information made by the Contractor's financial agent.

(i) Payment information. The payment or disbursing office shall forward to the Contractor available payment information that is suitable for transmission as of the date of release of the EFT instruction to the Federal Reserve System. The Government may request the Contractor to designate a desired format and method(s) for delivery of payment information from a list of formats and methods the payment office is capable of executing. However, the Government does not guarantee that any particular format or method of delivery is available at any particular payment office and retains the latitude to use the format and delivery method most convenient to the Government. If the Government makes payment by check in accordance with paragraph (a) of this clause, the Government shall mail the payment information to the remittance address contained in the CCR database.

(End of Clause)

52.232-5000 PAYMENT FOR MATERIALS DELIVERED OFF-SITE (MAR 1995)--EFARS

(a) Pursuant to FAR clause 52.232-5, Payments Under Fixed Priced Construction Contracts, materials delivered to the contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the General Provisions are fulfilled. Payment for items delivered to locations other than the work site will be limited to: (1) materials required by the technical provisions; or (3) materials that have been fabricated to the point where they are identifiable to an item of work required under this contract.
(b) Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contractor and including the value of material and labor incorporated into the item. In addition to petroleum products, payment for materials delivered off-site is limited to the following items:
_____

(End of clause)

52.233-1 DISPUTES. (JUL 2002) -- ALTERNATE I (DEC 1991)

(a) This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) Claim, as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $100,000 is not a claim under the Act until certified. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d)(1) A claim by the Contractor shall be made in writing and, unless otherwise stated in this contract, submitted within 6 years after accrual of the claim to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2) (i) Contractors shall provide the certification specified in subparagraph (d)(2)(iii) of this clause when submitting any claim -

(A) Exceeding $100,000; or

(B) Regardless of the amount claimed, when using -

(1) Arbitration conducted pursuant to 5 U.S.C. 575-580; or

(2) Any other alternative means of dispute resolution (ADR) technique that the agency elects to handle in accordance with the Administrative Dispute Resolution Act (ADRA).

(ii) The certification requirement does not apply to issues in controversy that have not been submitted as all or part of a claim.

(iii) The certification shall state as follows: "I certify that the claim is made in good faith; that the supporting data are accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable; and that I am duly authorized to certify the claim on behalf of the Contractor.

(3) The certification may be executed by any person duly authorized to bind the Contractor with respect to the claim.

(e) For Contractor claims of $100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) If the claim by the Contractor is submitted to the Contracting Officer or a claim by the Government is presented to the Contractor, the parties, by mutual consent, may agree to use ADR. If the Contractor refuses an offer for alternative disputes resolution, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the request. When using arbitration conducted pursuant to 5 U.S.C. 575-580, or when using any other ADR technique that the agency elects to handle in accordance with the ADRA, any claim, regardless of amount, shall be accompanied by the certification described in subparagraph (d)(2)(iii) of this clause, and executed in accordance with subparagraph (d)(3) of this clause.

(h) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (certified, if required); or (2) the date that payment otherwise would be due, if that date is later, until the date of payment. With regard to claims having defective certifications, as defined in (FAR) 48 CFR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(i) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

(End of clause)

52.233-3 PROTEST AFTER AWARD (AUG. 1996)

(a) Upon receipt of a notice of protest (as defined in FAR 33.101) or a determination that a protest is likely (see FAR 33.102(d)), the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule

or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

(f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available, and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

(End of clause)

52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least **20%** percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

(End of clause)

52.236-2 DIFFERING SITE CONDITIONS (APR 1984)

As prescribed in 36.502, insert the following clause in solicitations and contracts when a fixed-price construction contract or a fixed-price dismantling, demolition, or removal of improvements contract is contemplated and the contract amount is expected to exceed the small purchase limitation. The Contracting Officer may insert the clause in solicitations and contracts when a fixed-price construction or a fixed-price contract for dismantling, demolition, or removal of improvements is contemplated and the contract amount is expected to be within the small purchase

limitation.

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of

(1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or

(2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

(End of clause)

52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to

(1) conditions bearing upon transportation, disposal, handling, and storage of materials;

(2) the availability of labor, water, electric power, and roads;

(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site;

(4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.

(b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any

understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

(End of clause)

52.236-4 PHYSICAL DATA (APR 1984)

Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) The indications of physical conditions on the drawings and in the specifications are the result of site investigations by . . . . . [insert a description of investigational methods used, such as surveys, auger borings, core borings, test pits, probings, test tunnels].

(b) Weather conditions . . . . . (insert a summary of weather records and warnings).

(c) Transportation facilities . . . . . (insert a summary of transportation facilities providing access from the site, including information about their availability and limitations.

(d) . . . . . (insert other pertinent information).

(End of clause)

52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer

may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

(End of clause)

52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(End of clause)

52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(End of clause)

52.236-8 OTHER CONTRACTS (APR 1984)

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

(End of clause)

52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those

limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities

(1) at or near the work site, and

(2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(End of clause)

52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(End of clause)

52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

(End of clause)

52.236-12 CLEANING UP (APR 1984)

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

(End of clause)

52.236-13 ACCIDENT PREVENTION (NOV 1991)

(a) The Contractor shall provide and maintain work environments and procedures which will

(1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;

(2) avoid interruptions of Government operations and delays in project completion dates; and

(3) control costs in the performance of this contract.

(b) For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall-

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purposes are taken.

(c) If this contract is for construction or dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.

(d) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until

satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(viii) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

(End of clause)

52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.

(End of clause)

52.236-17 LAYOUT OF WORK (APR 1984)

The Contractor shall lay out its work from Government established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(End of clause)

52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997) - ALTERNATE I (APR 1984

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by," or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown," as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place," that is "furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise

indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor. Upon completing the work under this contract, the Contractor shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted.

(End of clause)

52.236-24 WORK OVERSIGHT IN ARCHITECT-ENGINEER CONTRACTS (APR 1984)

The extent and character of the work to be done by the Contractor shall be subject to the general oversight, supervision, direction, control, and approval of the Contracting Officer.

(End of clause)

52.236-25 REQUIREMENTS FOR REGISTRATION OF DESIGNERS (JUN 2003)

Architects or engineers registered to practice in the particular professional field involved in a State, the District of Columbia, or an outlying area of the United States shall prepare or review and approve the design of architectural, structural, mechanical, electrical, civil, or other engineering features of the work.

(End of clause)

52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

(End of clause)

52.242-13 BANKRUPTCY (JUL 1995)

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government contract numbers and contracting offices for all Government contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

(End of clause)

52.242-14 SUSPENSION OF WORK (APR 1984)

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract. (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

(End of clause)

52.243-4 CHANGES (AUG 1987)

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating

(1) the date, circumstances, and source of the order and

(2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after

(1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(End of clause)

52.243-5 CHANGES AND CHANGED CONDITIONS (APR 1984)

(a) The Contracting Officer may, in writing, order changes in the drawings and specifications within the general scope of the contract.

(b) The Contractor shall promptly notify the Contracting Officer, in writing, of subsurface or latent physical conditions differing materially from those indicated in this contract or unknown unusual physical conditions at the site before proceeding with the work.

(c) If changes under paragraph (a) or conditions under paragraph (b) increase or decrease the cost of, or time required for performing the work, the Contracting Officer shall make an equitable adjustment (see paragraph (d)) upon submittal of a "proposal for adjustment" (hereafter referred to as proposal) by the Contractor before final payment under the contract.

(d) The Contracting Officer shall not make an equitable adjustment under paragraph (b) unless--

(1) The Contractor has submitted and the Contracting Officer has received the required written notice; or

(2) The Contracting Officer waives the requirement for the written notice.

(e) Failure to agree to any adjustment shall be a dispute under the Disputes clause.

(End of clause)

52.244-4 SUBCONTRACTORS AND OUTSIDE ASSOCIATES AND CONSULTANTS (ARCHITECT-ENGINEER SERVICES) (AUG 1998)

Any subcontractors and outside associates or consultants required by the Contractor in connection with the services covered by the contract will be limited to individuals or firms that were specifically identified and agreed to during negotiations. The Contractor shall obtain the Contracting Officer's written consent before making any substitution for these subcontractors, associates, or consultants.

(End of clause)

52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

(a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not--

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;

(2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

(3) Constitute or imply acceptance; or

(4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) of this section.

(d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

(e) The Contractor shall promptly furnish, at no increase in contract price, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or

otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.

(h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

(End of clause)

52.246-21 WARRANTY OF CONSTRUCTION (MAR 1994)

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.
(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

(End of clause)

52.247-34 F.O.B. DESTINATION (NOV 1991)

(a) The term "f.o.b. destination," as used in this clause, means--

(1) Free of expense to the Government, on board the carrier's conveyance, at a specified delivery point where the consignee's facility (plant, warehouse, store, lot, or other location to which shipment can be made) is located; and

(2) Supplies shall be delivered to the destination consignee's wharf (if destination is a port city and supplies are for export), warehouse unloading platform, or receiving dock, at the expense of the Contractor. The Government shall not be liable for any delivery, storage, demurrage, accessorial, or other charges involved before the actual delivery (or "constructive placement" as defined in carrier tariffs) of the supplies to the destination, unless such charges are caused by an act or order of the Government acting in its contractual capacity. If rail carrier is used, supplies shall be delivered to the specified unloading platform of the consignee. If motor carrier (including "piggyback") is used, supplies shall be delivered to truck tailgate at the unloading platform of the consignee, except when the supplies delivered meet the requirements of Item 568 of the National Motor Freight Classification for "heavy or bulky freight." When supplies meeting the requirements of the referenced Item 568 are delivered, unloading (including movement to the tailgate) shall be performed by the consignee, with assistance from the truck driver, if requested. If the contractor uses rail carrier or freight forwarded for less than carload shipments, the contractor shall ensure that the carrier will furnish tailgate delivery, when required, if transfer to truck is required to complete delivery to consignee.

(b) The Contractor shall--

(1)(i) Pack and mark the shipment to comply with contract specifications; or

(ii) In the absence of specifications, prepare the shipment in conformance with carrier requirements;

(2) Prepare and distribute commercial bills of lading;

(3) Deliver the shipment in good order and condition to the point of delivery specified in the contract;

(4) Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the consignee at the delivery point specified in the contract;

(5) Furnish a delivery schedule and designate the mode of delivering carrier; and

(6) Pay and bear all charges to the specified point of delivery.

(End of clause)

52.248-3 VALUE ENGINEERING--CONSTRUCTION (FEB 2000)

(a) General. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) Definitions. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that--

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change--

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for

(i) the affected portions of the existing contract requirement and

(ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) Submission. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) Government action.

(1) The Contracting Officer will notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer will notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

If the VECP is not accepted, the Contracting Officer will notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price

reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The decision to accept or reject all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.

(f) Sharing.

(1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by

(i) 45 percent for fixed-price contracts or

(ii) 75 percent for cost-reimbursement contracts.

(2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) Collateral savings. If a VECP is accepted, the Contracting Officer will increase the instant contract amount by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings will not exceed the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or $100,000, whichever is greater. The Contracting Officer is the sole determiner of the amount of collateral savings.

(h) Subcontracts. The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering-- Construction clause of contract . . . . . , shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations." If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

(End of clause)

52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996) - ALTERNATE I (SEP 1996)

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (b)(6) of this clause; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) The Contractor shall submit complete termination inventory schedules no later than 120 days from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 120-day period.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(f) Subject to paragraph (e) of this clause, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid or remaining to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (g) or paragraph (g) of this clause, exclusive of costs shown in subparagraph (g)(3) of this clause, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be modified, and the Contractor paid the agreed amount. Paragraph (g) of this clause shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(g) If the Contractor and Contracting Officer fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (f) of this clause:

(1) For contract work performed before the effective date of termination, the total (without duplication of any items) of--

(i) The cost of this work;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (g)(1)(i) of this clause; and

(iii) A sum, as profit on subdivision (g)(1)(i) of this clause, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(2) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(h) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (g) of this clause, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(i) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(j) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e), (g), or (l) of this clause, except that if the Contractor failed to submit the termination settlement proposal or request for equitable adjustment within the time provided in paragraph (e) or (l), respectively, and failed to request a time extension, there is no right of appeal.

(k) In arriving at the amount due the Contractor under this clause, there shall be deducted--

(1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

(l) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(m)(1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(n) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

(End of clause)

52.249-7 TERMINATION (FIXED-PRICE ARCHITECT-ENGINEER) (APR 1984)

(a) The Government may terminate this contract in whole or, from time to time, in part, for the Government's convenience or because of the failure of the Contractor to fulfill the contract obligations. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the nature, extent, and effective date of the termination. Upon receipt of the notice, the Contractor shall (1) immediately discontinue all services affected (unless the notice directs otherwise), and (2) deliver to the Contracting Officer all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this contract, whether completed or in process.

(b) If the termination is for the convenience of the Government, the Contracting Officer shall make an equitable adjustment in the contract price but shall allow no anticipated profit on unperformed services.

(c) If the termination is for failure of the Contractor to fulfill the contract obligations, the Government may complete the work by contract or otherwise and the Contractor shall be liable for any additional cost incurred by the Government.

(d) If, after termination for failure to fulfill contract obligations, it is determined that the Contractor had not failed, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Government.

(ix) The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.253-1 COMPUTER GENERATED FORMS (JAN 1991)

(a) Any data required to be submitted on a Standard or Optional Form prescribed by the Federal Acquisition Regulation (FAR) may be submitted on a computer generated version of the form, provided there is no change to the name, content, or sequence of the data elements on the form, and provided the form carries the Standard or Optional Form number and edition date.

(b) Unless prohibited by agency regulations, any data required to be submitted on an agency unique form prescribed by an agency supplement to the FAR may be submitted on a computer generated version of the form provided there is no change to the name, content, or sequence of the data elements on the form and provided the form carries the agency form number and edition date.

(x) If the Contractor submits a computer generated version of a form that is different than the required form, then the rights and obligations of the parties will be determined based on the content of the required form.

(End of clause)

252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)

(a) "Definition. Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the contracting officer to perform specific technical or administrative functions.

(b) If the Contracting Officer designates a contracting officer's representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the contracting officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

252.203-7001 PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-CONTRACT-RELATED FELONIES (MAR 1999)

(a) Definitions. As used in this clause—

(1) “Arising out of a contract with the DoD” means any act in connection with—

(i) Attempting to obtain;

(ii) Obtaining, or

(iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).

(2) "Conviction of fraud or any other felony" means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of *nolo contendere*, for which sentence has been imposed.

(3) "Date of conviction" means the date judgment was entered against the individual.

(b) Any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from serving--

(1) In a management or supervisory capacity on any DoD contract or first-tier subcontract;

(2) On the board of directors of any DoD contractor or first-tier subcontractor;

(3) As a consultant, agent, or representative for any DoD contractor or first-tier subcontractor; or

(4) In any other capacity with the authority to influence, advise, or control the decisions of any DoD contractor or subcontractor with regard to any DoD contract or first-tier subcontract.

(c) Unless waived, the prohibition in paragraph (b) of this clause applies for not less than 5 years from the date of conviction.

(d) 10 U.S.C. 2408 provides that a defense contractor or first-tier subcontractor shall be subject to a criminal penalty of not more than $500,000 if convicted of knowingly—

(1) Employing a person under a prohibition specified in paragraph (b) of this clause; or

(2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.

(e) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as—

(1) Suspension or debarment;

(2) Cancellation of the contract at no cost to the Government; or

(3) Termination of the contract for default.

(f) The Contractor may submit written requests for waiver of the prohibition in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify—

(1) The person involved;

(2) The nature of the conviction and resultant sentence or punishment imposed;

(3) The reasons for the requested waiver; and

(4) An explanation of why a waiver is in the interest of national security.

(g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation, except those for commercial items or components.

(h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Federal Benefits Office, U.S. Department of Justice, telephone (202) 616-3507.

(End of clause)

252.203-7002 DISPLAY OF DOD HOTLINE POSTER (DEC 1991)

(a) The Contractor shall display prominently in common work areas within business segments performing work under Department of Defense (DoD) contracts, DoD Hotline Posters prepared by the DoD Office of the Inspector General.

(b) DoD Hotline Posters may be obtained from the DoD Inspector General, ATTN: Defense Hotline, 400 Army Navy Drive, Washington, DC 22202-2884.

(xi) The Contractor need not comply with paragraph (a) of this clause if it has established a mechanism, such as a hotline, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.

(End of clause)

252.204-7000 DISCLOSURE OF INFORMATION (DEC 1991)

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract, unless--

(1) The Contracting Officer has given prior written approval; or

(2) The information is otherwise in the public domain before the date of release.

(b) Requests for approval shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 45 days before the proposed date for release.

(c) The Contractor agrees to include a similar requirement in each subcontract under this contract. Subcontractors shall submit requests for authorization to release through the prime contractor to the Contracting Officer.

(End of clause)

252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the contractor.

(End of clause)

252.209-7000 ACQUISITION FROM SUBCONTRACTORS SUBJECT TO ONSITE INSPECTION UNDER THE INTERMEDIATE-RANGE NUCLEAR FORCES (INF) TREATY (NOV 1995)

(a) The Contractor shall not deny consideration for a subcontract award under this contract to a potential subcontractor subject to on-site inspection under the INF Treaty, or a similar treaty, solely or in part because of the actual or potential presence of Soviet inspectors at the subcontractor's facility, unless the decision is approved by the Contracting Officer.

(b) The Contractor shall incorporate this clause, including this paragraph (b), in all solicitations and contracts exceeding the simplified acquisition threshold in part 13 of the Federal Acquisition Regulation, except those for commercial items.

(End of clause)

252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of $25,000 with a firm, or subsidiary of a firm, that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country.

(b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country. The notice must include the name of the proposed subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and Nonprocurement Programs.

(End of clause)

252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of $25,000 with a firm, or subsidiary of a firm, that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country.

(b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country. The notice must include the name of the proposed subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and Nonprocurement Programs.

(End of clause)

252.215-7000 PRICING ADJUSTMENTS (DEC 1991)

The term "pricing adjustment," as used in paragraph (a) of the clauses entitled "Price Reduction for Defective Cost or Pricing Data - Modifications," "Subcontractor Cost or Pricing Data," and "Subcontractor Cost or Pricing Data - Modifications," means the aggregate increases and/or decreases in cost plus applicable profits.

(End of clause)

252.215-7002 COST ESTIMATING SYSTEM REQUIREMENTS (OCT 1998)

(a) "Definition."

"Estimating system" means the Contractor's policies, procedures, and practices for generating estimates of costs and other data included in proposals submitted to customers in the expectation of receiving contract awards. Estimating system includes the Contractor's --

(1) Organizational structure;

(2) Established lines of authority, duties, and responsibilities;

(3) Internal controls and managerial reviews;

(4) Flow of work, coordination, and communication; and

(5) Estimating methods, techniques, accumulation of historical costs, and other analyses used to generate cost estimates.1997

(b) "General."

(1) The Contractor shall establish, maintain, and comply with an estimating system that is consistently applied and produces reliable, verifiable, supportable, and documented cost estimates that are an acceptable basis for negotiation of fair and reasonable prices.

(2) The system should be --

(i) Consistent and integrated with the Contractor's related management systems; and

(ii) Subject to applicable financial control systems.

(c) "Applicability". Paragraphs (d) and (e) of this clause apply if the Contractor is a large business and either --

(1) In its fiscal year preceding award of this contract, received Department of Defense (DoD) prime contracts or subcontracts, totaling $50 million or more for which certified cost or pricing data were required; or

(2) In its fiscal year preceding award of this contract --

(i) Received DoD prime contracts or subcontracts totaling $10 million or more (but less than $50 million) for which certified cost or pricing data were required; and

(ii) Was notified in writing by the Contracting Officer that paragraphs (d) and (e) of this clause apply.

(d) "System requirements."

(1) The Contractor shall disclose its estimating system to the Administrative Contracting Officer (ACO) in writing. If the Contractor wishes the Government to protect the information as privileged or confidential, the Contractor must mark the documents with the appropriate legends before submission.

(2) An estimating system disclosure is adequate when the Contractor has provided the ACO with documentation that--

(i) Accurately describes those policies, procedures, and practices that the Contractor currently uses in preparing cost proposals; and

(ii) Provides sufficient detail for the Government to reasonably make an informed judgment regarding the acceptability of the Contractor's estimating practices.

(3) The Contractor shall --

(i) Comply with its disclosed estimating system; and

(ii) Disclose significant changes to the cost estimating system to the ACO on a timely basis.

(e) "Estimating system deficiencies."

(1) The Contractor shall respond to a written report from the Government that identifies deficiencies in the Contractor's estimating system as follows:

(i) If the Contractor agrees with the report findings and recommendations, the Contractor shall --

(A) Within 30 days, state its agreement in writing; and

(B) Within 60 days, correct the deficiencies or submit a corrective action plan showing proposed milestones and actions leading to elimination of the deficiencies.

(ii) If the Contractor disagrees with the report, the Contractor shall, within 30 days, state its rationale for disagreeing.

(2) The ACO will evaluate the Contractor's response and notify the Contractor of the determination concerning remaining deficiencies and/or the adequacy of any proposed or completed corrective action.

(End of clause)

252.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DOD CONTRACTS) (APR. 1996)

This clause supplements the Federal Acquisition Regulation 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, clause of this contract.

(a) *Definitions. Historically black colleges and universities,* as used in this clause, means institutions determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. The term also means any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

Minority institutions, as used in this clause, means institutions meeting the requirements of section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)). The term also includes Hispanic-serving institutions as defined in section 316(b)(1) of such Act (20 U.S.C. 1059c(b)(1)).

(b) Except for company or division-wide commercial items subcontracting plans, the term *small disadvantaged business,* when used in the FAR 52.219-9 clause, includes historically black colleges and universities and minority institutions, in addition to small disadvantaged business concerns.

(c) Work under the contract or its subcontracts shall be credited toward meeting the small disadvantaged business concern goal required by paragraph (d) of the FAR 52.219-9 clause when:

(1) It is performed on Indian lands or in joint venture with an Indian tribe or a tribally-owned corporation, and

(2) It meets the requirements of 10 U.S.C. 2323a.

(d) Subcontracts awarded to workshops approved by the Committee for Purchase from People Who are Blind or Severely Disabled (41 U.S.C. 46-48), may be counted toward the Contractor's small business subcontracting goal.

(e) A mentor firm, under the Pilot Mentor-Protege Program established under Section 831 of Pub. L. 101-510, as amended, may count toward its small disadvantaged business goal, subcontracts awarded--

(f) The master plan approval referred to in paragraph (f) of the FAR 52.219-9 clause is approval by the Contractor's cognizant contract administration activity.

(g) In those subcontracting plans which specifically identify small, small disadvantaged, and women-owned small businesses, the Contractor shall notify the Administrative Contracting Officer of any substitutions of firms that are not small, small disadvantaged, or women-owned small businesses for the firms listed in the subcontracting plan. Notifications shall be in writing and shall occur within a reasonable period of time after award of the subcontract. Contractor-specified formats shall be acceptable.

(End of clause)

252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)

(a) Definitions.

(1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security; health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

(2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of title 21 of the United States Code, the possession of which is unlawful under chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

(b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.

(c) Contractor programs shall include the following, or appropriate alternatives:

(1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;

(2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;

(3) Provision for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;

(4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:

(i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, and efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.

(ii) In addition, the Contractor may establish a program for employee drug testing--

(A) When there is a reasonable suspicion that an employee uses illegal drugs; or

(B) When an employees has been involved in an accident or unsafe practice;

(C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;

(D) As part of a voluntary employee drug testing program.

(iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

(iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2..1 of subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53 FR 11980 (April 11, 1988), issued by the Department of Health and Human Services.

(d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such times as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.

(e) The provisions of this clause pertaining to drug testing program shall not apply to the extent that are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter,

the Contractor agrees those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

(End of clause)

252.225-7001 BUY AMERICAN ACT AND BALANCE OF PAYMENTS PROGRAM (APR 2003)

(a) Definitions. As used in this clause--

(1) Component means an article, material, or supply incorporated directly into an end product.

(2) Domestic end product means--

(i) An unmanufactured end product that has been mined or produced in the United States; or

(ii) An end product manufactured in the United States if the cost of its qualifying country components and its components that are mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. The cost of components includes transportation costs to the place of incorporation into the end product and U.S. duty (whether or not a duty-free entry certificate is issued). Scrap generated, collected, and prepared for processing in the United States is considered domestic. A component is considered to have been mined, produced, or manufactured in the United States (regardless of its source in fact) if the end product in which it is incorporated is manufactured in the United States and the component is of a class or kind for which the Government has determined that--

(A) Sufficient and reasonably available commercial quantities of a satisfactory quality are not mined, produced, or manufactured in the United States; or

(B) It is inconsistent with the public interest to apply the restrictions of the Buy American Act.

(3) End product means those articles, materials, and supplies to be acquired under this contract for public use.

(4) Foreign end product means an end product other than a domestic end product.

(5) Qualifying country means any country set forth in subsection 225.872-1 of the Defense Federal Acquisition Regulation Supplement.

(6) Qualifying country component means a component mined, produced, or manufactured in a qualifying country.

(7) Qualifying country end product means--

(i) An unmanufactured end product mined or produced in a qualifying country; or

(ii) An end product manufactured in a qualifying country if the cost of the following types of components exceeds 50 percent of the cost of all its components:

(A) Components mined, produced, or manufactured in a qualifying country.

(B) Components mined, produced, or manufactured in the United States.

(C) Components of foreign origin of a class or kind for which the Government has determined that sufficient and reasonably available commercial quantities of a satisfactory quality are not mined, produced, or manufactured in the United States.

(b) This clause implements the Buy American Act (41 U.S.C. Section 10a-d). Unless otherwise specified, this clause applies to all line items in the contract.

(c) The Contractor shall deliver only domestic end products unless, in its offer, it specified delivery of other end products in the Buy American Act--Balance of Payments Program Certificate provision of the solicitation. If the Contractor certified in its offer that it will deliver a qualifying country end product, the Contractor shall deliver a qualifying country end product or, at the Contractor's option, a domestic end product.

(d) The contract price does not include duty for end products or components for which the Contractor will claim duty-free entry.

(End of clause)

252.225-7012 PREFERENCE FOR CERTAIN DOMESTIC COMMODITIES (FEB 2003)

(a) Definitions. As used in this clause--

(1) Component means any item supplied to the Government as part of an end product or of another component.

(2) End product means supplies delivered under a line item of this contract.

(b) The Contractor shall deliver under this contract only such of the following items, either as end products or components, that have been grown, reprocessed, reused, or produced in the United States, its possessions, or Puerto Rico:

(1) Food.

(2) Clothing.

(3) Tents, tarpaulins, or covers.

(4) Cotton and other natural fiber products.

(5) Woven silk or woven silk blends.

(6) Spun silk yarn for cartridge cloth.

(7) Synthetic fabric, and coated synthetic fabric, including all textile fibers and yarns that are for use in such fabrics.

(8) Canvas products.

(9) Wool (whether in the form of fiber or yarn or contained in fabrics, materials, or manufactured articles).

(10) Any item of individual equipment (Federal Supply Class 8465) manufactured from or containing fibers, yarns, fabrics, or materials listed in this paragraph (b).

(c) This clause does not apply--

(1) To items listed in section 25.104(a) of the Federal Acquisition Regulation (FAR), or other items for which the Government has determined that a satisfactory quality and sufficient quantity cannot be acquired as and when needed at U.S. market prices;

(2) To end products incidentally incorporating cotton, other natural fibers, or wool, for which the estimated value of the cotton, other natural fibers, or wool--

(i) Is not more than 10 percent of the total price of the end product; and (ii) Does not exceed the simplified acquisition threshold in FAR part 2;

(3) To foods that have been manufactured or processed in the United States, its possessions, or Puerto Rico, regardless of where the foods (and any component if applicable) were grown or produced, except that this clause does apply to fish, shellfish, or seafood manufactured or processed in the United States and fish, shellfish, or seafood contained in foods manufactured or processed in the United States;

(4) To chemical warfare protective clothing produced in the countries listed in subsection 225.872-1 of the Defense FAR Supplement; or

(5) To fibers and yarns that are for use in synthetic fabric or coated synthetic fabric (but does apply to the synthetic or coated synthetic fabric itself), if--

(i) The fabric is to be used as a component of an end product that is not a textile product. Examples of textile products, made in whole or in part of fabric, include--

(A) Draperies, floor coverings, furnishings, and bedding (Federal Supply Group 72, Household and Commercial Furnishings and Appliances);

(B) Items made in whole or in part of fabric in Federal Supply Group 83, Textile/leather/furs/apparel/findings/ tents/flags, or Federal Supply Group 84, Clothing, Individual Equipment and Insignia;

(C) Upholstered seats (whether for household, office, or other use); and

(D) Parachutes (Federal Supply Class 1670); or

(ii) The fibers and yarns are para-aramid fibers and yarns manufactured in the Netherlands.

(End of clause)

252.225-7020 TRADE AGREEMENTS CERTIFICATE (JAN 2004)

(a) Definitions. Caribbean Basin country end product, designated country end product, Free Trade Agreement country end product, nondesignated country end product, qualifying country end product, and U.S. -made end product have the meanings given in the Trade Agreements clause of this solicitation.

(b) Evaluation. The Government--

(1) Will evaluate offers in accordance with the policies and procedures of Part 225 of the Defense Federal Acquisition Regulation Supplement; and

(2) Will consider only offers of end products that are U.S.-made, qualifying country, designated country, Caribbean Basin country, or Free Trade Agreement country end products, unless the Government determines that--

(i) There are no offers of such end products;

(ii) The offers of such end products are insufficient to fulfill the Government's requirements; or

(iii) A national interest exception to the Trade Agreements Act applies.

(c) Certification and identification of country of origin.

(1) For all line items subject to the Trade Agreements clause of this solicitation, the offeror certifies that each end product to be delivered under this contract, except those listed in paragraph (c)(2) of this provision, is a U.S.-made, qualifying country, designated country, Caribbean Basin country, or Free Trade Agreement country end product.

(2) The following supplies are other nondesignated country end products:

(Line Item Number)

(Country of Origin)

(End of provision)

252.225-7021 TRADE AGREEMENTS (JAN 2004)

(a) Definitions. As used in this clause--

(1) Caribbean Basin country means--

Antigua and El Salvador Nicaragua

Barbuda
Aruba
Bahamas
Barbados
Belize
British Virgin Islands
Costa Rica
Dominica
Dominican Republic.
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Montserrat
Netherlands Antilles
St. Kitts-Nevis
St. Lucia
St. Vincent and the Grenadines
Trinidad and Tobago
.....
.....
.....

(2) Caribbean Basin country end product--

(i) Means an article that--

(A) Is wholly the growth, product, or manufacture of a Caribbean Basin country; or

(B) In the case of an article that consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a Caribbean Basin country into a new and different article of commerce with a name, character, or use distinct from that of the article or articles from which it was transformed. The term refers to a product offered for purchase under a supply contract, but for purposes of calculating the value of the end product includes services (except transportation services) incidental to its supply, provided that the value of those incidental services does not exceed the value of the product itself; and

(ii) Excludes products, other than petroleum and any product derived from petroleum, that are not granted duty-free treatment under the Caribbean Basin Economic Recovery Act (19 U.S.C. 2703(b)). These exclusions presently consist of--

(A) Textiles, apparel articles, footwear, handbags, luggage, flat goods, work gloves, leather wearing apparel, and handloomed, handmade, or folklore articles that are not granted duty-free status in the Harmonized Tariff Schedule of the United States (HTSUS);

(B) Tuna, prepared or preserved in any manner in airtight containers; and

(C) Watches and watch parts (including cases, bracelets, and straps) of whatever type, including, but not limited to, mechanical, quartz digital, or quartz analog, if such watches or watch parts contain any material that is the product of any country to which the HTSUS column 2 rates of duty (HTSUS General Note 3(b)) apply.

(3) Component means an article, material, or supply incorporated directly into an end product.

(4) Designated country means--

Aruba
Austria
Bangladesh
Belgium
Benin
Bhutan
Botswana
Burkina Faso
Burundi
Canada
Germany
Greece
Guinea
Guinea-Bissau
Haiti
Hong Kong
Iceland
Ireland
Israel
Italy
Niger
Norway
Portugal
Republic of Korea
Rwanda
Sao Tome and Principe
Sierra Leone
Singapore
Somalia

Cape Verde	Japan	Spain
Central African Republic	Kiribati	Sweden
Chad	Lesotho	Switzerland
Comoros	Liechtenstein	Tanzania U.R.
Denmark	Luxembourg	Togo
Djibouti	Malawi	Tuvalu
Equatorial Guinea	Maldives	Uganda
Finland	Mali	United Kingdom
France	Mozambique	Vanuatu
Gambia	Nepal	Western Samoa
	Netherlands	Yemen

(5) Designated country end product means an article that--

(i) Is wholly the growth, product, or manufacture of the designated country; or

(ii) In the case of an article that consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a designated country into a new and different article of commerce with a name, character, or use distinct from that of the article or articles from which it was transformed. The term refers to a product offered for purchase under a supply contract, but for purposes of calculating the value of the end product includes services (except transportation services) incidental to its supply, provided that the value of those incidental services does not exceed the value of the product itself.

(6) End product means those articles, materials, and supplies to be acquired under this contract for public use.

(7) Free Trade Agreement country means Canada, Chile, Mexico, or Singapore.

(8) Free Trade Agreement country end product means an article that--

(i) Is wholly the growth, product, or manufacture of a Free Trade Agreement country; or

(ii) In the case of an article that consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a Free Trade Agreement country into a new and different article of commerce with a name, character, or use distinct from that of the article or articles from which it was transformed. The term refers to a product offered for purchase under a supply contract, but for purposes of calculating the value of the end product includes services (except transportation services) incidental to its supply, provided that the value of those incidental services does not exceed the value of the product itself.

(9) Nondesignated country end product means any end product that is not a U.S.-made end product or a designated country end product.

(10) Qualifying country means any country set forth in subsection 225.872-1 of the Defense Federal Acquisition Regulation Supplement.

(11) Qualifying country end product means--

(i) An unmanufactured end product mined or produced in a qualifying country; or

(ii) An end product manufactured in a qualifying country if the cost of the following types of components exceeds 50 percent of the cost of all its components:

(A) Components mined, produced, or manufactured in a qualifying country.

(B) Components mined, produced, or manufactured in the United States.

(C) Components of foreign origin of a class or kind for which the Government has determined that sufficient and reasonably available commercial quantities of a satisfactory quality are not mined, produced, or manufactured in the United States.

(12) United States means the United States, its possessions, Puerto Rico, and any other place subject to its jurisdiction, but does not include leased bases or trust territories.

(13) U.S.-made end product means an article that--

(i) Is mined, produced, or manufactured in the United States; or

(ii) Is substantially transformed in the United States into a new and different article of commerce with a name, character, or use distinct from that of the article or articles from which it was transformed.

(b) This clause implements the Trade Agreements Act of 1979 (19 U.S.C. 2501, et seq.), the North American Free Trade Agreement Implementation Act of 1993 (19 U.S.C. 3301 note), and the Caribbean Basin Initiative. Unless otherwise specified, this clause applies to all items in the Schedule.

(c) The Contractor shall deliver under this contract only U.S.-made, qualifying country, designated country, Caribbean Basin country, or NAFTA country end products unless--

(1) In its offer, the Contractor specified delivery of other nondesignated country end products in the Trade Agreements Certificate provision of the solicitation; and

(2) The Government determines that--

(i) Offers of U.S.-made end products or qualifying, designated, Caribbean Basin, or NAFTA country end products from responsive, responsible offerors are either not received or are insufficient to fill the Government's requirements; or

(ii) A national interest exception to the Trade Agreements Act applies.

(d) The contract price does not include duty for end products or components for which the Contractor will claim duty-free entry.

(e) United States law will apply to resolve any claim of breach of this contract.

(f) The HTSUS is available on the Internet at http://www.customs.ustreas.gov/impoexpo/impoexpo.htm. The following sections of the HTSUS provide information regarding duty-free status of articles specified in paragraph (a)(2)(ii)(A) of this clause:

(1) General Note 3(c), Products Eligible for Special Tariff Treatment.

(2) General Note 17, Products of Countries Designated as Beneficiary Countries Under the United States--Caribbean Basin Trade Partnership Act of 2000.

(3) Section XXII, Chapter 98, Subchapter II, Articles Exported and Returned, Advanced or Improved Abroad, U.S. Note 7(b).

(4) Section XXII, Chapter 98, Subchapter XX, Goods Eligible for Special Tariff Benefits Under the United States--Caribbean Basin Trade Partnership Act.

(End of clause)

252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (APR 2003)

(a) Definitions. As used in this provision--

(1) Foreign person means any person (including any individual, partnership, corporation, or other form of association) other than a United States person.

(2) United States person is defined in 50 U.S.C. App. 2415(2) and means--

(i) Any United States resident or national (other than an individual resident outside the United States who is employed by other than a United States person);

(ii) Any domestic concern (including any permanent domestic establishment of any foreign concern); and

(iii) Any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern that is controlled in fact by such domestic concern.

(b) Certification. If the offeror is a foreign person, the offeror certifies, by submission of an offer, that it--

(1) Does not comply with the Secondary Arab Boycott of Israel; and

(2) Is not taking or knowingly agreeing to take any action, with respect to the Secondary Boycott of Israel by Arab countries, which 50 U.S.C. App. 2407(a) prohibits a United States person from taking.

(End of provision)

252.226-7001 Utilization of Indian Organizations and Indian-Owned Economic Enterprises-DoD Contracts (Sep 2001)

(a) Definitions. As used in this clause--

“Indian” means any person who is a member of any Indian tribe, band, group, pueblo, or community that is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c) and any “Native” as defined in the Alaska Native Claims Settlement Act (43 U.S.C. 1601).

“Indian organization” means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indian tribe for the purposes of 25 U.S.C. Chapter 17.

“Indian-owned economic enterprise” means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership constitutes not less than 51 percent of the enterprise.

“Indian tribe” means any Indian tribe, band, group, pueblo, or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, that is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1452 (c).

“Interested party” means a contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

(b) The Contract shall use its best efforts to give Indian organizations and Indian-owned economic enterprises the maximum practicable opportunity to participate in the subcontracts it awards, to the fullest extent consistent with efficient performance of the contract.

(c) The Contracting Officer and the Contractor, acting in good faith, may rely on the representation of an Indian organization or Indian-owned economic enterprise as to its eligibility, unless and interested party challenges its status or the Contracting Officer has independent reason to question that status.

(d) In the event of a challenge to the representation of a subcontractor, the Contracting Officer will refer the matter to the U.S. Department of the Interior, Bureau of Indian Affairs, Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street NW, MS-2626-MIB, Washington, DC 20240-4000. The BIA will determine the eligibility and will notify the Contracting Officer. No incentive payment will be made--

(1) Within 59 working days of subcontract award;

(2) While a challenge is pending; or

(3) If a subcontractor is determined to be an ineligible participant.

(e)(1) The Contractor, on its own behalf or on behalf of a subcontractor at any tier, may request an adjustment under the Indian Incentive Program to the following:

(i) The estimated cost of cost-type contract.

(ii) The target cost of a cost-plus-incentive-fee contract.

(iii) The target cost and ceiling price of a fixed-price incentive contract.

(iv) The price of a firm-fixed-price contract.

(2) The amount of the adjustment that may be made to the contract is 5 percent of the estimated cost, target cost, or firm-fixed price included in the subcontract initially awarded to the Indian organization or Indian-owned economic enterprise.

(3) The Contractor has the burden of proving the amount claimed and must assert its request for an adjustment prior to completion of contract performance.

(4) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, will authorize an incentive payment of 5 percent of the amount paid to the subcontractor.

(5) If the Contractor requests and receives an adjustment on behalf of a subcontractor, the Contractor is obligated to pay the subcontractor the adjustment.

(f) The Contractor shall insert the substance of this clause, including this paragraph (f), in all subcontracts that--

(1) Are for other than commercial items; and

(2) Are expected to exceed the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation.

(End of clause)

252.227-7022 GOVERNMENT RIGHTS (UNLIMITED) (MAR 1979)

The Government shall have unlimited rights, in all drawings, designs, specifications, notes and other works developed in the performance of this contract, including the right to use same on any other Government design or construction without additional compensation to the Contractor. The Contractor hereby grants to the Government a paid-up license throughout the world to all such works to which he may assert or establish any claim under design

patent or copyright laws. The Contractor for a period of three (3) years after completion of the project agrees to furnish the original or copies of all such works on the request of the Contracting Officer.

(End of clause)

252.236-7000 MODIFICATION PROPOSALS - PRICE BREAKDOWN. (DEC 1991)

(a) The Contractor shall furnish a price breakdown, itemized as required and within the time specified by the Contracting Officer, with any proposal for a contract modification.

(b) The price breakdown --

(1) Must include sufficient detail to permit an analysis of profit, and of all costs for --

(i) Material;

(ii) Labor;

(iii) Equipment;

(iv) Subcontracts; and

(v) Overhead; and

(2) Must cover all work involved in the modification, whether the work was deleted, added, or changed.

(c) The Contractor shall provide similar price breakdowns to support any amounts claimed for subcontracts.

(d) The Contractor's proposal shall include a justification for any time extension proposed.

252.236-7001 CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (AUG 2000)

(a) The Government will provide to the Contractor, without charge, one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.

(b) The Contractor shall--

(1) Check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies;

(4) Be responsible for any errors that might have been avoided by complying with this paragraph (b); and

(5) Reproduce and print contract drawings and specifications as needed.

(c) In general--

(1) Large-scale drawings shall govern small-scale drawings; and

(2) The Contractor shall follow figures marked on drawings in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work that are manifestly necessary to carry out the intent of the drawings and specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform such details as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified on the following index of drawings: (see Clause SCR-DB-016)

(End of clause)

252.236-7012 MILITARY CONSTRUCTION ON KWAJALEIN ATOLL--EVALUATION PREFERENCE (MAR 1998)

(a) Definitions. As used in this provision--

(1) Marshallese firm means a local firm incorporated in the Marshall Islands, or otherwise legally organized under the laws of the Marshall Islands, that--

(i) Is more than 50 percent owned by citizens of the Marshall Islands; or

(ii) Complies with the following:

(A) The firm has done business in the Marshall Islands on a continuing basis for not less than 3 years prior to the date of issuance of this solicitation;

(B) Substantially all of the firm's directors of local operations, senior staff, and operating personnel are resident in the Marshall Islands or are U.S. citizens; and

(C) Most of the operating equipment and physical plant are in the Marshall Islands.

(2) United States firm means a firm incorporated in the United States that complies with the following:

(i) The corporate headquarters are in the United States;

(ii) The firm has filed corporate and employment tax returns in the United States for a minimum of 2 years (if required), has filed State and Federal income tax returns (if required) for 2 years, and has paid any taxes due as a result of these filings; and

(iii) The firm employs United States citizens in key management positions.

(b) Evaluation. Offers from firms that do not qualify as United States firms or Marshallese firms will be evaluated by adding 20 percent to the offer, unless application of the factor would not result in award to a United States firm.

(c) Status. The offeror is _____ a United States firm; _____ a Marshallese firm; _____ Other.

252.242-7000 POSTAWARD CONFERENCE (DEC 1991)

The Contractor agrees to attend any postaward conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation subpart 42.5.

(End of clause)

252.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR part 31 and DFARS part 231, in effect on the date of this contract, apply.

252.243-7002 REQUESTS FOR EQUITABLE ADJUSTMENT (MAR 1998)

(a) The amount of any request for equitable adjustment to contract terms shall accurately reflect the contract adjustment for which the Contractor believes the Government is liable. The request shall include only costs for performing the change, and shall not include any costs that already have been reimbursed or that have been separately claimed. All indirect costs included in the request shall be properly allocable to the change in accordance with applicable acquisition regulations.

(b) In accordance with 10 U.S.C. 2410(a), any request for equitable adjustment to contract terms that exceeds the simplified acquisition threshold shall bear, at the time of submission, the following certificate executed by an individual authorized to certify the request on behalf of the Contractor:

I certify that the request is made in good faith, and that the supporting data are accurate and complete to the best of my knowledge and belief.

(Official's Name)

(Title)

(c) The certification in paragraph (b) of this clause requires full disclosure of all relevant facts, including--

(1) Cost or pricing data if required in accordance with subsection 15.403-4 of the Federal Acquisition Regulation (FAR); and

(2) Information other than cost or pricing data, in accordance with subsection 15.403-3 of the FAR, including actual cost data and data to support any estimated costs, even if cost or pricing data are not required.

(d) The certification requirement in paragraph (b) of this clause does not apply to----

(1) Requests for routine contract payments; for example, requests for payment for accepted supplies and services, routine vouchers under a cost-reimbursement type contract, or progress payment invoices; or

(2) Final adjustment under an incentive provision of the contract.

252.246-7000 MATERIAL INSPECTION AND RECEIVING REPORT (MAR 2003)

(a) At the time of each delivery of supplies or services under this contract, the Contractor shall prepare and furnish to the Government a material inspection and receiving report in the manner and to the extent required by Appendix F, Material Inspection and Receiving Report, of the Defense FAR Supplement.

(b) Contractor submission of the material inspection and receiving information required by Appendix F of the Defense FAR Supplement by using the Wide Area WorkFlow-Receipt and Acceptance (WAWF-RA) electronic form (see paragraph (b)(1) of the clause at 252.232-7003) fulfills the requirement for a material inspection and receiving report (DD Form 250).

(End of clause)

252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (MAY 2002)

(a) Definitions. As used in this clause --

(1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.

(2) "Department of Defense" (DoD) means the Army, Navy, Air Force, Marine Corps, and defense agencies.

(3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.

(4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.

(5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract.

(6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use by or owned by the DoD at the time of transportation by sea.

(i) An item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.

(ii) "Supplies" includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.

(7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.

(b)(1) The Contractor shall use U.S.-flag vessels when transporting any supplies by sea under this contract.

(2) A subcontractor transporting supplies by sea under this contract shall use U.S.-flag vessels if--

(i) This contract is a construction contract; or

(ii) The supplies being transported are--

(A) Noncommercial items; or

(B) Commercial items that--

(1) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it contracts for f.o.b. destination shipment);

(2) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or

(3) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

(c) The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that --

(1) U.S.-flag vessels are not available for timely shipment;

(2) The freight charges are inordinately excessive or unreasonable; or

(3) Freight charges are higher than charges to private persons for transportation of like goods.

(d) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum --

(1) Type, weight, and cube of cargo;

(2) Required shipping date;

(3) Special handling and discharge requirements;

(4) Loading and discharge points;

(5) Name of shipper and consignee;

(6) Prime contract number; and

(7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.

(e) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Maritime Administration, Office of Cargo Preference, U.S. Department of Transportation, 400 Seventh Street SW., Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information:

(1) Prime contract number;

(2) Name of vessel;

(3) Vessel flag of registry;

(4) Date of loading;

(5) Port of loading;

(6) Port of final discharge;

(7) Description of commodity;

(8) Gross weight in pounds and cubic feet if available;

(9) Total ocean freight in U.S. dollars; and

(10) Name of the steamship company.

(f) The Contractor shall provide with its final invoice under this contract a representation that to the best of its knowledge and belief--

(1) No ocean transportation was used in the performance of this contract;

(2) Ocean transportation was used and only U.S.-flag vessels were used for all ocean shipments under the contract;

(3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.S.-flag ocean transportation; or

(4) Ocean transportation was used and some or all of the shipments were made on non-U.S.-flag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:

ITEM DESCRIPTION	CONTRACT LINE ITEMS	QUANTITY
TOTAL		

(g) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

(h) In the award of subcontracts for the types of supplies described in paragraph (b)(2) of this clause, the Contractor shall flow down the requirements of this clause as follows:

(1) The Contractor shall insert the substance of this clause, including this paragraph (h), in subcontracts that exceed the simplified acquisition threshold in part 2 of the Federal Acquisition Regulation.

(2) The Contractor shall insert the substance of paragraphs (a) through (e) of this clause, and this paragraph (h), in subcontracts that are at or below the simplified acquisition threshold in part 2 of the Federal Acquisition Regulation.

(End of clause)

252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)

(a) The Contractor has indicated by the response to the solicitation provision, Representation of Extent of Transportation by Sea, that it did not anticipate transporting by sea any supplies. If, however, after the award of this contract, the Contractor learns that supplies, as defined in the Transportation of Supplies by Sea clause of this contract, will be transported by sea, the Contractor --

(1) Shall notify the Contracting Officer of that fact; and

(2) Hereby agrees to comply with all the terms and conditions of the Transportation of Supplies by Sea clause of this contract.

(b) The Contractor shall include this clause; including this paragraph (b), revised as necessary to reflect the relationship of the contracting parties--

(1) In all subcontracts under this contract, if this contract is a construction contract; or

(2) If this contract is not a construction contract, in all subcontracts under this contract that are for--

(i) Noncommercial items; or

(ii) Commercial items that--

(A) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it subcontracts for f.o.b. destination shipment);

(B) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or

(C) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

(End of clause)

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SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

CLAUSES INCORPORATED BY FULL TEXT

52.211-10 COMMMENCEMENT, PROSECUTION AND COMPLETION OF WORK (APR 1984) – ALTERNATE I (APR 1984)

This contract will have a separate Notice To Proceed (NTP) and completion date for each phase of work as described below.

PHASE ONE – DESIGN AND OPTIONAL FAST-TRACK CONSTRUCTION:

The Contractor shall be required to **(a)** commence design work under this contract within ten (10) calendar days after the date the Contractor receives the notice to proceed (NTP), **(b)** prosecute work diligently, and **(c)** have an approved design ready to start construction of all site work and housing units within 210 calendar days of NTP.

The time stated includes all time for optional "fast track design", and all Government review required as stated in 01012 of the contract RFP.

In the event the Contractor chooses to do fast-track design and construction, and provided the Contractor's fast-track design is complete and in compliance with the RFP prior to the end of the **210 calendar days**, a limited NTP will be issued to allow the Contractor to proceed with construction activities for clearing, grubbing, grading, curbs, gutters, roads, pavement and the installation of main utilities as set forth in the paragraph "To facilitate fast-track design-construction…" of Section 01012.

PHASE TWO – CONSTRUCTION OF THE NEW FAMILY HOUSING UNITS:

Once the Contractor's design is complete and deemed to be in compliance with the RFP, the Government will issue a Notice to Proceed for all construction. The Contractor shall be required to **(a)** commence construction work under this contract within ten (10) calendar days after the date the Contractor receives the notice to proceed (NTP), **(b)** prosecute work diligently, and **(c)** complete all site work and housing unit construction ready for occupancy and acceptance by the Government within **610 calendar days** of the NTP for all construct.

The contactor will not be allowed to start construction of any portion of any housing unit, including its foundation until all main utilities are complete and operational and all curb and gutter, roads and pavements are installed. The time stated includes all time for Government submittal review, inspections, final cleanup, landscaping, seeding, and sodding as stated by the contract RFP. Completion of the requirements for landscaping, seeding, and sodding will not be exempt from the requirements for liquidated damages. The maintenance, upkeep, and any repairs required to utilities, curb and gutter, roads, and pavements will remain the responsibility of the Contractor until such time as all housing units are accepted. There will be no separate acceptance date for these items.

Turnover of housing units for acceptance and beneficial occupancy: The contractor will be allowed to turn over the housing in a maximum of four (4) separate groupings as indicated on the drawings provided with this solicitation. The order of turnover and the date of turn over of each grouping shall be at the contractor's discretion. The Government will not take ownership or accept of individual units.

PHASE THREE – DEMOLITION OF EXISTING ARMY FAMILY HOUSING UNITS:

Notice to proceed for demolition will not be issued until all new family housing units have been accepted as ready to occupy by the Government. A Notice to Proceed with demolition will be issued approximately 60 days after this occurs, at which time the contractor shall be required to **(a)** commence work under this contract within ten (10) calendar days after the contractor receives the Notice to Proceed, **(b)** prosecute work diligently, and **(c)** complete work within **120 calendar days** of NTP. The time stated includes all time for final cleanup and seeding of the site.

Completion of the requirements for seeding and sodding will not be exempt from the requirements for liquidated damages.

(End of Clause)

52.211-12 LIQUIDATED DAMAGES – CONSTRUCTION (SEP 2000)

(a) If the Contractor fails to complete each phase of work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount(s) indicated in the schedules (c) below.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

(c) Schedules for Liquidated Damages:

(1) Design and Optional Fast-track Construction. If the Contractor fails to complete the design of the family housing ready for construction and fails to secure Government acceptance as being in compliance with the RFP criteria within the time frame specified by the contract, the Contractor shall pay liquidated damages to the Government in the amount of **EIGHT HUNDRED AND SEVENTY-ONE DOLLARS ($871)** for each calendar day of delay until the design is accepted as complete.

(2) Construction of New Family Housing. If the Contractor fails to complete the construction of all 62 new family housing units, and fails to secure Government acceptance of these units as being ready to occupy within the time frame specified by the contract, the Contractor shall pay liquidated damages to the Government in the amount of **NINE HUNDRED ONE DOLLARS ($900)** for each calendar day of delay until the all work is complete and accepted by the Government.

(3) Demolition of Existing Army Family Housing. If the Contractor fails to complete the demolition of exiting housing within the time frame specified by the contract, and fails to secure Government acceptance of said work, the Contractor shall pay liquidated damages to the Government in the amount of **EIGHT HUNDRED AND SEVENTY-ONE DOLLARS ($871)** for each calendar day of delay until the all work is complete and accepted by the Government.

SCR-DB-001 DESIGN-BUILD CONTRACT - ORDER OF PRECEDENCE – AUG 1997

(a) The contract includes the standard contract clauses and schedules current at the time of contract award. It entails (1) the solicitation in its entirety, including all drawings, cuts, and illustrations, and any amendments, and (2) the successful offeror's accepted proposal. The contract constitutes and defines the entire agreement between the Contractor and the Government. No documentation shall be omitted which in any way bears upon the terms of that agreement.

(b) In the event of conflict or inconsistency between any of the provisions of this contract, precedence shall be given in the following order:

(1) Betterments: Any portions of the accepted proposal which both conform to and exceed the provisions of the solicitation.

(2) The provisions of the solicitation. (See also Contract Clause: SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION.)

(3) All other provisions of the accepted proposal.

(4) Any design products including, but not limited to, plans, specifications, engineering studies and analyses, shop drawings, equipment installation drawings, etc. These are "deliverables" under the contract and are not part of the contract itself. Design products must conform with all provisions of the contract, in the order of precedence herein.

(End of Clause)

SCR-DB-002 PROPOSED BETTERMENTS – AUG 1997

(a) The minimum requirements of the contract are identified in the Request for Proposal. All betterments offered in the proposal become a requirement of the awarded contract.

(b) A "Betterment' is defined as any component or system, which exceeds the minimum requirements stated in the Request for Proposal. This includes all proposed betterments listed in accordance with the "Proposal Submission Requirements" of the Solicitation, and all Government identified betterments.

(c) "Government identified betterments" include the betterments identified on the "List of Accepted Project Betterments" prepared by the Proposal Evaluation Board and made part of the contract by alteration, and all other betterments identified in the accepted Proposal after award.

(End of Clause)

SCR-DB-004 KEY PERSONNEL, SUBCONTRACTORS AND OUTSIDE ASSOCIATES OR CONSULTANTS – AUG 1997

In connection with the services covered by this contract, any in-house personnel, subcontractors, and outside associates or consultants will be limited to individuals or firms that were specifically identified and agreed to during negotiations. The contractor shall obtain the Contracting Officer's written consent before making any substitution for these designated in-house personnel, subcontractors, associates, or consultants.

(End of Clause)

SCR-DB-005 RESPONSIBILITY OF THE DESIGN-BUILD CONTRACTOR FOR DESIGN – MAY 2002

(a) The Contractor shall be responsible for the professional quality, technical accuracy, and the coordination of all designs, drawings, specifications, and other non-construction services furnished by the Contractor under this contract. The Contractor shall, without additional compensation, correct or revise any errors or deficiency in its designs, drawings, specifications, and other non-construction services and perform any necessary rework or modifications, including any damage to real or personal property, resulting from the design error or omission.

(b) The standard of care for all design services performed under this agreement shall be the care and skill ordinarily used by members of the architectural or engineering professions practicing under similar conditions at the same time and locality. Notwithstanding the above, in the event that the contract specifies that portions of the Work be performed in accordance with a performance standard, the design services shall be performed so as to achieve such standards.

(c) Neither the Government's review, approval or acceptance of, nor payment for, the services required under this contact shall be construed to operate as a waiver of any rights under this contract or of any cause of action arising out of the performance of this contract. The Contractor shall be and remain liable to the Government in accordance with applicable law for all damages to the Government caused by the Contractor's negligent performance of any of these services furnished under this contract**.**

(d) The rights and remedies of the Government provided for under this contract are in addition to any other rights and remedies provided by law.

(e) If the Contractor is comprised of more than one legal entity, each entity shall be jointly and severally liable hereunder.

(End of Clause)

SCR-DB-006 WARRANTY OF CONSTRUCTION WORK – AUG 1997

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (1) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of:

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, or workmanship.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

If the Contractor fails to remedy any failure, defect, or damage within a

reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

Obtain all warranties that would be given in normal commercial practice;

Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

(End of Clause)

SCR-DB-007 SEQUENCE OF DESIGN-CONSTRUCTION – AUG 1997

(a) After receipt of the Contract Notice to Proceed (NTP) the Contractor shall initiate design, comply with all design submission requirements as covered under Division 01 General Requirements, and obtain Government review of each submission. The Contractor may begin construction on portions of the work for which the Government has reviewed the final design submission and has determined satisfactory for purposes of beginning construction. The ACO or COR will notify the Contractor when the design is cleared for construction. The Government will not grant any time extension for any design resubmittal required when, in the opinion of the ACO or COR, the initial submission failed to meet the minimum quality requirements as set forth in the Contract.

(b) If the Government allows the Contractor to proceed with limited construction based on pending minor revisions to the reviewed Final Design submission, no payment will be made for any in-place construction related to the pending revisions until they are completed, resubmitted and are satisfactory to the Government.

(c) No payment will be made for any in-place construction until all required submittals have been made, reviewed, and are satisfactory to the Government.

(End of clause)

SCR-DB-008 SEQUENCE OF DESIGN -CONSTRUCTION (FAST TRACK) – AUG 1997

(a) After receipt of the Contract Notice to Proceed (NTP) the Contractor shall initiate design, comply with all design submission requirements as covered under Division 01 General Requirements, and obtain Government review of each submission. The Contractor may begin construction on portions of the work for which the Government has reviewed the final design submission and has determined satisfactory for purposes of beginning construction. The ACO or COR will notify the Contractor when the design is cleared for construction. The Government will not grant any time extension for any design resubmittal required when, in the opinion of the ACO or COR, the initial submission failed to meet the minimum quality requirements as set forth in the Contract.

(b) If the Government allows the Contractor to proceed with limited construction based on pending minor revisions to the reviewed Final Design submission, no payment will be made for any in-place construction related to the pending revisions until they are completed, resubmitted and are satisfactory to the Government.

(c) No payment will be made for any in-place construction until all required Submittals have been made, reviewed and are satisfactory to the Government.

(End of Clause)

SCR-DB-009 CONSTRUCTOR'S ROLE DURING DESIGN PROCESS – JUN 1998

The Contractor’s construction management key personnel shall be actively involved during the design process to effectively integrate the design and construction requirements of this contract. In addition to the typical required construction activities, the Contractor's involvement includes, but is not limited to, actions such as: integrating the design schedule into the Master Schedule to maximize the effectiveness of fasttracking design and construction (within the limits allowed in the contract), ensuring constructibility and economy of the design, integrating the shop drawing and installation drawing process into the design, executing the material and equipment acquisition programs to meet critical schedules, effectively interfacing the construction QC program with the design QC program, and maintaining and providing the design team with accurate, up-to-date redline and as-built documentation. The Contractor shall require and manage the active involvement of key trade subcontractors in the above activities.

(End of Clause)

SCR-DB-010 VALUE ENGINEERING AFTER AWARD – JUNE 1999

(a) In reference to Contract Clause 52.248-3, "Value Engineering Construction," the Government may refuse to entertain a "Value Engineering Change Proposal" (VECP) for those "performance oriented" aspects of the Solicitation documents which were addressed in the Contractor's accepted contract proposal and which were evaluated in competition with other offerors for award of this contract.

(b) The Government may consider a VECP for those "prescriptive" aspects of the Solicitation documents, not addressed in the Contractor's accepted contract proposal or addressed but evaluated only for minimum conformance with the Solicitation requirements.

(c) For purposes of this clause, the term "performance oriented" refers to those aspects of the design criteria or other contract requirements which allow the Offeror or Contractor certain latitude, choice of and flexibility to propose in its accepted contract offer a choice of design, technical approach, design solution, construction approach or other approach to fulfill the contract requirements. Such requirements generally tend to be expressed in terms of functions to be performed, performance required or essential physical characteristics, without dictating a specific process or specific design solution for achieving the desired result.

(d) In contrast, for purposes of this clause, the term "prescriptive" refers to those aspects of the design criteria or other Solicitation requirements wherein the Government expressed the design solution or other requirements in terms of specific material, approaches, systems, and/or processes to be used. Prescriptive aspects typically allow the Offerors little or no freedom in the choice of design approach, materials, fabrication techniques, methods of installation, or any other approach to fulfill the contract requirements.

(End of Clause)

SCR-DB-011 PARTNERING – FEB 2000

In order to most effectively accomplish this contract, the Government proposes to form a partnership with the Contractor to develop a cohesive building team. It is anticipated that this partnership would involve the Corps of Engineers, the Directorate of Environmental and Master Planning, the Contractor, primary subcontractors and the designers. This partnership would strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership would be bilateral in membership and participation will be totally voluntary. Any cost associated with effectuating this partnership, excluding travel and lodging cost of Government personnel, will be borne by the Contractor/each part/the Government. The partnering meetings shall be held at Fort Riley, Kansas.

(End of Clause)

SCR-DB-012 DESIGN CONFERENCES – AUG 1997

(a) Pre-Work: As part of the Pre-work Conference conducted after contract award, key representatives of the Government and the Contractor will review the design submission and review procedures specified herein, discuss the preliminary design schedule and provisions for phase completion of the D/B documents with construction activities (fast tracking), as appropriate, meet with Corps of Engineers Design Review personnel and key Using Agency points of contact and any other appropriate pre-design discussion items.

(b) Design Review Conferences: Review conferences will be held on base for each design for each submittal. The Contractor will bring the personnel that developed the design submittal to the review conference. The conferences will take place the week after the review is complete.

(End of Clause)

SCR-DB-013 TRAINING – FEB 2000

The Contractor shall provide operational and maintenance training for all systems furnished under this contract for the operating and maintenance personnel. The system manufacturer shall put on the training, where feasible. All operation and maintenance manuals shall be submitted and approved prior to conducting the training and shall be used during training. The Contractor shall video tape the training session on VHS tapes and provide the tapes to the Government.

(End of Clause)

SCR-DB-014 RECOMMENDED INSURANCE COVERAGE (FEB 2000)

The Design-Build Contractor's attention is invited to the contract requirements concerning "RESPONSIBILITY OF THE CONTRACTOR FOR DESIGN" and "WARRANTY OF CONSTRUCTION WORK". These requirements vest in the Contractor complete responsibility for the professional quality, technical accuracy, and coordination of all design, drawings, specifications and other work or materials furnish by his in-house or consultant forces. The Design-Build Contractor must correct and revise any errors or deficiencies in his work, notwithstanding any review, approval, acceptance or payment by the Government. The Contractor must correct and change any work resulting from his defective design at no additional cost to the Government. The requirements further stipulate that the Design-Build Contractor shall be liable to the Government for the damages to the Government caused by negligent performance. Though not a mandatory requirement, this is to recommend that the Design-Build Contractor investigate and obtain appropriate insurance coverage for such liability protection.

(End of Clause)

SCR-DB-016 GOVERNMENT-FURNISHED RFP DRAWINGS, SURVEYS AND SPECIFICATIONS – JUL 2001

(xii) The Contractor shall

(b) Check all Government-furnished drawings and surveys immediately upon receipt;
(c) Compare all drawings and surveys and verify the figures before laying out the work;
(d) Promptly notify the Contracting Officer of any discrepancies; and
(e) Be responsible for any errors which might have been avoided by complying with this paragraph.

(xiii) Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

(xiv) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(xv) The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

CRITERIA DRAWINGS AND SURVEYS

FAMILY HOUSING REPLACEMENT, FORT RILEY, KANSAS

PN 60301 & 60320

Sequence No.	**Title**
(ii)	DRAWINGS DATED May 4, 2004 COVER SHEET - FAMILY HOUSING REPLACEMENT- NEW CONSTRUCTION AS100 AREA MAP T102 LOCATION MAP AS102 ELLIS HEIGHTS AND S. O'DONNELL SITE SURVEY CD101 ELLIS HEIGHTS DEMOLITION PLAN CD102 ELLIS HEIGHTS DEMOLITION PLAN CD103 SOUTH O'DONNELL DEMOLITON PLAN CD104 TOBIE COURT DEMOLITION PLAN CD105 FLEETWOOD COURT DEMOLITON PLAN CD106 BUILDING DEMOLITON – 1ST FLOOR PLANS CD107 BUILDING DEMOLITON - 2ND FLOOR PLANS CD108 BUILDING DEMOLITION – ELEVATIONS CD109 BUILDING DEMOLITION – WALL SECTIONS CS101 LAYOUT AND MATERIALS – ELLIS HEIGHTS SITE CS102 LAYOUT AND MATERIALS – ELLIS HEIGHTS SITE CS103 LAYOUT AND MATERIALS – SOUTH O'DONNELL SITE CS201 PAVING DETAILS CS202 PAVEMENT JOINT DETAILS AND SECTIONS CG5.1 SIDEWALK DETAILS CG5.2 GRADING PLAN ELLIS HEIGHTS SITE CG5.3 GRADING PLAN ELLIS HEIGHTS SITE CG103 GRADING PLAN SOUTH O'DONNELL SITE CU101 ELLIS HEIGHTS UTILITY PLAN

	CU102	ELLIS HEIGHTS UTILITY PLAN
	CU103	ELECTRICAL UTILITIES ELLIS HEIGHTS SITE
	CU104	SOUTH O'DONNELL UTILITY PLAN
	CU105	ELECTRICAL UTILITIES O'DONNELL HEIGHTS SITE
	LP101	LANDSCAPE PLAN ELLIS HEIGHTS SITE
	LP102	LANDSCAPE PLAN ELLIS HEIGHTS SITE
	LP103	LANDSCAPE PLAN SOUTH O'DONNELL SITE
	A101	TYPE A-1 PLAN, ELEVATION
	A102	TYPE A-2 PLAN, ELEVATION
	A103	TYPE B-2 PLAN, ELEVATION
	A104	TYPE B-3 PLAN, ELEVATION
	A105	TYPE C-2 PLAN, ELEVATION
	A106	TYPE C-3 PLAN, ELEVATION
	A107	TYPE D PLAN, ELEVATION
	A108	TYPE E PLAN, ELEVATION

SCR-DB-019 DEVIATING FROM THE ACCEPTED DESIGN (JUN 2002)

(a.) The Contractor must obtain the approval of the Designer of Record and the Government's concurrence for any Contractor proposed revision to the professionally stamped and sealed and Government reviewed and concurred design.

(b.) The Government reserves the right to non-concur with any revision to the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

(c.) Any revision to the design, which deviates from the contract requirements (i.e., the RFP and the accepted proposal), will require a modification, pursuant to the Changes clause, in addition to Government concurrence. The Government reserves the right to disapprove such a revision.

(d.) Unless the Government initiates a change to the contract requirements, or the Government determines that the Government furnished design criteria are incorrect and must be revised, any Contractor initiated proposed change to the contract requirements, which results in additional cost, shall strictly be at the Contractor's expense.

(e.) The Contractor shall track all approved revisions to the reviewed and accepted design and shall incorporate them into the as-built design documentation, in accordance with agreed procedures. The Designer of Record shall document its professional concurrence on the as-builts for any revisions in the stamped and sealed drawings and specifications.

(End of Clause)

SCR-DB-020 Warranty of Design (Firm-Fixed Price Design-Build Contract) – MAY 2002

(a) The Contractor warrants that the design shall be performed in accordance with the Contract requirements. Design and design related construction not conforming to the Contract requirements shall be corrected at no additional cost to the Government. The standard of care for design is defined in paragraph (b) of Special Contract Requirement "RESPONSIBILITY OF THE CONTRACTOR FOR DESIGN".

(b) The period of this warranty shall commence upon final completion and the Government's acceptance of the work, or in the case of the Government's beneficial occupancy of all or part of the work for its convenience, prior to final completion and acceptance, at the time of such occupancy.

(c) This design warranty shall be effective from the above event through the Statue of Limitations and Statute of Repose, as applicable to the state that the project is located in.

(d) The rights and remedies of the Government provided for under this clause are in addition to any other rights and remedies provided in this contract or by law.

(End of Clause)

SECTION 00810

WAGE RATES

1. KS030001, dated 06/13/2003, no mods.
2. KS030004, dated 06/13/2003, no mods.
3. KS030027, dated 06/13/2003, no mods.

General Decision Number KS030001 06/13/2003 KS1

Superseded General Decision No. KS020001

State: Kansas

Construction Type:
RESIDENTIAL

County(ies):
GEARY RILEY

RESIDENTIAL CONSTRUCTION PROJECTS (Consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	06/13/2003

COUNTY(ies):
GEARY RILEY

SUKS4021A 02/09/1990

	Rates	Fringes
BRICKLAYERS	10.00	
CARPENTERS	16.88	
ELECTRICIANS	17.16	
LABORERS:		
Common	5.15	
Form Setter	5.15	
Mason Tenders	5.15	
PAINTERS	9.63	
PLUMBERS	13.51	1.57
POWER EQUIPMENT OPERATORS:		
Air Compressor	5.15	
Backhoe	6.00	
Bulldozer	6.00	
Concrete Saw	5.15	
Grader	6.00	
Loader	5.50	
Scraper	6.00	
Shovel	5.38	
Tractor	6.00	
Trenching Machine	5.15	
ROOFERS	16.00	
SHEET METAL WORKERS	15.00	
TRUCK DRIVERS	5.15	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations

indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the

interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

General Decision Number KS030004 06/13/2003 KS4

Superseded General Decision No. KS020004

State: Kansas

Construction Type:
HIGHWAY

County(ies):

ALLEN	GREELEY	OTTAWA
ANDERSON	GREENWOOD	PAWNEE
ATCHISON	HAMILTON	PHILLIPS
BARBER	HARPER	POTTAWATOMIE
BARTON	HARVEY	PRATT
BOURBON	HASKELL	RAWLINS
BROWN	HODGEMAN	RENO
BUTLER	JACKSON	REPUBLIC
CHASE	JEFFERSON	RICE
CHAUTAUQUA	JEWELL	RILEY
CHEROKEE	KEARNY	ROOKS
CHEYENNE	KINGMAN	RUSH
CLARK	KIOWA	RUSSELL
CLAY	LABETTE	SALINE
CLOUD	LANE	SCOTT
COFFEY	LINCOLN	SEDGWICK
COMANCHE	LINN	SEWARD
COWLEY	LOGAN	SHERIDAN
CRAWFORD	LYON	SHERMAN
DECATUR	MARION	SMITH
DICKINSON	MARSHALL	STAFFORD
EDWARDS	MCPHERSON	STANTON
ELK	MEADE	STEVENS
ELLIS	MITCHELL	SUMNER
ELLSWORTH	MONTGOMERY	THOMAS
FINNEY	MORRIS	TREGO
FORD	MORTON	WABAUNSEE
FRANKLIN	NEMAHA	WALLACE
GEARY	NEOSHO	WASHINGTON
GOVE	NESS	WICHITA
GRAHAM	NORTON	WILSON
GRANT	OSAGE	WOODSON
GRAY	OSBORNE	

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest areas projects, and railroad construction; bascule, suspension & spandrel arch bridges; bridges designed fo commercial navigation; bridges involving marine construction; other major bridges)

Modification Number	Publication Date
0	06/13/2003

COUNTY(ies):

ALLEN	GREELEY	OTTAWA
ANDERSON	GREENWOOD	PAWNEE
ATCHISON	HAMILTON	PHILLIPS

BARBER	HARPER	POTTAWATOMIE
BARTON	HARVEY	PRATT
BOURBON	HASKELL	RAWLINS
BROWN	HODGEMAN	RENO
BUTLER	JACKSON	REPUBLIC
CHASE	JEFFERSON	RICE
CHAUTAUQUA	JEWELL	RILEY
CHEROKEE	KEARNY	ROOKS
CHEYENNE	KINGMAN	RUSH
CLARK	KIOWA	RUSSELL
CLAY	LABETTE	SALINE
CLOUD	LANE	SCOTT
COFFEY	LINCOLN	SEDGWICK
COMANCHE	LINN	SEWARD
COWLEY	LOGAN	SHERIDAN
CRAWFORD	LYON	SHERMAN
DECATUR	MARION	SMITH
DICKINSON	MARSHALL	STAFFORD
EDWARDS	MCPHERSON	STANTON
ELK	MEADE	STEVENS
ELLIS	MITCHELL	SUMNER
ELLSWORTH	MONTGOMERY	THOMAS
FINNEY	MORRIS	TREGO
FORD	MORTON	WABAUNSEE
FRANKLIN	NEMAHA	WALLACE
GEARY	NEOSHO	WASHINGTON
GOVE	NESS	WICHITA
GRAHAM	NORTON	WILSON
GRANT	OSAGE	WOODSON
GRAY	OSBORNE	

SUKS3002A 04/26/2002

	Rates	Fringes
ASPHALT PAVER SCREED OPERATOR	11.25	
ASPHALT PAVING MACHINE OPERATOR	12.25	
ASPHALT PLANT OPERATOR	12.25	
ASPHALT RAKER	9.00	
AUTOGRADER OPERATOR	13.00	
BACKHOE OPERATOR	11.25	
BATCH PLANT SCALE OPERATOR	8.50	
BLOWER MULCHER SEEDER OPERATOR	9.75	
BORING MACHINE OPERATOR	11.00	
BRICK, BLOCK AND STONESETTER	13.00	
BULLDOZER OPERATOR	11.50	
CARPENTER	12.00	
CARPENTER (ROUGH)	10.00	
CAT MIXER/BOMAG OPERATOR	10.25	
CONCRETE CENTRAL MIX PLANT OPERATOR	12.25	
CONCRETE FINISHER	11.75	
CONCRETE FINISHING MACHINE OPERATOR	12.25	
CONCRETE PUMP TRUCK OPERATOR	12.00	
CONCRETE SAW OPERATOR	10.75	
CRANE OPERATOR	13.75	
CRUSHER AND SCREENING PLANT OPERATOR	11.50	
DISTRIBUTOR OPERATOR	11.25	
DRILL RIG OPERATOR (DRILLED SHAFT)	12.00	

DRILL RIG OPERATOR	12.75
ELECTRICIAN	14.00
EXCAVATOR OPERATOR	12.25
FLAGGER	9.00
FORM LINER AND SETTER	9.75
FRONT END LOADER OPERATOR	11.00
LINEMEN (TRAFFIC SIGNAL LIGHTING)	13.00
LINEMEN OPERATOR (TRAFFIC SIGNAL LIGHTING)	12.00
GROUNDMAN (TRAFFIC SIGNAL LIGHTING)	11.25
HYDRO-DEMOLITION OPERATOR	11.75
LABORER (CONSTRUCTION)	8.50
MATERIAL TRANSFER VEHICLE OPERATOR	11.25
MECHANIC	13.25
MIXER (CONCRETE PORTABLE) OPERATOR	10.00
MOTOR GRADER OPERATOR (FINISH)	12.50
MOTOR GRADER OPERATOR (ROUGH)	11.25
MOTOR SCRAPER OPERATOR	11.00
PAINTER (PAVEMENT MARKING)	10.00
PAINTER (STRUCTURAL STEEL & BRIDGES)	13.00
PAVEMENT BREAKER OPERATOR (SELF-PROPELLED)	10.50
PAVING EQUIPMENT OPERATOR	11.25
POST DRIVER/AUGER OPERATOR	10.75
POWDERMAN	11.50
PROFILE GRINDER OPERATOR	13.75
REINFORCING STEEL SETTER	9.00
ROCK DRILL OPERATOR	11.25
ROLLER/COMPACTOR OPERATOR (SELF-PROPELLED)	10.25
ROLLER/COMPACTOR OPERATOR (SELF-PROPELLED)(ASPHALT)	10.75
ROTARY BROOM OPERATOR	9.50
ROTOMILL OPERATOR	12.50
ROTOMILL GROUNDMAN	10.50
SANDBLASTER (STRUCTURAL STEEL & BRIDGE)	10.50
SERVICEMAN (EQUIPMENT)	11.00
SHOULDER MACHINE OPERATOR	10.75
SKIDSTEER LOADER OPERATOR	10.25
SLURRY MACHINE OPERATOR	11.25
SPREADER BOX OPERATOR	10.50
STEELWORKERS (STRUCTURAL)	10.25
TRACTOR OPERATOR	9.75
TRENCHING MACHINE OPERATOR	10.25
TRUCK DRIVER (SINGLE AXLE)	10.50
TRUCK DRIVER (TANDEM AXLE)	10.75
TRUCK DRIVER (TRIPLE AXLE & SEMI)	11.00
TRUCK DRIVER (HEAVY DUTY OFF ROAD)	11.00
TRAFFIC CONTROL SERVICE DRIVER	10.75
WELDER	11.00

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses

(29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

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U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

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Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

General Decision Number KS030027 06/13/2003 KS27

Superseded General Decision No. KS020027

State: Kansas

Construction Type:
HEAVY
SEWER AND WATER LINE

County(ies):
GEARY RILEY

HEAVY, SEWER AND WATER LINE CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	06/13/2003

COUNTY(ies):
GEARY RILEY

SUKS2002A 01/22/1988

	Rates	Fringes
BRICKLAYERS	15.89	
CARPENTERS	10.06	1.80
CEMENT MASONS	8.93	
ELECTRICIANS	14.24	1.25
FORM SETTERS	7.10	
LABORERS:		
Laborers	6.23	1.52
Pipelayers	5.83	
Rebar workers	11.18	
PIPEFITTERS	16.74	
PLUMBERS	17.65	1.98
POWER EQUIPMENT OPERATORS:		
Backhoe	7.59	
Bulldozer	6.50	
Crane	8.55	
Grader	7.47	
Loader	7.70	
TRUCK DRIVERS	5.94	

WELDERS: Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses

(29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

DIVISION 1 – GENERAL REQUIREMENTS

01010	Statement of Work
01012	Design After Award
01100	General
01312	Quality Control System (QCS)
01320	Project Schedule Design-Build Construction
01330	Submittal Procedures Design-Build
01355A	Environmental Protection
01356	Storm Water Pollution Prevention Measures
01450	Testing for Mechanical and Electrical Systems
01451A	Contractor Quality Control
01500A	Temporary Construction Facilities
01567	NPDES Permit Requirements for Storm Water Discharges from Construction Sites
01911	Quarters Cleaning

SECTION 01010 - STATEMENT OF WORK

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FIGURE 10 – SUB-MEMBRANE DEPRESSURIZATION SYSTEM 77

STATEMENT OF WORK

1. DESIGN OBJECTIVES.

1-1 DESIGN REQUIREMENTS. The design and construction shall comply with the minimum requirements contained in this Request for Proposals (RFP).

1-1.1 Primary Consideration. All proposals received MUST include must include a price for all items in the base bid as a minimum. Failure to meet this requirement may result in non-consideration of the Offeror's proposal. Betterments will only be considered upon verification that the primary consideration requirements have been met.

1-2. WORK SCOPE. This contract shall consist of the design and construction of a total of 30 duplexes, 2 single-family residences, supportive infrastructure, and landscape at Fort Riley, Kansas, in accordance with the requirements of this RFP.

1-2.1 Residences. For the purposes of this RFP, a duplex is defined as a one- or two-story structure divided by a common party wall into two separate residences, each with separate exterior entrances. The required number, type, and location of individual residences are as shown on the RFP documents.

1-2.2 Betterments. The Contractor shall refer to the Bid Schedule for a list of Government-requested betterments, or upgrades, to be included in the Contractor's proposal. Refer to Section 00110 - Proposal Submission Requirements and Instructions and Section 00120 - Proposal Evaluation and Award.

1-2.2 SITEWORK.

1-2.2.1 Sitework. Sitework includes all design and construction of the site design to include grading, storm drainage, erosion control, pedestrian and vehicular circulation, utility systems, outdoor lighting, play lots, and physical security.

1.2.2.2 Development for this Project is planned in two separate noncontiguous sites. As indicated in the drawings, these sites have been subdivided into lots. The number of lots per site may not be changed; however, the lot configuration may be slightly altered to fit the proposer's specific design assuming that it complies with other requirements of this RFP. Construct sixty-two (62) new dwelling units with approximate distribution of the housing units on the two sites as follows:

Site 1 – Ellis Heights:
22 duplexes and 2 single-family residences
(46 residences)

Site 2 – South O'Donnell Heights:
8 duplexes (16 residences)

1-2.3 Special utilities and supplementary construction. Refer to Design Analysis.

1-2.4 Demolition considerations and requirements. Demolition of seventy-two (72) existing housing residences located in Tobie and Fleetwood courts will be required as a part of this Project. Above ground demolition consists of eighteen (18) buildings comprising seventy-two (72) residences and is part of the base bid. Existing Concrete foundations shall be completely removed. In general, it

is the offeror’s responsibility to ensure that any inherently unsafe conditions are not left behind after demolition operations are completed. Cap and install shut off valves on underground utilities. Remove all power, poles, conductors and transformers for housing units removed. Contractor shall grade and seed all areas disturbed by the contractor during demolition. These residences contain no asbestos materials to be removed prior to demolition. There is no lead paint abatement required in the buildings to be demolished.

1-3 (NOT USED)

1-4 DESIGN FREEDOM. This Section 01010, the attached specifications, floor plans, elevations and site plans provided by the Government shall not be modified by the Design-Build Contractor. The size and location of the rooms and exterior features are prescriptive and shall not be changed by the Design-Build Contractor. Any proposed change or deviation to accommodate utilities by the Design-Build Contractor must be approved by the Contracting Officer.

1-5 HOUSING CONSTRUCTION METHODS. The Offeror may utilize the following construction methods: Site-built and factory-built housing components/modules. Use of factory-built housing methods must not result in alteration of the RFP Floor Plans.

1-6 DEFINITION OF HOUSING CONSTRUCTION METHODS. Terms for housing construction methods used in these criteria are defined as follows:

1-6.1 Site- or stick-built housing. Residences are wholly constructed at the site.

1-6.2 Factory-built components and modules. Construction consisting of components, sub-assemblies such as modules, panelized walls, roof trusses, floor joists, and other factory-assembled components, which are transported to the construction site and further assembled into completed residences.

1-7 SITEWORK AND HOUSING CONSTRUCTION COORDINATION. The Contractor will not be allowed to start construction of any housing unit, including its foundation, until all main utilities, curbs and gutters and roads are installed. The maintenance, upkeep and any repairs required to utilities, curbs and gutters, roads and pavements will remain the responsibility of the Contractor until such time as all housing units are complete and accepted by the Government. Prior to final acceptance by the Government, the Contractor shall repair any damage to these items at no additional cost to the Government. There will not be a separate acceptance date for these items.

2. CRITERIA REFERENCES.

2-1 DESIGN AND CONSTRUCTION CRITERIA. Criteria to be used for design and construction shall be taken from the most current references at the date of issue of the RFP. Administrative, contractual, and procedural features of the contract shall be as described in other sections of the RFP. Referenced codes and standards herein and those listed below are minimum acceptable criteria. In the event there is a conflict between the Government specifications provided with this RFP and local and state codes or standards, the Government specification shall take precedence.

2-2 LOCAL AND STATE CODES AND STANDARDS. The following specifications, standards, bulletins, and handbooks form a part of this document to the extent specified herein.

2-2.1 International Residential Code (IRC), International Mechanical Code (IMC), International Plumbing Code (IPC), 2003 Editions. National Electrical Code (NEC), latest edition.

2-3 FEDERAL LAWS. The Federal laws and regulations listed in Table 2-1 form a part of this document. They are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401-9325 (202) 512 - 1800

TABLE 2-1 – FEDERAL LAWS & REGULATIONS

CFR/USC No.	Description
10 CFR 430	National Appliance Energy Conservation Act (NAECA)
16 CFR 1630	Standard for Surface Flammability of Carpet and Rugs
29 CFR 1926	Occupational Safety and Health Administration (OSHA) Standards and Regulations
40 CFR 247.12	Comprehensive Procurement Guideline for Products Containing Recovered Materials, Construction Products
49 CFR 192	Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards
42 USC 4321-4361	National Environmental Policy Act (NEPA)
Army Regulation 200-1	Environmental Protection and Enhancement, May 1990
E.O. 13123	Energy Efficiency and Water Conservation in Federal Facilities

2-4 OTHER GOVERNMENT DOCUMENTS AND PUBLICATIONS. The following Government documents and publications form a part of this document to the extent specified

herein:

2-4.1 Americans With Disabilities Act Accessibility Guidelines are available from U.S. Architectural and Transportation Barriers Compliance Board, 1331 F Street, N.W., Washington, D.C. 20004-1111

2-4.2 Federal Emergency Management Agency, Mitigation Directorate; 500 C Street, SW; Washington DC 20472: National Performance Criteria for Tornado Shelters and FEMA 320, Taking Shelter from the Storm: Building a Safe Room Inside Your Home. http://www.fema.gov/

2-5 NON-GOVERNMENT PUBLICATIONS. The following publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the Department of Defense Index of Specifications and Standards (DODISS).

2-5.1 Air-Conditioning and Refrigeration Institute (ARI). Information listed below is available from ARI, 4301 Fairfax Dr., Suite 425, ATTN: Pubs Dept., Arlington, VA 22203, Ph: 703-524-8800, Fax: 703-528-3816, Internet E-Mail: ari@dgsys.com, Directory of Certified Unitary Air Conditioners, Unitary Heat Pumps and Sound Rated Outdoor Unitary Equipment; ARI 210/240, Unitary Air Conditioning and Air-Source Heat Pump Equipment: http://www.ari.org/

2-5.2 AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA), AMCA 210, Laboratory Methods of Testing Fans For Rating, is available from AMCA, 30 West University Drive, Arlington Heights, IL 60004, (312) 394-0150: http://www.amca.org/

2-5.3 American Architectural Manufacturers Association (AAMA). AAMA specifications shown in Table 2-2 are available from AAMA, 1540 East Dundee Rd., Suite 310, Palatine, IL 60067-8321,Ph: 708-202-1350,Fax: 708-202-1480 2700 River Road, Suite 118, Des Plaines, IL 60018, (312) 699-7310.

TABLE 2-2 - AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION SPECIFICATIONS

No.	Description
AAMA 1002.10	Voluntary Specifications for Aluminum Insulating Storm Products for Windows and Sliding Glass Doors

2-5.4 American Gas Association (AGA). Standards and specifications are available from AGA, 1515 Wilson Blvd., Arlington, VA 22209, Ph: 703-841-8556,Fax: 703-841-8406: http://www.aga.org/

2-5.5 American National Standards Institute, Inc. (ANSI). Copies of the standards listed in Table 2-3 are available from ANSI, 11 West 42nd St., New York, NY 10036, Ph: 212-642-4900, Fax: 212-302-1286: http://www.ansi.org/

TABLE 2-3 - AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS

Std. No.	Std. Description
A112.19.1	Enameled Cast Iron Plumbing Fixtures
A112.19.2	Vitreous China Plumbing Fixtures (DoD Adopted)
A112.19.4	Porcelain Enameled Formed Steel Plumbing Fixtures (DoD Adopted)
A112.19.5	Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards) (DoD Adopted)
A161.1	Recommended Construction and Performance Standards for Kitchen and Vanity Cabinets
B16.5	Steel Pipe Flanges and Flanged Fittings (DoD Adopted)
B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings (DoD Adopted)
B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes (DoD Adopted)
B31.8	Gas Transmission and Distribution Piping Systems
C2	National Electrical Safety Code
ANSI C105 AWWA A21.5	Polyethylene Encasement for Ductile-Iron Pipe Systems
Z21.10.1	Water Heaters, Gas, Volume I, Storage Type, 75,000 BTUH Input or Less
Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
Z60.1	American Standard for Nursery Stock
Z124.1	Plastic Bathtub Units
Z124.2	Plastic Shower Receptors and Shower Stalls

2-5.6 American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) documents, listed in Table 2-4, are available from ASHRAE,1791 Tullie Cir., NE, Atlanta, GA 30329-2305, Ph: 404-636-8400 Fax: 404-321-5478 1791 Tullie Circle, N.E., Atlanta, GA 30329, (404) 636-8400: http://www.ashrae.org/

TABLE 2-4 – AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR-CONDITIONING ENGINEERS (ASHRAE)

No.	Description
ASHRAE -	Handbook of Fundamentals
ASHRAE -	Residential Cooling Load Calculations
ASHRAE 62	Ventilation for Acceptable Indoor Air Quality
ASHRAE 52	Method of Testing Air Cleaning Devices used in General Ventilation for Removing Particulate Matter
ASHRAE 111	Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems

2-5.7 American Society of Mechanical Engineers (ASME). ASME B16.11, Forged Fittings, Socket-Welding and Threaded, and ASME B31.8, Gas Transmission and Distribution Systems, are available from ASME, 22 Law Dr., Box 2300, Fairfield, NJ 07007-2900, Ph: 800-843-2763, Fax: 201-882-1717: http://www.asme.org/

2-5.8 American Society for Testing and Materials (ASTM). ASTM specifications listed in Table 2-5 are available from ASTM, AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) 1916 Race St., Philadelphia, PA 19103, Ph: 215-299-5585, Fax: 215-977-9679: http://www.astm.org/

TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS

Spec. No.	Spec. Description
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A526	Specification for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality (DoD Adopted)
B117	Method of Salt Spray (Fog) Testing (DoD Adopted)
C90	Specification for Hollow Load-Bearing Concrete Masonry Units (DoD Adopted)
C216	Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale) (DoD Adopted)
D3676	Rubber Cellular Cushion Used for Carpet or Rug Underlay

TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS

Spec. No.	Spec. Description
D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft 2700kN-m/m)
D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 (DoD Adopted)
D2513	Standard Specification for Thermoplastic Gas Pressure Piping (DoD Adopted)
D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing (DoD Adopted)
D2846	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold-Water Distribution Systems (DoD Adopted)
D3018	Specification for Class A Asphalt Shingles Surfaced with Mineral Granules (DoD Adopted)
E84	Standard Test Method for Surface Burning Characteristics of Building Materials (DoD Adopted)
E90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions (DoD Adopted))
E108	Standard Methods of Fire Tests of Roof Coverings
E119	Standard Methods of Fire Tests of Building Construction and Materials
E162	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source (DoD Adopted)
E283	Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors
E330	Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
E336	Standard Test Method for Measurement of Airborne Sound Insulation in Buildings
E547	Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential
E648	Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source

TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS

Spec. No.	Spec. Description
E779	Measuring Air Leakage by the Pressurization Method
E1007	Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures
E1465	Standard Guide for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings
F1292	Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment
E1423	Standard Practice for Determining the Steady State Thermal Transmittance of Fenestration Systems
E 1554	Determining External Air Leakage of Air Distribution Systems by Fan Pressurization.
F 1066	Standard Specification for Sheet Vinyl Composition Floor Covering
F1487-98	Standard Consumer Safety Performance Specification for Playground Equipment for Public Use
G90	Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

2-5.9 American Water Works Association, Inc. (AWWA). Specifications listed below are available from AWWA, 6666 West Quincy, Denver, CO 80235, Ph: 800-926-7337, Fax: 303-795-1989, AWWA C500, Gate Valves for Water and Sewerage Systems (DoD adopted); AWWA C502, Dry-Barrel Fire Hydrants; and AWWA C503, Wet-Barrel Fire Hydrants: http://www.awwa.org/

2-5.10 Associated Air Balance Council (AABC). AABC MN-1, National Standards for Total System Balance, is available from AABC, 1518 K St., NW, Washington, DC 20005, Ph: 202-737-0202, Fax: 202-638-4833: http://www.aabchq.com/

2-5.11 American Association of Textile Chemists and Colorists (AATCC). AATCC 134, Electrostatic Propensity of Carpets, is available from AATCC, P.O. Box 12215, Research Triangle Park, NC 27709, (919) 549-8141.: http://www.aatcc.org/

2-5.12 Builders Hardware Manufacturers Association, Inc. (BHMA). Specifications shown in Table 2-6 are available from the Builders Hardware Manufacturers Association, Inc. (BHMA), 355 Lexington Ave., New York, NY 10017, Ph: 212-661-4261, FAX: 212-370-9047.

TABLE 2-6 - BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA) SPECIFICATIONS

No.	Description (Specs. are DoD Adopted)
BHMA 101	Butts and Hinges
BHMA 301	Door Controls, Closers
BHMA 501	Auxiliary Locks and Associated Products
BHMA 601	Bored and Preassembled Locks and Latches
BHMA 611	Interconnected Locks and Latches

2-5.13 Council of American Building Officials (CABO). The CABO One (1) and Two (2) Family Dwelling Code and Model Energy Code, are available from the COUNCIL OF AMERICAN BUILDING OFFICIALS (CABO) 5203 Leesburg Pike, Suite 708, Falls Church, VA 22041, Fax: 703-379-1546: http://www.intlcode.org/

2-5.14 Electronic Industries Association Telecommunications Industry Association (EIA/TIA). EIA/TIA Standard EIA/TIA-570, is available from Electronic Industries Association, Engineering Department, Order From: Global Engineering Documents, 7730 Carondelet Ave., Suite 407 Clayton, MO 63105, Ph: 800-854-7179, or 714-979-8135, Fax: 314-726-6418

2-5.15 Illuminating Engineering Society of North America (IESNA). The IESNA Lighting Handbook, is available from Illuminating Engineering Society of North America, (IESNA), 120 Wall St., 17th Floor, New York, NY 10005-4001, Ph: 212-248-5000, Fax: 212-248-5017: http://www.iesna.org/

2-5.16 International Conference of Building Officials (ICBO). The Uniform Building Code is available from the, INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO), 5360 S. Workman Mill Rd., Whittier, CA 90601-2258, Ph: 310-699-0541, Fax: 310-692-3853: http://www.icbo.org/

2-5.17 National Association of Corrosion Engineers (NACE). NACE RP-0286, The Electrical Isolation of Cathodically Protected Pipelines, is available from NACE, P.O. Box 218340, Houston, TX 77218: http://www.nace.org/.

2-5.18 National Electrical Manufacturers Association (NEMA). NEMA standards listed below are available from the National Electrical Manufacturers Association (NEMA), NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA),2101 L St., NW, Suite 300,Washington, DC 20037-1526
Ph: 202-457-8474 Fax: 202-457-8473 NEMA DC 3, Wall-Mounted Room Thermostats; and NEMA WD 1, General Requirements for Wiring Devices: http://www.nema.org/

2-5.19 NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), NEBB-01, Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems, is available from NEBB, 875 Grove Mount circle, Gaithersburg, MD 20877-4121, Ph: 301-977-3698, Fax: 301-977-9589: http://www.nebb.org/

2-5.20 National Fenestration Rating Council (NFRC). NFRC 100-91, Procedure for Determining Fenestration Product Thermal Properties, is available from NFRC, 1300 Spring Street, Suite 500, Silver Spring, MD. Telephone: (301) 589-NFRC, http://www.nrfc.org

2-5.21 National Fire Protection Association, Inc. (NFPA). NFPA codes listed in Table 2-7 are available from the National Fire Protection

Association, Inc. (NFPA), 1Battery March Park, P.O. Box 9101, Quincy, MA 02269. Telephone: (617) 770-3000, Fax: (617) 770-0700: http://www.nfpa.org/

TABLE 2-7 - NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES

Code No.	Code Description
NFPA 30	Flammable Liquids Code
NFPA 31	Installation of Oil Burning Equipment
NFPA 54	National Fuel Gas Code
NFPA 70	National Electrical Code (DoD Adopted)
NFPA 72	National Fire Alarm Code
NFPA 101	Life Safety Code
NFPA 101M	Alternative Approaches to Life Safety
NFPA 255	Method of Test of Surface Burning Characteristics of Building Materials
NFPA 501A	Manufactured Home Installations
NFPA 701	Standard Methods of Fire Tests for Flame Resistant Textiles and Films

2-5.22 National Wood Window and Door Association (NWWDA) standard, NWWDA I.S.2, Standard for Wood Window Units is available from the National Wood Window and Door Association (NWWDA), 1400 East Touhy Ave., Suite 470, Des Plaines, IL 60018, (847) 299-5200, Fax: (847) 299-1286: http://www.nwwda.org/.

2-5.23 Sheet Metal and Air Conditioning Contractors National Association (SMACNA). SMACNA Installation Standards for Residential Heating and Air Conditioning Systems and SMACNA-07, HVAC Systems, Testing, Adjusting, and Balancing, are available from SMACNA, 4201 Lafayette Center Drive, Chantilly, VA 22180, (703) 803-2980, Fax: (703) 803-3732: http://www.smacna.org/

2-5.24 Underwriters Laboratories, Inc. (UL) specifications listed in Table 2-8 are available from the Underwriters Laboratories, Inc. (UL), 333 Pfingston Road, Northbrook, IL 62096. Telephone: (847) 272-8800. Fax: (847) 509-6220: http://www.ui.com/.

TABLE 2-8 – UNDERWRITERS LABORATORIES SPECIFICATIONS

No.	Description (Specs. Are DoD Adopted)
UL 430	Waste Disposers
UL 507	Electric Fans
UL 555	Fire Dampers
UL 567	Pipe Connectors for Flammable and Combustible Liquids and LP Gas
UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
UL 749	Household Dishwashers
UL 858	Household Electric Ranges
UL 923	Microwave Cooking Appliances
UL 900	Test Performance of Air Filter Units

3. SITE PLANNING AND DESIGN.

3-1 SCOPE. This Project consists of the construction of 20, three-bedroom units and 42 four-bedroom units to be distributed in two housing sites totaling 28.1 acres. The site design, project composition, and gross density are fixed and shall not be altered except as required to accommodate site constraints such as grading limitations and utility routing. There are demolition aspects of this project related to the above Ellis Heights and South O'Donnell additions and existing infrastructure that will be replaced. In addition, there are two existing residential sites, Tobie and Fleetwood Courts that will be completely demolished only when the construction of the new units is completed. Tobie and Fleetwood Courts each consist of nine residential buildings and 4.6 acres and 4.1 acres, total area, respectively. The Contractor will not be allowed to start construction of any housing unit, including its foundation, until all main utilities, curbs and gutters and roads are installed.

3-2 RESIDENCE GROUPING AND ORIENTATION. The residence-grouping layout is indicated on the drawings and is fixed. The final grouping layout shall not vary significantly from this layout except as required for utility routing and accommodations for topography.

3-2.1 Grading. The grading will maintain existing topography to the extent possible, but must incorporate the specific grading requirements indicated below. The successful offeror is responsible for design and construction of the final grades. The contractor's grading design must manage site runoff, ensure drainage away from the residences and other site features and provide a smooth transition between graded and natural areas.

3-2.1.1 Grading within 15 feet of the building shall not be less than 4 percent away from the building.

3-2.1.2 Site grading in turfed areas between 15 feet and 50 feet from a building shall maintain existing topography to the extent possible, but must incorporate the specific grading requirements indicated below. The successful Offeror's proposed grading must manage all site runoff, ensure drainage away from residences and other site features, and provide a smooth transition between graded and natural areas.

3-2.1.3 Grading slopes over 3:1 shall not occur within the project boundaries.

3-2.1.4 All drainage swales shall have flat bottoms lined with sod or erosion control material to prevent erosion.

3-2.1.5 Driveways shall not be steeper than 5 percent slope.

3-3. CUL-DE-SAC DESIGN. The diameter of the cul-de-sacs shall be a minimum of 100 feet to accommodate the turning radius of moving vans and fire trucks.

3-3.1 INTERSECTION DESIGN. Provide intersections as indicated on the drawings.

3-3.2 STREET DESIGN. Curbs shall be depressed at entrances to driveways unless the rolled types of curbs are provided throughout. All gradients shall provide positive drainage with no ponding, 1 percent minimum slope, 6 percent maximum slope parallel to traffic.

3-3.2.1 Residential street widths shall have two 10-foot moving lanes, two 2-foot curb and gutter sections, and one 7-foot parking lane for a total street width of 31 feet back-to-back of curb. Curb width is assumed to be 6 inches.

3-3.2.2 Curb and gutters shall be concrete, roll type, 2'-0" wide. Portland Cement Concrete (PCC) curb and gutters shall be placed on 4-inches graded crushed

aggregate base course and 8-inches lime-modified subgrade. Joints in curbs and gutters shall be aligned to match the joints in the adjacent PCC pavements and sidewalks. The Design-Build Contractor is directed to the prescriptive design analysis and prescriptive specifications and drawings provided with this RFP.

3-3.2.3 Street Construction: Street paving shall be asphalt, on graded-crushed-aggregate base course. Kansas Department of Transportation (KDOT) specifications that conform to the Technical Manual requirements, as indicated in the Design Analysis, shall be acceptable. KDOT refers to the Kansas Department of Transportation Standard Specifications for Road and Bridge Construction. Subgrade for streets shall be compacted in conformance with "Pavement Design Analysis and Materials Recommendations" and as described in the Geotechnical Report furnished by the Offeror.

The Architect-Engineer shall design the project to ensure compliance with all the listed design criteria and the recommendations of the project geotechnical report. The asphalt pavement section for residential streets should be as follows:
2-inches AC surface course
2-inches AC intermediate course
4-inches graded-crushed-aggregate base course
9.5 inches aggregate sub-base course (rounded up to the nearest ½-inch increment)
8-inches lime-modified sub-grade

The Design-Build Contractor shall use the prescriptive drawings and specifications provided with this RFP. The Design-Build Contractor shall incorporate these prescriptive drawings and specifications into the complete final design without editing. The Design-Build Contractor is not allowed to change, modify or deviate from the requirements of these drawings and specifications.

3-3.2.4 Street Signs: Provide street signs at all intersections. Signs shall comply with the Manual on Uniform Traffic Control Devices (http://mutcd.fhwa.dot.gov) for size and location. Street names will be provided by the installation. Signage letters shall be dark brown characters (FED-STD-595-A-#20059) on a standard buff white background (FED-STD-595-A-#33690). Posts shall be galvanized steel painted dark brown (FED-STD-595-A-#20059). The Offerer must match the existing street signage and conform to the existing Installation Design Guide.

3-3.2.5 Residence Driveway. Driveways shall be a minimum of 20 feet wide with a maximum gradient of 5 percent away from the garage. Pavement for driveways shall be Portland Cement Concrete, 6-inches PCC (with at least 0.05 percent crack control reinforcing steel), 6-inches graded crushed aggregate base course, 8-inches lime-modified sub-grade. The Design-Build Contractor is directed to the prescriptive Design Analysis and specification provided with this RFP.

Provide control joints at a maximum spacing of 12 feet.

3-3.2.6 Sidewalk design. Portland cement concrete sidewalks shall be provided on both sides of any street within the Project limits. Walks shall be 4-feet wide, 4-inches thick PCC (6-inches thick PCC at residential driveways), 4-inches graded crushed aggregate base course, 8-inches sub-grade. Walks along the street shall have an 8-foot-wide grassed space maintained between the sidewalk and the back of the curb. Ramps for handicapped individuals shall be provided at intersections by depressing street curbs and adjacent sidewalk.

Sidewalks shall meet the requirements of the "Pavement Design Analysis and Materials Recommendations."

3-3.2.7 Asphalt Paths. An asphalt path currently exists through the middle of the proposed South O'Donnell site. Children use the path daily for access to the schools on First Division Drive. Provide a temporary, 8-foot-wide asphalt path during construction that allows for continued use of the entire path. Path paving shall be 2-inches thick asphalt KDOT BM-2, on 4-inches of graded-crushed-aggregate base course equal to KDOT AB-3. Connect the path to the existing pedestrian circulation. After completion of Phase One of the new residential development, the Offeror has the option of using the new sidewalks as part of the path connection or making the temporary path a permanent path.

3-4 Outdoor Play Areas. The design of the children's outdoor play areas (playgrounds) shall comply with the safety requirements of ASTM F 1487 and ASTM F 1292. Playground grading shall be well-drained and should be sloped between 2% and 4%.

3-4.1 Child Safety and Accessibility.

3-4.1.1 Use zones. In accordance with ASTM F 1487, a use zone is a clear, unobstructed area under and around play equipment where a child would be expected to land when jumping or falling from a piece of play equipment. These zones require a playground safety surface in accordance with ASTM F 1292. Requirements for use zones vary for the age group and for different pieces of equipment. All use zones for play equipment should be shown on the site plan to ensure there is no conflict between play activities on the ground and swinging or jumping from the equipment. Use zones will not overlap.

3-4.1.2 Playground safety surface. A playground safety surface is constructed of a material that meets the shock absorbency criteria recommended in ASTM F 1292. Playground safety surfaces in the Ft. Riley Housing Areas shall be constructed of sand in sufficient thickness that meets the shock absorbency criteria in ASTM F1292. Playground safety surfaces shall be provided throughout all use zones and under all play equipment as required for the different types of playground equipment. To contain the sand safety surfaces, the contractor shall provide a concrete curb border that is flush with the surrounding grade and ground surfaces at the perimeter of the playground areas and at a safe distance from the playground equipment.

3-4.1.3 Playground equipment made of lumber treated with arsenic, such as CCA, is not acceptable.

3-4.2 Manufactured play equipment. Play equipment is part of the base bid. The Contractor shall provide the following play equipment:

3-4.2.1 Existing Playgrounds at Ellis Heights: Three play areas on the Ellis Heights site are to be demolished. The playground equipment shall be carefully removed in conformance with Section 02220, Demolition, and as directed by the Contracting Officer.

3-4.2.2 New Playgrounds at Ellis Heights and South O'Donnell Heights: Provide new playgrounds where indicated on the drawings with one each (except as noted) of the following equipment at each new playground:

Swing Set: 6-swing set, 10 feet high, 4 rigid molded rubber adult seats, 2 pliable rubber (over stainless steel core) slash-proof infant seats, 4/0 straight link galvanized swing chain with hanger with bearings, equal to Playworld Systems - Standard Swing 0255.

Double Large Slide: Two 60-inch plastic slides, vinyl-coated steel ladder and deck, 3½-inch galvanized steel powder-coated posts, full-

length handrails on ladder, equal to Playworld Systems - Double-Lightning, CH3982.

Jungle Gym: Geodesic dome structure, 17-foot diameter, 7-foot high, 1-1/16-inch OD powder-coated galvanized pipe, walk-in adult access, equal to Playworld Systems - Super Dome 0400.

Combination Play Unit: Short plastic slide, spiral slide, hop-scotch climber, deck-to-deck climber, pipe wall with steering wall, Tic-Tac-Toe, transition station with step, and 6-foot horizontal spiral ladder with access ladder, equal to Playworld Systems - Challengers 350-0007.

(2) Park Bench: 8-foot long, angle-leg, pressure-treated pine planks for seat and back, 2-3/8-inch painted galvanized steel pipe frame with end caps equal to Playworld System – Bench 1372.

Picnic Table: 8-foot long, portable, perforated steel top and seats, 2-3/8-inch galvanized steel pipe frame, powder-coated top and frame, equal to Playworld Systems – 1403.

3-4.3 Plant materials in play areas. Trees shall be integrated into play settings, which may vary from designs shown on the Site Plans, and shall be selected from Table 3-1 below. The intent is to furnish play lots with as much shade as possible (as trees mature) without compromising fall zone and other safety requirements.

3-5 Landscape Planting Plan. The Offerer shall obtain and use the services of a registered landscape architect, experienced in site planning and planting design. A complete, integrated landscape planting plan shall be provided for the overall housing Project. The design shall reflect appropriate groupings, foundation plantings, and street tree plantings to define the open spaces to ensure a completely landscaped Project. Selected plant materials shall be easily maintained and tolerant of the specific site conditions. Planting or seeding shall occur only during periods when beneficial results can be obtained.

3-5.1 Suitable Plants for Use in Ft. Riley Housing Area. For the purposes of a plant list for this project, refer to Attachment 10. Plants to consider for use are listed in the category of “Upland Range” located at the back part of the document. Plants that require acidic soils should be avoided. The soil throughout the Ft. Riley Housing Area ranges from 7.0 – 8.2 pH; therefore, lime should not be used as a soil additive. No more than forty percent (40%) of trees or shrubs shall be of any single variety. There shall be a minimum of five (5) different species of trees and five (5) different species of shrubs.

3-5.2 Required Quantities and Minimum Sizes.

3-5.2.1 Each duplex unit and single-family residence shall receive a minimum of the plantings per unit as indicated on the Landscape Drawings in this RFP. Refer to the Landscape Drawings for the character and quantities of plantings.

3-5.2.2 Minimum Sizes:

Large deciduous trees – 1¾”–2” caliper (8–10 feet)
Flowering tree – 5-6 feet
Coniferous evergreen tree – 5-6 feet
Deciduous or evergreen shrubs – 2-gallon
Evergreen dumpster screening shrubs – 5-gallon
Ground covers – 3-inch pots

3-5.3 Trees, shrubs, and ground cover. Plant varieties shall be nursery grown or plantation grown stock conforming to ANSI/ANLA Z60.1. They shall be grown under climatic conditions similar to those in the locality of the Project.

3-5.3.1 Quality. Well shaped, well grown, vigorous, healthy plants having healthy and well branched root systems shall be provided. Plants shall be free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement, and abrasion. Plants shall be provided that are typical of the species or variety, and conforming to standards as set forth in ANSI/ANLA Z60.1. Poisonous plants and plants with thorns are not allowed and should be removed from the play areas. Refer to the U.S Army Center for Health Promotion and Preventative Medicine, Guide to Poisonous and Toxic Plants: chppm-www.apgea.army.mil/ento/default.htm.

3-5.3.2 Shade and flowering trees. A height relationship to caliper shall be provided as recommended by ANSI/ANLA Z60.1. Height of branching should bear a relationship to the size and variety of tree specified, and with the crown in good balance with the trunk.

3-5.3.2.1 Single stem. Trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

3-5.3.2.2 Multi-stem. All countable stems, in aggregate, shall average the size specified. To be considered a stem, there should be no division of the trunk which branches more than 150 mm (6 in) from the ground level.

3-5.3.2.3 Specimen. A plant shall be provided that is well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

3-5.3.3 Deciduous shrub. Plants shall be provided that have the height and number of primary stems as recommended by ANSI/ANLA Z60.1 An acceptable plant shall be well shaped with sufficient well-spaced side branches recognized by the trade as typical for the variety grown in the region.

3-5.3.4 Coniferous evergreen. Trees shall be provided that have the height-to-spread ratio as recommended by ANSI/ANLA Z60.1. Trees shall not be "poled" or the leader removed. An acceptable plant shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

3-5.3.5 Broadleaf evergreen. Plants shall be provided that have ration of height-to-spread as recommended by ANSI/ANLA Z60.1. An acceptable plant shall be well shaped and recognized by the trade as typical for the variety grown in the region.

3-5.4 Ground cover. Plants shall be provided with the minimum number of runners and length of runner as recommended by ANSI/ANLA Z60.1. Plants shall be furnished that have heavy, well developed, and balanced top with vigorous well developed root system, and shall be furnished in containers.

3-5.5 Measurement. Plant measurements shall be in accordance with ANSI/ANLA Z60.1.

3-5.6 Installation. Verify the location of underground utilities. When obstructions below ground or poor drainage affect the planting operation, proposed adjustments to plant location, type of plant, and planting method or drainage correction shall be submitted. The plant material shall be installed during appropriate planting times and conditions recommended by the trade for the type and variety of plant material specified. Plant pits shall be excavated and backfilled as recommended by the trade and ANSI/ANLA Z60.1. The planting operation shall be performed only during periods when beneficial results can be

obtained. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted.

3-5.7 Maintenance during establishment period. The maintenance of plants shall include straightening plants, tightening stakes and guying material, repairing tree wrap, protecting plant areas from erosion, maintaining erosion material, supplementing mulch, accomplishing wound dressing, removing dead or broken tip growth by pruning, maintaining edging of beds, checking for girdling of plants and maintaining plant labels, watering, weeding, removing and replacing unhealthy plants.

3-5.8 Unhealthy plant. A plant shall be considered unhealthy or dead when the main leader has died back, or 25 percent of the crown is dead. Determine the cause for an unhealthy plant. Unhealthy or dead plants shall be removed immediately and shall be replaced as soon as seasonal conditions permit in accordance with the following warranty paragraph.
The Contractor shall be required to replace plants as often as necessary until they survive one full growing season.

3-5.9 Warranty. Furnished plant material shall be guaranteed to be in a vigorous growing condition for a period of 12 months regardless of the contract time period. A plant shall be replaced as many times as necessary, until it survives one full 12 month growing season under this guarantee. Transplanting existing plants requires no guarantee but shall be done with care according to ANSI/ASLA standards.

3-5.10 Turf. Turf consists of seed or sod.

3-5.10.1 The Design-Build Contractor shall use the prescriptive specifications provided with this RFP. The Design-Build Contractor shall incorporate these prescriptive specifications into the complete final design without editing. The Design-Build Contractor is not allowed to change, modify or deviate from the requirements of these Landscape drawings and specifications.

3-5.11 Existing trees located beyond 50 feet from the buildings should be protected and saved except where substantial cut or fill is expected. Where existing trees can be saved, a construction fence should be placed at the drip line of the tree(s) and construction activities and storage should be prohibited from that area.

3-6 Postal Service. Provide individual rural-type mailboxes where indicated on the drawings. At each location, provide a maximum of five (5) individual mailboxes mounted on a steel post and frame set 90 degrees from the street between the sidewalk and back of curb on a 6-foot x 8-foot concrete pad and walk area. Mailboxes shall be metal construction and designed for loading and unloading from the same side. Final mailbox design, orientation and locations shall be submitted to the Contracting Officer and U.S. Postal Service for approval before fabrication and installation.

3-7 Street Numbers. Street Numbers will be painted on the curb immediately adjacent to the curb radius at the entrance to each residence driveway as required by the new Installation Design Standards.

4 SITE ENGINEERING

4-0 General: It shall be the Contractor's responsibility to protect all existing utility lines from damage during excavation. Any damage resulting to existing utility lines and systems shall be repaired by the Contractor, to the satisfaction of the Contracting Officer, at no additional cost to the Government, except as noted in Item 4-0.1 below.

4-0.1 The Contractor shall contact Kansas One-Call for utility checks for gas lines owned by Williams Natural Gas, Sprint, Southwestern Bell, and American Cablevision. The Offeror is also directed to SECTION 01100 General, the paragraph titled "Protection of Utilities" provided with this RFP.

4-0.2 Fort Riley personnel will locate underground Post telephone and communications lines. The contractor shall deliver to the PW work order desk at building 85, 820 McClellan, or transmit via fax 913-684-8950, a diagram showing the approximate area that the posts telephone and communication lines need to be located. The Contractor shall mark the proposed route or limits of the excavation in white prior to the request so that the Government personnel will know where to mark for utilities. The Contractor should allow a minimum of three (3) working days for the utility locates to be conducted. The permit expires every ten (10) days. If the Contractor damages any marked lines during excavation, the Contractor shall contact the Government QA Representative immediately to determine whether the Contractor will perform repairs or reimburse the Government for repairs.

4-1 Soils.

4-1.1 Soil and Foundation Report (Geotechnical Report). A preliminary Soil and Foundation Report is provided as part of this RFP. Drawings indicating Subsurface Explorations and Geologic Profiles for the proposed site are also provided. The report provides an overview of soils and geologic conditions, and is furnished for informational purposes only. The Offeror to whom this contract is awarded shall, with his or her consulting professional geotechnical engineer experienced in geotechnical engineering, be responsible for determining site specific geotechnical conditions and preparing his own report. Inclusion of the draft report by the Government does not relieve the Design-Build Contractor of his responsibility to conduct a thorough investigation of the sites and take responsibility for the final design. The Design-Build Contractor's investigations and subsequent report must verify the validity of the draft soils report provided with this RFP and/or provide documentation of any conflicts between the draft report and his final design recommendations before proceeding with the design.

4-1.1.1 The Contractor provided site specific geotechnical conditions report shall include, but not be limited to:

4-1.1.1.1 Classification of soil and rock.

4-1.1.1.2 Depth to bedrock.

4-1.1.1.3 Extent of boulders.

4-1.1.1.4 Bearing capacity of soil and rock.

4-1.1.1.5 Settlement potential.

4-1.1.1.6 Compaction requirements.

4-1.1.1.7 Groundwater characteristics.

4-1.1.1.8 Infiltration and permeability.

4-1.1.1.9 Erosion and siltation.

4-1.1.1.10 Surface and subsurface drainage.

4-1.1.1.11 Soil resistivity.

4-1.1.1.12 Foundation Types

4-1.1.1.13 Swell Potential

4-1.1.1.14 Soil Modification Techniques

4-1.1.1.15 Lateral Earth Pressure Coefficient

4-1.1.2 The Offeror and his or her professional geotechnical engineer consultant shall certify in writing that the design of the Project has been developed consistent with the site specific geotechnical conditions. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the fast-track design and/or 50 percent design submission. If revisions are made to the 50 percent design submission, a new certification shall be provided with the final design submission.

4-1.2 Soil compaction.

4-1.2.1 Soil compaction shall be achieved by equipment approved by a professional geotechnical engineer. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the compaction specified with the equipment used. Compact each layer to not less than the percentage of maximum density specified in the Design Analysis and prescriptive specifications provided with this RFP and determined in accordance with ASTM D 1557 Method D.

4-1.2.2 The requirements shall be verified or modifications recommended by the consulting professional geotechnical engineer in the report wherever engineering, soils, or climatic factors indicate the necessity. Any modification to the stated compaction requirements shall require the approval of the Contracting Officer.

4-1.2.3 Refer to the Civil Site Design Analysis for specific requirements of pavement and subgrade preparation. In general, requirements are as follows:

Asphalt Concrete Surfaced Streets:
2-inches AC surface course
2-inches AC intermediate course
4-inches graded crushed aggregate base course
9.5-inches aggregate subbase course
8-inches lime-modified subgrade

Rigid Pavement Design, Residential Driveways:
6-inces pcc
6-inches graded crushed aggregate base course
8-inches lime-modified subgrade

Portland Cement Concrete Sidewalks:
4-inches pcc
4-inches graded crushed aggregate base course
8-inches lime-modified subgrade

Portland Cement Curbs and Gutters:
Portland Cement curbs and Gutters
4-inches graded, crushed aggregate base course
8-inches lime-modified subgrade.

4-1.3 Capillary water barrier. A capillary water barrier is required for all interior slabs on grade, including garages, carports and storage rooms.

4-1.4 Soil treatment. Soil treatment for termites shall be by the chemical method. Methods and extent of protection required are as follows:

4-1.4.1 Soil treatment shall comply with the attached Specification Section 02364 Termiticide Treatment Measures for Subterranean Termite Control.

4-2 Water Distribution System. Connection to the existing water distribution system shall be made at the locations shown on the RFP drawings.

4-2.1 Water Mains and Building Service Connections. Mains shall be considered as that part of the distribution system supplying fire hydrants, or fire hydrant laterals. Service connections supply water from the main to the residence. Mains shall be looped with no dead ends where practical and be of adequate size to satisfy both domestic and fire flow requirements. Minimum main size is 6 inches. Sufficient sectional control valves shall be provided so that no more than two fire hydrants will be out of service in the event of a single break in a water main. In addition, a standard grade, non-magnetic, warning Tape will be installed above all underground utility lines. The tape will be buried 1 foot below the surface, running the entire length of the buried utility. The color of the tape will correspond to the utility it is protecting (see Section 02222 for specific requirements. The pipe, valves, and all other materials shall meet the American Water Works Association (AWWA) standards for a 150 psi working pressure system. Provide sacrificial anodes for all valves and metal pipe as directed by the Contractor’s Cathodic Protection Engineer. Building connections shall be designed and constructed in accordance with the National Standard Plumbing Code.

4-2.2 Flow requirements. Water must be supplied by mains of appropriate capacity to provide 500 gpm at one-story units, 750 gpm at two-story structures, and 1000 gpm at structures which are three or more stories high, for a flow duration of 1-1/2 hours. This mandatory flow is over and above domestic requirements. Domestic requirements shall be based on 300 gal/day per residence for single-family housing, and 250 gal/day per residence for multi-family housing. Mains shall be sized to carry this flow with a 2.5 peak hourly factor. Flow shall be a minimum of 1000 gpm with a residual pressure of 20 psi at each fire hydrant, and a maximum of 150 psi at each outlet after allowing for friction, elevation, and other pressure losses. Pressure at each residence shall not exceed 75 psi. Design shall be based in the Flow data in Table 4-2 below. Water flow calculations shall be provided for Government review in the design analysis provided by the Contractor.

TABLE 4-1: FIRE FLOW DATA

Hydrant Location	Static Pressure (psi)	Residual Pressure (psi)	Flow (gpm)

Washington and Lincoln Streets	60	37	1021
Lincoln and Roosevelt Streets	55	30	919
HQ Fire Station	42	30	919
Wofford Dr. and Thomas Ave.	68	55	1061

4-2.3 Trenches. Water and gas mains may be installed in the same trench, with the gas main placed on a shelf at least 12 inches above and to one side of the water mains. (Coordinate with the local gas utility supplier to determine system acceptability). Water mains shall have a minimum of 48 inches of earth cover. Sufficient cover must also be provided to protect the pipe against structural damage due to superimposed surface loads.

4-2.4 Fire hydrants. Hydrants shall conform to AWWA C502, Dry-Barrel Fire Hydrants, except as required by the local utility supplier. Valves shall conform to AWWA C500, Gate Valves for Water and Sewerage Systems. Fire hydrants shall be compatible with those presently in use at the installation, with similar pump and hose connections. Fire hydrant spacing shall be no greater than 350 feet apart, by paved road. In addition, a hydrant shall be provided so that all parts of the residences can be reached by hose lines not over 350 feet long. Hydrant laterals shall be 6 inches minimum size, shall not exceed 10 feet in length, and shall have an underground shutoff valve. Valve box, at each lateral, shall be located within 10 feet of the hydrant, and shall not be located where obstructed by parked vehicles, shrubbery, etc. Guard post barriers shall be provided where hydrant locations are subject to vehicle damage.

4-2.5 Shutoff valve. Each residence shall be provided with a separate service and main shutoff valve, readily accessible to maintenance and emergency personnel. Shutoff valves in walks are prohibited. Plastic shutoff valves are prohibited.

4-3 Sanitary Sewerage System. Connections to the existing sewage collection system shall be made at the location shown on the RFP drawings. Sewage collection systems shall be designed and constructed in accordance with the National Standard Plumbing Code criteria in this paragraph, and installation requirements. Pipe sizes and slopes shall be calculated using the Manning Formula. Manholes are required at all changes of direction and spaced not more than 400 ft apart. Curved sewers are prohibited. Pipes shall be designed to flow full and maintain a minimum velocity of 2 ft per second.

4-3.1 Sewer mains. Design shall be based on an average daily per capita flow of sanitary sewage of 100 GAL per day with a 4.0 peak hourly factor. Mains shall be a minimum of 8 inch in diameter.

4-3.2 Sewer Building Laterals. Each residence lateral shall be connected directly to a sewer main. Combining multiple laterals is prohibited. Cleanouts shall be provided to allow cleaning of all lines to grade. Cleanouts, in yard areas, shall be set in a box with a hinged cover and allow for two-way cleanout capability, both toward the house and toward the sewer main. Laterals from one building shall not cross under another building. Lines shall be sized in accordance with the National Standard Plumbing Code. Sewer laterals serving one residence shall be a minimum of 6″ in diameter.

4-3.3 Trenches. Sewer and water lines, mains or laterals, shall be placed in separate trenches. The separate trenches shall maintain a minimum lateral separation of 10 ft.

4-3.3.1 Cover. Sewer lines shall be located at a minimum depth of 3 ft.

4-4 Storm Drainage System. The storm drainage system shall be properly coordinated with surrounding properties to ensure that runoff does not cause damage to other properties. All drainage lines, if required, shall remain in conduit to stable grade. The minimum velocity of flow in conduits during a design storm shall be 2.5 fps. Storm water collection, disposal (and retardation) system shall be designed for a minimum of a 10-year return frequency. Rainfall intensities for Project locations shall be in accordance with local community/locality/State Transportation (Highway) agency design parameters.

4-4.1 Site specific storm drainage criteria. The Contractor shall comply with all NPDES requirements and be responsible for all permits and applications.

4-4.2 Manholes. Manholes shall be located at intersections and changes in alignment or grade. Intermediate manhole maximum spacing shall be 250 ft for pipes 3 ft or less in diameter or box drains with the smallest dimension less than 3 ft. Maximum spacing for intermediate manholes on larger pipes and drain boxes shall be 500 ft. Manholes shall be precast concrete and shall conform to ASTM C 478 or AASHTO M 199. Steps shall be installed where the depth of the manhole exceeds 4 ft. The wall where the steps are installed shall be vertical. The manhole shall have a 2 ft minimum opening as measured from the face of the steel ladder.

4-4.3 Drainage of roads and pavements. Provide a positive crown or sheet drainage to all streets and roads. Pavement collectors for storm water shall be by curb inlets and gutters. Open areas shall be drained by field inlets and an underground collection system. No roadside ditches shall be permitted. Overland flow shall be held to a minimum.

4-4.4 Pipe for culverts and storm drains shall be of RCP Class III, or PVC profile pipe.

4-5 Gas Distribution System. Provide a gas distribution system, connected to existing systems and designed in accordance with local codes or utility company requirements, whichever is more stringent. Gas distribution systems shall comply with the requirements of ASME B31.8. Connection to existing gas distribution system shall be made at the location shown on the enclosed RFP drawings. When connecting to existing steel piping system, provision shall be made to ensure that the integrity of the cathodic protection is not compromised. Shutoff valves shall be provided on the exterior of each residence. A gas regulator and provision for future installation of an individual gas meter to monitor fuel use shall be provided for each residence. The residence service entrance shall be installed at a height sufficient to allow for future installation of the gas meter. Existing lines that are to be abandoned shall be either removed or physically disconnected from all gas sources and purged. Abandoning existing gas piping shall be done in accordance with ANSI B31.8, Gas Transmission and Distribution Piping Systems. Installation of gas piping will be in accordance with ANSI B31.8 and 49 CFR 192.

4-5.1 Materials. Materials and appurtenances shall be free of defects and suitable to accomplish the stated objectives of gas distribution systems. Pipe shall be polyethylene as described below.

4-5.1.1 Polyethylene pipe, with anodeless risers, shall conform to ASTM D2513, Standard Specification for Thermoplastic Gas Pressure Piping Systems, with fittings complying with either ASTM D2513 or ASTM D2683, Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing. Connections to metal pipe shall comply with ANSI B16.5, Pipe Flanges and Flanged Fittings, or manufacturer's recommended standards.

4-5.2 Testing. Prove that the entire system of gas mains and service lines is gas-tight by an air test, in accordance with ANSI B31.8. The test shall continue for at least 24 hours between initial and final readings of pressure and temperature.

4-5.3 Drips. Unless high pressure natural gas is used, drips shall be installed at the low points, immediately following reduction from high pressure to medium pressure (at supply points) and at occasional low points throughout the system to provide for blowing out the lines.

4-5.4 Valves. Plug valves shall be installed at intersections of mains and other locations so that interruptions to service can be confined to no more than 30 residences.

4-5.5 Mains and service lines. Lines shall not be placed under any buildings. Lines shall be placed with a minimum of 30 inches of earth cover. Protective casings shall be provided to protect lines from superimposed street or heavy traffic loads.

4-6 Electrical Distribution. The main feed consists of overhead lines routed along First Division Road, which provides all electrical service to the new housing areas from Substation No. 1. Connection to the existing electrical distribution system shall be made at the location shown on the enclosed RFP drawings (Ellis Heights: near First Division Road and Williston Point Road; O’Donnell Heights: near First Division Road and Thomas Avenue). These lines have

adequate capacity to provide electrical service for this Project. Pad-mounted transformers shall be fed from these lines using underground feeders. The distribution level voltage is 12.47 kV. Provide advanced written notice to all residents for all required power outages due to construction.

4-6.1 System design. Provide new electrical distribution system as necessary and connect to existing system. Connect to the existing pad-mounted switches at Ellis Heights and provide new pad-mounted switches with primary master meters at new tie-in point at O'Donnell Heights. Coordinate utility interruptions in advance with Contracting Officer. System shall be a loop-primary radial system. Primary feeder cables shall be copper and concrete encased. High voltage conductors shall have protective shielding. Cable shall be buried a minimum of 3 ft below the finished grade to the top of the concrete encasement with continuous cable marker tape and tracer wire 6 inches below grade. Cable markers shall be installed along the length of direct-burial cable runs to identify their routes from the surface. Markers will be provided at changes of direction and at intervals not to exceed 500 ft. The electrical on-site distribution system shall be designed in compliance with the rules and recommendations of ANSI C2, National Electrical Safety Code, and NFPA 70, National Electrical Code, whichever is more stringent. Underground direct-burial distribution is required unless otherwise directed. The distribution system and transformers shall be routed at the rear of the housing area. Provide tracer wire and warning tape over all electrical underground utilities (See Section 02222).

4-6.1.1 Provide three 15-kV primary conductors and one 600V concentric neutral. All primary conductor insulation shall be 133 percent and cross-linked polyethylene or ethylene propylene rubber (NEMA WC74). Loading at connections shall be balanced between all three phases. Distribution of primary feeders shall be loop fed so that if power is lost at any location, power can be supplied from another direction until the problem is corrected. Distribution system includes conductors, pad-mounted switches, pad-mounted transformers and pads. Coordinate the installation of the electrical system with the telephone and cable TV system companies.

4-6.2 Underground splices. Underground connection or splices are prohibited, except in boxes or manholes. Splices shall be in a self-draining, rodent-resistant box with a cover.

4-6.3 Service laterals. Route all service laterals underground. Minimize the length of secondary distribution service laterals from the transformer secondary to the building service entrances. Secondary service laterals shall be copper and may be direct-buried.

4-6.4 Service entrance. Provide only one service entrance per residence. Bury the service entrance conductors a minimum of 3 ft below finished grade with a minimum separation of 1 ft from telephone or TV cables. Route feeder from the service entrance to the individual residence in conduit below the building slab. Design the system such that the fault current available at the service entrance equipment will not exceed 10,000 amps.

4-6.5 Transformers. Provide pad-mounted transformers with two non-fused switches for the loop connection. The high voltage compartment of the transformer shall include a load break switch with fused circuit for the transformer. The primary voltage shall be 7,200V, single-phase. The transformed secondary voltages shall be 240/120V, single-phase, three-wire, solid neutral service to residences. In selecting a transformer, the name plate rating shall not be less than 90 percent of the kilovolt/amperes (kVA) demand load calculated for the transformer. The demand load shall be calculated per NFPA 70, National Electrical Code.

Transformers shall be low profile, pad mounted type, mineral oil insulated, with tamperproof enclosure and copper primary and secondary windings. Transformers shall be certified non-PCB and shall contain less than 50 parts per million PCB.

4-6.6 Street and area lighting. Residential roadway lighting, including collector streets, shall be provided in accordance with the IES Lighting Handbook. Provide lighting at roadway intersections, and at intervals not exceeding 200 ft between intersections. Provide area lighting at intervals not exceeding 200 ft. along area walkways not otherwise illuminated, common area walks connecting playgrounds, and at all steps in area walkways. Area lighting shall be provided in accordance with the IES Lighting Handbook. Luminaries shall be actuated by photoelectric control, one photocell per circuit, and supplied from multiple circuits originating from a pad-mounted transformer. Street lighting poles shall be uniformly spaced and set back from the curb edge a minimum of 4 feet and between sidewalk and curb. Street and parking area light fixtures shall be high pressure sodium. Provide standard cobra-head style, 240-volt luminaires for street and area lighting. Luminaire finish shall be standard aluminum. Poles shall be round aluminum with standard anodized finish.

4-7 Metering. Metering of utilities shall be provided as follows:

4-7.1 Master Meters. Master meters for water, electricity, and gas shall be provided for both sites where not already existing. Individual residential meters are not required. Contractor is to provide proper rough-ins with shutoff valves of main disconnects for future installation of meters (gas, water, electric) for each individual residence.

4-7.2 Gas and water metering. Provide for future individual residence metering devices. Comply with local requirements. Meter and regulator location for gas meter shall be sight screened, and located to provide convenient access while not distracting from building appearance. Water meter well and piping with shut-off valves for future installation of water meter and yoke shall be provided.

4-7.3 Individual or main disconnects meter drops. Provide individual utility meter for all residences. Provide sockets for electric watt-hour meters at each residence. Provide manual by-pass jumper plates for each socket. Locate utility meter drops in an area readily accessible by service personnel. Sight screen meters and meter bases, and locate to provide convenient access while not distracting from building appearance.

4-8 Telephone. The telephone company will furnish and install distribution cables. Conduit required between underground terminal boxes and the buildings will also be furnished and installed by the telephone company. Contractor shall coordinate with the telephone company for the location, type, and installation of the required telephone system. Telephone company distribution cables and above-ground enclosures shall be routed at the rear of the housing area.

4-9 Television. The cable TV service provider will provide all site distribution systems for this project. Coordinate with the cable TV service provider to determine who is responsible for all trenching, conduit, boxes, and backfilling required to install the distribution systems. Cable TV distribution cables and above-ground enclosures shall be routed at the rear of the housing area.

4-10 Cathodic Protection. Cathodic Protection (CP) is mandatory on buried ferrous metallic structures as described below:

4-10.1 Corrosion control is mandated for all metallic underground storage tanks storing petroleum or hazardous substance by 40 CFR, Part 280 and AR 200-1 and on

hazardous liquid pipelines (e.g., liquid fuel) by 49 CFR, Part 195.4-10.2 Corrosion control is mandated for all metallic underground storage tanks storing petroleum or hazardous substance by 40 CFR, Part 280 and AR 200-1 and on hazardous liquid pipelines (e.g., liquid fuel) by 49 CFR, Part 195.

4-10.2 CP systems must be designed to provide protective potential to meet the requirements of the National Association of Corrosion Engineers (NACE) Standard RP-0169, Control of External Corrosion on Underground or Submerged Metallic Piping Systems, or NACE Standard RP-0185, Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems, as appropriate.

4-10.3 New or supplemental CP systems shall be compatible with existing CP systems and other adjacent structures or components. New systems should be compatible with existing systems to allow ease of repair and maintenance.

4-10.4 CP and protective coatings shall be provided for the following buried and submerged ferrous metallic structures regardless of soil or water resistively:4-10.6 CP and protective coatings shall be provided for the following buried and submerged ferrous metallic structures regardless of soil or water resistively:

4-10.4.1 Natural gas piping.

4-10.4.2 Other structures with hazardous products as identified by the installation.

4-10.5 Cast iron pipe shall be treated as follows:

4-10.5.1 For soil resistivity below 10,000 Ohm-cm at pipeline installation depth, provide CP, bonded joints, and protective coatings. Poly-wrap is not a sufficient coating.

4-10.5.2 For soil resistivity between 10,000 and 30,000 Ohm-cm at pipeline installation depth, provide bonded joints only.

4-10.6 Copper water service lines will be dielectrically isolated from ferrous pipe. Dielectric isolation shall conform with NACE RP-0286.

4-10.7 Ferrous metallic piping passing through concrete shall not be in contact with the concrete.

4-10.8 Tracer Wire: All non-conductive underground utilities will have a tracer wire buried directly above, and immediately adjacent to each line. The tracer wire will be a 12 gauge, solid copper, coated wire. The tracer wire will run the entire length of the buried utility line. The tracer wire will run on primary and secondary feeders from manhole to manhole (or valve box), and be terminated within each manhole, or valve box at a point easily reachable from the surface. On lateral lines, the tracer wire will run the entire length of the lateral and be terminated, next to the house above ground, at the point where the utility comes out of the ground. The wire will be snuggly wrapped around the pipe a minimum of three times. If the lateral line enters the house below grade, the tracer wire will be terminated above the utility line, immediately next to the exterior of the foundation, in a standard non-waterproof exterior junction box attached to a vertical piece of 1/2" plastic PVC pipe buried a minimum of one foot below the surface. Within the junction box the continuous tracer wire will

be left coiled, a minimum of one foot long, with the interior of the box labeled with a permanent marking pen, (i.e. Gas Line Tracer).

Warning Tape: Standard grade, non-magnetic, Warning Tape will be installed above all underground utility lines. The tape will be buried 1 foot below the surface, running the entire length of the buried utility. The color of the tape will correspond to the utility it is protecting.

Electrical = Red
Gas = Yellow
Water = Blue
Sewer = Green
Telephone = Orange
Cable TV and Others = Silver

5. ARCHITECTURAL DESIGN

5-1 ARCHITECTURAL DESIGN REQUIREMENTS. Designs shall conform to the plans as shown in the RFP drawings. Only minor variations are permitted to accommodate ductwork, piping, and other similar requirements.

5-1.2 ACCESSIBILITY. Design of accessible residences shall conform to the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Refer to the RFP Drawings for designated accessible unit locations and information. The designated units shall be accessible to disabled persons with wheelchairs as well as visually and/or hearing impaired persons. This means required access clearances, room sizes, bathroom layout, kitchen layout, doors and hardware, grab bars, plumbing hookups, light switches and outlets and controls must meet accessibility requirements at time of construction, or they shall be readily and easily modifiable to meet accessibility requirements. The accessibility requirements for adjustable height cabinets and work surfaces and plumbing fixtures, and other accessibility requirements for the hearing and visually impaired, must also be made at time of construction.

5-1.2.1 Consumer Information for Accessibility Requirements. The Contractor shall furnish a report including drawings in accordance with the Uniform Federal Accessibility Standards, paragraph 4.34.4 “Consumer Information” for the modified and adaptable features of each applicable unit type of family housing.

5-1.3 HOUSING UNIT VARIATION. The goal is to provide distinctly different exterior appearances for each duplex. For the Base Bid which uses siding and no brick, the Contractor may provide more than one color of siding on the same building. All adjacent structures will vary in two or more of the following: Floor plan (combination of different residence types), elevation and orientation, and color of exterior materials. Refer to paragraph on exterior materials for permissible variations in exterior materials. Duplexes shall vary in color, in a random pattern, with no two adjacent structures being the same color. Elevations of the duplexes indicated in this RFP are included to indicate required form, massing and material usage.

5-1.4 MAINTAINABILITY. The design of residences, including the selection and specifying of exterior and interior finishes, equipment, appliances, and systems shall include consideration of maintenance ease and cost. Avoid products that require continuing maintenance at high cost.

5-2 BASEMENTS. Not Used.

5-2.1 Refer to Section 5-4.6, Tornado Safe Rooms.

5-3 MATERIALS. All materials used shall be new and shall not be discontinued.

5-4 FIRE PROTECTION AND SAFETY. Residences will comply with the applicable National Fire Codes, including NFPA 101, Life Safety Code. Construction features will be provided in accordance with the International Residential Code (IRC), 2003 edition. The Design/Builder shall furnish a complete code analysis.

5-4.1 FIRE-RESISTANCE OF PARTY WALLS AND ROOFING MATERIALS. Party walls shall extend without openings, from ground to the underside of roof sheathing. Provide firestops at floor, and ceiling or roof line. Provide Class A (ASTM E108, Standard Methods of Fire Tests of Roof Coverings) roof covering material throughout. Party walls (walls separating residences) shall have the minimum fire-resistance rating of one hour.

5-4.2 ALARM SYSTEMS. Smoke detectors are required to sound an alarm only within the residence are not required to be transmitted to the installation fire department.

5-4.3 SAFETY OF HEATER/ MECHANICAL ROOMS. Rooms equipped with fuel-fired equipment such as a furnace and/or fuel-fired water heater that serve only one housing unit shall be separated by minimum one-hour rated fire-resistive construction. Provide easy access to the equipment controls and filters.

5-4.4 GARAGE WALLS. Walls between the garage and dwelling areas shall be separated by minimum one-hour rated fire-resistive construction. All openings in such rated walls shall conform to opening protection requirements in conformance with the applicable codes.

5-4.5 EGRESS. Every sleeping room and living area shall have a secondary means of egress where required by NFPA 101 and International Residential Code.

5-4.6 TORNADO SAFE ROOMS. Provide each and every family housing unit with a tornado safe room built in accordance with the standards in the Federal Emergency Management Agency (FEMA) Publication No. 320, “Taking Shelter from the Storm: Building a Safe Room Inside Your House.” Refer to the attachments to the RFP for the 16-page set of “In-Residence Shelter” drawings, revised August 1999, indicating various methods for meeting the standards. For accessible units, the preferred location of the safe room is on the main level of the unit. The locations of the tornado safe rooms are located on the drawings provided with this RFP.

5-5 SOUND ATTENUATION.

5-5.1 REQUIREMENTS. Walls and floor ceiling systems shall be designed to meet or exceed the requirements stated below. In cases where the field tested performance of the systems does not meet the designed performance, the maximum acceptable difference between field tests and sound transmission ratings shall be 2 decibels (dB) for airborne sound ratings and 5 dB for impact sound ratings.

5-5.2 PARTY WALLS. Party walls construction between residences shall be designed to provide the minimum airborne sound transmission ratings and impact isolation ratings stated in Table 5-1.

TABLE 5-1 - SOUND TRANSMISSION STANDARDS FOR PARTY WALLS AND FLOOR/CEILING CONSTRUCTION

Area	FSTC[1]	FIIC[2]
Party Walls (Unit Separation)	52	-
Habitable Areas Over Garages	52	-

Note[1]: Field Sound Transmission Class. See ASTM E336.

Note[2]: Field Impact Isolation Class. See ASTM E1007.

5-5.3 TESTING. Certified proof-of-performance field tests will be conducted by the Contractor to demonstrate that the floor and wall systems as constructed provide the required sound isolation. Tests for air-borne sound shall be made in compliance with ASTM E336. Tests for impact sound shall be made in compliance with ASTM E1007. Testing will take place on 4 units randomly selected by the Contracting Officer.

5-5.3.1 DEFICIENCIES. Any wall or floor system found to be inadequate shall have the deficiencies corrected and the additional qualifying tests conducted at the Contractor's expense. Testing at the Contractor's expense of additional units beyond the initial 4 units, of each system, may be required if the Contracting Officer determines that the quality of construction requires this additional testing.

5-5.4 PLUMBING AND HVAC EQUIPMENT. Design of plumbing and Heating, Ventilating, Air-Conditioning (HVAC) shall include design provisions such as location, enclosure and acoustical treatment, to minimize transmission of noise generated by equipment within each residence, particularly the single-story units, and to eliminate transmission of noise to other residences.

5-6 LIVEABLITY, DIMENSIONS AND AREAS. The floor plans in the RFP indicate the dimensions and area layouts for interior room and exterior spaces.

5-6.1 CEILING HEIGHTS. Ceiling heights in habitable rooms shall be a minimum of (8 ft). As a part of the betterments to the Contract RFP, provide 9-foot ceilings on the first floor of all residences, except those that are handicapped accessible.

5-6.2 LIVING, FAMILY AND DINING ROOMS. Living, Family and Dining Room areas shall have direct access and be open to each other as indicated on the floor plans in the RFP. The Family and Dining Rooms shall have direct access and be open to the Kitchen area as indicated on the floor plans in the RFP.

5-6.3 BEDROOMS. Bedrooms shall be designed to accommodate king-size beds in Master Bedrooms and twin beds in the other bedrooms. Window, door and closet placement should accommodate functional placement of furniture. Each bedroom shall be accessible without passing through another bedroom. Design consideration shall be given to the movement of oversized furniture in and out of the bedrooms. Bedroom closets shall maximize space with wood shelving and organizers. As a minimum, provide 2 shelves and 2 rods on 50 percent of the hanging space with shelves mounted at heights of approximately 3’-8” and 6’-0” above the floor. The remaining 50 percent of the closet space shall have one shelf and rod mounted at a height of approximately 6’-0” above the floor.

5-6.4 LAUNDRY. Separate Laundry Rooms or Closets shall be provided as indicated on the floor plans in the RFP. Two full-length shelves,(10 inches) minimum nominal depth, are required above the washer and dryer in all locations.

5-6.5 CLOSETS. Closet shelving. Closets (except linen closets) shall be equipped with a (12 inches) deep shelf and a clothes hanger rod. Linen closets shall have at least four full-depth shelves. Closet shelving and rods in excess of (4 ft) shall have center supports. Shelves and supports shall be capable of carrying (35 lbs./ft). Closet shelving shall be minimum (3/4 inch) thick solid wood, plywood, or high density particle board. In walk-in closets, provide one full height drawer or open shelf storage unit for each 6 feet of clothes hanger rod. Factory Finished welded wire shelving and closet organizers meeting the capacity requirements is also permitted. Intermediate supports must be anchored to studs.

5-6.5.1 CLOSET DOORS. All closet doors shall be swinging except for bi-fold doors where indicated at Laundry Closets on the floor plans in the RFP.

5-6.5.2 INTERIOR STORAGE ROOMS. Provide a minimum of three nominally (12 inches) deep shelves with a combined length of (24 ft) within each interior storage room in single-story units.

5-7 KITCHEN.

5-7.1 LAYOUT. The Kitchen shall provide efficient working arrangements between the sink, refrigerator, cooking and food preparation areas as indicated on the floor plans in the RFP.

5-7.2 DISHWASHER. The dishwasher shall be installed adjacent to the kitchen sink.

5-7.3 PANTRY. A full-height pantry with a minimum of six 12-inch deep adjustable shelves shall be provided.

5-7.4 Backsplash. The contractor shall provide a backsplash behind the range, extending to the underside of the range hood, finished to match the backsplash above the countertop.

5-8 BATHROOMS. Provide a combination tub with shower enclosure for the typical common bathrooms in the hall. The tub will be enameled cast iron. The enclosure will be a single- or multiple-piece unit with integral soap dish. All bathtubs except those in the master bedroom shall be furnished with a curtain rod. The master bathrooms shall have an enameled cast iron bathtub with a ceramic tile backsplash enclosure extending around the tub at a minimum height of 6-feet above the adjacent finish floor. Master Bathroom bathtubs shall have a recessed ceramic tile soap dish and a curtain rod. The towel bar holder and the toilet paper holder arms shall be ceramic with a plastic spring-loaded rod for the towel bar. Provide one 24-inch-long towel bar for each half-bath and two 24-inch-long towel bars for each full bath. All bathroom accessories shall be rigidly attached to studs or blocking. Bathtubs in handicapped accessible units shall be ADA-compliant and incorporate grab bars and a seating bench within the tub.

At non-accessible housing units, the Master Bathroom shower stalls shall have ceramic tile floors and walls extending around the shower space at a minimum height of 6-feet above the adjacent finish floor. Ceramic tile shall be installed in compliance with the latest edition of “Handbook for Ceramic Tile Installation” published by the Tile Council of America, Inc. The shower tile installation shall be in conformance with the applicable “Shower Receptors and Walls” standards for the type of floor and wall construction provided.

At accessible housing units, the Master Bathrooms shall also have a single-or multiple-piece shower unit made of molded acrylic. Roll-in type showers are not required at accessible units. Molded acrylic shower units shall be capable of accommodating a person of 250 pounds without damage.
Shower units shall incorporate a tempered glass door except that shower curtains shall be used at the accessible units.

5-8.1 MEDICINE CABINETS. A recessed medicine cabinet shall be provided in master bathroom only. Cabinets shall be corrosion-resistant with plate glass mirrors, hinged door type. Medicine cabinets shall be placed on a sidewall of the bathroom. Do not place recessed medicine cabinets in party walls. Medicine cabinet is in addition to mirror in all bathrooms. A single continuous length of corrosion-resistant plate glass mirror measuring the width of the vanity by 42 inches high shall be furnished in all bathrooms.

5-9 INTERIOR FINISHES

5-9.1 WALLS AND CEILINGS. Provide minimum 1/2-inch gypsum wallboard where studs are 16” o.c. maximum. Provide minimum 5/8-inch gypsum wallboard where studs are greater than 16” o.c. Walls shall be taped and smooth finished. All ceilings shall receive an off-white blown-on acoustical finish. Water-resistant wallboard shall be used in wet areas such as bath, powder, and laundry rooms. Ceiling board must be rated for ceiling use by the manufacturer. Cementitious backer board

shall be used for ceramic tile applications. Interior finish shall have a flame-spread rating of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E84.

5-9.1.1 GYPSUM BOARD CONSTRUCTION. All gypsum board shall be installed with screws, shall be manufactured in the United States and shall not contain asbestos. Provide metal corner beads on all gypsum board exterior corners.

5-9.1.2 As a part of the Base Bid, the stairwells shall be finished in their entirety.

5-9.1.3 All electrical devices such as wall-mounted receptacles and light switches shall be masked prior to gypsum wallboard taping to protect devices from wallboard compound entering the devices or touching sheathing on electrical wiring or cable.

5.9.2 FLOORING. Flooring in all areas of the first and second floors of all residences, except garages and mechanical rooms, entry, entry closet, kitchen, laundry room and toilet/bathrooms, shall be carpet. Entry, entry closet, kitchen, laundry room and toilet/bathrooms shall have sheet vinyl with painted wood base. Provide suitable transition strips between changes in adjacent flooring material. As a betterment, flooring shall be hardwood flooring with wood base in areas indicated shall be provided by the Offeror. Also in the betterment, a ceramic porcelain tile shall be provided in the entry foyer, entry closet, master and full bathrooms, and laundry room for all residences.

5-9.2.1 STAIRS. Interior stairs shall be softwood with carpeted treads and risers.

5-9.2.2 SHEET VINYL. Sheet vinyl shall conform to ASTM F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type I, Grade 1, Class B. Wear layer shall be urethane/PVC containing 90% binder. Flooring shall be installed as a monolithic material with seams heat welded. Provide material equal to the following:

Congoleum “Ovations” 12-foot width, 10-year limited warranty.

5-9.2.3 CERAMIC TILE. Ceramic tile shall conform to ANSI 137.1, moderate grade and shall be lead-free. Ceramic tile shall be installed in compliance with the latest edition of the “Handbook for Ceramic Tile Installation” published by Tile Council of America, Inc., and each installation shall be in conformance with applicable standards for the type of floor and wall construction provided. Ceramic tile shall be installed on shower floors and walls, except at accessible residences, and bathroom walls at master bathroom tubs (to a minimum height of 6-feet above the adjacent finish floor) including walls around tubs in non-accessible master baths.

Ceramic tile shall also installed above all kitchen counters and below the wall cabinets and behind ranges from the counter height to the bottom of the range hood.

5-9.2.3.1 CERAMIC PORCELAIN TILE. As a part of the Government desired betterments in the bid schedule, provide ceramic porcelain floor tile where shown on the drawings. Tile shall be a stone pattern, minimum 12″ x 12″ in size. Install in a thin-set mortar to match the level of the laminate flooring. Tile shall have the following characteristics:

Water Absorption: ASTM C373 0.1% max.
Abrasive Wear: ASTM C501 200 min.
Breaking Strength: ASTM C648 300 lbs. min.

Bond Strength: ASTM C482 200 psi min.
Coefficient of Friction: ASTM C 1028 0.6 dry (min.); 0.5 wet (min.)

5-9.2.4 CARPET. As part of the base bid, Carpet shall be Mohawk Aladdin Saxony, solid color, 100 percent polyester, with polyester primary and secondary backing, heatset, yarn weight of 38 ounces per square yard, 0.125-gauge, 3500 minimum density, with 10-year limited lifetime warranty or equal.

5.9.2.4.1 CARPET PADS. Carpet pad shall be ½-inch bonded urethane, minimum 6-pound density. Urethane pad will conform to ASTM.D.3676.

5-9.2.4.2 CARPET EDGING. Carpet edging shall be 1-1/2-inch minimum width floor flange and minimum 5/8-inch wide face.

5-9.2.4.3 CARPET STRIPS. Tackless strip shall be exterior grade Douglas Fir plywood, with minimum dimensions of 1-1/8 inches wide suitable for the cushion thickness specified. Tackless strips with two or three rows of staggered pins shall be used. For areas over 20 feet long, tackless strip with three rows of pins shall be used. Pins of the proper length shall be provided to penetrate through carpet backing, but shall not be a safety hazard.

5-9.2.5 HARDWOOD FLOORING. As a betterment to the contract, the Offeror shall furnish and install hardwood flooring as indicated on the Drawings, complete with all required trim and accessories in accordance with the manufacturer’s installation instructions, including wood base, base shoe molding, and reducer strips as required. All edges against dissimilar materials must incorporate a matching hardwood transition strip.

5-9.2.5.1 Hardwood flooring shall comply with NOFMA grading rules for species, grade, and cut. All materials shall carry NOFMA grade stamp. All materials shall be from one source and shall be of consistent quality, appearance and physical properties.

5-9.2.5.2 Products:

1. Provide one of the following manufacturers:

   a. Harris Tarkett
   b. Robbins
   c. Bowen

2. Species: Red oak.
3. Grade: No. 1 clear.
4. Cut: Plain sawn.
5. Thickness: ¾-inch (19 mm).
6. Width: 2-1/4 inches.
7. Length: Manufacturer’s standard random.
8. Edges: Square tongue and groove.
9. Matching: End matched.
10. Finish: Unfinished, for field-applied finish.
11. Backs: Channeled (kerfed).
12. Random Lengths: Standard random-length strips.

5-9.2.5.3 Finishing Materials:

1. Urethane Finish System: Complete system of compatible components that is recommended by finish manufacturer for application indicated.

   a. Type: Water-based.

b. Stain: Penetrating and nonfading type, ultraviolet (UV) stable as recommended by urethane finish manufacturer for compatibility. Color: light oak.
c. Floor Sealer: Pliable, oil-based, penetrating type, as recommended by urethane finish manufacturer for compatibility.
d. Clear Finish Coats: Formulated for multicoat application on wood flooring.

2. Application: Minimum of 3 coats, 4 mil D.F.T. each.
3. Wood Filler: Formulated to fill and repair seams, defects, and open-grain hardwood floors; compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved samples, provide pigmented filler.

5-9.2.5.4 Felt Underlayment: Where strip or plank flooring is nailed to solid-wood subfloor, install flooring over a layer of asphalt-saturated felt stapled in place with minimum 3-inch overlaps. Run underlayment tight to stud partitions, as detailed on Drawings.

5-9.3 PAINTING. Finishes shall be lead free. All interior surfaces, except factory prefinished material, shall be painted a minimum of one prime coat and one finish coat.

5-9.3.1 WALLS. Walls in all rooms and all painted trim shall be painted with eggshell enamel. Colors shall be Post standard colors. All interior wall surfaces shall be painted with off-white paint equal to Sherwin Williams SW-1018. All ceilings, except basement study rooms, shall receive an off-white blown-on acoustical finish.

5-9.4 TRIM. As a part of the base bid, provide colonial-style painted wood door casing, floor bases and other trim as required. All base shall be colonial-style painted solid wood, 3 inches high with quarter-round base shoe. As a part of the betterments, provide painted wood chair rail moulding and 6-inch painted wood crown moulding in the dining rooms and the great rooms.

5-10 GARAGES. Provide an attached double car garage for each residence as indicated on the floor plans in the RFP. Garage floors shall be concrete and have a construction joint installed between the garage floor slab and the driveway. Slope slabs to drain out the garage door. Garages shall be uninsulated except on walls and ceiling areas adjacent to heated spaces. Garage doors shall have hardware that can be opened and locked from inside and outside of the garage. As part of the Base Bid, all interior walls and ceilings in garages shall be finished with gypsum board and shall be fire-taped finished in conformance with the applicable codes. The garage walls shall be completely finished with paint. The ceilings shall be completely finished with acoustical texture blown-on finish.

5-11 ROOFING AND DRAINAGE. Minimum slopes for roofs shall be 1:3.

5-11.1 ROOF WATER. Seamless guttering and downspouts shall be provided for all roof areas. Downspouts draining onto a lower roof shall have metal or plastic splash deflectors. Concrete splash blocks shall be provided under downspouts. No downspouts shall be drained across sidewalks or driveways. Provide 4-inch PVC drainage sleeves under walks if downspouts are unavoidable.

5-11.2 ROOF SURFACE. Roofing shall be limited to the following:

5-11.2.1 Minimum of 225-pound Class A wind-resistant fiberglass shingles conforming to ASTM D3018, Specification for Class A Asphalt Shingles Surfaced

With Mineral Granules. Provide a 25-year warranty on roofing shingles. Roofing shingles shall be Tamko Elite Glass-Seal or equal. Color shall be “Rustic Black.”

5-11.3 ROOF CONSTRUCTION.

5-11.3.1 Roof shingles shall be nailed (pneumatic nailing is permitted). Staples are not allowed.

5-11.3.2 Roof shingles must be installed per manufacturer’s recommendations.

5-11.3.3 Do not install shingles when it is too windy.

5-11.3.4 Do not install shingles when temperature will not allow self-stick surfaces to adhere.

5-12 EXTERIOR FINISHES. Emphasis shall be placed on low maintenance and durability for exterior finish materials. Materials shall be residential in size, scale, and texture. Exterior finish materials for exterior screen walls, and garages will match the primary dwelling unit. In order to create variety in the appearance of the neighborhood and along individual streets, a variety of exterior color schemes for the units shall be incorporated. Stucco, concrete, and aluminum siding are not permitted. The following siding materials are the only materials permitted for use.

5-12.1 BRICK. In addition to the vinyl siding required by the base bid, as a betterment, provide brick veneer to each unit as indicated on the drawings provided with this RFP. Brick shall conform to ASTM C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale). Provide brick cap and flashing for all offset brick veneer. Brick shall start three courses above the finished grade.

5-12.1.1 Brick color, finish and hue shall vary between adjacent units. Provide a minimum of two different brick colors for this Project.

5-12.2 VINYL SIDING. As part of the Base Bid, the Contractor shall furnish vinyl siding on all residences as shown on the RFP drawings. Vinyl siding shall be “American Legend Vinyl Siding” as manufactured by Wolverine Siding, Valley Forge, PA or an approved equal. Installation of the vinyl siding shall be in accordance with the manufacturer’s printed instructions.

5-12.2.1 Siding Profiles. Siding profiles shall be horizontal patterns in double 4-inch clapboard and single 8-inch widths as shown on the RFP drawings. Vertical joints in the siding shall be kept to minimum, and full-length segments of siding shall be used at all exterior wall areas less than 12-feet in horizontal width. At exterior wall areas greater than 12-feet in width, the contractor shall indicate all vertical joint locations on the design drawings for approval. All vertical joints should have a wall stud or solid blocking behind the joint in the framed wall and should be staggered in accordance with the manufacturer’s printed instructions

5-12.2.2 Siding Finishes. Siding finishes shall be selected by the Contracting Officer from samples submitted by the Contractor from the manufacturer’s standard finishes.

5-12.2.3 Siding Colors. Siding colors shall be selected by the Contracting Officer from samples submitted by the Contractor from the manufacturer’s standard finishes. Refer to paragraph 5-1.3 regarding housing unit variation.

5-12.2.4 Siding Design. Siding panels shall be formed to provide post-formed

full-length edge interlock, so that after installation, fasteners will be concealed from view. All siding fasteners shall align and connect with wall studs in the framed wall.

5-12.2.5 Siding Accessories. Siding accessories may be utilized that are compatible with siding styles, profiles and colors. Accessory products may include installation components, soffits, window and door trims, corner lineals, corner systems and decorative moldings.

5-12.2.6 Siding Technical Standards. Siding products shall be produced in compliance with the ASTM D 3679 specification for Rigid Polyvinyl Chloride (PVC) siding.

Siding shall meet the weathering standard in ASTM D 3679 using ASTM D 1435 procedures.

Double siding shall be tested per ASTM D 5206 standard test method for windload resistance to withstand negative and positive windloads in compliance with the applicable International Building Code (IRC) requirements.

Siding products shall be in compliance with the following ASTM Fire and Smoke procedures and meet or exceed the applicable International Residential Code (IRC) and National Fire Protection Association (NFPA) requirements: ASTM E 84; ASTM D 1929; ASTM E119; ASTM D635; NFPA 268.

5-12.2.7 Siding Warranty. Siding products shall be provided with a transferrable lifetime warranty.

5-12.3 TRIM ELEMENTS. Provide prefinished trim elements and accessories to match siding as recommended by the siding manufacturer. All exposed wood is to be primed and painted.

5-12.3.1 Wood fascia and rakes shall be 1-inch nominal boards with solid blocking or 2-inch nominal boards without blocking. Plywood, hardboard, or gypsum board is required on the base bid. Cover fascia, rakes, and soffits with prefinished vinyl accessories to match siding in accordance with the vinyl siding manufacturer’s printed instructions.

5-12.3.2 Miscellaneous trim such as window trim, door sills and window sills shall be covered with prefinished vinyl to match siding.

5-12.3.3 Front porch and step railings and balusters shall be prefinished steel or composite plastic. Finish shall carry a 10-year warranty. The Offeror will select a railing style appropriate to the character of the residence. The style may vary between duplexes and this variation may be used to develop variation in the exterior appearance.

5-12.3.4 Ornamental Columns at Porch. Column shall be manufactured from cast stone, fiberglass, or composite material with minimum 8-inch size. 10-year warranty on the finish. Column shall be self-supporting and load-bearing. The style of the column, base and capitol shall be the contractor’s option but shall be compatible with the porch railing. The style may vary between duplexes and this variation may be used to develop variation in the exterior appearance.

5-12.4 EXTERIOR CEILING AND SOFFITS. Exposure of roof framing and underside of roof/floor decks is not permitted. Exterior porch ceilings and roof eave soffits shall be pre-finished vinyl accessories to match the vinyl siding for the base bid.

5-12.5 REAR PATIOS. Concrete patios shall be provided and shall be sloped to

drain away from the unit, with a broom-finished concrete floor surface. Concrete steps integral to the patio shall be furnished as shown on the Drawings. Provide railings at steps to match front porch.

5-12.5.2 The rear patios shall be screened from each other and other units by a portion of the house or by a privacy screen wall as indicated. The privacy screen wall shall be included in the base bid and shall be constructed of the same materials as the main structure. A wood fence is not permitted.

5-12.6 PORCHES. Porches floors shall be sloped to drain away from the unit and have a concrete floor surface which provides a waterproof and non-slip surface. Plastic coating or films over concrete decks are not acceptable. Exposed wood (cedar) decks, where indicated on the drawings should be sealed not stained or painted. Steps shall be integral to the porch and shall be concrete and have railings and shall be a minimum of 48 inches wide. Porches shall be covered with roofs.

5-13 WINDOWS. Window units shall be equal to: Capitol 7500 Series, double-hung, thermally broken extruded aluminum frame with tilt-in sashes, simulated divided lite, insulated glass, and insect screen. The window specified meets the following industry standards: AAMA/NWWDA 101/I.S.2-97 and ASTM F 588-97. The following specific criteria were met: NFRC overall design pressure testing (25), ASTM E330 structural testing (less than 0.4 residual deflection at a test pressure of 37.5 lb/sq ft), operating force (less than 30 lbs), ASTM E547 air infiltration testing (leakage not to exceed 0.25 cu ft/min/sq ft at a test pressure of 1.57 lbs/sq ft), ASTM E547 water resistance testing (no leakage when tested in three cycles of five minutes ea, with a one minute rest period between cycles at a test pressure of 3.75 lbs/sq ft), ASTM F 588-97 forced entry testing (passed), and ASTM 588-97 deglazing testing in operating direction at 70 lbs and remaining direction at 50 lbs. The Government will allow aluminum-clad wood, vinyl-clad wood, and solid-vinyl windows provided they meet all of the above salient characteristics.

5-13.1 Interior window trim and stools shall be solid-wood, paint-grades with a minimum thickness of 3/4-inch. Contractor to furnish wood blocking above the window heads for attachment of curtain rods.

5-13.2 All residences shall incorporate windows as shown on the RFP Drawings. Windows must be sized equal to, or larger than those shown on the Drawings, and must always comply with the requirements of the International Residential Code (IRC).

5-13.3 In addition, windows shall be furnished for the entry vestibule areas, the stairwells, the hallways, and the general basement area, as indicated on the RFP Drawings.

5-13.4 Windows in sleeping rooms shall incorporate one operable window for emergency escape or rescue, in accordance with the Uniform Building Code. Escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet. The sill height of the openable escape or rescue window shall not be more than 44 inches above finished floor.

5-13.5 Windows installed in the handicap accessible units shall also comply with the following ADA requirements:

- Operating heights for hardware accessible to the handicapped.
- Hardware specifically designed for use by the handicapped.
- Amount of force required to operate sashes and ventilators.
- Clear space in front of windows to accommodate wheelchairs and permit

access to hardware and operable sashes and ventilators for users with disabilities.

5-14 NOT USED

5-15 WINDOW TREATMENTS. Provide horizontal 1-inch metal blinds at windows and glazed hung doors. Color shall be manufacturer's standard off white, and shall be coordinated with wall color.

5-16 NOT USED

5-17 DOORS. See Table 7-1 for thermal performance requirements for exterior doors.

5-17.1 ENTRANCE DOORS. The residence primary entrance door shall be 3 ft-6 inches in width by 6 ft-8 inches in height by 1-3/4 inch thick, thermal metal. Other residence entrance doors should meet this requirement but may be of 3-foot width. Sliding glass doors are not permitted. Incorporate a small insulated-glass area in each exterior door with curtain rods.

5-17.1.1 ENTRY DOORS. Main entry doors shall be equal to: Responsive Door “Energy-Building” steel door, 42 inches wide, prehung, 6-panel, 26-gauge with solid polyurethane core, primed and ready for field painting.

5-17.1.2 STORM DOORS. Storm doors shall be equal to: Columbia “New Crown” storm door, 42 inches wide, self-storing, 11-1/4-inch master frame. Marine glazed tempered glass with solar tint.

5-17.1.3 PATIO DOORS. Patio doors shall be equal to: Therma-tru “Smooth Star” flush glazed, Model S2010, compression-molded fiberglass on solid urethane foam core.

5-17.2 GARAGE DOOR. Garage doors shall be painted 24-gauge galvanized steel with embossed finish and stamped raised-panel design. Provide manufacturer’s standard full-view glazed panels. Doors on non-accessible units shall be manually operated and complete with tracks, bottom seal, counterbalance and lock. Doors on accessible units shall have a power-operated opener. Provide two remote operators per door. Finish on door shall have a “lifetime” finish warranty.

5-17.2.1 Garage doors shall be equal to: Overhead Door Corp. 281 Series, white.

5-17.3 ALUMINUM SCREEN AND STORM DOORS. Screen and self-storing storm doors shall be provided for all residence exterior hinged doors. Frames shall be a minimum of 1-1/4 inches thick and 2 inches wide. Aluminum alloy materials shall be not less than 0.05-inch thick and 2 inches wide. Doors shall have solid bottom panels and midsection protective grills. Screening materials shall be nonferrous.

5-17.4 INTERIOR DOORS. Interior doors shall be a minimum of 3 feet wide, except that closet and bathroom doors may be 2 ft – 6 inches wide. Interior doors shall be a minimum of 6 ft - 8 inches in height by 1-3/8-inch thick, six-panel pressboard. All doors will be painted.

5-17.5 ATTIC ACCESS DOOR AND FRAME. Provide a lockable steel flush access door and frame located in a hallway ceiling of each residence for maintenance access only to the attics. The door size shall be 3-foot x 3-foot and shall be minimum 0.060-inch thick sheet steel set flush with the surrounding surface. The frame shall be minimum 0.060-inch thick sheet steel with exposed flange set flush with the surrounding surface. Hinges shall be concealed spring-loaded pin-type. Locks shall be a key-operated cylinder lock with interior release.

5-18 BUILDER'S HARDWARE. All provided hardware shall have the same finish. Hinges, locks, and latches will comply with the specifications indicated in Table 5-2, and the following subparagraphs:

TABLE 5-2 – HARDWARE SPECIFICATIONS

Hardware Type/ Specification	Specific Requirements
Hinges BHMA 101	Hinges shall be 102 mm x 102 mm (4 in x 4 in) at exterior doors, and 90 mm x 90 mm (3-1/2 in x 3-1/2 in) at interior doors. Minimum 3 per door.
Locks & Latches BHMA 601	Series 4000, Grade 2. Provide trim of wrought brass, aluminum, or stainless steel.
Auxiliary Locks BHMA 501	Series 4000, Grade 2. Provide matching trim of wrought brass, aluminum, or stainless steel.
Interconnected Lock & Latches BHMA 611	Grade 2. Provide matching trim of wrought brass, aluminum, or stainless steel.
Closers BHMA 301	Series CO2000, Grade 2.

5-18.1 LOCKS AND KEYS. Provide a master keying system. Locks for each residence, including garage door, shall be keyed alike. The Contractor shall provide one extra set of cores for each 50 residences and furnish four keys for each key change and for master key system and control key. Locks and keys shall conform to the standards and requirements of the Builders Hardware Manufacturers Association (BHMA) listed above. Exterior storage units shall have a hasp. Padlocks will be provided by the occupants.

5-18.1.1 Front and back door locks, interior garage door, and garage door cylinders must be Best Lock Corporation's Model 62K7AB4D-STK-612-RH, Brass Finish, M-keyway, interchangeable core, entrance locks. Key locks so that one key operates all locks in a unit. Prior to purchase, contact the Contracting Officer and locksmith for make and model numbers.

5-18.2 WEATHERSTRIPPING AND EXTERIOR THRESHOLDS. Provide nonferrous metal or vinyl weatherstripping for all residence exterior doors. Vinyl magnetic weatherstripping is acceptable for metal doors. Exterior thresholds shall be nonferrous metal. Low-rise thresholds shall be furnished for the accessible units.

5-18.3 APPLICATIONS. Locks and hinges shall be applied as follows:

5-18.3.1 Exterior hinged doors shall have 1-1/2 pair of hinges, lockset, and an auxiliary lock or interconnected lock and latch,

5-18.3.2 Interior doors shall have three hinges and latchset with BHMA 601, F75 or F76 operations.

5-18.3.3 Doors in fire-rated walls, residence to garage, shall have 1-1/2 pair of ball-bearing hinges, lockset, auxiliary lock or interconnected lock.

5-18.3.4 Bathrooms. Doors of all bathrooms shall be provided with privacy locks.

5-18-4 VIEWPORT. Each windowless entrance door shall be provided with a through-door 180-degree viewer mounted at an eye level of approximately 5’-0” above the interior finish floor.

5-18.5 DOOR BELLS. Front entrances to each housing unit shall be provided with low-voltage door chimes. Provide an illuminated push button mounted on the exterior wall near the latch side of the entrance door. A locked storm door shall not prevent access to the door bell button.

5-19 BUILDING SIGNAGE.

5-19.1 ADDRESS. All new units shall be provided with an address sign located beside the front door so that it is well illuminated by the porch light. The address sign shall have seven digits and 3-inch high reflective numbers on a colored background to match the unit’s exterior trim color and shall be installed in accordance with the Installation Design Standards.

5-20 CABINETS. Kitchen and vanity cabinets shall be factory manufactured of wood. Wall cabinets shall have adjustable shelves. Cabinets shall have magnetic catches except where spring-loaded self-closing hinges are provided. Cabinets shall include handles pulls and shall conform to ANSI A161.1, Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets, except where modified below. Wall and base cabinets and vanities shall be essentially of the same construction and appearance.

5-20.1 CABINET CONSTRUCTION. Cabinet design and construction shall conform to ANSI 161.1 and the requirements herein. Standard construction plywood shall conform to PS 1. Softwood lumber shall conform to PS 20. Hardwood plywood shall conform to PS 51. Particleboard shall conform to ANSI A208.1 or CS 236, Type 2, Grade B, Class 2. All hardwood shall be kiln-dried clear oak. Wall-hung cabinets shall be 12 inches deep. Kitchen base cabinets shall be 24 inches deep and 34-1/2 inches high at non-accessible housing units. Refer to Paragraph 5-1.2 for cabinet design requirements at accessible housing units.

5-20.1.1 Fronts and Framing. Cabinets shall have ¾ inch thick by 1-1/2 inch wide (minimum) hardwood flush framed fronts and framing members. Fronts and framing members shall be mortised and tenoned, dovetailed, doweled or biscuited and glued together. Top and bottom corners shall be braced with hardwood blocks that are glued and fastened in place, or an approved equal design.

5-20.1.2 Bottoms, Backs, Ends and Tops. Bottoms and ends of base and wall cabinets shall be ½ inch hardwood plywood. Bottoms of base cabinets shall be braced with solid wood members glued and fastened in place. Backs of base and wall cabinets shall be ¼ inch hardwood plywood. Tops of wall cabinets shall be ½ inch hardwood plywood.

5-20.1.3 Shelves. Shelves shall be ¾ inch hardwood plywood or ¾ inch particleboard and have a hardwood nosing and veneer on both sides. Shelves shall be vertically adjustable in 1-1/4 inch increments and be supported on the ends and on 24 inch centers. Shelf support rails, if used, shall be mortised into cabinet ends. Unless otherwise indicated, all base cabinets, except sink base cabinets, shall have one full width and depth shelf. Unless otherwise indicated, all wall cabinets, except over range and refrigerator wall cabinets, shall have two full width and depth shelves.

5-20.1.4 Roll-out Trays. Roll-out trays shall have ¾ inch thick by 1-1/2 inch wide (minimum) hardwood sides with ¼ inch hardwood plywood bottoms. Bottoms shall be rabbeted into the sides, fastened and glued.

5-20.1.5 Lazy Susans. Lazy Susans shall have two 28 inch diameter metal shelves that rotate with the doors attached. Shelves shall be designed to support 15 pounds per square foot, with maximum loading not to exceed 50 pounds per shelf. Shelf edges shall be turned up to prevent contents from sliding off during rotation.

5-20.1.6 Doors and Drawer Fronts. Door and drawer front designs shall be selected by the Contracting Officer from samples provided by the Contractor. Cabinet door and drawer fronts shall be designed for concealed hinges and one-half inch overlay.

5-20.1.6.1 Raised Panel. Doors shall have ¾ inch thick hardwood frames and 5/8 inch thick (minimum) hardwood raised panel inserts. Drawer fronts shall be ¾ inch thick hardwood. Routed finger pulls shall be provided on the backside of door and drawer fronts. Finger pulls shall be at the top of door and drawer fronts on base cabinets and at the bottom of wall cabinets.

5-20.1.7 Drawers. Drawer sides shall be ½ inch hardwood. Drawer bottoms shall be ¼ inch hardwood plywood.

5-20.1.8 Hardware. Hardware shall conform to ANSI A156.9. Hardware shall be corrosion resistant steel or brass, and the finish and design selected by the Contracting Officer from samples provided by the Contractor. Hinges shall be concealed self-closing European type with a minimum 120 degree swing. Drawers and roll-out trays shall have nylon rollers and be mounted on 20-gauge steel drawer guides, both with a factory-applied baked epoxy enamel finish. Slides and guides shall be full extension and have 100 pound minimum load capacity.

5-20.1.9 Finish. Wood cabinets shall have a factory-applied natural wood finish selected by the Contracting Officer from samples provided by the Contractor. Cabinet finish shall consist of one coat of hand wiped quality wood stain; one coat of penetrating sealer; and two coats of a conversion varnish, or an approved equal finish system. All surfaces shall be sanded between coats. All interior and exterior cabinet surfaces shall be finished.

5-20.1.10 Toe Kick Cover Strips. Toe kick cover strips shall be ¼ inch hardwood plywood finished to match cabinets and furnished in 8 foot lengths for placement after base cabinet installation. Also shoe molding (1/4 round) is required at all base cabinets where they meet the floor surface.

5-20.1.11 Pantry. Provide 12-inch deep, floor-to-ceiling pantry cabinet in each kitchen with five (5) adjustable shelves.

5-20.1.12 Kitchen Glass Panels. Provide glass panels in one upper cabinet (one pair of doors) in the Kitchen.

5-20.2 COUNTERTOPS. Countertops finish may be high pressure laminated plastic with post-formed tops. Minimum backsplash height is 4 inches.

5-20.2.1 Countertop Construction. Countertops shall be constructed of ¾ inch particleboard conforming to ANSI A208.1 or CS 236, Type 2, Grade B, Class 2; and high-pressure plastic laminate sheet, not less than 0.042 inch thick, conforming to FS L-P-508 and NEMA LD 3; and be 25 inches front-to-back. Splices will not be allowed on countertops 12 feet or less long. Countertops shall be self-edged without an integral back splash. Countertops shall consist of high-pressure plastic laminate sheet cut, fitted and trimmed, to fit all exposed top surfaces.

Countertops may be post-formed to meet this requirement. Edge treatments shall consist of 3mm thick PVC cut, fitted and trimmed, to fit all exposed countertop edges. Colors and patterns of high-pressure plastic laminate and PVC edge treatment shall be selected by the Contracting Officer from samples provided by the Contractor.

5-20.2.2 Sealer. Sealer shall be used to seal raw edges and areas of countertop core at miters, seams, sink cut-outs and dishwashers and shall conform to FS TT-S-176. Apply two coats of sealer to the exposed bottom of new countertops directly above dishwashers from the front edge of the countertop back 6 inches.

5-20.2.3 Sealing Compound. Sealing compound to be used to seal under sink rims and at joints between walls, back splashes and end splashes shall be paintable, non-hardening silicone rubber base sealant which conforms to FS TT-S-1543.

5-21 APPLIANCES. Provide the following equipment in accordance with specifications listed, one each per residence. A listing of currently labeled Energy Star appliances is available through the internet at the EPA Website: http://www.energystar.gov/products/appliances.html.

5-21.1 REFRIGERATORS. Comply with UL 250, Household Refrigerators and Freezers and shall bear the EPA “Energy Star” certified label. Provide refrigerators with frost-proof, top freezer, automatic defrosting, and ice maker. Refrigerator shall have two vegetable bottom baskets, at least four adjustable shelves, at least two shelves and egg container in door; freezer compartment shall contain separate interior shelves, multiple door shelves, and ice maker. Provide reversible (left swing and right swing interchangeable) doors. Provide baked enamel finish. Refrigerators shall conform to the energy compliance standards of 10 CFR 430, including those refrigerators manufactured before the code took effect. The use of refrigerants with an Ozone Depletion Potential (ODP) of .05 or less is required. Connect the icemaker to the building water service. Minimum refrigerator volume and maximum energy use are as follows:

5-21.1.1 Volume: 0.58 CM, 21 CF

5-21.1.2 Energy Efficiency: 722 kWh/yr.

5-21.1.3 Standard Housing Units: Contractor shall furnish a refrigerator, GE Model GTS22KCMWW, 21.7-cubic-foot top freezer with factory-installed icemaker, color white or equal. Provide 40 inches wide space for refrigerator.

5-21.1.4 Accessible Housing Units: Contractor shall furnish a refrigerator, GE Model GSS20DBMWW, 19.8-cubic-foot side-by-side refrigerator and freezer with factory-installed icemaker, color white or equal. Provide 40 inches wide space for refrigerator.

5-21.2 RANGES AND OVENS. Ranges shall be 760 mm (30 inches) wide and provided with porcelain enamel cooktop, oven, clock and timer, oven light, and cooking surface light. Oven shall have black glass window door, broiler pan, and self-lock racks. At Standard Housing Units, provide free-standing gas ranges and ovens. At the Accessible Housing Units, provide electric drop-in ranges and ovens. Also, the Accessible Housing Units shall be provided with capped gas piping stub-outs in the walls at the oven and range locations for future adaptability.

5-21.2.1 Standard Housing Units: Gas ranges shall have two, 150 mm (6-inch) and two, 205 mm (8-inch) burners, a self-cleaning oven, and AGA-approved electronic ignition. Gas ranges shall be in accordance with AGA Z21.1, American National Standard for Household Cooking Gas Appliances. Furnish GE Spectra 30 freestanding XL44, Model JGBP28WEAWW, gas, self-cleaning, with sealed burners, electronic

clock and timer, or equal.

5-21.2.2 Accessible Housing Units: Electric ranges shall have two, 150 mm (6-inch) and two, 205 mm (8-inch) coil heating elements and porcelain drip bowls, a self-cleaning oven, electronic oven controls, standard window, lift-up porcelain cook-top, . Furnish GE 30” Drop-in Electric Range with Self-Cleaning Oven, Model JDP39WWWW, or equal.

5-21.3 MICROWAVE OVENS. “User-furnished”

5-21.4 RANGE HOODS. Provide metal range hoods, the same length and finish as the range, with separately switched light and exhaust fan. The hood shall have a washable filter and be vented directly to the outside, not the attic. The fan shall be two-speed and shall have a capacity of not less than 78.7 L/s per meter of range hood (50 cfm per linear foot of range hood). The sound level shall not exceed 6 sones. Provide GE Profile 30, Model JV535CWW or equal. Provide stainless steel finish. Duct the fan to the exterior; also, refer to Section 01010, paragraph 10-6.3 for additional information.

5-21.5 GARBAGE DISPOSALS. Garbage disposals shall conform to UL 430 and ASSE 1008; Waste Disposers; continuous feed, minimum 1/2 HP motor, stainless steel grinding elements, two 360-degree stainless steel swivel impellers, manual motor reset, and sound insulation. Furnish Insinkerator Model Badger 5, or equal.

5-21.6 DISHWASHERS. Dishwashers shall conform to UL 749, Household Electric Dishwashers, and be UL listed, electric type, with air gap, racks, lift-out utensil holder, spraying arms, and detergent dispenser. Unit shall be listed as “Energy Star” compliant and shall bear the “Energy Star” label. The automatic controls shall cycle through the Wash, Rinse, Dry / Heat, and Stop phases, and shall be capable of rinse and hold cycle as well as a no heat-drying feature. The unit shall contain instantaneous, or in-line, water heater booster, with automatic thermostat set for 60 degrees C (140 degrees F). Rated energy use for standard capacity models will not exceed 620 kWh/yr. Furnish GE Model GSD4500GWW, white, or equal.

5-21.7 COLOR. Kitchen appliances, except disposals, shall be of matching finish, white in color.

6. UNIT DESIGN - STRUCTURAL.

6-1 SELECTION OF STRUCTURAL SYSTEMS AND MATERIALS. The structural systems and materials to be selected for the design of the residences will be suitable for permanent-type construction; capable of carrying the required loads; and compatible with fire protection requirements, and architectural and functional concepts. Materials may be of any of those listed in table 6-1, or any combination, selected for desirability, economy, general availability, low maintenance costs over the design life of the residences, and resistance to fire.

a. Design Considerations. It is required at the inception of the design that the structural system layout be properly coordinated with the architect to develop an overall effective plan. Installation of water lines, soil, waste, vent and drain lines may have ramifications for the selection of structural members by the designer, however relocation of plumbing fixtures from the locations depicted on the RFP drawings will not be allowed. Columns will be allowed in the garages. However, if columns are provided, the contractor shall provide and install two standard 8’-0” width garage doors. No columns will be allowed in the great room to reduce the span required.

b. The Design-Build Contractor will establish the type of structure and construction used. In selecting the type of structural system, the total facility should be considered, since the choice will influence such features as heating, ventilation or air-conditioning, as well as architectural, lighting, and utility requirements.

c. Structural Materials. When choosing structural materials for a specific Project, consideration will be given to:
(1) Availability of labor and materials.
(2) Design life of the facility and maintenance costs over this period.
(3) Feasibility of preassembling or precasting major structural elements.
(4) Site environment, including accessibility, climate, seismic hazard, subsurface conditions, and wind velocity.

6-2 STRUCTURAL DESIGN REQUIREMENTS.

a. Design Codes. Design methods and stress allowances or load factors for the various structural materials will be according to the 2003 International Residential Code and the current editions of the codes and specifications listed below.

TABLE 6-1 STRUCTURAL DESIGN METHODS AND STRESS ALLOWANCES

Materials	Codes or Specifications
Aluminum	The Aluminum Association (AA), "Specifications for Aluminum Structures"
Concrete	American Concrete Institute (ACI), "Building Code Requirements for Reinforced Concrete"
Masonry	American National Standards Institute (ANSI), "American Standard Building Code Requirements for Reinforced Masonry" Brick Institute of America (BOA), "Recommended Building Code Requirements for Engineering Brick Masonry" National Concrete Masonry Association (NCMA), Specifications For the Design and Construction of Load

	Bearing Concrete Masonry"
Precast-Prestressed Concrete	Prestressed Concrete Manuals
Steel	American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" Steel Deck Institute (SDI), “SDI Design Manual for Composite Decks, Form Decks, and Roof Decks”
Steel Joists	Steel Joists Institute (SJI), "Standard Specifications and Load Tables, Open Web Steel Joists and Longspan Steel Joists," and similar publications covering deep longspan steel joists
Steel, Light Gage	American Iron and Steel Institute (AISI), "Specifications for the Design of Cold-Formed Steel Structural Members" “Design of Cold–formed Load-bearing Steel Systems and Masonry Veneer/Steel Stud Walls,” TI 809-07
Welding	American Welding Society Codes, Standards and Specifications
Wood	National Forest Products Association, "National Design Specifications for Stress Grade Lumber and its Fastenings" Truss Plate Institute (TPI), “Design Specification for Metal Plate Connected Wood Trusses” American Plywood Association (APA), “APA Design/Construction Guide “

b. Design Dead, Live, Snow and Wind Loads. The load assumptions for the design of buildings and other structures will conform to ASCE 7-98, “Minimum Design Loads for Buildings and Other Structures.”

c. Seismic Design. The seismic design of the new residences will be according to FEMA 302, “NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures”. Use site class “D”, Ss = 0.13, S1 = 0.06 for seismic calculations. Acceptable lateral force resisting systems will be any of those listed in table 5.2.2 of FEMA 302. Wood framed structures with panel diaphragms and shear walls will be classified as light frame walls with shear panels. Light gage metal framing which uses tensioned diagonal bracing will be classified as ordinary steel concentrically braced frames.

d. Design Dead Loads. Use actual weights of materials. For mechanical equipment, use weight of actual equipment plus a ten percent increase for future replacements.

e. Design Live Loads. Use 40 psf for the floor live load. Use 60 psf for the floor live load at exterior cantilevered balconies if used. Uninhabitable attics will be designed for a live load of 10 psf. A minimum roof live load of 20 psf for maintenance and construction will be used.

f. Climatic Considerations. Use a 20-psf ground snow load for determining snow loads. Use 90-mph design wind speed for determining wind loads. Foundations and utilities shall be located below the depth of maximum frost penetration. Minimum depth for heated structures is 34 inches. Minimum depth for unheated structures is 45 inches.

g. Tornado Shelter Design. Provide tornado shelter design as described in Section 5-4.6, Tornado Safe Rooms

6-3 STRUCTURAL DESIGN DEVELOPMENT

a. Building Design. Lateral structural design and siting considerations may conflict with functional considerations in building design. For instance, shear walls may limit horizontal flexibility and diaphragms may limit vertical circulation.

b. Building Configuration. Lateral loading considerations may require limits on the height of structures and design configurations. It must be noted that the building configuration plays an important role in the performance of the structure when subjected to lateral wind and seismic forces. To obtain optimal lateral resistance and performance, a symmetrically configured structural framing system with effectively and efficiently placed lateral resisting elements (shear walls and braced frames) must be considered. Further, the nonstructural elements must be seismic and wind resistant in order to maintain the expected capability (against collapse or post-earthquake operations).

c. Shelter Design for Tornado. Structures to be constructed in tornado areas will be designed so structural integrity and continuity are provided from the foundation to the roof, irrespective of the materials selected for the facility. All components of the structure must be tied positively together to establish an overall integrated resistance to high wind effects.

6-4 STRUCTURAL DESIGN CONSIDERATIONS

a. If wind loading on the main lateral force resisting system and/or the components and cladding members are greater than the seismic loadings and thus the controlling forces that are used for structural design, the structural seismic detailing requirements given in FEMA 302 must also be used. Both wind and seismic loading for components and cladding must be investigated to determine controlling forces regardless of controlling loads on the main force resisting system.

b. The tributary area “A” to be used in determining the exterior wind pressure coefficients for components and cladding shall be the actual loaded area of the structural element under consideration and not the entire area of the loading region in which the member resides. However, for rectangular tributary areas, the width need not be assumed to be less than one third of the length of the member.

c. When determining the internal wind pressure coefficients for buildings, doors and windows shall be assumed opened or closed as required to produce the coefficients that will produce the greatest wind loadings, both inward and outward.

d. When the design roof snow or snow on rain loading is less than 0.96 KN/sq m (20 psf), a roof live loading for construction and maintenance of 0.96 KN/sq m (20 psf) shall be used for the design of the structure. The minimum roof live load is used in lieu of and not in addition to the snow or rain on snow loading.

e. The maximum net inward and outward loads used in the design shall be indicated on the contract drawings. The design engineer is responsible for calculating the wind loads based on the ASCE 7 wind load requirements. The component and cladding loads shall be calculated based on the tributary area of the member under consideration. A minimum tributary area of one

square meter (10 sf) shall be used.

f. Lateral Resistance. Walls used or required for lateral resistance to wind or earthquake shall be considered bearing walls and shall have a complete load path to the foundation.

g. Embedded Steel. Nonstructural steel (handrails, etc.) embedded in concrete shall be prefinished galvanized steel or plastic. All damaged galvanized areas shall be repaired prior to embedment.

h. Wood Flooring Systems. Wood flooring systems shall be glued and screwed. Glue lines shall not be considered for stress transfer.

i. Subfloor. ¾-inch tongue and groove plywood, glued and screwed in place, is required for all rooms requiring a subfloor. ¾-inch tongue and groove plywood subfloor for wet areas (i.e., bathrooms, kitchens, laundry room, and utility rooms)is required and will be rated for Exposure 1 or exterior use.

j. Underlayment: Sanded face underlayment (plywood) is required. Underlayment must be a minimum thickness of 8.7 mm (11/32 inches). Acceptable sanded face underlayment panels can be APA rated A-C, B-C, A-D, B-D, or C-C plugged. Underlayment should be rated for Exposure 1 or exterior use. Underlayment should be installed after interior finish work is complete to avoid damage to the underlayment.

k. Construction Tolerances. Allowable variations from level, or specified slopes, shall be as follows:

For overall length, or surface of 10 feet or less: plus or minus 1/8-inch.

Up to 20 feet: plus or minus 1/4-inch.

Up to 40 feet: plus or minus 3/8-inch.

Walls are to be constructed straight, true, and plumb.

l. Do not use keys in horizontal and vertical concrete construction joints. Specify the use of joints roughened to ¼-inch amplitude per ACI 318.

m. All foundations are to be of reinforced, cast-in-place concrete.

n. Use minimum 4,000 psi strength concrete measured at 28 days for all concrete work.

o. Concrete stoops shall be provided at all exterior doors. All stoops shall have frost protection.

p. Cast-in-place anchor bolt shall be used at all x-bracing or shear wall hold down locations. The use of expansion bolt anchors is not permitted for connections between elements of the main lateral force resisting system. Cast-in-place anchor straps are not allowed.

q. Slab on grade construction shall be detailed so that the slabs are independent of the foundations and footings. A 6-inch sand cushion shall be provided between the bottom of the slab and any underlying foundation elements.

r. Concrete Reinforcement: Fiber reinforced concrete is not an acceptable

alternative to be utilized in this Project.

s. Brick veneer with steel stud backup exterior wall systems shall strictly adhere to the criteria and detailing requirements of TI 809-05 and TI809-07.

t. Steel or wood columns shall not be embedded over all or part of their height in CMU or concrete.

u. CMU masonry shall be placed in running bond pattern only.

v. In units where tensioned diagonal bracing is used, the stability of the structure shall not depend on any single connection. Redundancy shall be provided either by using multiple bays of tension only bracing members or by using members that are capable of resisting both tension and compression in the same bay.

w. The use of field welding for connections between members of the main lateral force resisting system shall be avoided.

x. The use of APA sheathing over light gage steel framing as structural roof or floor diaphragms is not allowed.

y. Use of particle board for walls, floors, or roofs will not be allowed.

z. If wood framing systems are selected for use on this Project, use APA’s “Code Plus “ system for walls, floors, and roofs.

aa. Floor joists supporting plywood floor sheathing should be spaced no further than 16 inches on center.

bb. Veneered plywood is to be used for walls, floors, and roofs. Oriented strand board (OSB) may be used at walls only.

cc. If light gage steel is selected for the building’s framing system, coordinate thermal requirements and detailing with HVAC system design. Brick veneer with steel stud backup exterior wall systems will strictly adhere to the criteria and detailing requirements of TI 809-05 and TI 809-07. The technical instructions are available in electronic form via the TECHINFO internet site http://www.hnd.usace.army.mil/techinfo/.

7. UNIT DESIGN - THERMAL PERFORMANCE.

7-1 THERMAL CHARACTERISTICS. Family Housing Unit construction shall provide at least the minimum R values/maximum U values indicated in Table 7-1 for the appropriate weather region. R and U values shall be calculated in accordance with ASHRAE methods.

TABLE 7-1 THERMAL CHARACTERISTIC REQUIREMENTS[1, 2]

Weather Region	Wall[3] R Value	Ceiling/ Roof R Value[4]	Basement R Value[6]	Slab on Grade R Value[7]	Door R Value[8]	Glazed Openings U Value[9]	
						Window	Door
7	3.3 (19)	6.7 (38)	1.8 (10)	0.9 (5)	0.9 (5)	2.2 (0.38)	2.2 (0.38)

Note[1]: Metric R values are in square meter-kelvin (K)/watt. (English R values are bracketed, and are in square foot-degrees F/BTUH). (R = 1/U)

Note[2]: R values listed represent the minimum acceptable insulation values for each construction type. Listed U values represent the maximum thermal conductance allowed for windows and doors.

Note[3]: Requirements for opaque, exterior walls.

Note[4]: For buildings with ventilated attics, no credit may be taken for the roof construction. R value shall be computed for construction between conditioned space and ventilated attic or building exterior. Insulation for floors which extend over outside air spaces shall conform to the ceiling and roof requirements.

If cathedral ceilings are being used, the effective R-Value of the overall roof area must meet the required “Ceiling/Roof” performance level. The effective R-Value of the overall roof area can be determined by calculating the weighted average of the R-Values of the different areas (based on the percentage of the total roof area each type covers). For example, if the Ceiling/Roof insulation required was R-38 and 25 percent of the ceiling was cathedral insulated to R-19, and then the required R-Value for the remaining roof would be:
(38-0.25*19)/0.75=44.33, or R-45 (min).

If metal framing is used, insulation between wall studs shall be derated per Table 8C-2 of ASHRAE 90.1 as follows:

Size/Gauge of Member	Framing Spacing (inches)	Rating of Insulation (R)	Derated (R) Value
2 x 4; 18-16 Ga.	16″ o.c.	R-13 R-15	R-6.0 R-6.4
2 x 4; 18-16 Ga.	24″ o.c.	R-13 R-15	R-7.2 R-7.8
2 x 6; 18-16 Ga.	16″ o.c.	R-19 R-21	R-7.1 R-7.4
2 x 6; 18-16 Ga.	24″ o.c.	R-19 R-21	R-8.6 R-9.0

Note[5]: Not used.

Note[6]: Requirements for basement wall insulation extending downward 3050 mm (10 ft) from outside finished grade, or downward from outside finished grade to basement floor, whichever is less.

Note[7]: Requirements for perimeter insulation. Perimeter insulation shall extend downward to a total distance of 610 mm (24 inches) as described above.

Note[8]: Requirements for opaque doors in exterior walls (insulated metal).

Note[9]: Window requirements for double pane, low emissivity glass windows as specified in paragraph 5 of this STATEMENT OF WORK. Total Window (including glazing and frame) U values as rated by the National Fenestration Rating Council (NFRC) shall be used. Glazing area shall be limited to 14 percent of the heated floor space. Solar Heat Gain Coefficient shall be limited to 0.55. Solar Heat Gain Coefficient shall be limited to 0.40.

7-2 THERMAL INSULATION.

7-2.1 Characteristics. Thermal insulation shall have a flame-spread rating of 25 or less and a smoke-development rating of 50 or less, exclusive of the vapor barrier, when tested in accordance with ASTM E84. A vapor barrier shall be provided on the warm-in-winter side of exterior wall and ceiling insulation. Polyurethane is allowed as an insulation material for slabs and outside concrete or unit masonry walls. It is prohibited as an injected insulation material in walls or floor cavities or within the building envelope.

7-3 AIR INFILTRATION.

7-3.1 To limit air infiltration buildings will be sealed with an air infiltration barrier, installed in accordance with the manufacturer's recommendations. The building envelope shall be caulked, gasketed, weatherstripped or otherwise sealed: around window and door frames, between wall cavities and frames, between walls and ceiling and roof, between walls and floors, at access doors and panels, at utility penetrations through walls, floors, and roofs, and at any other exterior envelope joint which may be a source of air leakage. These steps, in combination with provision of a continuous vapor barrier and sealed ductwork as specified in paragraph 10. shall constitute tight building construction.

7-3.2 A blower door test, performed in accordance with ASTM E 779, Measuring Air Leakage by the Pressurization Method, shall be performed on 5 percent of the Project buildings, which will been randomly selected by the Contracting Officer. If buildings are to be turned over in phases, the blower door test shall be

performed on 5 percent of the buildings completed in each phase. No additional testing will be required if ALL of the tested buildings pass the test requirements. If less than 100 percent of the tested buildings pass the test, an additional 5 percent of the Project buildings shall be tested. This process shall continue until 100 percent of the total number of tested buildings pass the blower door test. All prototype units will be included in the required blower door testing procedures.

7-3.2.1 Before beginning the test, all combustion devices shall be turned off, and all intentional openings in the building envelope (dryer vent, bathroom and kitchen exhausts, etc.) shall be sealed. All doors and windows shall be closed and latched.

7-3.2.2 To pass the blower door test, the building shall have an air tightness rating within the range of 3 to 4 ACH at 50 Pa (0.2 inch of water). The Contractor shall correct all residences not found in compliance, and shall be responsible for all labor and materials required to reduce air leakage to within acceptable parameters. All testing shall be performed by a firm certified by the Associated Air Balance Council, the National Environment Balancing Bureau, or State licensed to perform such tests within the state where the Project is being constructed.

7-3.2.3 Any measures taken to reduce the air leakage to acceptable values shall be permanent, and shall be implemented on all similar residences.

8. UNIT DESIGN - PLUMBING.

8-1 Design and install plumbing system in accordance with the Ft. Riley Family Housing Guide, the International Residential Plumbing Code, American Society of Sanitary Engineering (ASSE), American Society for Testing and Materials (ASTM), American Water Works Association AWWA), Cast Iron Soil Pipe Institute (CSISPI), Copper Development Association (CDA), Federal Specifications (FS), Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), Underwriters Laboratories (UL) and Military Specifications(MS). Perform Inspection, testing and purging of the plumbing system as prescribed in the International Residential Code (IRC), International Fuel Gas Code (IFGC), American Gas Association (AGA), National Association of Home Builders (NAHB) and National Fire Protection Association (NFPA).

8-2 Water Piping. Limit under slab supply piping to residence service entrance only. Service line to each residence shall be no less than 25 mm (1 inch) diameter and shall include pressure-reducing valves. Size all water supply piping in accordance with methods outlined in the IRC, to limit water velocity in the pipe to 8 ft./sec unless a lower velocity is recommended by the plumbing fixture manufacturer(s). Do not route water piping in unheated spaces. Include an isometric diagram of the water system and the waste and vent system in the 100% design submittal after contract award. Allowable materials are listed below.

8-2.1 Copper tubing. All interior water piping shall be type K or L hard-drawn copper. Joints under the slabs are prohibited. Type M copper tubing shall not be installed. Fittings for soft copper tubing shall conform to ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes, and for hard-drawn to ANSI B16.22, Wrought Copper and Copper alloy Solder Joint Pressure Fittings.

8-3 Soil, Waste, Vent, and Drain Piping. Soil, waste, vent, and drain, piping shall be cast iron or DWV PVC, if approved, suitable for installation in a residential waste, soil, vent, and drain system. Provide each fixture and piece of equipment, except water closets, requiring connection to the drainage system, with a trap. Provide deep seal trapped drain for cooling coil condensate drain. Building waste main lines shall be no less than 102-mm (4-inch) diameter. Size all soil, waste, and drain piping in accordance with the methods outlined in the International Residential Code. Offset water closet flanges are prohibited. Locate vents through roof on the back side of residence so as to not be visible from the front side of the unit. Install “Wye” connections for common drain lines between residences. Tee connections are not permitted. Use full-sweep, 90-degree ells in all drain connections.

8-4 Route piping concealed. All interior water pipe shall be routed concealed, except at the fixture connection. Install Individual shutoff or stop valves on water supply lines to all plumbing fixtures except bathtubs and showers. Install ball-type, 1/4-turn shutoff valves for each bathroom group. Connections to fixtures shall be copper. All vents through roof shall be on back side of residence. Avoid water piping in exterior and common walls.

8-4.1 Piping Location. Install water piping running in attics and spaces over garages on the warm side of insulation and wrap with insulation and a vapor barrier jacket. Determination of the warm side shall be the same as determined for vapor barrier location. No water piping runs in exterior walls shall be allowed. Coordinate wall penetrations of interior tornado shelter with Federal Emergency Management In-Residence Shelter Requirements.

8-4.2 Pipe Support. Install hangers on all piping at intervals, horizontally and vertically, to conform with the IRC requirements. Install pipe hangers of such material and design as to rigidly secure piping without causing damage to the piping, fittings or insulation. Provide electrical bonding and grounding to conform to the National Electric code.

8-4.3 In Ground Shelter. Do not penetrate or route piping in walls of concrete reinforced interior shelter.

8-5 Gas Connections. Install schedule 40; black steel pipe, as specified in ASME B31.8 and conform to all aspects of NFPA 54 and ASME BPVC Section IV . The use of semi-rigid tubing and flexible connectors for gas equipment and appliances is prohibited. Provide accessible steel gas shutoff valve, with hand wheel or square wrench operator and coupling for each gas equipment item. Comply with IRC or model code seismic requirements. Exposed horizontal piping shall not be installed farther than 150 mm (6 inches) from the nearest parallel wall in laundry areas or areas where clothes hanging could be attempted. Install entrance piping to ensure ample room for future meter installation at each residence. See paragraph 4 for gas line distribution requirements.

8-6 Plumbing Fixtures. Installation of soil lines may have ramifications for the selection of structural members by the designer, however relocation of plumbing fixtures from the locations depicted on the RFP drawings will not be allowed. Install residential type fixtures and trim complete with fittings, and chromium- or nickel-plated brass (polished bright or satin surface) trim. All fixtures, fittings, and trim in the Project shall be from the same manufacturer and shall have the same finish; faucets may be from a different manufacturer as the fixtures, fittings and trim, however, all faucets shall be from the same manufacturer for each of the new family housing units. Install metal (chrome plated or polished metal) corrosion resisting escutcheon plates at all water supply and drainpipe connections through walls or cabinets. Plumbing shall meet the following criteria:

8-6.1 Install water conservation type fixtures, free from defects and concealed fouling surfaces and in accordance with the International Residential Code.

8-6.2 Install chromium-plated type exposed traps, adjustable-bent tube, 20-gauge brass. Concealed traps may be material compatible with DWV piping.

8-6.3 Faucets shall conform to ANSI/ASME A112.18.1M and FS WW-F-1910. Single control faucets shall have all brass body and a single control to turn the water on and off and to regulate the volume and temperature of the flow. Install faucets designed so that the valve body has no wearing parts and all operating

parts are easily renewed without disconnecting the faucet from the fixture on which it is mounted or disconnecting the water supply lines. It shall have a water conservation device to control the volume flow to no more than 2.5 gpm regardless of water pressure. The faucet should be of a cartridge type design constructed so that all operating parts subject to wear are within the cartridge and are replaced as a single unit. The cartridge shall be interchangeable with any other single-control faucets used from the same manufacturer. The cartridge should also be so designed to take advantage of any back to back installations and allow a change in the polarity of the water without having to remove the cartridge or disconnect any water supply lines.

Lavatory - Moen Legend #4420 (single lever)4" center set with lift rod and waste assembly or approved equal. Install brass replacement cartridges by Moen, model #1200, or approved equal.

Kitchen - Moen Legend #7300 without spray or #7310 with spray (single lever)8" center set or approved equal. Install brass replacement cartridges by Moen, model #1200, or approved equal.

8-6.4 Install shower and bath combination controlled by a diverter valve. Install baths and shower and bath combinations with waste fitting pop-up, concealed with all parts removable and renewable through the overflow and outlet openings in the tub. Equip showers and shower and bath combinations with a combination valve and flow control device to limit the flow to 0.158 L/s (2.5 gpm) at pressures between 137.9 to 413.7 kPa (20 and 60 psi). Install pressure balancing type control valves. Shower heads shall be the following makes and models to match existing post standards for availability of uniform parts, and ease of replacement.

Tub and shower – Moen Legend #L3189 (single lever) for shower/tub combinations or approved equal. Install brass replacement cartridges by Moen, model #1200, or approved equal.

8-6.5 Vitreous china plumbing fixtures shall conform to ANSI A112.19.2, Vitreous China Plumbing Fixtures. Stainless steel fixtures shall be in accordance with ANSI A112.19.3, Stainless Steel Plumbing Fixtures (residential design). Plastic fixtures shall conform to ANSI Z124. Enameled cast iron plumbing fixtures shall comply with ANSI A112.19.1, and enameled steel fixtures shall comply with ANSI A112.19.4.

8-6.6 Water closets. Water closets shall conform to ANSI/ASME A112.19.2m and shall have elongated bowl with inclined tank, close coupled, siphon jet flushing tank with floor outlet, wax gasket, and closed-front seat and cover. Water consumption shall be no more than 6 L (1.6 gal) per complete flushing cycle and have a Flush Performance Index of 10 or less as rated by the NAHB. Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards). Gerber "Ultra flush." Color to be white.

8-6.7 Lavatories. Install white self rimming Lavatories, with oval-shape, minimum 20 by 17 inches in size with overflow, and 4 inch faucet centers. Lavatories shall have metal pop-up drains.

8-6.8 Bathtubs. Install white slip resistant bathtubs constructed of enameled cast iron and conform to ANSI/ASME A112.19.1M, recess type, one piece tubs with tile flange. Install bathtubs complete with brass trip-lever tub drain, overflow, shower heads, shower and tub valves and tub diverter spouts. Exposed parts of the tub drain and overflow shall be chrome plated. Appropriately located integral grab bars are required for handicapped accessible units.

8-6.9 Showers. Shower stalls shall be installed with 2-inch drains, removable strainers, and the shower heads and shower valves specified. Appropriately located integral grab bars are required for handicapped accessible units. Provide ADA approved, one-piece, fiberglass shower stall base in the ADA accessible units.

8-6.10 Kitchen sinks. Install kitchen sinks of Type 302 stainless steel, 18 gauge minimum, seamless drawn, sound deadened with faucet ledge and hole for hand spray. Install double bowl sinks, self-rimming without mounting rings, complete with cup strainer and neoprene stopper. Food waste disposers are specified in Section 5. Strainer and plug shall be eliminated where food waste disposers are provided. Sinks with ADA compliant depths, drain and p-trap offsets are required for handicapped accessible units.

8-6.11 Floor drains. Floor drains shall conform to ANSI/ASME A112.21.1. Cast iron body, cast iron grate, sediment bucket, and 2 inch outlet. Design shall ensure bucket replacement after cleaning by requiring top grate installation only with bucket in place. Install floor drains for general medium duty service, Jay R. Smith, 2005 series, or an approved equal. Provide a floor drain near HVAC units to receive condensate, and near clothes washers.

8-6.12 Clothes Washer Connections. Install drainage, hot and cold water supply for all automatic clothes washers. Washer connection, complete with 2-inch drain, 3/4-inch hose thread supplies with water shutoff valves shall be provided in standard manufactured recessed wall box with single-face plate. Boxes shall be constructed of plastic. Steel boxes shall have a corrosion-resistant epoxy enamel finish. Boxes shall be mounted a minimum of 2 feet-10 inches above the finish floor and include Electrical outlets for both washer and dryer.

8-6-13 Refrigerator Ice Maker Connection. Install cold water supply for refrigerator ice makers. Ice maker connection shall include an angle valve and a 1/4 inch hose thread supply, in line water filter and provide in standard plastic manufactured recessed wall box with single-face plate. Boxes shall be mounted a minimum 2 ft-10 inches above the finish floor.

8-6.14 Hose Bibbs. Install hose bibbs at the front and rear of each dwelling unit (no sharing). Hose bibbs shall be frostproof, shall be supplied with an integral vacuum breaker, shall have knob type shut off (no keys) and shall be positive draining type bibbs.

8-7 Cleanouts. Install cleanouts at each change in direction of sanitary sewer lines, at the intervals specified in the IRC, and at the building service entrance. All cleanouts shall be permanently accessible. Refer to Section 4 Site Engineering, for ground cleanout specifications. Interior and exterior cleanouts shall have standard locations in all residences to the greatest extent possible and shall conform to ANSI/ASME A112.36.2M.

8-8 Water Heater. Gas-fired water heaters shall have an input of 75,000 Btuh or less shall conform to ANSI Z21.10.1 and FS W-H-196. Install 50-gallon capacity water heaters with a 40.6 gph recovery rate at 90 degrees F. rise, shall be supplied with high performance power vent, flues and roof caps as necessary to make complete installations. All water heaters shall be supplied with pressure temperature relief valves conforming to ANSI Z21.22. Insulate hot water piping for the first 10 ft downstream of the water heater. The water heater relief drain shall be manufacturer approved, and shall be indirectly connected to the building sanitary sewer system. Install water heaters in accordance with Table 8-1, conform to manufacturer’s required clearances and provide seismic bracing

per IRC 1307.2.

Table 8-1: Water Heater Sizing

Rheem	3 BR 3 Bath	4 BR 3 Bath
41VRP	x	x

Vent water heaters in accordance with manufacturer's instructions, and ensure combustion intake and exhaust are routed to back surface of roof peak. Install water heaters to allow easy removal and maintenance without obstructions.

8-9 Relief Valves. Water heaters and hot water storage tanks shall have combination pressure and temperature (P and T) relief valves. The pressure relief element of a P and T relief valve must have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P and T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Install relief valves rated according to ANSI Z21.22. Relief valves for systems where the maximum rate of heat input is less than 200,000 BTUH shall have 0.75 inch minimum inlets, and 0.75 inch outlets, with a vacuum relief valve installed on the cold water supply line to the water heater or hot water storage tank. The discharge pipe from the relief valve shall be of approved material, the size of the valve outlet and discharge over floor drain with an air gap.

8-10 Radon Removal System. Refer to paragraph 10.8 for Radon Removal System requirements.

8-11 Plumbing Calculations. Refer to Table 8.2 and Table 8.3 attached to the end of this section.

9. UNIT DESIGN - ELECTRICAL.

9-1 Conformance to Code. The electrical system shall be designed in compliance with the rules and recommendations of ANSI C2, National Electrical Safety Code, and NFPA 70, National Electrical Code (NEC), and applicable model codes, whichever is more stringent.

9-2 Service Entrance. Sightscreen or enclose all service entrances and exterior meters. Service feeders shall be underground with exterior meters. Individual electric watt-hour meters, Class 200, shall be installed for each dwelling unit. Provide interior panelboards with factory painted galvanized steel enclosures and with main breakers, sized in accordance with the NEC (200 amps minimum). Load centers are acceptable if commercial grade. Acceptable manufacturers of all electrical panelboards, disconnects, etc. are *Square "D" and Cutler Hammer*. Provide panelboards with flush, one-piece fronts and full size, plug-in circuit breakers. Panelboards may be surface or recessed mounted depending on their location. No recessed panelboards are to be located in party walls and fire walls. Driven ground rod and grounding wire design shall be required at each unit's main distribution panelboard per the NEC. Provide details indicating the grounding required in the construction documents. The panelboard shall have at least 24 full-size slots. Provide one full-size spare circuit breaker for every five active circuits. Walls housing service entrance panelboards shall have sufficient thickness to accommodate wiring bends. Provide a type-written panelboard directory clearly indicating each circuits purpose or use and the room served.

9-3 Panelboard Locations. Locate residence panelboards in the rear exterior corner of the garage.

9-4 Conductors. Provide copper conductors. Provide solid conductors for #10 AWG and below. Raceways are not required for interior conductors above grade.

9-4.1 Do not route branch circuit conductors on the exterior of the dwelling unit. Service entrance feeders may be run on the exterior, in conduit from grade to the meter can. Exterior above grade conduits shall be galvanized rigid steel. Exterior conduit below grade shall be schedule 40 (minimum) PVC. Provide slip joint per the NEC in the exterior conduit to the meter to allow for ground movement and expansion. EMT is permitted only in interior or protected locations.

9-5 Outlet Circuits. Provide separate circuits for lighting and convenience outlets. Offset outlets on party walls to maintain integrity of the fire wall and sound deadening rating of the wall.

9-6 Exterior Lighting and Outlets. Provide a minimum of one light fixture and one receptacle in each entry, and patio area. Locate the light fixture at the entry so it adequately illuminates the street address. Provide light fixtures on each side of the garage door. Provide exterior receptacles with ground fault protection and "In-Use" weatherproof covers. Switch light fixtures from the residence interior and incorporate motion detection. Control the entry and garage light fixtures on the same switch and photocell. Control the patio light fixtures from a separate switch and photocell.

9-7 Interior Lighting and Switched Outlets.

9-7.1 Provide all lighting in accordance with the IES Lighting Handbook. The general type and style of light fixtures shall be in accordance with those

indicated in Attachment. Provide 3500 K fluorescent lamps, with a color-rendering index (CRI) of 85 or better. Minimum efficiency standard for fluorescent lamps are as follows:

9-7.1.1 Fluorescent tubes, 4 feet: 90 lumens/watt.

9-7.1.2 Fluorescent tubes less than 4 feet: 80 lumens/watt.

9-7.1.3 Compact fluorescent and other lamps: 50 lumens/watt.

9-7.2 Locations. Provide wall-switch operated ceiling lights in dining rooms, utility rooms, halls, bedrooms, kitchens, dinette areas, walk-in closets, and bulk storage areas. Provide wall-switch operated wall-mounted lights above the mirror over the lavatory in bathrooms and half baths. Provide additional light fixtures in rooms whose configuration requires them for adequate lighting. Provide a minimum of two ceiling-mounted light fixtures in the garage (one per vehicle bay). Control the garage lights via a switch (switches) located at each door opening into the garage.

9-7.2.1 Provide general lighting intensity in kitchens of 320 to 540 Lx (30 to 50 footcandles). Provide fluorescent kitchen light sources and lamps that are easy to change. Provide supplementary lighting the sink and under one of the wall cabinets for a work center to produce a composite lighting level of 210 Lx (75 footcandles) using fluorescent fixtures surface-mounted below wall cabinets. Provide a kitchen range hood with a light, fan, and switches.

9-7.2.2 Provide metallic fixture boxes for the ceiling fan/lights in the family room, living room, and all bedrooms, suitably supported from the ceiling structure so that it may support a ceiling fan, and with additional wiring to allow for independent wall switch control of the fan and light.

9-7.2.3 Light Fixture Types:

Dining Room & Entry Foyer - Manufactured by Progress Lighting, P.O. Box 5704, Spartanburg, SC 29304-5704, Prescott Collection, Product No.P3733-10, or equal.

Mirror Lighting in Bathrooms - Manufactured by Progress Lighting, P.O. Box 5704, Spartanburg, SC 29304-5704, Opal Glass, Product No's. P3034-10 or P3035-10 or equal. The length of the light fixture will be determined by width of the mirror it serves.

Kitchen (Ceiling) - Manufactured by Progress Lighting, P.O. Box 5704, Spartanburg, SC 29304-5704, Product No. P7336-30EB, or equal.

Kitchen (Undercabinet) - Manufactured by Progress Lighting, P.O. Box 5704, Spartanburg, SC 29304-5704, Product No. P7008-30EB, or equal.

All Remaining Interior Lights - Manufactured by Progress Lighting, P.O. Box 5704, Spartanburg, SC 29304-5704, 5" Incandescent New Construction Air Tight IC Universal Housing, open/open shower trims as appropriate.

Exterior Lanterns for Residences (all locations) - Manufactured by Progress Lighting, P.O. Box 5704, Spartanburg, SC 29304-5704, BrassGuard Lanterns, Product No P5846-10, or equal.

Street Light - Manufactured by General Electric Lighting Systems 3010 Spartanburg Highway, Hendersonville, NC 28793 Product No. M2AC15S3H1LMC22F

color: aluminum, or equal.

Street Light Posts - Manufactured by, General Electric Lighting Systems 3010 Spartanburg Highway, Hendersonville, NC 28793 Charleston Series, Product No.RRTA20SA4S7.02C/Aluminum or equal.

9-7.2.4 Provide a ceiling outlet in all garages for the garage door openers.

9-7.2.5 Provide separate wall switches for independent control of bathroom lights and exhaust fan.

9-8 Heat and Smoke Detectors. Provide heat and smoke detectors in accordance with NFPA 72 and NFPA 101, and other applicable codes. Provide a heat detector in the garage and in the kitchen. Interconnect heat and smoke detectors so that if any device goes into alarm, the alarm in all other devices shall activate. Detectors shall have battery backup. Include in the construction documents the minimum clearance requirements for detectors and HVAC air flow.

9-8.1 Provide fixed temperature, 120 volt, UL Listed heat detectors.

9-8.2 Provide photoelectric type, 120 volt, UL Listed residential smoke detectors with a built in piezo horn rated 85 dB at 10 feet, red LED alarm/power on indicator, test button, and tamper proof locking base. Detectors shall not contain radioactive material.

9-9 Carbon Monoxide Alarm Detectors: All residences shall receive carbon monoxide detectors as follows:

9-9.1 Locate one CO detector on each level of the residence. A required detector shall be located in vicinity of the bedrooms, such as in the corridor outside of the bedrooms. Do not provide CO detectors in garages, furnace rooms, unfinished basements or unfinished attics.

9-9.2 Hardwire CO detectors and wall-mount at the same height as the thermostat, approximately 52 inches off the floor. Avoid dead air spaces such as corners. Units may be powered from circuits powering smoke detectors. In all cases, follow manufacturer's guidelines and recommendations.

9-9.3 Provide CO detectors equipped with an audible alarm, battery back-up, continuous digital display, peak level memory, test button, and test reset button and shall be UL listed by passing standard test UL 2034.

9-10 Telephone. Pre-wire residences in accordance with local telephone company requirements. Provide outlets in kitchen, family room, living room and bedrooms of each residence. Provide eight position modular jack connectors at all outlets. Provide jacks in the kitchen for a wall-mounted phone. All wiring methods shall comply with EIA/TIA Standard 570, Residential and Light Commercial Telecommunications Wiring Standard. Provide Category 5E Cable and jacks per TIA/EIA 568B, Commercial Building Telecommunications Cabling Standard. Pre-wire each residence separately from other residences in the same building. Provide two plug-in type terminal blocks in the garage located on an outside wall near the protected telephone terminal. Provide two outside telephone lines, one terminated to each terminal block. Terminate all interior wiring to one of these plug-in terminal blocks. The occupant shall be able to choose which line each telephone outlet is plugged into. Label each telephone circuit as “Telephone”

along with the room served. Terminate the two outside telephone lines in a surface mounted, weatherproof, protected telephone terminal located on an outside wall adjacent to the building meter equipment. ("Demarcation Box"). Provide the protected telephone terminal cover with means for padlocking, accessible from the outside, and permanently labeled "Telephone". Only one protected telephone terminal shall be required for each separate building. Each protected telephone terminal shall accommodate a minimum of two outside telephone lines per residence. Provide a single #6, CU, green equipment grounding conductor, run in 1/2-inch non-metallic conduit, from the building metering equipment to the protected telephone terminal box. Coordinate the number of pairs and type of cable, type of modular jacks, and sizes of protected telephone terminals and outlet boxes with local Telephone Company (Sprint). Locate telephone jacks in locations as indicated on the RFP Floor Plans. Locate the protected telephone terminal unit near the side or rear of each residence and adjacent to the metering equipment.

9-10.1 Data. Pre-wire residences for data. Provide outlets in the kitchen, living room, family room, and bedrooms of each residence. Provide eight-position modular jack connectors at all outlets. All wiring methods shall comply with EIA/TIA Standard 570, Residential and Light Commercial Building Telecommunications Wiring Standard. Provide category 5E cable and jacks per TIA/EIA 568B, Commercial Building Telecommunications Cabling Standard. Pre-wire each residence separately from other residences in the same building. Terminate all wiring at the telephone system demarcation box. Label each data circuit as “Data” along with the room served. Locate data jacks in locations as indicated on the RFP Floor Plans.

9-11 Television.

9-11.1 Commercial Cable Television. Provide Cable television (TV) outlets in the living room, kitchen, family room, and bedrooms of each housing unit as indicated. Prewire each housing unit in conformance with all local cable TV company (Charter Cable) requirements. Prewire each residence separately from other residences in the same building. The local cable company (Charter Cable) has requested that the cables be run inside the house in the following manner. Contained within the stud walls or other hidden areas and in accordance with industry standards, run two separate and continuous RG-6 cables in conduit from each room outlet location to a central location at the exterior of the residence’s garage near either the electrical meter or telephone demarc box with sufficient cable for the necessary connections. Provide (2) weatherproof enclosures per the Cable Company for connection to both Cable TV and Satellite TV. Boxes shall be approximately 12”Wx18”Hx8”D. Provide 2” conduit elbow from Cable TV box to below grade for direct buried cable from pedestal. Provide 2” conduit from Satellite TV box to 1” above finished grade and cap. Provide 2” conduit nipple between boxes. Label each pair of cables terminating in the garage as “Cable TV” along with the room served. Provide 8 inches of extra cable at each wall outlet in the designated rooms, neatly rolled up in a standard electrical wall junction box, and covered with a solid plastic face plate. For additional technical information prior to installation, contact Mr. Tom Black, Charter Cable Field Service Supervisor at (785) 784-3853. Place cable television outlets in locations as indicated on the RFP Floor Plans. Locate the protected television terminal near the side or rear of each residence and adjacent to the protected telephone terminal.

9-12 Door Bell. Provide a low-voltage doorbell or buzzer and an illuminated push button at the front entrance to each residence.

9-13 Convenience Outlets. Provide grounded type outlets. Provide GFCI and convenience outlets in accordance with the NEC and attached RFP Floor Plans.

9-13.1 Provide a GFCI convenience receptacle with a waterproof, while-in-use cover near condensing units.

9-13.2 Special Outlets. Provide 240 volt electric outlets for electric dryer. Provide 240 volt electric outlet for range in ADA accessible units.

9-13.3 Wiring. Maximum use shall be made of nonmetallic sheathed cable for branch circuit wiring, and of service entrance cable for heavy-duty interior circuits and for service entrance conductors. Locate service entrance conductors a minimum of 36 inches below finished grade. Locate conductors in conduit only where specifically required by the NEC.

9-13.4 Branch Circuit Conductors. Provide branch circuit conductors and over current devices as rated by NEC. Provide a minimum of one spare circuit space for every five active breakers in the panelboard per residence. Provide individual circuits for the washer, dryer (with receptacles located behind the washer and dryer), dishwasher, garbage disposal, freezer, furnace or air handling unit, air conditioning unit, and water heater. Provide two utility circuits (20-amp) in the kitchen area for the convenience outlets for small appliances serving the kitchen and dining area. Provide a separate 20-amp branch circuit for each refrigerator. Provide a separate 20-amp branch circuit for each bathroom receptacle per the NEC. Provide arc-fault circuit interrupter type circuit breakers for all circuits serving bedroom outlets.

9-14 Mechanical Equipment. Provide overcurrent protection sized per the manufacturer and direct connect all mechanical equipment. Provide local disconnecting means for all equipment. Disconnect switch for condensing units shall be fused, dead front, pullout type, NEMA 3R rated, of metal constructed housings.

9-14.1 Radon Removal System. Provide 20 amp, 120 volt circuit in junction box near radon removal pipe in attic for radon exhaust fan, attic light and outlet.

9-15 Demolition. Disconnect and remove electrical services for units to be demolished at Tobie and Fleetwood Courts. Maintain service to units not being removed.

10. UNIT DESIGN - HEATING, VENTILATING, AND AIR CONDITIONING.

10-1 Design. Heat gain and loss calculations shall be, as a minimum, in accordance with the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Residential Cooling Load Calculation methodology. Computer-generated load calculations shall be provided, and shall include complete input and output summaries. Design shall be based on Fort Riley, Marshall AAF 1% Dry-Bulb Temperature (°F) and 1% Mean Wet-Bulb Temperature (°F) weather data shown in Table 10-1.

TABLE 10-1 – WEATHER DATA

Type of Design / Design Information	
	Inch-pound
Heating	
Indoor Design Temperature	70°F
Outdoor Design Temperature	5°F
Annual Heating Degree Days	4822
Largest Number of Monthly Heating Degree Days	1032
Cooling	
Indoor Design Temperature	75°F
Outdoor Design Dry Bulb Temperature	96°F
Outdoor Design Wet Bulb Temperature	74°F

Note[1]: Inch-pound data are based on degree days Fahrenheit to a base of 65 degrees F.

10-1.1 Load calculations. Computer generated load calculations shall be performed for each possible orientation up to four representative orientations for each housing type included in the project. Room airflow requirements shall be computed based on the individual room load. However, the minimum acceptable airflow shall be 0.5 cfm/ft^2 for all spaces. The design for each individual residence shall be based on the heating and cooling loads as well as room airflow requirements computed for the housing type and orientation, which it most closely matches. Internal loads shall be included in the computerized load calculations in accordance with ASHRAE recommendations for residential analyses.

10-1.2 Supply Air Ductwork System Layout. The family housing units shall be

equipped with a single supply air ductwork layout regardless of orientation. The family housing supply air ductwork system shall be sized at a maximum air pressure loss of 0.08" wg/100 feet. The sheet metal supply air ductwork system shall deliver and distribute the required airflow to each room with respect to its worst-case orientation. Balancing dampers shall then be used to reduce airflow to the appropriate level as required. Permanent access and required maintenance clearances shall be provided to all opposed blade dampers.

10-1.3 Return Air Ductwork System Layout. The family housing units shall be equipped with return air ductwork from each room being provided with conditioned supply air regardless of orientation. The family housing return air system shall be sized at a maximum air pressure loss of 0.05" wg/100 feet. The return air path shall return the required airflow from each room back to the gas-fired furnace, incorporating the least path of resistance into the design.

10-2 Equipment Safety and Efficiency. All equipment and associated materials provided, here to, should be the manufacturers standard cataloged product. Manufacturers standard cataloged product is the equipment that the manufacturers regularly engage in current production and is the manufacturers most recently approved equipment standard design.

10-2.1 All heating, ventilation and air-conditioning (HVAC) equipment proposed and installed in this contract shall bear the Energy Star Label.

10-2.2 Equipment shall comply with the requirements of American Gas Association (AGA), American National Standards Institute (ANSI), Air Conditioning and Refrigeration Institute (ARI), American Society for Testing and Materials (ASTM), Gas Appliance Manufacturers Association (GAMA), National Electric Manufacturers Association (NEMA), National Fire Protection Association (NFPA), Underwriters Laboratories, Inc. (UL) or other national trade associations as applicable.

10-2.3 Equipment efficiencies are listed in Table 10-2 below. The listed efficiencies are the minimum acceptable level.

Table 10-2: Minimum Equipment Efficiencies

	Natural gas fired equip	Ground Source Heat pump (ground coupled)[4]		Electric cooling equip
Furnace AFUE	90%+[1]	Size A[2]	Size B[2]	
SEER		12[3]	13[3]	12[3]

Note[1]: Efficiency is based on DOE test procedure 10CFR430, Subpart B, Appendix N.
Note[2]: Size A heat pumps have a capacity of 5.9 kW (20,000 Btu/h or less. Size B heat pumps have a capacity of 5.9 kW to 13.5 kW (20,000 to 46,000 Btu/h)
Note[3]: Efficiency is based on DOE test procedure 10CFR430, Subpart B, Appendix M.
Note[4]: Ground Source Heat Pump Systems shall be evaluated for construction cost feasibility issues due to site-specific restrictions.

10-3 Heating, Ventilation and Air-Conditioning (HVAC) Systems. Each Family Housing Unit shall be provided with a central direct-expansion heating and air-conditioning split system. Split systems shall be designed, installed, balanced and adjusted to distribute conditioned heating and cooling air to all habitable rooms, including bathrooms. The furnace system air-balance shall be distributed to all spaces in proportion to the calculated load requirements. Supply fans serving the gas-fired furnaces shall be a direct drive type equipped with an adjustable blower speed control. The furnace system installation shall conform to SMACNA Installation Standards for Residential Heating and Air-Conditioning Systems.

10-3.1 The direct-expansion condensing unit shall be selected for 105°F ambient outdoor temperature. The direct-expansion cooling system capacities selected for installation shall not be oversized with respect to load calculations. The gas-fired furnace and heat exchanger equipment capacities selected for installation shall not be oversized more than 125 percent of the load calculations.

10-3.2 Exterior direct-expansion condensing unit(s) shall be pad-mounted on minimum 4″ thick concrete housekeeping pad(s). Concrete housekeeping pad(s) shall be installed level and supported by compacted soil or concrete foundation to eliminate settlement. The condensing unit location shall be selected based on site-specific conditions and intended uses of outdoor space. Every effort shall be made to locate the condensing unit out of the occupant's direct line of sight, (shrubbery screening shall be located minimum distance of 36″ away from condensing unit air intake or provide minimum 50% free open area wall/enclosure minimum 30″ clear distance) locate condensing unit on sides of residence and avoid placement under windows.

10-3.3 The primary concern shall be equipment location and coordination within the mechanical utility room. The gas-fired furnace shall be located in the ground level mechanical utility room. The gas-fired furnace shall be arranged and coordinated with all other equipment devices to allow for ease of maintenance and proper venting. The mechanical utility room shall have a light and a GFCI electrical convenience receptacle.

10-3.4 Natural Gas-Fired Furnace Systems. The gas-fired furnace system shall be a high efficiency up flow unit. Gas-fired furnaces shall be equipped with hot surface ignitor, slow open redundant gas valve, direct-vent sealed combustion, monoport gas-fired burner and a 25-year heat exchanger warrantee. The furnaces shall have a direct drive supply fan with adjustable blower speed control, disposable filters, electronic analog thermostat controls and transformer. It shall be possible to service internal components and replace all controls from one side of the furnace. The contractor shall supply Carrier, model number 58MCA or equal

10-3.5 Gas-Fired Furnace Flue Venting System. The furnace units shall be vented in accordance with NFPA 211. High efficiency (AFUE ≥ 90 percent) gas-fired furnaces shall be vented in accordance with AGA requirements and the manufacturer's instructions. Natural gas-fired furnace shall vent combustion products through code approved vent flue piping. Vent flue piping shall extend from outside the residence exterior wall. The flue piping discharge shall be located away from residence outside air intakes as indicated per the most current International Mechanical Code. Flue vent piping shall be routed across the attic space and terminated up through the roof on the rear exposure of the house peak. Coordinate flue vent pipe routing and size with manufacturers recommendations.

10-3.6 Direct-Vent Sealed Combustion Intake. Direct-vent sealed combustion air

system shall transfer air from the outside in accordance with the manufacturers installation specifications. Sealed combustion intake piping material shall conform to the most current International Mechanical Code. Combustion air intake piping shall be installed in accordance with SMACNA Installation Standards for Residential Systems. Combustion air intake piping shall be routed across the attic space and terminated up through the roof on the rear exposure of the house peak. Coordinate combustion air intake pipe routing and size with manufacturers recommendations.

10-3.7 Condensate Drain Piping. Condensate drains for high efficiency units shall be per manufacturer recommendations and shall be indirectly connected to the building sanitary sewer system or daylight minimum 6” above finished grade. Condensate drain piping that is daylight shall be terminated with a 90-degree elbow turned down toward finished grade.

10-3.8 Direct-Expansion Split Air-Conditioning Unit.

10-3.8.1 Direct-Expansion Split Air-Conditioning Unit shall consist of an air-cooled condensing unit, evaporator coil (cased “A” coil) and evaporator/blower as matched components with the gas-fired furnace. Both gas-fired furnace, evaporator coil and condensing unit shall be provided from the same manufacturer. Refrigerants used shall have an Ozone Depletion Potential (ODP) of .055 or less. The condensing unit shall contain, as a minimum, the features indicated in Table 10-3. Equipment shall be sized to meet the computer generated load calculation. The contractor shall provide a Carrier, Model number, 38BRC or equal.

TABLE 10-3 – DIRECT-EXPANSION SPLIT SYSTEM AIR-CONDITIONING FEATURES

High and low pressure compressor protection.
Filter-drier.
Scroll compressor protected by internal temperature and current sensitive overloads.
Electric crankcase heaters.
Compressor start assist capacitor and relay
Thermostatic expansion valve (TXV) single flow
Anti-short-cycle timer. (factory installed)
Site Glass
Testing and charging refrigerant connections.
Standard 5-year limited warrantee on all parts and scroll compressor.
Fan and coil guards.

10-3.8.2 Evaporator Coil. The cased “A” coil (evaporator coil) shall be provided with a liquid strainer, expansion device, pre-insulated housing, copper coils and insulated sloped condensate drain pan. Cased “A” coil face velocity shall not exceed 500 fpm air velocity.

10-3.8.3 The condensing unit and matching cased “A” coil shall deliver a Seasonal Energy Efficiency Rating (SEER), consistent with the minimum requirements shown in Table 10-2.

10-3.8.4 Refrigerant Charge Verification: When the direct-expansion split air-conditioning systems are completely installed, the contractor shall check refrigerant level, calibrate, and provide additional refrigerant charge as required for equipment start-up. While the direct-expansion split air-conditioning system is in operation the refrigerant will be adjusted for maximum energy efficiency and optimal evaporator coil leaving air conditions (LDB Temperature and LWB Temperature). A third party company shall test the direct-expansion refrigeration system(s) that was performed on the same 5 percent of the family housing units that had the blower door and duct tightness testing. If the direct-expansion refrigeration system(s) tested have a low or excessive refrigerant charge, all direct-expansion systems installed under this contract shall be tested. All direct-expansion refrigeration systems tested shall be certified by the third party company, in written documentation stating full compliance, prior to acceptance by the Government.

10-4 Air Distribution.

10-4.1 Ceiling Mounted Supply Grilles and Floor Mounted Registers. First floor ceiling mounted supply grilles and second floor baseboard supply registers shall be located to ensure the air distribution will completely cover all exterior wall surfaces with a blanket of conditioned air or may be of a compact design to eliminate 'dead air spots' within the room being served. Provide a minimum of one grille/register in each habitable room. Grilles/registers shall have louvered faces with individually adjusted airfoil blades. All grilles and registers shall be provided with integral opposed blade dampers. Plastic grilles and registers are prohibited. Grilles and registers core velocities shall be limited to 600 fpm maximum jet velocity, with a maximum air pressure drop of 0.06-inches wg. Ceiling mounted grilles shall have factory finish to match architectural finish schedule. Floor mounted registers shall have factory finish to match the architectural finish schedule. All Grille frames and register frames shall be installed tight and flush against each respective surface(s). Sponge-rubber gasket material shall be provided between ceiling mounted grilles and floor mounted registers as required for air leakage control. Sponge-rubber material shall be completely concealed and non-visible outside the grille or register. Grille and register boots shall be sealed with heavy liquid sealant around all longitudinal and transverse joints. Provide appropriate grille and register frame/trim for flush-mounted devices. Supply air boots connecting the supply branch ductwork to the grille and/or register shall be airtight and shall not interfere with opposed blade damper operation. Ceiling mounted supply grilles shall be installed at least 6-inch distance away from all walls.

10-4.2 Return air and exhaust air grilles. Grilles shall be fixed horizontal, louver face type similar in appearance to the supply grille face. Plastic grilles are prohibited. Core velocity shall be limited to 400 fpm maximum jet velocity, with a maximum air pressure drop of 0.05-inch wg. Grilles shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Return air and exhaust air boots shall be sealed tight to the wall or ceiling using duct mastic or caulking. Wall return grilles shall be located at least 6 inches distance above the floor or below ceiling. Return grilles shall be located in all rooms served

by conditioned supply air.

10-4.3 Ductwork. Provide sheet metal in thickness indicated, minimum 26-gauge, packaged and marked as specified in ASTM A 700. Galvanized sheet steel shall be lock forming quality, ASTM A 653, coating designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view. Galvanized sheet metal ductwork shall be externally insulated. Flexible ductwork shall not be installed in concealed locations. Ductwork located under-slab, intra-slab, or within crawlspace is prohibited. Volume dampers shall be provided integrally to the supply air floor registers and ceiling mounted grilles. No portion of the building construction (such as joist space in a floor or ceiling, wall stud space, etc.) shall be used as an air path. The requirements for ductwork set forth below apply to all ductwork installed in the residence, supply systems, return systems, exhaust systems, ventilation systems, and outside air supply ductwork.

10-4.3.1 The single supply air main ductwork shall be routed within a lowered soffit area located below the second floor, floor joists. The supply air ductwork shall be installed tight to the bottom of the second floor, floor joists and routed perpendicular to the floor joist. All supply air branch ductwork shall be tapped from the top of the single supply air main ductwork with 45-degree take-off boot taps and connected to a long sweep, 5-section 90-degree elbow. All supply air branch ducts shall be routed between the second floor, floor joists. The supply air branch ductwork shall serve the first floor ceiling supply grilles and second floor supply baseboard registers.

10-4.3.2 Maximum supply air ductwork pressure loss shall be limited to 0.08-inches wg/100ft for mains and branches. Maximum pressure loss in return air ductwork shall be limited to 0.05-inches wg/100ft for mains and branches.

10-4.3.3 All transverse and longitudinal ductwork joints shall be sealed airtight with heavy liquid sealant. Ducts shall have no visible or audible leaks to ensure quiet, economical system performance. Ductwork in conditioned spaces shall be constructed for a 2-inch static pressure construction class with seal class B, as described in the SMACNA HVAC Duct Construction Standard.

10-4.3.4 Provide a minimum of 2-inch thick mineral fiber blanket insulation (or other listed insulation with an equivalent R value) on the exterior of all supply, outside and return air ducts located within unconditioned spaces. Exhaust ductwork does not require insulation. Insulation shall be faced with a vapor barrier material having a performance rating not to exceed 1.0 perm. Insulation, vapor barrier, and closure systems shall be non-combustible as defined in NFPA 255, with a flame-spread rating of not more than 25, and a smoke development rating of not more than 50, as defined in ASTM E-84.

10-4.3.5 Return air ductwork shall be sized for a maximum velocity of 600 fpm. Short runs of return air ductwork 5 ft or less directly upstream of the evaporator fan assembly shall be acoustically lined to minimize noise. Acoustic liner shall be minimum 0.5-inches thick, 3.0 PCF density, long textile fiber with anti-microbial

10-4.4 Filtration. Provide a disposable 1-inch pleated panel filter, sized for and installed in the return air system in accordance with UL 900. Filter shall be rated for 20 percent efficiency as determined by ASHRAE 52; Method of Testing Air Cleaning Devices used in General Ventilation for Removing Particulate Matter. All filters shall be easily accessible for changing and maintenance and shall be installed in the return grilles whenever possible.

10-4.5 Crawl Space Airflow Design. Provide minimum two supply air horizontal discharge ductwork openings to supply conditioned heating and cooling airflow with sufficient enough “throw” across the entire crawlspace to create air mixing. The minimum total supply airflow delivered into the crawlspace shall be calculated to 0.05 CFM of the conditioned crawlspace floor area. The crawlspace returns shall be ducted back to the gas-fired furnace. Provide a minimum of two return air openings extending into the crawlspace. Locate the return air openings in opposite crawlspace areas and route back to the return air ductwork of the gas-fired furnace. All ductwork routed within the crawlspace shall be sealed airtight. All transverse and longitudinal seams/joints shall be sealed with heavy liquid sealant.

10-5 Temperature Controls. Thermostats shall be located on interior partitions, close to main system return air intake. Thermostat wall placement shall not be placed in the middle of an open wall space. Thermostat shall be installed above finished floor per ADA requirements. Placing a thermostat on the exterior wall, near an exterior opening or any place the thermostat is subject to unrepresentative temperatures is unacceptable.

10-5.1 Thermostats shall be Carrier, Model TSTATCCN, Energy Star labeled, standard non-programmable. The thermostat shall be equipped with standard features, OFF/COOL/HEAT/AUTO, fan shall switch for ON/AUTO, auto heat/cool changeover, equipment ON indicator, battery free, LCD display current and desired temperatures and two temperature set points for (1) heating and (1) cooling. Thermostat option when used for heat-pump applications, the thermostat shall have an emergency heat option, auxiliary heat indicator and auxiliary heat lockout.

10-6 Exhaust Fans. Reference ASHRAE Standard 62.2-2003, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings.” Specifically reference section 4, “Whole Building Ventilation”.

10-6.1 Bathroom and shower room shall be ducted to the outside. Bathroom and/or shower room exhaust fans shall be switched separately from the lights. Each bathroom and/or shower room shall have its own fan. Exhaust fans shall not discharge near the air conditioning condensing unit, entry doors, windows, patios, porches, or garages. Exhaust fans shall be tested and rated in accordance with AMCA 210, and shall operate with 120-volt, single-phase power supply. Exhaust fans shall be provided with an integral back draft damper. Bathroom and/or shower exhaust fans shall be ceiling mounted and shall be sized to provide not less than 10 air changes per hour in the space served. Maximum allowable noise level for bathroom exhaust fans shall be 2 sones as installed.

10-6.2 Tornado Shelter. The lower level bathroom and shower room is being designed for a tornado shelter room. Coordinate the supply air ductwork routing and supply air grille serving the bathroom with the exhaust fan. Reference tornado shelter requirements for allowed maximum opening sizes in square-inches.

10-6.3 Kitchen range hood exhaust fan shall be a telescoping downdraft style hood for countertop island installation. Kitchen range hood exhaust shall be ducted to the outside. Exhaust ductwork shall be routed through the crawl space between floor joists. Exhaust fans shall not discharge near the air conditioning condensing unit, entry doors, windows, patios, porches, or garages. Exhaust fans shall be tested and rated in accordance with AMCA 210, and shall operate with 120-volt, single-phase power supply. Exhaust fans shall be provided with an integral back draft damper. Reference 2003 International Residential Code for One and Two-Family Dwellings, chapter 15, section M1502.

10-7 Dryer Vents. A minimum 4-inch diameter dryer vent shall discharge to the

exterior and provide connection to occupant-owned dryer (one dryer per vent). Dryer vent material shall be rigid galvanized steel with exterior wall cap and integral back draft damper. Dryer vent piping maximum horizontal length shall be 14 feet, with no more than three 90-degree angle elbows (with minimum radius of 6 inches). Dryer vent piping maximum vertical length shall be 12 feet, with no more than three 90-degree angle elbows (with minimum radius of 6 inches). Dryer vents shall not exhaust closer than 10 feet horizontal distance to exterior openings (entry doors, windows, etc.); 10 feet above patios and sidewalks; or 3 feet vertical distance above exterior openings. Dryer vents shall not run through non-accessible spaces or garages. Dryer vent shall not terminate at the front exposure of the house.

10-8 Radon Removal System.

10-8.1 Radon Prevention and Testing. The housing units shall be constructed to include a passive system for control in the structure. This system shall be constructed in accordance with Indoor Radon Prevention and Mitigation.

10-8.2 Radon Vent Pipe Installation. Provide a sub-membrane depressurization system with a mechanical draft using minimum 4-inch diameter, plenum rated PVC vent piping installed vertically to remove radon gases. Radon vent piping shall be routed from below the soil-gas-retarder membrane up inside interior walls or chases through the housing unit, up through the attic and penetrate at least 12-inches above the roofline. A rainproof installation above the roof shall be provided. Radon vent pipe is to be routed through the attic space in a location that will facilitate radon gas fan maintenance.

10-8.3 Multiple branch vent pipe runs may be routed within the crawlspace and connected to one common stack as required.

10-8.4 A length of 4-inch diameter perforated pipe shall be installed horizontally beneath the radon membrane sheeting and connected to a 4-inch “T” fitting with a vertical standpipe installed through the sheeting, servicing each 1500 square feet of membrane area. Rough in shall be provided for electrical wiring to facilitate a switched radon fan and system failure-warning device. After the building envelope is complete, and with all HVAC systems operating on normal cycles, the Government may elect to test the facility for radon levels. The Government will test the housing unit for radon levels with the radon fan off. If the housing unit fails the radon test the in-line radon fan (and system failure warning device) shall be energized to remove captured radon gases. Refer to Table 8-2 for more information.

10-8.5 Radon mitigation. The design and construction of foundation walls, slabs, and crawl spaces shall include provisions for the reduction of radon entry and facilitate its removal. Radon mitigation shall comply with the requirements of ASTM E1465. Reference figure 10-1 at the end of this section.

10-9 Piping Requirements. Evaporator coil condensate drain piping, exterior refrigerant suction and exterior refrigerant liquid piping shall be insulated with minimum 1-inch thick cellular glass or unicellular foam pipe insulation. Exterior refrigerant piping insulation shall be covered with an aluminum or PVC jacket to prevent damage. Condensate drain piping shall be installed one pipe size larger than the drain pan condensate connection. The evaporator condensate drain piping shall be properly trapped, and not directly connected to a sanitary sewer system (air gap fitting required).

10-9.1 Refrigerant Piping Material. All refrigerant suction and liquid piping above grade shall be copper piping, ASTM B 280, Type ACR, hard drawn straight

lengths and soft annealed coils, seamless copper tubing. All refrigerant suction and liquid piping below grade and within slabs shall be copper piping, ASTM B 88, Type K, hard drawn straight lengths and soft annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation and have ends capped to protect cleanliness of pipe interiors prior to shipping. Above grade and within family housing unit provide brazed joints. Below grade and within slabs provide Type K, copper piping with no joints.

10-9.2 Evaporator Coil Condensate Drain Piping. All condensate piping above grade shall be copper piping, ASTM B 280, Type ACR, hard drawn straight lengths and soft annealed coils, seamless copper tubing. All condensate piping below grade and within slabs shall be copper piping, ASTM B 88, Type K, hard drawn straight lengths and soft annealed coils, seamless copper tubing. All copper tubing or piping shall be factory cleaned, ready for installation and have ends capped to protect cleanliness of pipe interiors prior to shipping. Above grade and within family housing unit provide brazed joints. Below grade and within slabs provide Type K, copper piping with no joints.

10-10 Testing, Adjusting, and Balancing. Adjusting and balancing of each family housing unit shall be the contractor's responsibility. The Contractor shall correct all residences not found in compliance, and shall be responsible for all labor and materials required for this effort. NEBB-01, SMACNA-07 or ASHRAE 111 shall be used as the standard for providing testing of air systems. The selected standard shall be used throughout the Family Housing Project. Instrumentation accuracy shall be in accordance with the standard selected. A firm certified for testing by the National Environmental Balancing Bureau (NEBB) shall accomplish all air testing. Prior to conducting testing, adjusting, and balancing, the contractor shall submit in written report declaring the air systems has been installed and is operating as specified. Where specific systems require special or additional procedures for testing, such procedures shall be in accordance with the standard selected. Approved detail drawings and all other data required for each system and/or component to be tested shall be made available at the job site during the entire testing effort. Air testing shall not commence until approved by the Contracting Officer in written documentation. The facility shall be essentially complete with final ceiling, walls, windows, doors, and all partitions sealed and in place. Doors and windows in the family housing unit to be balanced shall be closed during testing and balancing operations. Air systems and exhaust fans shall be complete and operable. All data, including deficiencies encountered and corrective action taken, shall be recorded. After approval of the certified air balance written reports from the contracting officer indicating final acceptance, all HVAC adjustment device settings shall be permanently marked with phenolic paint/marker by the contractor's balancing engineer so that adjustments can be restored if disturbed at any time.

10-11 Duct Tightness Testing Requirements. The installation of the supply and return ductwork within the family housing units is an item of prime concern with respect to the energy efficient operation of the residence as a whole. The heating and air-conditioning designs that include ductwork outside of the conditioned envelope, the contractor will be required to test the proto-type units and all units that are blower door tested for tightness (see paragraph 7.3.2+) to ascertain the leakage levels from the ductwork in accordance with the following requirements.

10-11.1 Duct tightness testing shall ensure that the leakage rate from ductwork shall not exceed 0.15 $(L/s)/m^2$ (0.03 cfm/ft^2). If the units tested fail to meet this requirement, the ductwork installation shall be examined, corrections made, and the test redone until the installation passes this requirement. The entire ductwork system that is installed in proto-type housing units and all housing units that receive blower door tests shall be completely leak test

validated, prior to any ductwork installed in any other housing unit. Several methods to accomplish this testing are acceptable.

10-11.1.1 Testing may be done in accordance with ASTM Standard E 1554-94, “Determining External Air Leakage of Air Distribution Systems by Fan Pressurization”. This method describes the process and methodology required to accomplish basically a ‘blower door subtraction’ method of duct tightness testing.

10-11.1.2 Testing may also be accomplished utilizing “Duct Blaster” methodologies and pressurizing the ductwork to 25 Pascal (0.1-inch of water).

10-12 The Contractor is advised that the EPA may test, or hire a consultant to test randomly selected residences constructed in this Project. These tests will be completed without cost to the contractor; however, the contractor will be required to coordinate access to the selected housing unit(s). If the EPA testing is conducted, the testing is not expected to interfere or delay the construction in any manner. Whole House Fans. As betterment bid, provide a whole house fan in each residence. Locate the fan in the ceiling of the bedroom hallway exhausting into the attic. Fan shall be a minimum of 36-inch propeller fan, 1/3 HP, belt driven, with automatic closing louver. Provide adequate attic ventilation for exhaust. Control fan by wall switch near fan, interlock with furnace/AC unit so that the furnace will not be energized when the whole-house fan is energized. Reference ASHRAE Standard 62.2-2003, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings.” Specifically reference section C4, “Selecting the Whole-House Ventilation System”, equation $Q_{fan}=Q_r/(\varepsilon f)$, where Q_{fan}=fan airflow rate, Q_r=ventilation air requirement, ε=ventilation effectiveness and f=fractional on-time

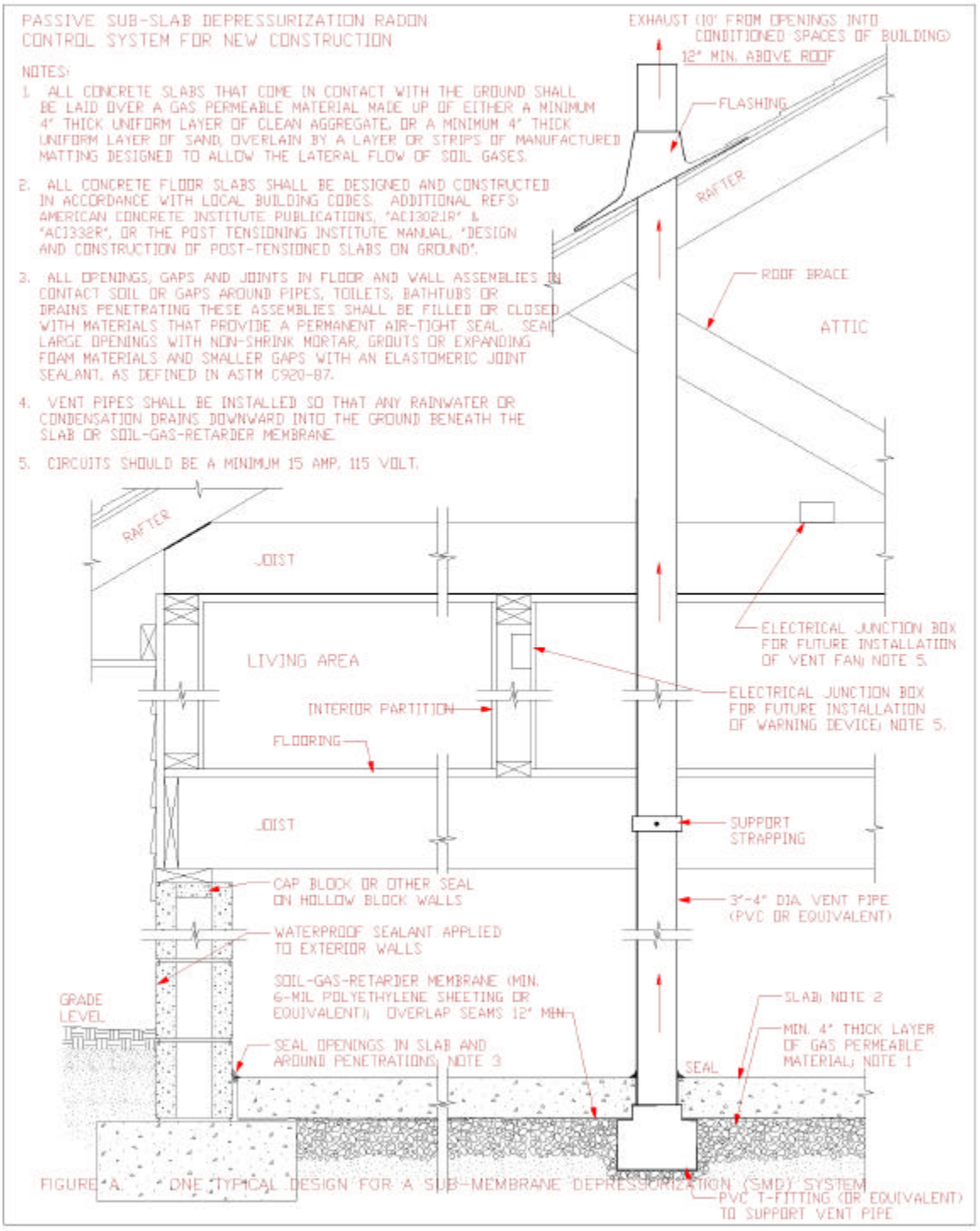

FIGURE A. ONE TYPICAL DESIGN FOR A SUB-MEMBRANE DEPRESSURIZATION (SMD) SYSTEM

11. Paragraph 11 is not used in this section.

12. CONTRACTOR PREPARED SPECIFICATIONS

12-1 The contractor's DESIGNER OF RECORD is required to prepare the remaining specifications and drawings required to complete the design. The contractor's DESIGNER OF RECORD and shall have the freedom to use the following in his Specifications: AIA Masterspec, CSI standard specification, manufacturer's standard data and installation instructions, COE guide specifications, or the new Uniform Facility Guide Specifications. The specifications shall be tailored to meet the requirements of this job. Specifications shall be brief and to the point. Inapplicable data and materials shall be deleted. All prescriptive information and guide specifications provided by the Government with this RFP shall be incorporated into the final specifications and drawings without editing. Specific requirements are outlined in the Specification Outline portion of this RFP. See also Section 1012, "DESIGN AFTER AWARD" and other specifications provided with this RFP for detailed requirements and guidelines.

12-2 Contractor prepared specifications and individual specification sections for this work shall be organized into divisions and sections in accordance with Construction Specifications Institute (CSI), Master list of Tiles and Numbers for Construction Industry, latest edition.

12-3 Submittal requirements, submittal procedures and quality control are addressed in other specification sections provided with this RFP. The DESIGNER OF RECORD shall use all prescriptive specifications and drawings provided with this RFP without editing.

Table 8.2

PROJECT:	Ft. Riley Family Housing
LOCATION:	Ft. Riley, KS
JOB NUMBER:	0350000712
DATE:	February 9, 2004

HENDERSON ENGINEERS INCORPORATED

FIXTURE TYPE	QTY	D.F.U. (EA)	TOTAL D.F.U.	HOT S.F.U. (EA)	COLD S.F.U. (EA)	COMBINED S.F.U. (EA)	TOTAL S.F.U. (HOT)	TOTAL S.F.U. (COLD)	TOTAL SERVICE S.F.U.
BATHROOM GROUP (1.6 GPF FLUSH TANK)		5.0	0.0	1.50	2.70	3.60	0	0	0.0
BATHROOM GROUP (3.5 GPF FLUSH TANK)		6.0	0.0	3.00	6.00	8.00	0	0	0.0
BATHTUB (PRIVATE)	3	2.0	6.0	1.00	1.00	1.40	3	3	4.2
BIDET		1.0	0.0	1.50	1.50	2.00	0	0	0.0
PRIVATE CLOTHES WASHER RESIDENTIAL	1	2.0	2.0	1.00	1.00	1.40	1	1	1.4
PUBLIC CLOTHES WASHER RESIDENTIAL		3.0	0.0	3.00	3.00	4.00	0	0	0.0
CLINICAL SERVICE SINK		6.0	0.0	1.50	8.00	8.00	0	0	0.0
DISHWASHER (RESIDENTIAL)		2.0	0.0	1.40	0.00	1.40	0	0	0.0
DRINKING FOUNTAIN		0.5	0.0	0.00	0.25	0.25	0	0	0.0
PRIVATE SINK (BAR, KITCHEN OR BREAKROOM)	1	2.0	2.0	1.00	1.00	1.40	1	1	1.4
PUBLIC SINK (KITCHEN OR BREAKROOM)		2.0	0.0	3.00	3.00	4.00	0	0	0.0
SINK (FLUSHING RIM)		6.0	0.0	3.00	3.00	4.00	0	0	0.0
SINK (WASH FOUNTAIN PER HEAD)		2.0	0.0	1.00	1.00	1.40	0	0	0.0
PRIVATE LAVATORY	3	1.0	3.0	0.50	0.50	0.70	1.5	1.5	2.1
PUBLIC LAVATORY		1.0	0.0	1.00	1.00	1.40	0	0	0.0
SERVICE SINK (MOP BASIN)		3.0	0.0	2.25	2.25	3.00	0	0	0.0
PRIVATE LAUNDRY TUB		2.0	0.0	2.00	2.00	3.00	0	0	0.0
FLOOR DRAIN		2.0	0.0	0.00	0.00	0.00	0	0	0.0
SHOWER (PUBLIC - EACH HEAD)		2.0	0.0	3.00	3.00	4.00	0	0	0.0
SHOWER (PRIVATE- 0NE HEAD)	3	2.0	6.0	1.00	1.00	1.40	3	3	4.2
URINAL (1.0 GPF)		2.0	0.0	0.00	5.00	5.00	0	0	0.0
WALL HYDRANT		0.0	0.0	0.00	5.00	5.00	0	0	0.0
WALL HYDRANT - NON-FREEZE	2	0.0	0.0	0.00	5.00	5.00	0	10	10.0
PRIVATE / PUBLIC WC (1.6 GPF FLUSHOMETER TANK)		4.0	0.0	0.00	2.00	2.00	0	0	0.0
PRIVATE WATER CLOSET (1.6 GPF FLUSH TANK)	3	3.0	9.0	0.00	2.20	2.20	0	6.6	6.6
PUBLIC WATER CLOSET (1.6 GPF FLUSH TANK)		4.0	0.0	0.00	5.00	5.00	0	0	0.0
PRIVATE WATER CLOSET (1.6 GPF FLUSH VALVE)		3.0	0.0	0.00	6.00	6.00	0	0	0.0
PUBLIC WATER CLOSET (1.6 GPF FLUSH VALVE)		4.0	0.0	0.00	10.00	10.00	0	0	0.0
PUBLIC WATER CLOSET (3.5 GPF FLUSH VALVE)		6.0	0.0	0.00	10.00	10.00	0	0	0.0
MISC. CONTINUOUS FLOW (GPM)		0.13	0.0	0.00	0.13	0.13	0	0	0.0
SPECIALTY KITCHEN EQUIP.									
DISPOSER (2" TRAP)		3.0	0.0	0.00	2.00	2.00	0	0	0.0
DISPOSER (3" TRAP)		5.0	0.0	0.00	2.00	2.00	0	0	0.0
PRE-SCRAPPER		2.0	0.0	1.50	1.50	2.00	0	0	0.0
SINK (DUMP)		2.0	0.0	3.00	3.00	4.00	0	0	0.0
SINK (HAND)		1.0	0.0	1.00	1.00	1.40	0	0	0.0
SINK (PREP / VEGGIE)		2.0	0.0	3.00	3.00	4.00	0	0	0.0
SINK (2 COMPARTMENT)		2.0	0.0	3.00	3.00	4.00	0	0	0.0
SINK (3 COMPARTMENT)		2.0	0.0	6.00	6.00	8.00	0	0	0.0
DISHWASHER (RESTUARANT)		3.0	0.0	6.00	0.00	6.00	0	0	0.0
COMMERCIAL WASHER EXTRACTOR		6.0	0.0	7.50	7.50	10.00	0	0	0.0
ICE MACHINE		2.0	0.0	0.00	1.00	1.00	0	0	0.0
COFFEE MAKER		1.0	0.0	0.00	0.50	0.50	0	0	0.0
TEA MAKER		1.0	0.0	0.00	0.50	0.50	0	0	0.0
CAPPUCCINO MACHINE		1.0	0.0	0.00	0.50	0.50	0	0	0.0
KETTLE		1.0	0.0	1.50	1.50	2.00	0	0	0.0
CARBONATOR		1.0	0.0	0.00	0.50	0.50	0	0	0.0
HOT FOOD TABLE		1.0	0.0	0.75	0.75	1.00	0	0	0.0
DIPPER WELL		1.0	0.0	0.00	0.75	0.75	0	0	0.0
TOTAL UNITS:	16		28.0				9.5	26.1	29.9

2003 IPC FIXTURE LOADING

THE FIXTURE UNIT LOADS IN THIS SCHEULE ARE FOR PUBLIC AND PRIVATE USE.

BELOW ARE GUIDELINES FOR SIZING WATER SERVICE LINES & SANITARY BUILDING DRAINS

TOTAL BUILDING DRAIN FIXTURE UNITS:	28	4.0	PIPE SIZE: (MIN SANITARY BUILDING DRAIN)
TOTAL WATER SERVICE FIXTURE UNITS[1]:	29.9	1.5	PIPE SIZE: (TYPE K CU @ 8 FPS, PRIMARILY FLUSH VALVES)
TOTAL WATER SERVICE FIXTURE UNITS[1]:	29.9	1.3	PIPE SIZE: (TYPE K CU @ 8 FPS, PRIMARILY FLUSH TANKS)
TOTAL HOT WATER FIXTURE UNITS:	9.5	1.0	PIPE SIZE: (TYPE L CU @ 5 FPS, PRIMARILY FLUSH TANKS)

Table 8.3

PROJECT:	Ft. Riley Family Housing
LOCATION:	Ft. Riley, KS
JOB NUMBER:	0350000712
DATE:	February 9, 2004

HENDERSON ENGINEERS
INCORPORATED
8325 LENEXA DRIVE, SUITE 400
LENEXA, KS 66214
P. 913-307-5300 F. 913-307-5400

WATER HEATER CALCULATION

PLAN MARK	FIXTURE TYPE	QUANTITY	GPH	TOTAL GPH
	PRIVATE LAVATORY	3	2	6
	PUBLIC LAVATORY	0	4	0
	SHOWER (NUMBER OF SHOWER HEADS)	3	*[3]	37
	MOP SINK	0	20	0
	CLASSROOM SINK	0	8	0
	BREAKROOM SINK	0	10	0
	KITCHEN SINK	1	20	20
	CLOTHES WASHER[1]	1	30	30
	DISHWASHER[1]	1	15	15
	DOUBLE WASHFOUNTIAN	0	8	0
	TRIPLE WASHFOUNTIN	0	12	0
	QUADRUPLE WASHFOUNTAIN	0	16	0
			TOTAL PEAK DEMAND (GPH) =	108

CALCULATION INPUTS	
C.W. TEMPERATURE (°F)	40
H.W. TEMPERATURE (°F)	120
HEATER EFFICIENCY	80%
DEMAND FACTOR	1.00
STORAGE FACTOR	0.25
ALTITUDE (Feet)	2,000
ALTITUDE CORRECTION[4]	0%

SHOWER CALCULATION	
TEMPERATURE OF MIXED WATER (°F)	105
PERCENTAGE OF MIXTURE FOR HW	81%
GPM OF 140°F HW (2.5 GPM HEAD)	2.03
NUMBER OF SHOWERS PER HOUR	1
SHOWER DURATION PER STUDENT (min)	6.0
HOURLY DEMAND (GPH)	37

RECOMMENDED MINIMUM WATER HEATER SIZE CALCULATION

	GPH	DEMAND/STORAGE FACTOR	CAPACITY	MINIMUM INPUT
PROBABLE MAX DEMAND	108	1.00	108 GPH	21.0 kW
STORAGE CAPACITY	108	0.25	27 GALLONS	89,707 BTU[4]

[1] RESIDENTIAL LOAD SHOWN - VERIFY DEMAND IN GPH FROM EQUIPMENT MANUFACTURER

[2] ACTUAL SELECTED WATER HEATER PEAK CAPACITY MUST EXCEED TOTAL PEAK DEMAND

[3] SEE SHOWER CALCULATION SECTION

[4] ALTITUDE CORRECTION REQUIRED FOR ELEVATIONS GREATER THAN 2,000 FEET ABOVE SEA LEVEL. MINIMUM GAS FIRED WATER HEATER INPUT IN BTU'S IS INCREASED 2% FOR EVERY 1,000 FEET ABOVE 2,000 FEET

ACTUAL WATER HEATER SELECTION [2]

MODEL	QUANTITY	STORAGE CAPACITY	RECOVERY
MANUFACTURER Rheem	1	50 GALLONS	0.0 GPH

WATER HEATER TOTAL PEAK DEMAND	108	GPH	WATER HEATER SELECTION IS:
PEAK CAPACITY	40	GPH	
DIFFERENCE	-68		

SECTION 01012

DESIGN AFTER AWARD

1.0 GENERAL

1.1 Design Quality Control (DQC) Plan: The Contractor shall prepare and submit DQC for Government review prior to starting any work. At a minimum the Contractor's DQC Plan shall provide and maintain an effective quality control program, which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents shall be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product shall not perform the independent technical review (ITR).

The Contractor shall include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project tasks within the specific contract period. This should be at a detailed level of scheduling sufficient to identify all major tasks including those that control the flow of work. The schedule shall include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, the Contractor shall submit a revised schedule reflecting the change within seven calendar days. The Contractor shall include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. These completed checklists shall be submitted at each design phase as part of the project documentation.

The DQC Plan shall be implemented by an assigned person with the Contractor's organization who has the responsibility of being present during the times work is in progress, and shall be cognizant of and assure that all documents on the project have been coordinated. This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. The Contractor shall notify the Contracting Officer, in writing, of the name of the individual and the name of an alternate person assigned to the position.

The Contracting Officer will notify the Contractor, in writing, of the acceptance of the DQC Plan. After acceptance, any changes proposed by the Contractor are subject to the acceptance of the Contracting Officer.

1.2 Description of The Project. Design and construct 62 family housing residences (30 duplexes and 2 single family units). This consists of 20 three-bedroom and 42 four-bedroom residences, supporting infrastructure, site development and landscaping at Fort Riley, Kansas, in accordance with requirements of this RFP.

1.3 The Contractor shall propose a schedule for each of the design submittal phases. As a minimum, design submittals are required at the “fast track, preliminary (50%), final (100%), and at the design complete phase. The requirements of each design stage are listed hereinafter. The Contractor shall show the submittal phase and schedules for each design submittal phase in the progress charts. The 50%, 100%, and “design complete” submittals shall be submitted individually and each package complete, and includes each of the major categories listed in paragraph “Contents of Design Submittals”. The contractor may elect to not “fast track” work and submit all work in a combined 50%, 100% and Final submittal process.

1.4 To facilitate fast-track design-construction activities the contractor

may choose to submit a 100% Site/Utility Design as the first design submittal. Following review, resolution, and incorporation of all Government comments, and submittal of a satisfactory set of site/utility design documents, the Kansas City District shall issue a limited Notice to Proceed (NTP) which shall allow the contractor to proceed with site development activities within the parameters set forth in the accepted design submittal.

Submittal review, comment, and resolution times from this specification apply to this initial 100% Site/Utility Design Submittal. No on-site construction activities shall begin prior to receipt of a construction NTP by the contractor.

1.5 DESIGN CAUTION: This RFP (Request for Proposal) contains drawings and some prescriptive specifications of some work items. The contractor shall use the conceptual drawings and specifications as the basis of further design effort. The contractor shall not deviate significantly from those drawings and specification without prior Government approval. Housing layouts and depicted materials shown have been reviewed and approved by the Installation and shall not be significantly revised except to accommodate site utility layouts, mechanical, electrical or structural elements. The contractor is required to survey the site and use this survey for the basis of actual design. Metric design is not required. Final design documents shall be done in English units.

1.6 "Dr. Checks". Dr. Checks is a web based system for management of project reviews and review comments. Dr. Checks will be utilized by the contractor and the Government to make and manage review comments. The AE/Contractor is not required to make replies or annotation to the Dr. Checks Comments prior to the review conference. Comments will be sorted, printed and review by individual reviewers. The access to Dr. Checks will be at no charge to the contractor. Microsoft Internet Explorer 5.0 is necessary to access and utilize the program. The Government will provide access passwords to the contractor and setup the project for using Dr. Checks to manage the review. The contractor shall be responsible to provide responses to comments and maintain necessary documentation for the management of all reviews accomplished under this contract. Additional information about the program and how it is used can be found at Dr. Check web address: http://65.204.17.188/projnet/home/version1/index.cfm .

2.0 DESIGNER OF RECORD

2.1 Contractor Design Services. Design work accomplished by the Design-Build Contractor (also referred to in this RFP as DESIGNER or DESIGNER(s) of RECORD) consists of design and preparation of Design Analysis, Construction Drawings and Specifications. Dr. Checks will be utilized for the processing of design review comments and responses.

Although Structural (i.e., building related) Interior Design shall be performed by the DESIGNER, Furniture Related Interior Design is not required by the DESIGNER.

Energy Evaluation and Energy Analysis, as required by the Kansas City District AE Manual, Chapter 14, paragraph 1.1 and 4., respectively, will not be required to be performed by the DESIGNER.

The Contracting officer may allow the use of shop drawings in lieu of Contract Design drawings (where practical) and allow the use of catalogue cuts and manufactures installation instructions that show compliance with this RFP in lieu of providing specifications. The Contractor is encouraged to utilize this process to improve the efficiency and timeliness of the design effort.

2.2 The Contractor shall identify, for approval, the Designer of Record for each area of work. One Designer of Record may be responsible for more than one area. All areas of design disciplines shall be accounted for by a listed, registered Designer of Record. The Designer(s) of Record shall stamp, sign, and date all design drawings under their responsible discipline at each design submittal stage (see SCR - "Registration of Designers"). The Contractor shall designate a Project Manager who shall monitor the progress of the design for the Construction Contractor. This person shall provide whatever coordination needs to be accomplished between the Construction Contractor and the Designer(s) of Record to minimize problems during design and construction.

3.0 DEFINITION OF DESIGN SUBMITTALS

3.1 First Site/Utility Design and Road Construction Submittal (100%) "Fast Track". This submittal is provided to allow the contractor to concentrate initial efforts for the site/utility and road construction portions of the project. By allowing this work to be separated, the contractor is given the opportunity to "fast track" and begin construction on the site/utility and road construction work prior to completion of the building designs. This submittal shall consist of the following:

3.1.1 Design analysis, developed to 100% for site/utility and road construction work only.

3.1.2 100% complete site/utility and road construction drawings

3.1.3 Final site/utility and road construction specifications

3.1.4 Environmental permits, as required. When environmental permits are not required, the Contractor shall provide a statement with justification to that effect.

3.2 Preliminary Conformance Review Submittal (50%). The submittal shall also depict any work submitted utilizing the "Fast Track" process to ensure proper coordination. This submittal is intended to insure that the contractor's design is proceeding in accordance with the terms of the solicitation and in a timely manner. This submittal shall consist of the following:

3.2.1 Design analysis, developed to 50%

3.2.2 50% complete drawings

3.2.3 Draft specifications

3.2.4 Environmental permits, as required. When environmental permits are not required, the Contractor shall provide a statement with justification to that effect. If the Contractor has elected to "Fast Track" site and utility work, no additional site/utility design information is required for this submittal (except utility interface with each floor plan type). However if the Contractor elected not to "Fast Track", then site/utility plans and specification, at least 50% complete will be provided.

3.3 Final Design Submittal (100%). The review of this submittal is to insure that the design is in accordance with directions provided the

Contractor during the design process as well as the original solicitation. The Contractor shall submit the following documents for Final Design Review:

3.3.1 Annotated 50% review comments and responses utilizing Dr. Checks.

3.3.2 The Design Analysis submitted for Final Design Review shall be in its final form. The Design Analysis shall include all backup material previously submitted and revised as necessary. All design calculations shall be included. The Design Analysis shall contain all explanatory material giving the design rationale for any design decisions.

3.3.3 The Contract Drawings submitted for Final Design Review will be in a design complete condition, ready for construction. It shall include the drawings previously submitted which have been revised and completed as necessary. The Contractor is expected to have completed all of his coordination checks including the incorporation of any design review comments generated by the previous design reviews. If deemed appropriate by the Contracting Officer, shop drawings will be considered design drawings.

3.3.4 The Draft Specifications on all items of work submitted for Final Design Review shall consist of legible marked-up specification sections. The Specifications on all items of work submitted for Final Design Review shall consist of ready to construct specification sections.

3.3.5 If the Contractor has elected to “Fast Track” site and utility work, no additional site/utility design information is required for this submittal (except utility interface with each floor plan type). However if the Contractor elected not to “Fast Track”, then site/utility plans and specification, at least 100% complete will be provided.

3.3.6 The Contractor may begin construction work for items the Government has reviewed, and the Final Design Submission has been determined satisfactory for purposes of beginning construction. The Administrative Contracting Officer (ACO) or COR will notify the Contractor when the design is cleared for construction. The Government will not grant any time extension for any design resubmittal required when, in the opinion of the ACO or COR, the initial submission failed to meet the minimum quality requirements as set forth in the Contract.

3.4 Design Complete Submittal. After the Final Design Review, the Contractor shall revise the Contract Documents by incorporating any comments generated during the Final Design Review and shall prepare final hard copy Contract Specifications. The Contractor shall submit the following documents for the design complete submittal:

3.4.1 Design analysis, in final 100% complete form.

3.4.2 100% complete drawings.

3.4.3 Final specifications

3.4.4 Annotated Final review comments and responses utilizing Dr. Checks.

3.4.5 Electronic Submission: All CADD files in native **Intergraph Microstation** format, as well as all prepared technical specifications and design analysis shall be provided on CD-ROM. Two copies are required.

3.4.6 Design to construction procedure.

a. The Contractor shall submit the Design Complete Submittal within the number of calendar days specified in his project schedule. Final copies of drawings and specifications must be available to the Government prior to starting any construction work.

b. If the Government allows the Contractor to proceed with limited construction based on pending minor revisions to the reviewed Final Design submission, no payment will be made for any in-place construction related to the pending revisions until they are completed, resubmitted with the Design Complete Submittal and are satisfactory to the Government.

c. Design Reviews by the Government are to primarily verify that the final design conforms to the RFP. They are not for technical verification of the design. Where possible, obvious errors and omissions will be noted and brought to the Contractor's attention. However, the Government does not assume any responsibility either explicitly or implied for the technical adequacy of the design documents. The Government never approves the design.

3.5 Structural Interior Design (Color Boards). The Contractor will submit three of each: samples, catalogue cuts, manufacture's installation instructions, and other information as necessary to fully describe all interior and exterior finish items (installed) that show conformance with this RFP. All interior finish materials will be submitted together to allow coordination of color and finish selections. Likewise, all exterior finish materials will be submitted together to allow coordination of color and finish selections. Each submittal item will be identified with a title block that includes the Contractor's name, contract number, name and location of the project, and name of the applicable item of work being submitted. These items will also be stamped and approved by the Designer of Record and the Contractor's Quality Control Manager prior to submission. Approved items do not need to be resubmitted during subsequent design reviews. **See section 01100 for addition information.**

4.0 QUANTITY OF DESIGN SUBMITTALS

4.1 The Contractor shall submit copies of each item required to be submitted at the "Fast Track," Preliminary (50%) and Final (100%) Conformance Review Submittals in accordance with paragraph 5.1 below. All drawings submitted for review shall be half-size (11" X 17"). In addition to the quantities listed in table 5.1, the Contractor shall submit one full size set of plans to the installation (Fort Riley Family Housing; ATTN: ATZL-PW-H/Pam Newman) and one full size set of plans to the U.S. Army Corps of Engineers (Fort Riley Area Office; ATTN: CENWK-FM-RI/Robert Avery) for each review submittal. Also submit one (1) full size copy to the installation (Fort Riley Family Housing; ATTN: ATZL-PW-H/Pam Newman) and five (5) full size sets of drawings to the U.S. Army Corps of Engineers (Fort Riley Area Office; ATTN: CENWK-FM-RI/Robert Avery) at the Design Complete Stage. Full size drawings shall be 24" X 36" the inside border shall be 22" X 34".

5.0 MAILING OF DESIGN SUBMITTALS

5.1 Mail all design submittals to the Government during design and construction using 2-day mailing service. All submittals are to be sent by express mail or other expeditious means. Distribution of each design submittal shall be made by the AE directly to the reviewing agencies with the required number of copies as indicated on the following submissions listing.

	Fast Track	50%	100%	Design complete
Commander Fort Riley Family Housing ATTN: ATZL-PW-H/Pam Newman 45 Barry Avenue (Carr Hall) Fort Riley, KS 66442	12	12	12	6
US Army Corps of Engineers Fort Riley Area Office ATTN: CENWK-FM-LV/Robert Avery Bldg. 322, Marshall Ave Fort Riley, KS 66442	6	6	6	6
U.S. Army Corps of Engineers Kansas City District ATTN: CENWK-PM-MO/Werner -Rm 807 601 E. 12th St., 700 Federal Bldg. Kansas City, MO 64106-2896	12	12	12	6
Gould Evans Goodman Associates, LC ATTN: Jim Schraeder 4041 Mill Street Kansas City, MO 64111	3	3	3	3

5.2 Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

6.0 COORDINATION:

6.1 Written Records. The Contractor shall prepare a written record of each design site visit, meeting, or conference, either telephonic or personal, and furnish within five (5) working days copies to the Contracting Officer and all parties involved. The written record shall include subject, names of participants, outline of discussion, and recommendation or conclusions. Number each written record for the particular project under design in consecutive order.

6.2 Design Needs List. Throughout the life of his contract the Contractor shall furnish the COR a monthly "needs" list for design related items. This list shall itemize in an orderly fashion design data required by the Contractor to advance the design in a timely manner. Each list shall include a sequence number, description of action item, name of the individual or agency responsible for satisfying the action item and remarks. The list will be maintained on a continuous basis with satisfied action items checked off and new action items added as required. Once a request for information is initiated, that item shall remain on the list until the requested information has been furnished or otherwise resolved. Copies of the list will be mailed to both the Administrative Contracting Officer and the agencies tasked with supplying the information.

6.3 The importance of careful checking and coordination of Drawings, Specifications, and other Project Documents cannot be overemphasized. It shall be the responsibility of the DESIGNER to check and coordinate all Project data prior to all design submittals. Deficiencies, ambiguities, conflicts and inconsistencies shall be rectified prior to submittal of Documents. The letter of

transmittal shall certify that all Documents have been checked, coordinated, approved, signed, and dated and that the Documents comply with Contract requirements. The transmittal letter shall be signed by a principal of the DESIGNER's firm.

7.0 GOVERNMENT REVIEW

7.1 Within 21 days after Notice to Proceed: If the Contractor's design schedule is different than the design schedule submitted with his proposal, the Contractor shall submit, for approval, a complete updated design schedule with all submittals and review times indicated in calendar dates. The Contractor shall update the design schedule at least once a month. The Contractor will also provide an updated design schedule whenever circumstances dictate a change in schedule. No design submittals will be reviewed or evaluated until after receipt and acceptance of the proposed design/review schedule.

7.2 Review Conferences. All review conferences will be held at Fort Riley, Kansas and will be scheduled approximately 21 calendar days after the Government receives all required design submittals for each review required. The review will be for conformance with the requirements of the RFP. At a minimum the following Contractor personnel shall attend these conferences: The Design PM, all Designers of Record and the Construction Project Manager. The DESIGNER shall be responsible for preparing and distributing meeting minutes for all conferences. Conference notes will be prepared and furnished to the COR, within 5 days after date of conference. These minutes shall include the date, place and a list of attendees, their organization and telephone number. General comments made during the conference, or decisions affecting criteria changes, must be recorded in the basic conference notes. The minutes must clearly indicate for any actions required that effect schedule or the next submittal and who is responsible, what is expected and when it is required. The Contractor shall answer and respond to all comments in Dr. Checks, and shall be included with the next scheduled submittal.

7.3 If a design submittal is late in accordance with the contractor's current design schedule, the Government review period will be extended an equal number of days for each day the contractor is late. Revisions to submittal submission dates and schedules must be made in writing at least one (1) week prior to the effected submittal. Submittals will not be reviewed during the last two weeks of December or the first 3 days of January. The contractor shall include this dead time in his schedule and adjust it accordingly.

7.4 Post review conference action: Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Valid comments will be incorporated. After receipt of final corrected design documents upon incorporation of backcheck comments the Kansas City District will recommend issuance of a Construction Notice to Proceed (NTP). The Government, however, reserves the right to disapprove design document submittals if comments are significant. If final or backcheck submittal(s) are incomplete or deficient, and require correction by the Contractor and resubmittal for review, the cost of rehandling and reviewing will be deducted from payment due the Contractor at the rate of $ 5,000.00 per submittal.

8.0 DESIGN ANALYSIS: The Design Analysis (DA) shall be prepared by the

DESIGNER in accordance with the guidance provided in the Kansas City District AE Manual. The Design Analysis will incorporate all contract requirements that are not appropriate for inclusion in the contract drawings and specifications

8.1 Media and Format. Present the design analysis on 8-1/2-inch by 11-inch paper except that larger sheets may be used when required for graphs or other special calculation forms. All final documents will be provide to the Government on CD-ROM

8.2 Organization. The DA shall be bound in one document. Furnish a table of contents, which shall be an index of the indices, when there is more than one volume. The title page shall indicate the name of the project, project number and the applicable submittal being made for review (“fast track, 50%, etc)

8.3 Design Calculations. Provide a general table of contents in addition to the individual indices. Bind them separately from the narrative part of the design analysis. The design calculations shall be clean and legible. Identify the source of loading conditions, supplementary sketches, graphs, formulae, and references. Explain all assumptions and conclusions. Calculation sheets shall carry the names or initials of the author and the checker and the dates of calculations and checking. No portion of the calculations shall be computed and checked by the same person. Include descriptions of the computer programs used and copies of the input data and output summaries. Provide sufficient information to permit manual checks of the results.

9.0 GENERAL DESIGN CRITERIA: criteria included in the RFP is intended to serve as a minimum standard for the DESIGNER in the preparation of Design Documents, which will satisfactorily meet design, and construction standards for the project. Technical manuals and other DOD criteria shall not be included by reference in the DESIGNER-prepared Specifications and Drawings. **Additional criteria** that may prove helpful in preparing the design are as follows:

- **Engineering Technical Letters (TL),** latest editions. (See Techinfo at http://www.hnd.usace.army.mil/techinfo/)

- **Fire Protection Plan.** All building design shall be in conformance with Military Handbook 1008C(see http://www.hnd.usace.army.mil/techinfo/). A fire protection plan shall be developed and submitted with the preliminary design submittal. It shall be updated with subsequent submittals.

- **Army Technical Manuals (TM),** latest editions.(See Techinfo)

- **U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1),** latest edition is provided as an attachment to the Electronic Bid Sets provided with this RFP.

- **Kansas City District AE Instruction Manual.** (Included in RFP Documents) The District AE Instruction Manual is provided as general guide in the preparation of Design Documents. Chapters 18 and 19 of the Manual do not apply to the design of this Project.

9.1 DRAWINGS: Prepare all drawings using Intergraph Microstation format. The final full-size drawings shall be 24” X 36” the drawing, inside the border shall be 22" x 34" format. The Contractor will be provided and use standard Corps of Engineers title blocks and borders on all drawings. An index of drawings will be included with each submittal. Additionally the contractor will use the Tri-Service Standards for CADD/GIS that are an attachment to this RFP. The Contractor can access the web site for Computer-Aided Designed Systems as guidance for standard details, cell libraries, title blocks, and layer/level assignments. https://tsc.wes.army.mil/products/standards/aec/intro.as. All Design complete files will be submitted on a read/write CD-Rom and must be independent, freestanding, and not supported by reference files. All Xrefs files shall be removed at the “Design Complete” submittal.

9.2 SPECIFICATIONS

9.2.1 The Specifications will be bound and have a cover with the project name, number and submittal phase. It will include a table of contents, an index page at the beginning of each specification section. The Kansas City District will provide electronic copies of the prescriptive specifications and drawing files contained in this RFP to the designer. The designer shall incorporate these Specifications without editing into their final design documents. However the technical specifications provided with this RFP are not inclusive, and must be supplemented by the Designer as necessary to satisfy the RFP requirements.

The Contractor is encouraged to use one of the major, well-known master guide specification sources such as **MASTERSPEC** from the American Institute of Architects, **SPECTEXT** from Construction Specification Institute or he may use **Corps of Engineers Guide Specifications,** etc. The Designer shall edit the specifications specifically for this project.

When the Contractor intends to provide a brand-name product indicated in RFP the solicitation (this does not include “or equal” submittals) no additional specification or submittal review for compliance is required. Instead the designer shall include a copy of the product manufacturer’s cut sheet and installation instructions that show compliance with the RFP in the appropriate Construction Division Section. The Contractor may also submit product manufacturer cut sheets and installation instructions for other items not specifically identified by brand name in lieu of a specification provided this does not change once the product is reviewed for compliance with the RFP, by the COR. The specification should be brief, and to the point. Discuss only the criteria needed to comply with this RFP.

9.2.2 Submittal Register. (Eng Form 4288 (RMS)). Develop the submittal requirements during construction during the design phase of the contract, by producing a Contractor Submittal Register during design. Attach a submittal register to each section of the specifications for the submittal requirements of that section. Prepare the Submittal Register on ENG Form 4288. The Contractor shall be responsible for listing all required submittals necessary to insure the project requirements are complied with. The Register shall identify submittal items such as shop drawings, manufacturer's literature, certificates of compliance, material samples, guarantees, test results, etc that the Contractor shall submit for review and/or approval action during the life of the construction contract. The Contractor shall place all the Submittal Register pages in an appendix of the final specifications. The DESIGNER shall create the Specifications, Submittal Register using the Corps' Resident Management System (RMS). The Corps will provide the DESIGNER with the necessary RMS software. The DESIGNER shall complete all information,

including title and location and specification section blocks and all columns of ENG Form 4288 (RMS) Submittal Register.

10.0 CONTENTS OF DESIGN SUBMITTALS

10.1 "FAST-TRACK" 100% site/utility design submittal if applicable.

10.1.1 The documents furnished with this RFP have established many of the factors influencing site decisions. Existing utility systems will be upgraded where necessary to meet design loads. Those not defined by the RFP are the responsibility of the Design-Build contractor:

10.1.2 All "fast track" drawings shall be developed to 100 percent completion. In addition to the individual utility plans, submit a combined utility plan drawn to the same scale as the individual utility plans.

a. General Site Layout: Scale shall be included.

b. Site Grading and Drainage Plans: Show locations of all sediment basins, diversion ditches, and other erosion control structures. Indicate the approximate drainage areas each will service. Indicate the materials, construction and capacity of each structure. Include limits of landscaping and seeded areas. General site grading and drainage shall be indicated by contour lines with an interval of not more than approximately .3 m [1 foot].

c. Road Alignment and Pavement Plans: Scale shall be no greater than as indicated and profiles showing pavement and shoulder widths, azimuths and curve data, limits of grading, and erosion control. The materials to be used shall be indicated.

d. Traffic Control Plan: Traffic routing and signage shall be in accordance with The Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highways Administration.

e. Utility Systems: The Contractor shall prepare a design narrative for the natural gas, water supply, storm drainage, and wastewater systems relating to this project. Include an analysis of the existing distribution systems capability to supply sufficient quantity at adequate levels. If the existing distribution systems are inadequate, provide the design solution to augment the systems to provide the requirements for the new facilities.

f. Sanitary Sewer Plan: Scale shall be as indicated and profiles showing location and elevation of pipe, thrust blocks, manholes, etc. Materials and construction of main and appurtenances shall be indicated.

g. Water Supply Line Plans: Scale shall be as indicated and profiles showing locations of valves, thrust blocks, connections, etc. Materials shall be indicated and specifications shall be provided for valves, pipes, etc.

h. Electrical Plan Requirements:
Required diagrams and details on Site Electrical Drawings.

a. Off-Site Electrical Distribution Plan:
b. Off-Site Primary Circuit Routing Plans:
c. Off-Site One Line Diagram. (If applicable)

d. Off-Site Details. (Aerial Pole Line Construction, etc.) (If applicable).
e. On-Site Electrical Distribution Plan:
f. On-Site One Line Diagram.
g. On-Site Distribution Transformer Schedule: Provide with the following headings:
Transformer Designation. Transformer Size (KVA). Building(s) Served. Primary Phase(s) and Circuit to which connected.

h. On-Site Details (Site Lighting, Trenching, Pad-Mounted Transformer, etc.).

i. Specifications: Provide final draft specifications that include all sections which apply to site/utility work.

j. Design Analysis: Design analysis shall include design calculations fully developed to support the design of the site and utility systems included in this submittal.

k. Geotechnical: Soils analysis and geotechnical report. Geotechnical information must be provided to support all assumptions and design parameters utilized in the presented site/utility design as applicable.

10.2 The 50% design submittal shall contain as a minimum, the following:

10.2.1 Landscape, Planting and Turfing: The concept drawings shall be prepared at a scale which corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas, as needed, to clarify requirements. The proposed layout shall indicate shade trees, evergreen trees, flowering trees, shrub masses, etc., according to designated functional and visual locations of planting. A legend which also indicates sizes of plants recommended for each of the above categories shall be included. The drawings and all subsequent plans shall indicate existing and proposed buildings, paved areas, signs, light standards, transformers, dumpster areas, storm drainage system, and other structures and utilities.

10.2.2 Architectural

a. The first sheet of the Architectural plans shall include a detailed code analysis that demonstrates compliance with the RFP solicitation, including all applicable NFPA and Life Safety Code requirements. Architectural Floor Plans shall indicate dimensions, columns lines, and detail references. Bathrooms and other specialized areas shall be drawn to 1/4" scale and shall show any needed interior features.
b. Finish schedule shall indicate material, finishes, colors and any special interior design features such as soffits, fascias, and lighting troughs, etc.
c. All required equipment shall be shown on the drawings with an equipment list.
d. List any special graphics requirements that will be provided.
e. Schedules shall be provided for both doors and windows. These schedules shall indicate sizes, types, and details for all items shown on floor plans.
f. Hardware sets using BHMA designations.

g. SID package.
h. Fire Protection and Life Safety Analysis.

10.2.3 Structural Systems

a. The first sheet of the Structural plans shall include a detailed code analysis that demonstrates compliance with the RFP. State the live loads to be used for design. Include roof and floor loads; wind loads, lateral earth pressure loads, seismic loads, etc., as applicable.
b. Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.
c. Furnish calculations for all principal roof, floor, and foundation members.
d. This submittal shall include drawings showing roof and floor framing plans as applicable. Principal members will be shown on the plans. A foundation plan shall also be furnished showing main footings and grade beams where applicable. Where beam, column, and footing schedules are used, show schedules and fill in sufficient items to indicate method to be used. Show typical bar bending diagram if applicable. Typical sections shall be furnished for roof, floor, and foundation conditions. Structural drawings for proposals and submittals shall be separate from architectural drawings.
e. Provide any computer analyses used shall be widely accepted, commercially available programs and complete documentation of the input and output of the program.
f. Provide complete seismic analyses for all building structural components. Seismic calculations shall clearly demonstrate compliance with all requirements set forth in the Statement of Work.

10.2.4 Plumbing Systems

a. Mechanical and plumbing sheets can be combined. The first sheet of the mechanical/plumbing plans shall include a detailed code analysis that demonstrates compliance with the RFP. List all references used in the design including Government design documents and industry standards.
b. If know at the time of design, submit catalogue cuts, manufactures installation instructions, and other appropriate information for each plumbing fixture, in lieu of a specification.
c. Prepare detail calculations and indicate appropriate size for systems such as domestic water piping and natural gas piping.
d. Indicate locations and general arrangement of plumbing fixtures and major equipment.
e. Include plan diagrams of all gas, hot water, cold water, waste and vent piping. Piping layouts and risers should also include natural gas (and meter as required), and other specialty systems as applicable.
f. Include equipment and fixture connection schedules with descriptions, capacities, locations, connection sizes and other information as required.

10.2.5 Electronic Systems: Electronic Systems responsibilities include the following: Fire Detection and Alarm System, Telephone System, Cable Television System, Special Grounding Systems, Cathodic Protection, Central Control and Monitoring System.
a. The design analysis shall include all calculations required to support design decisions and estimates at this stage of design. The analysis shall include specific criteria furnished, conference minutes and cost analyses of all systems considered.

b. Design of the fire alarm and detection system shall include layout drawings for all devices and a riser diagram showing the control panel, annunciator panel, all zones, radio transmitter and interfaces to other systems (HVAC, sprinkler, etc.).

c. The location of telephone outlets are shown on the plans. Include legend and symbol definition to indicate height above finished floor. Underground telephone distribution conduit shall be shown on either the electrical plan.

d. Grounding System. The specifications and drawings shall completely reflect all of the design requirements. The specifications shall require field tests (in the construction phase), witnessed by the Contracting Officer, to determine the effectiveness of the grounding system. The design shall include drawings showing existing construction. Verification of the validity of any existing drawings and/or any other data furnished by the Government shall be the responsibility of the engineering services firm.

e. Provide a statement describing the extent of any exterior work such as telephone lines, cable television (TV) distribution cables, duct banks, etc., outside of 5 feet from the building line.

f. When cathodic protection is required, provide the name of the licensed corrosion engineer or NACE specialist. Provide the following for cathodic protection systems:

- Clearly define areas of structures or components in soil or water to be protected.
- Type system recommended, comparison of systems, cost estimates showing all equipment alternatives.
- Calculations on all systems that are considered showing all information and descriptions.

Design of Cathodic Protection. The design shall clearly provide a thorough and comprehensive specification and drawing. The design plans and specifications shall show extent of the facilities to be protected, location and type of anodes, location of test points, details for sectionalizing an underground piping system. This design shall be complete enough to purchase equipment and build without design changes to meet criteria of protection.

g. Exterior work to be shown on electrical site plan.

- Existing and new communications service lines, both overhead and underground, shall be properly identified.
- Show removals and relocations, if any.

h. Provide a descriptive narrative of all electronic systems that are required for project. Define any hazardous areas (as defined in the National Electric Code) and indicate the type of equipment proposed for use in such areas. Show the location of all electronic system panels, etc., on the floor plans. Show the proposed riser diagrams for all systems. Sizes of all conduit, wires, cables, panels, etc. Provide a complete symbol legend for all devices or equipment shown on the plans. For work requiring removals or demolition, the designer shall show by use of drawings or narrative, how demolition work is to be done.

10.2.6 Electrical and Mechanical Systems: Provide all information as required on the 100% design submittal developed to 50% completion.

10.2.7 Specifications: Draft of specifications for housing units, including

index and trade sections.

10.3 The 100% design submittal shall contain, as a minimum, the following items for all submittals:

10.3.1 General: A complete set of construction documents plans and specifications at the same level of detail as if the project were to be bid including a complete list of equipment, fixtures and materials to be used. The final drawings are an extension of the reviewed 50% drawings and are to include the 50% comments and responses. All details shall be shown on the drawings.

10.3.2 The design analysis is an extension of the reviewed 50% design analysis and supports and verifies that the design complies with the requirements of the project.

10.3.3 Submit marked-up specifications. The specifications shall be coordinated with the drawings and describe in detail all items shown on the drawings.

10.3.4 Landscape, Planting and Turfing Final design drawing(s) shall include a complete schedule of plant materials which indicates their botanical and common names, plan symbols, quantities, sizes, condition furnished, and pertinent remarks. Scale of drawing shall be prepared at 1" = 30'. Drawing shall correspond with the site layout and grading plans and reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas as needed, to clarify requirements. Final design drawings, indicating proposed plants by a (+) mark for the plant location and a circle which is scaled at approximately 2/3 the ultimate growth spread (diameter) of plants, shall also include a complete schedule of plant materials which indicates botanical and common names, plan symbols, quantities, sizes, condition furnished, and pertinent remarks. Final drawings shall also include the basic details for installation of tree, shrub, and ground cover planting, as well as any other applicable details for clarification of specific project requirements.

10.3.5 Architectural

10.3.5.1 All architectural drawings shall be coordinated with the other engineering disciplines. Ensure that the plans are in compliance with the applicable codes. It will be the Contractor's responsibility to implement the comments generated from any design review submittal as well as verify the consistency between plans and specification. The evaluation of the Contractor's submittals shall be based on degree to which the submittal meet the requirements set forth in this document and the specifications.

10.3.5.2 SID package.

10.3.6 Structural Design

10.3.6.1 Furnish complete checked calculations for all structural members. Incorporate any changes required by comments on 50% Design Submittal.

10.3.6.2 Prior to this submittal, structural drawings shall be coordinated with all other design disciplines.

10.3.6.3 The final structural drawings shall contain the following information as a set of general notes:

The allowable soil bearing value.
The design stresses of structural materials used.
The design live loads used in the design of various portions of the structures.
The design wind speed.
The seismic zone and the "K", "C", "I" and "Z" values used in design.

10.3.6.4 All structural drawings and calculations shall be checked and stamped by the designer of record (a registered Professional Engineer).

10.3.7 Specific Mechanical and Plumbing Requirements:

10.3.7.1 Required Plans, Diagrams, Schedules and Details on Unit Mechanical Drawings:

10.3.7.1.1. Mechanical Floor Plan: The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plans shall also show the following:

Room designations.
Mechanical legend and applicable notes.
Location of all ductwork or piping (double line ductwork required).
Location and capacity of all terminal units (i.e., registers, diffusers, grilles). Exhaust fan and range hood location.
Size of all ductwork and piping.
Thermostat location.
Location of heating/cooling plant (i.e., hot water heater, furnace, condenser, heat pump wells, etc).
Location of all air handling equipment.
Return air paths (i.e., undercut doors, transfer grilles).
Flue piping size and location.

10.3.7.1.2. Equipment Schedule: Complete equipment Schedules shall be provided. Schedule shall also include:

Capacity
Electrical characteristics
Efficiency
Manufacturer's name
Optional features to be provided
Physical size

10.3.7.1.3 Details: Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design. Roof and exterior wall penetrations shall be detailed on the drawings.

10.3.7.2 Plumbing Floor Plan: Mechanical and Plumbing floor plans can be combined and shall show all principal architectural features of the building which will affect the plumbing design. Separate plumbing plans will not be required if sufficient information can be shown on the mechanical plans to meet the requirements shown above. The floor plan shall also show the following:

Room designations.
Fixture Schedule.
Location of utility entrances.
Waste and water pipe location and size.
Fixture designations.

10.3.7.3 Design Analysis: Complete design calculations for mechanical systems. Include computations for sizing PM&E equipment, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation (e.g., TRNSYS, DOE 2.1 Blast, etc.) is required. These calculations can be used to size the mechanical systems. Based on the results of calculations, provide a complete list of the materials and equipment proposed for heating and plumbing, with the manufacturer's published cataloged product installation specifications and roughing-in data. The heating and cooling equipment data shall include the manufacturer's wiring diagrams, installation specifications, ARI certification, and the standard warranty for the equipment.

10.3.8 Specific Electrical Requirements:

10.3.8.1 Required Plans, Diagrams, Schedules, and Details on Unit Electrical Drawings:

10.3.8.1.1. Electrical Floor Plan. The floor plans shall show all principle architectural features of the building which will affect the electrical design. The floor plan shall also show the following:

Room designations.
Electrical legend and applicable notes.
Lighting fixtures, properly identified.
Location of smoke and CO detectors.
Location of telephone and cable TV outlets.
Switches for control of lighting.
Receptacles.
Location and designation of panelboards. Plans should clearly indicate type of mounting required (flush or surface) and be reflected accordingly in specifications. Service entrance (conduit and main disconnect).
Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.

10.3.8.1.2. Building Riser Diagram (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.

10.3.8.1.3. Load Center Panelboard Schedule(s): Schedule shall indicate the following information:

Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting.
Branch Circuit Designations.
Load Designations.

Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)
Branch Circuit Connected Loads (AMPS).
Special Features.

10.3.8.1.4 Lighting Fixture Schedule: (Schedule shall indicate the following information:)
Fixture Designation.
General Fixture Description.
Number and Type of Lamp(s).
Type of Mounting.
Special Features.

10.3.8.1.5. Details: Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design.

10.3.8.2. Required Electrical Design Analysis: Design analysis and calculations for the electrical systems shall be prepared by a licensed professional engineer with experience in family housing, and shall be stamped as such. The design analysis shall be separately bound, in one or more volumes. Show functional and engineering criteria, design information, and calculations applicable to the project. The analysis shall be organized in a format appropriate for review, approval, and record purposes. The design calculations shall indicate methods and references identified, and shall explain assumptions and conclusions.

10.3.8.2.1. Voltage Drop (VD) Calculations: Select conductor sizes of primary feeders, site lighting circuits, service laterals, and unit feeder conductors. Calculate maximum length for each phase of each primary circuit, using a maximum allowable VD for each circuit. Calculate voltage drops for each conductor. Maximum allowable voltage drop for site lighting and service laterals is 3%. The combined voltage drop for the service laterals, unit feeders, and branch circuit cannot exceed 5%. Calculate the available fault current at the main breaker for the living unit panel. Provide a coordination study to support breaker selection.

10.3.9 Specifications: Provide final specifications. The Contractor shall make final identification of all materials and finishes at this stage.

10.4 Design complete submittal:

10.4.1 Design Drawings: Drawings shall be 100% complete, signed and sealed by the designer of record. All previous review comments shall be incorporated.

10.4.2 Design Analysis: Complete design analysis for all design disciplines. The final Fire Protection and Life Safety Analysis shall be included in the Design Analysis.

10.4.3 Design Specifications: Complete design specifications for all sections of work that demonstrates compliance with the RFP. All previous review comments shall be incorporated.

10.4.4 Comment Response Package: Complete package showing all comments from all previous reviews and the respective response and disposition.

10.4.5 This submittal shall include all drawings and design information from the 100% site/utility submittal to form a complete design package.

10.4.5 Consumer Information for Accessibility Requirements. The Contractor shall furnish a report including drawings in accordance with the Uniform Federal Accessibility Standards, paragraph 4.34.4 “Consumer Information” for the modified and adaptable features of each applicable unit type of family housing.

11.0 DESIGN RELATED PRODUCTS

11.1 DD Form 1354: Three (3) sets of DD Form 1354, Transfer and Acceptance of Military Real Property shall be prepared in accordance with ER 415-345-38 and submitted to the Contracting Officer. Copies of Form 1354 and ER 415-345-38 will be furnished to the successful contractor following award of the project.

11.2 Submittal Register, ENG FORM 4288: The Contractor shall complete and submit three (3) copies of a "preliminary" Eng Form 4288, Submittal Register to Contracting Officer. The "preliminary" Eng Form 4288, Submittal Register shall have the column "Submittal Identification", "Specification Paragraph Number", "Description of Submittal" "Type of Submittal", and "Remarks" completed; the Contractor shall identify whether the submittal is for "Government Approval" or for "Government Information" under the column "Remarks." The "final" Eng Form 4288, Submittal Register, shall be in accordance with clause CONTRACTOR SUBMITTALS AND SUBMITTAL CONTROL in this section.

11.3 Reproduction: Upon Government approval of 100% design documents, the original will be returned to the Contractor for reproduction purposes. The Contractor will be responsible for his own reproduction as well as reproduction for Government use. The original design drawings will be retained by the Contractor for recording of as-built conditions. Upon completion of the project, the original design documents shall be corrected to reflect as-built conditions and new revised drawings turned over to the Government.

12 Other Miscellaneous Requirements and Standards.

12.1 OSHA Regulations. The DESIGNER shall be responsible for full compliance with regulations of the occupational Safety and Health Act of 1970 and for the design of the Project to preclude violations to said act from occurring as a result of the design.

12.2 Site Inspection. The Government has provided site and soils information within the Request for Proposal (RFP) for the DESIGNER to use in preparing subsequent design. The DESIGNER shall be responsible for making the necessary field visits to assess existing conditions and to obtain such detailed information as is required to complete the design. Investigations to determine existing conditions and requirements include required upgrades/improvement to existing utilities.

12.3 Site Survey and Subsurface Explorations. Preliminary topographic survey of the buildings site and a preliminary “Subsurface Investigations Report” for the buildings site are furnished as part of the RFP for bidding purposes.

The Designers Boring logs and basic soils design assumptions shall be shown on the DESIGNER prepared Construction Drawings. It is the responsibility of DESIGNER OF RECORD to do perform his own topographic survey and boring logs to verify the actual site conditions regardless of the information provided with the RFP. The DESIGNER OF RECORD shall assume full responsibility for the design and design assumptions. The Government assumes no liability or responsibility for the design because of inaccurate or missing data in the preliminary site survey(s) or geo technical reports.

12.4 Design Project Manager. During the prosecution of the work under the Contract, the DESIGNER shall keep in close liaison with the Corps of Engineers Project Delivery Team and the Contracting Officer, who will coordinate the work with the Installation and the Contractor. All requests made by the Installation, Using Service and/or other agencies shall be made through the Contracting Officer. The Using service has no authority to make changes or direct the Contractor to do any work under this contract. At appropriate times, representatives of the Contracting officer may review the progress and technical adequacy of the work. Such review will not relieve the DESIGNER from performing all Contract requirements, except as may be waived by written instruction.

12.5 Checking of Shop Drawings. The DESIGNER shall check and recommend approval, or disapproval, of all contractor shop and working drawings, including catalog cuts, diagrams, samples required for the selection of material and/or colors, and other descriptive data designated for designer approval, pursuant to Section 01330, Submittal Procedures, and the technical provisions of the Construction Specifications approved by the government.

12.5.1 Pursuant to Section 01330, Submittal Procedures, for those submittals designated for approval by the DESIGNER, the contractor will submit copies of the shop and working drawings, catalog cuts, diagrams, and ENG Form 4025 directly to the DESIGNER for review and recommendations for approval. Any notes or changes recommended by the DESIGNER shall be incorporated on all copies of the drawings, catalog cuts, etc. The Designer’s recommended approval or disapproval shall be recorded on ENG Form 4026, or similar approved form, and copies thereof forwarded to the Resident Engineer. Action codes are contained on ENG Form 4025. Copies of the corrected shop drawings, catalog cuts, diagrams, etc., and copies of the ENG Form 4025 shall be forwarded by the DESIGNER to the Resident Engineer. Samples for selection of materials and/or color shall be returned to the Resident Engineer. The DESIGNER shall not mark actions on ENG Form 4025.

12.5.2 Data submitted from more than one manufacturer for a single item shall be returned with' a recommendation of "Not Approved" through the Resident Engineer, with the request that the contractor submit one (1) make, since approval can be given to only one. Substitutions submitted at a later date shall not be approved unless the contractor gives a valid reason, such as delayed delivery, discontinuance of manufacture, etc., which has been verified by the Resident Engineer. Equipment or materials which do not ' meet all requirements of the RFP and the plans and Specifications will not be approved. Substitute equipment and materials submitted by the contractor will be given no consideration and will be returned "Not Approved" through the Resident Engineer unless accompanied by a full explanation by the contractor, describing all points in which it differs from the requirements of the Specifications, how its substitution will affect other items, and the reasons for submittal. If material is submitted in this manner by the contractor, and

if, in the opinion of the DESIGNER, the substitute has merit and should be considered, the entire Submittal together with comments and recommendations, will be forwarded to the Resident Engineer for action and approval.

12.6.3 The contractor is responsible for field fit and dimensions.

12.6 Design Services During Construction: The DESIGNER must perform necessary visits to the site and preparation of modifications to the plans and Specifications, as required, such as those required by changed field conditions.

13.0 Designer Responsibility. The DESIGNER's responsibilities will remain in force until construction of the Project has been completed. During this period, the DESIGNER will be responsible for the correction of any design errors or deficiencies and any reconstruction costs resulting there from.

14.0 As-built Drawings. The Design Build Contractor shall provide final as-built drawings. The Design Build Contractor shall maintain Red Line as-built Drawings and CADD files during the course of Project construction. **See Section 01100 for additional information**.

15.0 NPDES Permit Requirements. The DESIGNER's site design shall include all appropriate measures, including best management practices, to control pollutants in storm water discharges during construction, in accordance with applicable state or local erosion and sediment control requirements. The construction activities for this Project are anticipated to disturb more than five acres. Pursuant to Section 01410, Environmental Protection and Erosion Control, the Corps of Engineers will obtain a National Pollution Discharge Elimination System (NPDES) permit for storm water discharges associated with construction activities. The design shall assure that all requirements under the terms and conditions set out by the permit are complied with.

16.0 Hazardous Materials. It is not anticipated that the DESIGNER will encounter any hazardous material not already identified with the RFP documents during the course of the Project design. However, in the event that a suspected hazardous material is encountered during field investigation or other design related effort, the DESIGNER will inform the ACO immediately. Further, a letter shall be forwarded to the ACO fully documenting the suspected material, location and other pertinent information. The term hazardous material shall include but not be limited to, lead based paint, asbestos, PCBs and pesticides. The DESIGNER has no responsibility, unless specifically stated otherwise in the Contract, to design for the remediation of any suspected hazardous material.

APPENDIX A

The final Design Documents shall include 100 percent complete and coordinated Drawings and Specifications.

1 Drawings. All Drawings shall bear the stamp (seal) and signature of the design discipline (Professional Engineer or Architect) responsible for the design of the Project. Upon completion of the Work, the electronic media and hard copy documentation shall become the property of the Government.

1.1 Drawings. Drawings shall include the following, as a minimum, in the order listed:

1.1.1 Civil Drawings.

a. Detailed Code Analysis Sheet
b. Demolition Plan

c. Site Layout (Complete Plans and Dimensions: Site layout shall show all surface features including buildings, pavements, roadways, curbs, manholes, fire hydrants, valve boxes, culvert headwalls, utility poles, exterior lighting poles, foundations at grade, sidewalks, meters, lift station, etc.

d. Grading and Drainage Plan
(1) New and existing grading contours with spot elevations and contours, at paved areas.
(2) Contours shall not be greater than one (1) foot.
(3) Complete storm drainage systems with manholes, inlets, headwalls, etc. (4) Identify storage area for stockpiled topsoil.
(4) Identify limits of construction and limits of grading.
(5) Indicate berms, swales, flumes, etc.
(6) Identify temporary erosion control measures.
(7) Locate area for Design/Build Contractor's storage, office, parking, and staging.
(8) Locate temporary fence.
(9) Underdrain drainage system.
(10) Set elevations for all buildings, foundations, manholes, etc. to a fixed elevation datum.

e. Site Utility Plan; Routing of sewer, water, gas, telephone, communications and electrical services.

f. Site Details
(1) Profile of gravity flow systems
(2) Paving section details including:

(a) Transition details between pavement types
(b) Pavement edge details

(3) Temporary markings and barricades
(4) Identify type of new surfaces and provide joint patterns in new concrete paving Concrete paving construction, contraction and expansion joints.

(5) Details of at-grade foundations
(6) Sidewalk details
(7) Drainage inlet and outlet details
(8) Manhole details
(9) Curb details

g. Landscaping:
(1) Identify limits
(2) Provide layout of planting, seeding, sodding, and ground cover
(3) Plant Lists
(4) Planting and details

1.1.2 Structural Drawings

a. Code Analysis Sheet. Structural Notes: Design statements shall be made on these Drawings such as design loads, design codes, allowable soil loads, etc.
b. Foundation Plans and Details
c. Roof and Wall Framing and Construction Details
d. Steel Details
e. Schedules

1.1.3 Architectural Drawings

a. Plans
(1) Code Analysis Data, Life Safety Plans
(2) Overall Floor Plan
(3) Enlarged Floor Plans
(4) Ceiling Plans
(5) Roof Plans

b. Elevations
(1) Exterior Buildings- all unit combinations and types
(2) Interior Elevations – Bathroom, Kitchen as required to indicate mounting heights for cabinets and accessories

c. Sections and Details
(1) Building
(2) Walls
(3) Windows and Doors

d. Schedules (some can be provided in the Specifications)
(1) Door and Windows/Hardware
(2) Room Finish (can be provided in Specifications)

1.1.4 HVAC Drawings may be combined with plumbing drawings as long as they are clear and legible

a. Plans
(1) Code Analysis Data.
(2) Overall Floor Plans: Layout of A/C units and ductwork, complete piping and equipment plans.
(3) HVAC equipment piping plans may be combined with plumbing plans as long as they are clear and legible.
(4) Enlarged Floor Plans: Mechanical rooms, and bathrooms.

b. Sections and Details
(1) Mechanical rooms and piping trenches. User equipment piping and systems.
(2) Fire protection details (risers, etc).
(3) Site utilities metering details.

c. Schedules: Mechanical equipment schedules for all equipment items.

1.1.5 Plumbing Drawings may be combined with HVAC drawings provided they are clear and legible.

a. Plans
(1) Code Analysis Data.
(2) Overall Floor Plan: Layout of all plumbing and piping.
(3) Enlarged Floor Plans: Mechanical rooms and rest rooms
(4) Plumbing details.

b. Schedules: Plumbing equipment schedules for all items.

c. Schematics
(1) Sewer Piping Schematics
(2) Cold Water Piping Schematics
(3) Hot Water Piping Schematics

1.1.6 Electrical Drawings

a. Site Electrical Plan
(1) Code Analysis Data.
(2) All electrical and communication services shown and sized.
(3) Transformers and vaults.
(4) Exterior equipment shown with service.
(5) Exterior lighting plans and details.
(6) Electrical feeds to all equipment.

b. Lighting Plans
(1) Code Analysis Data.
(2) Layout of all lighting fixtures with circuits.
(3) Lighting panels and transformer(s).
(4) Lighting Panel Schedule.

c. Power Plans
(1) Code Analysis Data.
(2) Layout of all receptacles, including junction boxes if required.
(3) Location of electrical disconnects for special equipment.
(4) Power panels and transformer(s).
(5) Panel schedules.
(6) Location of all major equipment requiring power.

-- End of Section --

SECTION 01100

GENERAL

PART 1 GENERAL

1.1 INQUIRIES

Pursuant to SECTION 00100 paragraph titled "Explanation to Prospective Bidders", any inquiries regarding this Invitation, before bids are opened, should be addressed to the District Engineer, Kansas City District, Corps of Engineers, 700 Federal Building, Kansas City, Missouri 64106, ATTN: Mr. David Werner. Inquiries for which oral explanation or advice on the plans and specifications will suffice may be referred to Mr. Werner by calling Area Code 816-983-3265. Telephone calls concerning the mailing of plans and specifications should be made to Contracting Division at Area Code 816-983-3975. Collect telephone calls will not be accepted. (KCDO APR 84)

1.2 SUPERINTENDENCE OF SUBCONTRACTORS

a. The Contractor shall be required to furnish the following:

(1) If more than 50% and less than 70% of the value of the contract work is subcontracted, one superintendent shall be provided at the site and on the Contractor's payroll to be responsible for coordinating, directing, inspecting and expediting the subcontract work. This superintendent is an additional person above that required under the FAR Contract Clause 52.236-6.

(2) If 70% or more of the value of the work is subcontracted, the Contractor shall be required to furnish two such superintendents to be responsible for coordinating, directing, inspecting and expediting the subcontract work. These superintendents are above that required by FAR Contract Clause 52.236-6.

b. If the Contracting Officer, at nay time after 50% of the subcontracted work has been completed, finds that satisfactory progress is being made, he may waive all or part of the above requirement for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at any time during the progress of the remaining work he finds that satisfactory progress is not being made. (KCD DEC 03)

1.3 IDENTIFICATION OF EMPLOYEES

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display identification as may be approved and directed by the Contracting Office. All prescribed identification shall immediately be delivered to the Contracting Officer, for cancellation upon the release of any employee. When required by the Contracting Officer the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project.

1.4 WORKING HOURS

Working hours for this project will be limited to Monday through Friday, 7:30 a.m. to 4:30 p.m., except as follows: Work will not be permitted on weekends and Federal holidays. In unusual circumstances, such as when utility turn-off is required for an extended period of time, authorization for weekend or holiday work may be requested from the Contracting Officer; these instances must be coordinated well in advance, in writing. Likewise, utility turn-off of short duration or work which will disrupt normal operations or traffic flow must be scheduled at least 3 working days in advance and may require schedule changes to ensure that safety is maintained.

1.5 INTERRUPTIONS TO UTILITY SERVICES

A schedule showing the approximate times of interruptions of utility services and

roads shall be submitted approximately 30 days in advance of interrupting services to make connections. Where it is necessary to interrupt services to make connections and the period of interruption will last more than 2 hours, the connections shall be performed on Saturday or Sunday, unless otherwise approved by the Contracting Officer. Final arrangements shall be made with the Contracting Officer at least 72 hours in advance of the scheduled times of interruptions.

1.6 FORT RILEY ACCESS CONTROL

Fort Riley is implementing physical security measures in the form of access control. These measures will apply to all contractors and their employees. Fort Riley will require each vehicle to have either a temporary or permanent identification marker attached. It shall be the Contractor's responsibility to monitor and control all company and employee identification markers and comply with Fort Riley's requirements for issuing and returning these markers.

1.6.1 Minimum Requirements

a. Contractor

(1) Current Lists of all employees.
(2) Current Lists of all subcontractors and employees.
(3) Company identification visibly marked on all vehicles.
(4) Current state vehicle registrations.
(5) Proof of liability insurance.
(6) Valid state drivers license.
(7) Picture identification.

b. Each Employee

(1) Contractor-provided picture identification.
(2) Written verification of employment.
(3) If the employee drives a personally owned vehicle to the job site: valid state drivers license, current state vehicle registration, and proof of liability insurance.

1.6.2 ID Cards

Picture identification cards shall be visibly worn at all times while on the installation.

1.6.3 Responsibility for Compliance

The Contractor shall be responsible for complying with all security conditions as determined by Fort Riley and shall be responsible for any additional requirements that may be implemented.

1.7 APPLICATION OF WAGE RATES

The inclusion of the Davis-Bacon Act General Wage Decision or the Service Contract Act Wage Determination in the solicitation is a statutory requirement. It is not a representation by the U.S. Army Corps of Engineers that any specific work task can be performed by any specific trade. Which work tasks can be performed by what trades depends on and is determined by the prevailing area practice for the local area where the contract is being performed. It is the sole responsibility of the bidder to determine and comply with the prevailing area practice. Inquiries regarding a prevailing area practice should be directed to the Corps of Engineers, Contractor Industrial Relations Specialist (telephone number 816-983-3723) or to the Department of Labor Regional Wage and Hour Division.

Application of wage rates and fringe benefits: For the application of the wage rates and fringe benefits contained in the Decisions of the Secretary of Labor, attached to and a part of this contract, all work required within 5 feet outside building lines shall be considered Residential Construction.

Highway Construction rates apply to the construction, alteration or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects.

All other construction not defined herein as Residential Construction or Highway Construction shall be considered Heavy Construction.

1.8 PAYMENTS TO SUBCONTRACTORS

The Contractor's attention is directed to CONTRACT CLAUSE titled "Payment Under Fixed-Price Construction Contracts." In addition to the requirements set forth in the referenced paragraph, the Government will reimburse the Contractor, upon request, for amount of premiums paid by the subcontractors for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor furnishes evidence of full payment to the surety.

1.9 PAYMENTS TO CONTRACTOR (KCD MAY 90 - FORMERLY FAR 52.2/9101(a))

The following is an example of a Contractor's release of claims clauses required to comply with the provisions of paragraph (h) of the CONTRACT CLAUSE titled "Payments Under Fixed-Price Construction Contracts":

RELEASE OF CLAIMS

The undersigned Contractor under contract dated _____, 2000, between the United States of America and said Contractor for the _____ located at _____, in accordance with paragraph (h) of the CONTRACT CLAUSE titled "Payments Under Fixed-Price Construction Contracts" of said contract, hereby releases the United States, its officers, agents, and employees from any and all claims arising under or by virtue of said contract or any modification or change thereof except with respect to those claims, if any, listed below:

(Here itemize claims and amounts due.)

1.10 PARTNERING

The Government intends to encourage the foundation of a cohesive partnership with the Contractor and its subcontractor. This partnership will be structured to draw on the strengths of each organization to identify and achieve mutual goals with the intent to complete the Contract within budget, on schedule and in accordance with plans and specifications. This partnership will be bilateral in makeup, and participation will be totally voluntary. Any cost associated with implementing this partnership will be agreed to by the Contractor and the Government, and will be shared equally with no change in Contract price. To implement this partnership initiative, it is anticipated that thirty (30) days after Notice to Proceed, a team building workshop will be conducted. Follow-up workshops will be held periodically throughout the duration of the Contract as agreed to by the Contractor and the Government.

1.11 PROSPECTIVE CONTRACTOR RESPONSIBILITY

Each bidder shall furnish, within 3 calendar days after receipt of request therefor, data which will show the bidder's ability to perform the work or services required by this Invitation for Bids. Such data shall include as a minimum: Bank certification of financial capability, or a financial statement not over 60 days old, which will be treated as confidential (if over 60 days old, a certificate shall be attached thereto stating that the financial condition is substantially the same or, if not the same, the changes that have taken place); names of commercial and financial reporting agencies from whom credit reports may be obtained; trade creditors; name and address of bonding company; business and construction experience; past record of performance of Government contracts; and construction plant and equipment available for this job, with resume of work in progress or other data that will assure that the bidder is in a position to perform the work within the time specified.

In addition, if the bid exceeds $1,000,000, the bidder shall furnish upon request, a certified statement listing:

(a) Each contract awarded to him within the preceding three-month period exceeding $1,000,000 in value with brief description of the contract.

(b) Each contract awarded to him within the preceding three-year period not already physically completed and exceeding $5,000,000 in value with brief description of the contract.

(c) If the prospective Contractor is a joint venture, each joint venture member will be required to submit the above defined certification. There shall also be furnished any other available information which will serve to substantiate the bidder's qualifications as a responsible prospective Contractor. (KCD APR 84)

1.12 PERFORMANCE OF WORK BY CONTRACTOR

Bidder's attention is directed to SPECIAL CLAUSE titled "Performance of Work by Contractor." The successful bidder will be required to furnish the Contracting Officer, a description of the work which he will perform with his own organization (e.g., earthwork, paving, etc.), the percentage of the total work this represents, and the estimated cost thereof. Such description of work to be performed by the Contractor's own organization shall be furnished to the Contracting Officer within 10 days after award of the contract.

1.13 LABORATORY AND TESTING FACILITIES

The Contractor shall provide and maintain all measuring and testing devices, laboratory equipment, instruments, transportation, and supplies necessary to accomplish the required testing. All measuring and testing devices shall be calibrated at established intervals against certified standards. The Contractor's measuring and testing equipment shall be made available for use by the Government for verification of their accuracy and condition as well as for any inspection or test desired pursuant to the CONTRACT CLAUSE titled "Inspection of Construction." The location of the laboratory shall be convenient to the site such that test results are available prior to proceeding with the next sequential phase of the work. (KCD)

1.14 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

(a) This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE titled "Default: (Fixed Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

(b) The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities for the duration of the project.

Note: After the original contract completion date has passed, adverse weather that causes delay for the completion of the project will be granted day-for-day without deducting anticipated adverse weather delay days.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY

WORK DAYS BASED ON (5) DAY WORK WEEK

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(9)	(5)	(3)	(3)	(4)	(5)	(4)	(3)	(5)	(3)	(3)	(6)

(c) Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical path activities for 50 percent or more of the Contractor's scheduled work day.

* Monthly anticipated weather delay days shall be adjusted proportionally if work is performed in a work week with greater than or less than a five-day work week. The following formula shall be used to adjust the monthly anticipated weather delays:

adjusted monthly anticipated weather delays - **A** multiplied by (**B** divided by **C**; where:

A = The monthly anticipated adverse weather delay for a particular month based on a five-day work week.
B = The actual average number of days worked per week during that particular month.
C = The number five (5).

eg., If the monthly anticipated adverse weather delay for January based on a five day work week is 10 days, but the Contractor actually worked an average of a six-day work week for that month, the monthly anticipated weather delay would be adjusted by applying the above formula as follows: 10 x (6/5) = 12 days.

1.15 REQUIRED INSURANCE SCHEDULE

In accordance with CONTRACT CLAUSE titled "Insurance - Work On A Government Installation," the Contractor shall procure and maintain during the entire period of his performance under this contract the following minimum insurance.

Type	Amount
Workmen's Compensation State Statute	coverage complying with applicable
Employers' Liability	minimum amount of $100,000.00
General Liability on Comprehensive Form of Policy	minimum limits of $500,000 per occurrence for bodily injury which includes, but is not limited to, insurance for all work required herein
Comprehensive Automobile Liability	minimum limits of $200,000 per person and $500,000 per occurrence for bodily injury, and $20,000 per occurrence for property damage

1.16 CONTRACTOR-FURNISHED EQUIPMENT DATA

At or before 30 days prior to final inspection and acceptance of the work, the Contractor shall submit the data mentioned in the following subclauses.

(1) Equipment List. An itemized equipment list showing unit retail value and nameplate data including serial number, model number, size, manufacturer, etc., for all Contractor-furnished items of mechanical equipment, electrical equipment,

and fire protection systems installed under this contract.

(2) Guarantees. A list of all equipment items which are specified to be guaranteed accompanied by a copy of each specific guarantee therefor. For each specific guaranteed item, a name, address, and telephone number shall be shown on the list for subcontractor who installed equipment, equipment supplier or distributor and equipment manufacturer. The completion date of the guarantee period shall correspond to the applicable specification requirements for each guaranteed item.

(3) Warranty Service Calls. The Contractor shall furnish to the Contracting Officer the names of local service representatives and/or Contractors that are available for warranty service calls and who will respond to a call within the time periods as follows: 4 hours for heating, air-conditioning, refrigeration, air supply and distribution, and critical electrical service systems and food service equipment, and 24 hours for all other systems. The names, addresses, and telephone numbers for day, night, weekend, and holiday service responses shall be furnished to the Contracting Officer and also posted at a conspicuous location in each mechanical and electrical room or close to the unit.

1.17 DATE OF SAFETY AND HEALTH REQUIREMENTS MANUAL (EM 385-1-1)

(a) EM 385-1-1 and its changes are available at http://www.hq.usace.army.mil (at the HQ homepage, select Safety and Occupational Health). See Section 00700, Contract Clause titled "Accident Prevention."

(b) Before initiation of work at the job site, an accident prevention plan, written by the prime contractor for the specific work and hazards of the contract and implementing in detail the pertinent requirements of EM 385-1-1, will be reviewed and found acceptable by designated Government personnel.

1.18 COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

The Contractor shall comply with OSHA standards as well as the most current edition of the Corps of Engineers General Safety Requirements Manual (EM 385-1-1). The OSHA standards are subject to change and such changes may affect the Contractor in his performance under the contract. It is the Contractor's responsibility to know such changes and effective dates of changes.

1.19 CONSTRUCTION EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE

Whenever a modification or equitable adjustment of contract price is required, the Contractor's cost proposal for equipment ownership and operating expenses shall be as set forth in SPECIAL CLAUSE titled "Equipment Ownership and Operating Expense Schedule." A copy of EP 1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" dated August 1995 can be ordered from the Government Printing Office (GPO) by calling Telephone No. 202-512-1800.

1.20 SHOP DRAWINGS

The Contractor's attention is directed to clause "Specifications and Drawings for Construction" of the Contract Clauses.

1.21 SUBMITTALS

(a) Submittal Procedures. See Division One SECTION: SUBMITTAL PROCEDURES.

(b) Shop Drawings shall be submitted in ample time to secure approval prior to the time the items covered thereby are to be delivered to the site. ENG Form 4025 and 4026 shall be used for the transmittal of shop drawings. Unless otherwise specified, shop drawings shall be submitted not less than 30 days before commencement of fabrication of fabricated items and not less than 15 days before delivery of standard stock manufactured items. Where materials are stock with the manufacturer, catalog data, including specifications and full descriptive matter, may be submitted as shop drawings. When catalog includes nonapplicable data, the applicable data shall be clearly designated and

identified by item number, item name, and name of manufacturer. Shop drawings submitted (including initial and final submittals) shall be reproductions on high quality paper with clear and legible print. Drawings shall generally be bordered a minimum of one inch and trimmed to neat lines and unless otherwise specified, the minimum scale shall be 3/8-inch to the foot. Shop drawings quality will be subject to approval. Each shop drawing, including catalog data, shall be identified with a title block including the name of Contractor, contract number, name and location of project, and name of item of work or structure to which the shop drawing applies. Material fabricated or delivered to the site before approved shop drawings have been returned to the Contractor will be subject to rejection. NO CONSTRUCTION OR INSTALLATION SHALL BE DONE FOR ANY ITEM REQUIRING SHOP DRAWINGS, UNTIL ALL SHOP DRAWINGS FOR THAT ITEM HAVE BEEN APPROVED.

(c) As-Built Shop Drawings: Upon completion of the work under this contract, the Contractor shall furnish five complete sets of prints or one complete set of reproducibles of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted. The quality of the reproducibles and prints is subject to approval.

(d) As-Built Drawings: The Contractor shall maintain three separate sets of red-lined, full scale, as-built construction drawings marked up to fully indicate as-built conditions. These drawings shall be maintained in a current condition at all times until completion of the work, and shall be available for review by Government personnel at all times. All variations from the contract drawings, for whatever reason, including those occasioned by modifications, optional materials, and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the contract drawings. In addition, the Contractor shall indicate on the As-Built Drawings, the brand-name, description, location, and quantity of any and all materials used which contain asbestos. The Contractor shall also be responsible for updating the Government-furnished CADD files to reflect the current as-built conditions throughout the duration of the project. The updated CADD design files shall be maintained in the Intergraph Microstation format consistent with the graphic standards established in the CADD contract drawings provided by the Government. The Contractor will be provided a copy of the Tri-Service CADD standards to facilitate his efforts in the maintenance of design files. The updated CADD files shall be reviewed by the Government on a monthly basis during the progress payment evaluation. The Contractor shall be prepared to demonstrate the status of the updated CADD files in his on-site office. The as-built utility drawings shall show locations and elevations of all underground new utilities and existing utilities encountered, including dimensions from permanent structures and/or survey locations. The submittal requirements for as-built utility drawings shall be shown as separate activities on the Contractor-prepared network analysis. Upon completion of the work, the marked-up drawings and the updated CADD files shall be furnished to the Contracting Officer on CD. In multiphased construction where portions of a system are to be turned over to the user prior to completion of the project, the marked-up drawings for that portion shall be furnished to the Contracting Officer at that time.(MRD ltr 30 Oct 70 and KCD 8 Apr 91)

(e) CADD Files: The Government will provide to the Contractor, within 30 calendar days after Notice of Award, copies of the CADD computer files of the contract drawings for the production of as-built drawings. These files will be in Intergraph Microstation format. The Government provides no warranty, expressed or implied, of the CADD computer files. The Contractor shall assume all responsibility to verify the CADD drawing files. The Contractor will not utilize the CADD drawing computer files to resolve dimensional or other discrepancies. The Government will not guarantee the measurable accuracy of the CADD drawing computer files.

(b) Purchase Orders: Each purchase order issued by the Contractor or his subcontractors for materials and equipment to be incorporated into the project, shall be maintained on file at the Contractor's field office for inspection and review by Government representatives. Each purchase order shall (1) be clearly identified with applicable DA contract number, (2) carry an identifying number, (3) be in sufficient detail to identify the material being purchased, (4) indicate a definite delivery date, and (5) display the DMS priority rating. At

the option of the Contractor, the copies of the purchase orders may or may not indicate the price of the articles purchased. (MRD Ltr 22 Oct 74)

(f) Color Boards:

1. The Contractor shall submit a minimum of three (3) complete sets of color boards within 120 calendar days of receipt of Notice to Proceed. Construction color boards shall be submitted in a 3-ring notebook binder with all materials securely mounted on rigid 8-1/2 by 11-inch presentation (mat) board, with a maximum spread of 25-1/2 by 33 inches for foldouts, clearly coded regarding location of materials in the facility.

2. An index shall be provided listing pertinent contract specifications and drawings for each sample and any proposed substitutions or variances shall be so designated. The Contractor shall also certify, in writing, that all submittal items technically comply with the project specifications.

3. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract as specified on the Interior Room Finish Schedule, the Exterior Finish Schedule and Interior Finish Materials Legend located in the Contract Drawings, and the sample requirements of the submittal registers. All materials must be labeled with the manufacturer's name, pattern and color reference. Patterned material samples (i.e., carpet) must be of sufficient size to enable evaluation of the pattern. Samples shall be keyed or coded to match any key or code system in the Contract Drawings.

4. The Contractor shall express mail a minimum of three (3) copies of the color boards to the Contracting Officer. The Contracting Officer will forward one copy of the colorboards to CENWK-EC-D for review and concurrence. Concurrence or comments will be provided not later than 45 calendar days after receipt of the submittal. This paragraph does not cover the quality of finishing materials. The quality, physical requirements, and method of installation shall be submitted with the appropriate shop drawings. The Contractor shall not submit any of the above requirements with the color boards. Specific locations where the various materials are required are shown on the drawings.

1.22 SPECIAL REFERENCES

(a) Shop Drawings. Bidder's attention is directed to SPECIAL CLAUSE titled "Shop Drawings." The basic requirements for Shop Drawings are set forth in the CONTRACT CLAUSES and SPECIAL CLAUSES.

(b) Approved Equal. Bidder's attention is directed to SPECIAL CLAUSE titled "Approved Equal."

(c) Payment to Subcontractors. Bidder's attention is directed to SPECIAL CLAUSE titled "Payments to Subcontractors."

1.23 DIFFERENCES IN DRAWINGS

In addition to the provisions of CONTRACT CLAUSE paragraph "Specifications and Drawings for Construction," the structural drawings shall govern in cases where they differ from the architectural drawings.

1.24 DAMAGE TO WORK (1966 MAR OCE)

The responsibility for damage to any part of the permanent work shall be as set forth in the CONTRACT CLAUSE titled "Permits and Responsibilities." However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices

applicable to any part of such work an equitable adjustment pursuant to CONTRACT CLAUSE titled, "Changes," of the contract, will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense, regardless of the cause of such damage.

1.25 WORK ADJACENT TO ROADS AND HIGHWAYS

Where the construction work is on or adjacent to, or involves hauling over public or private roads, streets, or highways, all herein referred to as "roads," the said roads shall, except as otherwise specified or directed, be kept open for traffic at all times during the construction period. Further, the Contractor shall, during said construction, provide, erect and maintain warning signs, lanterns or torches or other safety devices and, when necessary, provide flagmen for protection of traffic to the satisfaction of the Contracting Officer and local authorities. The Contractor shall keep the right-of-way of the roads free of debris that might be caused to accumulate thereon by his operations, and upon completion of the work, shall clean up the said roads and repair any damage to the roads occasioned by his operations under this contract to the satisfaction of the Contracting Officer and local authorities having jurisdiction. The drainage from the roads shall not be obstructed by the construction work. The Contractor shall be responsible for obtaining and paying for all permits required for operation on all roads.

1.26 APPROVED EQUAL

The drawings and the TECHNICAL PROVISIONS of these specifications may, in some instances, refer to certain items of equipment, material, or article by trade name. References of this type shall not be construed as limiting competition, but shall be regarded as establishing a standard of quality. In this respect, the Contractor's attention is directed to CONTRACT CLAUSE titled "Material and Workmanship."

1.27 SCHEDULE OF WORK

The Contractor's attention is directed to CONTRACT CLAUSE titled "Schedule for Construction Contracts," wherein if, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer.

1.28 UPKEEP OF ROADWAY AREAS WITHIN A MILITARY INSTALLATION WHICH THE CONTRACTOR USES

In addition to the requirements in CONTRACT CLAUSE titled "Operations and Storage Areas," the Contractor shall comply with the following requirements: Where the construction work is on or adjacent to, or involves hauling over public roads, streets, or highways located on a military installation, all herein referred to as "roads," the said roads shall except as otherwise specified or directed, be kept open for traffic at all times during the construction period. The Contractor shall keep the roads including adjacent construction site free of debris including litter, waste construction material, mud etc., that might be caused to accumulate thereon by his operations, and upon completion of the work, shall clean up the said roads and construction site and repair any damage occasioned with his operations under this contract to the satisfaction of the Contracting Officer. The drainage from the roads shall not be obstructed by the construction work.

1.29 PROTECTION OF UTILITY LINES

(a) It shall be the Contractor's responsibility to protect all existing utility lines from damage during excavation for utilities systems. Any damage resulting to existing utility systems shall be repaired by the Contractor, to the satisfaction of the contracting officer, at no additional cost to the Government.

(b) All requests for access and/or locations must be made through the Contracting Officer's Representative (COR) or Resident Engineer. The Director of Public Works will work directly with the Resident Engineer to provide timely information to the Contractor.

(c) Not less than 3 or more than 10 workdays prior to the actual day of excavation on each site, the Contractor shall contact Kansas One-Call System, Inc., Toll Free 1-800-344-7233 and obtain a Kansas Dig-Safe Ticket Number. Immediately after obtaining a Kansas Dig-Safe Number the Contractor shall contact Fort Riley Dig-Safe Coordinator at Public Works, Building 337, Telephone 1-785-239-8187, FAX 1-785-239-8188, and accomplish the items listed below. No exceptions to this policy will be tolerated. The Contractor will be held liable for all costs incurred by various underground utility owners for repairs to damaged underground utilities resulting from failure to comply with this procedure.

(1) Provide Kansas One-Call System Ticket Number.

(2) Provide company name, name and telephone number of point of contact.

(3) Provide a site drawing with measurements from nearest building showing depth and nature of work:

(4) Mark the area to be dug with white paint.

1.30 MODIFICATIONS PRIOR TO DATE SET FOR OPENING BIDS

The right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings or both prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. If the revisions and amendments are of a nature which requires material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the issuing officer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids. (KCD APR 84)

1.31 EXPEDITING NOTICE TO PROCEED

Notwithstanding the requirements of Block 12 on page 00010-1 of SECTION 00010 and SECTION 00100 paragraph titled "Late Submissions, Modifications, and Withdrawals of Bids," in order to expedite award of contract and issuance of NOTICE TO PROCEED, it is requested that an officer of the company or corporation determined to be the successful bidder shall appear in the office of the Commander, Kansas City District, Corps of Engineers, 757 Federal Building, 601 East 12th Street, Kansas City, Missouri, for signing contract documents. Therefore, upon written acceptance of this bid, mailed or otherwise furnished within 60 calendar days after the date of opening of bids, it is requested that the successful bidder shall within 48 hours after receipt of notification appear in the office of the Commander and execute Notice to Proceed documents, and give performance and payment bonds on Government Standard forms 25 and 25A with good and sufficient surety. It is also requested that the successful bidder furnish insurance certificates required in SPECIAL CLAUSE titled "Required Insurance Schedule" at this time.

1.32 UNEXPECTED HAZARDOUS SUBSTANCES

In the event that suspected hazardous substances are revealed during construction activities, all such construction activities in the immediate area shall be immediately suspended. Hazardous substances for purposes of this specification only, shall be defined as CERCLA hazardous substances, infectious or radioactive wastes, asbestos or oil. The Contractor shall leave the materials undisturbed and shall immediately report the find to the Contracting Officer's Representative (COR) so that proper authorities can be notified. The Contractor shall not resume construction activities in the vicinity of the suspected hazardous

substances until written clearance is received from the COR. Identification and removal of any such materials will be conducted in accordance with all Federal, state and local environmental laws and regulations according to the CONTRACT CLAUSE titled "Differing Site Conditions."

1.33 TIMBER DISPOSAL

(a) Any and all hardwood trees, stems and limbs three (3) inches in diameter or greater that must be removed as a result of construction be stockpiled by the Contractor in the area designated, i.e. 2d and K Street, Camp Funston. Excluded from this requirement are cedar, pine and cottonwood trees, stems and limbs.

(b) All cedar, pine and cottonwood trees, stems and limbs; all trees, stems and limbs less than three (3) inches in diameter; and all stumps and roots will be taken to the construction and demolition debris landfill for disposal. This landfill is located in the vicinity of the corner of E and 4th Streets in Camp Whitside.

1.34 FORT RILEY CONSTRUCTION DEMOLITION DEBRIS (C/D) LANDFILL OPERATIONS

The Fort Riley Construction Demolition Debris (CD) landfill is located on Campbell Hill Road approximately one mile north of Camp Funston. There is no charge for using the landfill. Delivery vehicles shall be identified with contractor signs on both sides of the vehicle and must provide the contract number. The CD landfill will have an attendant on duty and be open for normal operations (excluding Federal Holidays) Monday-Friday, 0730-1600. Only construction demolition debris materials will be accepted. Acceptable materials are posted on a board at the entrance. Asbestos materials deliveries require a call for an appointment 24 hours in advance of delivery. Telephone (785) 761-5002. All transformers and light ballasts shall be turned in to Building 339 within the PW maintenance yard on Main Post. Light ballasts shall have all wires cut off. POC is Don Wainwright, telephone (785) 239-3832. Any salvageable items shall be turned in to the Directorate of Environment and Safety (DES) Recycle Center, Building 1980, in Camp Funston. POC is the Solid Waste Program Manager, DES, telephone (785) 239-2860.

1.35 KANSAS SALES AND USE TAX

In accordance with FAR clause 52.229-3, notice is given that the contract price excludes the Kansas sales tax and compensating (use) tax on all sales of tangible personal property and materials purchased by the Contractor or subcontractors for the construction of projects, including repairing or remodeling facilities, for the United States. In accordance with Kan. Stats. Anno., sec. 79-3606(e), the Contracting Officer will obtain from the State and furnish to the Contractor an exemption certificate for this project for use by the Contractor and subcontractors in the purchase of materials for incorporation in the project and of services. The Contractor and the subcontractors shall furnish the number of such certificate to all suppliers from whom such purchases are made, and the suppliers shall execute invoices covering the same bearing the number of such certificate. Pursuant to a 1977 Amendment to K.S.A., 1976 Supp., 79-3606(e), effective 1 July 1977, the Contractor is required to retain all invoices for a period of five (5) years during which time these invoices are subject to audit by the Kansas Director of Taxation. Upon completion of the project, the Contractor shall complete the Project Completion Certification (Form STD 77, Rev. 6/77) in duplicate returning one copy to the Contracting Officer, and forwarding the other to the Kansas Director of Taxation. (KCD)

1.36 INTERRUPTIONS TO UTILITY SERVICES

A schedule showing the approximate times of interruptions of utility services and roads shall be submitted approximately 30 days in advance of interrupting services to make connections. Where it is necessary to interrupt services to make connections and the period of interruption will last more than 2 hours, the connections shall be performed on Saturday or Sunday, unless otherwise approved by the Contracting Officer. Final arrangements shall be made with the Contracting Officer at least 72 hours in advance of the scheduled times of

interruptions.

1.37 CLOSEOUT OF CONTRACTS (KCD July 1990)

The closing out of various features of the contract shall be done before or on the Government contract construction completion date. The Contractor's specific submittals and items required for closeout include, but are not limited to, Operation and Maintenance Manuals (O&M), training, spare parts, equipment list, guarantees, as-built shop drawings and contract drawings.

The Contractor shall review the contract documents and prepare a plan for closeout no later than 90 days after the notice to proceed date for approval by the Contracting Officer Representative (COR). The closeout plan shall also include the Specification Volume No., specification reference section and building name on each closeout item. A summary of the type of closeout information required for each of the items shall be prepared by the Contractor for the closeout plan. The closeout data base shall be updated as required by the Contracting Officer to ensure adequate tracking of the items noted.

The following is a general list of the various types of closeout materials and the data required for each. (* indicates data required on initial submittal)

(a) O&M Manuals:

Descriptions*, Specification Paragraph*, Date Due*, No. Copies Due*, Date Submit Action Code, Resubmit Date, Approved, Date to User

(b) Training Requirements:

Description*, Specification Paragraph*, Length Required*, Date Scheduled, Plan Submitted, Plan Approved, Date Training Held

(c) Spare Parts Required:

Description*, Specification Paragraph*, Quantity Required*, Date Turned Over to User

(d) Salvaged Material:

Description*, Specification-Plan Requirement*, Quantity*, Turn In Document Received

(e) Government-Furnished Equipment:

Description*, Specification-Plan Requirement*, GFCI-GFGI*, Number Required*, Date Equipment Data Required*, Date Equipment Required*, Turnover Document Provided

(f) Utilities Provided or Relocated by Others:

Description*, Relocate or Provide*, Specification-Plan Note*, Date Required*

1.38 LARGE VOLUME OF FORT RILEY CONSTRUCTION

Bidders are advised that a number of construction projects will be in progress at Fort Riley during the performance of this contract. Each individual Contractor shall be responsible for coordinating and scheduling the work such that the work shall be accomplished to minimize delays and interference.

1.39 CHECKPOINTS

The Contractor shall access the jobsite only through designated checkpoints and shall allow extra time for security clearing. The Contractor- designated checkpoint for material delivery is restricted to the 12th Street Control Point, unless otherwise directed by the Contracting Officer. The Contractor's employees may access the jobsite through any designated checkpoint.

1.40 UNEXPECTED DISCOVERY OF ASBESTOS ON CONSTRUCTION (RENOVATION AND DEMOLITION)

The buildings and areas to be renovated or demolished have been surveyed for the presence of asbestos-containing materials. This survey is not a warranty that asbestos-containing materials are either not present or limited to the amounts found in the survey. Should suspected asbestos-containing material be encountered, the Contractor shall promptly, and before the conditions or the substance encountered is disturbed, give a written notice to the Contracting Officer of the suspected asbestos-containing material conditions encountered. As directed by the Contracting Officer, the Contractor shall remove and dispose of any and all asbestos-containing material as necessary to accomplish the required work which shall be performed in accordance with all pertinent local, state, and federal laws. An equitable adjustment will be made to the Contractor in accordance with the CONTRACT CLAUSE entitled "Changes", for the additional work directed by the Contracting Officer.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

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SECTION 01312

QUALITY CONTROL SYSTEM (QCS)

PART 1 GENERAL

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as RMS-QC (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS and RMS-QC will facilitate electronic exchange of information and overall management of the contract. RMS-QC provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, "Project Schedule", Section 01330, SUBMITTAL PROCEDURES, and Section 01451A, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work.

1.2 RMS-QC SOFTWARE

RMS-QC is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the RMS-QC software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the RMS-QC software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide RMS-QC on 3-1/21, high-density diskettes or CD-ROM. Any program updates of RMS-QC will be made available to the Contractor via the Government RMS Website as they become available.

1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run RMS-QC:

Hardware

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the RMS-QC system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

Software

Microsoft (MS) Access 97 or newer version database software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

1.4 RELATED INFORMATION

1.4.1 RMMS-QC User Guide

After contract award, the Contractor shall download instructions for the installation and use of RMS-QC from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.4.2 Contractor Quality Control (CQC) Training

The use of RMS-QC will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.4.3 Video Training for RMS-QC

After contract award, the Contractor will be provided with a CD containing a training video on the use of RMS-QC.

1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for RMS-QC. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the RMS-QC database throughout the duration of the contract. The Contractor shall

establish and maintain the RMS-QC database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The RMS-QC database typically shall include current data on the following items:

1.6.1 Administration

1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in RMS-QC. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with 'IS". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Requests for Information

RMS-QC includes a means for the Contractor to enter, log, and transmit requests for information (RFI) to the Government. RFIs can be exchanged electronically using the import/export functions of RMS-QC. The Contractor shall also provide the Government with a signed, printed copy of each RFI. All RFIs from the Contractor to the Government shall have the prefix "RFI" and shall be numbered sequentially beginning with RFI-0001.

1.6.1.5 Equipment

The Contractor's RMS-QC database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.6.1.6 Management Reporting

RMS-QC includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of RMS-QC. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.6.2 Finances

1.6.2.1 Pay Activity Data

The RMS-QC database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs

equals the Contract Amount.

1.6.2.2 Payment Requests

All progress payment requests shall be prepared using RMS-QC. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using RMS-QC. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

RMS-QC provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the RMS-QC generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451A, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.6.3.1 Daily Contractor Quality Control (CQC) Reports

RMS-QC includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by RMS-QC shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the RMS-QC-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 Deficiency Tracking

The Contractor shall use RMS-QC to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC Comments. The contractor shall maintain a current log of its QC comments in the RMS-QC database. The Government will log the deficiencies it has identified using its QA comments. The Government's QA comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA comments.

1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS-QC.

1.6.3.4 Accident/Safety Tracking

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize RMS-QC to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the RMS-QC database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in RMS-QC. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via RMS-QC.

1.6.4 Submittal Management

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns as described in Section 01330, SUBMITTAL PROCEDURES. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use RMS-QC to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using RMS-QC. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts". This schedule shall be input and maintained in the RMS-QC database either manually or by using the Standard Data Exchange Format (SDEF). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.6.6 Import/Export of Data

RMS-QC includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.7 Implementation

Contractor use of RMS-QC as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its RMS-QC database, and to provide the Government with regular database updates. RMS-QC shall be an integral part of the Contractor's management of quality control.

1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the RMS-QC built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.8.1 File Medium

The Contractor shall submit required data on 3-1/211 double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the RMS-QC file name, full contract number, project name, project location, data date, name and telephone number of person responsible for the data.

1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the RMS-QC software.

1.9 MONTHLY COORDINATION MEETING

The Contractor shall update the RMS-QC database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable RMS-QC export file is received.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION 01320

PROJECT SCHEDULE
DESIGN-BUILD CONSTRUCTION

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Initial Project Schedule; G, RE.

Preliminary Project Schedule; G, RE.

Three (3) copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

SD-03 Product Data

Periodic Schedule Updates; G, RE.

Three (3) copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

SD-05 Design Data

Narrative Report.

Schedule Reports.

Three (3) copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

SD-07 Certificates

Qualifications

Documentation showing qualifications of personnel preparing schedule reports.

1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports. This person shall have previously created and reviewed computerized schedules. Qualifications of this individual shall be submitted to the Contracting Officer's Representative for review with the Preliminary Project Schedule submission.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The Contractor shall be responsible for scheduling of all design, procurement and construction

activities. Contractor management personnel shall actively participate in its development. Designers. Subcontractors and suppliers working on the project should also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel shall result in an inability of the Contracting Officer's Representative to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer's Representative to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer's Representative and those revisions have not been included in the Project Schedule, then the Contracting Officer's Representative may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require review by the Contracting Officer's Representative.

3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

3.3.2 Level of Detail Required

With the exception of the initial and preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer's Representative at the appropriate level of detail, as specified by the Contracting Officer's Representative, shall result in the disapproval of the schedule. The Contracting Officer's Representative will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

3.3.2.1 Activity Durations

Contractor submissions shall be required to follow the direction of the Contracting Officer's Representative regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods. A rule of thumb, that the Contractor should use, is that less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days.

3.3.2.2 Design and Permit Activities

The Contractor shall integrate design and permitting activities, including necessary conferences and follow-up actions and design package submission dates into the schedule.

3.3.2.3 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be

included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, reviews, procurement, fabrication, delivery, installation, start-up, and testing.

3.3.2.4 Government Activities

Government and other agencies activities that could impact progress shall be shown. These activities include, but are not limited to: design reviews, submittal reviews, environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and notice to proceed for phasing requirements.

3.3.2.5 Workers Per Day

All activities shall have an estimate of the average number of workers per day that are expected to be used during the execution of the activity. If no workers are required for an activity, in the case of activities related to procurement, for example, then the activity shall be identified as using zero workers per day. The workers per day information for each activity shall be identified by the Workers Per Day Code.

3.3.2.6 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

3.3.2.7 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

3.3.2.8 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number.

3.3.2.9 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. The bid item for each appropriate activity shall be identified by the Bid Item Code.

3.3.2.10 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not be allowed to contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.3.2.11 Category of Work

All Activities shall be identified in the project schedule according to the category of work which best describes the activity. Category of work refers, but is not limited to, the procurement chain of activities including such items as

submittals, reviews, procurement, fabrication, delivery, installation, start-up, and testing. The category of work for each activity shall be identified by the Category of Work Code.

3.3.2.12 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity call "End Project". The "End Project" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion, the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted at every project schedule update period to assist the Contracting Officer's Representative to evaluate the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in progress or completed activity and insure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer's Representative to evaluate Contractor progress for payment purposes.

3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) shall be allowed only by the case-by-case review of the Contracting Officer's Representative. The Contracting Officer's Representative may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

3.3.7 Extended Non-Work Periods

Designation of Holidays to account for non-work periods of over 5 days shall not be allowed. Non-work periods of over 5 days shall be identified by addition of activities that represent the delays. Modifications to the logic of the project schedule shall be made to link those activities that may have been impacted by the delays to the newly added delay activities.

3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for evaluation with the Offeror's proposal. After award, the schedule submitted with the Offeror's proposal shall become the baseline schedule. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

3.4.2 Periodic Schedule Updates

The Initial Project Schedule shall be submitted for review within 40 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

3.4.3 Standard Activity Coding Dictionary

The Contractor shall submit, with the Initial Project Schedule, a coding scheme that shall be used throughout the project for all activity codes contained in the schedule. The coding scheme submitted shall list the values for each activity code category and translate those values into project specific designations. For example, a Responsibility Code Value, "ELE", may be identified as "Electrical Subcontractor." Activity code values shall represent the same information

throughout the duration of the contract. Once approved with the Initial Project Schedule submission, changes to the activity coding scheme must be approved by the Contracting Officer's Representative.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor of the initial submission, and every periodic project schedule update throughout the life of the project.

3.5.1 Data Disks

Three (3) data disks containing the project schedule shall be provided. Data on the disks shall adhere to SDEF format specified in ER 1-1-11, Appendix A.

3.5.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44 MB of data, under the Microsoft Windows operating system or on a WINDOWS formatted CD-ROM disk, or e-mail attachments.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the software version format of the disk.

3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer's Representative (COR) for review.

3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer's Representative shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Schedule Reports

Format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in-progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.3 Total Flat Report

A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer's Representative at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer's Representative will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5 S-Curves

Earnings curves showing project early and late earnings and earnings to date.

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly on-site meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor will describe, on an activity-by-activity

basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer's Representative will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Job Superintendent, Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Remaining Durations, and Cost to Date shall be subject to the review of the Update information, including Actual Start Dates, Actual Finish Dates, Contracting Officer's Representative. The following minimum set of items which the Contractor shall address, on an activity by activity basis, during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment shall be based on earnings for each in-progress or completed activity. Payment for individual activities shall not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities are those delays beyond the Contractors control such as strikes and unusual weather. Also included are delays encountered due to submittals, Government Activities, deliveries or work stoppage which makes re-planning the work necessary, and when the schedule does not represent the actual prosecution and progress of the work.

3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, he shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer's Representative may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that

the delay occurred) is obligatory to any reviews.

3.7.1 Justification of Delay

The project schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's Representative's determination as to the number of allowable days of contract extension, shall be based upon the project schedule updates in effect for the time period in question and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, shall not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under two weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- A list of affected activities, with their associated project schedule activity number.
- A brief explanation of the causes of the change.
- An analysis of the overall impact of the changes proposed.
- A sub-network of the affected area.

Activities impacted in each justification for changes shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any request for time extension for over 2 weeks, the Contracting Officer's Representative may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's Representative's request.

3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer's Representative within 7 days of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer's Representative prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer's Representative may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until the Contractor submits revisions, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer's Representative, then the Contractor shall advise the Contracting Officer's Representative within 7 days of receipt of the revisions. Regardless of the objections, the Contractor will continue to update their schedule with the Contracting Officer's Representative's revisions until a mutual agreement in the revisions may be made. If the Contractor fails to submit alternative revisions within 7 days of receipt of the Contracting Officer's Representative's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's Representative's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

SECTION 01330

SUBMITTAL PROCEDURES
DESIGN-BUILD

PART 1 GENERAL

1.1 SUMMARY

This section includes administrative and procedural requirements for construction submittals presented by the contractor after 100% corrected plans and specifications have been accepted by the government. This section also includes requirements for developing, submitting and maintaining a "Submittal Register".

1.2 CONTRACTOR RESPONSIBILITIES

The Contractor is responsible for total management of his work including approval, scheduling, control, and certification of all submittals. The submittal management system provided in these specifications is intended to be a complete system for the Contractor to use to control the quality of materials, equipment and workmanship provided by manufacturers, fabricators, suppliers and subcontractors. The Contractor shall review each submittal for contract compliance. The Submittal Register (ENG Form 4298) will be utilized to log and monitor all submittal activities. No construction or installation activities shall be performed prior to required approvals and government compliance review of applicable submittals. The Contractor shall perform a check to assure that all materials and/or equipment have been tested, submitted and approved during the preparatory phase of quality control inspections. The Contractor shall coordinate all submittals with the Contractor's Designer (A-E). Approval by the Contractor's Designer means that the submittal is in compliance with the requirements of the RFP contract.

1.3 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers and titles as follows:

SD-01 Preconstruction Submittals

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

Construction progress schedule

Accident Prevention Plan /Safety and Health program and plan

Work plan

Quality control plan

Environmental protection plan

Permits

SD-02 Shop Drawings

Submittals which graphically show relationships of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts,

instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accordance with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test, required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on samples taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

A document, required of the Contractor or through the Contractor, from a supplier, installer, manufacturer, or other lower tier Contractor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of the contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements which are being certified.

Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

SD-10 Operation and Maintenance Data

Data intended to be incorporated in operations and maintenance manuals.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

As-built drawings

Special warranties

Posted operating instructions

Training plan

1.4 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.4.1 Designer Approved (G, AE)

Designer approval is required for extensions of design, critical materials, deviations, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". All submittals noted in the technical specifications and Submittal Register as "G, AE" are subject to approval by the Contractor's Designer, prior to submittal to the Government. The Contracting Officer has the option to review any submittal. The Government will review all "G, AE" submittals for conformance to the solicitation and all submittals designated as variations from the Solicitation or 100% corrected design or as directed by the Contracting Officer.

1.4.2 Government Reviewed Construction Submittals (G, RE)

"G, RE" submittals subject to Government review are those so designated by the Contacting Officer during the design process or preconstruction meeting. All "G, RE" submittals shall be reviewed and approved by the Contractor's Quality Control Representative and the Contractor's Designer prior to submittal to the Government. Within the terms of the Contract Clause entitled "Specification and Drawings for Construction," they are considered to be "shop drawings." Any variance must clearly identify the variance as specified in paragraph: "Variations", below.

Government review is required for designated "G, RE" submittals and variations from the solicitation requirements and completed design. Review will be only for conformance with the contract requirements. This also includes those construction submittals for which the design documents did not include enough detail to ascertain contract compliance. Government review will not include development of design calculations or other means of determining adequacy of design. The Contractor and his designer retain the sole responsibility for adequacy of design.

1.5 GOVERNMENT-REVIEWED SUBMITTALS

The Contracting Officer's review of submittals shall not be construed as a

complete check, but will indicate only that the general method of construction, materials, detailing and other information appear to meet the Solicitation requirements. Government Review will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Design and CQC requirements of this contract is responsible for design, compliance with design criteria required in the solicitation, dimensions, all design extensions, such as the design of adequate connections and details, etc. and the satisfactory construction of all work. After submittals have been reviewed for conformance, or approval as applicable, by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.6 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer, obtain the Contractor's Designer approval and Government review, or approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Any submittal found to contain errors or unapproved variations from the solicitation or accepted proposal, shall be resubmitted as one requiring "approval" action, requiring both Designer's approval and Government conformance review or approval, as applicable. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.7 WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer or Contractor Quality Control Representative approvals or required Government conformance reviews, or approvals as applicable, have not been obtained. No payment will be made for any materials incorporated in the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.8 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the construction drawings, Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. The Contractor's Quality Control (CQC) representative, and the Designer, as applicable, shall check, approve and stamp, sign, and date each item, indicating action taken. Proposed variations from the solicitation (contract requirements) or accepted 100% corrected design shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's. or fabricator's drawings; descriptive literature including (but not limited to)catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list);certifications; warranties, and other such required submittals. Submittals requiring conformance review or approval by the Government shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.9 SUBMITTAL REGISTER AND ENG FORM 4288

The Contractor's Designer(s) shall develop a complete list of submittals during design. The Designer shall identify required submittals in the specifications. The list is to be used in preparing the Submittal Register for a computerized equivalent as approved by the Contracting Officer's Representative. The example Submittal Register furnished with the Solicitation was created using Specsintact Software. The Contractor shall replace this example Submittal Register with the actual submittal register for the completed design specifications. The list is

not all inclusive and additional submittals may be required. The attached and contractor generated submittal register identifies only the submittal section, type of submittal, description of item submitted, paragraph number related to type of submittal item (section submittal paragraph if none listed), submittal classification (G), and submittal reviewer identifier (AE or RE). **Any submittal without a submittal classification and submittal reviewer identifier is considered to be For Information Only (FIO)**. The submittal register generated by the Government Resident Management System (RMS) Software is used for tracking construction submittals and is referred to as ENG Form 4288 (RMS) . Much of the same information contained on the Contractor-generated Submittal Register will be included on the ENG Forms 4288 (RMS). The Contractor shall maintain an ENG Form 4288 (RMS) for the project in accordance with the attached ENG Form 4288 (RMS) Instructions on which will be listed each item of equipment and material of each type for which fabricators, drawings, and/or related descriptive data, test reports, samples, spare parts lists, O&M manuals, or other types of submittals are required by the completed project specifications. Upon acceptance of the ENG Form 4288 (RMS) by the Contracting Officer, the ENG Form 4288 (RMS) will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period. The E-110 Form 4288 (PMS) ACTIVITY NO, is filled in when a network analysis system is a contract requirement. The TRANSMITTAL NO. and ITEM NO, shall be left blank and used later to record the respective transmittal and item number corresponding to those listed on the transmittal form entitled: "TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE" (ENG Form 4025). The approved ENG Form 4288 (RMS) will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated. Updates to the submittal register showing the Contractor action codes and actual dates shall be submitted monthly or until all submittals have been satisfactorily completed. When the progress schedule is revised, the ENG Form 4288 (RMS) shall also be revised and both submitted for approval.

1.10 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for conformance reviews by the Contracting Officer for submittals requiring Government review and for submittals which vary from the solicitation or accepted 100% corrected design. No delay damages or time extensions will be allowed for time lost in late submittals. An additional 20 calendar days shall be allowed and shown on the resister for conformance reviews by the Government of submittals for food service equipment and refrigeration and HVAC control systems.

1.11 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting all submittals in accordance with the instructions on the reverse side of the form. These forms are included in the Quality Control System (QCS) software that the Contractor is required to use for this contract. This form shall be properly, completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.12 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

1.12.1 Procedures

1.12.1.1 "G, AE" Submittals

All submittals shall be reviewed and approved by the Contractor's

Quality Control Representative and Contractor's Designer prior to submittal to the Government. A conformance review is required by the Government on all submittals, prior to construction of the related items.

Except as noted below, data for all items listed as submittals in the various sections shall be submitted in seven (copies). All seven copies shall be submitted to the Area Engineer using the transmittal form. Items not to be submitted in multiples, such as samples and test cylinders, shall be submitted to the Area or Resident Engineer (as directed), accompanied by seven (7) copies of the transmittal form.

Each required submittal, which is in the form of a drawing, shall be submitted as seven (7) prints of the drawing. Drawing prints shall be either blue or black line permanent-type prints on a white background or blueprint and shall be sufficiently clear and suitable for making legible copies.

Catalog cuts and other descriptive data which have more than one model, size, or type or which shows optional equipment shall be clearly marked to show the model, size, or type and all optional equipment which is provided. Submittals on component items forming a system or that are interrelated shall be submitted at one time as a single submittal in order to demonstrate that the items have been properly coordinated and will function as a unit.

1.12.1.2 "G, RE" and "FIO" Submittals

Except as noted below, data for all items listed, as "G, RE" Submittals in the various sections shall be submitted in five (5) copies. All five copies shall be submitted to the Area Engineer for solicitation conformance review using the transmittal form. Items not to be submitted in multiples, such as samples and test cylinders, shall be submitted to the Area or Resident Engineer (as directed) accompanied by five (5) copies of the transmittal form.

Except as noted below, data for all items listed as "FIO" Submittals in the various sections shall be submitted in three (3) copies. All three copies shall be submitted to the Area Engineer using the transmittal form. Items not to be submitted in multiples, such as samples and test cylinders, shall be submitted to the Area or Resident Engineer (as directed) accompanied by three (3) copies of the transmittal form.

All "G, RE" and "FIO" submittals shall be reviewed and approved by Contractor's Quality Control Representative and Contractor's Designer (as applicable) prior to submittal to the Government. A completed Government conformance review is required on all submittals, prior to Construction of the related items.

The Government has the option to review any FIO submittals.

1.12.1.3 Certificates of Compliance

Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

1.12.1.4 Purchase Orders

Copies of purchase orders shall be furnished to the Contracting Officer when the Contractor requests assistance for expediting deliveries of equipment or materials, or when requested by the Contracting officer for the purpose of quality assurance review. Each purchase order issued by the Contractor or his subcontractors for materials and equipment to be incorporated into the project

shall (1) be clearly identified with the applicable DA contract number, (2) carry an identifying number, (3) be in sufficient detail to identify the material being purchased, (4) indicate a definite delivery date, and (5) display the DMS priority rating, if applicable.

1.12.1.5 Operation and Maintenance Instructions and/or Manuals

Where required by various technical sections, operations and maintenance instructions and/or manuals with parts lists included shall be provided by the Contractor in quintuplicate, unless otherwise specified, and shall be assembled in three-ring binders with index and tabbed section dividers and having a cover indicating the contents by equipment or system name and project title and shall be submitted to the Area Engineer for review (after approval by the Contractor's Quality Control Representative), 90 days prior to final tests of mechanical and electrical systems, unless otherwise specified. Each operation and maintenance manual shall contain a copy of all warranties. If field testing requires these copies to be revised, they shall be updated and resubmitted for review within 10 calendar days after completion of tests. (The Operations and Maintenance Instructions and/or Manuals shall be shown as a separate activity on the Contractor-prepared construction schedule bar chart or network analysis system.

1.12.1.6 Interior/Exterior Finish Sample and Data

All submittals regarding color boards for interior finish samples and data shall be submitted concurrently and all submittals for exterior finish samples and data shall be submitted concurrently. These color boards are in addition to the samples required under the specific technical specifications listed as "samples".

1.12.2 Variations

Variations from the solicitation (contract requirements) or the accepted 100% corrected design must be approved by the Contractor's Designer, Contractor's Quality Control Representative and Contracting Officer. For submittals which include proposed variations, the column "variation" of ENG Form 4025 shall be checked and a serial letter shall be simultaneously prepared and sent to the Area Engineer referencing this variation. The Contractor shall set forth in writing the reason for any variations and clearly annotate such variations on the submittal. The narrative shall include documentation of the nature and features of the variation and why the variation is desirable and beneficial to the Government. When submitting a variation for acceptance, the Contractor warrants that the contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of the work. The Contractor shall take actions and bear the additional costs, including review costs by the Government, necessary due to the proposed variation. In addition to the submittal review period specified above, allow ten (10) additional working days for consideration by the Government of submittals with variations. The Government reserves the right to rescind inadvertent action codes of submittals containing unnoted variations.

1.13 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor-scheduled submittal date shown on the approved "Submittal Register".

1.14 SUBMITTALS (FINAL COPY)

Upon completion of review of submittals requiring Government conformance review or approval, the submittals will be identified as having received satisfactory review by being so stamped and dated.

1.14.1 "G, AE" Submittals

The Contracting officer has the option to review any submittal. Two (2) copies of "G, AE" submittals, for conformance review by the Government, will be returned to

the Contractor, except for samples, test cylinders, and O&M manuals for which two (2) copies of the transmittal form only will be returned to the Contractor, The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. All "G, AE" submittals shall be reviewed and approved by the Contractor's Designer and Contractor's Quality Control Representative prior to submittal to the Government.

1.14.2 "G, RE" Submittals

Two (2) copies of "G, RE" submittals for conformance review will be returned to the Contractor except for samples, test cylinders, and O&M manuals for which two (2) copies of the transmittal form only will be returned to the Contractor.

1.15 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Review by the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the contracting officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications; so prescribe.

1.16 STAMPS

Stamps used by the Contractor's Designer and the Contractor's designated Quality Control person on the submittal data to certify that the submittal meets contract requirements shall be similar to the following (use two stamps or submittals reviewed by both). Stamps shall be located on the back of the ENG Form 4025.

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheets(s).

SIGNATURE: _____

TITLE: Contractor's Chief of Quality Control_____

DATE: _____

SIGNATURE: _____

TITLE: Designer of Record_____

DATE: _____

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE

(Read instructions on the reverse side prior to initiating this form)

DATE

TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:

FROM:

CONTRACT NO.

CHECK ONE:

☐ THIS IS A NEW TRANSMITTAL

☐ THIS IS A RESUBMITTAL OF TRANSMITTAL

SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*

PROJECT TITLE AND LOCATION

CHECK ONE: THIS TRANSMITTAL IS FOR

FIO ☐ GOV'T. APPROVAL ☐

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED *(Type size, model number/etc.)* .	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *(See instruction no. 8) c.*	NO. OF COPIES *d.*	CONTRACT REFERENCE DOCUMENT SPEC. PARA. NO. *e.*	CONTRACT REFERENCE DOCUMENT DRAWING SHEET NO. *f.*	FOR CONTRACTOR USE CODE *g.*	VARIATION *(See instruction No. 6)* .	FOR CE USE CODE *i.*

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated.

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*

NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY

DATE

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted.

B -- Approved, except as noted on drawings.

C -- Approved, except as noted on drawings. Refer to attached sheet resubmission required.

D -- Will be returned by separate correspondence.

E -- Disapproved (See attached).

F -- Receipt acknowledged.

FX -- Receipt acknowledged, does not comply as noted with contract requirements.

G -- Other *(Specify)*

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

SUBMITTAL REGISTER

CONTRACT NO.
RFP

TITLE AND LOCATION
New Family Housing

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01320	SD-01 Preconstruction Submittals															
			Initial Project Schedule	3.4.1	G	RE												
			Preliminary Project Schedule	1.2	G	RE												
			SD-03 Product Data															
			Periodic Schedule Updates	3.4.2	G	RE												
			SD-05 Design Data															
			Narrative Report	3.5.2														
			Schedule Reports	3.5.4														
			SD-07 Certificates															
			Qualifications	1.2														
		01355A	SD-01 Preconstruction Submittals															
			Environmental Protection Plan	1.7	G	RE												
		01356	SD-07 Certificates															
			Mill Certificate or Affidavit	2.1.3														
		01450	SD-05 Design Data															
			Test Plans List	3.1.1	G	RE												
			Test Plans	3.1.2	G	RE												
			SD-07 Certificates															
			CERTIFICATION OF	3.2	G	RE												
			OPERATION TESTS															
		02220	SD-03 Product Data															
			Work Plan		G	RE												
			SD-07 Certificates															
			Demolition plan	1.8	G	RE												
			Notifications		G	RE												

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02220	Notification of Demolition and		G	RE												
			Renovation Forms															
			SD-11 Closeout Submittals															
			Receipts															
		02231	SD-03 Product Data															
			Materials Other Than Salable															
			Timber															
			SD-04 Samples															
			Tree wound paint	2.1														
			Herbicide	2.2														
		02364a	SD-03 Product Data															
			Termiticide Application Plan		G	RE												
			Termiticides	2.1														
			Foundation Exterior	3.2.3														
			Utilities and Vents	3.2.4														
			Crawl and Plenum Air Spaces	3.2.5														
			Verification of Measurement	3.5														
			Application Equipment	3.4.1														
			SD-04 Samples															
			Termiticides	2.1														
			SD-06 Test Reports															
			Equipment Calibration and Tank	3.4.1														
			Measurement															
			Soil Moisture	3.3.1														
			SD-07 Certificates															
			Qualifications	1.2														

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							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02510a	SD-03 Product Data															
			Installation	3.1														
			Waste Water Disposal Method															
			Satisfactory Installation															
			SD-06 Test Reports															
			Bacterial Disinfection	3.3														
			Fire Hydrant Flow Testing															
			SD-07 Certificates															
			Installation	3.1														
			Meters	2.8.8														
		02531	SD-02 Shop Drawings															
			Precast Concrete Manholes	2.3.1														
			Metal items	2.3.4														
			Frames, covers, and gratings	2.3.4.1														
			SD-03 Product Data															
			Pipeline materials	2.1														
			SD-07 Certificates															
			Portland Cement															
		02630a	SD-03 Product Data															
			Placing Pipe	3.3														
			SD-07 Certificates															
			Resin Certification	2.1.2														
			Pipeline Testing	3.8	G	RE												
			Determination of Density	3.7.5														
			Frame and Cover for Gratings	2.3.5														
		02712A	SD-03 Product Data															

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							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02712A	Plant, Equipment, Machines, and	1.5	G	RE												
			Tools															
			Waybills and Delivery Tickets															
			SD-06 Test Reports															
			Lime-Modified Soil Testing		G	GD												
			Sampling and Testing	3.5	G	RE												
			Field Density	3.6.2	G	RE												
			SD-07 Certificates															
			Lime		G	GD												
		02721A	SD-03 Product Data															
			Equipment	1.6	G	RE												
			SD-06 Test Reports															
			Sampling and Testing	1.4	G	G												
			Sampling and Testing	1.4	G	G												
		02722A	SD-03 Product Data															
			Plant, Equipment, and Tools	1.7	G	RE												
			Waybills and Delivery Tickets		G	RE												
			SD-06 Test Reports															
			Sampling and testing	1.5	G	GD												
			Field Density Tests	1.5.2.4	G	RE												
		02741A	SD-03 Product Data															
			Mix Design	2.3	G	GD												
			Contractor Quality Control	3.9	G	RE												
			Material Acceptance	3.10	G	RE												
			SD-06 Test Reports															
			Aggregates	2.1	G	GD												

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02741A	QC Monitoring	3.9.3.11	G	RE												
			SD-07 Certificates															
			Asphalt Cement Binder	2.2	G	GD												
			Testing Laboratory	3.5	G	RE												
		02748A	SD-06 Test Reports															
			Sampling and Testing	3.7	G	RE												
		02770A	SD-03 Product Data															
			Concrete	2.1	G	RE												
			SD-06 Test Reports															
			Field Quality Control	3.8	G	RE												
		02921a	SD-01 Preconstruction Submittals															
			Finished Grade and Topsoil	3.2.1														
			Delivery Schedule	1.4.1														
			Equipment Calibration	3.1.3														
			Seed Establishment Period	3.8.1														
			Application of Pesticide	3.5														
			SD-06 Test Reports															
			Soil Test	1.4.1.1														
			Soil Test	3.1.4														
			SD-07 Certificates															
			Seed	2.1														
			Delivered Topsoil															
			pH Adjuster															
			Fertilizer	2.3.1														
			Organic Material	2.3.2														
			Soil Conditioner	2.3.3														

SUBMITTAL REGISTER

CONTRACT NO.
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CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02921a	Mulch	2.4														
			Asphalt Adhesive	2.5														
			Pesticide	2.7														
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Record	3.8.3														
			Maintenance Record	3.8.3.5														
		02922a	SD-01 Preconstruction Submittals															
			Sod Establishment Period	3.9														
			Application of Pesticide	2.5														
			Application of Pesticide	3.6														
			Delivery Schedule	1.4.1														
			SD-06 Test Reports															
			Soil Test	3.1.4														
			Delivered Topsoil	1.4.1.2														
			Delivered Topsoil	2.2														
			Equipment Calibration	3.1.3														
			SD-07 Certificates															
			Sod	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Record	3.9.3.5														
		02930a	SD-02 Shop Drawings															
			Shop Drawings	3.3.1														
			Finished Grade, Topsoil and	3.2.1	G	RE												
			Underground Utilities															

SUBMITTAL REGISTER

CONTRACT NO.
RFP

TITLE AND LOCATION
New Family Housing

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
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		02930a	SD-03 Product Data															
			Delivery	1.4.1														
			Geotextile	2.5	G	RE												
			Chemical Treatment Material		G	RE												
			Plant Establishment Period	3.9	G	RE												
			Application of Pesticide	3.7	G	RE												
			SD-06 Test Reports															
			Soil Test	3.1.4.2	G	RE												
			Percolation Test	3.1.4.1	G	RE												
			SD-07 Certificates															
			Plant Material	2.1	G	RE												
			Topsoil	2.2	G	RE												
			pH Adjuster		G	RE												
			Fertilizer	2.3.1	G	RE												
			Organic Material	2.3.2	G	RE												
			Soil Conditioner	2.3.3	G	RE												
			Organic Mulch	2.4.2	G	RE												
			Mycorrhizal Fungi Inoculum	2.12	G	RE												
			Pesticide	2.14	G	RE												
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Record	3.9.2.6														
			Maintenance Instructions	3.9.5														
		03100a	SD-02 Shop Drawings															
			Formwork	3.1.1	G	RE												
			SD-03 Product Data															

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		03100a	Design	1.3	G	RE												
			Form Materials	2.1	G	RE												
			Form Releasing Agents	2.1.5	G	RE												
			SD-04 Samples															
			Fiber Voids	2.1.6	G	RE												
			SD-07 Certificates															
			Fiber Voids	2.1.6	G	RE												
		03150a	SD-03 Product Data															
			Preformed Expansion Joint Filler	2.2	G	RE												
			Sealant	2.3	G	RE												
			SD-04 Samples															
			Field-Molded Type	2.3.2	G	RE												
			SD-07 Certificates															
			Preformed Expansion Joint Filler	2.2	G	RE												
			Sealant	2.3	G	RE												
		03200A	SD-02 Shop Drawings															
			Reinforcement	3.1	G	RE												
			SD-03 Product Data															
			Welding	1.3	G	RE												
			SD-07 Certificates															
			Reinforcing Steel	2.3	G	RE												
		03300	SD-03 Product Data															
			Mixture Proportions	1.7	G	GD												
			Curing Materials	2.4	G	RE												
			SD-04 Samples															
			Surface Retarder	2.3.5	G	RE												

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CONTRACT NO.
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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		03300	SD-06 Test Reports															
			Testing and Inspection for	3.13	G	G												
			Contractor Quality Control															
			Testing and Inspection for	3.13	G	G												
			Contractor Quality Control															
			SD-07 Certificates															
			Qualifications	1.4	G	RE												
			CHEMICAL ADMIXTURES	2.3	G	GD												
		15776	SD-02 Shop Drawings															
			Heat Pump Equipment	2.2	G	RE												
			SD-07 Certificates															
			Materials	2.1	G	RE												
			Manufacturer's Warranty	2.2	G	RE												
		15777	SD-02 Shop Drawings															
			Shop Drawings		G	RE												
			SD-06 Test Reports															
			Tests	3.4	G	RE												
			SD-07 Certificates															
			Technician's Certificate		G	RE												
			References		G	RE												
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Data		G	RE												
			SD-10 Operation and Maintenance															
			Data															
			Manuals		G	RE												

SECTION 01355

ENVIRONMENTAL PROTECTION
10/00

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 260	Hazardous Waste Management System: General
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual
WETLAND MANUAL	Corps of Engineers Wetlands Delineation Manual Technical Report Y-87-1

1.2 DEFINITIONS

1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute

work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners,excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.4 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

1.2.5 Pesticide

Pesticide is defined as any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, or intended for use as a plant regulator, defoliant or desiccant.

1.2.6 Pests

The term "pests" means arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

1.2.7 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers,creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.2.8 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.9 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND MANUAL.

1.3 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

1.5 PAYMENT

No separate payment will be made for work covered under this section. The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor. All costs associated with this section shall be included in the contract price. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G, RE.

The environmental protection plan.

1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, the Contractor shall submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor shall address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

1.7.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.7.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.

b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.

c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.

d. Description of the Contractor's environmental protection personnel training program.

e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

f. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.

g. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.

h. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

i. Drawing showing the location of borrow areas.

j. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1 . This plan shall include as a minimum:

1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer and Facility Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.

2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.

3. Training requirements for Contractor's personnel and methods of accomplishing the training.

4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

5. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

6. The methods and procedures to be used for expeditious contaminant cleanup.

k. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that

non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

l. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

m. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

n. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated.

o. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan shall include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

p. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. The plan shall include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.

q. A pesticide treatment plan shall be included and updated, as information becomes available. The plan shall include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional specific requirements.

1.7.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents

shall be attached,as an appendix, to the Environmental Protection Plan.

1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report shall be signed by both the the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

1.9 SPECIAL ENVIRONMENTAL REQUIREMENTS

The Contractor shall comply with the special environmental requirements listed here and included at the end of this section.

1.10 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings,plans and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.11 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

1.12 PERMITS

The Contractor shall obtain all needed permits or licenses. The Government will not obtain any permits for this project; see Contract Clause PERMITS AND RESPONSIBILITIES. The Kansas Department of Health and Environment, through the national pollutant discharge elimination system (NPDES), requires stormwater construction project permitting. The Contractor shall be responsible for implementing the terms and requirements of the appropriate permits as needed and for payment of all fees.

1.12.1 Stormwater Pollution Prevention Plan (SWP2)

The Contractor shall develop a stormwater pollution prevention plan (SWP2) specific to construction activities which are to be employed at this site. The plan shall be in conformance with the Kansas Department of Health and Environment's (KDHE's) National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit requirements for construction activities. Copies of

the permit requirements can be obtained from the following:

Kansas Department of Health and Environment
1000 SW Jackson, Suite 420
Topeka, KS 66612-1367
785-296-5549/6804 (Alan Brooks/Joe Mester)

In addition to other submittals required, the Contractor shall provide an electronic copy (CD-ROM) and a hard copy of the Stormwater Pollution Prevention Plan and any other Environmental Plans to the following:

Directorate of Environment and Safety
407 Pershing Court
Fort Riley, KS 66442
ATTN: Pollution Prevention Division

1.12.2 Notice of Intent (NOI) Requirements

The Notice of Intent (NOI) for Stormwater Runoff from Construction Activities and the initial permit fee required by KDHE will be filed by the Corps of Engineers prior to construction start. The Corps of Engineers shall provide copies of the NOI and any related documents that are submitted to or received from KDHE, to the Directorate of Environment and Safety, ATTN: Pollution Prevention Division. The Contractor shall be responsible for all remaining requirements of the permit, to include development of the Stormwater Pollution Prevention Plan, submitting the annual fee to KDHE, required inspections, obtaining contractor certifications, maintaining on-site files, submitting the Notice of Termination to KDHE, etc. The Contractor shall be responsible for complying with all KDHE requirements. The Contractor shall provide copies of all documents to the Government within five working days of completion or approval, as appropriate.

A copy of the NOI and the Authorization to Discharge will be provided to the Contractor. The Government will also designate a representative of the Contractor to sign the inspection reports as outlined in Part VI of the permit.

The permit requirements include, but are not limited to the following:

The SWP2 plan shall be prepared using the concepts and methods for Best Management Practices (BMP) described in Environmental Protection Agency (EPA) document number EPA 832-R-92-005, Stormwater Management for Construction Activities - Developing Pollution Prevention Plans and Best Management Practices, Sep 92. The Contractor is not limited to the BMPs in this guidance manual but should develop BMPs with the goal of site specific effectiveness.

The SWP2 plan shall be prepared under the supervision of and sealed by a licensed professional engineer or landscape architect or a certified professional in erosion and sediment control. The engineer or landscape architect must be licensed to practice in the State of Kansas. The Contractor shall notify the Directorate of Environment and Safety at the 30%, 60%, and 100% construction completion of the project as follows:

by e-mail (afznesp@riley.army.mil) or

by mail to:

Directorate of Environment and Safety
ATTN: Pollution Prevention Division
407 Pershing Court
Fort Riley, KS 66442

Construction completion, for the purposes of this requirement, is a measure of civil and other tasks that directly affect Storm Water Pollution Prevention. It is not a measure of overall project completion and is not based on monthly pay estimates unless based on monthly pay estimates for

selected tasks.

1.12.3 Preconstruction Survey

Prior to starting any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs and grassed areas immediately adjacent to work sites and adjacent to the assigned storage area and access routes as applicable. This report will be signed by both the Contracting Officer and the Contractor upon mutual agreement as to its accuracy and completeness.

1.12.4 Meetings

The Contractor shall meet with representatives of the Contracting Officer to alter the environmental protection plan as needed for compliance with the environmental pollution control program.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

The Contractor shall be responsible for obtaining and complying with all environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations.

3.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

3.2.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.2.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be

such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs)as specified in Section 01356 STORM WATER POLLUTION PREVENTION MEASURES. BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Any temporary measures shall be removed after the area has been stabilized.

3.2.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas.

3.3 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise indicated. All water areas affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

3.3.1 Cofferdams, Diversions, and Dewatering Operations

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to maintain compliance with existing State water quality standards and designated uses of the surface water body. The Contractor shall comply with the State of Kansas water quality standards and anti-degradation provisions.

3.3.2 Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments.

3.3.3 Wetlands

The Contractor shall not enter, disturb, destroy, or allow discharge of contaminants into any wetlands

3.4 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

3.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers,

electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.

3.4.2 Odors

Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.4.3 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise. The Contractor shall comply with the provisions of the State of Kansas rules.

3.4.4 Burning

Burning shall be prohibited on the Government premises.

3.5 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. Waste materials shall be hauled to the Government landfill site shown on the drawings. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.5.2 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. There shall be no storage of fuel on the project site. Fuel must be brought to the project site each day that work is performed.

3.5.3 Waste Water

Disposal of waste water shall be as specified below.

a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related waste water or by collecting and placing it in a retention pond where suspended material can be settled out and/or the water can evaporate to separate pollutants from the water. The site for the retention pond shall be coordinated and approved with the Contracting Officer. The area shall be backfilled to the original grade, top-soiled and seeded/sodded.

b. For discharge of ground water, the Contractor shall surface discharge in accordance with all Federal, State, and local laws and regulations.

c. Water generated from the flushing of lines after land applied in accordance with all Federal, State, and local laws and regulations for land application.

3.6 RECYCLING AND WASTE MINIMIZATION

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.7 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.8 BIOLOGICAL RESOURCES

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.9 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

3.10 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.11 MILITARY MUNITIONS

In the event the Contractor discovers or uncovers military munitions as defined in 40 CFR 260, the Contractor shall immediately stop work in that area and immediately inform the Contracting Officer.

3.12 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with

statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.13 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

SECTION 01356

STORM WATER POLLUTION PREVENTION MEASURES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NAME (ACRONYM)	
ASTM D 448	(2003) Standard Classification for Sizes of Aggregate for Road and Bridge Construction
ASTM D 4355	(2002) Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
ASTM D 4439	(2002) Standard Terminology for Geosynthetics
ASTM D 4491	(1999) Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 2003) Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999) Standard Test Method for Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(2000; E 2002) Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(2002) Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01410 ENVIRONMENTAL PROTECTION, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit specified in Section 01567 NPDES PERMIT REQUIREMENTS FOR STORM WATER DISCHARGES FROM CONSTRUCTION SITES.

1.3 SUBMITTALS

Government review is required for all submittals with a "G-RE" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Mill Certificate or Affidavit

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described in the Storm Water Pollution Prevention Plans (SWPPP) attached to Section 01567 NPDES PERMIT REQUIREMENTS FOR STORM WATER DISCHARGES FROM CONSTRUCTION SITES.

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	445 N min.
Elongation (%)		30 % max.
Trapezoid Tear	ASTM D 4533	245 N min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of m. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum mass of 1.3 pound per linear foot and a minimum length of 5 feet.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2.1.5 Support Mesh

Support mesh shall be 14-1/2 gage or heavier steel wire with a mesh spacing of 6 inches by 6 inches or a prefabricated polymeric mesh of equivalent strength.

2.2 EROSION CONTROL BLANKET

Erosion control blankets shall be a machine-produced mat with a biodegradable agricultural straw matrix (approximately .05 pounds per square foot)and photodegradable netting on each side. The blanket shall be sewn together with degradable thread. Installation staple patterns shall be clearly marked on the erosion control blanket with environmentally safe paint.

2.3 COMPONENTS FOR SEDIMENT TRAP

Coarse aggregate shall conform to ASTM D 448, Size 3, 357, or 5. Minor variations from the gradations specified will be permitted. Stone for riprap shall consist of fieldstone or rough unhewn quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering. The specific gravity of individual stones shall be at least 2.5. Riprap stones shall weigh between 50 and 150 pounds each, except that approximately 10 percent may weigh 50 pounds or less. At least 60 percent shall weight more than 100 pounds. Geotextile shall conform to paragraph GEOTEXTILES.

2.4 COMPONENTS FOR INLET PROTECTION

Aggregates for gravel filter should be sized to get the greatest amount of filtering action possible (by using smaller-sized stone), while not creating significant ponding problems.

2.5 STONE CONSTRUCTION ENTRANCE

Aggregate for construction entrance shall conform to ASTM D 448, Size 1. Minor variations from the gradation specified will be permitted. Geotextile shall conform to paragraph GEOTEXTILES.

2.6 GEOTEXTILES

Geotextile for other than silt fence shall conform to the following requirements. Geotextile shall be a nonwoven pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. The use of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be allowed. Stabilizers and/or inhibitors shall be added to the base polymer, as needed, to make the filaments resistant to deterioration by ultraviolet light, oxidation, and exposure. Regrind material, which consists of edge trimmings and other scraps that have never reached the consumer, may be used to produce the geotextile. Post-consumer recycled material may also be used. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the selvages. Geotextiles shall meet the requirements specified below. Where applicable, property values represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum average roll values.

GEOTEXTILE PHYSICAL PROPERTIES

PROPERTY	TEST VALUE	TEST METHOD
Elongation at Break, percent	Greater Than 50	ASTM D 4632
Apparent Opening Size (U.S. Sieve)	70	ASTM D 4751
Puncture, N	250	ASTM D 4833
Grab Tensile, N	700	ASTM D 4632
Trapezoidal Tear, N	250	ASTM D 4533

Ultraviolet Stability (percent strength retain at 500 hours)	50	ASTM D 4355

2.7 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air-dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wire-bound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimension of 2 inches by 2 inches in cross section and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales shall have a minimum mass of 1.33 pounds per linear foot and a minimum length of 3 feet.

PART 3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. when joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6-inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon review by the Contracting Officer.

3.2 SEDIMENT TRAP

The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. Fill material for the embankment shall be placed in accordance with Section 02300 EARTHWORK. A geotextile shall be placed between the riprap and subgrade.

3.3 STONE CONSTRUCTION ENTRANCE

The area of the entrance shall be cleared of all vegetation, roots, and other objectionable material. A minimum of 3 inches of aggregate shall be placed in a cut section to provide stability and secure the geotextile. The geotextile shall be placed beneath coarse aggregate for the full width and length of the entrance.

3.4 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. Inspection and maintenance of protective measures shall conform to the requirements in the SWPPP.

3.5 INSTALLATION OF STRAW BALES

Straw bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of

the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

-- End of Section --

SECTION 01450

TESTING FOR MECHANICAL AND ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 APPLICABILITY

This section applies to all mechanical and electrical systems and all systems using electro magnetically driven equipment, or electronic systems; and high and low voltage electrical distribution systems (except branch panels). For purposes of this section a system is an entity comprised of a series of closely related interdependent components and which is capable of independent performance of a useful function. System components shall include all software and programming as applicable for the system. Some typical examples include:

Independently functioning HVAC systems

Alarms

Furnace and Air Conditioning Condenser

Electrical equipment including cable, splices, switchgear, relays, circuit breakers, fuses, transformers, instrumentation, etc.

1.2 SUBMITTALS

Government review is required for all submittals with a "G, RE" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-05 Design Data

Test Plans List; G, RE.

No later than sixty calendar days after Notice to Proceed, in accordance with section: Submittal Procedures, and other requirements of the technical provisions, the Contractor shall submit a list for review consisting of all systems for which test plans are required. This list will be reviewed by the Government and any systems found to be missing will be required to be added by the Contractor and appropriate test plans submitted. No work will be permitted on any of the above systems until this list is submitted.

Test Plans; G, RE.

Test plans shall be submitted for review for all systems contained on the list submitted as required above. Test plans should be submitted as soon as possible so that the progress of the project and corresponding payments will proceed on schedule.

SD-07 Certificates

CERTIFICATION OF OPERATION TESTS; G, RE.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 TEST PLAN

3.1.1 Test Plans List and Operational Testing

The Contractor shall develop test plans and schedule operational testing for the systems in the approved list. The testing shall be in accordance with the requirements in the appropriate technical provisions and shall include as a minimum the requirements below. All testing required by applicable codes, standards, manufacturers, suppliers, etc., shall be incorporated into the Contractor's test plans. Test plans shall list all equipment required to perform the tests and any Government support required. It shall be in sufficient detail to permit a step-by-step approach to the test and to demonstrate that each system operates as intended by the contract documents it shall describe as a minimum:

What system is being tested, including a listing of all components to be tested?

What individual or organization will perform the testing, who will certify the test and qualifications of test personnel?

A step by step narrative of testing procedures to be used to demonstrate contract compliance, including all governing standards, such as, sequence of controls," 11 ASTM Standard XXX; 11 or, IEEE Standard XXX, 11 etc.

What testing equipment will be utilized?

What operator interaction is required?

What results are to be expected?

Seasonal limitations, if any, including date(s) of proposed testing.

A complete schematic diagram (electrical and/or pneumatic, as appropriate) showing all components, and block diagram.

A checklist to be used during the operational test.

3.1.2 Testing Process

Outlined below are a number of events related to the status of the test plan and testing. The corresponding percentages indicate the maximum percentage of the value of the system that will be permitted to be installed after the successful completion of the corresponding event indicated for all systems to which this section applies. Events must be completed sequentially. Any work performed in excess of the permitted percentages will be at the Contractor's own risk and will not be paid until the event corresponding to the percentage of system value permitted to be installed is successfully completed.

EVENT	**MAX % OF SYSTEM VALUE ** PERMITTED TO BE INSTALLED**
Contractor has submitted list of systems that require test plans to be reviewed and system work is on-going but not test plan has been submitted.	**50**
Test plan submitted	**65**
* Test plan approved	**80**
Successful completion of test including submission of required documents reports (i.e. balancing reports for all HVAC systems), operations and maintenance manuals, spare parts, and spare parts data.	**100**

* The Government will process the submittal in accordance with the time frames

indicated in specification: Submittal Procedures. If the test plan is unacceptable and not in compliance with the requirements of the RFP, the Government will have an additional 30 days to review the resubmittal from the date it receives the document.

**** If a system involves both heating and cooling modes and one mode has been successfully tested, this percentage shall be reduced to 90% until the testing is completed on both modes. The contractor may proceed with events as indicated.

3.1.3 Operational Tests

Operational tests, including performance tests, shall be conducted for an entire system, not component parts only. Tests may be conducted only after an entire system has been completely installed. Contractor shall provide a minimum of 14-calendar day's notice to the Contracting Officer of scheduled tests. This notice must include the Contractor's assurance that all installed work previously identified to the Contractor as being unacceptable, along with all remaining work associated with the respective system, shall be completed and acceptable by the date scheduled for the operational test. Failure of the Contractor to have all contract work acceptably complete for this test will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection costs, if any.

3.2 CERTIFICATION OF OPERATION TESTS

For each system test, the Contractor shall obtain the services of an experienced professional who shall certify that the operational test was conducted in accordance with the approved test plan and the results of this test meet all the contract requirements. These individuals must have a minimum of eight (8) years experience in the testing of particular system being tested and shall also meet qualifications (if any) set forth in other technical sections of the contract specifications.

3.3 COMPONENTS IN SYSTEM FOR PAYMENT PURPOSES

When considering the value of a system for payment purposes, the following components shall be counted as part of a system.

All electro-magnetically driven equipment.

Gauges, dampers, valves, actuators, controllers, pipes, test sensing elements, logic/processors, CPUs, ducts, insulation, wiring, conduit, switchgear, etc.

All other mechanical or electrical components, devices or equipment which are essential to the proper function of the system such as pumps, motors, furnaces, condensers, heat pumps, etc.

Software programs and any refrigerants are also considered "parts" of a system.

3.4 CONFLICTS IN REQUIREMENTS

The Contractor shall comply with the requirements contained in this section supplement and other testing requirements contained in the RFP contract documents. If a conflict exists between the requirements of this section and other parts of the contract documents, the requirements of this section shall take precedence.

-- End of Section --

SECTION 01451A

CONTRACTOR QUALITY CONTROL
03/04

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(2001) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(2000b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence.

3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 20 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the Project Manager or someone higher in the Contractor's organization. Project Manager in this context shall mean the individual with responsibility for the overall management of the project, including quality and production. If the Project Manager and Project Superintendent are the same person, the CQC System Manager shall report to someone higher in the Contractor's organization than the Project Manager.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Laboratory facilities shall be validated by the Corps of Engineers Material Testing Center (MTC). The Contractor shall incorporate all tests required by the contract (including systems commissioning and operating tests) to derive the above list of testing information which shall be presented in matrix form as part of the CQC Plan. This matrix shall be suitable for use by the Contractor and the Government as a checklist to control testing to be done on the contract. The Contractor shall coordinate any additional test submission or plan requirements for Mechanical and Electrical Systems with appropriate specialized specification sections if applicable.

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation. The Contractor shall provide a matrix of Preparatory and Initial Inspections including specification reference paragraph, the name of the Definable Feature of Work, and spaces for date performed, results, and names of attendees.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

j. Contractor's plan for training all CQC personnel in the CQC System.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 2 years construction experience on construction similar to this contract, or a construction person with a minimum of 5 years experience in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the

System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical, and materials technician. Except for materials technicians, these individuals shall be directly employed by the prime Contractor and may not be employed by a supplier or sub-contractor on this project. These employees shall be responsible to the CQC System Manager; shall be physically present at the construction site during work on their areas of responsibility; and shall have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals shall have no other duties other than quality control.

Experience Matrix

	Area	Qualifications
a.	Mechanical	Graduate Mechanical Engineer with 2 yrs experience or person with 5 yrs related experience
b.	Electrical	Graduate Electrical Engineer with 2 yrs related experience or person with 5 yrs related experience
d.	Concrete, Pavements and Soils	Materials Technician with 2 yrs experience for the appropriate area

3.4.4 Additional Requirement

In addition to the above experience and/or educational requirements, the CQC System Manager, Alternate CQC System Manager, and Superintendent shall have completed the course entitled "Construction Quality Management for Contractors" within the past five years and shall be in possession of a valid certificate of instruction. If the individuals designated as CQC System Manager and Alternate CQC System Manager do not currently meet this training requirement, it is mandatory that the training be successfully completed within ninety calendar days of appointment to the positions of CQC System Manager and Alternate. The Contractor's CQC System Manager and Alternate may be appointed and serve fully in their capacities pending certification, providing all other qualifications are met. If the CQC System Manager or Alternate fails to successfully complete the training, the Contractor shall promptly appoint a new CQC System Manager or Alternate who shall then attend the next available course if he/she does not have a current course certification. The certification is valid for five years at which time retraining is required. If the Contractor needs this training, it will be provided by Government personnel after award of the contract. The cost for the training course shall be borne by the Contractor and will not exceed one hundred dollars ($100.00) per course, per person. Payment shall be by check in advance of the training. The Contractor shall contact the Contracting Officer upon award of the contract to arrange for course participation.

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer

for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. All contractor forms for submitting test results are subject to Contracting Officer approval.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of

workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase shall be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers validated testing laboratory or establish a validated testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract. The Contractor shall maintain test logs of all tests performed by Specification Section and type of test.

3.7.2 Testing Laboratories

3.7.2.1 Validation

The testing laboratory for aggregate, concrete, bituminous materials, soil, and rock shall be validated by the Corps of Engineers Materials Testing Center (MTC) for all tests required by the contract. The validation of a laboratory is site specific and cannot be transferred or carried over to a facility at a different location. Any and all costs associated with this validation shall be borne by the Contractor. If the selected laboratory fails the validation, the Contractor shall also be responsible for the costs of each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. The costs shall be the amounts on the MTC web site at the time the validation procedure is performed. Validation of a laboratory is not granted for the entire laboratory activity, but only of the specific procedures requested by the inspected laboratory. The inspected laboratory has full choice of the procedures to be inspected except that the Quality Assurance portion of ASTM E 329 and tests required by the contract are mandatory to be inspected.

a. Validation Procedures

Validation of a laboratory may consist of either an inspection or audit as defined herein. The MTC determines whether the laboratory will be inspected or audited. Validation of all material testing laboratories shall be performed by the MTC. Validation may be accomplished by one of the following processes:

1. Inspection. Inspection shall be performed by the MTC in accordance with American Society for Testing and Materials (ASTM) standards ASTM E 329 and ASTM D 3740.

2. Audit. A laboratory may be validated by auditing if it has been accredited by the Concrete and Cement Reference Laboratory (CCRL) or AASHTO Materials Reference Laboratory (AMRL) within the past two years in accordance with ASTM E 329. Audit shall be performed by the MTC. Inspection by MTC may be required after auditing if one or more of the critical testing procedures required in the project specifications were not included in the CCRL or AMRL inspection report or if there is any concern that the laboratory may not be able to provide required services.

b. Validation Schedule

1. For all laboratories testing aggregate, concrete, bituminous materials, soils, and rock, a validation shall be performed at least every two (2) years, unless extended by the MTC.

2. All laboratories shall be revalidated at any time at the discretion of the Corps of Engineers when conditions are judged to differ substantially from the conditions when last validated.

c. Validation Process

If a validated laboratory is unavailable or the Contractor elects to use a laboratory which is not validated, the Contractor shall coordinate with the Corps of Engineers Material Testing Center (MTC) in Vicksburg, MS, to obtain validation and pay all associated costs. Point of Contact at MTC is Daniel Leavell, telephone (601) 634-2496, fax (601) 634-4656, e-mail: daniel.a.leavell@erdc.usace.army.mil, at the following address:

U.S. Army Corps of Engineers
Materials Testing Center
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

The procedure for Corps of Engineers validation, including qualifications and inspection/audit request forms, is available at the MTC web site: http://www.wes.army.mil/SL/MTC/mtc.htm.

The Contractor shall comply with all requirements on the web site.

The Contractor shall coordinate directly with the MTC to obtain validation. The Contractor is cautioned the validation process is complicated and lengthy, may require an onsite inspection by MTC staff, correction of identified deficiencies, and the submittal and approval of significant documentation. A minimum of 60 days shall be estimated to schedule an inspection/submittal and receive a validation. The Contractor shall be as expeditious and punctual as possible in his coordination and submittal activities with the MTC. The Contractor shall copy the Contracting Officer of all correspondence and submittals to the MTC for purposes of laboratory validation.

3.7.2.2 Laboratory and Testing Facilities

The Contractor shall provide and maintain all measuring and testing devices, laboratory equipment, instruments, transportation, and supplies necessary to accomplish the required testing. All measuring and testing devices shall be calibrated at established intervals against certified standards. The Contractor's measuring and testing equipment shall be made available for use by the Government for verification of their accuracy and condition as well as for any inspection or test desired pursuant to the CONTRACT CLAUSE titled "Inspection of Construction". The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government. The location of the laboratory shall be convenient to the site such that test results are available prior to proceeding with the next sequential phase of the work.

3.7.3 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Government-contract laboratory designated by the Area Office.

Coordination for each specific test, exact delivery location, and dates will be made through the Area Office.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Clause, "Commencement, Prosecution, and Completion of Work", or elsewhere in the contract, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional personnel including, but not limited to, those from the customer, or Owner, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

g. Offsite surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy, both signed, of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report. A Contractor Quality Control Report shall be prepared for each calendar day of the Contract. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

SECTION 01500A

TEMPORARY CONSTRUCTION FACILITIES
02/97

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The items furnished under this section shall be maintained in good condition throughout the construction period. The items furnished shall remain the property of the Contractor and shall be removed from the site upon completion of the work.

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired. The site plan shall include drawings and details of all temporary utilities work.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

1.2.2 Meters and Temporary Connections

The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary connections, distribution lines, meter bases, and meters required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall make arrangements with the post utilities officer before final electrical connection is desired so that a utilities contract can be established. The Contractor will provide a meter and make the final hot connection after inspection and approval

of the Contractor's temporary wiring installation. The temporary plan shall be submitted for approval in accordance with EM 385-1-1.

1.2.3 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, and then the Contractor shall disconnect service, and remove the meters. The Contractor shall then remove all the temporary distribution lines, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

1.2.4 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 915 by 1220 mm in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

1.3.2 Project and Safety Signs

The requirements for the signs, their content, and location shall be as shown on the examples at the end of this chapter. The signs shall be erected within 15 days after receipt of the notice to proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the

safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.4.3 Custer Hill Access

There will be no access to the job site/Custer Hill during PT hours nor will there be any motor vehicle traffic allowed. The PT hours currently are 6:30 AM to 7:30 AM and may be changed to 4:00 PM TO 5:00 PM.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.5.2 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

Trailers utilized for the Government inspectors office shall present a clean and neat interior and exterior appearance and shall be in a state of good repair at all times during the duration of the project. Trailers which, in the opinion of the Contracting Officer, require exterior painting or interior or exterior maintenance will not be allowed on the military property.

1.5.3 Maintenance of the Construction Area Including the Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly. At no time shall the height of the grass exceed 4-inches. Weeds shall be controlled and shall not exceed grass height.

1.5.4 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.6 GOVERNMENT FIELD OFFICE

1.6.1 Accommodations for Government Inspectors

The Contractor shall furnish a temporary office facility approximately 12 feet by 70 feet. It shall be located where directed and shall be reserved for Government personnel only. Gravel parking area for a minimum of four vehicles will be provided and reserved for the sole use of the Government. Access from the parking area to the office shall be by elevated walkway or concrete sidewalks. The steps and landings at the doors shall be substantial.

The Contractor shall furnish bottled drinking water with cooler, thermostatically controlled space heat, ventilation and air conditioning, electric light (suitable for an office environment), sufficient power, and toilet facilities consisting of one lavatory, one water closet. The toilet shall be complete with hot and cold running potable water, sewer, and powered bathroom ventilation.

Utilities shall be connected and disconnected by the Contractor in accordance with local codes and to the satisfaction of the Contracting Officer. The facility shall be laid out and furnished as follows:

There shall be two private offices, one at each end furnished with two desks each, two office chairs each, two four drawer legal size file cabinets each, two telephone instruments each. In addition one office will be supplied with a laptop computer and one printer. The center area between the offices shall be a conference area furnished with a conference table and chairs for 14 persons, three four-drawer legal-size file cabinets, a table for the fax machine, a digital plain paper fax machine, a copying machine that is 11 X 17 inch capable, a mobile plan rack, and a moveable plan table large enough to accommodate full scale drawings. The required phone lines shall be extended to both offices and one corner location (phone and fax) in the conference room. Three telephone jacks shall be provided in each office. Five telephone instruments that roll over to available lines and have speaker and intercom capability shall be provided. The four in the offices shall be desk or wall mounted. The instrument in the conference room shall be cordless. The required data lines shall be extended to both offices and one corner location in the conference room. These connections shall be co-located with the telephone jacks.

The minimum configuration for the laptop computer is:

Base Unit: Latitude D800, 1.60GHz, Pentium M, 15.4 WUXGA, English (221-2231)

Memory: 512MB, 2 Dimms, Double Data Rate for Dell Latitude D600 Notebooks, Factory Install (311-1874)

Video Card: NVIDIA GeForce4 4200 Go 4XAGP graphics with 64 MB DDR Video Mem for Latitude D800,Factory Install (320-0649)

Hard Drive: 40GB Hard Drive 9.5MM 5400RPM for Dell Latitude D800,FactoryInstall (340-8243)

Floppy Disk Drive: Floppy Drive,Internal/Externalfor Dell Latitude D-Family, Notebooks, Factory Tied (340-6895)

Operating System: English - Windows 2000, SP4, No Media, for Dell Latitude Notebooks, Factory Install (420-3442)

Operating System: English - Windows 2000, SP4, with Media, for Dell Latitude Notebooks, Factory Install (420-3586)

Modem: Internal 56K Modem for Dell Latitude D-Family Notebooks, Factory Install (313-1535)

TBU: 90W AC Adapter for Latitude D800 (310-4224)

CD-ROM or DVD-ROM Drive: 24X CDRW/DVD for Latitude D-Family, Factory Install (313-2115)

Processor Cable: No Wireless LAN Card, Fact (430-2900)

Feature 9-Cell/72-WHr Primary Battery for Dell Latitude D800 Factory Install (312-0093)

Feature Deluxe Nylon Carrying Case for Dell Latitude D-Family Notebooks (310-3109)

Service: Type 3 Contract - Next Business Day Parts and Labor On-Site Response, Initial Year (900-0840)

Service: Type 3 Contract - Next Business Day Parts and Labor On-Site Response, 2YR Extended (900-1152)

Service: Complete Care Accidental Damage Svc, Lat, 3Yr , 1-800-624-9896 (960-0407)

Dirline: Gold Technical Support Service Latitude, 3 Years, (950-4919)

Software and Accessories:

Dell Ultra Sharp 1800FP,Flat Panel Monitor,18 inch(18.1 inch Viewable Image Size), Gray, Customer Install (320-0469)

D/Dock, Docking Station for Latitude D400, 600, 800 Customer Kit (310-2873)

Grey PS2,104,6 Pin, Keyboard, for Dell Latitude Notebooks, Customer Install (310-1634)

Dell USB Optical 2-Button Wheel Mouse, Customer Install (310-4073)

A215 Two Piece Stereo Speaker System for Dell Potpie Precision, Latitude Customer Install (313-2317)

D/Monitor Stand for Latitude D-Family, Customer Kit (310-2880)

Master Lock Universal Notebook Security Cable (235014)

Deluxe Nylon Carrying Case for Dell Latitude D500, 600, 800, Customer Install (310-3465)

Additional Software:

Most current version of Microsoft Office XP Professional, Norton Utilities Professional, Norton Antivirus

Or approved equal.

The minimum printer configuration is: Hewlett Packard 1200se or approved equal, the printer shall be compatible with the laptop.

Six cellular flip phones, with belt clip, and coverage at Fort Riley shall be provided. Each phone shall be provided with 500 anytime minutes anywhere in the United States. The cost of same to be borne by the Contractor.

Used furniture and equipment (except computer, printer and fax), in good condition, will be acceptable subject to approval of the Contracting Officer. Computer, printer and fax shall be new.

The main entrance shall be into the conference room. The second egress shall be a door in either of the offices. Entrance and egress doors shall be equipped with substantial locks.

The Contractor shall provide janitorial service and janitorial consumables, fuel for the heating facilities, electricity, telephone, unlimited internet access, copier, fax and printer consumables including but not limited to toner cartridges and paper, hot and cold running domestic water, and bottled water all at no cost to the Government.

The entire facility including the furniture and equipment will remain the property of the Contractor and shall be removed from the site at the completion of the work.

1.6.2 Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above. The trailer shall be securely anchored to the ground at all four corners to guard against movement during high winds in accordance with the regulations of the State of Kansas for mobile homes. The trailer shall be fully skirted for the life of the project.

1.7 PLANT COMMUNICATION

The Contractor shall furnish three phone lines (2 telephone and 1 fax) to the Corps of Engineers Site Office. All three telephone lines shall be "full service" including long distance capabilities with the first $75.00 of long distance charges on each to be borne by the Contractor. In the conference area there shall be telephone jacks for each of the three phone lines. In addition to the capabilities above, unlimited internet access shall be provided via either Digital Subscriber Line (DSL), cable modem, or T-1 direct to the ISP. Switching shall be provided to allow simultaneous usage in all three locations within the site office. Switch shall be a Cisco PIX501 with firewall. If special software is required by the provider in order to connect, this software shall be installed on the laptop provided under the terms of this contract. A static IP address shall be provided for this modem.

1.8 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud that is tracked onto paved or surfaced roadways shall be cleaned away as soon as it is deposited. Materials resulting from demolition activities that are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored, elevated from the ground contact on cribbing, and protected from the weather.

1.9 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

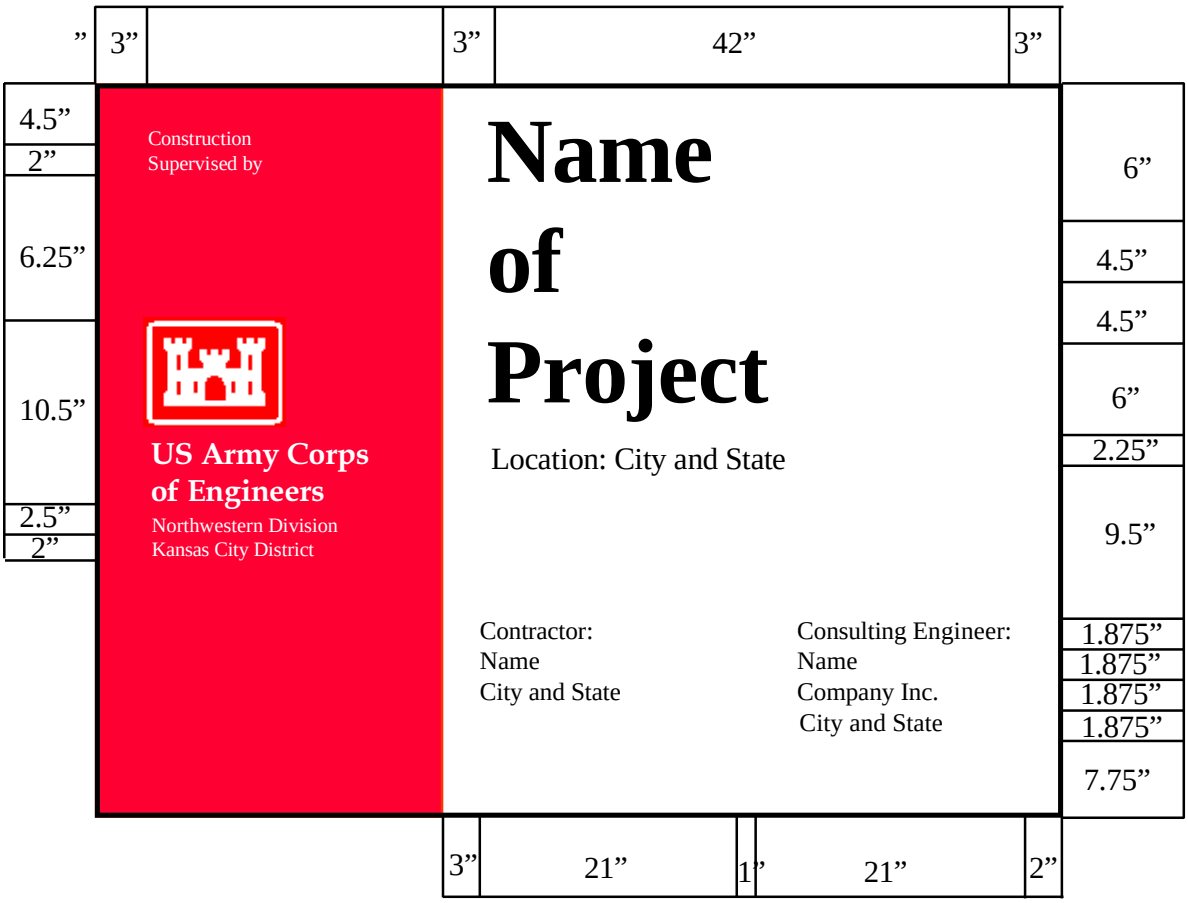
PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

The graphic format for this 4'x 6' sign panel follows the legend guidelines and layout as specified below. The large 4'x 4' section of panel on the right is to be white with black legend. The 2'x 4' section of the sign on the left with with the full Corps signature (reverse version) is to be screen printed Communications Red on the White background.

This sign is to be placed with the Safety Performance Sign (See Fig. 2).



Legend Group 1: One to two-line description of Corps relationship to project
Color White
Typeface 1.25" Helvehca Regular
Maximum line lenth: 19"

Legend Group 2: Division\ District Name Placed below 10.5" Reverse Signature (6" Castle).
Color: White
Typeface: 1.25" Helvetica Regular

Legend Group 3: One- to three-line project title legend describes the work beging done under this contract.
Color: Black
Typeface: 3" Helvetica Bold
Maximum line length: 42"

Legend Group 4: One- to two-line identification of project or facility (civil works) or name of sponsoring department (military).
Color: Black
Typeface: 1.5" Helveticia Regular
Maximum line length: 42"

Cross-align the first line of Legend Group 4 with the first line of the Corps Signature (US Army Corps) as shown.

Legend Groups 5a-b: One- to five-line identification of prime contractors including: type (arcthitect, general contractor, etc.), corporate or firm name, city, state. Use of Legend Group 5 is optional.
Color: Black
Typeface: 1.25" Helvetica Regular
Maximum line length: 21"

All typography is flush left and rag right, upper and lower case with initial capitals only as shown.
Letter- and word-spacing to follow Corps standards

Sign Type	Legend Size	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
CID-01	Various	4' x 6'	4" x 4"	HDO-3	48"	WH-RD/BK

CONSTRUCTION SIGN (CORPS OF ENGINEERS DESIGN)
(Use with Fig 2)

Fig. 1

SAFETY PERFORMANCE SIGN

Each contractor's safety record is to be posted on Corps managed or supervised construction projects and mounted with the construction project identification sign.

The graphic format, color, size and typefaces used on the sign are to be reproduced exactly as specified below. The title with First Aid logo in the top section of the sign and the performance record captions are standard for all signs of the type. Legend Groups 2 and 3 below identify the project and the contractor and are to be placed on the sign as shown.

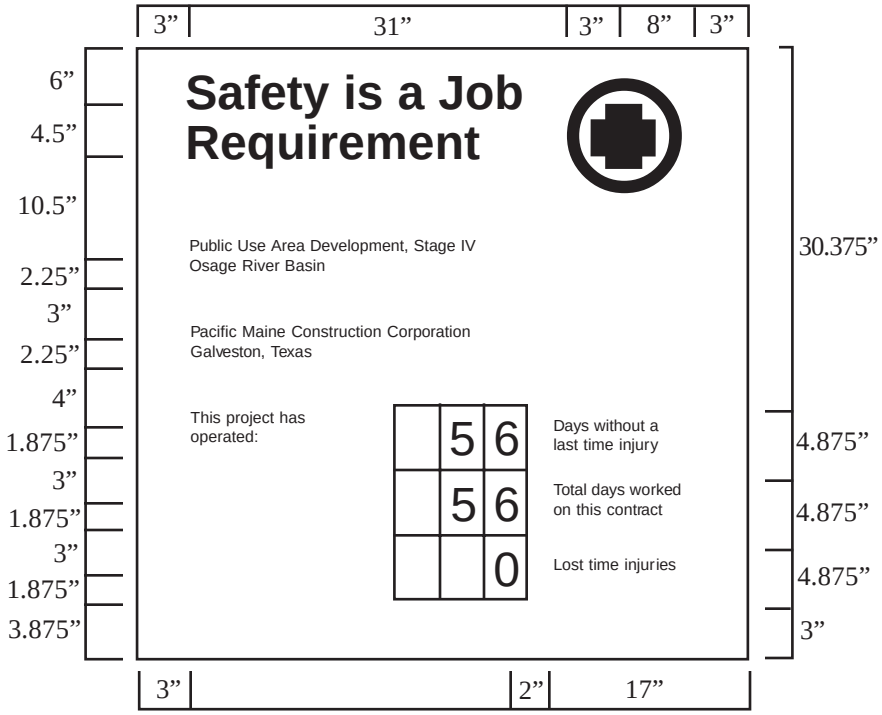
Safety record numbers are mounted on individual metal plates and are screw mounted to the background to allow for daily revisions to posted safety performance record.

Legend Group 1: Standard two-line title "Safety is a Job requirement" with (8 od.) Safety Green First Aid logo.
Color: to match PMS 347
Typeface: 3" Helvetica Bold
Color: Black

Legend Group 2: One to two-line project title legend describes the work being done under this contract and name of host project.
Color: Black
Typeface: 1.5" Helvetica Regular
Maximum line length: 42"

Legend Group 3: One to two-line identification; name of prime contractor and city, state address.
Color: Black
Typeface: 1.5" Helvetica Regular
Maximum line length: 42"

Legend Group 4: Standard safety record captions as shown.
Color: Black
Typeface: 12.5" Helvetica Regular



Sign Type	Legend Size	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
CID-02	Various	4' X 4'	4" X 4"	HDO-3	48"	WH/BK - GR

Replaceable numbers are to be mounted on white .060 aluminum plates and screw-mounted to background.
Color: Black
Typeface: 3" Helvetica Regular
Plate size: 2.5" X 5"

All typography is flush left and rag right. Upper and lower case with initial capitals only as shown. Letter - and word - spacing to follow Corps standards.

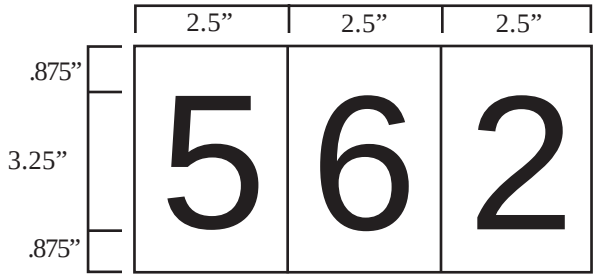


Fig. 2

SECTION 01567

NPDES PERMIT REQUIREMENTS FOR STORM WATER DISCHARGES FROM CONSTRUCTION SITES

PART 1 GENERAL (Not Applicable)

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall be responsible for implementing the terms and requirements of the attached "Kansas Water Pollution Control General Permit and Authorization to Discharge Stormwater Runoff From Construction Activities" (hereafter referred to as the "Permit") as specified below. The Government will be the permittee. The Government has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications. The Contractor shall have day-to-day operational control of those activities which are necessary to ensure compliance with the requirements specified herein. The Government will be responsible for all submissions to the State. The Government will retain the official copy of all documents pertaining to compliance with the Permit during construction. The project site is not located in designated critical habitat and there are no known "listed species" located in the project area.

3.2 IMPLEMENTATION

3.2.1 Notice of Intent

The Government will complete and submit the Notice of Intent (NOI) in accordance with the Permit and pay the annual permit fee. The Contractor may not begin land disturbance activities until authorized by the Contracting Officer's Representative (COR).

3.2.2 Storm Water Pollution Prevention Plan

Unless otherwise indicated, the Contractor shall be responsible for implementing all measures described in the Storm Water Pollution Prevention Plan (SWPPP). The Contractor shall sign the Contractor's Certification. The Contractor's Certification shall also be submitted to the COR at least 2 days prior to beginning land disturbance activities. The Government will be responsible for making any required modifications to the SWPPP.

3.2.3 Inspection and Reporting

The Contractor shall be responsible for all inspections specified in the SWPPP and the Permit. The Contractor shall also prepare all reports summarizing the inspections as required by the SWPPP and the Permit. The Government will sign the reports. Copies of inspection reports shall be furnished to the COR for attachment to the SWPPP no more than 2 days after each inspection. The Contractor shall notify the COR within 24 hours if an inspection identifies any incidents of non-compliance with the SWPPP and the Permit.

3.2.4 Maintenance

The Contractor shall be responsible for maintaining all erosion and sediment control measures and other protective measures identified in the SWPPP in an effective operating condition. The Government reserves the right to require the Contractor to perform maintenance on erosion and sediment control measures and other protective measures if the COR determines that environmental protection requirements are not being met.

3.2.5 Notice of Termination

The Contractor shall notify the COR within 2 days after final stabilization on all portions of the site has been achieved in accordance with Part VII of the Permit. The Government will complete and submit the Notice of Termination to the State.

3.2.6 Retention of Records

The Government will be responsible for retaining copies of the permit, SWPPP, site inspection records, Contractor's certifications, NOI, and NOT in accordance with the Permit.

-- End of Section --

SECTION 01911

QUARTERS CLEANING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section includes special requirements for quarters' cleanliness.

1.2 PURPOSE

The purpose of this section is to ensure the Contractor leaves the new houses in clean "ready-to-be-lived-in" condition upon completion of the required work. The Contractor shall perform all cleaning required to meet the cleanliness standards specified herein.

1.3 CLEANING MATERIALS

Use cleaning materials which will not create hazards to health, property or environment, and which will not damage surfaces to be cleaned.

1.4 CLEANING EQUIPMENT

Use cleaning equipment designed for the specific tasks to be performed. Electrically powered cleaning equipment shall be free form safety defects.

1.5 QUARTERS CLEANLINESS

1.5.1 Floors and Carpets

Floors, including stairs and landings, shall be clean and free of dirt, dust, marks, and scuffs; resilient tile floors shall be cleaned with a damp mop and free of dirt, marks, and streaks. Carpet shall be vacuumed and free of dirt, stains, paint and debris.

1.5.2 Ceilings, Walls, Woodwork, and Closets

Ceilings, walls, woodwork, and closets shall be clean and free of dirt and dust.

1.5.3 Cabinets

Cabinets shall be empty, clean and free of dirt, and the doors left closed.

1.5.4 Doors and Windows

The interior and exterior surfaces of doors and window glass shall be clean, free of dirt and dust, and be closed and locked.

1.5.5 Lights, Fans and Hoods

Light fixtures, porch lights, exhaust fans, and range hoods shall be clean, free of dirt and dust, and turned off.

1.5.6 Porcelain Fixtures and Mirrors

Porcelain fixtures, to include sinks, vanities, toilets, and bathtubs shall be cleaned thoroughly and free of dirt, cleaning residue, and stains. Shower walls and tracks must be clean and free of streaks and cleaning residue. Mirrors shall be clean and streak free.

1.5.7 Patios, Garages and Porches

Patios, garages, and porches must be cleaned and free of debris, dirt and stains. During the winter, they must be free of snow and ice as well.

1.5.8 New Appliances

New appliances must be clean and free of dirt, dust, stains, and adhesive left from labels.

1.5.9 Furnace Filters

New furnace filters must be clean and free of dust and stains.

1.5.10 Furnaces and Water Heaters

Furnaces and water heaters shall be clean and free of dirt and dust.

1.5.11 Exterior Surfaces

Exterior building surfaces shall be free of dirt or stains.

1.5.12 Concrete Surfaces

Concrete surfaces, basement walls and floors, sidewalks, and driveways shall be free of stains.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

DIVISION 2 – SITE WORK

02220	Demolition
02231	Clearing and Grubbing
02364A	Termiticide Treatment Measures for Subterranean Termite Control
02510A	Water Distribution System
02531	Sanitary Sewers
02630A	Storm-Drainage System
02712A	Lime-Modified Subgrade
02721A	Subbase Courses
02722A	Graded-Crushed Aggregate Base Course
02741A	Hot-Mix Asphalt (HMA) for Roads
02748A	Bituminous Tack and Prime Coats
02770A	Concrete Sidewalks and Curbs and Gutters
02921A	Seeding
02922A	Sodding
02930A	Exterior Planting

SECTION 02220

DEMOLITION
05/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6	(1990) Safety Requirements for Demolition Operations

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI Guideline K	(1997) Containers for Recovered Fluorocarbon Refrigerants

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 82	Protection of Stratospheric Ozone; Refrigerant Recycling

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. The work includes demolition, salvage of identified items and materials, as applicable, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible, and salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G, RE.

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials

specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of
utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

SD-07 Certificates

Demolition plan; G, RE.

Notifications; G, RE.

Notification of Demolition and Renovation Forms; G, RE.

Submit proposed demolition and removal procedures to the Contracting Officer for approval before work is started.

SD-11 Closeout Submittals

Receipts

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.5 DUST CONTROL

Prevent the spread of dust and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.6 PROTECTION

1.6.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.6.2 Existing Work

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

1.6.3 Trees

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 6 foot high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract

shall be replaced in kind or as approved by the Contracting Officer.

1.6.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, of lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.6.5 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.8 Required Data

Demolition plan shall include procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations.

1.9 ENVIRONMENTAL PROTECTION

The work shall comply with the requirements of Section 01355A ENVIRONMENTAL PROTECTION.

1.10 USE OF EXPLOSIVES

Use of explosives will not be permitted.

1.11 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available in accordance with the following schedule:

Area	Date
Demolition (Tobie Court and Fleetwood Court)	See SECTION 00800
South O'Donnell Heights	Notice to Proceed
Ellis Heights	Notice to Proceed

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

Existing structures indicated shall be removed to four feet below grade. Interior walls, other than retaining walls and partitions, shall be removed to four feet below grade or to top of concrete slab on ground. Sidewalks, curbs, gutters and street light bases shall be removed entirely. Exceptions are as noted in SECTION 01010.

3.1.2 Utilities and Related Equipment

Remove existing utilities uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. Where gas or water mains remain, cap abandoned service lines within one foot of the main. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and deliver to the post Director of Public Works, in accordance with instructions of the Contracting Officer. If utility lines are encountered that are not shown on drawings, contact the Contracting Officer for further instructions.

3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs to a depth of six inches below new finish grade. Provide neat sawcuts at limits of pavement removal.

3.1.4 Roofing

Sequence the work to minimize hazard to workers.

3.1.5 Air Conditioning Equipment

Remove air conditioning equipment without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990.

3.1.6 Locksets on Swinging Doors

The Contractor shall remove all locksets from all swinging doors indicated to be removed and disposed of. Contractor shall give the locksets to the Contracting Officer after their removal.

3.2 FILLING

Holes, open basements and other hazardous openings shall be filled in accordance with the Specifications.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Salvaged Materials and Equipment

Contractor shall salvage items and material to the maximum extent possible; however, Contractor shall assume no salvage value or compensation in the offer.

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract.

3.3.3 Asbestos Containing Materials>

Immediately notify the contracting officer should materials suspected to contain asbestos be encountered other than items listed below. Contractor is responsible for removal and disposal of material. Asbestos shall be removed in accordance with OSHA 29 CFR 1926.1101 and Kansas Asbestos Regulations (KAR) 28-50-1 thru 50-14. Contractor shall not disturb ACM without proper protection.

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting ARI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be remove from Government property and dispose of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.

3.3.5 DRMO

Deliver electrical transformers to DRMO, Camp Funston. Containers shall be properly identified as to contents.

3.3.6 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in the disposal area located at the construction landfill. After disposal is completed, the disposal area shall be uniformly graded to drain. Combustible material shall be disposed of off the site. ACM may be disposed at ACM cell at the CD landfill.

3.4 CLEANUP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

SECTION 02231

CLEARING AND GRUBBING
07/02

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials Other Than Salable Timber.

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

SD-04 Samples

Tree wound paint

Herbicide

Submit samples in cans with manufacturer's label.

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to, store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 PRODUCTS

2.1 TREE WOUND PAINT

Bituminous based paint of standard manufacture specially formulated for tree wounds.

2.2 HERBICIDE

Comply with Federal Insecticide, Fungicide, and Rodenticide Act (Title 7 U.S.C. Section 136) for requirements on contractor's licensing, certification and record keeping. Contact the command Pest Control Coordinator prior to starting work.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time to minimize interruption of the service.

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Apply herbicide in accordance with the manufacturer's label to the top surface of stumps designated not to be removed.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 PRUNING

Prune trees designated to be left standing within the cleared areas of dead branches 1 1/2 inches or more in diameter; and trim branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1 1/4 inches in diameter with an approved tree wound paint.

3.5 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.6 DISPOSAL OF MATERIALS

3.6.1 Saleable Timber

All timber on the project site noted for clearing and grubbing shall become the property of the Contractor, and shall be removed from the project site and disposed of off stations.

3.6.2 Nonsaleable Materials

Logs, stumps, roots, brush, rotten wood, and other wooden refuse from the

clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility or at the stump/brush/habitat timber site off Cambel Hill Road, south of Vinton School Road, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 02364A

TERMITICIDE TREATMENT MEASURES FOR SUBTERRANEAN TERMITE CONTROL
06/98

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Termiticide Application Plan; G, RE.

Termiticide application plan with proposed sequence of treatment work with dates and times. The termiticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area/volume treated, amount applied; and the name and state license number of the state certified applicator shall be included.

Termiticides.

Manufacturer's label and Material Safety Data Sheet (MSDS) for termiticides proposed for use.

Foundation Exterior.

Written verification that other site work will not disturb the treatment.

Utilities and Vents.

Written verification that utilities, vents have been located.

Crawl and Plenum Air Spaces.

Written verification that crawl spaces and plenum air spaces have been located.

Verification of Measurement.

Written verification that the volume of termiticide used meets the application rate.

Application Equipment.

A listing of equipment to be used.

SD-04 Samples

Termiticides.

Termiticide samples obtained during application, upon request.

SD-06 Test Reports

Equipment Calibration and Tank Measurement.

Certification of calibration tests conducted on the equipment used in the termiticide application.

Soil Moisture.

Soil moisture test result.

SD-07 Certificates

Qualifications.

Qualifications and state license number of the termiticide applicator.

1.2 QUALIFICATIONS

The Contractor's principal business shall be pest control. The Contractor shall be licensed and the termiticide applicators certified in the state where the work is to be performed. Termiticide applicators shall also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control.

1.3 SAFETY REQUIREMENTS

The Contractor shall formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Use the clothing and personal protective equipment specified on the labeling for use during all phases of the application.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Termiticide material shall be delivered to the site in the original unopened containers bearing legible labels indicating the EPA registration number and manufacturer's registered uses. All other materials to be used on site for the purpose of termite control shall be delivered in new or otherwise good condition as supplied by the manufacturer or formulator.

1.4.2 Storage

Materials shall be stored in designated areas and in accordance with manufacturer's labels. Termiticides and related materials shall be kept under lock and key when unattended.

1.4.3 Handling

Termiticides shall be handled in accordance with manufacturer's labels. Manufacturer's warnings and precautions shall be observed. Materials shall be handled preventing contamination by dirt, water, and organic material. Protect termiticides from sunlight as recommended by the manufacturer.

1.5 INSPECTION

Termiticides shall be inspected upon arrival at the job site for conformity to type and quality in accordance with paragraph TERMITICIDE. Each label shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended. Other materials shall be inspected for conformance with specified requirements. Unacceptable materials shall be removed from the job site.

1.6 WARRANTY

The Contractor shall provide a 5-year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Warranty shall include annual inspections of

the buildings or building additions.

PART 2 PRODUCTS

2.1 TERMITICIDES

Termiticides shall be currently registered by the EPA. Termiticide shall be selected for maximum effectiveness and duration after application. The selected termiticide shall be suitable for the soil and climatic conditions at the project site.

PART 3 EXECUTION

3.1 TECHNICAL REPRESENTATIVE

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for subterranean termites. They may be present during treatment application.

3.2 SITE PREPARATION

Site preparation shall be in accordance with Section 02921a SEEDING. Work related to final grades, landscape plantings, foundations, or any other alterations to finished construction which might alter the condition of treated soils, shall be coordinated with this specification.

3.2.1 Ground Preparation

Food sources shall be eliminated by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.2.2 Verification

Before work starts, the Contractor shall verify that final grades are as indicated and smooth grading has been completed. Soil particles shall be finely graded with particles no larger than 1 inch and compacted to eliminate soil movement to the greatest degree.

3.2.3 Foundation Exterior

The Contractor shall provide written verification that final grading and landscape planting operations will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

3.2.4 Utilities and Vents

The Contractor shall provide written verification that the location and identity of HVAC ducts and vents, water and sewer lines, and plumbing have been accomplished prior to the termiticide application.

3.2.5 Crawl and Plenum Air Spaces

The Contractor shall provide written verification that the location and identity of crawl and plenum air spaces have been accomplished prior to the termiticide application.

3.3 SITE CONDITIONS

The following conditions shall determine the time of application.

3.3.1 Soil Moisture

Soils to be treated shall be tested immediately before application. Soil moisture content shall be tested to a minimum depth of 3 inches. The soil

moisture shall be as recommended by the termiticide manufacturer. The termiticide will not be applied when soil moisture exceeds manufacturer's recommendations because termiticides do not adhere to the soil particles in saturated soils.

3.3.2 Runoff and Wind Drift

Termiticide shall not be applied during or immediately following heavy rains. Applications shall not be performed when conditions may cause runoff or create an environmental hazard. Applications shall not be performed when average wind speed exceeds 10 miles per hour. The termiticide shall not be allowed to enter water systems, aquifers, or endanger humans or animals.

3.3.2.1 Vapor Barriers and Waterproof Membranes

Termiticide shall be applied prior to placement of a vapor barrier or waterproof membrane.

3.3.2.2 Utilities and Vents

Prior to application, HVAC ducts and vents located in treatment area shall be turned off and blocked to protect people and animals from termiticide.

3.3.3 Placement of Concrete

Concrete covering treated soils shall be placed as soon as the termiticide has reached maximum penetration into the soil. Time for maximum penetration shall be as recommended by the manufacturer.

3.4 TERMITICIDE TREATMENT

3.4.1 Equipment Calibration and Tank Measurement

Immediately prior to commencement of termiticide application, calibration tests shall be conducted on the application equipment to be used and the application tank shall be measured to determine the volume and contents. These tests shall confirm that the application equipment is operating within the manufacturer's specifications and will meet the specified requirements. The Contractor shall provide written certification of the equipment calibration test results within 1 week of testing.

3.4.2 Mixing and Application

Formulating, mixing, and application shall be performed in the presence of the Contracting Officer or the technical representative. A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying termiticides shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.4.3 Treatment Method

For areas to be treated, the Contractor shall establish complete and unbroken vertical and/or horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products. Application shall not be made to areas which serve as crawl spaces or for use as a plenum air space.

3.4.3.1 Surface Application

Surface application shall be used for establishing horizontal barriers. Surface applicants shall be applied as a coarse spray and provide uniform distribution over the soil surface. Termiticide shall penetrate a minimum of 1 inch into the

soil, or as recommended by the manufacturer.

3.4.3.2 Rodding and Trenching

Rodding and trenching shall be used for establishing vertical soil barriers. Trenching shall be to the depth of the foundation footing. Width of trench shall be as recommended by the manufacturer, or as indicated. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Immediately after termiticide has reached maximum penetration as recommended by the manufacturer, backfilling of the trench shall commence. Backfilling shall be in 6 inch rises or layers. Each rise shall be treated with termiticide.

3.4.4 Sampling

The Contracting Officer may draw from stocks at the job site, at any time and without prior notice, samples of the termiticides used to determine if the amount of active ingredient specified on the label is being applied.

3.5 VERIFICATION OF MEASUREMENT

Once termiticide application has been completed, tank contents shall be measured to determine the remaining volume. The total volume measurement of used contents for the application shall equal the established application rate for the project site conditions. The Contractor shall provide written verification of the measurements.

3.6 CLEAN UP, DISPOSAL, AND PROTECTION

Once application has been completed, the Contractor shall proceed with clean up and protection of the site without delay.

3.6.1 Clean Up

The site shall be cleaned of all material associated with the treatment measures, according to label instructions, and as indicated. Excess and waste material shall be removed and disposed off site.

3.6.2 Disposal of Termiticide

The Contractor shall dispose of residual termiticides and containers off Government property, and in accordance with label instructions and EPA criteria.

3.6.3 Protection of Treated Area

Immediately after the application, the area shall be protected from other use by erecting barricades and providing signage as required or directed. Signage shall be placed inside the entrances to crawl spaces and shall identify the space as treated with termiticide and not safe for children and animals.

3.7 CONDITIONS FOR SATISFACTORY TREATMENT

3.7.1 Equipment Calibrations and Measurements

Where results from the equipment calibration and tank measurements tests are unsatisfactory, re-treatment will be required.

3.7.2 Testing

Should an analysis, performed by a third party, indicate that the samples of the applied termiticide contain less than the amount of active ingredient specified on the label, and/or if soils are treated to a depth less than specified or approved, re-treatment will be required.

3.7.3 Disturbance of Treated Soils

Soil and fill material disturbed after treatment shall be re-treated before placement of slabs or other covering structures.

3.7.4 Termites Found Within the Warranty Period

If live subterranean termite infestation or termite damage is discovered during the warranty period, the Contractor shall re-treat the site.

3.8 RE-TREATMENT

Where re-treatment is required, the Contractor shall:

a. Re-treat the soil and/or perform other treatment as necessary for prevention or elimination of subterranean termite infestation.

b. Repair damage caused by termite infestation.

-- End of Section --

SECTION 02510A

WATER DISTRIBUTION SYSTEM
05/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 88	(1996) Seamless Copper Water Tube
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(1996b) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3839	(1994a) Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
ASTM F 477	(1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1992) Hypochlorites

AWWA B301	(1992) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA C111	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153	(1994; Errata Nov 1996) Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm through 610 mm) and 54 In. through 64 In. (1,400 mm through 1,600 mm) for Water Service
AWWA C300	(1997) Reinforced Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids
AWWA C301	(1992) Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids
AWWA C303	(1995) Concrete Pressure Pipe, Bar-Wrapped, Steel Cylinder Type
AWWA C500	(1993; C500a) Metal-Sealed Gate Valves for Water Supply Service
AWWA C502	(1994; C502a) Dry-Barrel Fire Hydrants
AWWA C504	(1994) Rubber-Seated Butterfly Valves
AWWA C509	(1994; Addendum 1995) Resilient-Seated Gate Valves for Water Supply Service
AWWA C651	(1992) Disinfecting Water Mains
AWWA C702	(1992) Cold-Water Meters - Compound Type
AWWA C703	(1996) Cold-Water Meters - Fire Service Type
AWWA C704	(1992) Propeller-Type Meters Waterworks Applications
AWWA C706	(1996) Direct-Reading, Remote-Registration Systems for Cold-Water Meters
AWWA C707	(1982; R 1992) Encoder-Type Remote-Registration Systems for Cold-Water Meters
AWWA C800	(1989) Underground Service Line Valves and Fittings
AWWA C900	(1997; C900a) Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution
AWWA C901	(1996) Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service
AWWA C905	(1997) Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. Through 36 In.
AWWA M23	(1980) Manual: PVC Pipe - Design and Installation

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)

ACPPA 1344	(1988) Recommended Work Practices for A/C Pipe

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA TRD	(1997) Thrust Restraint Design for Ductile Iron Pipe

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(1995) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 49	(1994) Hazardous Chemicals Data
NFPA 291	(2002 Recommended Practice for Fire Flow Testing and Marking of Hydrants
NFPA 325-1	(1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 704	(1996) Identification of the Fire Hazards of Materials for Emergency Response

NSF INTERNATIONAL (NSF)

NSF 14	(1998) Plastics Piping Components and Related Materials
NSF 61	(1999) Drinking Water System Components - Health Effects (Sections 1-9)

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 21	(1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

1.2 PIPING

This section covers water distribution and service lines, and connections to building service at a point approximately 5 feet outside buildings and structures to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

1.2.1 Service Lines

Piping for water service lines less than 3 inchesin diameter shall be polyvinyl chloride (PVC) plastic, or copper tubing, unless otherwise shown or specified. Piping for water service lines 3 inchesand larger shall be polyvinyl chloride (PVC) plastic, unless otherwise shown or specified.

1.2.2 Distribution Lines 80 mm (3 Inches) or Larger

Piping for water distribution lines 3 inches or larger shall be polyvinyl chloride (PVC) through 36 inch nominal diameter plastic.

1.2.3 Sprinkler Supply Lines

Piping for water lines supplying sprinkler systems for building fire protection shall conform to NFPA 24 from the point of connection with the water distribution system to the building 5 foot line.

1.2.4 Potable Water Lines

Piping and components of potable water systems which come in contact with the potable water shall conform to NSF 61.

1.2.5 Plastic Piping System

Plastic piping system components (PVC,) intended for transportation of potable water shall comply with NSF 14 and be legibly marked with their symbol.

1.2.6 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02316A EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation.

The manufacturer's recommendations for each material or procedure to be utilized.

Waste Water Disposal Method.

The method proposed for disposal of waste water from hydrostatic tests and disinfection, prior to performing hydrostatic tests.

Satisfactory Installation.

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-06 Test Reports

Bacterial Disinfection.

Test results from commercial laboratory verifying disinfection.

Fire Hydrant Flow Testing.

Test results shall be provided upon conclusion of hydrant flow testing.

SD-07 Certificates

Installation.

A statement signed by the manufacturer's field representative

certifying that the Contractor's personnel are capable of properly installing the pipe on the project.

Meters.

Manufacturer's certificate stating that each meter furnished has been tested for accuracy of registration and compliance with the accuracy and capacity requirements of the appropriate AWWA standard.

1.4 HANDLING

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

1.4.1 Miscellaneous Plastic Pipe and Fittings

Polyvinyl Chloride (PVC) pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Reinforced and Prestressed Concrete Pipe

Steel cylinder reinforced concrete pipe shall conform to AWWA C300, AWWA C301, or AWWA C303 and shall be designed to withstand a working pressure of not less than 150 psi unless otherwise shown or specified.

2.1.2 Plastic Pipe

2.1.2.1 PE Plastic Pipe

Pipe, tubing, and heat-fusion fittings shall conform to AWWA C901.

2.1.2.2 PVC Plastic Pipe

Pipe, couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B.

a. Pipe Less Than 4 inch Diameter:

(1) Screw-Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified. Pipe couplings when used, shall be tested as required by ASTM D 2464.

(2) Elastomeric-Gasket Joint: Pipe shall conform to dimensional

requirements of ASTM D 1785 Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified, or it may be pipe conforming to requirements of ASTM D 2241, elastomeric joint, with the following applications:

SDR	Maximum Working Pressure psi	Minimum Hydrostatic Pressure psi
26	100	133
21	120	160
17	150	200
13.5	200	266

(3) Solvent Cement Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 or ASTM D 2241 with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.

b. Pipe 4 through 12 inch Diameter: Pipe, couplings and fittings shall conform to AWWA C900, Class 150, CIOD pipe dimensions, elastomeric-gasket joint, unless otherwise shown or specified.

c. Pipe 14 through 36 inch Diameter: Pipe shall conform to AWWA C905 unless otherwise shown or specified.

2.1.3 Copper Tubing

Copper tubing shall conform to ASTM B 88, Type K, annealed.

2.2 FITTINGS AND SPECIALS

2.2.1 PVC Pipe System

a. For pipe less than 4 inch diameter, fittings for threaded pipe shall conform to requirements of ASTM D 2464, threaded to conform to the requirements of ASME B1.20.1 for use with Schedule 80 pipe and fittings; fittings for solvent cement jointing shall conform to ASTM D 2466 or ASTM D 2467; and fittings for elastomeric-gasket joint pipe shall be iron conforming to AWWA C110 or AWWA C111. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104.

b. For pipe 4 inch diameter and larger, fittings and specials shall be iron, bell end in accordance with AWWA C110, 150 psi pressure rating unless otherwise shown or specified, except that profile of bell may have special dimensions as required by the pipe manufacturer; or fittings and specials may be of the same material as the pipe with elastomeric gaskets, all in conformance with AWWA C900. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Fittings shall be bell and spigot or plain end pipe, or as applicable. Ductile iron compact fittings shall be in accordance with AWWA C153.

2.2.2 Copper Tubing System

Fittings and specials shall be flared and conform to ASME B16.26.

2.3 JOINTS

2.3.1 Gaskets for Reinforced Concrete Pipe

Rubber-gasket joints shall be of the type using a bell-and-spigot joint design of steel. The gaskets shall conform to AWWA C300, AWWA C301, or AWWA C303, as applicable.

2.3.2 Plastic Pipe Jointing

2.3.2.1 PE Pipe

Joints for pipe fittings and couplings shall be strong tight joints as specified for PE in Paragraph INSTALLATION. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendation, and as approved by the Contracting Officer.

2.3.2.2 PVC Pipe

Joints, fittings, and couplings shall be as specified for PVC pipe. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer.

2.3.3 RTRP Pipe

2.3.4 Bonded Joints

For all ferrous pipe, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

2.3.5 Isolation Joints

Isolation joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Isolation joints shall consist of a sandwich-type flange isolation gasket of the dielectric type, isolation washers, and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

a. Sleeve-type couplings shall be used for joining plain end pipe sections. The two couplings shall consist of one steel middle ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets.

b. Split-sleeve type couplings may be used in aboveground installations when approved in special situations and shall consist of gaskets and a housing in two or more sections with the necessary bolts and nuts.

2.3.6 Copper Tubing Jointing

Joints shall be compression-pattern flared and shall be made with the specified fittings.

2.4 VALVES

2.4.1 Gate Valves

Gate valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

a. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150.

b. Valves 3 inches and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.

c. Resilient-Seated Gate Valves: For valves 3 to 12 inches in size, resilient-seated gate valves shall conform to AWWA C509.

2.4.2 Rubber-Seated Butterfly Valves

Rubber-seated butterfly valves shall conform to the performance requirements of AWWA C504. Wafer type valves conforming to the performance requirements of AWWA C504 in all respects, but not meeting laying length requirements will be acceptable if supplied and installed with a spacer providing the specified laying length. All tests required by AWWA C504 shall be met. Flanged-end valves shall be installed in an approved pit and provided with a union or sleeve-type coupling in the pit to permit removal. Mechanical-end valves 3 through 10 inches in diameter may be direct burial if provided with a suitable valve box, means for manual operation, and an adjacent pipe joint to facilitate valve removal. Valve operators shall restrict closing to a rate requiring approximately 60 seconds, from fully open to fully closed.

2.4.3 Pressure Reducing Valves

Pressure reducing valves shall maintain a constant downstream pressure regardless of fluctuations in demand. Valves shall be suitable for 200 psi operating pressure on the inlet side, with outlet pressure set for 75 psi. The valves shall be of the hydraulically-operated, pilot controlled, globe or angle type, and may be actuated either by diaphragm or piston. The pilot control shall be the diaphragm-operated, adjustable, spring-loaded type, designed to permit flow when controlling pressure exceeds the spring setting. Ends shall be threaded . Valve bodies shall be bronze, cast iron or cast steel with bronze trim. Valve stem shall be stainless steel. Valve discs and diaphragms shall be synthetic rubber. Valve seats shall be bronze. Pilot controls shall be bronze with stainless steel working parts.

2.4.4 Vacuum and Air Relief Valves

Vacuum and air relief valves shall be of the size shown and shall be of a type that will release air and prevent the formation of a vacuum. The valves shall automatically release air when the lines are being filled with water and shall admit air into the line when water is being withdrawn in excess of the inflow. Valves shall be iron body with bronze trim and stainless steel float.

2.4.5 Indicator Post for Valves

Each valve shown on the drawings with the designation "P.I.V." shall be equipped with indicator post conforming to the requirements of NFPA 24. Operation shall be by a wrench which shall be attached to each post. Tamper switches and cable/conduit shall be securly attached to the P.I.V.

2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

2.6 VALVE PITS

Valve pits shall be constructed at locations indicated or as required above and in accordance with the details shown. Concrete shall have compressive strength of 3000 psi in accordance with Section 03300CAST-IN-PLACE STRUCTURAL CONCRETE.

2.7 FIRE HYDRANTS

Hydrants shall be dry-barrel type conforming to AWWA C502 with valve opening at

least 5 inches in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 8 inches above the ground grade . Hydrants shall have a 6 inch bell connection, two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with 1 coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and 2 finish coats of silicone alkyd paint conforming to SSPC Paint 21, lime green. Suitable bronze adapter for the 4-1/2 inch outlet, with caps, shall be furnished.

2.8 MISCELLANEOUS ITEMS

2.8.1 Service Clamps

Service clamps shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable-iron body with cadmium plated straps and nuts. Clamps shall have a rubber gasket cemented to the body.

2.8.2 Corporation Stops

Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks.

2.8.3 Goosenecks

Copper tubing for gooseneck connections shall conform to the applicable requirements of ASTM B 88, Type K, annealed. Length of cable requirement connections shall be in accordance with standard practice.

2.8.4 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 psi.

2.8.5 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.8.6 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

2.8.7 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

2.8.8 Meters

Meters shall be the type and size shown on the drawings or specified. Meters of each of the various types furnished and installed shall be supplied by one manufacturer.

2.8.8.1 Compound Type

Compound type meters shall conform to AWWA C702 and shall be furnished with strainers. The main casing shall be bronze or cast iron protected by corrosion resistant coating with stainless steel external fasteners. The main casing shall be tapped for field testing purposes. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons . The meter shall be equipped with a coordinating register. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct reading remote register designed in accordance with AWWA C706 or an encoder type remote register designed in accordance with AWWA C707. Meters shall comply with the accuracy and capacity requirements of AWWA C702.

2.8.8.2 Propeller Type

Propeller type meters shall conform to AWWA C704. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons . Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct-reading remote register designed in accordance with AWWA C706 or an encoder-type remote register designed in accordance with AWWA C707. Meters shall comply with the accuracy and capacity requirements of AWWA C703.

2.8.9 Meter Boxes

Meter boxes shall be of cast iron, concrete, or plastic. The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop. Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic, shall use concrete covers with cast iron meter reader lids or concrete with cast iron lid and cast iron meter reader lid. Plastic boxes and lids shall not be used in unpaved areas or grass areas not subject to vehicular traffic. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

2.9 METER VAULTS

Large meters shall be installed in reinforced concrete vaults in accordance with the details shown on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

3.1.2 Adjacent Facilities

3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe, for a distance of at least 10 feet each side of the crossing, shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 2 feet above the sewer main. Joints in the sewer main, closer horizontally than 3 feet to the crossing, shall be encased in concrete.

3.1.2.2 Water Lines

Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

3.1.2.3 Copper Tubing Lines

Copper tubing shall not be installed in the same trench with ferrous piping materials.

3.1.2.4 Nonferrous Metallic Pipe

Where nonferrous metallic pipe, e.g. copper tubing, crosses any ferrous piping material, a minimum vertical separation of 12 inchesshall be maintained between pipes.

3.1.2.5 Structures and roads

Where water pipe is required to be installed within 3 feet of existing structures or under streets or roads, the water pipe shall be encased in concrete providing 6 inches of encasement all around the pipe. The Contractor shall install the water pipe ensuring that there will be no damage to the structures and no settlement or movement of foundations or footings.

3.1.3 Joint Deflection

3.1.3.1 Offset for Flexible Plastic Pipe

Maximum offset in alignment between adjacent pipe joints shall be as recommended by the manufacturer and approved by the Contracting Officer, but shall not exceed 5 degrees.

3.1.4 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Water-line materials shall not be dropped or dumped into the trench. Abrasion of the pipe coating shall be avoided. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by and at the Contractor's expense in a satisfactory manner. Pipe ends left for future connections shall be valved,

plugged, or capped, and anchored, as shown.

3.1.4.1 Plastic Pipe Installation

RTRP shall be installed in accordance with ASTM D 3839. RPMP shall be installed in accordance with the manufacturer's recommendations. PE Pipe shall be installed in accordance with ASTM D 2774. PVC pipe shall be installed in accordance with AWWA M23.

3.1.4.2 Piping Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. Connections to existing asbestos-cement pipe shall be made in accordance with ACPPA 1344.

3.1.4.3 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.4.4 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.1.5 Jointing

3.1.5.1 Reinforced Concrete Pipe Requirements

The inside and outside annular spaces between abutting sections of concrete pipe shall be filled with rich cement mortar in accordance with the pipe manufacturer's recommendations. Excess mortar shall be removed from interior annular spaces, leaving a smooth and continuous surface between pipe sections. Exposed portions of steel joint rings shall be protected from corrosion by a metallic coating or by an approved nonmetallic coating. Rubber gaskets shall be handled, lubricated where necessary, and installed in accordance with the pipe manufacturer's recommendations.

3.1.5.2 PVC Plastic Pipe Requirements

a. Pipe less than 4 inch diameter: Threaded joints shall be made by wrapping the male threads with approved thread tape or applying an approved lubricant, then threading the joining members together. The joint shall be tightened using strap wrenches to prevent damage to the pipe and/or fitting. To avoid excessive torque, joints shall be tightened no more than one thread past hand-tight. Preformed rubber-ring gaskets for elastomeric-gasket joints shall be made in accordance with ASTM F 477 and as specified. Pipe ends for push-on joints shall be beveled to facilitate assembly and marked to indicate when the pipe is fully seated. The gasket shall be prelubricated to prevent displacement. The gasket and ring groove in the bell or coupling shall match. The manufacturer of the pipe or fitting shall supply the elastomeric gasket. Couplings shall be provided with stops or centering rings to assure that the coupling is centered on the joint. Solvent cement joints shall use sockets conforming to ASTM D 2467. The solvent cement used shall meet the requirements of ASTM D 2564; the joint assembly shall be made in accordance with ASTM D 2855 and the manufacturer's specific recommendations.

b. Pipe 4 through 12 inch diameter: Joints shall be elastomeric gasket as specified in AWWA C900. Jointing procedure shall be as specified for pipe less than 4 inch diameter with configuration using elastomeric ring

gasket.

c. Pipe 14 through 36 inch diameter: Joints shall be elastomeric gasket push-on joints made in accordance with AWWA M23.

3.1.5.3 Copper Tubing Requirements

Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal-to-metal contact.

3.1.5.4 Bonded Joints Requirements

Bonded joints shall be installed in accordance with details specified for joints in paragraph JOINTS.

3.1.5.5 Isolation Joints and Dielectric Fittings

Isolation joints and dielectric fittings shall be installed in accordance with details specified in paragraph JOINTS. Dielectric unions shall be encapsulated in a field-poured coal-tar covering, with at least 1/8 inch thickness of coal tar over all fitting surfaces.

3.1.5.6 Transition Fittings

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

3.1.6 Installation of Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 5 feet outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 5 feet from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and valves shall be provided with service boxes. Service lines shall be constructed in accordance with the following requirements:

3.1.6.1 Service Lines 50 mm (2 Inches) and Smaller

Service lines 2 inches and smaller shall be connected to the main by a directly-tapped corporation stop or by a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Maximum sizes for directly-tapped corporation stops and for outlets with service clamps shall be as in TABLE I. Where 2 or more gooseneck connections to the main are required for an individual service, such connections shall be made with standard branch connections. The total clear area of the branches shall be at least equal to the clear area of the service which they are to supply.

TABLE I. SIZE OF CORPORATION STOPS AND OUTLET

Pipe Size Inches	Corporation Stops, Inches For Ductile-Iron Pipe	Outlets w/Service Clamps, Inches Single & Double Strap
3	--	1
4	1	1
6	1-1/4	1-1/2
8	1-1/2	2

TABLE I. SIZE OF CORPORATION STOPS AND OUTLET

Pipe Size Inches	Corporation Stops, Inches For Ductile-Iron Pipe	Outlets w/Service Clamps, Inches Single & Double Strap
10	1-1/2	2
12 & larger	2	2

NOTE:

a. Service lines 1-1/2 inches and smaller shall have a service stop.

b. Service lines 2 inches in size shall have a gate valve.

3.1.6.2 Service Lines Larger than 50 mm (2 Inches)

Service lines larger than 2 inches shall be connected to the main by a tapped saddle, tapping sleeve and valve, service clamp or reducing tee, depending on the main diameter and the service line diameter, and shall have a gate valve. Lines 3 inches and larger may use rubber-seated butterfly valves as specified above, or gate valves.

3.1.6.3 Service Lines for Sprinkler Supplies

Water service lines used to supply building sprinkler systems for fire protection shall be connected to the water distribution main in accordance with NFPA 24.

3.1.7 Setting of Fire Hydrants, Meters, Valves and Valve Boxes

3.1.7.1 Location and Testing of Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 6 inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway, with the center of the lowest outlet not less than 18 inches above the finished surrounding grade, and the operating nut not more than 48 inches above the finished surrounding grade. Fire hydrants designated on the drawings as low profile shall have the lowest outlet not less than 18 inches above the finished surrounding grade, the top of the hydrant not more than 24 inches above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished grade immediately after installation to obtain beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 4 inches thick and 15 inchessquare. Not less than 7 cubic feet of free-draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

Flow tests shall be tested per NFPA 291. The results shall be used to mark the fire hydrants per the FIRE HYDRANT paragraph of this specification section. The results are to be submitted per SUBMITTALS paragraph of this specification section.

3.1.7.2 Location of Meters

Meters and meter boxes shall be installed at the locations shown on the drawings. The meters shall be centered in the boxes to allow for reading and ease of removal or maintenance.

3.1.7.3 Location of Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition.

Check, pressure reducing, vacuum, and air relief valves shall be installed in valve pits. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be tamped around each valve box or pit to a distance of 4 feet on all sides of the box, or the undisturbed trench face if less than 4 feet.

3.1.7.4 Location of Service Boxes

Where water lines are located below paved streets having curbs, the boxes shall be installed directly back of the curbs. Where no curbing exists, service boxes shall be installed in accessible locations, beyond the limits of street surfacing, walks and driveways.

3.1.8 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

3.1.9 Thrust Restraint

Plugs, caps, tees and bends deflecting 11.25 degrees or more, either vertically or horizontally, on waterlines 4 inches in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

3.1.9.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2,000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.9.2 Restrained Joints

For ductile-iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA TRD.

3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Water supply lines designated on the drawings shall be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the

test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

a. Wet or unstable soil conditions in the trench.

b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.

c. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316AEXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Water supply lines designated on the drawings shall be subjected to a pressure equal to 200 psi. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

L = 0.0001351ND(P raised to 0.5 power)

L = Allowable leakage in gallons per hour
N = Number of joints in the length of pipeline tested
D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be as specified. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

a. Pressure test and leakage test may be conducted concurrently.

b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to

the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

3.3 BACTERIAL DISINFECTION

3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. From several points in the unit, personnel from the Contractor's commercial laboratory shall take at least Three each from each housing area water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with state approved methods. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

3.4 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION 02531

SANITARY SEWERS
07/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 74	(1998) Cast Iron Soil Pipe and Fittings
ASTM C 150	(2002) Portland Cement
ASTM C 270	(2001a) Mortar for Unit Masonry
ASTM C 33	(2001a) Concrete Aggregates
ASTM C 443	(2001) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478	(1997) Precast Reinforced Concrete Manhole Sections
ASTM C 478M	(1997) Precast Reinforced Concrete Manhole Sections (Metric)
ASTM C 564	(1997) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 828	(2001) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C 923	(2000) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C 924	(1989; R 1997) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 94	(1994) Ready-Mixed Concrete **
ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM C 969	(2000) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C 972	(2000) Compression-Recovery of Tape Sealant
ASTM C 990	(2001a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealers
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2241	(2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2321	(2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2412	(1996a) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2001) Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(2001) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2680	(2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	(1996a) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
ASTM D 3034	(2000) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	(1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 4101	(2002) Propylene Injection and Extrusion Materials
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 624	(2000) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM F 477	(1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 794	(1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 949	(2001a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105	(1999) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron

	Pressure Pipe and Fittings
AWWA C153	(2000) Ductile-Iron Compact Fittings for Water Service
AWWA C600	(1999) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C900	(1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution
AWWA M23	(1980) Manual: PVC Pipe - Design and Installation

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 2001) Pipe Threads, General Purpose, Inch

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(2000) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(1997) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-60005	(1998) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole ++

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-3	(1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch)
UBPPA UNI-B-6	(1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe

1.2 SYSTEM DESCRIPTION

1.2.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals of polyvinyl chloride (PVC) plastic pipe . Provide building connections 4 inch lines of polyvinyl chloride (PVC) plastic pipe at the Contractor's option.
Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein more than 5 feet outside of building walls.

1.2.2 Sanitary Sewer Pressure Lines

Provide pressure lines of polyvinyl chloride (PVC) plastic pressure pipe .

1.3 GENERAL REQUIREMENTS

The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Excavation and backfilling is specified in Section 02316A EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Precast Concrete Manholes

Metal items

Frames, covers, and gratings

SD-03 Product Data

Pipeline materials including joints, fittings, and couplings

Submit manufacturer's standard drawings or catalog cuts.

SD-07 Certificates

Portland Cement

Certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

1.5.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.5.1.3 Cement, Aggregate, and Reinforcement

As specified in Section 03300, "Cast-In-Place Structural Concrete."

1.5.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Cast-Iron Soil Piping

2.1.1.1 Cast-Iron Hub and Spigot Soil Pipe and Fittings

ASTM A 74, service , with ASTM C 564 compression-type rubber gaskets.

2.1.1.2 Cast-Iron Hubless Soil Pipe and Fittings

CISPI 301 with CISPI 310 coupling joints.

2.1.2 PVC Plastic Gravity Sewer Piping

2.1.2.1 PVC Plastic Gravity Pipe and Fittings

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints. ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior, size 8 inch through 48 inch diameters.

2.1.2.2 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.1.3 PVC Plastic Pressure Pipe and Associated Fittings

2.1.3.1 PVC Plastic Pressure Pipe and Fittings

a. Pipe and Fittings Less Than 4 inch Diameter: Pipe, couplings and fittings shall be manufactured of materials conforming to ASTM D 1784, Class 12454B.

(1) Screw-Joint: Pipe shall conform to dimensional requirements of ASTM D 1785, Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psihydrostatic test pressure, unless otherwise shown or specified. Fittings for threaded pipe shall conform to requirements of ASTM D 2464, threaded to conform to the requirements of ASME B1.20.1 for use with Schedule 80 pipe and fittings. Pipe couplings when used, shall be tested as required by ASTM D 2464.

(2) Push-On Joint: ASTM D 3139, with ASTM F 477 gaskets. Fittings for push-on joints shall be iron conforming to AWWA C110 or AWWA C111. Iron fittings and specials shall shall be cement-mortar lined (standard thickness) in accordance with AWWA C104.

(3) Solvent Cement Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 or ASTM D 2241 with joints meeting the requirements of 150 psiworking pressure and 200 psi hydrostatic test pressure. Fittings for solvent cement jointing shall conform to ASTM D 2466 or ASTM D 2467.

b. Pipe and Fittings 4 inch Diameter to 12 inch: Pipe shall conform to AWWA C900 and shall be plain end or gasket bell end, Pressure Class 150

(DR 18), with cast-iron-pipe-equivalent OD. Fittings shall be gray-iron or ductile-iron conforming to AWWA C110 or AWWA C153 and shall have cement-mortar lining conforming to AWWA C104, standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with the PVC plastic pressure pipe specified in this paragraph.

2.1.3.2 PVC Plastic Pressure Joints and Jointing Material

Joints for pipe, 4 inch to 12 inchdiameter, shall be push-on joints as specified in ASTM D 3139. Joints between pipe and fittings shall be push-on joints as specified in ASTM D 3139 or shall be compression-type joints/mechanical-joints as respectively specified in ASTM D 3139 and AWWA C111. Each joint connection shall be provided with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe shall conform to ASTM F 477. Gaskets for push-on joints and compression-type joints/mechanical-joints for joint connections between pipe and fittings shall be as specified in AWWA C111, respectively, for push-on joints and mechanical-joints.

2.2 CONCRETE MATERIALS

2.2.1 Cement Mortar

Cement mortar shall conform to ASTM C 270, Type M with Type II cement.

2.2.2 Portland Cement

Portland cement shall conform to ASTM C 150, Type II for concrete used in concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking. Where aggregates are alkali reactive, as determined by Appendix XI of ASTM C 33, a cement containing less than 0.60 percent alkalies shall be used.

2.2.3 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C 94/C 94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psiminimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.
Text

2.3 MISCELLANEOUS MATERIALS

2.3.1 Precast Concrete Manholes.

Precast concrete manhole risers, base sections, and tops shall conform to ASTM C 478; base and first riser shall be monolithic.

2.3.2 Gaskets and Connectors

Gaskets for joints between manhole sections shall conform to ASTM C 443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C 923 or ASTM C 990.

2.3.3 External Preformed Rubber Joint Seals

An external preformed rubber joint seal shall be an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" shall be tested for leakage in the same manner as pipelines as described in paragraph entitled "Leakage Tests." The seal shall be multi-section with a neoprene rubber top section and all lower sections made of Ethylene Proplene Di Monomer (EPDM) rubber

with a minimum thickness of 60 mils. Each unit shall consist of a top and bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be a non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. Extension sections shall cover up to two more adjusting rings. Properties and valves are listed in the following tables:

Properties, Test Methods and Minimum Values for Rubber used in Preformed Joint Seals

Physical Properties	Test Methods	EPDM	Neoprene	Butyl mastic
Tensile, psi	ASTM D 412	1840	2195	-
Elogation percent	ASTM D 412	553	295	350
Tear Resistance, ppi	ASTM D 624 (Die B)	280	160	-
Rebound, percent, 5 minutes	ASTM C 972 (mod.)	-	-	11
Rebound, percent, 2 hours	ASTM C 972	-	-	12

2.3.4 Metal Items

2.3.4.1 Frames, Covers, and Gratings for Manholes

FS A-A-60005, cast iron; figure numbers shall be as indicated:

Frames and covers shall be cast iron, ductile iron or reinforced concrete. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 400 pounds. Reinforced concrete frames and covers shall be as indicated or shall conform to ASTM C 478 or ASTM C 478M. The word "Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.4.2 Manhole Steps

conforming to 29 CFR 1910.27. Plastic or rubber coating pressure-molded to the steel shall be used. Plastic coating shall conform to ASTM D 4101, copolymer polypropylene. Rubber shall conform to ASTM C 443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 6 feet deep.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

Apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

The work covered by this section shall terminate at a point approximately 5 feet from the building . Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance.

a. Sanitary piping installation parallel with water line:

(1) Normal conditions: Sanitary piping or manholes shall be laid at least 10 feet horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.

(2) Unusual conditions: When local conditions prevent a horizontal separation of 10 feet, the sanitary piping or manhole may be laid closer to a water line provided that:

(a) The top (crown) of the sanitary piping shall be at least 18 inches below the bottom (invert) of the water main.

(b) Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron water pipe pressure tested in place without leakage prior to backfilling.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of sanitary piping crossing a water line:

(1) Normal conditions: Lay sanitary piping crossing water lines to provide a separation of at least 18 inches between the top of the sanitary piping and the bottom of the water line whenever possible.

(2) Unusual conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sanitary piping passing over or under water lines shall be constructed of AWWA-approved ductile iron water pipe, pressure tested in place without leakage prior to backfilling.

(b) Sanitary piping passing over water lines shall, in addition, be protected by providing:

1. A vertical separation of at least 18 inches between the bottom of the sanitary piping and the top of the water line.

2. Adequate structural support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of the water line.

3. That the length, minimum 20 feet, of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.

c. Sanitary sewer manholes: No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 02316

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell or groove ends in the upgrade direction. Adjust spigots in bells and tongues in grooves to give a uniform space all around. Blocking or wedging between bells and spigots or tongues and grooves will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same

purpose.

Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for ABS and PVC composite pipe shall conform to Figure 2 of ASTM D 2680; saddles for ABS pipe shall comply with Table 3 of ASTM D 2751; and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

3.1.1.4 Connections to Existing Lines

Obtain approval from the Contracting Officer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of Cast Iron Soil Piping

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the recommendations of the pipe manufacturer. Make joints with the rubber gaskets specified for cast iron soil pipe joints and assemble in accordance with the recommendations of the pipe manufacturer.

3.1.2.2 Installation of Ductile Iron Gravity Sewer Pipe

Unless otherwise specified, install pipe and associated fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of AWWA C600 for pipe installation and joint assembly.

a. Make push-on joints with the gaskets and lubricant specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical-joints with the gaskets, glands, bolts, and nuts specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111.

b. Exterior protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet in accordance with AWWA C105, using Class A Class C polyethylene film.

3.1.2.3 Installation of Ductile-Iron Pressure Lines

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of AWWA C600 for pipe installation, joint assembly, and valve-and-fitting installation.

a. Make push-on joints with the gaskets and lubricant specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical-joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111. Make flanged joints with gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight, taking care to avoid undue strain on flanges, fittings, and other accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fittings have dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer, as approved. Make

grooved and shouldered type joints with the couplings previously specified for this type joint connecting pipe with the grooved or shouldered ends specified for this type joint and assemble in accordance with the recommendations of the coupling manufacturer, as approved. Groove pipe in the field only with approved groove cutting equipment designed especially for the purpose and produced by a manufacturer of grooved joint couplings; secure approval for field-cut grooves before assembling the joint.

b. Exterior protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet in accordance with AWWA C105, using Class A Class C polyethylene film and cathodically protect with anodes.

c. Pipe anchorage: Provide concrete thrust blocks (reaction backing) for pipe anchorage. Size and position thrust blocks as indicated. Use concrete conforming to ASTM C 94 having a minimum compressive strength of 2,000 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

3.1.2.4 Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.1.2.5 Installation of PVC Plastic Pressure Pipe and Fittings

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section; with the requirements of UBPPA UNI-B-3 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, Chapter 7, "Installation."

b. Pipe 4 Inch Diameter Joints: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to fittings, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of UBPPA UNI-B-3 for laying the pipe and the recommendations in AWWA M23, Chapter 7, "Installation," for pipe joint assembly. Assemble push-on joints for connection to fittings in accordance with the requirements of UBPPA UNI-B-3 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners specified for this type joint and assemble in accordance with the requirements of UBPPA UNI-B-3 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.

c. Pipe anchorage: Provide concrete thrust blocks (reaction backing) for pipe anchorage. Size and position thrust blocks as indicated. Use concrete conforming to ASTM C 94 having a minimum compressive strength of

2,000 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

3.1.3 Concrete Work

Cast-in-place concrete is included in Section 03300, "Cast-In-Place Structural Concrete."

The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

3.1.4 Manhole Construction

Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

3.1.5 Miscellaneous Construction and Installation

3.1.5.1 Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.1.5.2 Metal Work

a. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.

b. Field painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

3.1.6 Sewage Absorption Trench Construction

Grade pipe lines uniformly downward to the outlet. Lay perforated pipe with the perforations downward. Lay drain tile with 1/4 inch open joints. Cover open joints of drain tile with the cover material specified so that it extends not less than 100 degrees on each side of the vertical center line of the tile. Wire covering in place.

3.1.7 Installations of Wye Branches

Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969.

b. Low-pressure air tests: Perform tests as follows:

(1) Clay pipelines: Test in accordance with ASTM C 828. Allowable pressure drop shall be as given in ASTM C 828. Make calculations in accordance with the Appendix to ASTM C 828.

(2) Concrete pipelines: Test in accordance with ASTM C 924. Allowable

pressure drop shall be as given in ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924.

(3) Ductile-iron pipelines: Test in accordance with the applicable requirements of ASTM C 924. Allowable pressure drop shall be as given in ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924.

(4) ABS composite plastic pipelines: Test in accordance with the applicable requirements of UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

(5) PVC plastic pipelines: Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

3.2.2.2 Deflection Testing

Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D 2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

a. Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:

(1) A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.

(2) Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.

(3) Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.

(4) Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

b. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.

c. Pull-through device procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.

d. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

3.2.3 Tests for Pressure Lines

Test pressure lines in accordance with the applicable standard specified in this paragraph, except for test pressures. For hydrostatic pressure test, use a hydrostatic pressure 50 psi in excess of the maximum working pressure of the system, but not less than 100 psi, holding the pressure for a period of not less than one hour. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test. Test PVC plastic pressure lines in accordance with the requirements of UBPPA UNI-B-3 for pressure and leakage tests, using the allowable leakage given therein.

-- End of Section --

SECTION 02630A

STORM-DRAINAGE SYSTEM
03/00

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 198	(1998) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Manual	(1999) Manual for Railway Engineering (4 Vol.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48	(1994a) Gray Iron Castings
ASTM A 536	(1999el) Ductile Iron Castings
ASTM A 929/A 929M	(1997) Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
ASTM B 26/B 26M	(1998) Aluminum-Alloy Sand Castings
ASTM C 76	(1999) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 139	(1999) Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C 231	(1997el) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 270	(1997) Mortar for Unit Masonry
ASTM C 425	(1998b) Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C 443	(1998) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478	(1997) Precast Reinforced Concrete Manhole Sections
ASTM C 506	(1999) Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C 655	(1995a) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C 789	(1998) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers

ASTM C 828	(1998) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C 850	(1998) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less Than 2 Ft. of Cover Subjected to Highway Loadings
ASTM C 877	(1994) External Sealing Bands for Noncircular Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C 923	(1998) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Materials
ASTM C 924	(1998) Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 1103	(1994) Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2321	(1989; R 1995) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM F 794	(1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 894	(1998a) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 949	(1999) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F 1417	(1992; R 1998) Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation

following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Placing Pipe.

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-07 Certificates

Resin Certification.

Pipeline Testing; G, RE.

Determination of Density.

Frame and Cover for Gratings.

Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed. Certification on the ability of frame and cover or gratings to carry the imposed live load.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Concrete Pipe

ASTM C 76, Class III, or ASTM C 655, 1350 D-Load.

2.1.1.1 Reinforced Arch Culvert and Storm Drainpipe

ASTM C 506, Class A-III.

2.1.2 PVC Pipe

The pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, shall be submitted prior to installation of the pipe.

2.1.2.1 Profile PVC Pipe

ASTM F 794, Series 46, produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B.

2.1.2.2 Corrugated PVC Pipe

ASTM F 949 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B.

2.2 DRAINAGE STRUCTURES

2.2.1 Flared End Sections

Sections shall be of a standard design fabricated from zinc coated steel sheets meeting requirements of ASTM A 929/A 929M.

2.2.2 Precast Reinforced Concrete Box

For highway loadings with 2 feet of cover or more or subjected to dead load only, ASTM C 789; for less than 2 feet of cover subjected to highway loading, ASTM C 850.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 2500 psi concrete under Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

2.3.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar but in no case shall exceed 10 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.3.3 Precast Concrete Segmental Blocks

Precast concrete segmental block shall conform to ASTM C 139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.3.4 Precast Reinforced Concrete Manholes

Precast reinforced concrete manholes shall conform to ASTM C 478. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure.

2.3.5 Frame and Cover for Gratings

Frame and cover for gratings shall be cast gray iron, ASTM A 48, Class 35B; cast ductile iron, ASTM A 536, Grade 65-45-12; or cast aluminum, ASTM B 26/B 26M, Alloy 356.OT6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

2.3.6 Joints

2.3.6.1 Flexible Watertight Joints

Water tight joints are required within 5 feet of building foundations due to the soil characteristics.

a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Factory-fabricated resilient joint materials shall conform to ASTM C 425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C 443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.3.6.2 External Sealing Bands

Requirements for external sealing bands shall conform to ASTM C 877.

2.3.6.3 PVC Plastic Pipes

Joints shall be solvent cement or elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

2.3.6.4 Profile Wall PE Plastic Pipe

Joints shall be gasketed or thermal weld type with integral bell in accordance with ASTM F 894.

2.4 STEPS

Steps shall be provided for depths greater than 6 feet.

2.5 DOWNSPOUT BOOTS

Boots used to connect exterior downspouts to the storm-drainage system shall be of gray cast iron conforming to ASTM A 48, Class 30B or 35B. Shape and size shall be as indicated.

2.6 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C 923.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 18 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified. Contractor shall not overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.1.2 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in Section 02316A "Excavation, Trenching, and Backfilling for Utilities Systems".

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the government.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or pipe arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.2.2 Plastic Pipe

Bedding for PVC and PE pipe shall meet the requirements of ASTM D 2321. Bedding, haunching, and initial backfill shall be either Class IB or II material.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of

trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (%)
Plastic	7.5

Not less than 30 days after the completion of backfilling, the Government may perform a deflection test on the entire length of installed flexible pipe using a mandrel or other suitable device. Installed flexible pipe showing deflections greater than those indicated above shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

3.3.1 Concrete, PVC, Ribbed PVC

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.3.2 Elliptical and Elliptical Reinforced Concrete Pipe

The manufacturer's reference lines, designating the top of the pipe, shall be within 5 degrees of a vertical plane through the longitudinal axis of the pipe, during placement. Damage to or misalignment of the pipe shall be prevented in all backfilling operations.

3.3.3 Multiple Culverts

Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 3 feet apart, whichever is less.

3.3.4 Jacking Pipe Through Fills

Methods of operation and installation for jacking pipe through fills shall conform to requirements specified in Volume 1, Chapter 1, Part 4 of AREMA Manual.

3.4 JOINTING

3.4.1 Concrete

3.4.1.1 Cement-Mortar Bell-and-Spigot Joint

The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be thoroughly cleaned with a wet brush and the lower portion of the bell filled with mortar as required to bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into a bell so that sections are closely fitted. After each section is laid, the remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped or bandaged with cheesecloth to hold mortar in place.

3.4.1.2 Cement-Mortar Oakum Joint for Bell-and-Spigot Pipe

A closely twisted gasket shall be made of jute or oakum of the diameter required to support the spigot end of the pipe at the proper grade and to make the joint concentric. Joint packing shall be in one piece of sufficient length to pass around the pipe and lap at top. This gasket shall be thoroughly saturated with neat cement grout. The bell of the pipe shall be thoroughly cleaned with a wet brush, and the gasket shall be laid in the bell for the lower third of the circumference and covered with mortar. The spigot of the pipe shall be

thoroughly cleaned with a wet brush, inserted in the bell, and carefully driven home. A small amount of mortar shall be inserted in the annular space for the upper two-thirds of the circumference. The gasket shall be lapped at the top of the pipe and driven home in the annular space with a caulking tool. The remainder of the annular space shall be filled completely with mortar and beveled at an angle of approximately 45 degrees with the outside of the bell. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint thus made shall be wrapped with cheesecloth. Placing of this type of joint shall be kept at least five joints behind laying operations.

3.4.1.3 Cement-Mortar Diaper Joint for Bell-and-Spigot Pipe

The pipe shall be centered so that the annular space is uniform. The annular space shall be caulked with jute or oakum. Before caulking, the inside of the bell and the outside of the spigot shall be cleaned.

a. Diaper Bands: Diaper bands shall consist of heavy cloth fabric to hold grout in place at joints and shall be cut in lengths that extend one-eighth of the circumference of pipe above the spring line on one side of the pipe and up to the spring line on the other side of the pipe. Longitudinal edges of fabric bands shall be rolled and stitched around two pieces of wire. Width of fabric bands shall be such that after fabric has been securely stitched around both edges on wires, the wires will be uniformly spaced not less than 8 inches apart. Wires shall be cut into lengths to pass around pipe with sufficient extra length for the ends to be twisted at top of pipe to hold the band securely in place; bands shall be accurately centered around lower portion of joint.

b. Grout: Grout shall be poured between band and pipe from the high side of band only, until grout rises to the top of band at the spring line of pipe, or as nearly so as possible, on the opposite side of pipe, to ensure a thorough sealing of joint around the portion of pipe covered by the band. Silt, slush, water, or polluted mortar grout forced up on the lower side shall be forced out by pouring, and removed.

c. Remainder of Joint: The remaining unfilled upper portion of the joint shall be filled with mortar and a bead formed around the outside of this upper portion of the joint with a sufficient amount of additional mortar. The diaper shall be left in place. Placing of this type of joint shall be kept at least five joints behind actual laying of pipe. No backfilling around joints shall be done until joints have been fully inspected and approved.

3.4.1.4 Cement-Mortar Tongue-and-Groove Joint

The first pipe shall be bedded carefully to the established gradeline with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be thoroughly cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned with a wet brush; while in horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe shall be inserted in the grooved end of the first pipe until mortar is squeezed out on interior and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside.

3.4.1.5 Cement-Mortar Diaper Joint for Tongue-and-Groove Pipe

The joint shall be of the type described for cement-mortar tongue-and-groove joint in this paragraph, except that the shallow excavation directly beneath the joint shall not be filled with mortar until after a gauze or cheesecloth band dipped in cement mortar has been wrapped around the outside of the joint. The cement-mortar bead at the joint shall be at least 1/2 inch, thick and the width of the diaper band shall be at least 8 inches. The diaper shall be left in place. Placing of this type of joint shall be kept at least five joints behind

the actual laying of the pipe. Backfilling around the joints shall not be done until the joints have been fully inspected and approved.

3.4.1.6 Plastic Sealing Compound Joints for Tongue-and-Grooved Pipe

Sealing compounds shall follow the recommendation of the particular manufacturer in regard to special installation requirements. Surfaces to receive lubricants, primers, or adhesives shall be dry and clean. Sealing compounds shall be affixed to the pipe not more than 3 hours prior to installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Sealing compounds shall be inspected before installation of the pipe, and any loose or improperly affixed sealing compound shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint with mastic-type sealant, a slight protrusion of the material is not visible along the entire inner and outer circumference of the joint when the joint is pulled up, the pipe shall be removed and the joint remade. After the joint is made, all inner protrusions shall be cut off flush with the inner surface of the pipe. If nonmastic-type sealant material is used, the "Squeeze-Out" requirement above will be waived.

3.4.1.7 External Sealing Band Joint for Noncircular Pipe

Surfaces to receive sealing bands shall be dry and clean. Bands shall be installed in accordance with manufacturer's recommendations.

3.5 DRAINAGE STRUCTURES

3.5.1 Manholes and Inlets

Construction shall be of reinforced concrete, precast reinforced concrete, precast concrete segmental blocks; complete with frames and covers or gratings; and with steps. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

3.5.2 Walls and Headwalls

Construction shall be as indicated.

3.6 STEP INSTALLATION

Steps, not steel ladders shall be installed where deptHs exceed 6 feet

3.7 BACKFILLING

3.7.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.7.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be

uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches.

3.7.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.7.4 Compaction

3.7.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.7.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

a. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

c. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.7.5 Determination of Density

Testing shall be the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished the

Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.8 PIPELINE TESTING

Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate. Low pressure air testing for concrete pipes shall conform to ASTM C 924. Low pressure air testing for plastic pipe shall conform to ASTM F 1417. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 or ASTM C 924, after consultation with the pipe manufacturer. Testing of individual joints for leakage by low pressure air or water shall conform to ASTM C 1103. Prior to exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by the exfiltration test shall not exceed 0.2 gallons per inch in diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correcting, and retesting shall be made at no additional cost to the Government.

-- End of Section --

SECTION 02712A

LIME-MODIFIED SUBGRADE
12/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 50	(1994) Sampling, Inspection, Packing, and Marking of Lime and Limestone Products
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place By Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.2 DEFINITIONS

1.2.1 Lime-Modified Subgrade

Lime-Modified Subgrade, as used in this specification, is a mixture of lime and satisfactory in-place or select borrow material uniformly blended, wetted, and thoroughly compacted, and cured to produce a lime modified pavement subgrade which meets the criteria set forth in the plans and this specification.

1.2.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as percent laboratory maximum density.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, Machines, and Tools; G, RE.

List of proposed equipment to be used in performance of construction work including descriptive data..

Waybills and Delivery Tickets.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all materials actually used.

SD-06 Test Reports

Lime-Modified Soil Testing; G, GD.

Certified copies of laboratory test results of subgrade soil and lime-modified soil, not less than 30 days before material is required for the work.

Sampling and Testing; G, RE.

Field Density; G, RE.

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results of materials and sources not less than 30 days before material is required for the work.

SD-07 Certificates

Lime; G, GD.

Source from which lime is to be obtained with certified mill test results showing the lime meets specified requirements.

1.4 JOB DESCRIPTION

The work specified consists of the construction of a lime-modified subgrade. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes, and typical sections shown in the drawings. Sources of materials shall be selected well in advance of the time when materials will be required in the work.

1.5 STOCKPILING MATERIALS

Select material, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Before stockpiling material, storage sites shall be cleared and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

1.5 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.5.1 General Requisites

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. Protective equipment, apparel, and barriers shall be provided to protect the eyes, respiratory system, and the skin of workers exposed to contact with lime dust or slurry.

1.5.2 Pulverizing/Mixing Equipment

The pulverizing and mixing equipment shall be self-propelled, four wheel drive and operated by a single operator. It shall be capable of pulverizing the soil in a single pass for the full depth to be modified, and for a width of at least 8-feet. The in-situ mixer shall be capable of uniformly blending and mixing the lime into the subgrade soil. The rotor shall be capable of up or down cutting. The rotor shall be equipped with tap-in, knock-out, bullet-type teeth.

1.5.3 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type with a total weight of not less than 10 tons, and a minimum weight of 300 pounds per inch width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

1.5.4 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall have 4 or more tires, each loaded to a minimum of 30,000 pounds and inflated to a minimum pressure of 150 psi. The loading shall be equally distributed to all wheels, and the tires shall be uniformly inflated. Towing equipment shall also be pneumatic-tired.

1.5.5 Mechanical Spreader

Mechanical spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall have variable speeds forward and reverse. The spreader and propelling unit shall be carried on tracks, rubber tires, or drum-type steel rollers that will not disturb the underlying material. The spreader shall contain a hopper, an adjustable screed, and outboard bumper rolls; and shall be designed to have a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted, the layer or layers shall conform to thickness and grade requirements indicated. The Contracting Officer may require a demonstration of the spreader prior to approving use in performance of the work.

1.5.6 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors, or other approved equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

1.5.7 Tampers

Tampers shall be of an approved mechanical type, operated by either pneumatic pressure or internal combustion, and shall have sufficient weight and striking power to produce the compaction required.

1.5.8 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 12 foot straightedge for each bituminous paver, for use in the testing of the

finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.6 WEATHER LIMITATIONS

Work on the base course shall not be performed during freezing temperatures. When the temperature is below 40 degrees F, the completed base course shall be protected against freezing by a sufficient covering of straw, or by other approved methods, until the course has dried out. Any areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be brought to a satisfactory condition without additional cost to the Government. Lime shall not be applied when the atmospheric temperature is less than 40 degrees F. No lime shall be applied to soils that are frozen or contain frost, or when the underlying material is frozen. If the temperature falls below 35 degrees F, completed lime-treated areas shall be protected against any detrimental effects of freezing.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Lime

Lime shall be a standard brand of hydrated or granular quicklime conforming to the following physical and chemical requirements. Lime shall be delivered and applied as a slurry. If in the opinion of the Contracting Officer the use of dry powder lime application will not pose a dust control concern lime applications may be applied in dry powder form. The design lime addition rate is at least 7 percent hydrated lime or at least 5.25 percent granular quicklime by weight.

2.1.1.1 Hydrated Lime

Hydrated lime for this purpose shall be a product consisting of hydrated lime and insoluble inert material and conforming to the following chemical composition and residue:

a. Available Lime Index as Calcium Hydroxide, minimum 90%

b. residue retained on a No. 30 sieve, maximum 1%
c. residue retained on a No. 200 sieve, maximum 20%

2.1.1.2 Granular Quicklime

Granular quicklime is a calcined material, the major part of which is calcium oxide or calcium oxide in natural association with a lesser amount of magnesium oxide capable of slaking with water. This specification applies specifically to limes made from calcium-type limestones. When tested under the appropriate methods of test, the lime shall conform to the following requirements:

a. Available Lime Index as Calcium Oxide (CaO): Not less than 90% Sieve Size

Percent Retained

5/8 inch	0-5
No. 40	75-100
No. 200	85-100

c. Residue after slaking (Wet Sieve):

Sieve Size

Percent Retained

No. 20	0-5

2.1.2 Material to be Modified

Material to be modified shall consist of satisfactory material. Satisfactory material shall be free of deleterious substances such as sticks, debris, organic matter, and stones greater than 3 inches in any dimension. Satisfactory material shall comprise any materials classified by ASTM D 2487 as GP, GM, SC, SW, SM, ML, CL, or CH. Unsatisfactory materials shall comprise any materials classified by ASTM D 2487 as Pt, OH, OL, MH. At least 10 percent of the material shall pass the No. 40 sieve. Plasticity index shall be greater than 12.

2.1.3 Water

Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, and other substances deleterious to the lime or soil-lime mixture, and shall be subject to approval.

PART 3 EXECUTION

3.1 LIME STABILIZATION MIXTURE

The Contractor shall construct a working platform for new pavement construction by lime-modifying the subgrade soil. To accomplish this, the Contractor shall incorporate at least 7 percent hydrated lime by weight (based on oven-dry weight of the soil) or at least 5.25 percent granular quicklime by weight (based on the oven-dry weight of soil) to the depth shown on the drawings below top of subgrade. The material to be lime modified shall be thoroughly pulverized and, when lime is applied in the dry state, the mix shall be thoroughly blended at a moisture content below optimum. After blending, water shall be blended into the dry mix in amounts necessary to bring the moisture content to optimum. Field moisture content shall be controlled within plus or minus 2 percent of optimum. When the modified subgrade is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweeper or power brooms except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire construction period to prevent water from collecting or standing on the area to be lime modified or on pulverized, mixed, or partially mixed material. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF BORROW PITS

Borrow pits shall be cleared, stripped and excavated in a manner that exposes vertical faces of the deposit for suitable working depths. Strata of unsuitable materials overlying or occurring in the deposit shall be wasted. Methods of operating pits and the processing and blending of materials may be changed or modified if necessary to obtain material conforming to the specified requirements. Upon completion of the work, pits shall be conditioned to drain readily, and be left in a satisfactory condition.

3.3 PREPARATION OF AREA TO BE MODIFIED

The area shall be cleaned of debris. The area will be inspected for adequate compaction and shall be capable of withstanding, without displacement, the compaction specified for the soil-lime mixture. Debris and removed unsatisfactory in-place material shall be disposed of as specified.

3.3.1 In-Place Material to be Modified

The entire area shall be graded to conform to the lines, grades, and cross sections shown in the plans prior to being processed. Soft or yielding subgrade areas shall be made stable before construction is begun.

3.3.2 In-Place Material to Receive Lime-Modified Course

Soft, yielding areas and ruts or other irregularities in the surface shall be corrected. The material in the affected areas shall be loosened and unsatisfactory material removed. Approved select material shall be added where directed. The area shall then be shaped to line, grade, and cross section, and shall be compacted to the specified density.

3.3.3 Quantity of Select Material

Sufficient select material shall be utilized to provide the required thickness of the soil-lime layer after compaction. Where in-place mixing is to be accomplished, the soil shall be graded and shaped to the approximate section and grade shown before lime stabilization is undertaken.

3.3.4 Grade Control

Underlying material shall be excavated to sufficient depth for the required lime modified-course thickness so that the finished lime modified course with the subsequent surface course will meet the fixed grade. Finished and completed lime modified area shall conform to the lines, grades, cross section, and dimensions indicated.

3.4 INSTALLATION

3.4.1 Mixed In-Place Method

3.4.1.1 Scarifying and Pulverizing of Soil

Lime-modification of subgrade soils shall be accomplished by the mixed in-place method, except as otherwise shown or approved. Prior to application of lime, the soil shall be scarified and pulverized to the depth shown. Scarification shall be controlled so that the layer beneath the layer to be treated is not disturbed. Depth of pulverizing shall not exceed the depth of scarification.

3.4.1.2 Application of Lime

Pulverized material shall be shaped to approximately the cross section indicated. Lime shall be applied so that when uniformly mixed with the soil, the specified lime content is obtained, and a sufficient quantity of lime-treated soil is produced to construct a compacted lime-treated course conforming to the lines, grades, and cross section indicated. Mechanical spreaders shall be used in applying bulk lime. Distributors shall be used in applying slurry. If lime is spread by hand, the bags shall be spotted accurately on the area being lime modified so that when the bags are opened the lime will be dumped and spread uniformly on the area being processed. No equipment except that used in spreading and mixing shall pass over the freshly applied lime.

3.4.1.3 Initial Mixing

Immediately after the lime has been distributed, the lime and soil shall be mixed. Initial mixing shall be sufficient to alleviate any dusting or wetting of the lime that might occur in the event of wind or rainstorms. This may be accomplished several days in advance of the final application and mixing. Immediately following the initial mixing the lime-modified soil mixture shall be compacted to a smooth, dense condition. The surface shall be moistened, if necessary, and shaped to the required lines, grades, and cross section. Density of compacted mixture shall be at least 90 percent of laboratory maximum density.

3.4.1.4 Water Application and Moist Mixing

Moisture content of the mixture shall be determined in preparation for final mixing. Moisture in the mixture following final mixing shall not be less than the water content determined to be optimum based on dry weight of soil and shall not exceed the optimum water content by more than 2 percentage points. Water may be added in increments as large as the equipment will permit; however, such increment of water shall be partially incorporated in the mix to avoid concentration of water near the surface. After the last increment of water has

been added, mixing shall be continued until the water is uniformly distributed throughout the full depth of the mixture, including satisfactory moisture distribution along the edges of the section.

3.4.2 Edges of Modified Course

Approved material shall be placed along the edges of the lime modified course in a quantity that will compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple-layer course, allowing at least a 1 foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the lime modified course.

3.4.3 Central-Plant Method

The Central-Plant method shall not be used except where specifically indicated or approved. Lime-modified subgrade is to be constructed by the mixed in-place method to the maximum extent practical. Plant shall be capable of producing a uniform lime-treated mixture at the specified lime and moisture contents. Mixture shall be hauled to the job in trucks equipped with protective covers. Underlying course shall be thoroughly moistened and the mixture then placed on the prepared area in a uniform layer with mechanical spreaders. The layer shall be uniform in thickness and surface contour; and the completed layer, after compaction, shall conform to the required grade and cross section.

3.4.4 Layer Thickness

Compacted thickness of the lime modified course shall be as indicated. No layer shall be more than 8 inches or less than 3 inches in compacted thickness.

3.4.5 Compaction

Before compaction operations are started and as a continuation of the mixing operation, the mixture shall be thoroughly loosened and pulverized to the full depth. Compaction shall be started immediately after mixing is completed. During final compaction, the surface shall be moistened, if necessary, and shaped to the required lines, grades, and cross section. Density of compacted mixture shall be at least 95 percent of laboratory maximum density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. At all times, the speed of the roller shall not cause displacement of the mixture to occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

3.4.6 Finishing

The surface of the top layer shall be finished to the grade and cross section shown. The surface shall be of uniform texture. Light blading during rolling may be necessary for the finished surface to conform to the lines, grades, and cross sections. If the surface for any reason becomes rough, corrugated, uneven in texture, or traffic-marked prior to completion, the unsatisfactory portions shall be scarified, reworked, relaid, or replaced as directed. If any portion of the course, when laid, becomes watersoaked for any reason, that portion shall be removed immediately, and the mix placed in a windrow and aerated until a moisture content within the limits specified is obtained; and then spread, shaped, and rolled as specified above.

3.4.7 Construction Joints

At the end of each phase of construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face free of loose or shattered material. Material along construction joints not properly compacted shall be removed and replaced with soil-lime mixture that is mixed, moistened, and compacted as specified.

3.4.8 Curing and Protection

Immediately after the soil-lime area has been finished as specified above, the surface shall be protected against drying for at least 7 days by moist curing. The modified subgrade shall be protected from freezing during the curing period.

3.4.8.1 Moist Curing

The area shall be moistened by sprinkling and shall be kept continuously moist for the 7-day curing period.

3.5 SAMPLING AND TESTING

3.5.1 General Requirements

Sampling and testing shall be the responsibility of the Contractor, and shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. Work requiring testing will not be permitted until the facilities have been inspected and approved. The first inspection will be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to ensure that materials and compaction meet specified requirements. Certified copies of the test results shall be furnished to the Contracting Officer.

3.5.2 Results

Results shall verify that the material complies with the specification. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced.

3.5.3 Sampling

All aggregate samples for laboratory testing shall be taken in accordance with ASTM D 75. Samples of lime shall be taken in accordance with ASTM C 50.

3.5.4 Sieve Analysis

Before starting work, one sample of material to be lime modified shall be tested in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11. After the initial test, a minimum of one analysis shall be performed for each 1,500 yards of lime-modified course, with a minimum of three analyses for each day's run until the course is completed.

3.5.5 Liquid Limit and Plasticity Index

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

3.5.6 Lime Source

The source of lime shall be designated by the Contractor. The Contractor shall furnish certified mill test reports at least 30 days prior to use in the construction. The certified mill test report shall show that the lime meets all requirements specified herein. Lime shall be tested for the specified chemical and physical requirements in accordance with ASTM C 25 and ASTM C 110.

3.5.7 Moisture-Density Determinations

Tests for determination of maximum density and optimum moisture shall be the responsibility of the Contractor, and accomplished in accordance with ASTM D 1557. Samples shall be representative of the materials to be placed. An optimum moisture-density curve shall be obtained for each principal type of materials or combination of materials encountered or utilized. Results of these tests shall be the basis of control for compaction. The moisture-density

determination, shall include test results on lime modified soil for Atterberg limits.

3.6 FIELD QUALITY CONTROL

Tests shall provide a moisture-density relationship for the lime-soil mixture. Results of field quality control testing shall verify that materials comply with this specification. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or repaired, as directed by the Contracting Officer, at no additional cost to the Government.

3.6.1 Thickness Control

Completed thicknesses of the lime modified course shall be within 1/2 inch of the thickness indicated. Where the measured thickness of the lime modified course is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding mixture of proper gradation, reblading, and recompacting as directed. Where the measured thickness of the lime modified course is more than 1/2 inch thicker than indicated, it shall be considered as conforming to the specified thickness requirement. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. Thickness of the lime modified course shall be measured at intervals which ensure one measurement for each 250 square yards or fraction thereof, of lime modified course. Measurements shall be made in 3 inch diameter test holes penetrating the lime modified course.

3.6.2 Field Density

Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least once per lift for each 1000 square yards of lime modified material, or fraction thereof. Calibration curves and calibration tests results shall be furnished to the Contracting Officer within 24 hours of conclusion of the tests. At least one field density test shall be performed for each 250 square yards of lime modified subgrade surface, or fraction thereof.

3.6.3 Smoothness Test

The surface of a stabilized layer shall show no deviations in excess of 3/8 inch when tested with the 12-foot straightedge. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed. Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline with a 12-foot straightedge. Measurements shall also be taken perpendicular to the road centerline at 50-foot intervals.

3.7 TRAFFIC

Completed portions of the lime-treated soil area may be opened immediately to light traffic provided the curing is not impaired. After the curing period has elapsed, completed areas may be opened to all traffic, provided the lime modified course has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic. Heavy equipment shall not be permitted on the area during the curing period. Lime and water may be hauled over the completed area with pneumatic-tired equipment if approved. Finished portions of lime-modified soil that are traveled on by equipment used in constructing an adjoining section shall be protected in a manner to prevent equipment from marring or damaging

completed work.

3.8 MAINTENANCE

lime modified area shall be maintained in a satisfactory condition until the completed work is accepted. Maintenance shall include immediate repairs of any defects and shall be repeated as often as necessary to keep the area intact. Defects shall be corrected as specified herein.

3.9 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for stabilization, material that is removed for the required correction of defective areas, waste material, and debris shall be disposed of as directed.

-- End of Section --

SECTION 02721A

SUBBASE COURSES
03/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457-mm (18-in) Drop

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.1.1 STATE SPECIFICATIONS

KANSAS DEPARTMENT OF TRANSPORTATION (KDOT), STANDARD SPECIFICATIONS FOR STATE ROAD AND BRIDGE CONSTRUCTION (including all subsequent supplements and updates), are referred to herein as State Specifications. Paragraphs pertaining to measurement and payment in the State Specifications shall not be used. References to State or Engineer shall be understood to be the Contracting Officer. The State Specifications form a part of this specification only to the extent referenced.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; G, RE

List of proposed equipment to be used in performance of construction work, including descriptive data.

SD-06 Test Reports

Sampling and Testing; G, RE.

Copies of in-place test results, testing during construction.

Sampling and Testing; G, GD.

Copies of material test reports for approval of source and material for use in the work, submit at least 30 days prior to use in the work.

1.3 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, or AASHTO T 180, Method D. In this specification, degree of compaction shall be a percentage of laboratory maximum density.

1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved testing laboratory in accordance with Section 01451A CONTRACTOR QUALITY CONTROL. Tests shall be performed at the specified frequency. No work requiring testing will be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements.

1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.4.2 Tests

1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136 and ASTM D 422. Sieves shall conform to ASTM E 11.

1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D

4318.

1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture shall be determined in accordance with ASTM D 1557 or AASHTO T 180, Method D.

1.4.2.4 Density Tests

Density shall be field measured in accordance with ASTM D 1556, the base plate, as shown in the drawing shall be used. Or by ASTM D 2167. Or by ASTM D 2922. The calibration curves shall be checked and adjusted, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and, when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration, in ASTM D 2922, on each different type of material to be tested at the beginning of a job and at intervals as directed.

1.4.2.5 Soundness Test

Soundness tests shall be accomplished on subbase course material in accordance with ASTM C 88.

1.4.2.6 Wear Test

Wear tests shall be made on subbase course material in conformance with ASTM C 131.

1.4.3 Testing Frequency

1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation.

a. Sieve Analysis including 0.02 mm size material
b. Liquid limit and plasticity index moisture-density relationship
c. Wear
d. Soundness

1.4.3.2 In-Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted subbase course. Samples shall be taken for each 300 square yards or fraction thereof, of each layer of material placed in each area, except for Kitty Drive. For Kitty Drive, samples shall be taken for each 500 square yards or fraction thereof, of each layer of material placed in each area.

a. Sieve Analysis including 0.02 mm size material
b. Field Density
c. Moisture liquid limit and plasticity index

1.4.4 Approval of Material

The source of the material shall be selected prior to the time the material will be required in the work. No material shall be used in the work until results of the material testing has been reviewed and approved. Approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted subbase course.

1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

1.6 EQUIPMENT

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Subbase Course

Aggregates shall consist of crushed stone or gravel, screenings, sand, or other sound, durable, approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. Material retained on the No. 4 sieve shall have a percentage of wear Less than 40 percent after 500 revolutions when tested as specified in ASTM C 131, and have a loss not greater than 18 percent weighted average at 5 cycles when tested for soundness in magnesium sulfate in accordance with ASTM C 88. The percent of flat and/or elongated particles shall not exceed 20 in the fraction retained on the 12.5 mm sieve and in the fraction passing the 12.5 mm sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set forth herein. In the portion retained on each sieve specified, the crushed gravel shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the face. When 2 fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as 2 fractured faces. Aggregate shall be reasonably uniform in density and quality. The specified gradation requirements shall apply to the completed subbase course. Sieves shall conform to ASTM E 11. Aggregates shall have a maximum size of 50 inch and shall be within the limits specified as follows:

Maximum Allowable Percentage by Weight
Passing Square-Mesh Sieve

Sieve Designation	No. 1
No. 10	50
No. 200	15

Particles having diameters less than 0.0008 inches shall not be in excess of 3 percent by weight of the total sample tested as determined in accordance with ASTM D 422. The portion of any blended component and of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.2 State Specification Subbase Course

State Specification aggregate material, Section 1100, Subsection 1105, Aggregates for Aggregate Base Construction, Type AB-3 may be used for subbase course. State Specification aggregate subbase course shall be produced from graded crushed aggregates conforming to State Class 2 aggregate source. All other requirements

herein for subbase course construction shall apply.

PART 3 EXECUTION

3.1 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer so as to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.2 PREPARATION OF UNDERLYING MATERIAL

Prior to constructing the subbase course, the underlying course or subgrade shall be cleaned of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02712A LIME-MODIFIED SUBGRADE. Ruts, or soft yielding spots, in the underlying courses, subgrade areas having inadequate compaction, and deviations of the surface from the specified requirements, shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the subbase course is placed.

3.3 GRADE CONTROL

The finished and completed subbase course shall conform to the lines, grades, and cross sections shown. The lines, grades, and cross sections shown shall be maintained by means of line and grade stakes placed by the Contractor at the work site.

3.4 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed to obtain uniformity of the subbase material at the water content specified. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

3.5 LAYER THICKNESS

The compacted thickness of the completed course shall be as indicated. When a compacted layer of 6 inches is specified, the material may be placed in a single layer; when a compacted thickness of more than 6 inches is required, no layer shall exceed 6 inches nor be less than 3 inches when compacted.

3.6 COMPACTION

Each layer of the subbase course shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 2 percent of optimum water content, as determined from laboratory tests, as specified in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory subbase course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.7 EDGES

Approved material shall be placed along the edges of the subbase course in such quantity as will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least a 1 foot width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the subbase course, as directed.

3.8 SMOOTHNESS TEST

The surface of each layer shall not show deviations in excess of 3/8 inch when tested with a 12 footstraightedge applied parallel with and at right angles to the centerline of the area to be paved. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding this amount shall be corrected by removing material, replacing with new material, or reworking existing material and compacting, as directed.

3.9 THICKNESS CONTROL

The completed thickness of the subbase course shall be in accordance with the thickness and grade indicated on the drawings. The thickness of each course shall be measured at intervals providing at least one measurement for each 250 square yards or fraction thereof, of subbase course. The thickness measurement shall be made by test holes, at least 3 inches in diameter through the course. The completed subbase course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, the Contractor shall correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown.

3.10 MAINTENANCE

The subbase course shall be maintained in a satisfactory condition until accepted. The subbase course shall be protected from changes in moisture content. The Contractor shall maintain the moisture content of the subbase course until the next overlying course of material is placed.

-- End of Section --

SECTION 02722A

GRADED-CRUSHED AGGREGATE BASE COURSE
05/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop
AASHTO T 224	(1996) Correction for Coarse Particles in the Soil Compaction Test

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993el) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1997) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock

	in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes
ASTM E 548	(1994el) General Criteria Used for Evaluating Laboratory Competence

1.2 STATE SPECIFICATIONS

KANSAS DEPARTMENT OF TRANSPORTATION (KDOT), STANDARD SPECIFICATIONS FOR STATE ROAD AND BRIDGE CONSTRUCTION (including all subsequent supplements and updates), are referred to herein as State Specifications. Paragraphs pertaining to measurement and payment in the State Specifications shall not be used. References to State or Engineer shall be understood to be the Contracting Officer. The State Specifications form a part of this specification only to the extent referenced.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.3.1 Graded-crushed Aggregate Base Course

Graded-crushed aggregate (GCA) base course is well graded, crushed, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.3.2 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 or AASHTO T 180, Method D and corrected with AASHTO T 224.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G, RE.

List of proposed equipment to be used in performance of construction work, including descriptive data.

Waybills and Delivery Tickets; G, RE.

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

SD-06 Test Reports

Sampling and testing; G, GD.

Certified copies of initial material test results for approval of source and material not less than 30 days before material is required for the work.

Field Density Tests; G, RE.

Calibration curves and related test results prior to using the device or equipment being calibrated. Certified copies of initial material test results for approval not less than 30 days before material is required for the work. Copies of field test results within 24 hours after the tests are performed.

1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor subject to approval in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. If the Contractor elects to establish testing facilities of his own, approval of such facilities shall be based on compliance with ASTM E 548, and no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved. The first inspection of the facilities will be at the expense of the Government and any subsequent inspections required because of failure of the first inspection shall be at the expense of the Contractor. Such costs will be deducted from the total amount due the Contractor. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. The Contracting Officer may specify the time and location of the tests. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of the tests.

1.5.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.5.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

1.5.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with ASTM D 1557 or AASHTO T 180, Method D and corrected with AASHTO T 224. To maintain the same percentage of coarse material, the "remove and replace" procedure as described in the NOTE 8 in Paragraph 7.2 of AASHTO T 180 shall be used.

1.5.2.4 Field Density Tests

Density shall be field measured in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. For the method presented in ASTM D 1556 the base plate as shown in the drawing shall be used. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in

paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed.

1.5.2.5 Wear Test

Wear tests shall be made on GCA course material in conformance with ASTM C 131.

1.5.2.6 Soundness

Soundness tests shall be made on GCA in accordance with ASTM C 88.

1.5.3 Testing Frequency

1.5.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

a. Sieve Analysis including size material.

b. Liquid limit and plasticity index.

c. Moisture-density relationship.

d. Wear.

e. Soundness.

1.5.3.2 In Place Tests

Each of the following tests shall be performed on samples taken from the placed and compacted GCA. Samples shall be taken and tested at the rates indicated.

a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or fraction thereof, of completed area.

b. Sieve Analysis including No. 635 size material shall be performed for every , or portion thereof, of material placed.

c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

1.5.4 Approval of Material

The source of the material shall be selected prior to the time the material will be required in the work. Material shall not be permitted for use in the work, until testing has been completed and the material approved. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted GCA.

1.6 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

1.7 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in

satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 2 PRODUCTS

2.1 AGGREGATES

The GCA shall consist of clean, sound, durable particles of crushed stone or crushed gravel, crushed recycled concrete, angular sand, or other approved material. GCA shall be free of silt and clay as defined by ASTM D 2487, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

2.1.1 Coarse Aggregate

Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

2.1.1.1 Crushed Aggregate

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

c. Crushed Recycled Portland Cement Concrete: Crushed recycled concrete shall consist of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. The recycled material shall be free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and shall be crushed and processed to meet the required gradations for coarse aggregate. Crushed recycled concrete shall meet all other applicable requirements specified below.

2.1.1.2 Graded-Crushed Aggregate Base Course

GCA coarse aggregate shall not show more than 40 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. GCA coarse aggregate shall not exhibit a loss greater than 18 percent weighted average, at five cycles, when tested for soundness in magnesium sulfate in accordance with ASTM C 88. The amount of flat and elongated particles shall not exceed 20 percent for the fraction retained on the 1/2 inch sieve nor 20 percent for the fraction passing the 1/2 inch sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregate shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 90 percent of which by weight are retained on the maximum size sieve listed in TABLE 1.

2.1.2 Fine Aggregate

Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

2.1.2.1 Graded-Crushed Aggregate Base Course

GCA fine aggregate shall consist of angular particles produced by crushing stone, slag, recycled concrete, or gravel that meets the requirements for wear and

soundness specified for GCA coarse aggregate. Fine aggregate shall be produced by crushing only particles larger than No. 4 sieve in size. The fine aggregate shall contain at least 90 percent by weight of particles having two or more freshly fractured faces in the portion passing the No. 4 sieve and retained on the No. 10 sieve, and in the portion passing the No. 10 sieve and retained on the No. 40 sieve.

2.1.3 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 1-1/2 inches and shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 2
2 inch	----
1-1/2 inch	100
1 inch	60-100
1/2 inch	30-65
No. 4	20-50
No. 10	15-40
No. 40	5-25
No. 200	0-8

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

2.1.4 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.5 State Specification Base Course

State Specification aggregate material, Section 1100, Subsection 1105, Aggregates for Aggregate Base Construction, Type AB-1 may be used for base course. State Specification aggregate base course shall be produced from graded crushed aggregates conforming to State Class 2 aggregate source. All other requirements herein for base course construction shall apply.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the GCA is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where

power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from offsite sources.

3.3 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.4 PREPARATION OF UNDERLYING COURSE

Prior to constructing the GCA, the surface of the underlying course shall be cleaned of all foreign substances. At the time of construction of the GCA, the underlying course shall contain no frozen material. The surface of the underlying course shall meet specified compaction and surface tolerances. The underlying course shall conform to the specified requirements for the course. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the GCA is placed.

3.5 INSTALLATION

3.5.1 Mixing the Materials

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory GCA meeting all requirements of this specification.

3.5.2 Placing

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the GCA is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable GCA.

3.5.3 Grade Control

The finished and completed GCA shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required GCA thickness so that the finished GCA with the

subsequent surface course will meet the designated grades.

3.5.4 Edges of Base Course

The GCA shall be placed so that the completed section will be a minimum of 1-foot wider, on all sides, than the next layer that will be placed above it. Additionally, approved fill material shall be placed along the outer edges of GCA in sufficient quantities to compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 2 foot width of this material to be rolled and compacted simultaneously with rolling and compacting of each layer of GCA. If this base course material is to be placed adjacent to another pavement section, then the layers for both of these sections shall be placed and compacted along this edge at the same time.

3.5.5 Compaction

Each layer of the GCA shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 2 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least 100 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory GCA. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.5.6 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 6 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the GCA course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the GCA course shall be measured at intervals in such a manner as to ensure one measurement for each 400 square yards or fraction thereof, of base course, for all areas. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.5.7 Finishing

The surface of the top layer of GCA shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of GCA is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

3.5.8 Smoothness

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.6 TRAFFIC

Completed portions of the GCA course may be opened to limited construction traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The GCA shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any GCA that is not paved over prior to the onset of winter, shall be retested to verify that it still complies with the requirements of this specification. Any area of GCA that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of as directed. No additional payments will be made for materials that must be replaced.

-- End of Section --

SECTION 02741A

HOT-MIX ASPHALT (HMA) FOR ROADS
09/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO MP 1	(1998)Provisional Specification for Performance Graded Asphalt Binder
AASHTO MP 2	(1998; Interim 1999) Superpave Volumetric Mix Design
AASHTO TP53	(1998; Interim 1999) Determining Asphalt Content of Hot Mix Asphalt by the Ignition Method
AASHTO T 283	(1989) Resistance of Compacted Bituminous Mixtures to Moisture Induced Damage

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 566	(1997) Evaporable Total Moisture Content of Aggregate by Drying
ASTM C 1252	(1998) Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
ASTM D 140	(1998) Sampling Bituminous Materials
ASTM D 242	(1995) Mineral Filler for Bituminous Paving Mixtures
ASTM D 995	(1995b) Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
ASTM D 1461	(1985)) Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous

	Mixtures Using Marshall Apparatus
ASTM D 2041	(1995) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	(1995) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2419	(1995) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 2489	(1984; R 1994el) Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	(1996el) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixture
ASTM D 2950	(1997) Density of Bituminous Concrete in Place by Nuclear Method
ASTM D 3665	(1999) Random Sampling of Construction Materials
ASTM D 3666	(1998) Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
ASTM D 4125	(1994el)Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D 4791	(1999) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4867/D 4867M	(1996) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D 5444	(1998) Mechanical Size Analysis of Extracted Aggregate
ASTM D 6307	(1998) Asphalt Content of Hot Mix Asphalt by Ignition Method

ASPHALT INSTITUTE (AI)

AI MS-2	(1997) Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 171	(1995) Test Method for Determining Percentage of Crushed Particles in Aggregate

1.2 DESCRIPTION OF WORK

The work shall consist of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. HMA designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Each course shall be constructed to the depth, section, or elevation required by the drawings and shall be rolled, finished, and approved before the placement of the next course.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the

submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mix Design; G, GD.

Submittals for asphalt cement binder and aggregate test reports shall be included in the mix design submittal.

Proposed JMF.

Contractor Quality Control; G, RE.

Quality control plan.

Material Acceptance; G, RE.

Acceptance test results.

SD-06 Test Reports

Aggregates; G, GD.

QC Monitoring; G, RE.

Aggregate and QC test results.

SD-07 Certificates

Asphalt Cement Binder; G, GD.

Copies of certified test data.

Testing Laboratory; G, RE.

Certification of compliance.

Plant Scale Calibration Certification

1.4 ASPHALT MIXING PLANT

Plants used for the preparation of hot-mix asphalt shall conform to the requirements of ASTM D 995 with the following changes:

a. Truck Scales. The asphalt mixture shall be weighed on approved certified scales at the Contractor's expense. Scales shall be inspected and sealed at least annually by an approved calibration laboratory.

b. Testing Facilities. The Contractor shall provide laboratory facilities at the plant for the use of the Government's acceptance testing and the Contractor's quality control testing.

c. Inspection of Plant. The Contracting Officer shall have access at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions, and material properties; checking the temperatures maintained in the preparation of the mixtures and for taking samples. The Contractor shall provide assistance as requested, for the Government to procure any desired samples.

d. Storage Bins. Use of storage bins for temporary storage of hot-mix asphalt will be permitted as follows:

(1) The asphalt mixture may be stored in non-insulated storage bins for a period of time not exceeding 3 hours.

(2) The asphalt mixture may be stored in insulated storage bins for a period of time not exceeding 8 hours. The mix drawn from bins shall meet the same requirements as mix loaded directly into trucks.

1.5 HAULING EQUIPMENT

Trucks used for hauling hot-mix asphalt shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum based products shall not be used as a release agent. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers (tarps) shall be securely fastened.

1.6 ASPHALT PAVERS

Asphalt pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable of spreading and finishing courses of hot-mix asphalt which will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

1.6.1 Receiving Hopper

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

1.6.2 Automatic Grade Controls

If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. A transverse slope controller shall not be used to control grade. The controls shall be capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 30 feet in length.

b. Taut stringline set to grade.

c. Short ski or shoe for joint matching.

d. Laser control.

1.7 ROLLERS

Rollers shall be in good condition and shall be operated at slow speeds to avoid displacement of the asphalt mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Equipment which causes excessive crushing of the aggregate shall not be used.

1.8 WEATHER LIMITATIONS

The hot-mix asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 1.

Table 1. Surface Temperature Limitations of Underlying Course

Mat Thickness, inches	Degrees F
3 or greater	40
Less than 3	45

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of crushed stone, crushed gravel, screenings, natural sand and mineral filler, as required. The portion of material retained on the No. 4 sieve is coarse aggregate. The portion of material passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate. The portion passing the No. 200 sieve is defined as mineral filler. The total aggregate (coarse aggregate, fine aggregate, and the material passing the 75 mm sieve) shall contain at least 80 percent crushed material. All aggregate test results and samples shall be submitted to the Contracting Officer at least 30 days prior to start of construction.

2.1.1 Coarse Aggregate

Coarse aggregate shall consist of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. All individual coarse aggregate sources shall meet the following requirements:

a. The percentage of loss shall not be greater than 40 percent after 500 revolutions when tested in accordance with ASTM C 131.

b. The percentage of loss shall not be greater than 18 percent after five cycles when tested in accordance with ASTM C 88 using magnesium sulfate.

c. At least 80 percent by weight of coarse aggregate shall have at least two or more fractured faces when tested in accordance with COE CRD-C 171. The area of each fractured face shall be at least 80 percent of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be produced by crushing.

d. The particle shape shall be essentially cubical and the aggregate shall not contain more than 20% percent, by weight, of flat and elongated particles (3:1 ratio of maximum to minimum) when tested in accordance with ASTM D 4791.

2.1.2 Fine Aggregate

Fine aggregate shall consist of clean, sound, tough, durable particles including natural sand or crushed stone or gravel that meets the requirements for wear and soundness specified for coarse aggregate. Fine aggregate produced by crushing gravel shall have at least 90 percent by weight of crushed particles having two or more fractured faces in the portion retained on the 600um sieve. This requirement shall apply to the material before blending with natural sand when blending is necessary. The aggregate particles shall be free from coatings of clay, silt, or any objectionable material and shall contain no clay balls. All individual fine aggregate sources shall have a sand equivalent value not less than 45 when tested in accordance with ASTM D 2419.

The fine aggregate portion of the blended aggregate shall have an uncompacted void content not less than 43.0 percent when tested in accordance with ASTM C 1252 Method A.

2.1.3 Mineral Filler

Mineral filler shall be nonplastic material meeting the requirements of ASTM D 242, and the following additional requirements. At least 50 percent of the mineral filler shall be hydrated lime, limestone dust, or portland cement conforming to ASTM C 150 Type I or II. However, in areas where long service has shown that there has been no problem with stripping when the proposed aggregates are used, this additional requirement may be waived by the Contracting Officer when requested in writing.

2.1.4 Aggregate Gradation

The combined aggregate gradation shall conform to gradations specified in Table 2, when tested in accordance with ASTM C 136 and ASTM C 117, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine. The Contractor shall be responsible for furnishing a combined aggregate which will produce a bituminous mixture meeting the specified requirements. Aggregate gradations which fail to produce a bituminous mixture conforming to the specified requirements shall be rejected and replaced with a satisfactory aggregate gradation at no additional cost to the Government No extension of time shall be allowed due to any delay caused by such replacement.

Table 2. Aggregate Gradations

Sieve Size, inch	Intermediate Course Percent Passing by Mass	Surface Course Percent Passing by Mass
1	---	---
3/4	100	---
1/2	76-96	100
3/8	69-89	76-96
No. 4	53-73	58-78
No. 8	38-60	40-60
No. 16	26-48	28-48
No. 30	18-38	18-38
No. 50	11-27	11-27
No. 100	6-18	6-18
No. 200	3-6	3-6

2.2 ASPHALT CEMENT BINDER

Asphalt cement binder shall conform to AASHTO MP 1 Performance Grade (PG) 64-22. Test data indicating grade certification shall be provided by the supplier at the time of delivery of each load to the mix plant. Copies of these certifications shall be submitted to the Contracting Officer. The supplier is defined as the last source of any modification to the binder. The Contracting Officer may sample and test the binder at the mix plant at any time before or during mix production. Samples for this verification testing shall be obtained by the Contractor in accordance with ASTM D 140 and in the presence of the Contracting Officer. These samples shall be furnished to the Contracting Officer for the verification testing, which shall be at no cost to the Contractor. Samples of the asphalt cement specified shall be submitted for approval not less than 30 days before start of the test section.

2.3 MIX DESIGN

The Contractor shall develop the mix design. The asphalt mix shall be composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt material. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF). No hot-mix asphalt for payment shall be produced until a JMF has been approved. The hot-mix asphalt shall be designed using procedures contained in AI MS-2 and the criteria shown in Table 3. The Tensile Strength Ratio (TSR) of the composite mixture, shall be determined in accordance with ASTM D 4867/D 4867M or AASHTO T 283. The test

specimens shall be conditioned by the freezing and thawing method. The Tensile Strength Ratio (TSR) shall be at least 80. If the Tensile Strength Ratio (TSR) is less than 80, the aggregates shall be rejected or the asphalt mixture treated with an approved anti-stripping agent. The amount of anti-stripping agent added shall be sufficient to produce a TSR of not less than 80. If an antistrip agent is required, it shall be provided by the Contractor at no additional cost. Mix design Tensile Strength Ratio (TSR)testing shall be accomplished on the design mix without an anti-stripping agent and with the proposed anti-stripping agent, the results of both tests shall be submitted with the mix design. When the water absorption of any aggregate in the mixture exceeds 1.25 percent as determined by ASTM C 127 and ASTM C 128, the material for the theoretical specific gravity ASTM D 2041 and for the Marshall specimens shall be cured at 135 degrees C for 2 hours in a closed oven after the mix is produced in the laboratory. The plant-produced mixture shall not be tested until the mix is 2 hours old. The mixture shall not be reheated.

At the option of the contractor a currently used DOT superpave hot mix may be used in lieu of developing a new hot mix design study as described herein. The superpave volumetric mix shall be designed in accordance with AASHTO MP 2.

2.3.1 JMF Requirements

The job mix formula shall be submitted in writing by the Contractor for approval at least 30 days prior to the start of the test section and shall include as a minimum:

a. Percent passing each sieve size.

b. Percent of asphalt cement.

c. Percent of each aggregate and mineral filler to be used.

d. Asphalt performance grade.

e. Number of blows of hammer per side of molded specimen.

f. Laboratory mixing temperature.

g. Lab compaction temperature.

h. Temperature-viscosity relationship of the asphalt cement.

i. Plot of the combined gradation on the 0.45 power gradation chart, stating the nominal maximum size.

j. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content as shown in AI MS-2.

k. Specific gravity and absorption of each aggregate.

l. Percent natural sand.

m. Percent particles with 2 or more fractured faces (in coarse aggregate).

n. Fine aggregate angularity.

o. Percent flat or elongated particles (in coarse aggregate).

p. Tensile Strength Ratio(TSR).

q. Antistrip agent (if required) and amount.

r. List of all modifiers and amount.

Table 3. Marshall Design Criteria

Test Property	50 Blow Mix
Stability, pounds minimum	1000 (NOTE 1)
Flow, 0.01 inch	8-18
Air voids, percent	3-5
Percent Voids in mineral aggregate VMA,	(NOTE 2)
TSR, minimum percent	75

Note 1: This is a minimum requirement. The average during construction shall be significantly higher than this number to ensure compliance with the specifications.

Note 2: The minimum VMA percent shall conform to the requirements specified in Table 5.3, Chapter 5 of the Asphalt Institute Manual MS-2, sixth edition. Calculate VMA in accordance with AI MS-2, based on ASTM D 2726 bulk specific gravity for the aggregate.

Note 3: When the absorption is high the mixture will be tender until the asphalt is absorbed into the aggregate. Therefore, it may be beneficial to silo the mixture at the plant for a time. This is more important when the truck haul is short.

Note 4: Extraction tests shall be accomplished in accordance with ASTM D 2172.

2.3.2 Adjustments to Field JMF

The Laboratory JMF for each mixture shall be in effect until a new formula is approved in writing by the Contracting Officer. Should a change in sources of any materials be made, a new laboratory jmf design shall be performed and a new JMF approved before the new material is used. The Contractor will be allowed to adjust the Laboratory JMF within the limits specified below to optimize mix volumetric properties with the approval of the Contracting Officer. Adjustments to the Laboratory JMF shall be applied to the field (plant) established JMF and limited to those values as shown. Adjustments shall be targeted to produce or nearly produce 4 percent voids total mix (VTM).

If adjustments are needed that exceed these limits, a new mix design shall be developed. Tolerances given above may permit the aggregate grading to be outside the limits shown in Table 2; while not desirable, this is acceptable.

PART 3 EXECUTION

3.1 PREPARATION OF ASPHALT BINDER MATERIAL

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 325 degrees F when added to the aggregates. Modified asphalts shall be no more than 350 degrees F when added to the aggregates.

3.2 PREPARATION OF MINERAL AGGREGATE

The aggregate for the mixture shall be heated and dried prior to mixing. No damage shall occur to the aggregates due to the maximum temperature and rate of heating used. The temperature of the aggregate and mineral filler shall not

exceed 350 degrees F when the asphalt cement is added. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

3.3 PREPARATION OF HOT-MIX ASPHALT MIXTURE

The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but no less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D 2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to at least achieve 95 percent of coated particles. The moisture content of all hot-mix asphalt upon discharge from the plant shall not exceed 0.5 percent by total weight of mixture as measured by ASTM D 1461.

3.4 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing the hot mix asphalt, the underlying course shall be cleaned of dust and debris. A prime coat and/or tack coat shall be applied in accordance with the contract specifications.

3.5 TESTING LABORATORY

The laboratory used to develop the JMF shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

3.6 TRANSPORTING AND PLACING

3.6.1 Transporting

The hot-mix asphalt shall be transported from the mixing plant to the site in clean, tight vehicles. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F.

3.6.2 Placing

Intermediate course, or any layer of surface shall not be left uncovered by the subsequent course for more than 5 days, weather permitting. Material trucks hauling materials other than asphaltic concrete or tack coat shall not travel on previously constructed layers of asphalt concrete until the final surface course is constructed. The mix shall be placed and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Upon arrival, the mixture shall be placed to the full width by an asphalt paver; it shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate

pulling and tearing of the asphalt mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot; however, the joint in the surface course shall be at the centerline of the pavement. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

3.7 COMPACTION OF MIXTURE

After placing, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible without causing displacement, cracking or shoving. After preliminary smoothness tests, rolling shall continue until density is obtained in all portions of each course of not less than 97.0 percent and not more than 100.5 percent of laboratory compacted Marshall specimens in the mat. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once. Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened but excessive water will not be permitted. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective shall be removed full depth, replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching will not be allowed.

3.8 JOINTS

The formation of joints shall be made ensuring a continuous bond between the courses and to obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade. Joints shall have a density of not less than 95.5 and not more than 100.5 percent percent of laboratory compacted Marshall specimens. Contact surfaces of previously constructed pavements, curbs, gutters, manholes, and other areas as shown, shall be cleaned and tack coated. The tack coat shall be applied far enough in advance of placement of the paving mixture to insure adequate curing of the tack coat, and shall be protected from damage or contamination of the tack coated surface.

3.8.1 Transverse Joints

The roller shall not pass over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint. The cutback material shall be removed from the project. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.

3.8.2 Longitudinal Joints

Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing adjacent lanes), or otherwise defective, shall be cut back a minimum of 2 inches from the edge with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course. All

cutback material shall be removed from the project. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

3.8.3 Edges of Pavement

Edges of pavement adjacent to the shoulders shall be trimmed neatly to line. Shoulder material not less than 0.3 meters wide (except as otherwise shown) shall be placed against and to the full height of the pavement surface as soon as practicable after final rolling has been completed and the pavement has sufficiently hardened.

3.9 CONTRACTOR QUALITY CONTROL

3.9.1 General Quality Control Requirements

The Contractor shall develop an approved Quality Control Plan. Hot-mix asphalt shall not be produced until the quality control plan has been approved. The plan shall address all elements which affect the quality of the pavement including, but not limited to:

a. Mix Design

b. Aggregate Grading

c. Quality of Materials

d. Stockpile Management

e. Proportioning

f. Mixing and Transportation

g. Mixture Volumetrics

h. Moisture Content of Mixtures

i. Placing and Finishing

j. Joints

k. Compaction

l. Surface Smoothness

3.9.2 Testing Laboratory

All quality control sampling and testing shall be the Contractor's responsibility and shall be in accordance with specified requirements. All sampling and testing shall be performed by a commercial testing laboratory with the capability of performing all of the testing specified herein and shall be supervised by a registered professional engineer. The laboratory shall meet the requirements as required in ASTM D 3666. The effective working area of the laboratory shall be a minimum of 150 square feet with a ceiling height of not less than 7.5 feet. Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 75 degrees F plus or minus 5 degrees F. Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Contracting Officer shall be permitted unrestricted access to inspect the Contractor's laboratory facility, to witness quality control activities, and to perform any check testing desired. The Contracting Officer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until

the deficiencies are corrected.

3.9.3 Quality Control Testing

The Contractor shall perform all quality control tests applicable to these specifications and as set forth in the Quality Control Program. The testing program shall include, but shall not be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability, flow, in-place density, grade and smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

3.9.3.1 Asphalt Content

A minimum of two tests to determine asphalt content will be performed per lot (a lot is defined in paragraph MATERIAL ACCEPTANCE AND PERCENT PAYMENT) by one of the following methods: the extraction method in accordance with ASTM D 2172, Method A or B, the ignition method in accordance with the AASHTO TP53or ASTM D 6307, or the nuclear method in accordance with ASTM D 4125, provided the nuclear gauge is calibrated for the specific mix being used. For the extraction method, the weight of ash, as described in ASTM D 2172, shall be determined as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture.

3.9.3.2 Gradation

Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of recovered aggregate in accordance with ASTM D 5444. When asphalt content is determined by the nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix plants. For batch plants, aggregates shall be tested in accordance with ASTM C 136 using actual batch weights to determine the combined aggregate gradation of the mixture.

3.9.3.3 Temperatures

Temperatures shall be checked at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

3.9.3.4 Aggregate Moisture

The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C 566.

3.9.3.5 Moisture Content of Mixture

The moisture content of the mixture shall be determined at least once per lot in accordance with ASTM D 1461 or an approved alternate procedure.

3.9.3.6 Laboratory Air Voids, Marshall Stability and Flow

Mixture samples shall be taken at least four times per lot and compacted into specimens, using 50 blows per side with the Marshall hammer as described in ASTM D 1559. After compaction, the laboratory air voids of each specimen shall be determined, as well as the Marshall stability and flow.

3.9.3.7 In-Place Density

The Contractor shall conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge may be used to monitor pavement density in accordance with ASTM D 2950.

3.9.3.8 Pavement Thickness

The Contractor shall conduct the necessary checks and tests to ensure the compacted thickness of pavement for each course conform to specified requirements and as shown on the drawings.

3.9.3.9 Grade and Smoothness

The Contractor shall conduct the necessary checks and tests to ensure the grade and smoothness conform to specified requirements and as shown on the drawings.

3.9.3.10 Additional Testing

Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.

3.9.3.11 QC Monitoring

The Contractor shall submit all QC test results to the Contracting Officer on a daily basis as the tests are performed. The Contracting Officer reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

3.9.4 Sampling

When directed by the Contracting Officer, the Contractor shall sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

3.10 Material Acceptance

Sampling and testing for acceptability of work shall be the Contractor's responsibility, and shall be accomplished by an independent laboratory hired by the Contractor. Test results shall be forwarded daily to the Contracting Officer. Acceptance of the plant produced mix and in-place requirements will be on a lot to lot basis. A standard lot for all requirements will be equal to 8 hours of production, or fraction thereof when a partial day of production occurs. Samples of each lot of paving shall be taken by noon of the following day and results of tests reported to the Contracting Officer by the end of that day. Acceptance of lots of hot-mix asphalt will be made based on in-place density, pavement thickness, laboratory air voids, grade and smoothness in accordance with the following paragraphs. Grade and surface smoothness determinations will be made on the lot as a whole. Exceptions or adjustments to this will be made in situations where the mix within one lot is placed as part of both the intermediate and surface courses, thus grade and smoothness measurements for the entire lot cannot be made. In order to evaluate laboratory air voids, in-place (field) density, and pavement thickness, each lot will be divided into four equal sublots. The Contractor shall furnish a power saw or core drill and labor for cutting samples and shall immediately replace the pavement. Cores shall be at least 100 mm in diameter, and sawed samples shall be at least 127 mm on each side. Sample holes shall have all surfaces tack coated. Hot-mix bituminous mix shall be placed and compacted in the sample hole to the satisfaction of the Contracting Officer. The finished surface of the repaired sample hole shall match the surface elevation of the adjacent pavement.

3.10.1 Sublot Sampling

One random mixture sample for determining laboratory air voids, theoretical maximum density, and for any additional testing the Contracting Officer desires, will be taken from a loaded truck delivering mixture to each sublot, or other appropriate location for each sublot. All samples will be selected randomly, using commonly recognized methods of assuring randomness conforming to ASTM D 3665 and employing tables of random numbers or computer programs. Laboratory air voids will be determined from three laboratory compacted specimens of each sublot

sample in accordance with ASTM D 1559. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.

3.10.2 Additional Sampling and Testing

The Contracting Officer reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. The cost of any additional testing will be paid for by the Government. Testing in these areas will be in addition to the lot testing, and the requirements for these areas will be the same as those for a lot.

3.10.3 Laboratory Air Voids

Laboratory air voids will be calculated by determining the Marshall density of each lab compacted specimen using ASTM D 2726 and determining the theoretical maximum density of every other sublot sample using ASTM D 2041. Laboratory air void calculations for each sublot will use the latest theoretical maximum density values obtained, either for that sublot or the previous sublot. The mean absolute deviation of the four laboratory air void contents (one from each sublot) from the JMF air void content will be evaluated. All laboratory air void tests will be completed and reported within 24 hours after completion of construction of each lot.

3.10.4 In-place Density and Thickness

3.10.4.1 General Density and Thickness Requirements

For determining in-place pavement density and thickness, one random core shall be taken from the mat (interior of the lane), and one random core taken from each longitudinal and transverse joint (immediately over the joint) of each sublot. Each random core shall be the full thickness of the layer being placed. After air drying to a constant weight, cores obtained from the mat and from the joints will be used for in-place density and pavement thickness determinations. The compacted thickness shall conform to the thickness shown on the drawings.

3.10.4.2 Mat and Joint Densities

The average in-place mat and joint densities are expressed as a percentage of the average Marshall density for the lot. The Marshall density for each lot will be determined as the average Marshall density of the four random samples (3 specimens compacted per sample). The average in-place mat density and joint density for a lot shall be determined and reported to the Contracting Officer within 24 hours following the testing.3.10.5 Grade

The final wearing surface of pavement shall conform to the elevations and cross sections shown and shall vary not more than 0.05 footfrom the plan grade established and approved at site of work. Finished surfaces at juncture with other pavements shall coincide with finished surfaces of abutting pavements. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved. The final wearing surface of the pavement will be tested for conformance with specified plan grade requirements. The grade will be determined by running lines of levels at intervals of 25 feet, or less, longitudinally and transversely, to determine the elevation of the completed pavement surface. Within 5 working days, after the completion of a particular lot incorporating the final wearing surface, the Contracting Officer will inform the Contractor in writing, of the results of the grade-conformance tests. When more than 5 percent of all measurements made within a lot are outside the 0.05 foot tolerance. In areas where the grade exceeds the tolerance, the Contractor shall remove the surface lift full depth; the Contractor shall then replace the lift with hot-mix asphalt to meet specification requirements, at no additional cost to the Government. Diamond grinding may be used to remove high spots to meet grade requirements. Skin

patching for correcting low areas or planing or milling for correcting high areas will not be permitted.

3.10.6 Surface Smoothness

The Contractor shall evaluate the surface smoothness of the pavement. All testing shall be performed in the presence of the Contracting Officer. Detailed notes of the results of the testing shall be kept and a copy furnished to the Government immediately after each day's testing. Where drawings show required deviations from a plane surface (crowns, drainage inlets, etc.), the surface shall be finished to meet the approval of the Contracting Officer.

3.10.6.1 Smoothness Requirements

a. Straightedge Testing: The finished surfaces of the pavements shall have no abrupt change of 1/4 inch or more, and all pavements shall be within the tolerances specified in Table 9 when checked with an approved 12 foot straightedge.

Table 9. Straightedge Surface Smoothness--Pavements

Pavement Category	Direction of Testing	Tolerance, inches
All paved areas	Longitudinal	1/4
	Transverse	1/4

3.10.6.2 Testing Method

After the final rolling, but not later than 24 hours after placement, the surface of the pavement in each entire lot shall be tested by the Contractor in such a manner as to reveal all surface irregularities exceeding the tolerances specified above. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas shall be retested immediately after grinding. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines. The transverse lines shall be 25 feet or less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane for lines less than 20 feet and at the third points for lanes 20 feet or greater. Other areas having obvious deviations shall also be tested. Longitudinal testing lines shall be continuous across all joints.

a. Straightedge Testing. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points.

-- End of Section --

SECTION 02748A

BITUMINOUS TACK AND PRIME COATS
01/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 82	(1975; R 1996) Cut-Back Asphalt (Medium-Curing Type)
AASHTO T 40	(1978; R 1996) Sampling Bituminous Materials

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 140	(200) Sampling Bituminous Materials
ASTM D 977	(1998) Emulsified Asphalt
ASTM D 2027	(1976; R 1997) Cutback Asphalt (Medium-Curing Type)
ASTM D 2397	(1998) Cationic Emulsified Asphalt
ASTM D 2995	(1999) Determining Application Rate of Bituminous Distributors

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Sampling and Testing; G, RE

Copies of all test results for bituminous materials, within 24 hours of completion of tests. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements, not less than 30 days before the material is required in the work.

1.3 PLANT, EQUIPMENT, MACHINES AND TOOLS

1.3 General Requirements

Plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times.

1.4 Bituminous Distributor

The distributor shall have pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the base surface or other layers in the pavement structure. The distributor shall be designed and equipped to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

1.5 Power Brooms and Power Blowers

Power brooms and power blowers shall be suitable for cleaning the surfaces to which the bituminous coat is to be applied.

1.6 WEATHER LIMITATIONS

Bituminous coat shall be applied only when the surface to receive the bituminous coat is dry. Bituminous coat shall be applied only when the atmospheric temperature in the shade is 50 degrees F or above and when the temperature has not been below 35 degrees F for the 12 hours prior to application.

PART 2 PRODUCTS

2.1 TACK COAT

Emulsified asphalt shall conform to ASTM D 977 or ASTM D 2397, Grade SS-1, SS-1H, CSS-1, or CSS-1H.

2.2 PRIME COAT

Cutback asphalt shall conform to ASTM D 2027 or AASHTO M 82, Grade MC-30 or MC-70.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

Immediately before applying the bituminous coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. The surface shall be dry and clean at the time of treatment.

3.2 APPLICATION RATE

The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

3.2.1 Tack Coat

Bituminous material for the tack coat shall be applied in quantities of not less than 0.05 gallonnor more than 0.15 gallon per square yard of pavement surface.

3.2.2 Prime Coat

Bituminous material for the prime coat shall be applied in quantities of not less than 0.15 gallonnor more than 0.40 gallon per square yard of pavement surface.

3.3 APPLICATION TEMPERATURE

3.3.1 Viscosity Relationship

Asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 centistokes, kinematic. The temperature viscosity relation shall be furnished to the Contracting Officer.

3.3.2 Temperature Ranges

The viscosity requirements shall determine the application temperature to be used. The following is a normal range of application temperatures:

Liquid Asphalts

MC-30	85-190 degrees F
MC-70	120-225 degrees F

Emulsions

SS-1	70-160 degrees F
SS-1h	70-160 degrees F
CRS-1	125-185 degrees F
CSS-1	70-160 degrees F
CSS-1h	70-160 degrees F

*These temperature ranges exceed the flash point of the material and care should be taken in their heating.

3.4 APPLICATION

3.4.1 General

Following preparation and subsequent inspection of the surface, the bituminous coat shall be applied at the specified rate with uniform distribution over the surface to be treated. All areas and spots missed by the distributor shall be properly treated with the hand spray. Until the succeeding layer of pavement is placed, the surface shall be maintained by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, clean dry sand shall be spread to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment shall be permitted within 25 feet of heating, distributing, and transferring operations of bituminous material other than bituminous emulsions. All traffic, except for paving equipment used in constructing the surfacing, shall be prevented from using the underlying material, whether primed or not, until the surfacing is completed. The bituminous coat shall conform to all requirements as described herein.

3.4.2 Prime Coat

The prime coat will be required if it will be at least seven days before the a sphalt concrete hot mix pavement layer is constructed on the underlying base course material. The type of liquid asphalt and application rate will be as specified herein. The Contractor shall protect the underlying course from damage (water, traffic, etc.) until the asphalt concrete pavement is placed. Damage to the underlying material caused by lack of, or inadequate, protection shall be repaired or replaced by approved methods at no additional cost to the Government. If the Contractor options to use the prime coat, it shall be applied as soon as possible after consolidation of the underlying material. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application to start and stop the prime coat on the paper. Immediately after application, the building paper shall be removed and destroyed.

3.4.3 Tack Coat

Tack coat shall be applied at the locations shown on the drawings.

3.5 CURING PERIOD

Following application of the bituminous material and prior to application of the succeeding layer of pavement, the bituminous coat shall be allowed to cure and to obtain evaporation of any volatiles or moisture. Prime coat shall be allowed to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course.

3.6 FIELD QUALITY CONTROL

Samples of the bituminous material used shall be obtained by the Contractor as directed, under the supervision of the Contracting Officer. The sample will be retained and tested by the Government at no cost to the Contractor.

3.7 SAMPLING AND TESTING

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved.

3.7.1 Sampling

The samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140 or AASHTO T 40. Sources from which bituminous materials are to be obtained shall be selected and notification furnished the Contracting Officer within 15 days after the award of the contract.

3.7.2 Calibration Test

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibration shall be made with the approved job material and prior to applying the bituminous coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with ASTM D 2995.

3.7.3 Trial Applications

Before providing the complete bituminous coat, three lengths of at least 100 feet for the full width of the distributor bar shall be applied to evaluate the amount of bituminous material that can be satisfactorily applied.

3.7.3.1 Tack Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous tack coat materials shall be applied in the amount of 0.05 gallons per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

3.7.3.2 Prime Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous materials shall be applied in the amount of 0.25 gallon per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

3.7.4 Sampling and Testing During Construction

Quality control sampling and testing shall be performed as required in paragraph FIELD QUALITY CONTROL.

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SECTION 02770A

CONCRETE SIDEWALKS AND CURBS AND GUTTERS
03/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(1991) Burlap Cloth Made from Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31/C 31M	(1996) Making and Curing Concrete Test Specimens in the Field
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 171	(1997) Sheet Materials for Curing Concrete
ASTM C 172	(1997) Sampling Freshly Mixed Concrete
ASTM C 173	(1996) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 231	(1997) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 309	(1997) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 920	(1995) Elastomeric Joint Sealants
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3405	(1996) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance

with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Concrete; G, RE.

Copies of certified delivery tickets for all concrete used in the construction.

SD-06 Test Reports

Field Quality Control; G, RE.

Copies of all test reports within 24 hours of completion of the test.

1.3 WEATHER LIMITATIONS

1.3.1 Placing During Cold Weather

Concrete placement shall not take place when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection shall be approved in writing. Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be subject to approval. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.3.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.4.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.4.2 Slip Form Equipment

Slip form paver or curb forming machine, will be approved based on trial use on the job and shall be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in 1 pass.

PART 2 PRODUCTS

2.1 CONCRETE

Concrete shall conform to the applicable requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except as otherwise specified. Concrete shall have a minimum compressive strength of 4000 psi at 28 days. Maximum size of aggregate shall be 3/4 inches.

2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

The concrete slump shall be 2 inches plus or minus 1 inch (or 1 inch plus or minus 1/2 inch for slipformed concrete placements). The slump shall be determined in accordance with ASTM C 143.

2.1.3 Reinforcement Steel

Reinforcement bars shall conform to ASTM A 615/A 615M. Wire mesh reinforcement shall conform to ASTM A 185. Use of rolled mesh is specifically prohibited. Wire mesh shall be supplied in flat sheets.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.2.2 Burlap

Burlap shall conform to AASHTO M 182.

2.2.3 Liquid Membrane-Forming Curing Compound

Liquid membrane-forming curing compound shall conform to ASTM C 309, Type 1-D or Type 2, Class A or B.

2.3 JOINT FILLER STRIPS

2.3.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

2.3.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 3/8 inch thick, unless otherwise indicated. The expansion joint filler material shall be certified by the manufacturer to be compatible with the joint sealants used in the work. Do not use bituminous joint filler if joint sealer is non-bituminous.

2.4 JOINT SEALANTS

2.4.1 Joint Sealant, Cold-Applied

Joint sealant, cold-applied shall conform to ASTM C 920, Type M or S, Grade P or NS as required, Class 25, use T.

2.4.2 Joint Sealant, Hot-Poured

Joint sealant, hot-poured shall conform to ASTM D 3405.

2.5 FORM WORK

Form work shall be designed and constructed to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.5.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

2.5.2 Curb and Gutter Forms

Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

PART 3 EXECUTION

3.1 SUBGRADE and BASE COURSE PREPARATION

The subgrade and base course shall be constructed to the specified grade and cross section prior to concrete placement. The subgrade shall be lime-modified and conform to Section 02712A LIME-MODIFIED SUBGRADE. Base course shall conform to Section 02722A GRADED-CRUSHED AGGREGATE BASE COURSE.

3.1.1 Sidewalk, Subgrade and Base Course

The subgrade and base course shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.1.2 Curb and Gutter, Subgrade and Base Course

The subgrade and base course shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade and base course shall be of materials equal in bearing quality to the subgrade and base course under the adjacent pavement.

3.1.3 Maintenance of Subgrade and Base Course

The subgrade and base course shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade and base course shall be in a moist condition when concrete is placed. The subgrade and base course shall be prepared and protected to produce a subgrade and base course free from frost when the concrete is deposited.

3.2 FORM SETTING

Forms shall be set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks

Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope of 1/4 inch per foot with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

3.2.2 Curbs and Gutters

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished, as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks

Concrete shall be placed in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a strike off.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished with a wood float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Curb and Gutter

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".

3.4.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

3.4.3 Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

3.4.4 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

3.4.5 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 SIDEWALK JOINTS

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs and driveways. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

3.5.1 Sidewalk Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

3.5.2 Sidewalk Expansion Joints

Expansion joints shall be formed with 1/2 inch joint filler strips. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler

during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with joint sealant. Joints as indicated or directed to be sealed, shall be sealed as specified.

3.5.3 Reinforcement Steel Placement

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed. Reinforcement shall be used at locations shown on the drawings.

3.6 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

3.6.1 Contraction Joints

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

3.6.2 Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 35 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.7.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 6 inches.The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a

continuous sheet is not used. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3.7.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet per gallon for the total of both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.7.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

3.7.3 Protection

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.8 FIELD QUALITY CONTROL

3.8.1 General Requirements

The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

3.8.2 Concrete Testing

3.8.2.1 Strength Testing

The Contractor shall provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 100 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C 172. Cylinders for acceptance shall be molded in conformance with ASTM C 31/C 31M by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.8.2.2 Air Content

Air content shall be determined in accordance with ASTM C 173 or ASTM C 231. ASTM C 231 shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests shall be made on randomly selected batches of each class of concrete for every 100 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.8.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 100 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

3.8.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

3.8.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the

hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch. Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --

SECTION 02921A

SEEDING
11/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2028	(1976; R 1997) Cutback Asphalt (Rapid-Curing Type)
ASTM D 4972	(1995a) pH of Soils
ASTM D 5268	(1992; R 1996) Topsoil Used for Landscaping Purposes
ASTM D 5883	(1996el) Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes
ASTM D 977	(1998) Emulsified Asphalt

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(1995) Federal Seed Act Regulations Part 201

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Finished Grade and Topsoil

Verification that finished grades are as indicated on drawings, and the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02300A EARTHWORK, prior to the commencement of the seeding operation.

Delivery Schedule

Equipment Calibration

Immediately prior to the commencement of seeding operations, calibration tests shall be conducted on the equipment to be used.

Seed Establishment Period.

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

Application of Pesticide.

All pesticide treatments shall be approved by the Installation Pest Management Coordinator before such applications and chemicals are applied. All pesticide applicators shall be commercially certified in the State of Kansas in the appropriate category according to the application planned. The Contractor shall have a Kansas Pesticide Business License. All certifications and licenses shall be provided to the Installation Pest Management Coordinator before the the initiation of work under this contract. A Fort Riley Daily Pesticide Report shall be completed and forwarded to the Installation Pest Management Coordinator for all pesticide applications. A Department of Defense Pesticide Application Report (DD Form 1532) shall be completed and forwarded to the Installation Pest Management Coordinator within 5 days of the end of the month for the previous month's applications. A copy of the Fort Riley Daily Pesticide Report and a DD Form 1532 is attached. All combination fertilizers (fertilizer combined with a herbicide, insecticide or other control) is considered a pesticide and falls under all requirements listed regarding pesticides.

SD-06 Test Reports

Soil Test.

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-07 Certificates

Seed.

Delivered Topsoil.

pH Adjuster.

Fertilizer.

Organic Material.

Soil Conditioner.

Mulch.

Asphalt Adhesive.

Pesticide.

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

a. Seed. Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.

b. Topsoil. Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.

c. pH Adjuster. Calcium carbonate equivalent and sieve analysis.

d. Fertilizer. Chemical analysis and composition percent.

e. Organic Material: Composition and source.

f. Soil Conditioner: Composition and source.

g. Mulch: Composition and source.

h. Asphalt Adhesive: Composition.

i. Pesticide. EPA registration number and registered uses.

SD-10 Operation and Maintenance Data

Maintenance Record.

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

1.3 SOURCE INSPECTION

The source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery Schedule

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Delivered Topsoil

Prior to the delivery of any topsoil, its availability shall be verified in paragraph TOPSOIL. A soil test shall be provided for topsoil delivered to the site.

1.4.1.2 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.3 Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

1.4.2 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be removed from the job site.

1.4.3 Storage

Materials shall be stored in designated areas. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials. Pesticides shall be stored in a locked chemical storage container with containment or in an approved pesticide handling facility.

All pesticides shall be mixed in the Fort Riley Pest management Facility mixing area or on a containment platform that meets the DoD and Fort Riley pest management criteria.

1.4.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.5 Time Limitation

Hydroseeding time limitation for holding seed in the slurry shall be a maximum 24 hours.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Seed Classification

State-approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS Seed Act and applicable state seed laws.

2.1.2 Permanent Seed Species and Mixtures

Permanent seed species and mixtures shall be proportioned by weight as follows: (use lawn seed mix except as noted otherwise

Botanical Name	Common Name	Mixture Percent by Weight	Percent Pure Live Seed	
LAWN SEED				
Turf Type Fescue				
Festuca arundinacea (turf type fescue dwarf varieties)	Bonsai Finelawn 8855 Shortstop Tomahawk Monarch Mini©Mustang Twilight	100	85	2.5

Notes: Any of the seed varieties listed above may be used singularly or in various mixed combinations (per centages).

FIELD SEED- Not Applicable

2.1.3 Temporary Seed Species

Temporary seed species for surface erosion control or overseeding shall be as follows:

Botanical Name	Common Name	Percent Pure Live Seed	
Annual Rye	lolium multiflorum	85	2.0

Seed mixtures shall not contain millet or any other large-seed producing grass.

2.1.4 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture.

2.1.5 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site as directed.

2.1.6 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300A EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the seed specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite or pearlite shall not be used.

2.3.1 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.2 Organic Material

Organic material shall consist of either bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.2.1 Bonemeal

Bonemeal shall be finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.2.2 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. It shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones, sticks, and soil.

2.3.2.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, yard trimmings, or other wood waste material that is free of stones, sticks, soil, and toxic substances harmful to plants, and is fully composted or stabilized with nitrogen.

2.3.2.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source.

Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length. The Contractor shall comply with EPA requirements.

2.3.2.5 Worm Castings

Worm castings shall be screened from worms and food source, and shall be commercially packaged.

2.3.3 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for use singly or in combination to meet the requirements of the soil test.

2.3.3.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.3.3.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized and applied according to the manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide, with an absorption capacity of 250-400 times its weight. Polymers shall also be added to the seed and be a starch grafted polyacrylonitrite, with graphite added as a tacky sticker. It shall have an absorption capacity of 100 plus times its weight.

2.3.3.3 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent shall pass a No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.3.3.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

2.3.3.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with ASTM D 5883.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.4.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.4.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.4.3 Wood Cellulose Fiber or wood chips

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0. Wood chips shall be commercial grade shredded, hardwood wood based chips.

2.4.4 Paper Fiber

Paper fiber mulch shall be recycled news print that is shredded for the purpose of mulching seed.

2.5 ASPHALT ADHESIVE

Asphalt adhesive shall conform to the following: Emulsified asphalt, conforming to ASTM D 977, Grade SS-1; and cutback asphalt, conforming to ASTM D 2028, Designation RC-70.

2.6 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.7 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved. All pesticide treatments shall be approved by the Installation Pest Management Coordinator before such applications and chemicals are applied.

2.8 SURFACE EROSION CONTROL MATERIAL

Surface erosion control material shall conform to the following:

2.8.1 Surface Erosion Control Blanket

Blanket shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers; covered on one side with either knitted straw blanket-like mat construction; covered with biodegradable plastic mesh; or interwoven biodegradable thread, plastic netting, or twisted kraft paper cord netting.

2.8.2 Surface Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

2.8.3 Surface Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 1.22 pounds per linear yard and 4 feet wide with mesh openings of approximately 1 inch square.

2.8.4 Surface Erosion Control Chemicals

Chemicals shall be high-polymer synthetic resin or cold-water emulsion of selected petroleum resins.

2.8.5 Hydrophilic Colloids

Hydrophilic colloids shall be physiologically harmless to plant and animal life without phytotoxic agents. Colloids shall be naturally occurring, silicate powder based, and shall form a water insoluble membrane after curing. Colloids shall resist mold growth.

2.8.6 Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

PART 3 EXECUTION

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Time

Seed shall be installed from 1 March to 15 May for spring establishment; from 15 May to 15 Sep for summer establishment; and from 15 Sep to Oct 30 for fall establishment.

3.1.2 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

3.1.3 Equipment Calibration

Immediately prior to the commencement of seeding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. The calibration test results shall be provided within 1 week of testing.

3.1.4 Soil Test

Delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection on site shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the seed species specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade and Topsoil

The Contractor shall verify that finished grades are as indicated on drawings, and the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02300A EARTHWORK, prior to the commencement of the seeding operation.

3.2.2 Application of Soil Amendments

3.2.2.1 Applying Fertilizer

The fertilizer shall be applied as recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be

incorporated as part of the tillage or hydroseeding operation. All granular fertilizers used in site preparation shall have a formulation that is slow release and contains a lower percentage of nitrogen than formulations used on established turf.

3.2.2.2 Applying Soil Conditioner

The soil conditioner shall be as recommended by the soil test. The soil conditioner shall be spread uniformly over the soil a minimum 1 inch depth and thoroughly incorporated by tillage into the soil to a maximum 4 inch depth.

3.2.2.3 Applying Super Absorbent Polymers

Polymers shall be spread uniformly over the soil as recommended by the manufacturer and thoroughly incorporated by tillage into the soil to a maximum 4 inch depth.

3.2.3 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inch depth. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inch depth by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster, fertilizer, and soil conditioner may be applied during this procedure.

3.2.4 Prepared Surface

3.2.4.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.

3.2.4.2 Lawn Area Debris

Debris and stones over a minimum 5/8 inch in any dimension shall be removed from the surface.

3.2.4.3 Field Area Debris

Debris and stones over a minimum 3 inch in any dimension shall be removed from the surface.

3.2.4.4 Protection

Areas with the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.1 Installing Seed

Seeding method shall be Broadcast Seeding Drill Seeding Hydroseeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed

directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved. Absorbent polymer powder shall be mixed with the dry seed at the rate recommended by the manufacturer.

3.3.1.1 Broadcast Seeding

Seed shall be uniformly broadcast at the rate of see table pounds per 1000 square feet using broadcast seeders. Half the total rate of seed application shall be broadcast in 1 direction, with the remainder of the seed rate broadcast at 90 degrees from the first direction. Seed shall be covered a maximum 1/4 inch depth by disk harrow, steel mat drag, cultipacker, or other approved device.

3.3.1.2 Drill Seeding

Seed shall be uniformly drilled to a maximum 1/2 inch depth and at the rate of see table pounds per 1000 square feet, using equipment having drills a maximum 7 inches distance apart. Row markers shall be used with the drill seeder. Half the total rate of seed application shall be drilled in 1 direction, with the remainder of the seed rate drilled at 90 degrees from the first direction. The drilling equipment shall be maintained with half full seed boxes during the seeding operations.

3.3.1.3 Rolling

The entire area shall be firmed with a roller not exceeding 90 pounds per foot roller width. Slopes over a maximum 3-horizontal-to-1 vertical shall not be rolled. Areas seeded with seed drills equipped with rollers shall not be rolled.

3.3.2 Hydroseeding

Seed shall be mixed to ensure broadcast at the rate of see table pounds per 1000 square feet. Seed and fertilizer shall be added to water and thoroughly mixed to meet the rates specified. The time period for the seed to be held in the slurry shall be a maximum 24 hours. Wood cellulose fiber mulch and tackifier shall be added at the rates recommended by the manufacturer after the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry. Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.3 Mulching

3.3.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.3.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

3.3.3.3 Asphalt Adhesive Tackifier

Asphalt adhesive tackifier shall be sprayed at a rate between 10 to 13 gallons per 1000 square feet. Sunlight shall not be completely excluded from penetrating to the ground surface.

3.3.3.4 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

3.3.3.5 Asphalt Adhesive Coated Mulch

Hay or straw mulch may be spread simultaneously with asphalt adhesive applied at a rate between 10 to 13 gallons per 1000 square feet, using power mulch equipment which shall be equipped with suitable asphalt pump and nozzle. The adhesive-coated mulch shall be applied evenly over the surface. Sunlight shall not be completely excluded from penetrating to the ground surface.

3.3.3.6 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

3.3.4 Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.4 SURFACE EROSION CONTROL

3.4.1 Surface Erosion Control Material

Where indicated or as directed, surface erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material or without deviation to finished grade.

3.4.2 Temporary Seeding

The application rate shall be see table pounds per 1000 square yards. When directed during contract delays affecting the seeding operation or when a quick cover is required to prevent surface erosion, the areas designated shall be seeded in accordance with temporary seed species listed under Paragraph SEED.

3.4.2.1 Soil Amendments

When soil amendments have not been applied to the area, the quantity of 1/2 of the required soil amendments shall be applied and the area tilled in accordance with paragraph SITE PREPARATION. The area shall be watered in accordance with paragraph Watering Seed.

3.4.2.2 Remaining Soil Amendments

The remaining soil amendments shall be applied in accordance with the paragraph Tillage when the surface is prepared for installing seed.

3.5 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program and coordinated with the Installation Pest Management Coordinator. Applications shall comply with the Installation Pest Management Plan, chemical label requirements and coordinated usage agreements with the Installation Pest Management Coordinator.

3.5.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.5.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately. A pesticide plan shall be submitted.

3.6 RESTORATION AND CLEAN UP

3.6.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense.

3.6.2 Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.7 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.8 SEED ESTABLISHMENT PERIOD

3.8.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of seeding work under this contract and shall continue through the remaining life of the contract and end 6 months after the last day of the seeding operation required by this contract. Written calendar time period shall be furnished for the seed establishment period. When there is more than 1 seed establishment period, the boundaries of the seeded area covered for each period shall be described. The seed establishment period shall be coordinated with Sections 02922a SODDING, and 02930a EXTERIOR PLANTING. The seed establishment period shall be modified for inclement weather, shut down periods, or for separate completion dates of areas.

3.8.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 3 inch high. A satisfactory stand of grass plants must exist before the turn over date.

3.8.2.1 Lawn Area

A satisfactory stand of grass plants from the seeding operation for a lawn area shall be a minimum 100 grass plants per square foot. Bare spots shall be a maximum 6 inches square. The total bare spots shall be a maximum 2 percent of the total seeded area.

3.8.2.2 Field Area

A satisfactory stand of grass plants from the seeding operation for a field area shall be a minimum 100 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

3.8.3 Maintenance Record During Establishment Period

Maintenance of the seeded areas shall include eradicating weeds, insects and diseases; protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

3.8.3.1 Mowing

a. Lawn Areas: Lawn areas shall be mowed to a minimum 3 inch height when the turf is a maximum 4 inches high. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

b. Field Areas: Field areas shall be mowed once during the season to a minimum 3 inch height. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

3.8.3.2 Post-Fertilization

The fertilizer shall be applied as recommended by the soil test. A maximum 1/2 pound per 1000 square feet of actual available nitrogen shall be provided to the grass plants. The application shall be timed prior to the advent of winter dormancy and shall be made without burning the installed grass plants.

3.8.3.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.8.3.4 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.8.3.5 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

-- End of Section --

SECTION 02922A

SODDING
07/02

PART 1 GENERAL

1.1 REFERENCES

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

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SD-01 Preconstruction Submittals

Sod Establishment Period.

Calendar time period for the sod establishment period. When there is more than one sod establishment period, the boundaries of the sodded area covered for each period shall be described.

Application of Pesticide.

All pesticide treatments shall be approved by the Installation PestManagement Coordinator before such applications and chemicals are applied.All pesticide applicators shall be commercially certified in the State ofKansas in the appropriate category according to the application planned.The Contractor shall have a Kansas Pesticide Business License. Allcertifications and licenses shall be provided to the Installation PestManagement Coordinator before the the initiation of work under this contract. A Fort Riley Daily Pesticide Report shall be completed andforwarded to the Installation Pest Management Coordinator for allpesticide applications. A Department of Defense Pesticide ApplicationReport (DD Form 1532) shall be completed and forwarded to the InstallationPest Management Coordinator within 5 days of the end of the month for theprevious month's applications. A copy of the Fort Riley Daily PesticideReport and a DD Form 1532 is attached. All combination fertilizers(fertilizer combined with a herbicide, insecticide or other control) isconsidered a pesticide and falls under all requirements listed regardingpesticides.

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Delivered Topsoil

A soil test shall be provided for topsoil delivered to the site.

Equipment Calibration

Immediately prior to the commencement of sodding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. Provide calibration test results within one week of testing.

SD-07 Certificates

Sod.

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

a. Sod. Classification, botanical name, common name, mixture percentage of species, percent purity, quality grade, field location and state certification.

SD-10 Operation and Maintenance Data

Maintenance Record.

A record of each site visit shall be furnished which describes the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

1.3 SOURCE INSPECTION

The sources of sod material and delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery Schedule

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Sod

Sod shall be protected during delivery to prevent desiccation, internal heat buildup, or contamination.

1.4.1.2 Delivered Topsoil

Prior to the delivery of any topsoil, its availability shall be verified in paragraph TOPSOIL. A soil test shall be provided for topsoil delivered to the site.

1.4.1.3 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.4 Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

1.4.2 Inspection

Sod shall be inspected upon arrival at the job site for conformity to species. Sod shall be checked for visible broadleaf weeds, and a visible consistency with no obvious patches of foreign grasses that exceed 2 percent of the canopy. Sod that is heating up, dry, moldy, yellow, irregularly shaped, torn, or of uneven thickness shall be rejected. Other materials shall be inspected for compliance with specified requirements. Open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts, shall be rejected. Unacceptable materials shall be removed from the job site.

1.4.3 Storage

1.4.3.1 Sod

Sod shall be stored in designated areas and kept in a moist condition by watering with a fine mist, and covered with moist burlap, straw, or other covering. Covering shall allow air to circulate, preventing internal heat from building up. Sod shall be protected from exposure to wind and direct sunlight until installed.

1.4.3.2 Other Material Storage

Materials shall be stored in designated areas. Lime and fertilizer shall be stored in cool, dry locations, away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with sod operation materials. Pesticides shall be stored in a locked chemical storage container with containment or in an approved pesticide handling facility. All pesticides shall be mixed in the Fort Riley Pest management Facility mixing area or on a containment platform that meets the DoD and Fort Riley pest management criteria.

1.4.4 Handling

Sod shall not be damaged during handling. Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.5 Time Limitation

Time limitation between harvesting and installing sod shall be a maximum 36 hours.

PART 2 PRODUCTS

2.1 SOD

2.1.1 Sod Classification

Nursery-grown sod shall be provided as classified by applicable state laws. Sod section shall be sized to permit rolling and lifting without breaking.

2.1.2 Grass Species

Grass species shall be proportioned as follows:

Botanical Name	Common Name	Mixture Percent

eed mixtures shall include any of the following varieties:

Botanical Name	Common Name	Percent Pure Live Seed
Turf Type Fescue		
Festuca (turf type fescue dwarf varieties)	Bonsai, Finelawn 8855, Shortstop, Tomahawk, Monarch, Mini-Mustang, Twilight	95

*Note: Any of the seed varieties listed above may be used singularly or in various mixed combinations (percentages).

2.1.3 Quality

Sod shall be relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 1 inch in diameter, woody plant roots, and other materials detrimental to a healthy stand of grass plants. Broadleaf weeds and patches of foreign grasses shall be a maximum 2 percent of the sod section.

2.1.4 Thickness

Sod shall be machine cut to a minimum 1-3/8 inch thickness. Measurement for thickness shall exclude top growth and thatch.

2.1.5 Anchors

Sod anchors shall be as recommended by the sod supplier.

2.1.6 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 DELIVERED TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300A EARTHWORK. When additional topsoil is required beyond the available topsoil from stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the sod species specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash, or other material over a maximum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material, and soil conditioners meeting the following requirements. Vermiculite or pearlite shall not be used.

2.3.1 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from

sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.2 Organic Material

Organic material shall consist of either bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.2.1 Bonemeal

Bonemeal shall be finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.2.2 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones, sticks, and soil.

2.3.2.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, yard trimmings, or other wood waste material free of stones, sticks, soil, and toxic substances harmful to plants, fully composted or stabilized with nitrogen.

2.3.2.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length. The Contractor shall comply with EPA requirements.

2.3.2.5 Worm Castings

Worm castings shall be screened from worms and food source, and shall be commercially packaged.

2.3.3 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for use singly or in combination to meet the requirements for topsoil.

2.3.3.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.3.3.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized and applied according to the manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide with an absorption capacity of 250-400 times its weight.

2.3.3.3 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent passing No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.3.3.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

2.3.3.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with ASTM D 5883.

2.4 WATER

Water shall be the responsibility of the Contractor unless otherwise noted. Water shall not contain elements toxic to plant life.

2.5 APPLICATION OF PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved. All pesticide treatments shall be approvedby the Installation Pest Management Coordinator before such applications and chemicals are applied.

PART 3 EXECUTION

3.1 INSTALLING SOD TIME AND CONDITIONS

3.1.1 Sodding Time

Sod shall be installed from 1 March to 1 June for spring establishment; from 1 June to 30 Sep for summer establishment; and from 30 Sep to 30 Oct for fall establishment.

3.1.2 Sodding Conditions

Sodding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the sodding operations, proposed alternate times shall be submitted for approval.

3.1.3 Equipment Calibration

Immediately prior to the commencement of sodding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. Provide calibration test results within one week of testing.

3.1.4 Soil Test

Delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection on site shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet

local growing conditions for the sod species specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade and Topsoil

Prior to the commencement of the sodding operation, the Contractor shall verify that finished grades are as indicated on drawings; the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02300A EARTHWORK.

3.2.1.1 Finished Grade for Airfields

Finished grades in sodded areas shall be undercut sufficiently so the top of newly laid sod will be 1-1/2 inches below adjacent paved areas and flush with any adjacent seeded or turfed areas except when directed otherwise by the Contracting Officer.

3.2.2 Application of Soil Amendments

3.2.2.1 Applying pH Adjuster

The pH adjuster shall be applied at the rate recommended by the soil test. The pH adjuster shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage operation.

3.2.2.2 Applying Fertilizer

The fertilizer shall be applied at the rate recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation. All granular fertilizers used in site preparation shall have a formulation that is slow release and contains a lower percentage of nitrogen than formulations used on established turf.

3.2.2.3 Applying Soil Conditioner

The soil conditioner shall be as recommended by the soil test. The soil conditioner shall be spread uniformly over the soil a minimum 1 inch depth and thoroughly incorporated by tillage into the soil to a maximum 4 inches depth.

3.2.2.4 Applying Super Absorbent Polymers

Polymers shall be spread uniformly over the soil as recommended by the manufacturer and thoroughly incorporated by tillage into the soil to a maximum 2 inches deep prior to placement of sod.

3.2.3 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inches deep. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inches deep by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster, fertilizer, and soil conditioner may be applied during this procedure.

3.2.4 Prepared Surface

3.2.4.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be rolled and completed with a light raking to remove from the surface debris and stones over a minimum 5/8 inch in any dimension.

3.2.4.2 Protection

Areas within the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing sod, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Areas shall be sodded as indicated. Adequate soil moisture shall be ensured prior to sodding by spraying water on the area to be sodded and wetting the soil to a maximum 1 inch depth.

3.3.1 Installing Sod

Rows of sod sections shall be placed parallel to and tightly against each other. Joints shall be staggered laterally. The sod sections shall not be stretched or overlapped. All joints shall be butted tight. Voids and air drying of roots shall be prevented. Sod sections shall be laid across the slope on long slopes. Sod sections shall be laid at right angles to the flow of water in ditches. Sod sections shall be anchored on slopes steeper than 3-horizontal-to-1-vertical. Anchoring may be required when surface weight or pressure upon placed sod sections is anticipated to cause lateral movement. Sod anchors shall be placed a minimum 2 feet on center with a minimum 2 anchors per sod section.

3.3.2 Finishing

Displacement of the sod shall be prevented by tamping or rolling the sod in place and knitting the sod to the soil. Air pockets shall be eliminated and a true and even surface shall be provided. Frayed edges shall be trimmed, and holes or missing corners shall be patched with sod. Sod will be rejected if installed with a non bio-degradable netting.

3.3.3 Rolling

The entire area shall be firmed with a roller not exceeding 90 pounds per foot roller width. Slopes over a maximum 3-horizontal-to-1 vertical shall not be rolled.

3.3.4 Watering Sod

Watering shall be started immediately after completing each day of installing sod. Water shall be applied at least 3 times per week to supplement rainfall, at a rate sufficient to ensure moist soil conditions to a minimum depth of 1 inch. Run-off, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or plant material shall be prevented.

3.4 TEMPORARY SEEDING

The application rate shall be as specified in the seeding specification. When directed during contract delays affecting the sodding operation or when a quick cover is required to prevent surface erosion, the areas designated shall be seeded with annual seed in accordance with Section 02921a SEEDING.

3.4.1 Soil Amendments, Tillage and Watering

When soil amendments have not been applied to the area, the quantity of 1/2 of the required soil amendments shall be applied and the area tilled in accordance with paragraph SITE PREPARATION. The area shall be watered in accordance with paragraph Watering Sod as required.

3.4.2 Remaining Soil Amendments

The remaining soil amendments shall be applied in accordance with the paragraph Tillage when the surface is prepared for installing sod.

3.5 QUANTITY CHECK

For materials provided in bags, the empty bags shall be retained for recording the amount used. For materials provided in bulk, the weight certificates shall be retained as a record of the amount used. The amount of the material used shall be compared with the total area covered to determine the rate of application. The quantity of sod used shall be compared against the total area established with sod. Differences between the quantity applied and the quantity specified shall be adjusted as directed.

3.6 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program and coordinated with the InstallationPest Management Coordinator. Applications shall comply with theInstallation Pest Management Plan, chemical label requirements andcoordinated usage agreements with the Installation Pest ManagementCoordinator.

3.6.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.6.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.7 RESTORATION AND CLEAN UP

3.7.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the sodding operation shall be restored to original condition at Contractor's expense.

3.7.2 Clean Up

Excess and waste material shall be removed from the sodded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.8 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the sodding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.9 SOD ESTABLISHMENT PERIOD

3.9.1 Commencement

The sod establishment period to obtain a healthy stand of grass plants shall commence on the first day of sodding work under this contract and shall continue through the remaining life of the contract and end 4 months after the last day of sodding operation required by this contract. Written calendar time period shall be furnished for the sod establishment period. When there is more than 1 sod establishment period, the boundaries of the sodded area covered for each period shall be described. The sod establishment period should be coordinated with Sections 02921a SEEDING, and 02930a EXTERIOR PLANTING. The sod establishment period shall be modified for inclement weather, shut down periods, or for separate completion dates of areas.

3.9.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health. A satisfactory stand of grass plants from the sodding operation shall be living sod uniform in color and leaf texture. Bare spots shall be a maximum 2 inch square. Joints between sod pieces shall be tight and free from weeds and other undesirable growth. A satisfactory stand of grass plants must exist before the turn over date.

3.9.3 Maintenance During Establishment Period

Maintenance of the sodded areas shall include eradicating weeds, insects and diseases; protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

3.9.3.1 Mowing

Sodded areas shall be mowed to a minimum 3 inch height when the turf is a maximum 4 inch height. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

3.9.3.2 Post-Fertilization

The fertilizer shall be applied as recommended by the soil test. A maximum 1/2 pound per 1000 square feet of actual available nitrogen shall be provided to the grass plants. The application shall be timed prior to the advent of winter dormancy and shall be made without burning the installed grass plants.

3.9.3.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.3.4 Repair

Unsatisfactory stand of grass plants shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.9.3.5 Maintenance Record

A record of each site visit shall be furnished which describes the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

-- End of Section --

SECTION 02930A

EXTERIOR PLANTING
01/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300	(1995) Tree Care Operations - Trees, Shrubs and Other Woody Plant Maintenance

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

ANLA Z60.1	(1996) Nursery Stock

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4972	(1995a) pH of Soils
ASTM D 5034	(1995) Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM D 5035	(1995) Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5268	(1992; R 1996) Topsoil Used for Landscaping Purposes
ASTM D 5883	(1996el) Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings.

Scale drawings defining areas to receive plant materials.

Finished Grade, Topsoil and Underground UtilitiesGA; G, RE.

Finished grade status; location of underground utilities and facilities; and availability of topsoil from the stripping and stock piling operation.

SD-03 Product Data

Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

GeotextileGA; G, RE.

Chemical Treatment MaterialGA; G, RE.

Manufacturer's literature including physical characteristics, application and installation instructions for geotextile and chemical treatment material.

Plant Establishment Period; G, RE.

Calendar time period for the plant establishment period. When there is more than one establishment period, the boundaries of the planted areas covered for each period shall be described.

Application of PesticideGA; G, RE.

All pesticide treatments shall be approved by the Installation PestManagement Coordinator before such applications and chemicals are applied.All pesticide applicators shall be commercially certified in the State ofKansas in the appropriate category according to the application planned.The Contractor shall have a Kansas Pesticide Business License. Allcertifications and licenses shall be provided to the Installation PestManagement Coordinator before the the initiation of work under this contract. A Fort Riley Daily Pesticide Report shall be completed andforwarded to the Installation Pest Management Coordinator for allpesticide applications. A Department of Defense Pesticide ApplicationReport (DD Form 1532) shall be completed and forwarded to the InstallationPest Management Coordinator within 5 days of the end of the month for theprevious month's applications. A copy of the Fort Riley Daily PesticideReport and a DD Form 1532 is attached. All combination fertilizers(fertilizer combined with a herbicide, insecticide or other control) isconsidered a pesticide and falls under all requirements listed regardingpesticides.

SD-06 Test Reports

Soil TestGA; G, RE.

Percolation TestGA; G, RE.

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-07 Certificates

Plant MaterialGA; G, RE.

TopsoilGA; G, RE.

pH AdjusterGA; G, RE.

FertilizerGA; G, RE.

Organic MaterialGA; G, RE.

Soil ConditionerGA; G, RE.

Organic Mulch GA; G, RE.

Mycorrhizal Fungi InoculumGA; G, RE.

PesticideGA; G, RE.

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

a. Plant Material: Classification, botanical name, common name, size, quantity by species, and location where grown.

b. Topsoil: Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.

c. pH Adjuster: Sieve analysis and calcium carbonate equivalent.

d. Fertilizer: Chemical analysis and composition percent.

e. Organic Material: Composition and source.

f. Soil Conditioner: Composition and source.

g. Organic Mulch: Composition, source, and treatment against fungi growth.

h. Mycorrhizal Fungi Inoculum: Plant material treated.

i. Pesticide. EPA registration number and registered uses.

SD-10 Operation and Maintenance Data

Maintenance Record

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

Maintenance Instructions

Written instructions shall be furnished containing drawings and other necessary information for year-round care of the installed plant material; including, when and where maintenance should occur, and the procedures for plant material replacement.

1.3 SOURCE INSPECTIONS

The nursery or source of plant material and the source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Plant Material Identification

Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the correct botanical plant name and size.

1.4.1.2 Protection During Delivery

Plant material shall be protected during delivery to prevent desiccation and damage to the branches, trunk, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport.

1.4.1.3 Delivered Topsoil

Prior to the delivery of any topsoil, the availability of topsoil shall be verified in paragraph TOPSOIL. A soil test shall be provided for delivered topsoil.

1.4.1.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.5 Pesticide Material

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

1.4.2 Inspection

Plant material shall be well shaped, vigorous and healthy with a healthy, well branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion. Plant material shall be checked for unauthorized substitution and to establish nursery grown status. Plant material showing desiccation, abrasion, sun-scald injury, disfigurement, or unauthorized substitution shall be rejected. The plant material shall exhibit typical form of branch to height ratio; and meet the caliper and height measurements specified. Plant material that measures less than specified, or has been poled, topped off or headed back, shall be rejected. Container-grown plant material shall show new fibrous roots and the root mass shall contain its shape when removed from the container. Plant material with broken or cracked balls; or broken containers shall be rejected. Bare-root plant material that is not dormant or is showing roots were pulled from the ground shall be rejected. Other materials shall be inspected for compliance with paragraph PRODUCTS. Open soil amendment containers or wet soil amendments shall be rejected. Topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material larger than 1-1/2 inch diameter shall be rejected. Topsoil that contains viable plant material and plant parts shall be rejected. Unacceptable material shall be removed from the job site.

1.4.3 Storage

1.4.3.1 Plant Material Storage

Plant material not installed on the day of arrival at the site shall be stored and protected in designated areas. Plant material shall not be stored longer than 30 days. Plant material shall be protected from direct exposure to wind and sun. Bare-root plant material shall be heeled-in. All plant material shall be kept in a moist condition by watering with a fine mist spray until installed.

1.4.3.2 Other Material Storage

Pesticides shall be stored in a locked chemical storage container with containment or in an approved pesticide handling facility. All pesticides shall be mixed in the Fort Riley Pest management Facility mixing area or on a containment platform that meets the DoD and Fort Riley pest management criteria.
Storage of other material shall be in designated areas. Soil amendments shall be stored in dry locations and away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with planting operation material.

1.4.4 Handling

Plant material shall not be injured in handling. Cracking or breaking the earth ball of balled and burlapped plant material shall be avoided. Plant material shall not be handled by the trunk or stems. Materials shall not be dropped from vehicles.

1.4.5 Time Limitation

Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum 90 days. The time limitation between installing the plant material and placing the mulch shall be a maximum 24 hours.

1.5 WARRANTY

Furnished plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12 month period. A minimum 12 month calendar time period for the warranty of plant growth shall be provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with paragraph PLANT ESTABLISHMENT PERIOD, it shall be replaced once under this warranty.

PART 2 PRODUCTS

2.1 PLANT MATERIAL

2.1.1 Plant Material Classification

The plant material shall be nursery grown stock conforming to ANLA Z60.1 and shall be the species specified.

2.1.2 Plant Schedule

The plant schedule shall provide botanical names as included in one or more of the publications listed under "Nomenclature" in ANLA Z60.1.

2.1.3 Substitutions

Substitutions will not be permitted without written request and approval from the Contracting Officer.

2.1.4 Quality

Well shaped, well grown, vigorous plant material having healthy and well branched root systems in accordance with ANLA Z60.1 shall be provided. Plant material shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems, which may occur from the digging and preparation for shipment, method of shipment, or shipment. Plant quality is determined by the growing conditions; method of shipment to maintain health of the root system; and growth of the trunk and crown as follows.

2.1.5 Growing Conditions

Plant material shall be native to or well-suited to the growing conditions of the project site. Plant material shall be grown under climatic conditions similar to those at the project site.

2.1.6 Method of Shipment to Maintain Health of Root System

2.1.6.1 Balled and Burlapped (BB) Plant Material

Ball size and ratio shall be in accordance with ANLA Z60.1. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. The plant stem or trunk shall be centered in the ball. All roots shall be clean cut at the ball surface. Roots shall not be pulled from the ground. Before shipment the root ball shall be

dipped in gels containing mycorrhizal fungi inoculum. The root ball shall be completely wrapped with burlap or other suitable material and securely laced with biodegradable twine.

2.1.6.2 Balled and Potted (Pot) Plant Material

Ball size and ratio shall be in accordance with ANLA Z60.1. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. Removal shall be done by hand digging or mechanical devices. The plant stem or trunk shall be centered in the ball. All roots shall be clean cut at the ball surface. Roots shall not be pulled from the ground. Before shipment the root ball shall be dipped in gels containing mycorrhizal fungi inoculum. Container shall be used to retain the ball unbroken. Container shall be rigid to hold ball shape and protect root mass during shipping.

2.1.6.3 Balled and Platform (BP) Plant Material

Ball size and ratio shall be in accordance with ANLA Z60.1. Plants shall be prepared as balled and burlapped plant material and securely fastened to wood platform for shipping.

2.1.6.4 Bare-Root (BR) Plant Material

Minimum root spread shall be in accordance with ANLA Z60.1. A well branched root system characteristic of the species specified shall be provided. Roots shall not be pulled from the ground. Bare-root plant material shall be inoculated with mycorrhizal fungi during germination in the nursery. Before shipment the root system shall be dipped in gels containing mycorrhizal fungi inoculum. Bare-root plant material shall be dormant. The root system shall be protected from drying out.

2.1.6.5 Container-Grown (C) Plant Material

Container size shall be in accordance with ANLA Z60.1. Plant material shall be grown in a container over a duration of time for new fibrous roots to have developed and for the root mass to retain its shape and hold together when removed from the container. Container-grown plant material shall be inoculated with mycorrhizal fungi during germination in the nursery. Before shipment the root system shall be dipped in gels containing mycorrhizal fungi inoculum. The container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

2.1.7 Growth of Trunk and Crown

2.1.7.1 Deciduous Trees

A height to caliper relationship shall be provided in accordance with ANLA Z60.1. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

b. Multi-stem: All countable stems, in aggregate, shall average the size specified. To be considered a stem, there shall be no division of the trunk which branches more than 6 inches from ground level.

c. Specimen: The tree provided shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

2.1.7.3 Deciduous Shrubs

Deciduous shrubs shall have the height and number of primary stems recommended by

ANLA Z60.1. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

2.1.7.2 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material shall have the height-to-spread ratio recommended by ANLA Z60.1. The coniferous evergreen trees shall not be "poled" or the leader removed. Acceptable plant material shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

2.1.7.3 Broadleaf Evergreen Plant Material

Broadleaf evergreen plant material shall have the height-to-spread ratio recommended by ANLA Z60.1. Acceptable plant material shall be well shaped and recognized by the trade as typical for the variety grown in the region of the project.

2.1.7.4 Ground Cover and Vine Plant Material

Ground cover and vine plant material shall have the minimum number of runners and length of runner recommended by ANLA Z60.1. Plant material shall have heavy, well developed and balanced crown with vigorous, well developed root system and shall be furnished in containers.

2.1.8 Plant Material Size

Plant material shall be furnished in sizes indicated. Plant material larger in size than specified may be provided at no additional cost to the Government.

2.1.9 Plant Material Measurement

Plant material measurements shall be in accordance with ANLA Z60.1.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300A EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the plant material specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite is not recommended.

2.3.1 Fertilizer

It shall be as recommended by the soil test . Fertilizer shall be controlled release commercial grade; free flowing, pellet or tablet form; uniform in composition; and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.2 Organic Material

Organic material shall consist of either bonemeal, peat, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.2.1 Bonemeal

Bonemeal shall be a finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.2.2 Rotted Manure

Rotted manure shall be unleached horse, chicken, or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and shall be free of stones, sticks, and soil.

2.3.2.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, or other wood waste material free of stones, sticks, and toxic substances harmful to plants, and stabilized with nitrogen.

2.3.2.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. It shall be derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length. The Contractor shall comply with EPA requirements.

2.3.2.5 Worm Castings

Worm castings shall be screened from worms and food source and shall be commercially packaged.

2.3.3 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for single use or in combination to meet topsoil requirements for the plant material specified.

2.3.3.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.3.3.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized according to manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide with an absorption capacity of 250-400 times its weight.

2.3.3.3 Calcined Clay

Granular particles shall be produced from montmorillonite clay calcined to minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent passing No. 8 sieve; a minimum 99 percent shall be retained on No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.3.3.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

2.3.3.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with ASTM D 5883.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure is not recommended to be used as a mulch because it would encourage surface rooting of the plant material and weeds.

2.4.1 Inorganic Mulch

When inorganic mulch is required for decorative purposes, it shall be provided in areas designated, and consist of:

a. riverbank stone ranging in size from 1/2 to 2 inches

c. granite chips ranging in size from 1/2 to 2 inches

d. marble chips ranging in size from 1/2 to 2 inches

2.4.2 Organic Mulch

Organic mulch materials shall be native to the project site and consist of recycled mulch, shredded bark, wood chips, or ground bark.

2.4.2.1 Recycled Mulch

Recycled mulch may include compost, tree trimmings, or pine needles with a gradation that passes through a 2-1/2 x 2-1/2 inch screen. It shall be cleaned of all sticks a minimum 1 inch in diameter and plastic materials a minimum 3 inch length. The material shall be treated to retard the growth of mold and fungi. Other recycled mulch may include peanut shells, pecan shells or coco bean shells.

2.4.2.2 Shredded Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

2.4.2.3 Wood Chips and Ground Bark

Locally chipped or ground material shall be treated to retard the growth of mold and fungi. Gradation: A maximum 2 inch wide by 4 inch long.

2.5 GEOTEXTILE

Geotextile shall be woven or nonwoven; polypropylene, polyester, or fiberglass, mat in accordance with ASTM D 5034 or ASTM D 5035. It shall be made specifically for use as a fabric around plant material. Nominal weight shall be a minimum 4 ounces per square yard. Permeability rate shall be a minimum 0.04 inch per second.

2.6 WOOD STAKING MATERIAL

Wood stakes shall be hardwood or fir; rough sawn; free from knots, rot, cross grain, or other defects that would impair their strength.

2.6.1 Bracing Stake

Wood bracing stakes shall be a minimum 2 x 2 inch square and a minimum 8 feet long with a point at one end. Stake shall be set without damaging rootball.

2.6.2 Wood Ground Stakes

Wood ground stakes shall be a minimum of 2 x 2 inch square and a minimum 3 feet long with a point at one end.

2.6.3 Deadmen

Wood deadmen shall be a minimum 4 x 4 x 36 inches long.

2.7 METAL STAKING AND GUYING MATERIAL

Metal shall be aluminum or steel consisting of recycled content made for holding plant material in place.

2.7.1 Bracing Stakes

Metal bracing stakes shall be a minimum 1 inch diameter and a minimum 8 feet long. Stake shall be set without damaging rootball.

2.7.2 Metal Ground Stakes

Metal ground stakes shall be a minimum 1/2 inch diameter and a minimum 3 feet long.

2.7.3 Earth Anchor

Metal earth anchors shall be a minimum 1/2 inch diameter and a minimum 2 feet long.

2.7.4 Guying Material

Metal guying material shall be a minimum 12 gauge wire. Multi-strand cable shall be woven wire. Guying material tensile strength shall conform to the size of tree to be held firmly in place.

2.7.5 Turnbuckle

Metal turnbuckles shall be galvanized or cadmium-plated steel, and shall be a minimum 3 inches long with closed screw eyes on each end. Screw thread tensile strength shall conform to the size of tree to be held firmly in place.

2.8 PLASTIC STAKING AND GUYING MATERIAL

Plastic shall consist of recycled plastic product made for holding plant material firmly in place. Plastic shall not be used for deadmen.

2.8.1 Plastic Bracing Stake

Plastic bracing stakes shall be a minimum 2 inch diameter and a minimum 8 feet long. Stake shall be set without damaging rootball.

2.8.2 Plastic Ground Stakes

Plastic ground stakes shall be a minimum 1 inch diameter and a minimum 3 feet long.

2.8.3 Plastic Guying Material

Plastic guying material shall be designed specifically for the purpose of firmly holding plant material in high wind velocities.

2.8.4 Chafing Guard

Plastic chafing guards shall be used to protect tree trunks and branches when metal is used as guying material. The material shall be the same color throughout the project site. Length shall be a minimum 1.5 times the circumference of the plant trunk at its base.

2.9 RUBBER GUYING MATERIAL

Rubber chafing guards, consisting of recycled material, shall be used to protect tree trunks and branches when metal guying material is applied. The material shall be the same color throughout the project. Length shall be a minimum 1.5 times the circumference of the plant trunk at its base.

2.10 FLAG

Plastic flag material shall be used on guying material. It shall be a minimum 6 inches long. Tape color shall be consistent and visually complimentary to the entire project area. The tape color shall meet pedestrian visual safety requirements for day and night.

2.11 TREE ROOT BARRIERS

Tree root barriers shall be metal or plastic consisting of recycled content. Barriers shall utilize vertical stabilizing members to encourage downward tree root growth. Barriers shall limit, by a minimum 90 percent, the occurrence of surface roots. Tree root barriers which are designed to be used as plant pit liners will be rejected.

2.12 MYCORRHIZAL FUNGI INOCULUM

Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

2.13 WATER

Unless otherwise directed, water shall be the responsibility of the Contractor. Water shall not contain elements toxic to plant life.

2.14 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved. All pesticide treatments shall be approved by the Installation Pest Management Coordinator before such applications and chemicals are applied.

PART 3 EXECUTION

3.1 INSTALLING PLANT MATERIAL TIME AND CONDITIONS

3.1.1 Deciduous Plant Material Time

Deciduous plant material shall be installed from as recommended by the nursery.

3.1.2 Evergreen Plant Material Time

Evergreen plant material shall be installed as recommended by the nursery.

3.1.3 Plant Material Conditions

Planting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval.

3.1.4 Tests

3.1.4.1 Percolation Test

Test for percolation shall be done to determine positive drainage of plant pits and beds. A positive percolation shall consist of a minimum 1 inch per 3 hours; when a negative percolation test occurs, a shop drawing shall be submitted indicating the corrective measures.

3.1.4.2 Soil Test

Delivered topsoil, excavated plant pit soil, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection onsite shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the plant material specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade, Topsoil and Underground Utilities

The Contractor shall verify that finished grades are as indicated on drawings, and that the placing of topsoil, the smooth grading, and the compaction requirements have been completed in accordance with Section 02300A EARTHWORK, prior to the commencement of the planting operation. The location of underground utilities and facilities in the area of the planting operation shall be verified. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

3.2.2 Layout

Plant material locations and bed outlines shall be staked on the project site before any excavation is made. Plant material locations may be adjusted to meet field conditions.

3.2.3 Protecting Existing Vegetation

When there are established lawns in the planting area, the turf shall be covered and/or protected during planting operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline to protect them during planting operations.

3.3 EXCAVATION

3.3.1 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to plant material location, type of plant and planting method shall be submitted for approval.

3.3.2 Turf Removal

Where the planting operation occurs in an existing lawn area, the turf shall be removed from the excavation area to a depth that will ensure the removal of the entire root system.

3.3.3 Plant Pits

Plant pits for ball and burlapped or container plant material shall be dug to a depth equal to the height of the root ball as measured from the base of the ball to the base of the plant trunk. Plant pits for bare-root plant material shall be dug to a depth equal to the height of the root system. Plant pits shall be dug

a minimum 50 percent wider than the ball or root system to allow for root expansion. The pit shall be constructed with sides sloping towards the base as a cone, to encourage well aerated soil to be available to the root system for favorable root growth. Cylindrical pits with vertical sides shall not be used.

3.4 INSTALLATION

3.4.1 Setting Plant Material

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown.

3.4.1.1 Bare-Root Plant Material

Bare-root plant material shall be placed in water a minimum 30 minutes prior to setting.

3.4.2 Tree Root Barrier

Tree root barriers shall be installed as recommended by the manufacturer. Tree root barriers shall be used for trees located up to a maximum 6 feet from paved surfaces or structures.

3.4.3 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used.

3.4.4 Adding Mycorrhizal Fungi Inoculum

Mycorrhizal fungi inoculum shall be added as recommended by the manufacturer for the plant material specified.

3.4.5 Backfill Procedure

Prior to backfilling, all metal, wood, synthetic products, or treated burlap devices shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system. Additional requirements are as follows.

3.4.5.1 Balled and Burlapped, and Balled and Platformed Plant Material

Biodegradable burlap and tying material shall be carefully opened and folded back from the top a minimum 1/3 depth from the top of the root ball. Backfill mixture shall be added to the plant pit in 6 inch layers with each layer tamped.

3.4.5.2 Bare-Root Plant Material

The root system shall be spread out and arranged in its natural position. Damaged roots shall be removed with a clean cut. The backfill soil mixture shall be carefully worked in amongst the roots and watered to form a soupy mixture. Air pockets shall be removed from around the root system, and root to soil contact shall be provided.

3.4.5.3 Container-Grown and Balled and Potted Plant Material

The plant material shall be carefully removed from containers that are not biodegradeable. Prior to setting the plant in the pit, a maximum 1/4 depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. For plant material in biodegradable containers the container shall be split prior to setting the plant with container. Backfill mixture shall be added to the plant pit in 6 inch layers with each layer tamped.

3.4.5.4 Earth Berm

An earth berm, consisting of backfill soil mixture, shall be formed with a minimum 4 inch height around the edge of the plant pit to aid in water retention and to provide soil for settling adjustments.

3.4.6 Plant Bed

Plant material shall be set in plant beds according to the drawings. Backfill soil mixture shall be placed on previously scarified subsoil to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas. Earth berms shall be provided. Polymers shall be spread uniformly over the plant bed and in the planting pit as recommended by the manufacturer and thoroughly incorporated into the soil to a maximum 4 inch depth.

3.4.7 Watering

Plant pits and plant beds shall be watered immediately after backfilling, until completely saturated.

3.4.8 Staking and Guying

Staking will be required when trees are unstable or will not remain set due to their size, shape, or exposure to high wind velocity.

3.4.8.1 One Bracing Stake

Trees 4 to 6 feet high shall be firmly anchored in place with one bracing stake. The bracing stake shall be placed on the side of the tree facing the prevailing wind. The bracing stake shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly to the stake with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. A chafing guard shall be used when metal is the guying material.

3.4.8.2 Two Bracing Stakes

Trees from 6 to 8 feet height shall be firmly anchored in place with 2 bracing stakes placed on opposite sides. Bracing stakes shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly between the stakes with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Chafing guards shall be used when metal is the guying material.

3.4.8.3 Three Ground Stakes

Trees over a minimum 8 feet height and less than a maximum 6 inch caliper shall be held firmly in place with 3 bracing or ground stakes spaced equidistantly around the tree. Ground stakes shall be avoided in areas to be mowed. Stakes shall be driven into firm ground outside the earth berm. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. For trees over maximum 3 inch diameter at breast height, turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing guards shall be used when metal is the guying material.

3.4.9 Deadmen or Earth Anchors

Trees over a minimum 6 inch caliper shall be held firmly in place with wood deadmen buried a minimum 3 feet in the ground or metal earth anchors. Multi-strand cable guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing guards shall be used.

3.4.10 Flags

A flag shall be securely fastened to each guy line equidistant between the tree and the stake, deadmen, or earth anchor. The flag shall be visible to pedestrians.

3.5 FINISHING

3.5.1 Plant Material

Prior to placing mulch, the installed area shall be uniformly edged to provide a clear division line between the planted area and the adjacent turf area, shaped as indicated. The installed area shall be raked and smoothed while maintaining the earth berms.

3.5.2 Placing Geotextile

Prior to placing mulch, geotextile shall be placed as indicated in accordance with the manufacturer's recommendations.

3.5.3 Placing Mulch

The placement of mulch shall occur a maximum 48 hours after planting. Mulch, used to reduce soil water loss, regulate soil temperature and prevent weed growth, shall be spread to cover the installed area with a minimum 4 inch uniform thickness. Mulch shall be kept out of the crowns of shrubs, ground cover, and vines and shall be kept off buildings, sidewalks and other facilities.

3.5.4 Pruning

Pruning shall be accomplished by trained and experienced personnel. The pruning of trees and palms shall be in accordance with ANSI A300. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3.6 MAINTENANCE DURING PLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation and shall continue until the plant establishment period commences. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

3.7 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program and coordinated with the InstallationPest Management Coordinator. Applications shall comply with the Installation Pest Management Plan, chemical label requirements andcoordinated usage agreements with the Installation Pest ManagementCoordinator. .

3.7.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.7.2 Application

A state certified applicator shall apply required pesticides in accordance with

EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.8 RESTORATION AND CLEAN UP

3.8.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

3.8.2 Clean Up

Excess and waste material shall be removed from the installed area and shall be disposed offsite. Adjacent paved areas shall be cleared.

3.9 PLANT ESTABLISHMENT PERIOD

3.9.1 Commencement

The plant establishment period for maintaining exterior plantings in a healthy growing condition shall commence on the first day of exterior planting work under this contract and shall continue through the remaining life of the contract and end 3 months after the last day of exterior planting required by this contract. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period, the boundaries of the planted area covered for each period shall be described. The plant establishment period shall be coordinated with Sections 02921A SEEDING; and 02922A SODDING. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for areas.

3.9.2 Maintenance During Establishment Period

Maintenance of plant material shall be according to section specification 01010.

3.9.2.1 Watering Plant Material

The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of 1 inch absorbed water per week, delivered in the form of rain or augmented by watering. Run-off, puddling and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or existing plant material shall be prevented.

3.9.2.2 Weeding

Grass and weeds in the installed areas shall not be allowed to reach a maximum 3 inches height before being completely removed, including the root system.

3.9.2.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.2.4 Post-Fertilization

The plant material shall be topdressed at least once during the period of establishment with controlled release fertilizer, reference paragraph SOIL AMENDMENTS. Apply at the rate of 2 pounds per 100 square feet of plant pit or

bed area. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy.

3.9.2.5 Plant Pit Settling

When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with paragraph INSTALLATION. The earth berm shall be maintained.

3.9.2.6 Maintenance Record

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

3.9.3 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

3.9.4 Replacement Plant Material

Unless otherwise directed, plant material shall be provided for replacement in accordance with paragraph PLANT MATERIAL. Replacement plant material shall be installed in accordance with paragraph INSTALLATION, and recommendations in paragraph PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with paragraph WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

3.9.5 Maintenance Instructions

Written instructions shall be furnished containing drawings and other necessary information for year-round care of the installed plant material; including, when and where maintenance should occur, and the procedures for plant material replacement.

3.9.6 Planting Distance

Trees shall not be planted within 4 feet of sidewalks and curbs or 8 feet within underground utilities and foundations. Neither trees nor shrubs shal be planted within 10 feet of fire hydrants.

3.9.7 Tree Varietties

Not more than 40% of trees shll be of any one variety. A minimum of 5 varieties shall be planted. Pines shall not be planted. Trees shall be selected from the Fort Riley Landscape pallet.

-- End of Section --

DIVISION 3 – CONCRETE

03100A	Structural Concrete Formwork
03150A	Expansion Joints, Contraction Joints, and Waterstops
03200A	Concrete Reinforcement
03300	Cast-in-Place Structural Concrete

SECTION 03100A

STRUCTURAL CONCRETE FORMWORK
05/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 347R	(1994) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 90	(1995) Load Bearing Concrete Masonry Units
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation

U.S. DEPARTMENT OF COMMERCE (DOC)

PS-1	(1996) Voluntary Product Standard - Construction and Industrial Plywood

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Formwork; G, RE

Drawings showing details of formwork, including dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-03 Product Data

Design; G, RE

Design analysis and calculations for form design and methodology used in the design.

Form Materials; G, RE

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

Form Releasing Agents; G, RE

Manufacturer's recommendation on method and rate of application of form releasing agents.

SD-04 Samples

Fiber Voids; G, RE

One sample unit of fiber voids prior to installation of the voids.

SD-07 Certificates

Fiber Voids; G, RE

Certificates attesting that fiber voids conform to the specified requirements.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms For Class A Finish

Forms for Class A finished surfaces shall be plywood panels conforming to PS-1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

2.1.2 Forms For Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to PS-1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

2.1.3 Forms For Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

2.1.4 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inchin diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

2.1.5 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

2.1.6 Fiber Voids

Fiber voids shall be the product of a reputable manufacturer regularly engaged in the commercial production of fiber voids. The voids shall be constructed of double faced, corrugated fiberboard. The corrugated fiberboard shall be fabricated of standard kraft paper liners, impregnated with paraffin, and laminated with moisture resistant adhesive, and shall have a board strength of 275 psi. Voids which are impregnated with paraffin after construction, in lieu of being constructed with paraffin impregnated fiberboard, are acceptable. Voids shall be designed to support not less than 1000 psf. To prevent separation during concrete placement fiber voids shall be assembled with steel or plastic banding at 4 feet on center maximum, or by adequate stapling or gluing as recommended by the manufacturer. Fiber voids placed under concrete slabs and that are 8 inches in depth may be heavy duty "waffle box" type, constructed of paraffin impregnated corrugated fiberboard.

2.2 FIBER VOID RETAINERS

2.2.1 Polystyrene Rigid Insulation

Polystyrene rigid insulation shall conform to ASTM C 578, Type V, VI, or VII, square edged. Size shall be 1-1/2 inches thick by 16 inches in height by 3 feet in length, unless otherwise indicated.

2.2.2 Precast Concrete

Precast concrete units shall be load bearing concrete masonry units conforming to ASTM C 90. Precast concrete units shall have a compressive strength of not less than 2500 psi, reinforced with 6 inch by 6 inch by W1.4 WWF wire mesh, and 12 inches (height) by 3 feet (length) by 1-5/8 inches (thickness) in size unless indicated otherwise or approved.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

3.1.2 Fiber Voids

Voids shall be placed on a smooth firm dry bed of suitable material, to avoid being displaced vertically, and shall be set tight, with no buckled cartons, in order that horizontal displacement cannot take place. Each section of void shall have its ends sealed by dipping in paraffin, with any additional cutting of voids at the jobsite to be field dipped in the same type of sealer, unless liners and flutes are completely impregnated with paraffin. Prior to placing reinforcement,

the entire formed area for slabs shall be covered with a 4 x 8 feet minimum flat sheets of fiber void corrugated fiberboard. Joints shall be sealed with a moisture resistant tape having a minimum width of 3 inches. If voids are destroyed or damaged and are not capable of supporting the design load, they shall be replaced prior to placing of concrete.

3.1.3 Fiber Void Retainers

Fiber void retainers shall be installed, continuously, on both sides of fiber voids placed under grade beams in order to retain the cavity after the fiber voids biodegrade.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1.	Variations from the plumb:	In any 10 feet of length ---------- 1/4 inch
	a. In the lines and surfaces of columns, piers, walls and in arises	Maximum for entire length ---------- 1 inch
	b. For exposed corner columns,control-joint grooves, and other conspicuous lines	In any 20 feet of length ---------- ---- 1/4 inch Maximum for entire length---------- 1/2 inch

TABLE 1

TOLERANCES FOR FORMED SURFACES

2.	Variation from the level or from the grades indicated on the drawings:	In any 10 feet of length ----------1/4 inch In any bay or in any 20 feet of length---------- 3/8 inch
	a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores	Maximum for entire length ---------- 3/4 inch
	b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	In any bay or in any 20 feet of length ---------- ----- 1/4 inch Maximum for entire length---------- 1/2 inch
3.	Variation of the linear building lines from established position in plan	In any 20 feet --------- 1/2 inch Maximum ----------1 inch
4.	Variation of distance between walls, columns, partitions	1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay,and not more than 1 inch total variation
5.	Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
6.	Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
7.	Footings:	
	a. Variation of dimensions in plan	Minus ---------- 1/2 inch Plus ---------- 2 inches when formed or plus 3 inches when placed against unformed excavation
	b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than 2 inches
	c. Reduction in thickness of specified thickness	Minus ---------- 5 percent
8.	Variation in steps:	Riser ---------- 1/8 inch
	a. In a flight of stairs	Tread ---------- 1/4 inch
	b. In consecutive steps	Riser ---------- 1/16 inch Tread ---------- 1/8 inch

-- End of Section --

SECTION 03150A

EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS
05/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 919	(1984; R 1998) Use of Sealants in Acoustical Applications
ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM D 1190	(1997) Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1191	(1984; R 1994el)

Concrete Joint Sealers

ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 5249	(1995) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Preformed Expansion Joint Filler; G, RE
Sealant; G, RE

Manufacturer's literature, including safety data sheets, for field-molded sealants and primers (when required by sealant manufacturer).

Manufacturer's recommended instructions for installing preformed fillers, and field-molded sealants.

SD-04 Samples

Field-Molded Type; G, RE

Sample specimens of field-molded sealant and joint filler to demonstrate color, character, and type of material.Samples should be at least 4-inch by 4-inch by the width of the joint, to allow inspection and handling.

SD-07 Certificates

Preformed Expansion Joint Filler; G, RE
Sealant; G, RE

Certificates of compliance stating that the joint filler and sealant materials conform to the requirements specified.

1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 CONTRACTION JOINT STRIPS

Contraction joint strips shall be 1/8 inch thick tempered hardboard conforming

to AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.2 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751or ASTM D 1752. Unless otherwise indicated, filler material shall be 1/2 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.3 SEALANT

Joint sealant shall conform to the following:

2.3.1 Hot-Poured Type

ASTM D 1190 tested in accordance with ASTM D 1191.

2.3.2 Field-Molded Type

ASTM C 920, Type M for horizontal joints or Type NS for vertical joints, Class 25, and Use NT. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, nonreactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

PART 3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations indicated and as authorized.

3.1.1 Contraction Joints

Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC or HIPS insert strips into the plastic concrete using a steel parting bar, when necessary, or by cutting the concrete with a saw after concrete has set. Joints shall be approximately 1/8 inch wide and shall extend into the slab one-fourth the slab thickness, minimum, but not less than 1 inch.

3.1.1.1 Joint Strips

Strips shall be of the required dimensions and as long as practicable. After the first floating, the concrete shall be grooved with a tool at the joint locations. The strips shall be inserted in the groove and depressed until the top edge of the vertical surface is flush with the surface of the slab. The slab shall be floated and finished as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, the top portion of the strip shall be sawed out after the curing period to form a recess for sealer. The removable section of PVC or HIPS strips shall be discarded and the insert left in place. True alignment of the strips shall be maintained during insertion.

3.1.1.2 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

3.1.2 Expansion Joints

Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 1/8 inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

3.1.3.1 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. When the sealants are meant to reduce the sound transmission characteristics of interior walls, ceilings, and floors the guidance provided in ASTM C 919 shall be followed. Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.2 CONSTRUCTION JOINTS

Construction joints are specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

-- End of Section --

SECTION 03200A

CONCRETE REINFORCEMENT
09/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 318/318R	(1995) Building Code Requirements for Structural Concrete and Commentary

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1999) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 82	(1997a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 184/A 184M	(1996) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 675/A 675M	(1990a; R 1995e1) Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1998) Structural Welding Code - Reinforcing Steel

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 1MSP	(2001) Manual of Standard Practice

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Reinforcement; G, RE

Detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-03 Product Data

Welding; G, RE

A list of qualified welders names.

SD-07 Certificates

Reinforcing Steel; G, RE

Certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel.

1.3 WELDING

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 DOWELS

Dowels shall conform to ASTM A 675/A 675M, Grade 80. Steel pipe conforming to ASTM A 53, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

2.2 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184/A 184M.

2.3 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M, grade 60, sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82. ASTM A 706/A 706M, Grade and sizes as indicated, shall be used for reinforcing steel where welding is required.

2.4 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185. Use of rolled mesh is specifically prohibited. Wire mesh shall be supplied in flat sheets.

2.5 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.6 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI 1MSP and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to

view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms. Welding of reinforcing steel is specifically prohibited, except were indicated on the drawings or approved by the Contracting Officer.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding will not be permitted. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

3.2 WELDED-WIRE FABRIC PLACEMENT

Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated.
Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

3.3 DOWEL INSTALLATION

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be

coated with a bond breaker.

-- End of Section --

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE
11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214.3R	(1988; R 1997) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 305R	(1999) Hot Weather Concreting
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(1991; R 1996) Burlap Cloth Made from Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31/C 31M	(2000e1) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 39/C 39M	(2001) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM C 123	(1998) Lightweight Particles in Aggregate
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143/C 143M	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(1999a) Portland Cement

ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 192/C 192M	(2000) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997el) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494/C 494M	(1999ae1) Chemical Admixtures for Concrete
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 595	(2000a) Blended Hydraulic Cements
ASTM C 618	(2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 989	(1999) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1017/C 1017M	(1998) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1064/C 1064M	(1999) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(1999) Packaged Dry, Hydraulic-Cement Grout(Nonshrink)
ASTM C 1260	(1994) Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 1751	(1999) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(2004) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion

	Joint Fillers for Concrete Paving and Structural Construction
ASTM E 96	(2000) Water Vapor Transmission of Materials

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1997) NIST Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1996) Concrete Plant Standards \n/c\X
NRMCA QC 3	(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities
NRMCA TMMB 100	(1994) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete
COE CRD-C 540	(1996) Handbook for Concrete and Cement Standard Specification for Nonbituminous inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type
COE CRD-C 572	(1974) Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop
COE CRD-C 94	(1995) Surface Retarders

1.2 LUMP SUM CONTRACT

Under this type of contract concrete items will be paid for by lump sum and will not be measured. The work covered by these items consists of furnishing all concrete materials, reinforcement, miscellaneous embedded materials, and equipment, and performing all labor for the forming, manufacture, transporting, placing, finishing, curing, and protection of concrete in these structures.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mixture Proportions; G, GD

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of

ingredients that will be used in the manufacture of each strength or class of concrete, at least 30 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

Curing Materials; G, RE.

SD-04 Samples

Surface Retarder; G, RE

Sample of surface retarder material with manufacturer's instructions for application in conjunction with air-water cutting.

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control; G, GD

Initial material and source test reports prior to use in the work. Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project. Submit with mixture proportions submittal.

Testing and Inspection for Contractor Quality Control; G, RE

Certified copies of laboratory test reports for testing during construction. Certified copies of field tests, inspections and reports.

SD-07 Certificates

Qualifications; G, RE

Written documentation for Contractor Quality Control personnel.

CHEMICAL ADMIXTURES; G, GD

Chemical admixtures shall be certified for compliance with all specification requirements.

1.4 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II

Concrete Transportation Construction Inspector or
Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Official and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.5 SPECIAL REQUIREMENTS

A pre-installation meeting with the Contracting Officer will be required at least 10 days prior to start of construction. The Contractor shall be responsible for calling the meeting; the Project Superintendent and active installation personnel shall be present.

1.6 GENERAL REQUIREMENTS

1.6.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.6.1.1 Floors

For the purpose of this Section the following terminology correlation between ACI 117/117R and this Section shall apply:

Floor Profile Quality Classification From ACI 117/117R	This Section
Conventional Bullfloated	Same
Conventional Straightedged	Same
Flat	Float Finish or Trowel Finish

Levelness tolerance shall not apply where design requires floors to be sloped to drains or sloped for other reasons.

1.6.1.2 Floors by the Straightedge System

The flatness of the floors shall be carefully controlled and the tolerances shall be measured by the straightedge system as specified in paragraph 4.5.7 of ACI 117/117R, using a 10 foot straightedge, within 72 hours after floor slab installation and before shores and/or forms are removed. The listed tolerances shall be met at any and every location at which the straightedge can be placed.

Bullfloated	1/2-inch
Straightedged	5/16-inch
Float Finish	3/16-inch
Trowel Finish	3/16-inch

1.6.2 Strength Requirements and w/c Ratio

1.6.2.1 Strength Requirements

Specified compressive strength (f'c) shall be as follows:

COMPRESSIVE STRENGTH	STRUCTURE OR PORTION OF STRUCTURE
4000 psi at 28 days	All work

Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland

cement. Compressive strength shall be determined in accordance with ASTM C 39/C 39M.

a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42/C 42M. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.

c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

1.6.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete shall be as follows:

WATER-CEMENT RATIO, BY WEIGHT	STRUCTURE OR PORTION OF STRUCTURE
0.45	All Work

These w/c's may cause higher strengths than that required above for compressive strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement plus pozzolan and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where GGBF slag is used, the weight of the GGBF slag shall be included in the equations of ACI 211.1 for the term P which is used to denote the weight of pozzolan. The water content of all admixtures used in the mix shall be reported and included in the w/c ratio determination for

the mixture.

1.6.3 Air Entrainment

All concrete shall be air entrained to contain between 4.5 and 7.5 percent total air content. Specified air content shall be attained at point of placement into the forms. Air content shall be determined in accordance with ASTM C 231.

1.6.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143/C 143M.

Structural Element	Slump Minimum	Slump Maximum
Walls, columns and beams	2 in.	4 in.
Foundation walls, substructure walls, footings, slabs	1 in.	3 in.
Any structural concrete approved for placement by pumping:		
At pump	2 in.	6 in.
At discharge of line	1 in.	4 in.

When use of a plasticizing admixture conforming to ASTM C 1017/C 1017M or when a Type F or G high range water reducing admixture conforming to ASTM C 494/C 494M is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

1.6.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F. When the ambient temperature during placing is 40 degrees F or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.

1.6.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.6.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

1.7 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified. The total cementitious material content for concrete shall be at least 564 lbs. per cu. yd.

1.7.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in subparagraph Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where GGBF slag is used, the weight GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the weight of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by weight of the total cementitious material, and the maximum shall be 35 percent. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance withASTM C 192/C 192M. They shall be tested at 7 and 28 days in accordance with ASTM C 39/C 39M. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

1.7.2 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'cr) exceeding the specified compressive strength (f'c) by the amount indicated below. This required average compressive strength, f'cr, will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'cr during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'cr, the mixture shall be adjusted, as approved, to bring the daily average back up to f'cr. During production, the required f'cr shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

1.7.2 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'c) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'cr used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

f'cr = f'c + 1.34S where units are in psi

f'cr = f'c + 2.33S - 500 where units are in psi

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

1.7.3 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'cr shall be determined as follows:

a. If the specified compressive strength f'c is less than 3,000 psi,

f'cr = f'c + 1000 psi

b. If the specified compressive strength f'c is 3,000 to 5,000 psi,

f'cr = f'c + 1,200 psi

c. If the specified compressive strength f'c is over 5,000 psi,

f'cr = f'c + 1,400 psi

1.8 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

1.9 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

1.9.1 Materials

The Government will sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the specifications as

considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

1.9.2 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

1.9.3 Hardened Concrete

Tests on hardened concrete will be performed by the Government when such tests are considered necessary.

1.9.4 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, portland-pozzolan cement, or portland cement in combination with pozzolan or ground granulated blast furnace slag and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type I or II, meeting the low alkali requirement. White portland cement shall meet the above requirements except that it may be Type II or Type III. White Type III shall be used only in specific areas of the structure, when approved in writing.

2.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III with tricalcium aluminate limited to 8 percent, meeting the low alkali requirement. Type III cement shall be used only in isolated instances and only when approved in writing.

2.1.3 Blended Cements

ASTM C 595, Type IP, meeting the mortar expansion requirement.

2.1.4 Pozzolan (Fly Ash)

ASTM C 618, Class C or F with the optional requirements for multiple factor, drying shrinkage, and uniformity from Table 2A of ASTM C 618. Requirement for maximum alkalies from Table 1A of ASTM C 618 shall apply. Loss on ignition shall not exceed 3 percent. Fly Ash, when used to mitigate alkali-aggregate reactivity, shall be Class F and have a Calcium Oxide (CaO) content of less than 8 percent. If pozzolan is used, it shall never be less than 15 percent nor more than 35 percent by weight of the total cementitious material. The Contractor shall comply with EPA requirements.

2.1.5 Ground Granulated Blast-Furnace (GGBF) Slag

ASTM C 989, Grade 120.

2.2 AGGREGATES

Aggregates shall consist of clean, hard, uncoated particles meeting the quality and gradation requirements of ASTM C 33, and the other requirements specified herein. Coarse aggregate shall have a satisfactory service record of at least 5 years successful service in three building projects or, if a new source is used, shall meet the requirements when tested for resistance to freezing and thawing. Aggregate not having a satisfactory demonstrable service record shall have a durability factor of 50 or more when subjected to freezing and thawing in concrete in accordance with ASTM C 666 Procedure A. Optionally, coarse aggregate shall comply with the Kansas Department of Transportation (KDOT) Durability Class 2 requirements. A list of sources designated by KDOT as meeting the durability requirements for Class 2 aggregates may be obtained from KDOT by contacting the KDOT Research Materials Laboratory, 2300 Van Buren, Topeka, Kansas 66611. Aggregates shall conform to the following.

2.2.1 Aggregate Sources

Fine and coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with ASTM C 1260. Coarse aggregate and fine aggregate shall be tested separately. Test results shall have a measured expansion equal to or less than 0.08 percent at 16 days after casting. Should the test data indicate an expansion greater than 0.08 percent, the aggregate(s) shall be rejected, or additional testing, using a modified version of ASTM C 1260, shall be performed by the Contractor as described below. ASTM C 1260 shall be modified as follows to include one of the following options:

a. Utilize the Contractor's proposed low alkali portland cement and Class F fly ash in combination for the test proportioning. Class F fly ash shall contain less than 8 percent Calcium Oxide (CaO) and shall be used in the range of 25 to 40 percent of the total cementitious material by mass. The quantity shall be determined that will meet all the requirements of these specifications and which will lower the expansion equal to or less than 0.08 percent at 16 days after casting.

b. Utilize the Contractor's proposed low alkali portland cement and ground granulated blast furnace (GGBF) slag in combination for the test proportioning. GGBF slag shall be used in the range of 40 to 50 percent of the total cementitious material by mass. The quantity shall be determined that will meet all the requirements of these specifications and which will lower the expansion equal to or less than 0.08 percent at 16 days after casting.

c. Change the source or type of cement, or try using a blended cement conforming to ASTM C 595 IP and meeting the mortar expansion requirement. The replacement cement shall be selected that will meet all the requirements of these specifications and which will lower the expansion equal to or less than 0.08 percent at 16 days after casting.

If any of the above options does not lower the expansion equal to or less than 0.08 percent at 16 days after casting, the aggregate(s) shall be rejected and the Contractor shall submit new aggregate sources for retesting. The results of the testing shall be submitted to the Contracting Officer for evaluation and acceptance.

2.2.2 Fine Aggregate

Fine aggregate shall consist of natural sand, manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33. Fine aggregate as delivered to the mixer shall not contain more than 0.1 percent lignite. Total lightweight aggregate particles, including coal and lignite, in natural sand shall be less than 0.25 percent as determined in accordance with ASTM C 123.

2.2.3 Coarse Aggregate

Coarse aggregate shall consist of crushed or uncrushed gravel, crushed stone, or a combination thereof. Coarse aggregate shall be sound and durable free of objectionable coatings. The nominal maximum size of the coarse aggregate shall be 3/4-inch. Coarse aggregate shall conform to ASTM C 33, Class 5S, size designation 67, except that loss on abrasion shall be less than 40 percent. In addition, coarse aggregate shall not contain more than 0.5 percent by weight of white tripolitic chert that has a specific gravity, saturated surface dry, of less than 2.40 as determined in accordance with ASTM C 123. Tripolitic chert is the white porous siliceous form of weathered chert found in nodules and beds within some limestones. The total amount of all types of chert shall not exceed 3 percent by weight.

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.3.2 Accelerating Admixture

ASTM C 494/C 494M, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494/C 494M, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

2.3.4 High-Range Water Reducer

ASTM C 494/C 494M, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.3.5 Surface Retarder

COE CRD-C 94.

2.3.6 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017/C 1017M, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2,

except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Nonpigmented compound shall contain a fugitive dye, and shall have the reflective requirements in ASTM C 309 waived.

2.4.3 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107, Grade A, B, or C, and shall be a commercial formulation suitable for the proposed application.

2.7 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Hangers for suspended ceilings shall be as specified. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

2.8 PERIMETER INSULATION

Perimeter insulation shall be polystyrene conforming to ASTM C 578, Type II or polyurethane conforming to ASTM C 591, Type II. The Contractor shall comply with EPA requirements.

2.11 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 10 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.9 JOINT MATERIALS

2.9.1 Joint Fillers, Sealers, and Waterstops

Expansion joint fillers shall be preformed materials conforming to ASTM D 1751 or ASTM D 1752. Materials for waterstops shall be in accordance with Section 03150a EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS. Materials for and sealing of joints shall conform to the requirements of Section 03150a EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

2.9.2 Contraction Joints in Slabs

Sawable type contraction joint inserts shall conform to COE CRD-C 540. Nonsawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of Section 3.4 "Resistance to Sawing". Plastic inserts shall be polyvinyl chloride conforming to the materials requirements of COE CRD-C 572.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces

to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100A STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200A CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

3.1.1.2 Preparation of Rock

Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semidetached or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Contracting Officer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting as specified below for Previously Placed Concrete. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.

3.1.1.3 Excavated Surfaces in Lieu of Forms

Concrete for footings may be placed directly against the soil provided the earth or rock has been carefully trimmed, is uniform and stable, and meets the compaction requirements of Section 02315AEXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS. The concrete shall be placed without becoming contaminated by loose material, and the outline of the concrete shall be within the specified tolerances.

3.1.2 Previously Placed Concrete

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next horizontal lift by cleaning the construction joint surface with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Concrete at the side of vertical construction joints shall be prepared as approved by the Contracting Officer. Air-water cutting shall not be used on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean surfaces of well bonded coarse aggregate are exposed and make up at least 10-percent of the surface area, distributed uniformly throughout the surface. The edges of the coarse aggregate shall not be undercut. The surface of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing fresh concrete. The surface shall be washed completely clean as the last operation prior to placing the next lift. For heavy duty floors and two-course floors a thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the topping placing. The grout shall be a 1:1 mixture of portland cement and sand

passing the No. 8 sieve. The topping concrete shall be deposited before the grout coat has had time to stiffen.

3.1.2.1 Air-Water Cutting

Air-water cutting of a fresh concrete surface shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 100 psi plus or minus, 10 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a surface retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure waterjet or sandblasting shall be used as the last operation before placing the next lift.

3.1.2.2 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi shall be used for cutting and cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the waterjet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

3.1.2.3 Wet Sandblasting

Wet sandblasting shall be used after the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. After wet sandblasting, the surface of the concrete shall then be washed thoroughly to remove all loose materials.

3.1.2.4 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

3.1.2.1 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water when concrete is placed.

3.1.3 Vapor Barrier

Vapor barrier shall be provided beneath the interior on-grade concrete floor slabs. The greatest widths and lengths practicable shall be used to eliminate joints wherever possible. Joints shall be lapped a minimum of 12 inches. Torn, punctured, or damaged vapor barrier material shall be removed and new vapor barrier shall be provided prior to placing concrete. For minor repairs, patches may be made using laps of at least 12 inches. Lapped joints shall be sealed and edges patched with pressure-sensitive adhesive or tape not less than 2 inches wide and compatible with the membrane. Vapor barrier shall be placed directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier. In this case, the surface shall be choked with a light layer of sand, as approved, before placing the vapor barrier. A 2 inch layer of compacted, clean concrete sand (fine aggregate) shall be placed on top of the vapor barrier before placing concrete. Concrete placement shall be controlled so as to prevent damage to the vapor barrier, and covering sand.

3.1.4 Perimeter Insulation

Perimeter insulation shall be installed at locations indicated. Adhesive shall be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

3.1.5 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 1 feet of the surface of the concrete. Tack welding shall not be performed on or to embedded items.

3.2 CONCRETE PRODUCTION

3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall be batched and mixed from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94/C 94M, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete.

3.2.1.1 General

The batching plant shall be located off site close to the project. The batching, mixing and placing system shall have a capacity of at least 50 cubic yards per hour. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

3.2.1.2 Batching Equipment

The batching controls shall be semiautomatic or automatic, as defined in NRMCA CPMB 100. A semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. The weight of water and admixtures shall be recorded if batched by weight. Separate bins or compartments shall be provided for each size group of aggregate and type of cementitious material, to prevent intermingling at any time. Aggregates shall be weighed either in separate weigh batchers with individual scales or, provided the smallest size is batched first, cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cementitious material. If both portland cement and other cementitious material are used, they may be batched cumulatively, provided that the portland cement is batched first. Water may be measured by weight or volume. Water shall not be weighed or measured cumulatively with another ingredient. Filling and discharging valves for the water metering or batching system shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. Piping for water and for admixtures shall be free from leaks and shall be properly valved to prevent backflow or siphoning. Admixtures shall be furnished as a liquid of suitable concentration for easy control of dispensing. An adjustable, accurate, mechanical device for measuring and dispensing each admixture shall be provided. Each admixture dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and individually discharged automatically in a manner to obtain uniform distribution throughout the water as it is added to the batch in the specified mixing period. When use of truck mixers makes this requirement impractical, the admixture dispensers shall be interlocked with the sand batchers.

Different admixtures shall not be combined prior to introduction in water and shall not be allowed to intermingle until in contact with the cement. Admixture dispensers shall have suitable devices to detect and indicate flow during dispensing or have a means for visual observation. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment, and for sampling and calibrating the dispensing of cementitious material, water, and admixtures. Filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3.2.1.3 Scales

The weighing equipment shall conform to the applicable requirements of CPMB Concrete Plant Standard, and of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. The tests shall be made at the specified frequency in the presence of a Government inspector. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

3.2.1.4 Batching Tolerances

(A) Tolerances with Weighing Equipment

MATERIAL	PERCENT OF REQUIRED WEIGHT
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

(B) Tolerances with Volumetric Equipment

For volumetric batching equipment used for water and admixtures, the following tolerances shall apply to the required volume of material being batched:

MATERIAL	PERCENT OF REQUIRED MATERIAL
Water:	plus or minus 1 percent
Chemical admixtures:	0 to plus 6 percent

3.2.1.5 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched.

3.2.1.6 Concrete Mixers

Mixers shall be stationary mixers or truck mixers. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

3.2.1.7 Stationary Mixers

Concrete plant mixers shall be drum-type mixers of tilting, nontilting, horizontal-shaft, or vertical-shaft type, or shall be pug mill type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94/C 94M applicable to central-mixed concrete.

3.2.1.8 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94/C 94M. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it is possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed. Or, if approved in lieu of this, the number of revolutions shall be marked on the batch tickets. Water shall not be added at the placing site unless specifically approved; and in no case shall the water be allowed to exceed the specified w/c. Any such water shall be injected at the base of the mixer, not at the discharge end.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers, agitators, nonagitating transporting equipment conforming to NRMCA TMMB 100 or by approved pumping equipment or conveyors.

3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet.The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yardsshall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

3.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94/C 94M. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper , for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

3.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.5.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494/C 494M, Type C or E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used.

3.5.4 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

3.5.5 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the

Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.5.6 Placing Concrete in Congested Areas

Special care shall be used to ensure complete filling of the forms, elimination of all voids, and complete consolidation of the concrete when placing concrete in areas congested with reinforcing bars, embedded items, waterstops and other tight spacing. An appropriate concrete mixture shall be used, and the nominal maximum size of aggregate (NMSA) shall meet the specified criteria when evaluated for the congested area. Vibrators with heads of a size appropriate for the clearances available shall be used, and the consolidation operation shall be closely supervised to ensure complete and thorough consolidation at all points. Where necessary, splices of reinforcing bars shall be alternated to reduce congestion. Where two mats of closely spaced reinforcing are required, the bars in each mat shall be placed in matching alignment to reduce congestion.

3.6 JOINTS

Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure. In general, such joints shall be located near the middle of the spans of supported slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs, unless otherwise approved. Joints shall be perpendicular to the main reinforcement. All reinforcement shall be continued across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction or contraction joints in slabs on grade. Reinforcement shall be 2 inches clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 30 pound asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 03150aEXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

3.6.1 Construction Joints

For concrete other than slabs on grade, construction joints shall be located as indicated or approved. Concrete shall be placed continuously so that each unit is monolithic in construction. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least 24 hours old. Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete begins to lose its plasticity, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to

conform to structural requirements or architectural details. Where horizontal construction joints in walls or columns are required, a strip of 1 inch square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph Previously Placed Concrete.

3.6.2 Contraction Joints in Slabs on Grade

Contraction joints shall be located and detailed as shown on the drawings. Contraction Joints shall be produced by forming a weakened plane in the concrete slab by use of rigid inserts impressed in the concrete during placing operations, use of snap-out plastic joint forming inserts, or sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 1/8 and 3/16 inch wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent raveling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

3.6.3 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03150a EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

3.6.4 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200A CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1/8 inch in 12 inches. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

3.7 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03100a STRUCTURAL CONCRETE FORMWORK. Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive

honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

3.7.1 Class A Finish Finish

Class A finish is required where indicated on the drawings, and shall include all exterior and interior concrete surfaces which will be exposed to view. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2 inch in diameter or more than 1/2 inch deep, shall be repaired and, except as otherwise indicated or as specified in Section 03100a STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Defects more than 1/2 inch in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep. Metal tools shall not be used to finish repairs in Class A surfaces.

3.7.2 Class C and Class D Finish

Class C finish is required where indicated on the drawings. Class D finish is required on concrete surfaces that are to be permanently covered by soil backfill, such as foundation footings. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated or as specified in Section 03100a STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 1/2 inch deep or more than 2 inches in diameter shall be repaired. Defects more than 2 inches in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep.

3.8 REPAIRS

3.8.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inchesshall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

3.8.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class A finishes, more than 1/2 inch in diameter and, for Class C and D finishes, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.8.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inchesshall be outlined by saw cuts at least 1 inch deep. Defective areas less

than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.8.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that are otherwise so identified by the Project Office. Such defects shall not be repaired and that portion of the structure shall be completely removed and replaced.

3.9 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

3.9.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 50 degrees F. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still

plastic, to detect high or low areas.

3.9.2 Rough Slab Finish

As a first finishing operation for unformed surfaces, the surface shall receive a rough slab finish prepared as follows. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

3.9.3 Floated Finish

Slabs to receive more than a rough slab finish shall next be given a wood float finish. Areas as indicated on the drawings shall be given a float finish. Also, unformed surfaces of foundations, such as tops of stemwalls, and as a next preparation step for surfaces to receive a trowel or nonslip finish. The screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 1/4 inch and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Floating shall be performed by use of suitable hand floats or power driven equipment. Sufficient pressure shall be used on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

3.9.4 Troweled Finish

Areas as indicated on the drawings shall be given a trowel finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel-troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled 3 times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

3.9.5 Non-Slip Finish

3.9.5.1 Broomed

Exterior slabs on grade, driveways, sidewalks, exterior steps and surface which will be subject to vehicle and/or pedestrian traffic as shown shall be given a broomed finish. After floating, the surface shall be lightly steel troweled, and then carefully scored by pulling a coarse fiber push-type broom across the surface. Brooming shall be transverse to traffic or at right angles to the slope of the slab. After the end of the curing period, the surface shall be vigorously broomed with a coarse fiber broom to remove all loose or semi-detached particles.

3.10 EXTERIOR SLAB AND RELATED ITEMS

3.10.1 Exterior Slabs on Grade

Exterior slabs on grade such as driveways, patios, and other exterior slabs as required shall be constructed where shown on the drawings. After forms are set and underlying material prepared as specified, the concrete shall be placed uniformly throughout the area and thoroughly vibrated. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross section and to such elevation above grade that when consolidated and finished, the surface of the slabs will be at the required elevation. The entire surface shall be tamped with the strike off, or consolidated with a vibrating screed, and this operation continued until the required compaction and reduction of internal and surface voids are accomplished. Care shall be taken to prevent bringing excess paste to the surface. Immediately following the final consolidation of the surface, the slabs shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces. After finishing is completed but while the concrete is still plastic, minor irregularities and score marks in the slab surface shall be eliminated by means of long-handled cutting straightedges. Straightedges shall be 12 feet in length and shall be operated from the sides of the slabs and from bridges. A straightedge operated from the side of the slabs shall be equipped with a handle 3 feet longer than one-half the width of the slabs. The surface shall then be tested for trueness with a 12 foot straightedge held in successive positions parallel and at right angles to the center line of the slabs, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the slabs in successive stages of not more than one-half the length of the straightedge. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is true. Before the surface sheen has disappeared and well before the concrete becomes nonplastic, the surface of the slabs shall be given a nonslip sandy surface texture by use of a burlap drag. A strip of clean, wet burlap from 3 to 5 feet wide and 2 feet longer than the slab width shall be carefully pulled across the surface. Edges and joints shall be rounded with an edger having a radius of 1/8 inch. Curing shall be as specified.

3.11 CURING AND PROTECTION

3.11.1 General

Concrete shall be continuously cured by an approved method for at least 7 days.

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded. Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

3.11.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

3.11.3 Membrane Forming Curing Compounds

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.11.4 Impervious Sheeting

The following concrete surfaces may be cured using impervious sheets: slabs that will be permanently covered with a floor covering. However, except for plastic coated burlap, impervious sheeting alone shall not be used for curing. Impervious-sheet curing shall only be used on horizontal or nearly horizontal surfaces. Surfaces shall be thoroughly wetted and be completely covered with the sheeting. Sheeting shall be at least 18 inches wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.11.5 Cold Weather Curing and Protection

When the daily ambient low temperature is less than 32 degrees F the temperature

of the concrete shall be maintained above 40 degrees F for the first seven days after placing. During the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by suitable temperature measuring devices furnished by the Contractor, as required, and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor as directed.

3.12 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated on the contract drawings. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 3/4 inch. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed.

3.12.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed. The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

3.12.2 Nonshrink Grout

Nonshrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.12.2.1 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

3.12.2.2 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a parge coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

3.13 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based

upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once every 2,000 cubic yards of concrete production thereafter for conformance with ASTM C 1077.

3.13.1 Grading and Corrective Action

3.13.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.13.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.13.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.13.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When

either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.13.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during each day's plant operation.

3.13.5 Concrete Mixture

a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled as directed.

b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.

c. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143/C 143M for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.

d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.

e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.

f. Strength Specimens. At least one set of test specimens shall be made, for compressive strength, on each different concrete mixture placed during the day for each 250 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C

39/C 39M for test cylinders and. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

3.13.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.13.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.13.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

3.13.9 Curing Inspection

a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.

c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square feet per gallon, and shall note whether or not coverage is uniform.

d. Membrane Curing Corrective Action. When the coverage rate of the curing

compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.

f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.13.10 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.13.11 Mixer Uniformity

a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M.

b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.

c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.13.12 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --

DIVISION 4 – MASONRY

THRU

DIVISION 14 – CONVEYING SYSTEMS

NOT APPLICABLE

DIVISION 15 – MECHANICAL

15776 Water Source Heat Pumps
15777 Closed Loop Ground Coupled Heat Exchangers

SECTION 15776

WATER SOURCE HEAT PUMPS

PART 1 GENERAL

1.1 SCOPE

Work covered in this section includes furnishing all plant, labor, equipment, materials, and transportation necessary for installation of water source heat pumps required in this project.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Heat Pump Equipment; G, RE.

The Contractor shall submit shop drawings of the proposed installation of heat pump equipment including connections to piping, controls, ductwork, and electrical power.

SD-07 Certificates

Materials; G, RE.

The Contractor shall submit a certified list of materials or manufacturer's descriptive literature for all major materials proposed for use in work under this section.

Manufacturer's Warranty; G, RE.

The Contractor shall submit copies of the manufacturer's written warranty for all heat pump equipment.

PART 2 PRODUCTS

2.1 MATERIALS

Materials furnished under this section shall be standard products of manufacturers regularly engaged in the production of the items and the most current design which conforms to the requirements specified.

2.2 HEAT PUMPS

Provide factory-assembled and tested packaged water-source heat pump equipment as indicated, with manufacturer's warranty, consisting of cabinet; sealed refrigerant circuit including compressor, refrigerant to water heat exchanger, refrigerant to air heat exchanger (coil), and reversing valve; evaporator fans; hot water generator and refrigeration and temperature controls. Provide capacities and electrical characteristics as scheduled. Units shall be designed for use with ground loop heat pump systems.

2.2.1 Cabinet

2.2.1.1 Cabinet Construction

Provide manufacturer's standard galvanized steel or aluminum casing for ducted

models. Provide cabinet type as scheduled. Provide access panels for inspection and access to internal parts. Insulate cabinet with minimum ½-inch thick, 1.5-pcf density fiberglass insulation. Provide knockouts for electrical and piping connections. Provide condensate drain connection. Provide with integral filter rack or field-built filter rack to provide for easy filter replacement from front of unit. Cabinet shall be constructed with compartments, so that compressor, reversing valve, and water coil are out of air stream. Supplemental electric heater shall mount to unit discharge.

2.2.1.2 Instruction Plate

2.2.1.2 Contractor shall furnish embossed metal instruction plate permanently attached to each heat pump cabinet stating filter size and detailed filter changing procedure.

2.2.2 Evaporator Fans

Provide centrifugal type, direct drive fans with permanently lubricated motors.

2.2.3 Heat Exchangers

Provide insulated refrigerant to water heat exchangers of coaxial type, with inner copper water tube and outer steel refrigerant tube. Test and rate heat exchanger for 450-psi refrigerant working pressure.

2.2.4 Reversing Valve

Provide 4-way solenoid-active refrigerant reversing valve designed for fail-safe in heating position.

2.2.5 Compressor

Provide hermetic type compressor, installed on spring or rubber in shear vibration isolators and enclosed in acoustically treated enclosure. Provide high and low temperature cutouts and compressor motor overload protection. Provide capability to reset compressor lockout circuit at either remote thermostat or circuit breaker. Units over 15,000 BtuH shall have discharge muffler.

2.2.6 Internal Refrigerant Piping

Provide hard-drawn temper Type ACR copper tube with wrought-copper fittings and brazed joints.

2.2.7 Thermostats

Indoor thermostats shall be combination heating and cooling auto changeover type complete with subbase and shall conform to UL 873. Thermostats shall have a mode switch for OFF - COOL - HEAT, a fan switch for ON - AUTO, separate temperature setting indicators for heating and cooling modes. Two-stage heat required for units with electric heaters, and shall activate electric heat as second stage heater. Thermostats shall have low temperature setting 10 degrees F below setpoint for unoccupied control, momentary reset for 2-hour override. Outside air stat to lock out electric heat above 35 degrees F.

2.2.8 Ratings

Minimum efficiency ratings shall be 14.0 EER and 3.2 cop, in accordance with AAI 330 ratings.

2.2.9 Filters

Provide manufacturer's standard fiberglass throw-away type filters in return air stream.

2.2.10 Accessories

Isolation valves, pressure compensating automatic flow control valves, expansion valve, cycle protection, and internal vibration isolation. Domestic hot water generator heat exchanger built in, with DHWW circuit pump and control circuit and connections.

2.3 ELECTRIC HEATER

Supplementary electric heaters may be used for operating conditions below 10 degrees F only. Ground loop shall be designed to provide all heat requirements plus 10 percent for outdoor conditions 10 degrees F and above.

2.4 HOT WATER GENERATOR

Hot Water Generator which utilizes excess heat during cooling, and aid hot water generation at units COP rating in heating mode. Unit shall have a built-in water-to-refrigerant heat exchanger to eliminate field tie-in to refrigerant circuit. Unit shall include recirculation pump and controls, piped to water heater per manufacturer's instructions. Set control for 140 degrees F and domestic heater for 130 degrees F. Provide backflow preventer at connection to domestic water service for ground loop systems.

PART 3 EXECUTION

3.1 INSPECTION

Examine areas and conditions under which water-source heat pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION OF WATER-SOURCE HEAT PUMPS

3.2.1 General

Install water-source heat pumps in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

3.2.2 Electrical Wiring

Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

3.2.3 Verification

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.2.4 Ductwork

Refer to Section "LOW PRESSURE STEEL DUCTWORK." Connect supply and return ducts to heat pumps with flexible duct connections. Provide transitions to exactly match unit duct connection size.

3.2.5 Ground Loop Piping Insulation

Ground loop piping above grade shall be insulated.

3.2.6 Drain Piping

Connect heat pump drain pan to nearest indirect waste connection as indicated on Plumbing Plans.

3.2.7 Ground Loop Piping

See Section 15777 CLOSED LOOP GROUND COUPLED HEAT EXCHANGERS.

3.3 FIELD QUALITY CONTROL

Start up water-source heat pumps in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Schedule training with Owner; provide at least 7-day notice to Contracting Officer of training date.

3.4 SPARE PARTS

Furnish to Owner, with receipt, the following spare parts for each water-source heat pump: 2 sets filters for each unit.

3.5 ELECTRIC HEATERS

Electric heaters shall be installed in accordance with Unit Manufacturer's recommendations and controlled as a second stage of heating.

3.6 TESTING, ADJUSTING, AND BALANCING

Heat pumps shall be tested and balanced as specified in Section LOW PRESSURE STEEL DUCTWORK.

-- End of Section --

SECTION 15777

CLOSED LOOP GROUND COUPLED HEAT EXCHANGERS

PART 1 GENERAL

1.1 SCOPE

Work covered in this section includes all labor, equipment, materials, and transportation necessary for the following:

- Bore Holes
- Bore Hole Loop
- Bore Hole Grouting
- Ground Loop
- Debris Purging and Flushing
- Ground Loop Fill
- Permits and Inspections: The contractor shall obtain and pay for necessary Base, Municipal, State, and Water Board inspections and permits, and make such tests as are called for by regulations of such authorities. These tests shall be made in the presence of the authorized representatives of such authorities.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1693	(2001) Environmental Stress-Cracking of Ethylene Plastics
ASTM D 2581	(2002) Polybutylene (PB) Plastics Molding and Extrusion Materials
ASTM D 2666	(1996) Polybutylene (PB) Plastic Tubing
ASTM D 3350	(2002) Polyethylene Plastics Pipe and Fittings Materials

1.3 QUALITY ASSURANCE

1.3.1 Loop Contractor

The loop contractor shall have a certified installer (technician) trained by IGSHPA or an IGSHPA certified manufacturer's training program.

1.3.2 Ground Heat Exchanger Fabricators

Ground heat exchanger fabricators shall have completed a heat fusion school in which each participant has performed a heat fusion procedure under the direct supervision of an IGSHPA-certified heat fusion technician or DOT certified heat fusion technician.

1.3.3 Manufacturer Qualification

The system shall be the product of firms regularly engaged in the business of providing equipment earth coupled ground loop.

1.3.4 Regulations

All local and State laws and ordinances as they pertain to buried pipe systems shall be strictly followed or a variance obtained.

1.3.5 References

The Contractor shall submit references for work on a minimum of three (3) installations of similar or larger size.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G, RE.

Submit drawings indicating layout, construction, sizes, jointing, fastening, anchors, wiring, piping and miscellaneous accessories in detail.

SD-06 Test Reports

Tests; G, RE.

Provide a copy of all test reports to the Contracting Officer.

SD-07 Certificates

Technician's Certificate; G, RE.

References; G, RE.

Provide references for work on a minimum of three (3) installations of similar or larger size.

SD-08 Manufacturer's Instructions

Manufacturer's Data; G, RE.

Submit manufacturer's specifications and installation instructions on each component of the system.

SD-10 Operation and Maintenance Data

Manuals; G, RE.

Submit copies of the latest IGSHPA manuals.

PART 2 PRODUCTS

2.1 GROUND HEAT EXCHANGER MATERIALS

2.1.1 Pipe Materials

Acceptable pipe materials for the underground buried portion of the ground heat exchanger are polyethylene or polybutylene.

2.1.2 Warranty

The pipe and fittings of the buried system shall be warranted by the manufacturer for ground source heat pump service.

2.1.3 Identification

Provide information permanently marked on the pipe which will allow the pipe to be properly identified.

2.1.4 Specification

Specifications of polyethylene pipe will be by cell classification number. The specification of PE pipe shall be as follows:

· Pipe shall be manufactured with dimensional specifications of ASTM D2513 or F-714, as appropriate.

· Cell classification defined by ASTM D 3350 of ######Z.

· The resin shall exhibit not more than 20Z failures (F 20%) when tested for 192 hours or more under ASTM D 1693, Condition C.

2.1.5 Cell Classification

The minimum cell classification number acceptable for polyethylene pipe shall be PE345434C or PE355434C when tested under ASTM D 3350

2.1.6 Polybutylene Pipe

Specification for polybutylene pipe furnished under this specification shall be manufactured in accordance with ASTM D 2581. The material shall be as follows:

· Either Class B (general purpose and dielectric, in colors) or Class C (weather resistant, black in color containing not less than 2% carbon black.).

· Type II (density, 0.91 to 0.92 g/cm).

· Grade 1 (flow rate 0.25 to 0.75 g/10 min).

· For fusible pipe, dimensional standards are given by ASTM D 2666 and ASTM D 3350.

2.2 PIPE JOINTING METHOD

· The only acceptable method for joining buried pipe is by heat fusion process. No other method is acceptable.

· Polyethylene pipe joints shall be by the butt and socket fusion.

· Polybutylene pipe joints shall be by the socket fusion method.

· Follow the pipe manufacturer's recommendation for joining pipe.

2.3 GROUTING MATERIALS - ACCEPTABLE MANUFACTURERS

· Economy Mud Product, Houston, TX., Econoplug Grout

· Black Hills Betonite Company, Mills. WY.; Black Hills Grout

· American Colloid Company. Arlington Hts., IL.; Volclay Grout

2.4 GROUTING MATERIALS

· Grouting Materials: Bentonite Based Slurry.

· Use high-solid clay bentonite grout.

· Provide bentonite-water mixture of at least 20Z bentonite by weight of water.

· Grout shall have a permeability of less than 1X10-7 cm/sec.

2.5 DRILLING FLUIDS

· Drilling fluid shall be a fresh-water based mud.

· Non-dissolved fluid additives shall be bentonite.

· Drilling-fluid properties shall be maintained within the following limits using test procedures conforming to APIRP 138:

- o Weight (fluid density) - limits: 70-85 lb/cu. ft.
- o Viscosity limits: 32-40.
- o Filtration limits: 3/32 in., with maximum 20 cc water loss.
- o Sand-content (solids larger than 200 mesh) - limits: 2-4% by volume.

PART 3 EXECUTION

3.1 DRILLING METHODS

Use the hydraulic rotary or hollow-stem auger method for drilling 4-inch diameter holes. Provide 200-foot bore per nominal ton as indicated.

3.2 TRENCHING METHODS

Use the chain excavator method for trenching of horizontal header piping trenches. Where murky or sandy conditions exist, use a pipe guide mounted on the trenching boom to guide pipe into bottom of trench as it is excavated. Where trenches intersect, insert and wedge 2 x 6 dams at previously dug trenches to prevent dirt from entering previously dug trenches.

3.3 BORE HOLE LOOP INSTALLATION

Assemble each loop, laid out straight. Tape each bore hole loop to prevent spring back friction during loop insertion. Insert loop pipe into bore hole, tape scrap steel billet reinforcing steel to the ends of the loop to offset buoyancy of pipe. Test each loop section using water at a minimum pressure of 40 psi. Maintain pressure on piping section for a minimum of 24 hours with no loss of water.

3.4 TRENCH INSTALLATION

Remove all debris and rocks from bottom of trenches immediately after trenching operations. Remove debris and rocks with long handled tongs. Inspect trench to ensure that all debris is removed. Remove all rocks from edge of trench and top of spoils piles to prevent damage to piping during backfilling operations. Install pipe after testing on a sand bed, backfill around pipe with sand to 2 inches above pipe. Complete backfilling with spoil material excavated from trench. Compact backfill using hand compaction methods in maximum of 8 inches. No water jetting of backfill will be permitted. Before trenches are closed, verify that all header pipes are properly fabricated and installed. Test entire ground loop with water at pressure of 40 psi, for minimum of 24 hours without loss of water pressure. Measure pressure drop at inlet and outlet of each paralleled floor header to determine pressure difference, compare to calculated values. This test will be performed in accordance with manufacturer's recommendations. Submit the tests information in tabular form for review by the Contracting Officer.

3.5 GROUTING METHODS

Use grout pipe method to install grout materials in bore hole. Place grout in one continuous operation, keeping grout pipe submerged in grout and full of grout during grouting operations. Gradually remove grout pipe as annular space in the hole is filled. If the grouting operation is suspended temporarily, flush grout from the delivery system with a volume of water equal to that of the pump and the grout pipe to remove grout residue. Resubmerge grout pipe and continue grouting operations.

3.6 FLUSHING AND PURGING OF LOOP PIPING

Flush debris from piping and purge air from loop system. Pump sufficient water through the pipe loop in sections, as required to produce a flushing velocity of 2 feet per second. Submit a schedule indicating the Contractor's intended flushing rates to the Contracting Officer for review. Provide auxiliary pumps, as required, to accomplish the indicated flow rate for flushing and purging. The entire heat pump and ground loop system shall be filled with 25% by volume propylene glycol solution after flushing is complete. The system shall be circulated for 24 hours and then tested. The Contractor shall notify the Contracting Officer or authorized representative a minimum of 24 hours prior to performing the test. Pressurize the system to 30 psi. Run the circulating pump continuously for 48 hours. Check the static pressure, if less than 30 psi. Remove air from system and repressurize to 30 psi, and repeat the test. Notify the Contracting Officer or Authorized Representative 24 hours prior to performing each test.

-- End of Section --

DIVISION 16 – ELECTRICAL

NOT APPLICABLE

ATTACHMENTS

ATTACHMENT 1: A/E DESIGN GUIDE

ATTACHMENT 2: PRELIMINARY GEOTECHNICAL REPORTS

ATTACHMENT 3: DRAWING FORMAT (TRI-SERVICE STANDARDS)

ATTACHMENT 4: SAFETY AND HEALTH REQUIREMENTS MANUAL PROVIDED WITH RFP

ATTACHMENT 5: DRAWINGS PROVIDED WITH RFP

ATTACHMENT 6: HOUSING QUALITY VERIFICATION CHECKLIST

ATTACHMENT 7: CHAPTER 2 – PAVEMENT DESIGN ANALYSIS AND MATERIALS RECOMMENDATIONS

ATTACHMENT 8: IN-HOUSE SHELTER (FEMA DRAWINGS)

ATTACHMENT 1

A/E DESIGN GUIDE

ARCHITECT-ENGINEER INSTRUCTION MANUAL

FOR
DESIGN OF MILITARY PROJECTS

PREPARED BY
U.S. ARMY ENGINEERING DISTRICT
CORPS OF ENGINEERS
KANSAS CITY

April 1995

ARCHITECT-ENGINEER INSTRUCTION MANUAL

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CHAPTER 1

GENERAL INSTRUCTIONS

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CHAPTER 1

GENERAL INSTRUCTIONS

1. OBJECTIVE OF MANUAL. The objective of this manual is to instruct the Architect-Engineer (A-E) on the standards, policies, and basic requirements to be used in the preparation of design analyses, drawings, cost estimates, and specifications for Military Construction projects assigned to the U.S. Army Engineer District, Kansas City (the District). The A-E must be thoroughly familiar with the contents of this manual and with the whole system of instructional guides to efficiently design a military project for the District.

2. DESIGN CRITERIA, REGULATIONS, MANUALS AND STANDARDS. All facilities shall be designed in accordance with this Manual; the Corps of Engineers Manual entitled "General Safety Requirements", EM 385-1-1; the U.S. Department of Labor Safety and Health Regulations (OSHA Standards); and the Architectural and Engineering Instructions Design Criteria (CEMP-E) and other criteria as defined in the scope of work. The scope for each project may contain and/or reference specific instructions or criteria which will take precedence over this manual.

3. DESIGN PHASES. Project scope, requirements, and criteria are described in the Project Development Brochure (PDB) for Army Projects or in the Requirements and Management Plan (RAMP) for Air Force Projects. The drawings, design analysis, specifications, and cost estimate for each design phase shall be prepared in accordance with instructions contained within the appropriate chapters of this manual and the scope of work.

4. ESTIMATES. The A-E shall follow the Estimating Guide in this manual.

5. SCOPE AND SCHEDULE OF CONTRACT SERVICES. The specific requirements for a project will be defined in the scope of work. A-E contracts with this District normally provide for one or more of the following: (1) studies, (2) concept design, (3) preliminary design, and (4) final design. A-E contracts may contain optional provisions, such as a value engineering review, checking of shop drawings, preparing as-built drawings, or providing engineering services during construction. Occasionally, A-E contracts are for special services such as preparation of master planning studies or special reports. It is essential that all documents required in a submittal including required design analyses and cost estimates, be submitted at one time. Care will be exercised in the scheduling of completion dates to assure compliance with the above. The incremental submittal of segments of the required documents at any phase (i.e., concepts, preliminaries, finals) is not acceptable, except when specifically authorized in writing. It is the A-E's responsibility to complete, coordinate, and thoroughly check design documents according to the agreed-upon contract schedules.

6. REVIEW PROCEDURES. Design verification requires review to a degree commensurate with the complexity of the project. Submittals and reviews may be required at any of the various

phases. Such review will not relieve the A-E from performing all contract requirements, except as may be waived by written instruction. The scope of work indicates the specific submittals required. All data prepared by the A-E will be reviewed by the District for conformance with contract requirements; however, it is important that before submission the A-E review its design and carefully check and coordinate all elements thereof to ensure that the design is clear, consistent and complete. District comments will be entered into the Automated Review Management System (ARMS) for use by the A-E. The A-E will comply with all comments noted, except as provided below, making the necessary corrections on the original documents. If, during the correction of data, a difference of opinion develops concerning the marked corrections, or if there are any additional changes found necessary by the A-E, the A-E shall contact the project manager via telephone and discuss these differences. If the A-E has made changes other than those necessary to comply with review comments or there are still District comments which are not complied with, the A-E will annotate the "District Comments" in the manner indicated below. The notes will fully explain the reasons for non-compliance. In the event that the District agreed to withdraw or partially change a comment, the annotation will indicate the telecon date and who at the District agreed to the non-compliance (i.e., Ceramic tile in lieu of resilient flooring provided for Toilet No. 2, because . . . per telecon . . . date . . . between Smith and Peters).

7. AUTOMATED REVIEW MANAGEMENT SYSTEM (ARMS). The District uses the Automated Review Management System (ARMS). ARMS allows for A-E responses to review comments that have been entered into the system. The ARMS program operates on all MS DOS compatible microcomputers. The A-E will be given a copy of the program to incorporate all responses to the design review comments. The review comments and responses will be made part of subsequent design analysis submittals. Use of the system is described in the ARMS User Manual.

8. AUSTERITY IN DESIGN. All military design and construction shall be performed consistent with the principles of maximum economy. Materials and finishes shall result in minimum maintenance and first cost. Efforts shall be made to produce aesthetically pleasing structures, especially for buildings housing administration, housing, community, or morale activities. This embraces use of suitable facing materials to provide a more pleasing appearance, including use of picture windows, overhangs, architectural treatment of main entrances, and other measures. The basic concept is to achieve pleasing appearance with due consideration to economy of design and without resort to purely decorative features. This improved appearance concept does not apply to industrial type buildings located in industrial areas. Energy conservation and value engineering are also important design considerations. Where there is a difference of opinion concerning "Design Choice" it is District policy not to change the design, unless it is not acceptable for valid and specific reasons.

9. USE OF COMPUTER-AIDED ANALYTICAL PROGRAMS. The District encourages use of Computer-Aided Analytical Programs whenever this will result in cost reductions and/or improved design. These instructions establish procedures to facilitate monitoring of such use to assure that designs consistent with conventional methods and Corps standards are attained, and that maximum benefits are realized from system integration and data feedback.

9.1 Identification of Programs. The A-E shall furnish write-ups or identification of programs which the firm intends to use on major features of the work as part of its preliminary or concept submittal. The write-up shall contain sufficient detail so that the general method of solution and problem limitations may be identified and test problem data may be assembled for trial runs by the District if desired. When programs not otherwise identified are implemented while the work is in progress, output listings shall include enough input data and intermediate results to afford manual checks on the final results.

9.2 Data Files. Unless otherwise specified, data files used for final computations shall be retained by the A-E for the life of the construction contract. These materials shall be available to the District, without additional cost, at any time during said period.

9.3 Special Conditions.

9.3.1 When earthwork designs are processed by computer, plotted cross sections shall not be furnished except to clarify the structural or geometric arrangement of the proposed installation.

9.3.2 When plotted cross sections are not used to prepare quantity estimates, the A-E shall note in the outline and final specifications that plotted cross sections are not available for the bidder's inspection.

9.4 District Approval. The District's approval of any computer program or acceptance of computed results shall not relieve an A-E of any responsibility for accuracy of data or technical validity of assumptions and formula used.

10. SAFETY. All work shall include the necessary features required to produce a facility in which safety has been incorporated so as to conform to the established safety codes and regulations. Particular attention shall be given to such safety features as snowguards, windscreens, mechanical equipment guards, stairway head clearances, handrails, access hatches, ladder cages, fixed ladders, and non-slip treads. In addition to the CE Safety Manual EM 385-1-1 and OSHA Standards, all U.S. Army Materiel Command work shall be in compliance with AMC Regulation 385-100.

11. PUBLIC RELEASE OF INFORMATION. Any inquiries regarding a specific project shall be referred to the District Public Affairs Office, for an answer. The A-E shall not publicize nor release in any manner information or data in regard to projects on which it may be working or negotiating with this office, nor discuss prior to public release by this office, a project, any future program, or any planning with anyone not directly concerned with the design of the project.

12. REAL ESTATE. The A-E will at all times zealously guard against discussing real estate problems with property owners. Any real estate matters of a controversial or merely of an informative nature shall be directed to the project manager by either the property owner or the A-E

for solution or answer.

13. CLASSIFIED INFORMATION. Classified information obtained from this office will be treated in accordance with DD Form 254 and regulations specified in the contract concerning the protection of classified material. All such data shall be returned to this office on completion of design and prior to finalization of contract.

14. FEDERAL, STATE AND LOCAL POLLUTION ABATEMENT CRITERIA AND ENVIRONMENTAL PERMITS. The A-E shall be responsible for ensuring that the project is in full compliance with all applicable Federal, State and local environmental laws and regulations including but not limited to: National Environmental Policy Act (NEPA), Clean Water and Clean Air Acts, Endangered Species Act, Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), i.e., Superfund, etc. Specific responsibilities of the A-E are described in the scope of work.

15. CERTIFICATION OF ENVIRONMENTAL ACTION COMPLIANCE. Each U.S. Army Engineer District is charged with the responsibility of protecting the public interest in the waters of the United States, including wetlands. This is accomplished through a Department of the Army permit program. Under this program, the discharge of dredged or fill material into waters of the United States, which includes lakes, streams, rivers, and wetlands, requires prior authorization from the U.S. Army Engineer Districts under Section 404 of the Clean Water Act (33 USC 1344). Also, any work or structures in, over, or under a navigable water of the United States requires prior authorization from the U.S Army Engineer Districts under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 401). (Navigable water of the U.S. in the Kansas City District include the Missouri, Kansas, Osage, Gasconade, Lamine, Grand and Blue Rivers, and the Lake of the Ozarks.) Federal regulations require that a Department of the Army permit be issued by the U.S. Army Engineer Districts prior to the initiation of any construction on the portion of a proposed activity which is within the U.S. Army Engineers District's regulatory jurisdiction. Therefore, it is imperative that early contact be made with the appropriate U.S. Army Engineer District Regulatory Branch for activities that involve any waters of the United States, including wetlands, to determine if a Department of the Army permit will be required. Additionally, Section 404(b)(1) of the Clean Water Act requires the following sequencing steps to be followed when a Section 404 activity is proposed in a water of the U.S.: (1) alternatives must be examined to determine if the activity can be moved completely out of the water of the U.S. (avoid); (2) then alternatives must be examined to determine if the activity can be redesigned to reduce the impact to the water of the U.S. (minimize); (3) after completing both of the above steps, appropriate mitigation must be provided to mitigate for filling a water of the U.S. (mitigate). Appropriate U.S. Army Engineer District Regulatory Branches should be available to furnish guidance and advice on meeting all Department of the Army requirements under the above mentioned acts.

16. ENGINEERING INSPECTIONS/FIELD VISITS.

16.1 Visits to the Construction Site. Many projects contain features which must be built exactly as designed. Any changes to accommodate field conditions can result in the feature not

adequately performing its required function. Any such changes should only be made at the direction of the designers, and may necessitate a visit to the construction site by the designer during critical construction periods. The purpose of the visits shall be to inspect the project features to verify how field conditions compare with expected conditions, to observe conditions not fully covered in the design, and to assist field personnel in interpreting plans and specifications. The time and number of these field visits are dependent upon the project and shall be addressed in the scope of work for Title II services.

16.2 Critical Construction Features. The A-E shall identify in the specifications critical construction features of the work and require the construction Contractor to detail the construction activities on these features separately on Critical Path Method (CPM) or bar charts. The specifications shall require the construction Contractor to submit for review and approval sufficient submittals to assure that the critical requirements have been adequately addressed. In addition, the A-E shall prepare instructions to the field for those elements of the design that must be built as designed or that require designer approval for changes to accommodate field conditions. These instructions must describe those critical features and construction procedures that should be viewed by the designer. These instructions are to be submitted in draft form with the prefinal design review submittal and submitted in final form with the final, ready-to-advertise submittal.

CHAPTER 2

PRESENTATION OF DATA

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CHAPTER 2

PRESENTATION OF DATA

1. GENERAL. The standards for data presentation contained in this chapter shall be used in the preparation of all documents. If the format for a document is not prescribed herein, the format chosen by the designer must be approved by the District. Each volume of drawing data required by this manual to be submitted shall be adequately titled and dated. The name of the submittal phase, including percentage completed, shall be printed or otherwise marked on the cover sheet. Drawing sheets shall be consecutively numbered and indexed so that specific items of information can be easily located and referenced.

2. REFERENCE DOCUMENTS.

2.1 American National Standards Institute, Inc. Standards.

ANSI X32.2.4 Graphic Symbols for Heating, Ventilation and Air Conditioning (R1953).

ANSI Y32.2 Graphic Symbols for Electrical and Electronics Diagrams 1975

ANSI Y32.4 Graphic Symbols for Plumbing Fixtures for Diagrams Used in Architecture and Building Construction 1977.

ANSI Y32.7 Graphic Symbols for Railroad Maps and Profiles 1972.

ANSI Z32.2.3 Graphical Symbols for Pipe Fittings, Valves and Piping (R1952).

ANSI 172 Fire-Protection Symbols for Architectural and Engineering Drawings 1980.

2.2 Department of the Air Force Regulation.

AFR 89-1 Design and Construction Management

2.3 Department of the Army Engineer Manual.

EM 1110-1-1807 Standards Manual for US Army Corps of Engineers Computer-Aided Design and Drafting Systems

2.4 Instrument Society of America.

ISA-S5.1-1978	Instrumentation Symbols and Identification.
For updates:	American National Standards Institute 11 West 42nd Street New York, NY (212) 642-4900

2.5 Military Specification.

MIL-M-9868C	Microfilming of Engineering Documents 35mm, Requirement for

2.6 Military Standard.

MIL-STD-12C	Abbreviations for Use on Drawings, Specifications, Standards, and in Technical Documents, 15 June 1968.

3. DRAWING FORMAT.

3.1 Multiple Volumes. For designs that consist of more than 250 drawings, the drawing sheets shall be broken into volumes having 200 or fewer sheets per volume. However, the drawings for one facility shall not be divided between volumes. If there are more than 250 site development drawings, they should be broken into volumes of no more than 200 sheets, but they shall not be broken within a discipline. A separate cover sheet (with volume identification), index sheet, site development sheet and general legend sheets are required for each volume of drawings.

3.2 Grouping. A building or individual facility design shall be grouped in the design drawing package so that a single building may be withdrawn by deleting a consecutive block of sheets. Conversely, it shall be possible for the District to add a building to the bid package, if necessary.

3.3 Details. Typical sheets of standard details uniformly used on all buildings are acceptable. Sheets of standard details shall be prepared so that they can be reused if the design package must be divided into separate construction packages.

3.3.1 Each typical detail drawing sheet shall be limited to a particular design discipline. Standard detail sheets shall be organized by discipline as other drawing sheets.

3.3.2 Schedules and details peculiar to one facility shall not be shown in the standard details but with the group of drawings for the facility to which they pertain.

3.3.3 Arrangement of details on sheet shall be such that crowding of details to limit the

number of drawings in the set shall not be permitted. Extra sheets only partially filled shall be used if necessary in lieu of placing details on inappropriate sheets. Not less than 8 inches of clear space will be left above the title block.

3.3.4 Detailing shall be complete. Unnecessary or extensive details of standard products or items that are adequately covered by specifications, except installation details, shall not be included on drawings.

3.4 Designation. The A-E shall maintain control in packaging contract drawings by providing an easy reference to all drawings within a discipline. The drawing package shall be divided according to facility or system. The divisions proposed herein shall be utilized.

Discipline Designation	Discipline
T	General (i.e.,Index)
C	Civil
L	Landscaping
CE	Exterior Electrical
CM	Exterior Mechanical
A	Architectural
S	Structural
P	Plumbing and Process Piping
H	Environmental
M	Mechanical
FP	Fire Protection
E	Electrical
B	Communications
I	Instrumentation and Control
G	Geotechnical

If all of the drawings and details for small buildings can be consolidated and completely shown on one or two sheets, the symbol for the major discipline shall be selected in order to properly arrange the sheets in the package.

3.5 Drawing Layout. Printed drawings shall be bound on the left to permit mounting in a vertical map file. Adequate binding space shall be provided on the left side so that information placed near the border is convenient to read. Details shall be reasonably spaced on a drawing sheet and shall be arranged in a consecutive sequence. Associated details shall be separated from other groups of details and identified with a title, e.g., "Concrete Masonry Details." Orientation of plans shall be consistent, with north arrow pointed toward the top of the sheet or towards the left when necessary. When more than one plan is shown on a sheet the north arrow of each of these plans shall be oriented in the same direction.

3.6 Scales. Scales shall be selected to avoid overcrowded and cluttered conditions on the

drawings. Where necessary to maintain proper scale, drawings of large structures shall be placed on two or more sheets with appropriate key plans and match lines provided on these sheets. Reduction of the following scales or use of unusual scales shall be avoided. The letter scale notation (i.e. 3/4" = 1' 0") shall be indicated under the title of each plan, elevation, section, and detail.

*Site Plans for all disciplines - 1" = 30'

To avoid a crowded condition it may be necessary to use 1" = 20' or 1" = 10' profiles, details, and sections, as appropriate, for clarity.

**Floor Plans for all disciplines - 1/4" = 1' 0"

For large, open structures, a 1/8" = 1' 0" scale may be used, with congested areas such as toilet rooms, mechanical rooms, etc., being blown-up to 1/2" = 1' 0".

Reflected Ceiling Plans - 1/8" or 1/4" = 1' 0"

Roof Plan - 1/8" or 1/4" = 1' 0"

**Exterior Elevations and Cross Sections - 1/8" or 1/4" = 1' 0"

Interior Elevations - 1/4" = 1' 0"

Wall Sections - 1-1/2" or 3/4" = 1' 0"

Stair Details - 3/4" = 1' 0"

Other Details - shall be of sufficient size to clearly delineate the condition.

* Note: The scale shown is desired. Site plans shall be drawn at the scale of the survey data, when survey data is Government-furnished.

** Note: Scale of these items shall be the same.

3.7 Graphic Scale. A graphic scale for each of the different scales used on a drawing shall be placed on the drawing in an area approximately 5 inches wide immediately to the left of the title block.

3.8 Lines. Lines shall be opaque and of uniform width for each type of line. The degree of darkness (opacity) shall be the same regardless of the type of line. Adjustment of the line width shall be used to obtain required variations known as weight, density, or gage. Generally, four widths of lines will be used; i.e., thin, medium, thick, and extra thick. These lines shall have widths in the proportion 1:2:4:6, and the appropriate widths shall be governed by the size and style of the drawing, always reflecting the more important features more prominently than the secondary or

related features.

3.9 Lettering. Lettering shall be all capitals of single stroke commercial gothic style. Stroke opacity shall be the same as line work for the same medium used. Lettering may be either freehand or mechanical. Minimum height shall be 1/8 inch. Particular care shall be given to permit half-size reduction with character definition such that drawings may be reduced to 35mm film and blown back full size or half-size through four generations by microreproduction processes without showing evidence of filled-in loops or leaching of lettering. Vertical lettering is preferred; however, inclined lettering may be used, provided the angle of inclination is uniform. When making alterations or additions to existing drawings, special care shall be exercised to follow the same style and size of lettering, line work, and all other conventions on the drawings for uniformity. Lettering created by a CADD system shall be in accordance with EM 1110-1-1807, Standards Manual for US Army Corps of Engineers CADD Systems.

3.10 Dimensioning. Dimensions must be complete, accurate and fully coordinated for all phases of the design. Dimensions should be to points easily measurable in the construction, and should be laid out to eliminate refiguring in the field. Dimensions should be tied-in to column lines, etc., to facilitate checking. Plan dimensions for frame construction should be to face of stud (or sheathing) for exterior walls, to one face of stud for interior partitions, and to centerline of openings. For masonry construction, dimensions should be to nominal face of masonry and to jambs of opening.

4. SEQUENCE OF DRAWINGS.

4.1 Cover Sheet. The first sheet of each volume in a project shall be a cover sheet. The cover sheet shall include, as a minimum, the project title, project number, location, base map and execution year. The base map shall indicate the location of the project site. A space for the contract number should also be allocated on the cover sheet. The number and date of the Invitation for Bids (IFB) or Request for Proposals (RFP) is usually inserted here just prior to advertisement.

4.2 Index.

4.2.1 In general, the second sheet shall provide an index of sheets. The drawing index shall be included with each volume of drawings and shall be an index of all drawing sheets in all volumes. The drawing index shall identify by reference number, date and title each sheet within the set of drawings and list the number of sheets in each discipline group. The drawing index shall precede the site development drawings and each facility package. Designers shall provide sufficient spaces within the format for discipline and multiple building designation and separation, and for possible addition of drawings. For small sets of drawings, the index may be placed on the cover sheet. Sequence numbers shall not be used on projects unless directed by the District. Sequence numbers should be considered when there is more than one building in the project.

4.2.2 A signature block will be furnished by the District. This signature block shall be

placed on the index sheet located directly to the left of the title block and signed by the appropriate representative of the A-E firm prior to the project advertisement for bids.

4.3 Legend Sheets.

4.3.1 A legend sheet will be provided to the A-E firm on a diskette. Symbols shown shall be used to depict all work items. Symbols which conflict with those on the legend sheet shall not be used. Additional symbols, properly identified, that are necessary to depict any additional work items shall be added to this sheet. Appropriate portions from this sheet shall be used on small projects not requiring a separate legend sheet. The legend sheet should follow the index sheet. Color shall not be used to indicate concrete or any other symbol.

4.3.2 Individual discipline legends may be used and should be located on the first sheet of this group. If the complete legend sheet is also retained, add the note: "See Drawing, Sheet _____, supplemental legend."

4.3.3 When adapting HQUSACE Standard Plans which contain an existing legend sheet and/or legends on individual drawings, these legends shall be retained for those standard drawings only.

4.4 Abbreviations and Symbols. Abbreviations and symbols in MIL-STD-12C, and ANSI X32.2.4, Y32.2, Y32.4, Y32.7, and Z32.2.3 shall be used. Generally accepted professional standards are acceptable. When previously prepared drawings are site adapted, symbols may be altered to conform to those already in use. The triangular (delta) symbol shall not be used on any design; this symbol shall be used to designate revisions on drawings. An abbreviation sheet is available from the District on a diskette. Abbreviations shown on this sheet shall be used to describe all work items. Additional word abbreviations, not found on the abbreviation sheet but necessary to describe the work, shall be properly identified and incorporated with the other standard word abbreviations.

4.5 Site Plans.

4.6 Pavement.

4.7 Buildings (each set of building drawings shall be separate). For each building:

4.7.1 Architectural and Structural.

4.7.2 Utilities.

Sanitary Sewers and Waterlines and Sewer and Water details.
Gas Distribution or Steam Distribution and details.
Electrical Distribution and details.

4.7.3 Mechanical.

4.7.4 Electrical.

5. DRAWING MEDIA.

5.1 Original Drawing Sheets. Original drawing sheets shall be prepared on mylar polyester film furnished by the District. Only ink shall be used. The size of all drawings shall be size "F", 30 inches by 42 inches, with trim lines 28 inches by 40 inches, except in the case of OMA projects, where 24 inches by 36 inches drawings are requested. Printed formats on mylar are available from the District. Commercially available title blocks, north arrows, symbols, etc., similar to decals which adhere to drawings are not acceptable. Reproducible drawings shall also be mylar polyester film, 0.004-inch thick matte finished on both sides. Ammonia developed mylars and plastic-coated paper reproducibles are unacceptable. Reproducible drawings shall be wash-off mylars, except when reproducing continuous tone subjects, such as aerial photographs, renderings, etc., which shall be fixed line mylar.

5.2 Study Drawings and Sketches. Study drawings and sketches shall be prepared, when possible, on size "F" drawings, 30 inches x 42 inches, with the title block altered to permit the signature desired.

5.3 Drawings and Details. All drawings larger than 8-1/2 inches by 11 inches shall be suitable for half size reduction unless instructed otherwise. Reproduction processes for half size reduction do not accommodate shading in any form; therefore, shading will not be permitted on reproducible materials.

6. USE OF COMPUTER-AIDED DESIGN AND DRAFTING (CADD) SYSTEMS.

6.1 Requirements. Computer-Aided Design and Drafting (CADD) may or may not be required for a project. CADD will be the option of the government. If CADD is required, the A-E shall be responsible for delivering the drawings in the latest available version of Intergraph Corp., Microstation native format (.dgn), adhering to EM 1110-1-1807, Standards Manual for the US Army Corps of Engineers Computer-Aided Design and Drafting (CADD) Systems.

6.2 Files. When CADD is required, the A-E shall be responsible for returning to the District, either electronic files created by the A-E or files modified from existing source material supplied by the District. All electronic files shall be fully compatible with the latest version of Intergraph Corp., Microstation native format (.dgn). The CADD data shall be delivered on a 2.3 gigabyte tape cartridge with all data being copied to the tape using Intergraph Corp. CLIX Version 7.0 operating system 'scpio' command. A reproducible mylar or vellum "hard" copy in full-size shall be delivered with the electronic files.

6.3 Translation. The District will not be involved in any translation process. The District will only accept the final product suitable for full operation on the target system.

6.4 Standards. The drawing standards used shall comply with the Standards Manual for U.S. Army Corps of Engineers Computer-Aided Design and Drafting (CADD) System, EM 1110-1-1807, Parts 1 through 4. A-E's under contract will be provided a copy of the manual and a set of 5 1/4 inch diskettes containing the cell libraries, user commands, and font libraries as referenced by the manual. In addition to the above, a 5 1/4 inch diskette containing the District Master Cell library, Font library and Seed file will be provided to the A-E. This is to be used as a supplement to EM 1110-1-1807 and will assist the A-E in complying with specific requirements of the District.

7. PHOTOGRAPHS. Photographs of existing site and work areas should be made. When photographs are used on drawings to better illustrate existing conditions, they shall be a minimum size of 4" x 5", maximum 8" x 10," and shall be half-tone on positive film using an 85 line per inch screen. The positive half-tone film shall be printed on mylar and title added to orient photo with plan. All photo prints and negatives shall accompany final submittal of design drawings.

8. STANDARD PLANS. Standard plans and/or fully developed project plans, prepared by others, furnished for adaptation to another site, shall be carefully reviewed for technical adequacy, for conformance to criteria furnished, which may in some instances supersede data on the standard plans, and shall be corrected as required. When errors or deficiencies are found in the Definitive or Standard Plans, complete details with recommendation of corrective action necessary shall be reported by letter or form card, if available. Complete adaptation to the site and for connections to utilities at that site will be required. A polyester film reproducible of all Standard Plans and/or site adaptation plans will be furnished by the District. In the event that a good reproducible cannot be obtained, the District will furnish the A-E a print from which he shall prepare a new drawing. When Standard Plans are used, nonapplicable details will be deleted by erasure or eradication, rather than crossed out.

9. TITLE BLOCKS. Lettering in all title blocks shall be mechanical lettering and shall be in ink. The general project title shall be as assigned by the District prior to the first submittal and shall be shown in the title block of newly prepared drawings as directed by the District. Specific sheet titles shall indicate the actual contents of the data on the drawings. Alphabetical designations after the sheet number shall only be used when adding a drawing by amendment and/or modification. Each drawing for the particular facility shall be designated by the discipline designation and sheet number, i.e., E-6 is the sixth Electrical drawing. Cross-referencing shall be accomplished using sheet reference numbers. Each drawing shall be initialed by the designer, drafter, checker and the submitter. Assignment of drawing numbers provided by the District will be made prior to or during the concept review.

9.1 Site Adapted Drawings. The title blocks for site adapted drawings shall have all references to the previous project deleted from the title and revision block. If deletions are extensive, a new

title block and revision block may be cut in, using the same material as the drawing. Delete all amendment and modification notations and symbols throughout the drawings. A note similar to the one below shall be shown above the title block, indicating the project from which the drawing has been site adapted.

THIS DRAWING ADAPTED FROM FORT RILEY, KS
TACTICAL EQUIPMENT SHOP, PN 410
CONTRACT DACA41-90-C-0120

9.2 Standard Plans. Do not make any changes or deletions within the title block and revision block. Add the adaption notation, using the triangle symbol, in the revision block, i.e., 'Adapted for Fort Riley, KS.' The site name, location, title of project, line item number, drawing number, date and sheet number shall be placed above the title block, as shown below. Alternate location is to the left and near the title block. Leave a space for the contract number, which will be added by the District.

FORT RILEY, KS	
TACTICAL EQUIPMENT SHOP PN 410	
DWG NO AW 78-12-01	SHEET E-4
JAN 1994	DACA41-94-C-0126

10. DRAWING CHECKING. A thorough interference and coordination check for technical adequacy and dimensional accuracy shall be made by the A-E of the architectural, structural, mechanical, and electrical plans, of all buildings, together with all plans for exterior work before releasing for printing. Drawings shall further be checked against the completed specifications for inclusion of all details of construction, locations, sizes, gages, types, etc., of materials, equipment and facilities, referenced in the specifications.

11. DRAFTING TECHNIQUES.

11.1 Responsibility. THE A-E SHALL BE RESPONSIBLE FOR THE PREPARATION OF ALL ORIGINAL DRAWINGS THAT CAN OR WILL BE REPRODUCED LITHOGRAPHICALLY AT ONE-HALF THE ORIGINAL SCALE. Any drawings not found acceptable for half-scale reproduction will be returned to the A-E for corrective action. Therefore, the following instructions must be followed if clear legible drawings are to be obtained.

11.2 Workmanship. The quality of graphic workmanship must be maintained in all forms of drafting fundamentals. Ink linework and lettering shall be of sharp, crisp strength and able to withstand half-scale reproduction without image fade-out. Care should be taken to use a mylar polyester film that will readily take ink and from which ink will not flake off. Only high density waterproof ink specially formulated for mylar polyester film will be acceptable. Latex based inks

are not acceptable. Pencil, including plastic lead, will not be used or accepted.

11.2.1 All lines, lettering, cross-hatching, key maps and photos are to be drawn or placed on the front side of format. IN NO CASE SHOULD THE BACK SIDE OF FORMAT BE USED AS A WORKING SURFACE. ADHESIVE APPLIQUE FILMS ARE UNACCEPTABLE (requirement for half-scale reproduction camera work).

11.2.2 Where possible, the direction of the north arrow will be oriented towards the top or left side of the drawing. When more than one is showing on a sheet, or when several sheets show the same area, such as key map, grading and drainage, utilities, location plans and vicinity map, the north arrow of each of these plans will be oriented in the same direction.

11.2.3 To facilitate the location of project elements and the coordination of the various disciplines' drawings, all plans shall indicate a column line or blank grid. All floor plans except structural plans, shall show room numbers.

11.2.4 Appropriate key plans and match lines shall appear on segmented drawings. Key plans shall be used not only to relate large scale plans to total floor plans, but also to relate individual buildings to complexes of buildings. Key plans shall be drawn in a convenient location and have the same orientation as the segmented plan. The relative location of the represented plan area shall be indicated by crosshatching.

11.2.5 Building elevations shall be drawn on the sheet so that the main, normally the front, elevation is located in the lower left corner of the sheet. The elevation drawings shall be placed on the sheet in a clockwise sequence from the main elevation if all elevations can be drawn on one sheet.

11.2.6 Sight direction symbols shall be shown on site drawings and floor plans.

11.2.7 When new work is being added to existing facilities, the new work shall be clearly distinguished from existing features.

11.2.8 The District will furnish the A-E with the drawings to be used for site adapted projects. These drawings shall be used to the maximum extent possible. The title blocks shall be as stated in Paragraph: Title Blocks.

11.2.9 Avoid notes such as "see architectural" or "see structural." Always refer to a specific detail and sheet.

11.2.10 Keep the number of drawings to a minimum. Plan what will be on each sheet and combine where possible. On small projects, architectural, mechanical, or electrical site and roof plans can often be combined on one sheet.

11.2.11 Avoid match lines where possible.

11.2.12 All wall sections should be shown at relative elevations to each other on the same sheet.

11.2.13 Avoid ambiguity in notes. Notes may be placed on drawings to reduce the amount of repetitive drafting, provided that clarity is not lost and notes do not become ambiguous. General notes should be placed at the right-hand side of the sheet and, if possible, should be located on the first sheet in each set of civil, architectural, structural, mechanical and electrical drawings. Abbreviations should be avoided in notes as well as references to design criteria.

11.2.14 Avoid references to third parties. Only the "Contractor" and the "Contracting Officer" should be used. The terms "other", "owner", "engineer," etc., and references solely to the subcontractor or any other third party shall not be used on drawings.

11.2.15 The terminology used on drawings shall match that of contract specifications. The specification requirements may not be binding if terminology used on drawings and in the specifications are not consistent. Trade names and manufacturer's descriptions should be avoided in describing drawing notes.

11.2.16 The A-E will furnish the signed original mylar drawings. The drawings are the property of the U.S. Government.

12. REVISIONS TO DRAWINGS.

12.1 General. No changes shall be made after advertisement unless authorized by the District for inclusion in an amendment. Prior to changing any drawings issued for bids, reproducible file copies shall be made. After making the record reproducible, any "clouds" from a previous change shall be removed so that only the latest revision is emphasized.

12.2 Revision Identification. The triangular symbol is reserved for annotating revisions to the original drawings during advertisement. This symbol shall not be used otherwise. The triangle shall be placed on the drawing near each revision and a black grease pencil "cloud" drawn on the back of the sheet around the change and the triangle. In the case of CADD drawings, the cloud shall be placed on a separate level.

12.3 During Advertisement. During the advertising period, the triangles shall contain a numeric character corresponding to the amendment, i.e., amendment 2 changes shall be noted as 2.

12.4 After Contract Award. After contract award, modification changes shall be made using the modification designation, i.e., modification P00006 shall be noted as P-6.

12.5 Revision Annotation. Revised drawings shall carry a simple statement such as "AM.

No._____ deleted wall." Revisions to drawings reflecting written descriptive amendments and amendment sketches shall be described as "Revised to conform to AM. No. _____." The revision notation shall include the final subscript number. The A-E shall neither date nor sign in the revision block.

12.6 Amendment or Revision Sketches. The practice of issuing amendment or revision sketches or descriptive changes in lieu of revised drawings during advertisement is discouraged and shall be used only when time is of the essence and approved by the Project Manager. If permitted, descriptive changes and/or sketches must be complete. The original drawing shall be revised to incorporate the sketch data and reissued to Contractor and Construction Division after contract award. Conventions for describing revisions will include marking the area of the drawings with a "cloud" around the area revised, so that the area can be easily located and describing the change in the revision block.

CHAPTER 3

SITE DESIGN

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CHAPTER 3

SITE DESIGN

1. GENERAL. Site design includes all the siting requirements for the location and layout of a construction project. The image of a military installation is largely determined by the design character and siting of its buildings. Therefore, site design excellence is a prime goal for all military construction projects. To achieve this goal designers must seek to improve appearance and function of military projects by enhancing natural site assets; compatibly relating the natural and built environment; establishing an orderly organization of activities, circulation and open space; and achieving a consistent architectural character while promoting energy conservation and reducing maintenance.

2. INSTALLATION STANDARDS. The A-E shall use the Installation Master Plan and Design Guides when they are available and applicable. These documents establish specific design criteria and outline programs with which to implement improvements in the visual environment.

3. PLANS REQUIRED. Any or all of the following plans may be required to show the complete design requirements:

3.1 Concept Plans.

3.1.1 Location Plan

3.1.2 Site Plan

3.2 Final Plans.

3.2.1 Vicinity Map

3.2.2 Location Plan

3.2.3 Site Plan

3.2.4 Removal Plan

3.2.5 Landscape Plan

3.2.6 Landscape Details

3.2.7 Erosion Control Plan

3.2.8 Irrigation Plan and Details

3.2.9 Utility Plan

3.2.10 Grading and Storm Drainage Plan

4. DESCRIPTION OF PLANS.

4.1 Vicinity Map. A Vicinity Map consists of a small scale drawing of the project location, similar to a road map.

4.2 Location Plan. A Location Plan consists of a small scale drawing showing the Government property or reservation limit with the construction project site shown. The drawing shall show the facility approved Contractor access and haul routes, load limits on any bridges along haul routes, and the designated waste and/or borrow areas.

4.3 Site Plan. The Site Plan shall show all the site design and layout information necessary to field locate the buildings, drives, walks, roads, and all other appurtenances to be constructed on the project. The information shall be complete to the extent that every constructed item above and below the ground will be located by dimensions or coordinates. Site Plans shall be a scale of 1 inch equals 30 feet (1" = 30'). Other scales must be approved by the District. The Site Plan, prior to adding the dimensions, should serve as the base sheet to provide reproducible drawings for the Utilities Plan, the Grading and Drainage Plan, and the Landscape Plan. The Site Plan shall show all existing physical features and utilities within and adjacent to the work site that will remain after the proposed construction has been completed. Whenever the Site Plan occupies more than one sheet of drawings, a Key Plan shall be included.

4.4 Removal Plan. The removal plan will show the existing physical condition of the site before construction. The physical features usually include field survey information such as the above and below ground utilities; buildings, drives, roads and parking areas, walks, trees and tree sizes, shrubs, and other vegetation; and such facilities as retaining walls, athletic facilities, etc. Each physical feature to be removed shall be as indicated on the standard legend sheet and properly noted to be removed, to remain, or to be relocated.

4.5 Landscape Plan. A Landscape Plan showing trees, shrubs, ground covers, seeded and sodded areas, shall be prepared by the A-E. All unsurfaced ground areas disturbed by construction within the project limits shall be seeded and/or sodded. Seed mixes, rates, and fertilizer shall be obtained by the A-E from any of the following sources: County University Extension Services, USDA Soil Conservation District, Local Base or Post Agronomist. Criteria for design are: TM 5-803-13 (AFM 126-8). Specification for topsoiling are covered in the guide specification sections: "Grading", and "Excavation and Filling and Backfilling for Buildings".

4.6 Landscape Details. A standard Landscape Detail sheet will be furnished by the A-E. The A-E shall provide designs and details as necessary for other site furnishings and accessories that may be required for the project.

4.7 Erosion Control Plan. An erosion control plan and specification shall be prepared by the A-E showing berms and dikes, retention or detention ponds, silt fences and temporary seeded areas if determined to be necessary for the specific project.

4.8 Irrigation Plan and Specification. The Irrigation Plan and specifications shall be prepared by the A-E unless otherwise directed by the scope of work. The Irrigation Plan prepared by the A-E shall designate the trees, shrubs, ground covers, and lawn areas to be irrigated. The detailed irrigation system plan showing head locations, distribution lines and sizes, controller location, valve locations and sizes, etc., shall be Contractor designed in accordance with specifications prepared by the A-E. Drip irrigation systems are not allowed. These items, including design calculations, shall be submitted for approval to the District after the project is under construction.

5. SURVEY REQUIREMENTS. A field survey for design of the project shall be furnished by the District or by the A-E as directed by the scope of work. The survey requirements are as follows:

5.1 District Furnished Survey. The District will furnish to the A-E the engineering and topographic surveys for use on the project. The A-E shall review these surveys and perform onsite investigations to field check for as-built conditions as may be required. This verification shall also include field checking areas adjacent to the project site with recent construction, i.e., utilities and grading. The A-E shall promptly notify the District if additional surveys are needed.

5.2 Architect-Engineer Furnished Survey.

5.2.1 General. The A-E shall perform all engineering and topographic surveys for this project. The original surveys and field notes are District property and shall be furnished to the District. The following are minimum survey requirements for this project.

5.2.2 Horizontal and Vertical Control. Standard ground control survey methods shall be used to prepare surveys. Surveys shall incorporate basic control for which positions have been established, consisting of existing triangulation, traverse station monuments, markers and bench marks referenced to national datums (National Vertical Datum or North American Datum). The name and year of the national datum shall be shown on the survey map (NAD27, NAD83, NVD27, NVD89). The horizontal positions of project control shall be computed on the State Plane Coordinate System unless directed to establish a local system. The use of these control stations and bench marks by the A-E shall be fully documented on the survey and in the field notebooks. All benchmarks set shall be referenced to mean-sea-level datum (NVD29 and NVD 89) and described fully in the field notes and on the map. Show the combination factor used in the reduction to State Plane (scale factor x sea level factor).

5.2.3 Equipment and Use. Vertical control shall be established with spirit or self-leveling instruments. Trigonometric leveling or "total stations" shall not be used in setting vertical control or in determining the elevation of critical items such as floors, foundations, runways or taxiways, drainage structures, and utility lines. Horizontal control shall be established with equipment capable of producing the accuracies specified below.

5.2.4 Accuracy. The project survey shall meet or exceed the horizontal and vertical accuracy criteria as defined by the Standards of Accuracy and General Specifications of Geodetic Control Surveys established by the U.S. Department of Commerce. Horizontal control position of this survey and/or monumentation shall be within Third Order, Class I accuracy. The closing error of control leveling of this survey and/or monumentation shall not exceed 0.05 ft. times square root of M, where M is the miles of leveling. Computations for all control stations and bench marks shall be furnished to the District. Topographic mapping at any scale shall meet or exceed the criteria defined by the National Standards for Map Accuracy.

5.2.5 Limits and Scale. The survey shall cover the entire project area, and beyond, to include any requirements for connections to utilities, roadways, grading, and drainage. The scale of the survey shall be 1 inch = 30 feet (1" = 30').

5.2.6 Project Site Survey. The survey shall show all natural and manmade features to include all utilities above and below ground indicating types, sizes, depths, invert elevations, etc. Show all trees by species, diameter, and location. Show all infrastructure at a level of detail appropriate for the mapping scale and accuracy. Plot all ground shots to the nearest 0.1 foot and all hardened surfaces to the nearest 0.01 foot. Show all bench marks and other control points with elevations. Also, establish and show coordinate locations for key permanent points, i.e., streets intersections and corners of structures, and the control traverse of the survey.

6. PARKING LAYOUT shall be designed in accordance with TM 5-803-5 and the Uniform Federal Accessibility Standards.

7. COMBINING PLANS. Some combinations of site plans on a drawing sheet may be made when plans have relatively small amounts of data which can be legibly combined with another plan. The Location Plan and Vicinity Map may be combined on the cover sheet with the index, or placed on the same sheet as the Site Plan. The Site Plan and the Utilities Plan may be combined as one plan with the approval of the District, or they may appear as separate plans on the same sheet of drawings. Under no circumstances shall the Site Plan be combined as one plan with the Grading and Drainage Plan, although they may appear on the same sheet of drawings. Projects having little or no existing facilities to be removed may not require a separate site preparation plan, and the small amount of removals can be shown on the Site Plan.

8. WASTE AND BORROW AREAS. Unless specifically instructed otherwise by this office, the A-E shall determine the waste and/or borrow sites for the project in conjunction with the installation. Any waste or borrow area located on Government lands shall be clearly identified on a Location Plan and labeled in a manner which indicates the material acceptable for borrow or waste. The sites shall be selected to meet all existing regulations for pollution control and environmental quality as established by the City, County, State, and Federal Governmental agencies. Each waste area shall be checked for type of materials which may, or may not, be disposed in the area.

9. FENCING. Whenever a project requires that a fence be constructed along the Government

property line, the A-E shall show the limits of the fencing on the Site Plan, or if necessary to obtain complete clarity, on a separate drawing. All fences will be installed along the Government property line in such a way that no part of the fence, including apron and post foundations, encroaches on the adjoining property. Apron slant will be as directed; however, in no case will it extend beyond the Government property line. A detail shall be included on the drawings showing the relationship of the corner and line posts in reference to the property line. Corner posts will be set with concrete foundation tangent to property lines.

10. OUTDOOR SPORTS FACILITIES shall be designed in accordance with TM 5-803-10, AFR 88-33.

11. CONTRACTOR'S ACCESS AND HAUL ROUTES. Show on the location plan all access gates and routes to be used by the Contractor. Coordinate with the installation and the District.

12. CONTRACTOR'S STAGING AREA AND PARKING. Show areas for Contractor storage, temporary fencing, sheds, and parking for subcontractors and their employees if this information is available during design. Coordinate with the installation and the District.

13. WORK BY OTHERS. Any work, be it construction, relocation, and/or removal, shown on the drawings, which is not existing but to be performed by others shall be identified on the Site Plan, Site Preparation, Utilities and/or Grading and Drainage Plans as "N.I.C." (for "Not in Contract"). Note on each drawing that there is information on the drawings for work which is not in the contract.

14. DESIGN ANALYSIS. The design analysis shall specifically address concerns with energy efficiency in the areas of site layout, exposure, use of plant materials, and landforms to mitigate the adverse effects of climatic conditions and how exterior conservation efforts correlate with the approaches taken for the interior. The major portions of the conceptual analysis requires the approval of this office during the initial stages of the design. The design analysis shall describe layout conditions, landscape or planting problems, and turf considerations. Special attention shall be directed towards adverse soil conditions, climate, restricted use of water and erosion problems, plant materials, and turf types. See chapter: Design Analysis.

CHAPTER 4

FOUNDATIONS AND MATERIALS

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CHAPTER 4

FOUNDATIONS AND MATERIALS

1. GENERAL. Preliminary and final soils reports, complete with soil boring logs, will be furnished by the District unless instructed otherwise in the scope of work.

2. DESIGN ANALYSIS. The soil report provided by the District shall be included in the design analysis.

3. DRAWINGS. The following items shall be included in the drawings.

3.1. Location of Borings. Location of borings shown in the soils report shall be transferred to the site plan required by the chapter: Pavement Geometry, Grading, Drainage and Other Civil of this document.

3.2. Boring Logs (provided by the District).

3.3. Boring Log Legend (provided by the District).

CHAPTER 5

PAVEMENT, BASE, SUBBASE & JOINT DESIGN & TRAFFIC ANALYSIS

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CHAPTER 5

PAVEMENT, BASE, SUBBASE & JOINT DESIGN & TRAFFIC ANALYSIS

1. TYPICAL PAVEMENT AND ROAD SECTIONS. The A-E shall provide the following:

1.1 Traffic Summary. Summary of composition and volume of anticipated traffic using new pavements.

1.2 Design Calculations. Rigid and flexible pavement design calculations shall be furnished by the District unless otherwise instructed.

1.2.1 Pavement cross sections based on sketches provided with pavement design.

1.2.2 Pavement details showing interface between new and existing pavements and new pavements of different sections.

1.2.3 Pavement joint layout plans shall be furnished by the District unless otherwise instructed. The A-E shall provide plan views of all paved areas showing dimensions of lot, building footprint, door locations and locations of any protrusions into paved areas. Plan shall be at a scale of 1" = 10'.

1.2.4 Use District standard detail drawings for concrete pavement joint details.

Subdrain Details
Road Pavement Joint Details (with poured joint sealant)
Road Pavement Joint Details (with preformed joint seal)

2. PAVEMENT DESIGN CRITERIA.

2.1 Department of the Army and Air Force Technical Manuals.

TM 5-820-2 / 88-5, Chap 2 — Drainage and Erosion Control, Subsurface Drainage Facilities for Airfield Pavements (Mar 79)

TM 5-822-2 / 88-7, Chap 5 — General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas (July 87)

TM 5-822-5 / 88-7, Chap 3 — Pavements Design for Roads, Streets Walks, and Open Storage Areas (Jun 92)

TM 5-822-7 / 88-6, Chap 8 — Standard Practice for Concrete Pavements (Aug 87)

2.2 Department of the Army Technical Manuals.

TM 5-822-8 Bituminous Pavement, Standard Practice (Jul 87)

2.3 Roads and Parking Areas. Design shall be provided by the District unless otherwise directed. A particular type of pavement may be required based on anticipated types of vehicular traffic or other considerations.

CHAPTER 6

PAVEMENT GEOMETRY, GRADING, DRAINAGE AND OTHER CIVIL

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CHAPTER 6

PAVEMENT GEOMETRY, GRADING, DRAINAGE AND OTHER CIVIL

1. GENERAL. The instructions in this chapter provide guidance for the design criteria to be used and for the scope and content of the design documents required for each phase of the design. Items covered in this section include pavements, grading, drainage, railroads, fencing, storage tank enclosures, and traffic signage.

2. DESIGN CRITERIA. For a detailed listing of additional applicable design criteria, see the scope of work. All designs for airfields, railroads, and roadway projects shall be forwarded to the Transportation System Mandatory Center of Expertise (TSMCX) for review per ER 1110-34-1.

3. PRE-CONCEPT OR PROJECT DEFINITION DESIGN.

3.1 Drawings. Drawings shall contain, as a minimum, a location plan for a conceptual layout design of the storm drain system or culverts. The storm drain requirements may be shown on a composite utility plan for this phase of design. The site plan shall indicate type of pavement (Concrete, Bituminous or Gravel).

3.2 Design Analysis. The design analysis shall include a preliminary pavement design provided by the District. Storm Drainage will not require any calculation to support the sizes. A statement shall be provided on the capacity of the existing system to accept additional flow. Indicate if concrete curb and gutter will be used. The design analysis shall indicate pipe size that will be used for the cost estimate and a rough estimate of earthwork quantities. The design analysis shall state if borrow material is available on site. The design analysis shall indicate approximate amount of fill under buildings and roads. Minimum and/or maximum grades (% slope) will be stated.

4. CONCEPT OR PRELIMINARY DESIGN.

4.1 Drawings. Drawings shall contain, as a minimum, the following:

4.1.1 Site Grading Plan shall be at a scale of 1" = 20’ or 1" = 30, using the basic site plan layout (without siting notes and dimensions) showing the following:

4.1.1.1 Existing utilities to remain.

4.1.1.2 Existing grading contours. Tentative finished floor elevations of new buildings should be shown.

4.1.1.3 Uniform grades shall be labeled using slope arrows.

4.1.1.4 Proposed new culverts, storm drains, and subdrains with tentative sizes.

4.1.1.5 The A-E shall edit the following notes accordingly and add to the Grading Plan.

4.1.1.5.1 All elevations are _____ plus elevation shown unless otherwise indicated. Elevations refer to Mean Sea Level Datum.

4.1.1.5.2 Existing contours were interpolated from a topographic survey made _____. (Give Date)

4.1.1.5.3 Bench Mark. (Give location, description, and elevation.)

4.1.1.6 Show flow lines.

4.1.1.7 Location of borings.

4.1.2 Plan and profiles for all new roads, streets, and railroads, with horizontal curve information. Profile shall show all utilities existing and new. Plans shall be at a scale of 1 inch equals 30 feet (1" = 30'). Other scales must be approved by the District.

4.1.3 Two grading sections through each building, embankment, or road showing existing and finished grade lines.

4.2 Design Analysis. For a general discussion of format and scope, see chapter: Design Analysis. The following items, as a minimum, should be included (when applicable) under the chapter for Civil.

4.2.1 List of applicable criteria.

4.2.2 Summary of composition and volume of anticipated train traffic using new railroad tracks along with wheel loadings used to design the track structure.

4.2.3 Railroad track analysis calculations used to determine minimum rail weight, tie plate size, size and spacing of ties, depth of ballast and subballast, and depth of compacted subgrade.

4.2.4 Drainage area map showing the boundaries of specific drainage areas tributary to their respective drain inlets or culverts.

4.2.5 Storm run-off calculations for each drainage area.

4.2.6 Preliminary pipe sizing calculations.

4.2.7 All earthwork quantity calculations and a summary table with a discussion of the earthwork balancing.

4.2.8 Summary of composition and volume of anticipated traffic on roads, streets, open storage areas and parking areas.

4.2.9 Pavement design calculations provided by the District.

5. FINAL DESIGN. In general, the final design documents must include sufficient information for bidding and construction of the project. Specific requirements for plans, specifications, and design analysis are given below.

5.1 Drawings. Generally, the corrected and approved concept plans may be used as the basis for the final plans; however, all details necessary for bidding and complete construction must be included. The following information is required (when applicable) in addition to the previously stated requirements for concept plans.

5.1.1 New grading contours shall be provided on the site grading plan. New spot elevations shall be provided at the corners of buildings and parking areas, top of curb, changes in grade, etc.

5.1.2 Profiles of all new storm drains, subdrains, and culverts showing new and existing grades, pipe diameters and lengths, pipe slopes, invert elevations, top of grade elevations, top of man hole elevations, etc. Class and gage of all storm drain pipes should be provided.

5.1.3 Details of all storm drain and subdrain structures.

5.1.4 Storm drain and subdrain structure schedules showing A, B, C, and D dimensions of all structures.

5.1.5 Grading sections through new buildings and parking areas showing finished and existing grades, pavements, spot elevations, dimensions, slope percentage, ditches, etc.

5.1.6 Grading sections at significant events (intersections, utility crossings, bridges) NTE 100-foot intervals along major roads, streets, and railroads.

5.1.7 Chainlink fence details.

5.1.8 Traffic Signing and Striping Details.

5.1.9 A grading plan with finished contours or a plan and profile with complete horizontal and vertical curve data. Plan and profile drawing shall also show existing contours for bidding earthwork quantities.

5.2 District Standard Detail Drawings. A list of available standard detail drawings will be provided in the scope of work and will be furnished to the A-E upon request.

5.3 Design Analysis. In addition to the items required for concept or preliminary design, as a minimum, include (when applicable) design frost depth and the following:

5.3.1 Tabulation of capacities of new storm drains and culverts including: diameter and slope of storm drain pipes, design storm discharge and velocity for each storm drain pipe, maximum discharge capacity of each storm drain pipe, headwater depth of each culvert during design storm discharge.

5.3.2 Hydraulic capacity calculations for each new curb and area inlet.

5.3.3 Anticipated service life of all allowable storm drain pipe materials. Discussion of corrosion design for corrugated metal pipe shall include the soil Ph and resistivity used, anticipated service life of uncoated metal pipe and additional life provided by any required non-metallic coatings and paving.

5.3.4 Discussion of watertight joint requirements for storm drains. The A-E shall determine whether watertight joints are required for new storm drains.

5.4 Specifications. For a detailed explanation of the use of guide specifications see chapter: Specifications.

6. QUANTITIES. Earthwork computations shall be furnished to the District with project plans for checking purposes. The substantiating data to be furnished shall include a marked-up contour plan showing the exact location and the cross sections taken. These instructions are applicable to all graded areas including roads and parking areas where they are not specifically set out by separate cross sections on designated stationing. Additional data will be furnished as follows: Shrinkage factor, material obtained from building excavation material required for building fills, unsuitable material (estimated when required) and borrow. The A-E shall retain, in his files, the detailed computation sheets covering quantities paid for on unit price basis for all items pertaining to paving, drainage, etc., until the construction is completed. These computation sheets will be prepared in a legible form with identifying markings (drawing numbers, etc.) so that they may be easily reviewed. The computation sheets will be made available to the District upon request.

7. GRADING.

7.1 General. Positive drainage shall be provided for all areas and existing drainageways shall be utilized to the extent possible. It is desirable to direct drainage away from buildings to curb and gutter or road ditches. Swales between buildings and parking areas or roads shall be avoided, if possible. Parking areas shall be graded such that storm water is directed off to the sides, with curbs and gutter to control drainage, and not down the center of the parking area, where possible. Required excavation and embankment quantities shall be balanced to the extent possible without compromising the design. Special attention shall be given to sidewalks that are on the north (shaded) side of the building. These walks should be designed to ensure a freeze/thaw cycle does not result in the formation of ice on the walk. Ice on walks should be a safety consideration for all areas.

7.2 Design Criteria.

7.2.1 Department of the Army and Air Force Technical Manuals.

TM 5-822-2 - General Provisions and Geometric Design for Roads, Streets, 88-7, Chap 5 - Walks, Open Storage Areas (July 87)

7.2.2 Handicapped Standards.

Uniform Federal Accessibility Standards (1984)

7.3 Additional Criteria Limits.

7.3.1 Transverse Parking Area Grades:

7.3.1.1 Desirable minimum of 2 percent.

7.3.1.2 Absolute minimum of 1.5 percent for flexible pavement and 1 percent for rigid pavement.

7.3.1.3 Desirable maximum of 8 percent.

7.3.2 Longitudinal Parking Area Grades:

7.3.2.1 Desirable maximum of 4 percent.

7.3.2.2 Absolute maximum of 15 percent, 8-1/2 percent for handicapped use.

7.3.3 Ramp Grades:

7.3.3.1 Desirable maximum of 7 percent.

7.3.3.2 Absolute maximum of 10 percent for short distances only.

7.3.4 Gutter Grades:

7.3.4.1 Desirable minimum of 0.8 percent.

7.3.4.2 Absolute minimum of 0.5 percent.

7.3.5 Longitudinal Walk Grades:

7.3.5.1 Maximum of 15 percent in non-freezing climates.

7.3.5.2 Maximum of 10 percent in freezing climates.

7.3.5.3 Handrails shall be required when gradients are 10 percent or greater.

7.3.5.4 Maximum of 8.33 percent for handicapped accessible walks. See Uniform Federal Accessibility Standards for additional requirements.

7.3.6 Grades Away From Building:

7.3.6.1 Desirable minimum of 5 percent for 10 feet.

7.3.6.2 Desirable maximum of 10 percent for 10 feet.

7.3.7 Overlot Grades:

7.3.7.1 Minimum 1 percent for cohesionless sandy soils.

7.3.7.2 Minimum 2 percent for cohesive soils or turfed areas.

7.3.8 Minimum grade of 0.3 percent for channelized flow.

7.3.9 Ditch widths:

7.3.9.1 Absolute minimum of 4 feet.

7.3.9.2 Desirable minimum of 8 feet.

7.3.10 Maximum front slopes of 1V on 4H.

7.3.11 Maximum back slopes of 1V on 3H.

7.3.12 Bottom of ditches shall be a minimum of 0.3 feet below the bottom of adjacent pavement courses.

7.3.13 Provide a minimum drop of 6 to 8 inches at all personnel doors without structural stoops.

7.3.14 The use of steps in walks will be avoided whenever possible. The use of single riser steps is especially discouraged. When steps are unavoidable, they should have at least three risers and will be provided with handrails.

7.3.15 Double purpose walks are a combination of a straight curb and a concrete walk. There use shall be limited to area where the drainage flows away from the curb line or gutter. Details are attached to the concrete walk specification.

8. DRAINAGE.

8.1 Design Criteria.

8.1.1 Department of the Army and Air Force Technical Manuals.

TM 5-820-1 - Surface Drainage Facilities for Airfields and Heliports (Aug 87)
88-5, Chap 1

TM 5-820-4 - Drainage for Areas Other Than Airfields (Oct 83)
88-5, Chap 4

8.1.2 Department of the Army Technical Manuals.

TM 5-820-3 - Drainage and Erosion Control, Structures for Airfields and .... Helip

8.1.3 Engineer Manuals.

EM 1110-2-2902 - Conduits, Culverts, and Pipes (Mar 69)

8.2 Storm Run-off. Determination of storm run-off shall be in accordance with the method presented in TM 5-820-1/AFM 88-5, Chapter 1 or TM 5-820-4/AFM 88-5, Chapter 4. Sizing of storm drainage systems for developed portions of military installations such as administrative, industrial, and housing areas as well as roadway culverts shall be based on rainfall of 10-year frequency. Sizing of culverts beneath railroad tracks shall be based on rainfall of 25-year frequency. Drainage for non-developed areas of military airfields shall be based on rainfall of 2-year frequency. Protection of military installations against floodflow originating from areas exterior to the installation will normally be based on 25-year or greater rainfall, depending on operational requirements, cost-benefit considerations, and nature and consequences of flood damage resulting from the failure of protective works. Potential damage or operational requirements may warrant a more severe criterion.

8.3 Storm Drainage System Layout. The storm drainage system shall be designed so as to minimize the number of drainage structures required. Structures shall be located at all changes in direction of storm drain line, at the intersection of two or more storm drain lines, and where required to intercept rainfall runoff. The distance between drainage structures will be not more than approximately 300 feet for conduits with a minimum dimension smaller than 30 inches. Storm drain lines shall be located outside of paved areas to the extent possible. Under no circumstance shall storm drain lines be located beneath buildings. Existing storm drain lines located beneath proposed new building sites shall be relocated around the building. Curb inlets shall be spaced along two-lane roads so that the width of flooded areas does not exceed half the lane width. Where possible, a minimum drop of 0.2 feet between inverts of equal diameter storm drain pipes shall be provided at the centerline of drainage structures. Where storm drain pipes are of different diameters, the pipe

crowns shall be matched at the centerline of drainage structures.

8.4 Roof Drain Outfall Lines. Roof drain outfall lines (beyond 5 feet from the building) shall be of the same materials as the exterior storm drainage system. Minimum diameters shall be 12 inches for lengths over 50 feet and 8 inches for lengths under 50 feet. In addition, the diameter shall be at least 2 inches larger than the diameter of the line as it leaves the building. If a cleanout is not provided between the building and 5-foot line, one shall be provided just outside the 5-foot line if the line leaving the building is smaller than 12 inches. If the line leaving the building is 12 inches or larger, a manhole shall be provided just outside the 5-foot line. All changes in direction of outfall lines shall occur at storm drain structures except that cleanouts may be used in lines smaller than 12 inches. Roof drain outfall lines smaller than 12 inches may be tapped directly into storm drain lines by matching pipe centerlines if the diameter of the pipe being tapped is at least twice that of the roof drain outfall line and has sufficient capacity to handle the additional discharge. All outfall lines 12 inches and larger shall be considered part of the storm drainage system.

8.5 Storm Drain Pipe. Several factors should be considered in selecting the type of pipe to be used in construction. The factors include strength under either maximum or minimum cover being provided, pipe bedding and backfill conditions, anticipated loadings, length of pipe sections, ease of installation, resistance to corrosive action by liquids carried or surrounding soil materials, suitability of jointing methods, provisions for expected deflection without adverse affects on the pipe structure or joints, and cost of maintenance. Durability requirements of pipe materials shall be based on a design service life of 50 years unless additional design life can be justified. The service life of corrugated metal pipe shall be the sum of the lives of the nonmetallic protective coating, the metallic protective coating, and the basic metal pipe. The life of the basic metal pipe and metallic protective coating shall be the time to first perforation as determined using the California Chart (California Division of Highways Test Method 643-B). Always specify RCP under runways.

9. RAILROADS.

9.1 Design Criteria.

9.1.1 Department of the Army and Air Force Technical Manuals.

TM 5-850-2 - Railroad Design and Construction at Army and Air Force 88-7, Chap 2 - Installations (July 80), with Change 1 (Dec 89)

TM 5-627 - Maintenance of Trackage (Jan 74)

TM 5-628 - Handbook of Railroad Tract Standards (Apr 91)

9.1.2 Department of the Army Technical Manuals.

TM 5-370 - Railroad Construction (Sep 70)

9.1.3 American Railway Engineering Association (AREA) Publication.
Manual for Railway Engineering

9.2 Additional Criteria Limits.

9.2.1 New rails shall be 115-lb RE section. Relayer rail shall be 132-lb, 136-lb, 115-lb, 130-lb, or 133-lb.

9.2.2 Standard No. 8 turnouts or No. 10 turnouts for track required to handle 89 foot cars.

9.2.3 Turnouts shall not be permitted on curved track with horizontal or vertical curves.

9.2.4 Degree of curvature on running track.

9.2.4.1 Desirable maximum of 8 degrees.

9.2.4.2 Absolute maximum of 10 degrees.

9.2.5 Degree of curvature on access track.

9.2.5.1 Desirable maximum of 12 degrees.

9.2.5.2 Absolute maximum of 14 degrees.

9.2.6 Desirable maximum grade shall be 1 percent. Grades steeper than 1.5 percent are subject to approval and will require submittal of written justification.

9.2.7 Bank slopes of 1V on 2H maximum except where slopes are maintained by mowing a 1V on 3H maximum shall be used. Steeper cut slopes in rock are permitted, but are subject to approval.

9.2.8 Minimum ditch width of 8 feet.

9.2.9 Cuts or fills greater than 30 feet require soil and bank stabilization analysis.

9.3 Minimum Rail Section. Determination of minimum rail section shall be in accordance with Chapter 22, Part 3, Para 3.1, Appendix 1 of the AREA Manual.

9.4 Influence Curve. Using the design wheel configuration and loading the master influence curve provided in Chapter 22, Part 3 of the AREA Manual, the following shall be determined from Chapter 22, part 3, Para 3.2, Appendix II of the AREA Manual:

9.4.1 Maximum Track Depression. The maximum allowable track depression shall be 0.25 inches.

9.4.2 Maximum Bending Moment.

9.4.3 Maximum Flexural Stress in the Rail.

9.4.4 Maximum Intensity of Pressure Against the Underside of the Rail.

9.4.5 Maximum Rail Seat Load.

9.5 Tie Bearing Area. Determination of effective bearing area of tie shall be in accordance with Chapter 22, Part 3, Para 3.2, Appendix II of the AREA Manual.

9.6 Tie Flexural Stress. Determination of maximum flexural stress in the Tie shall be in accordance with Chapter 22, Part 3, Para 3.2, Appendix II of the AREA Manual. The maximum allowable flexural stress in a wood tie shall be 1100 psi.

9.7 Crushing Strength of Tie. The maximum allowable crushing strength of a softwood tie shall be 250 psi and the maximum allowable crushing strength of a hardwood tie shall be 400 psi.

9.8 Determination of Minimum Depth of Ballast. The minimum depth of ballast shall be determined in accordance with Chapter 22, Part 3, Para 3.3 of the AREA Manual. The maximum allowable intensity of pressure on the subgrade shall be 20 psi, unless the maximum allowable soil bearing pressure of the existing soils is less, in which case the maximum allowable soil bearing pressure shall be used. The maximum intensity of pressure on the ballast shall be 65 psi for wood ties. The Government will provide guidance on the rail support modulus for each project.

10. FENCING DESIGN CRITERIA. Contact the District for high security type chain link fencing requirements. Some documents may require a security clearance to obtain access to the criteria.

11. FUEL STORAGE TANK ENCLOSURES DESIGN CRITERIA.

11.1 Department of the Army Technical Manuals.

TM 5-848-2 - Handling of Aircraft and Automotive Fuels

11.2 National Fire Protection Association (NFPA) Publication.

NFPA 30 - Flammable and Combustible Liquids Code.

12. TRAFFIC SIGNAGE DESIGN CRITERIA. Unless otherwise directed, traffic signage shall be provided for all new roads. The A-E shall address traffic signage with the facility user. American National Standards Institute (ANSI) Standards:

D6. 1-1988 - Manual on Uniform Traffic Control Devices for Streets and Highways

CHAPTER 7

WATER AND WASTEWATER FACILITIES

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CHAPTER 7

WATER AND WASTEWATER FACILITIES

1. GENERAL. Items covered in this section include water supply and distribution systems, water treatment plants, outside fire protection, water supply for interior fire protection, sanitary sewage systems, industrial wastewater systems, pumping stations for water and wastewater and sprinkler irrigation systems.

2. DESIGN CRITERIA. For a detailed listing of applicable design criteria, see the scope of work.

3. COMPLIANCE WITH STATE OR FEDERAL WATER QUALITY STANDARDS. Effluent from treatment plants must comply with appropriate State and Federal water quality standards. See paragraph: Federal, State and Local Pollution Abatement Criteria and Environmental Permits, chapter: General Instructions.

4. PROJECT DEFINITION (PD) DESIGN (AIR FORCE ONLY).

4.1 Drawings. Drawings shall contain, as a minimum, the following:

4.1.1 The basic site layout including all existing utilities (i.e., water, sewer, gas, electrical, etc.) shall be provided.

4.1.2 All proposed utilities shall be indicated at their proposed locations including tentative sizes. Utilities shall be shown from their tie-in point with existing up to within the 5-foot line.

4.1.3 All potential interferences with utility routings including any existing infrastructure which may pose an obstacle.

4.2 Design Analysis. See chapter: Design Analysis for a general discussion of format and scope of the design analysis. As a minimum, the following should be included in the PD design submittal:

4.2.1 A tabulation of criteria and design analysis for the basis of design of all utilities systems, and/or components thereof. Provide a narrative description of all system design and the rationale for such proposal.

4.2.2 The A-E shall determine the adequacy of the water distribution system for fire protection by contacting the Fire Department having jurisdiction to obtain fire hydrant flow test results for locations pertinent to the site. Should this information prove unobtainable, the A-E shall promptly contact the District.

4.2.3 A separate section shall be included in the Design Analysis including the listing of unresolved items or criteria required to complete the final design. These issues shall be presented

by the A-E at the PD review in order to facilitate expeditious resolution.

5. CONCEPT OR PRELIMINARY DESIGN.

5.1 Drawings. Drawings shall contain, as a minimum, the following:

5.1.1 Water Distribution and Sewage Collection Systems (including building services). Using the basic site plan layout (without siting notes and dimensions) show the following:

5.1.1.1 Existing Utilities.

5.1.1.2 Proposed new lines with tentative sizes.

5.1.1.3 Proposed valves (including PIVs), lift station and manhole locations.

5.1.1.4 Proposed fire hydrant locations.

5.1.2 Water Supply Lines, Trunk or Outfall Sewers and Long Force Mains. Develop separate layout sheet showing:

5.1.2.1 Proposed routing and tentative sizes.

5.1.2.2 Existing utilities and aboveground features which could affect construction.

5.1.2.3 Show proposed locations for manholes, relief valves, blowoffs, isolation valves, etc.

5.1.2.4 For off-base portions show sufficient information to define the right-of-way required.

5.1.3 Pumping Stations.

5.1.3.1 Include a site plan showing structure location and exterior piping.

5.1.3.2 Include a floor plan of structures showing equipment layout and single line piping with tentative sizes.

5.1.3.3 Provide one section through structure showing pertinent elevations.

5.1.4 Water and Wastewater Treatment Plants.

5.1.4.1 Provide a site plan showing major unit treatment items and their

relationship to existing facilities. Include exterior yard piping (new and existing). For clarity, do not show site dimensions, siting notes or topographic contours on this drawing.

5.1.4.2 Include drawings showing schematic flow diagrams of the following:

Process flow
Solids handling
Chemical feed
Service water

5.1.4.3 Include a hydraulic profile.

5.1.4.4 For all buildings, include a floor plan showing equipment layout and single line piping with tentative sizes.

5.1.4.5 Provide at least one section through each structure showing pertinent elevations and pipe locations.

5.2 Design Analysis. For a general discussion of format and scope, see chapter: Design Analysis. The following items, as a minimum, should be included (when applicable) under the chapter for Water and Wastewater.

5.2.1 Water Supply.

5.2.1.1 List of applicable criteria.

5.2.1.2 Description of water source.

5.2.1.3 Design demands, pressures and required pumping heads.

5.2.1.4 Pump types, capacities and horsepower.

5.2.1.5 Listing of allowable pipe materials.

5.2.1.6 Well capacities and geologic data on water bearing formation.

5.2.1.7 Chemical analyses of water proposed for use.

5.2.1.8 Preliminary calculations necessary to support equipment and piping sizes.

5.2.1.9 Description of operating sequence and controls.

5.2.2 Water Storage.

5.2.2.1 List of applicable criteria.

5.2.2.2 Available and required storage.

5.2.2.3 Storage tank type, capacity and elevation.

5.2.2.4 Insulation and/or heating requirements, particularly dedicated fire water storage.

5.2.2.5 Controls and operating sequence.

5.2.2.6 Preliminary calculations necessary to support tank sizing.

5.2.3 Water Treatment.

5.2.3.1 List of applicable criteria.

5.2.3.2 Raw water quality (Chemical Analyses) and required finished water quality.

5.2.3.3 Required flow-through rate.

5.2.3.4 Type, size, and capacity of equipment required.

5.2.3.5 Pump types, capacity and horsepower.

5.2.3.6 Controls, instrumentation and proposed operating sequence.

5.2.3.7 Chemical type and dosages required.

5.2.3.8 Proposed disposal method for backwash water and chemical sludges.

5.2.3.9 All calculations necessary to support treatment plant capacity, equipment sizing, chemical dosages, etc.

5.2.4 Water Distribution Systems (Including Building Services and Non-Potable Fire Mains).

5.2.4.1 List of applicable criteria.

5.2.4.2 Peak and average domestic demands.

5.2.4.3 Fire flow required.

5.2.4.4 Available flow and residual pressures.

5.2.4.5 Listing of allowable pipe materials.

5.2.4.6 Preliminary calculations necessary to support pipe sizing, fire demands, domestic demands, etc.

5.2.5 Sewage and Industrial Wastewater Collection Systems (Including Building Services).

5.2.5.1 List of applicable criteria.

5.2.5.2 Average and peak contributing flows.

5.2.5.3 Capacity of existing system.

5.2.5.4 Special requirements of industrial wastewater systems including pretreatment.

5.2.5.5 Listing of allowable pipe materials.

5.2.5.6 Preliminary calculations used to develop peak and average flows.

5.2.6 Pumping Stations For Potable Water and Fire Water Systems.

5.2.6.1 List of applicable criteria.

5.2.6.2 Average, extreme peak and minimum flows.

5.2.6.3 Proposed pumping rates.

5.2.6.4 Pump types, capacity, head and horsepower.

5.2.6.5 Controls and operating sequence.

5.2.6.6 Discharge main materials and sizing.

5.2.6.7 Preliminary calculations used in determining flow rates and pumping heads.

5.2.6.8 Preliminary hydraulic transient (surge) analysis, if specified in the scope of work.

5.2.7 Wastewater Treatment Plants (Sewage and Industrial).

5.2.7.1 List of applicable design criteria.

5.2.7.2 Applicable State and/or Federal water quality and/or effluent

standards.

5.2.7.3 Complete lab analysis of wastewater to be treated.

5.2.7.4 Design flow rates.

5.2.7.5 Special requirements for industrial wastewater treatment (or pretreatment facilities), i.e. acid and/or oily wastewaters.

5.2.7.6 Cost effective analysis (life cycle cost) as required by Chapter 5, TM 5-814-3.

5.2.7.7 Narrative description of proposed unit processes including capacities.

5.2.7.8 Anticipated effluent quality.

5.2.7.9 Narrative description of instrumentation and controls.

5.2.7.10 Calculations necessary to support cost effective analysis, equipment sizing, design flow rates, etc.

5.2.8 Aqueous Film Forming Foam (AFFF) Wastewater Facilities.

5.2.8.1 List of applicable criteria.

5.2.8.2 Design flow rates.

5.2.8.3 Narrative description of the system including wastewater storage and diverter facilities.

5.2.8.4 Listing of allowable pipe materials.

5.2.8.5 Calculations supporting hydraulic design of the drainage system and tank sizing.

5.2.9 Sprinkler Irrigation Systems.

5.2.9.1 List of applicable criteria and/or design standards.

5.2.9.2 Precipitation rates.

5.2.9.3 Narrative description of the system including special requirements for trickle systems.

5.2.9.4 Listing of allowable pipe materials.

5.2.9.5 Preliminary calculations of total flow and pressure requirements.

5.2.10 Additional Requirements.

5.2.10.1 Sewers. Contact user to determine if sewers in the area are overloaded. Verify system capacity if sewers are known to be overloaded or if large sewage flows will be generated by the new facility. Do not route wastewater, other than domestic sewage, to the sanitary sewage system without adequate pretreatment and/or verification of compatibility with the existing treatment system. Exterior building service lines shall be 6-inch minimum diameter and 8-inch minimum diameter beyond the first manhole. Shut-off valves for raw sewage or sludge shall not be gate valves. Small lift stations (100 gpm to 300 gpm) should be of the submersible pump type with plug and check valves in a separate valve manhole. Where flows indicate pump capacities substantially below 100 gpm, consideration should be given to use of a submersible, grinder-type pump station (duplex) with shut-off and check valves located in the wet well. Force mains for grinder pump stations shall be 2-inch through 3-inch diameter. Wet wells and valve manholes shall be precast or cast-in-place concrete.

5.2.10.2 Oil/Water Separator. Wastewater streams containing petroleum products, or the potential thereof, shall be pretreated prior to discharge into the sanitary sewer system. An oil/water separator shall be provided for pretreatment, consisting of gravity separation of oil, grease, and settleable solids. The separator shall be located outside of the building and shall be of the pre-packaged (pre-manufactured) type suitable for the application. Cylindrical oil/water separators should not be used unless approved by the installation because of increased difficulties in operation and maintenance. Uncovered oil/water separators are preferred if there are no climate or air pollution constraints. If a waste oil storage tank is required, the tank shall be double-walled if it is buried. The pre-packaged unit shall be designed to provide adequate volume for grit settling and removal of accumulated grit. Consideration shall also be given to cathodic protection, surface and interior coating requirements, and the combined structural liveloads and deadloads which the unit will be subjected. The pre-packaged separator and the waste oil storage tank shall be a Steel Tank Institute (STI) tank and be fabricated, inspected, and tested in accordance with Underwriters Laboratories, Inc. (UL-58). Steel tanks shall be installed underground in accordance with NFPA Standard 30 unless otherwise required. The waste oil storage tank shall be equipped with an overfill alarm and leak detection monitoring system for the annular space between the tank walls. The leak detection monitor shall be supervised to a panel located within a nearby facility. The overfill alarm shall be connected to an audible alarm located adjacent to the tank. The A-E shall determine (with input from the User) whether a waste oil storage tank shall be provided with the separator. The following parameters shall be used for the pre-packaged oil/water separator design:

> The oil/water separator shall be designed for the maximum flow capable of flowing into the separator. Design temperatures of the oil-in-water mixture will be based on expected values (5 to 25 degrees C. typical) and an ambient air temperature range for the installation. The specific gravity(ies) of the oils and grease will range from .90 to .95. The total oil and grease concentration will range from 1000 to 2000 milligrams per liter (mg/l) unless existing data is available. The effluent requirements should be based on regulatory criteria. The separator

should be capable of achieving an effluent of 10 mg/l for oil droplets greater than 60 microns in diameter.

5.2.10.3 Septic Tank and Leach Field Systems. Septic tank and leach field systems shall be designed in accordance with TM 5-814-3 (AFM 88-11, Chapter 3) and applicable state or local standards. The A-E shall perform percolation tests at the exact site of the leach field. Any change in location will require new percolation tests.

5.2.10.4 Fire Flow Requirements. Determine Fire Flow requirements in accordance with the guidance contained in the scope of work.

5.2.10.5 Fire Hydrants shall be provided in accordance with all requirements as set forth in MIL-HDBK-1008. All fire hydrants shall be color coded as required by the user.

5.2.10.6 Waterlines and Force Mains. For design of waterlines and force mains use maximum Hazen-Williams "C" value of 130 for plastic pipe and 120 for other pipe materials.

5.2.10.7 Aqueous Film Forming Foam (AFFF) Wastewater Facilities shall be designed to handle by gravity flow the maximum flow rate and contain the maximum volume of wastewater including the water flow after AFFF concentrate is exhausted. The system shall not receive domestic sewage. Normal industrial wastewater flows shall not pass through the storage tank. AFFF wastewater shall be diverted to the storage tank automatically when fire suppression system is activated. No gravity drain shall be provided from the storage tank.

5.2.10.8 Sprinkler Irrigation Systems shall be Contractor designed or as otherwise directed in the scope of work. The system shall be completely underground, automatically operated by a central sprinkler controller, and capable of providing complete coverage over the area to be irrigated. Irrigation system design shall minimize the application of water to roads, drives, and walks. Water shall not be sprayed on buildings. Heads in turfed or seeded areas shall be either pop up spray or rotary impact type, dependent upon the size of the area to be irrigated. Precipitation rates shall be approximately equal between part circle and full circle heads when valved together. Irrigation system shall be capable of applying an equivalent of 2-inches of precipitation per week (or as otherwise indicated in the scope of work), over the area to be irrigated while operating during non-daylight hours. Areas containing trees, shrubs or ground cover requiring only a limited volume of water, and not readily covered by the sprinkler irrigation system shall have water supplied by a trickle or drip irrigation system valved separately from other areas.

5.2.10.8.1 Head spacing shall not exceed the manufacturer's recommendations for winds in excess of 10 mph. The A-E shall require the Contractor to submit design calculations for review. The Contractor shall also provide design drawings that include head spacing, system layout, pipe size, arrangement, pressures and patterns.

5.2.10.8.2 A reduced pressure principle backflow preventer shall be installed between the irrigation system and the potable water system, either in a mechanical room, or outside, on an aboveground concrete pad. Provide a self-draining, freezeproof shut-off

valve ahead of the backflow preventer when the irrigation system is located outside. A strainer shall be installed upstream of the backflow preventer with a screening element compatible with the emitters or sprinkler heads used and as recommended by the manufacturer. Vacuum breakers shall not be used in lieu of the reduced pressure principle backflow preventer.

5.2.10.8.3 Low points in the irrigation system shall be equipped with automatic drain valves to protect the system from freezing. The system shall also be equipped with an air connection to blow the water out of the system at the end of the season.

5.2.10.8.4 The system shall consist of standard, commercially available components so that at least three manufacturers can furnish the equipment. The components shall be products of manufacturers regularly engaged in the manufacture of such items and shall essentially duplicate those that have been in satisfactory operation for at least two years.

6. FINAL DESIGN. In general, the final design documents must include sufficient information for bidding and construction of the project. Specific requirements for plans, specifications, and design analysis are given below.

6.1 Drawings. Generally, the corrected and approved concept plans may be used as the basis for the final plans; however, all details necessary for bidding and complete construction must be included. The following information is required in addition to the previously stated requirements for concept plans.

6.1.1 Water Distribution and Sewage Collection Systems.

6.1.1.1 Profiles of all gravity sewers, waterlines and sewage force mains. Profiles may be omitted for short waterlines unless necessary to assure adequate cover or avoid interference with other underground facilities.

6.1.1.2 Indicate existing pipe material where new lines connect. Indicate type of connection and elevation.

6.1.1.3 Location of all valves, fire hydrants and similar appurtenances.

6.1.1.4 Appropriate water and sewer details.

6.1.1.5 For railroad or airfield pavement crossings, indicate installation method (open cut, boring, jacking, etc.).

6.1.1.6 Where lift stations are required, provide appropriate details showing piping required, pumps, valves and accessories. Include at least one section showing all required elevations.

6.1.1.7 For pavement cuts, show type of pavement to be removed and replaced.

6.1.2 Water Supply Lines, Outfall Sewers, Long Force Mains.

6.1.2.1 Include survey ties and/or bearings.

6.1.2.2 Include stationing in both plan and profile.

6.1.2.3 Show contours in plan.

6.1.2.4 Add appropriate notes, details, etc., for railroad and airfield pavement crossings.

6.1.3 Water and Wastewater Treatment Plants.

6.1.3.1 Complete equipment layout showing all required piping, valves, meters, pumps, etc. Show double line piping on all sizes 3 inches and larger.

6.1.3.2 Sufficient sections and details to permit construction.

6.1.3.3 Provide equipment schedules showing capacity, head, etc., for major items of equipment.

6.1.4 AFFF Wastewater Facilities.

6.1.4.1 Profiles of all gravity lines.

6.1.4.2 Appropriate details.

6.1.5 Sprinkler Irrigation Systems.

6.1.5.1 Sprinkler irrigation plan shall designate the trees, shrubs, bushes, ground cover, and lawn area to be irrigated. Provide flow and pressure requirements.

6.1.5.2 Appropriate details.

6.2 Specifications. For a detailed explanation of the use of guide specifications, see chapter: Specifications.

6.3 Design Analysis. For format and general scope, see chapter: Design Analysis. For mechanical items such as pumps, treatment equipment, etc., provide a listing of at least three manufacturers whose equipment will perform the desired function. In addition to the items required for concept or preliminary design the following items should be included.

6.3.1 AFFF Wastewater Facilities. Provide narrative and calculations pertinent to ultimate disposal (i.e. sewage treatment plant) such as maximum flow rate to the treatment facility.

6.3.2 Sprinkler Irrigation Systems. Provide complete flow and pressure calculations.

6.3.3 Water and Wastewater Treatment Facilities. Provide complete narrative and calculations describing pilot testing.

6.3.4 Pumping Stations For Potable Water and Fire Water Systems. Provide complete hydraulic transient (surge) analysis if specified in the scope of work.

6.3.5 Non-Government Facilities. Where water supply and/or wastewater treatment utilize non-government facilities, provide documentation showing coordination.

6.3.6 Other Documentation. Provide copies of pertinent correspondence and conversation summaries.

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CHAPTER 8

ARCHITECTURAL DESIGN

1. DESIGN EXCELLENCE. Excellence in architectural design is a primary goal for all military construction projects. Reaching this goal requires a commitment to architectural quality, and to design that is sensitive both to the surrounding community and to the specific needs of the building's users. Attention shall be given to functional requirements, an aesthetic solution compatible with the local environment, interior and exterior detail, siting, and energy efficiency and economy of design including life cycle cost. New facilities shall be harmonious with those existing facilities that are considered to be architecturally appropriate. It should be recognized that quality design does not imply added expense, and can often provide savings in operating, maintenance, and construction costs. Materials shall be selected and used with proper consideration for constructibility, durability and maintainability. Design decisions and material selections must have the supporting data necessary to justify the design adopted.

2. DESIGN CRITERIA. The design of buildings shall be in accordance with the instructions contained in this Chapter and in other applicable chapters of the A-E Instruction Manual. In addition, Corps of Engineers Guide Specifications and Technical Manuals, Using Service criteria publications, and the scope of work, all include applicable design criteria. Applicable requirements shall be incorporated from recognized national standards including the National Fire Codes, Life Safety Code, Occupational Safety and Health Standards (OSHA), and the Uniform Building Code. Applicable manuals covering specific buildings, equipment, or materials will be cited in the scope of work.

3. COMPLETE DESIGN. Since the designer has little chance to actively inspect the construction, and due to the undesirability of making changes after contract award, it is imperative that all items required in the construction, including minor fixtures and refinements, be included in the design. The design shall include sufficient detail to completely describe and locate all fixtures and accessories, and phases of the construction.

3.1 Interior Building Signage. Provide interior building signage as required by the scope of work.

3.2 Special Ventilation. The use of louvers, or door undercuts of a maximum of 1 inch, to provide adequate ventilation in janitor's closets, telephone rooms, toilets, and other similar rooms, may be permissible in some cases, if allowed by fire protection criteria.

3.3 Toilet Room Accessories. All toilet room accessories shall be provided for and located in the contract documents. Provide soap dispenser with metal container in public toilets, using powder type in shops and liquid type elsewhere. Use basin mounted dispensers where counter mounted lavatories are provided. Use accessory types as listed in current guide specification. Accessory types and mounting for handicapped use shall be in accordance with the Uniform Federal Accessibility Standards and the Americans with Disabilities Act (ADA).

3.4 Addition or Alteration Projects. For Addition or Alteration projects, As-Built drawings must be obtained from the appropriate office at the military installation. The As-Built drawings must be carefully compared with the construction in place and shall be revised as necessary to ensure that they are accurate and up to date. If needed to illustrate existing conditions, selected sheets of As-Built drawings may be included in the contract documents for information purposes only. The use of photographs to show existing conditions is strongly encouraged. The photographs must be of sufficient size and clarity to provide meaningful information.

4. DESIGN FOR SAFETY.

4.1 General Safety. Applicable provisions of the OSHA Standards shall be incorporated into the design where not inconsistent with Army or Air Force safety criteria. In cases of conflict, the standards in the Army or Air Force safety criteria take precedence. Questions on applicability should be referred to the District for resolution.

4.1.1 Stairs. Exterior stairs shall be provided with 6 inch wide safety treads. Interior stairs shall be provided with 3 inch wide safety nosings or safety treads. Stairs shall be properly proportioned, and shall have adequate clearances, in accordance with OSHA Standards, and NFPA 101, Life Safety Code.

4.1.2 Guards and Handrails. Guards and handrails shall be provided for all stairs having three or more risers, and for elevated platforms. No flight of stairs shall have an unbroken vertical rise of more than 12 feet (6 feet for handicapped). Toeboards will be provided at stairwells, catwalks, and elevated platforms to comply with OSHA standards.

4.2 Safety and Fire Protection. Safety and fire protection shall be an integral part of every building design. Recognized codes and accepted safety standards shall be followed for the design of all facilities. Of the various codes and safety standards, the National Fire Protection Association's "Life Safety Code" (NFPA document 101) shall take precedence. All applicable requirements of the Life Safety Code shall be incorporated into the design. Special attention shall be given to the application of fire codes as they relate to Life Safety. Features of Fire Protection such as area separation walls, smoke stop barriers, fire extinguisher cabinets, and exiting requirements must be clearly defined and coordinated. See Fire Protection chapter for additional requirements.

4.2.1 Features of Fire Protection. Features of fire protection, such as partitions or doors, shall be coordinated and provided to protect property and inhabitants from the hazards of fire occurrence. These features shall especially address the isolation of hazardous spaces or materials, the protection of egress components, and the coordination of such features with other (e.g. security) unusual functions connected with them. All such components of the fire protection shall be clearly indicated in the contract and review documents.

4.2.2 Exiting for Inhabitants. Emergency exits, equipped with exit devices, shall be provided for personnel safety in hazardous areas and places of public assembly. Design of these exits must facilitate rapid egress in accordance with the requirements of NFPA 101, Life Safety Code.

4.2.3 Special Coordination. The interrelationship between the requirements for Fire Protection, Life Safety, Tempest Shielding, Sound Control and Physical Security must be carefully studied. For example, individual doors that will satisfy more than a single requirement are generally not available. This can often mean that multiple doors in about the same location are necessary to cover any group of differing requirements, and unless they are correctly placed, can in turn interfere with one another's operation.

5. DESIGN FOR THE PHYSICALLY HANDICAPPED. Design features to accommodate the physically handicapped shall be in accordance with the Uniform Federal Accessibility Standards and ADA. The Using Service determines the applicability and scope of special design features based on their analysis of potential handicapped use. The designer must be sensitive to the special needs of the physically handicapped, and should actively promote the incorporation of accommodating features into the design.

6. DESIGN FOR ENERGY CONSERVATION.

6.1 Energy Conservation. Energy conservation shall be considered in the orientation and layout of all new buildings. All projects shall be designed to take advantage of solar energy when directed in the scope of work. Economic studies shall evaluate solar energy in accordance with Engineering Technical Letter (ETL) 1110-3-332. Solar systems shall be used where they will be cost effective over a 25-year life.

6.2 Weather Protection. Protection from the effects of weathering and the differences in interior and exterior environmental conditions, shall be an integral part of the design for all buildings. Particular attention should be given to areas heated to 68 degrees F for comfort. The elimination of frost and condensation must be fully accomplished.

6.2.1 Entrance Vestibules. Vestibules shall be provided at all main entrances and at frequently used secondary entrances. Vestibule length should be at least 2'-0" longer than the door width unless a greater length is required to accommodate the physically handicapped. Whenever possible, provide a longer vestibule length, offset alignment of the doorways, and other features which will minimize the possibility of both sides of the vestibule being "open" at the same time. This will better limit direct air infiltration through the vestibule. Recessed floor mats should be considered at entrances.

6.2.2 Exterior Entry/Exit Doors. Doors in exterior openings should generally be metal, 1-3/4 inches thick, and insulated. Metal doors shall be installed in metal frames. Wood doors, 2-1/4 inches thick, may be used for chapels, clubs, and similar buildings if desired for architectural treatment. Wood doors must be protected from weather exposure. Weatherstripping shall be provided for all exterior doors and thresholds. Double doors should be provided with a mullion or an astragal. Provide an appropriate means of eliminating the possibility that wind could catch and swing an unlatched door, to the point of damaging the door, door hardware, or exterior wall. Do not assume that a door closer will accomplish this. Entry/Exitways should be recessed or provided with wind screens whenever possible.

6.2.3 Stoops at Exterior Entry/Exit Doors. Where accumulated ice and snow could impede the opening of an exterior door, the platform stoop should be located approximately 6 inches lower than floor level. The step may be eliminated if overhead protection is sufficient to prevent accumulations of ice and snow. At entrances for the physically handicapped and at required fire exits, the step will be eliminated and overhead protection provided, and special attention will be given to wind screening.

6.2.4 Prime Windows. Prime windows shall be of a quality which satisfies all energy conservation requirements. In areas with winter design temperatures below 15 degrees F, windows in new buildings heated to 65 degrees F shall have double glazing, air infiltration rates less than 0.25 cfm, and resistance to condensation on interior surfaces. If metal windows are to be used they should have thermal break frames.

6.2.5 Louvers Through Exterior Walls. Louvers must be of a stormproof type. In areas subject to high winds, use two louvers or a louver with adjustable damper. Louvers greater than 4 feet wide will require a mullion. Do not place louvers where they are directly exposed to severe wind conditions.

6.2.6 Joint Sealing. The design of caulked and sealed joints shall be in accordance with TM 5-805-6 and Guide Specification 07920. Caulked joints should be avoided on the interior of buildings. Where interior caulking is required in painted surfaces, a paintable caulking shall be specified.

7. DESIGN FOR LOW MAINTENANCE. Maintenance is a substantial factor in the ultimate cost of a building and must be considered in the design. The majority of military facilities, and especially dormitories, recreation facilities, and shops, will receive rough usage in excess of that contemplated in normal commercial practice. Buildings must be designed to withstand rough usage with a minimum of maintenance.

7.1 Selection of Interior Doors. Metal doors shall be used at interior locations subject to above normal humidity, dampness, or damage, and where fire-rated assemblies are required. Doors fabricated of stainless steel, aluminum, or other special materials shall be used at interior locations (sterilizing rooms, washracks, etc.) subject to excessive humidity or dampness. Natural finish, flush, solid core wood doors shall be used in locations where appearance is important, and the functional requirements are not above normal. Generally such doors should be of Stain grade, hardwood veneer. Plastic laminate faced doors may also be appropriate for some projects. Hollow core doors may be used only when so directed.

7.2 Protecting Partition Finishes. External tile corners in kitchen areas shall be protected with rigidly attached stainless steel corner guards. Guards shall also be provided at corners in all buildings where wheeled or cart traffic is anticipated. Bumper rails may be required where cart traffic is severe. Guards and rails, either metal or plastic, should be provided at locations where hard use and damage are expected. Bullnose masonry units shall be used wherever possible at vertical corners of interior partitions, except at door and window jambs, to reduce chipping.

7.3 Concrete Masonry. Lightweight concrete masonry units shall not be used where exposed to the weather. Use only standard weight concrete masonry in such locations, and carefully plan and describe how the material used will be protected from the effects of moisture absorption from exposure to the weather. Several of the military installations have very specific criteria about what methods are acceptable to them. The use of exposed or painted concrete masonry surfaces shall be kept to maintenance, shop, mechanical and janitor closet type areas.

7.4 Partition Stiffness. Interior nonbearing masonry partitions containing hinged doors shall be a minimum of 6 inches thick. Adequate provisions must be made for the installation of "wall-hung" fixtures. Generally, this will include special mounting plates, floor mounted fixture carriers, and/or increased partition thickness. Special supporting members shall also be included in every partition which is to carry the weight of an equipment item, or similar extra load.

7.5 Access to the Roof. A roof access hatch shall be provided to facilitate roof inspection and the maintenance of roof mounted equipment. The hatch may be omitted on structures with no roof mounted equipment and with sloping roofs, when specific approval is requested and granted.

7.6 Ceilings Exposed to Unusual Conditions. Where ceilings will be exposed to unusual amounts of moisture, humidity, or other potentially damaging conditions, provide materials and assemblies able to endure these conditions.

7.7 Floors Exposed to Unusual Conditions. Where flooring will be exposed to unusual and potentially damaging conditions, provide materials and assemblies able to endure these conditions. Acid resistant floors shall be either ceramic tile or quarry tile with furan-resin grout as required by the guide specifications.

8. NOISE CONTROL. Noise Control shall be considered in all building designs. Both internal and external sound shall be controlled. Where possible, use should be made of building orientation, room arrangement, etc., to reduce noise problems. Conventional building materials should generally be used for sound suppression. The services of an acoustical consultant should be utilized where noise control problems are severe. Special construction to reduce aircraft noise shall be in accordance with current Army or Air Force policy as applicable.

9. BUILDING INSULATION.

9.1 General. Insulation materials shall be used to create the optimum degree of energy efficiency within criteria. Placement of insulation shall be clearly thought through and identified. Use detailing which allow discontinuous planes of insulation to lap one another. Structural beams and columns, window mullions, etc., shall be insulated to prevent excessive condensation and frost. All uses of insulation shall include a careful analysis of the control of moisture vapor. Metal roofing is particularly likely to reach temperatures which can condense uncontrolled moisture vapor and lead to serious damage to the facility.

9.2 Quantity of Insulation. Required U-values for building elements shall be in accordance with current Army and Air Force criteria. U-value calculation shall be included in the design

analysis. The R-value of insulation shall be indicated on the drawings.

9.3 Acceptable Fire Characteristics of Insulating Materials. Current regulations require that unprotected insulating materials have a flame spread rating of 75 or less and a smoke development rating of 150 or less. Cellular plastic insulations do not generally meet these requirements, and may only be used as permitted by Chapter 9 of the Architectural and Engineering Instructions, Design Criteria. The visible facing of exposed insulation should be unmarked and must meet the flame spread and smoke developed requirements for interior finishes.

9.4 Insulating Walls. The preferred methods for insulating exterior building walls are to use rigid insulation in the cavity of masonry walls, or blanket insulation on furring or between stud framing. Loose fill insulation will not provide acceptable insulating values.

9.5 Insulating Roofs. The preferred method for insulating the roof of a building is to place the insulation on the structural roof deck. Insulation at the ceiling line is sometimes permitted where there is nothing located above the insulation that would be adversely affected by temperature extremes, but the designer must request approval of this choice as early in the design process as possible, and there are very few situations where it has any advantage.

9.6 Insulating at the Building Perimeter. Perimeter insulation shall be provided for all heated buildings. Thickness shall be 2 inches. Insulation should be placed on the inside face of the foundation, extending down to top of footing or to design frost depth, whichever is less.

10. ROOFING.

10.1 Selection of Appropriate Roofing Systems. Consideration of the most appropriate roofing materials and systems must occur early in the design process. In general, where building size and configuration allow, roofing systems other than built-up roofing should be considered first. There are special requirements for using these roofing systems, and for using them at different locations, or between Army and Air Force work. These special requirements can involve such things as placement or type of insulation, the form of the subdeck required for the type of roofing, slope minimums and maximums, and other features which will impact the appearance and structure of the facility. The designer should review the Guide Specifications for each kind of roofing he is considering, at the earliest appropriate time, to determine how such requirements will impact the design.

10.1.1 Shingle Systems. For economy, asphalt strip shingles are recommended on buildings where size or configuration allow for simple roofs of appropriate slope. Slopes of 4-inches on 12-inches or greater are preferred, but slopes as low as 2-inches on 12-inches may be used with self-sealing shingles using application methods recommended by the shingle manufacturer.

10.1.2 Metal Standing Seam Systems. Metal standing seam concealed fastener roofing systems may be used, especially where high roofing reliability is required. Slopes of 2-inches on 12-inches or greater are preferred, but lower slopes may be permitted where dictated by the building design.

10.1.3 Single-ply Systems. Single-ply elastomeric roof systems can be considered for use in some locations, and for some kinds of building types. However the governing criteria for single-ply roof systems must be determined for each individual project. Consequently, they and sprayed-on membranes shall be considered only where they will provide a significant advantage, based on the building design, where specifically requested by the using service, and when specific approval is requested and granted. Primary roof slopes shall be 1/2-inch per foot minimum.

10.1.4 Built-up Systems. Where built-up roofing is used, the primary roof slope shall be 1/2 inch per foot. The structural roof deck shall be sloped to provide the primary roof slope. Secondary slope in valleys shall be at least 1/4 inch per foot. Tapered insulation or light weight fill may be used to provide the secondary slope. Where wet fill material is used, venting must be provided to permit drying out of the fill material. The specifications for built-up roofing include a variety of special requirements designed to improve the quality of the installed roofing. These requirements include increased Contractor quality control, and make the roofing system manufacturer responsible for part of the work.

10.2 Roof Drainage. The roof drainage system shall be designed to minimize leaks to the interior of the building, and to minimize damage due to winter freezing. There are special requirements for acceptable roof drainage systems at different locations, or between Army and Air Force work. Generally a perimeter drainage system with exterior downspouts will be the most satisfactory, but the designer must request approval of his choice of roof drainage system as early in the design process as possible.

10.3 Roof Parapets. The use of parapets shall be eliminated where possible. Parapets have contributed to premature roofing failures due to the action of ice against the flashings.

11. USE OF GUIDE SPECIFICATIONS.

11.1 Guide Specifications. Guide Specifications are prepared by the Corps to achieve the maximum uniformity in contract specifications. The guide specifications describe the type and quality of material and installation normally acceptable for Corps construction, and often represent specific agreement between the Corps and the applicable industry. The technical provisions of the guide specifications should not be changed without justification. Optional materials shall be retained unless there is a requirement to match existing construction or the optional materials will not meet performance requirements.

11.2 Details and Descriptions. Complete descriptions including specific size, gauge, and configuration are included in the guide specifications for a wide variety of items. The designer must be familiar with the guide specification requirements in order to provide details fully coordinated with the specification descriptions. Terminology used on the drawings shall be the same as used in the guide specifications. Where it is desirable to detail at variance with the standard provisions of the guide specifications, the specifications must be revised to coordinate with the details.

11.3 New Guide Specifications. New guide specifications shall be edited for site-adaptation projects. Use of the Standard Specification, if furnished with the Standard Drawings, shall be

limited to those specialty type items not covered in the regular sections of guide specifications.

11.4 Specifications for New Items. When the A-E prepares specifications for items which do not have HQUSACE guide specifications, the specification shall be formatted in the HQUSACE standard format. The A-E must take extra care in the preparation of new specifications to insure that the specification is non-proprietary, yet provides complete information on the product and its installation.

12. MISCELLANEOUS REQUIREMENTS.

12.1 Control Joints. Control joints in masonry walls shall be extended through the applied finish. To prevent shrinkage cracking, plastered surfaces shall be provided with control joints at corners and at other designated intervals given in the guide specifications. Control joints shall be located on the plans and indicated on elevations.

12.2 Interior Waterproofing. Provide membrane waterproofing in the floors of gang toilet rooms located above inhabited spaces. Ceramic tile shower floors shall be installed over nonferrous shower pan. For Air Force projects, the specific provisions of Military Handbook 1190, "Facility Planning and Design Guide," shall be followed. Shower walls shall be adequately waterproofed.

12.3 Door Swing. The swing of doors shall be coordinated to prevent interference between doors or with the flow of traffic.

12.4 Ventilation. Provide fixed wall louvers, roof ventilators, or other devices to provide ventilation for spaces not fully controlled by the facility air-handling system. Coordinate with mechanical to assure that louvers with the same appearance are specified throughout.

12.5 Flashings. Flashing shall be carefully integrated into the final design. The sections and details shall show properly designed flashing at all locations where consistent with good practice and as required by the guide specifications. Flashing must be designed with turnups to divert water to the wall exterior. Where interior finish is exposed masonry, window sills should be of two-piece construction with the flashing turned up in the joint. Flashing shall project a minimum of 4 inches beyond jambs into the masonry. Building expansion joints must be carefully and thoroughly detailed. Details should be provided for flashing joints where required.

12.6 Exterior Face Brick. Exterior face brick shall extend to two or three courses below grade. Coordinate brick ledge and finished grade.

12.7 Overhead Coiling Steel Doors. Because of vibration, thermal insulating, noise insulating, and infiltration characteristics, overhead coiling steel doors shall not be used in exterior openings of occupied buildings, such as administrative or housing facilities.

13. ARCHITECTURAL DRAWINGS.

13.1 Drawing Scale. Architectural work shall be drawn at the scales noted in chapter:

Presentation of Data. Other scales may be used only by written authorization from the District. All disciplines should use the same scale for plan sheets.

13.2 Legends. Standard material symbols to be used on the drawings shall be those as indicated on the Legend Sheet. Additional material symbols should be added to the Legend Sheet as needed for each project.

13.3 North Arrows. North arrows shall be oriented the same on all plan sheets and on all disciplines.

13.4 Repetitive Drafting. To reduce repetitive drafting, portions of wall sections, etc., may be shown in outline if the information is presented elsewhere at a larger scale. For items such as folding partitions, where the installation detail will vary depending on the product approved, detailing on the contract drawings should be kept diagrammatic or generic, and should indicate the information necessary to integrate these items into the rest of the construction. Repetition in detailing should generally be avoided. Details that simply illustrate totally standardized items or procedures should be omitted.

13.5 Area Tabulation. The first Architectural Plan Sheet shall include a square footage area tabulation for new building.

13.6 Modular Design. Modular Design practices shall be followed in the design of all masonry buildings. Modular dimensions shall be based on the structural (backup) wythe and figured to whole or half-unit lengths (in increments of 8 inches) in order to reduce on-site cutting of masonry. Units less than 8 inches long shall be avoided. Brick veneer masonry coursing will normally start 5-1/3 to 8 inches below the floor line.

13.7 Symbols. The Room and Door Numbering system shall be consistent for all buildings designed under any one contract. Where plans are site-adapted, the symbols need not be changed to the District standards, except those related to the identification of amendments and modifications to a contract. The standard symbols for Amendments or Modifications (see chapter: Presentation of Data) to the contract shall not be used for any other purpose and care must be taken to avoid using even similar appearing but technically different symbols. Room numbering shall start at the main entrance and proceed clockwise around functional areas.

13.8 Schedules. Schedules for room finish, doors, etc., shall be clear and complete. As many columns as necessary should be provided in order to present the essential information. The "Remarks" column should not be used as a substitute for an information column. Normally a single item should be presented on each schedule line. Category group scheduling will be permitted only for buildings with a large percentage of repetitive rooms. Other scheduling methods as standard with the A-E may be used if approved by written authorization through the District.

13.9 Notes. Notes may be placed on drawings to reduce the amount of repetitive drafting, provided that clarity is not lost. General notes should be placed at the right-hand edge of the sheet and, if possible, should be located on the first sheet in the set.

13.10 Dimensions. Dimensions must be complete, accurate and fully coordinated for all phases of the design. Dimensions should be to points easily measurable in the construction, and should be laid out to eliminate refiguring in the field. Dimensions should be tied-in to column lines, etc., to facilitate checking. For masonry construction, dimensions should be to nominal face of masonry and to jambs of openings. Dimensions on CADD Drawings shall be accurate to within 1/8".

13.11 Facility Elevation. The elevation of the first floor shall be indicated as 100'-0". Elevation for other floors, footings, etc., shall be related to this figure. Sea level elevations shall not be shown on the building drawings. Elevations of the first floor above sea level shall be shown on the grading plan.

13.12 Access to Utilities. Utilities within the building, such as piping, ductwork, electrical work, etc. should be concealed to the maximum extent possible in finished areas. The clear space above ceilings and the size of chases must be carefully figured to accommodate piping slopes and connections, ductwork crossovers, and similar situations. Access must be provided to valves, cleanouts, etc. Space provided for utilities system must be adequate but should not be excessive. Avoid locating mechanical and electrical rooms near entrances. Exterior equipment and dumpsters shall be hidden behind screen walls. Mechanical and electrical rooms shall be located on grade with access directly to the outside.

13.13 Reflected Ceiling Plans. Reflected Ceiling Plans shall be provided for all large or significant acoustic tile ceiling areas, and for lobbies, waiting rooms, conference rooms, Commander's office, etc., regardless of ceiling material. Reflected plans shall show the ceiling tile layout where applicable and all light fixtures, air diffusers, grilles, registers, and other ceiling mounted items. The fixtures and other equipment shall be laid out in a regular pattern symmetrical with the ceiling tile grid, or symmetrical with the room centerlines, columns, windows, or other feature that dominates. Fire rated walls and wall heights shall be shown on the reflected ceiling plans.

13.14 Standard Drawings. Standard Drawings, when furnished for site adaptation, will generally be utilized without basic architectural change. Portions of the drawings not pertinent to the project will be deleted. Specific instructions will be given when design changes are required.

14. DESIGN ANALYSIS. The design analysis shall follow the format described in the chapter titled "Design Analysis" of this manual. The design analysis shall address the following items, as applicable.

14.1 General Parameters.

14.1.1 The purposes, functions, and capacities of the facility.

14.1.2 The desired image or visual appearance of the exterior and interiors of the building, and how this facility coordinates with the image criteria of the installation on which it will

be constructed.

14.1.3 The number of personnel to use facility; military, civilian, and visiting personnel.

14.1.4 The type of activities, equipment, and vehicles involved.

14.1.5 The anticipated life of the functions to be accommodated.

14.1.6 The type and method of construction; permanent, temporary, or relocatable.

14.2 Functional and Technical Requirements.

14.2.1 Functional areas, occupant capacities, and allocation, including a functional relationship matrix.

14.2.2 All items of equipment, required.

14.2.3 Occupational safety and health.

14.2.4 Handicapped accessibility, and provision of blind vending areas operated by state agencies.

14.2.5 Energy conservation including solar energy applications and energy budget goals.

14.2.6 Sound and vibration control.

14.2.7 Interior parking and service areas.

14.2.8 Physical security; lock and keying, intrusion-detection, alarms, restricted access areas, interior guard/canine support, and ties to local authorities.

14.2.9 Signage; directional, informational, and motivational.

14.2.10 Selection of exterior and interior finishes and materials.

14.2.11 Moisture Vapor Control.

14.3 Design Objectives and Provisions.

14.3.1 Adaptation of the building to the size, shape, and orientation of the site to include benefit from natural warming and cooling effects afforded by the site.

14.3.2 Organization of functional spaces to establish workable adjacency relationships.

14.3.3 Building layout to establish convenient circulation flows during normal operation and emergency evacuation activities, for materials, equipment, services, and people.

14.3.4 Grouping spaces into sound-compatible zones and protective construction zones, e.g., for fire, storm, and fallout.

14.3.5 Space layout compatible with modular (structural and environmental) support systems.

14.3.6 Type of construction materials, architectural systems, and finishes to include basis for selection.

14.3.7 Building expandability/changeability.

14.3.8 Physical security.

14.3.9 Barrier-free design.

14.3.10 Energy conservation (passive, insulation, orientation).

14.3.11 Acoustical design.

14.3.12 Moisture vapor condensation design.

14.3.13 Composition of masses and spaces architectural compatibility and architectural details to reflect the desired image, and the scale and nature of the activities involved.

14.3.14 Perception of the building details and volumes. (Specific provisions made, e.g., an identifiable sequence of viewing positions for experiencing the architectural and interior design.)

14.3.15 Enhancement of materials and systems maintenance and operation.

14.3.16 Economy of building construction, operation, and maintenance: life-cycle cost effectiveness.

14.4 Coordination with Installation or Outside Agencies.

14.4.1 Physical security support.

14.4.2 Blind vending operations.

14.4.3 Occupational safety and health, as required.

14.4.4 Government furnished equipment.

14.4.5 Make-up of signage.

14.4.6 Operations and maintenance support.

14.5 Calculations.

14.5.1 Net room areas, occupant capacity and gross building areas. (Categorize areas and capacities under the titles of "Operational Space Requirements", "Administrative Space Requirements", "Storage Space Requirements", and "Support Space Requirements".)

14.5.2 U-values for each wall, window, door, or roof type studied or selected.

14.5.3 Ratio of exterior window and room area, if applicable.

14.5.4 Acoustics, if applicable.

14.6 Sketches. All sketches presented to the user during the project definition phase of design shall be reduced to 8-1/2" by 11" and included in this design analysis to document the design options evaluated during the design process.

15. PRE-CONCEPT (PC) DESIGN (ARMY) OR PROJECT DEFINITION (PD) DESIGN (AIR FORCE). PC/PD design shall be completed in two phases.

15.1 Phase 1. The first phase is the conceptual phase and shall involve the development of program information, functional relationship bubble diagrams, flow diagrams, free hand one line concept site and floor plan sketches and freehand one-line concept elevations. The conceptual phase is the innovative/discovery phase of the architectural process. Freehand one-line concept site and floor plan schemes will be developed and presented to the customer for comment and approval. The presentation shall include a list of pro's and con's on each of the presented site and floor plan schemes and the presenter shall discuss the design intent, desired image, materials, and architectural compatibility of each scheme. This step provides the customer an opportunity to confirm the program, budget, and functional relationships and allows the customer to buy in to the design solutions presented.

15.2 Phase 2. The second phase shall be further refinement of the design solution and shall include building cross sections, typical interior and exterior wall sections, scaled two-line floor plans and elevations, special features plan (fire protection, security, etc.) and a perspective. Floor plans need to indicate overall control dimensions, room names and numbers, general notes, north arrows and a gross area tabulation. All sketches presented to the customer during the first phase of the project definition design shall be included in the Design Analysis along with the meeting minutes and a functional relationship matrix.

16. CONCEPT DESIGN (ARMY) OR EARLY PRELIMINARY DESIGN (AIR FORCE).

16.1 Drawings.

16.1.1 Floor plans shall be double-line drawings showing the functional arrangement, location of all openings and fixtures, and control dimensions. The plans shall indicate door swing and window type; however, door and window schedules are not required. North arrow shall be shown on each floor plan. The first plan sheet shall include a gross area tabulation for the building. A-E suggestions for plan improvement shall be fully shown and justified in the preliminary documents. For large buildings that require the floor plans to be divided into areas, provide a double line Composite Floor Plan of the entire building, drawn at the largest scale practicable to include the entire building or floor level on a single sheet. Include:

Overall and Control dimensions
Match Lines for combining individual portions of floor plans
Room Names and Numbers
Structural Column or Bay Indicators
Wall and Building section cuts
Door Swings
Square Footage
General Notes

Also provide a Key Plan at a uniform location on all Floor Plan sheets which shows the interrelationships between the building portions. When dimensioning, use arrowheads, not dots or slashes. Where major structural elements are included as parts of architectural detailing, do

not indicate sizes. These elements should all be fully defined as part of the structural design documents.

16.1.2 Provide four building elevations to show the general appearance and architectural treatment. Elevations shall be dimensioned to show story height, total height, and relation to grade.

16.1.3 One building cross section shall be included to show general framing method and height of ceilings and partitions. Identify materials used and necessary dimensions.

16.1.4 Drawings shall include at least two typical wall sections drawn to scale of 3/4" = 1'-0" showing vertical control dimensions and with all materials labeled. The sections should normally be cut through doors, windows, and other critical wall sections. Additional details shall be included when necessary to illustrate important or unusual features. All horizontal dimensions shall occur on the plans and vertical dimensions on the sections and elevations.

16.1.5 A perspective drawing shall be included when so required by the special instructions.

16.1.6 Features of Fire Protection, their ratings, and the hazards requiring them, shall be clearly indicated. When other functions coexist with the fire protection functions, their integration shall be clearly indicated, with an analysis that describes how both functions will be served. Provide a separate, composite type floor plan which makes an accurate presentation of these various features and functions. By authorized written permission, where the building and features being shown are unusually simple, this information may be included on other drawings.

16.1.7 Major elements of mechanical and electrical equipment, affecting space allocation, shall be shown on the architectural plan to the extent practicable. Separate mechanical and electrical drawings shall be prepared when necessary to avoid crowding architectural drawings to the extent they would be difficult to read. When applicable, Government-furnished, Contractor-installed, or Government-furnished and installed items shall be shown.

16.1.8 For Addition or Alteration projects, new work and removal work should be shown on separate drawings. The type and the scope of work intended, shall be clear from an inspection of the documents.

16.2 Design Analysis. The Design Analysis shall be as complete as the design stage permits with emphasis on the following:

16.2.1 A statement indicating the basic criteria to be applied to the design including type of construction (noncombustible, etc.), category of construction (permanent, etc.), major fire protection and exit requirements, etc.

16.2.2 A description of materials for all major building components and of all interior and exterior finishes. The description of materials must include type of exterior wall construction, room finish schedule, window types, panel materials, etc. For Air Force projects, the description of

materials should follow the continuity of Military Handbook 1190, Facility Planning and Design Guide. The description of finishes may be presented in schedule form.

16.2.3 A list of items on which additional criteria, clarification, or guidance is required.

16.2.4 The written presentation must include the designer's reasons for selecting specific materials, plan solutions, architectural compatibility, and architectural treatment in all cases in which the reason for selection is not obvious.

16.2.5 Site Adaptation of standard drawings shall include the following in the design analysis.

16.2.5.1 An outline of the selections made where the standards permit the designer a choice of design or material.

16.2.5.2 An outline of items on the standard that do not conform to current criteria or to the design instructions, and suggested methods for changing the standards.

16.2.5.3 An outline of errors found in the standards and suggested methods for correction.

16.2.5.4 An outline of improvements the designer feels should be made to the standards, with full explanation and justification.

17. FINAL DESIGN.

17.1 Drawings. The drawings shall be complete, thoroughly checked, and coordinated. Previous comments and applicable criteria changes shall have been incorporated into the design. For Addition or Alteration projects, new work and removal work should be shown on separate drawings. The contract drawings shall fully describe the type and the scope of work required. The final form of the contract documents shall make it possible for bidders to evaluate working conditions and to estimate quantities from an inspection of the documents. It shall not be necessary for bidders to visit the worksite to make such evaluations. The layout of individual sheets and the organization of the assembled set shall follow and communicate a logical sequence. General information shall be presented first, progressing to more detailed information. When assembling details, begin in the upper left-hand corner of the sheet with letters progressing to the right and down. Where major structural elements are included as parts of architectural detailing, do not indicate sizes. These elements must be fully defined in the
structural design documents. For large buildings that require the floor plans to be divided into areas, provide a double line Composite Floor Plan of the entire building, drawn at the largest

scale practicable to include the entire building or floor level on a single sheet. Include:

Overall and Control dimensions
Match Lines for combining individual portions of floor plans
Room Names and Numbers
Structural Column or Bay Indicators
Wall and Building section cuts
Door Swings
Square Footage
General Notes

Also provide a Key Plan at a uniform location on all Floor Plan sheets which shows the interrelationships between the building portions. In addition to the Composite Floor Plan provide an additional, separate, (composite type) floor plan which makes an accurate presentation of the various Fire Protection features and functions, and shows the interrelationships between them.

17.2 Design Analysis. The Design Analysis shall include the basic information presented in the previous submittal, corrected to reflect changes in tense, and changes in content made in response to review comments. Outline specifications shall be omitted from the Final Design Analysis as the information is included on the final drawings and project specifications. The final design analysis shall be written in the past tense.

17.3 Specifications. The specifications shall be complete and fully coordinated with the drawings.

CHAPTER 9

INTERIOR DESIGN

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CHAPTER 9

INTERIOR DESIGN

1. DESIGN EXCELLENCE. Excellence in interior design is a primary goal for all military construction projects. Attention shall be given to economy of design including life cycle costs and functional requirements. It should be recognized that quality design does not imply added expense, and can often provide savings in operating, maintenance, and construction costs.

2. DESIGN CRITERIA. The design of buildings shall be in accordance with the instructions contained in this chapter and in other applicable chapters of the A-E Instruction Manual. In addition, Corps of Engineers Guide Specifications and Technical Manuals, Using Service criteria publications, and the scope of work, all include applicable design criteria. Applicable requirements shall be incorporated from recognized national standards including the National Fire Codes, Life Safety Code, Occupational Safety and Health Standards (OSHA), and the Uniform Building Code. Applicable manuals covering materials will be cited in the scope of work.

3. FINISH, COLOR, AND FURNISHING SELECTION. All work shall be performed by an Interior Design professional in accordance with current and generally recognized design principles and shall comply with ER 1110-345-122 Engineering and Design - Interior Design. Careful consideration shall be given to the aesthetics, function, maintainability, and quality of each selection.

4. BUILDING RELATED INTERIOR DESIGN.

4.1 Technical Requirements.

4.1.1 Includes the selection and coordination of interior and exterior materials and finishes, including color, texture, and pattern.

4.1.2 Considerations in this project include structural finish, color, prewired workstations (for Air Force and Army facilities), window treatment (with the exception of drapery) and other items which are permanently attached to, or are integral to the building. The Project Development Book (PDB) will define whether or not prewired workstations are required.

4.1.3 Exterior color guidance shall be obtained from the user and incorporated into the design. If an Exterior Master Plan is available for the installation, it shall be utilized.

4.1.4 Limit the number of similar colors for each material.

4.1.5 New finishes and colors shall be compatible with existing colors and finishes where they occur in areas that are adjacent to occupied areas. More flexibility in color and finish selections can be exercised in areas not adjacent to existing occupied areas. Where it is imperative that existing materials be matched closely, include both a "color range" for the Contractor to prepare his bid, and the requirement to match the existing materials for the actual construction process.

4.1.6 Basic space planning for anticipated furniture and equipment requirements in conjunction with the functional layout of the building design and such requirements as life safety, privacy, lighting, ventilation, and handicapped accessibility.

4.1.7 Color, texture, and pattern for all exterior and interior finishes shall be specified for all projects either on the Finish Schedule located in the Drawings or in the Guide Specification entitled Exterior/Interior Design Schedule.

4.1.8 All carpet shall conform to applicable design criteria. Carpet tile shall be specified where electrical power and/or communications is accessed from the floor. Carpet in highly trafficked areas shall be of a loop construction.

4.1.9 Uniformity of window covering color and material shall be maintained to the maximum extent possible within a building.

4.1.10 Colors selected for use in UEPH sleeping rooms shall be psychologically beneficial to the long term occupant.

4.1.11 Panel supported workstations acquired with MCP (MILCON) funds shall be referred to as "Prewired Workstations." Prewired workstation design shall be a part of the construction bid documents and shall conform to ETL 90-2, General Policy for Prewired Workstations and Systems Furniture. (Disregard all information pertaining to ergonomic seating. Ergonomic seating cannot be purchased with MCP funds.) Workstation layout shall be coordinated with the communication and electrical design of the building. Placement of wall switches, thermostats, and all other miscellaneous wall installed items shall be coordinated with the appropriate discipline in order to eliminate conflicts with prewired workstations. Workstation design shall conform to all fire protection, bio-environmental, security, and safety requirements specified in Military Handbook 1190, "Facility Planning and Design Guide," the Uniform Federal Accessibility Standards, and the Americans with Disabilities Act (ADA).

4.2 Submittal Requirements. Submittal requirements for medical facilities will be provided on a project specific basis. All other facility submittals shall be as follows:

4.2.1 Project Definition (PD) Design Submittal:

4.2.1.1 Design Analysis. The design analysis shall follow the format described in the chapter titled "Design Analysis" of this manual. The design analysis shall contain a description of applied finishes and an explanation of the desired image or visual appearance of the interior of the facility.

4.2.1.2 Furniture Footprint. A furniture footprint indicating proposed furniture layout should be provided in critical areas. All furnishings with the exception of MCP funded prewired workstations shall not be considered part of the construction contract and shall be indicated as such on the drawings by the use of a dashed line. If prewired workstations are a part of the contract, a layout shall be blocked on 1/4" scale plans and individual components clarified on 1/2" plan view drawings. Components shall be labeled to fully illustrate workstation design.

4.2.1.3 Plans and Elevations of special decorative features, built-in furnishings, and other enhancements into the building.

4.2.1.4 Coordination of interior components, lighting, acoustical, electrical and mechanical elements.

4.2.1.5 Plans and Elevations of Typical Prewired Workstations. (Where required). Typical prewired workstations shall be shown in plan and elevation at 1/2 inch scale. Components shall be labeled and a legend shall accompany the drawings which clearly identifies all components and sizes. The quantity of typicals should be minimized. It is recommended that each workstation type be assigned a code (A typ., B typ.,) and that codes be referenced on the layout rather than drawing workstations in repetition. In some instances, variations to typicals will need to be developed as a result of column placement, etc. These variations can be referenced on the plan as being similar to typicals and shall be coded with a designation (A sim., B sim.). The variations should be clearly indicated on the drawings. Clarify all ways the workstation is different from the typical.

4.2.1.6 Color Boards and Legends. (Where required). Color boards shall show actual samples of all proposed exterior and interior structural finishes. A color board legend shall accompany the board and shall clearly identify all finishes. Clarification of finish placement will be required when more than one color of a single finish is proposed. Include prewired workstation finishes and fabric samples where applicable. Color boards shall be 8 1/2" x 11" in size and provided in a three ring notebook or 17" x 22" foam core, whichever the client prefers.

4.2.2 Early Preliminary Submittal:

4.2.2.1 Design Analysis. The design analysis shall follow the format described in the chapter titled "Design Analysis" of this manual. The design analysis shall contain a description of applied finishes and an explanation of the desired image or visual appearance of the interior of the facility.

4.2.2.2 Furniture Footprint. A furniture footprint indicating proposed furniture layout shall be incorporated into the drawings. All furnishings with the exception of MCP funded prewired workstations shall not be considered part of the construction contract and shall be indicated as such on the drawings by the use of dashed lines. If prewired workstation are included in the contract, a layout will be required at 1/4" scale. Panel placement shall be shown and electrical, communications, and EDP outlet placement shall be clearly indicated. Typical workstations shall be coded (A typ., A sim.) on these sheets rather than drawing all components in repetition.

4.2.2.3 Interior Finish Schedule.

4.2.2.4 Plans and Elevations of special decorative features, built-in furnishings, and other enhancements into the building.

4.2.2.5 Coordination of interior components, lighting, acoustical, electrical,

and mechanical elements.

4.2.2.6 Plans and Elevations of Typical Prewired Workstations. Typical prewired workstations shall be shown in plan and elevation at 1/2 inch scale. Components shall be labeled and a legend shall accompany the drawings which clearly identifies all components and sizes. The quantity of typicals should be minimized. It is recommended that each workstation type be assigned a code (A typ., B typ.) and that codes be referenced on the layout rather than drawing workstations in repetition. In some instances, variations to typicals will need to be developed as a result of column placement, etc. These variations can be referenced on the plan as being similar to typicals and shall be coded with a designation (A sim., B sim.). The variations should be clearly indicated on the drawings. Clarify all ways the workstation is different from the typical.

4.2.2.7 Color Boards and Legends. (Where required.) Color boards shall show actual color samples of all proposed exterior and interior structural finishes. A color board legend shall accompany the board and shall clearly identify all finishes. Clarification of finish placement will be required when more than one color of a single finish is proposed. Include prewired workstation finishes and fabric samples where applicable. Color boards shall be 8 1/2" x 11" in size and provided in a three ring notebook.

4.2.2.8 Users Brochure. A Users brochure will be required for selected projects.

4.2.3 Final Submittal:

4.2.3.1 Design Analysis. The design analysis shall follow the format described in the chapter titled "Design Analysis" of this manual. The design analysis shall contain a description of applied finishes and an explanation of the desired image or visual appearance of the interior of the facility.

4.2.3.2 Furniture Footprint. A furniture footprint indicating proposed furniture layout for critical areas shall be incorporated into drawings. All furnishings (with the exception of MCP funded prewired workstations) shall not be considered a part of the construction contract and shall be indicated as such on the drawings by the use of dashed lines. If prewired workstations are a part of the contract, a prewired workstation layout will be required to be shown at 1/4" scale. Panel placement shall be shown and electrical, communications, and EDP outlet placement shall be clearly indicated. Typical workstations shall be coded (A typ., A sim.) on these sheets rather than drawing all components in repetition.

4.2.3.3 Interior Finish Schedule.

4.2.3.4 Plans and Elevations of special decorative features, built-in furnishings, and other enhancements into the building.

4.2.3.5 Coordination of interior components, lighting, acoustical, electrical, and mechanical elements.

4.2.3.6 Plans and Elevations of Typical Prewired Workstations. Typical prewired workstations shall be shown in plan and elevation at 1/2 inch scale. Components shall be labeled and a legend shall accompany the drawings which clearly identifies all components and sizes. The quantity of typicals should be minimized. It is recommended that each workstation type be assigned a code (A typ., B typ.) and that codes be referenced on the layout rather than drawing workstations in repetition. In some instances, variations to typicals will need to be developed as a result of column placement, etc. These variations can be referenced on the plan as being similar to typicals and shall be coded with a designation (A sim., B sim.). The variations should be clearly indicated on the drawings. Clarify all ways the workstation is different from the typical. It is necessary that documents be complete to ensure an accurate bid package.

4.2.3.7 Color boards and Legends. Color boards shall show actual samples of all proposed exterior and interior structural finishes. A color board legend shall accompany the board and shall clearly identify all finishes. Clarification of finish placement will be required when more than one color of a single finish is proposed. Include prewired workstation finishes and fabric samples where applicable. Color boards either shall be 8 1/2" x 11" in size and provided in a three ring notebook or 17" x 22" foam core, whichever is preferred by the client.

4.2.3.8 Guide Specifications. Guide Specifications shall be used by the A-E to achieve the maximum uniformity in contract specifications. The guide specifications describe the type and quality of material and installation normally acceptable for Corps construction. The technical provisions of the guide specifications should not be changed without justification. The A-E shall use Guide Specifications for all applicable sections to include all finishes, window treatments, and prewired workstations. Care shall be taken to insure specification is not proprietary, yet specifies a quality product.

4.2.3.9 Users Brochure. A users brochure will be required for selected projects.

4.2.4 Revised Final Submittal:

4.2.4.1 Revised color boards, legends, photos, and negatives reflecting all changes required as a result of final review.

4.2.4.2 Revised furniture footprint, interior details, elevations, typical prewired workstations, guide specifications, and design analysis.

4.2.4.3 A users brochure will be required for selected projects.

4.2.4.4 Revised interior finish schedule.

5. FURNITURE RELATED INTERIOR DESIGN.

5.1 Technical Requirements.

5.1.1 The A-E is to provide a furnishing design which includes all services and

information necessary for a complete furnishings package for the facility. The designer shall insure that the furniture related and building related design schemes are congruous.

5.1.2 Quality, function, aesthetics, comfort and safety should be considered in the selection of furnishings.

5.1.3 Items to be covered in the furnishings package include furniture, art work, plants and planters, and draperies.

5.1.4 Furniture will be selected from Unicor-Federal Prison Industries (FPI), GSA Stock Catalog, and GSA Supply Schedules (Single and Multiple Award), whenever possible.

5.1.5 Communication and electrical requirements for the facility shall be considered and coordinated with the furnishings layout.

5.1.6 Panel supported workstations acquired with O & M 3400 (NON-MILCON) funds are termed "Systems Furniture." The design of systems furniture shall comply with ETL 90-2, General Policy for Prewired Workstations and Systems Furniture, and Federal Acquisition Regulations. Specific information pertaining to design procedure shall be obtained from the District. The placement of Non-MILCON funded systems shall be shown on construction contract drawings by the use of dashed lines to insure coordination with the building electrical design.

5.2 Submittal Requirements.

5.2.1 Submittal requirements for review and approval, shall be presented in notebook form in a way which organizes the required items in a logical manner.

5.2.2 Submittals shall contain an index. The submittal shall be tabbed according to index headings.

5.2.3 Project name and location shall be clearly labeled on the project binder spine and front panel.

5.2.4 Furnishing items shall be arranged in alphabetical order by location code.

5.2.5 Each furnishing illustration sheet should precede the order form for that item.

5.2.6 Half-sized composite floor plan(s) shall be included in the package for reference, showing furniture placement.

5.2.7 The A-E shall provide a Furnishing Source Sheet. The list should include manufacturer's name, address, phone number, FSC Group, contract number, contract expiration date, and MOL. If there is a separate Contractor, list also that name, address, and phone number.

5.2.8 Individual room plans shall be provided showing 1/4" furniture layouts, coded to an itemized listing of furnishings. Drawings shall show proper placement and scale.

5.2.9 Actual samples of furniture and accessory finishes shall be included in binder(s).

5.2.10 Cost estimate shall be provided which shows itemized quantities and totals including any freight and/or installation costs.

CHAPTER 10

STRUCTURAL

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CHAPTER 10

STRUCTURAL

1. GENERAL. The instructions in this chapter provide guidance for the scope and content of the structural portion of the design documents required for each phase of the design. The structural design criteria to be used is contained in the Kansas City District Structural Design Controlling Criteria (SDCC) document. The structural design, including the resulting design documents, shall conform to the instructions set forth below, as supplemented by instructions and criteria contained in the project specific scope of work and the SDCC, with the SDCC controlling in cases of conflict.

2. PROJECT DEFINITION (AIR FORCE PROJECTS) or PRE-CONCEPT (ARMY PROJECTS). Normally, the Project Definition or Pre-Concept design submittal is typically an approximate 10% design submittal and will consist of a design analysis and drawings. Structural drawings are required only when the project contains complex or unusual structural features which impact either the appearance or the cost of the project.

2.1 Project Definition/Pre-Concept, Design Analysis. Design analysis shall be developed in accordance with ER 1110-345-700, the instructions in chapter: Design Analysis, and as a minimum the specific content shall be essentially as outlined below.

2.1.1 GENERAL. A Statement identifying the design as one of the following: (Specific requirements for each category of design are contained in paragraph: Final Design Analysis.)

2.1.1.1 An original design.

2.1.1.2 A site adaptation of an OCE standard design.

2.1.1.3 A site adaptation of a previous design.

2.1.1.4 A rehabilitation of an existing structure.

2.1.2 STRUCTURAL SYSTEM. Description of the structural system for original designs. A general description of the structural system for the building/structure including seismic considerations should be given with reasons for selection of the system used and including cost comparisons. Additionally, for all medical facilities, provide a comparative cost study of at least three (3) apparent competitive systems, taking into account mechanical, electrical, and other features which vary between systems. For site adaptations of standard or other existing designs or for rehabilitation of an existing structure, describe the proposed design changes necessary for adapting the existing design to the immediate project's site conditions, including changes resulting from loading, climatic and soil conditions at the new site and/or updating for conformance to current criteria.
All principal elements of the structural system selected shall be described. Typically, these may

include:

2.1.2.1 *Roof and Floor System*. General method of framing and type of deck including options. Cost comparisons shall be furnished to justify system selected. Address the type, span to depth ratios and classification of the diaphragm. Address features which impact the layout of the structural framing, such as standing seam metal roofing.

2.1.2.2 *Walls and Partitions*. Describe composition and general range of thicknesses, seismic design when used, method of providing lateral support for the partitions, and location of load bearing and shear walls.

2.1.2.3 *Foundation System*. Foundation design data or assumptions and description of type of foundation system to be used for the buildings and/or structures. For example, whether spread footings, continuous footings with concrete foundation walls, piling or drilled piers with concrete grade beams are used, existence of foundation tie beams, etc. Address concrete slab-on-grade floors, locations where used, whether capillary water barrier is required, and the general arrangement, approximate spacing and types of crack control joints.

2.1.3 DESIGN CRITERIA. A list of design criteria references such as U.S. Army Corps of Engineers Technical Instructions, Department of the Army Technical Manuals, ACI Standards, AISC Specifications, etc. which are applicable to the immediate project.

2.1.4 DESIGN LOADS. A list of structural design loads and conditions comprised of, but not limited to the following:

2.1.4.1 Structure dead loads.

2.1.4.2 Roof live loads and snow load parameters.

2.1.4.3 Floor live loads, identifying each loading with usage and the room or space where used. For "heavy-duty" slab-on-grade floors subjected to wheel loads, identify the type and size of vehicles plus the maximum wheel or axle load. If only human occupancy loads are anticipated, so state. Truck loads for the design of the truck loading docks.

2.1.4.4 Basic wind loading parameters.

2.1.4.5 Seismic design parameters.

2.1.4.6 Foundation design criteria, including the design depth for footings, allowable soil bearing pressure, equivalent fluid densities (or lateral earth pressure coefficients) for the design of earth retaining structures and building components, modulus of subgrade reaction, and any other pertinent data derived from the recommendations of the Preliminary Foundation Analysis, a copy of which shall be included as an Appendix to the design analysis.

2.1.5 DESIGN DATA. A list of structural materials, together with the stress grades an/or ASTM designations, as applicable, for timber, structural steel, concrete, and reinforcing steel; the series for steel joists; and identification of the proposed use of each material in each building structure, including allowable soil properties (with source notation). Where precast concrete structural units are proposed as part of the design, the A-E shall attest to their availability by providing the documentation described in paragraph: Final Design Submittal, subparagraph: Availability of Precast Concrete Units.

2.1.6 DESCRIPTION OF MISCELLANEOUS/UNUSUAL DESIGN FEATURES. Those which might be controversial should be clearly presented in such a manner that definite approval can be given. Where applicable to the immediate project, include a description of each of the following design features:

2.1.6.1 The proposed system for resisting lateral forces (wind and earthquake) and transferring them to the ground, whether diaphragms, shear walls, braced or moment resisting frame, etc.

2.1.6.2 The proposed treatment of any unusual structural features or unique solutions to structural problems.

2.1.6.3 Measures taken to compensate for expansion/contraction and crack control.

2.1.6.4 Identification of any major vibrating elements and measures taken to isolate them.

2.1.7 A list of criteria needed to continue and complete final design.

2.1.8. Structural computations shall be developed only to the extent of determining preliminary sizing and spacing of structural components necessary for preparation of the project construction cost estimate and for coordination with the designs of other disciplines.

2.2 Project Definition/Pre-Concept, Structural Drawings. Structural drawings at this stage are required only when the structural design includes unique or complex features which impact the visual appearance of the project or add significant structural costs beyond those considered normal for the type of project designed.

3. CONCEPT DESIGN. Normally, the concept design submittal is typically an approximate 35% design submittal and will consist of a design analysis, calculations, and drawings, plus a list of the guide specification sections proposed for inclusion in the final design. If a standard design or other existing design is being site-adapted, a statement of the proposed design changes and drawing revisions necessary to meet the immediate project conditions shall be provided.

3.1 Concept Design, Design Analysis. The design analysis shall include all items included in

the Project Definition/Pre-Concept submittal expanded as necessary to reflect the current stage of the project, any revisions necessitated by comments on the Project Definition/Pre-Concept submittal, and as a minimum the following additional items:

3.1.1 Calculations for determine building/structure design loads, including all dead loads, roof and floor(s) live loads. Determination of snow loads, including rain-on-snow, drift, and sliding snow loads as applicable.

3.1.2 Calculations of seismic loads and main force resisting system wind loads and comparison thereof to determine which controls in each major direction of the building or structure. Description of method of providing lateral stability for the proposed structural system to meet these seismic and/or wind loads with sufficient calculations to verify adequacy of the proposed method.

3.1.3 Calculations for typical roof, floor(s) and foundation members as applicable for the structural system proposed to be used.

3.1.4 Structural connections used to fasten the major structural components of the basic structural system (both vertical and lateral) can either be narratively described or supported by sketches.

3.1.5 Sufficient calculations and sketches to support structural quantities used for the Code B construction cost estimate.

3.2 Concept Design, Structural Drawings.

3.2.1 For Original Designs, show structural roof and floor framing by wall sections and partial framing plans in sufficient detail to indicate type of framing, estimated overall depth, and spacing of all structural members. Type of foundations and their approximate elevations shall be shown, although structural members and footings are not to be designed beyond the requirements for estimates and coordination with mechanical and electrical requirements. The location of all columns must be shown. Proposed treatment of cantilever footings, combined footings, and all other complex details shall be shown on concept drawings as an aid to the estimator.

3.2.2 For Site Adaptations of existing designs, list the titles and drawing numbers of the standard or other existing drawings with the basic revisions proposed.

3.2.3 For All Designs. Structural drawings to be included in the concept submittal shall consist, as a minimum, the following:

3.2.3.1 If available, show the logs of exploratory drill holes and their location together with relative vertical elevation of building footings.

3.2.3.2 Foundation plan showing footings, piling, and column locations as

applicable.

3.2.3.3 Floor and roof framing plans.

3.2.3.4 Typical framing elevations and cross section.

3.2.3.5 For masonry construction, show proposed control joints, bond beams, and joint reinforcing on wall elevations.

4. FINAL DESIGN. The Final Design submittal is typically an approximate 95% or 100% design submittal and shall include a final design analysis, final calculations, final drawings, and specifications all as described below.

4.1 Final Design, Design Analysis. The design analysis shall include all items included in the Concept submittal expanded as necessary to reflect the current stage of the project, any revisions necessitated by comments on the Concept submittal, and as a minimum the following additional items. Complete checked calculations are required for Original Designs and a checked Comparative Analysis for Site Adaptation as outlined below.

4.1.1 Site Adaptation Design of OCE Standard Drawings. It is not necessary to develop complete structural calculations for a site adaptation, because the adapted design is presumed to be correct for the conditions for which it was designed. Site adaptations always involve some changes in design conditions, such as length or spacing of beams, exterior wall construction, actual live loads, and foundation conditions. A comparative analysis for site adaptations is required in lieu of complete calculations. The analysis will identify the previous design being copied, enumerate the structural differences and provide sufficient computations to justify the differences. Include the original design calculations in the design analysis.

4.1.2 Site Adaptation of Previous Design. The A-E shall verify that the previous design is adequate for the new roof live load, wind and seismic loadings and for the changed site conditions. A new foundation design shall be prepared. A new design analysis shall be submitted containing all the pertinent information and calculations from the original design analysis plus all the new information and calculations required above.

4.1.3 Rehabilitation of an Existing Structure. The A-E shall incorporate into the final design analysis any structural design and/or investigation associated with the alterations to the existing mechanical/electrical systems. Where applicable, the following specific items shall be addressed:

4.1.3.1 Verification of the adequacy of supports for new or altered equipment, ducts, and piping, including the design and details of new supports when necessary.

4.1.3.2 Investigation of the existing building structure for capability of supporting any increased loading, including design and details for strengthening the structure when

necessary.

4.1.3.3 For any new openings which must be cut through existing structural concrete walls, floors, or roof, the selection of opening locations which are least likely to affect the integrity of the existing structure. Calculations as necessary to verify the adequacy of the altered structure shall be provided. When the existing structure is adversely affected by new openings, the design and details for the necessary strengthening shall be provided.

4.1.4 Original Design Computations shall be prepared by an experienced structural engineer and shall include an investigation of loading, (gravity, wind, seismic, blast and/or radiation, and allowance for future loads, etc.) shear, moment, stress analysis diagram, uplift, stability and deflection calculations. The computations are to be presented in a logical, systematic manner with all assumptions and conclusions clearly identified. Basic assumptions of loads, working stresses, and methods of analysis must appear in the calculations; these assumptions must be applied consistently to a given problem. Similar beams, columns, or connections may be grouped by designing the largest member of connection in the group, but every individual slab, beam, column, footing, connection or other structural member or structural consideration indicated by the plans shall be accounted for by pertinent calculations, statement or reasoning, or reference to source. Design formulas and equations shall be written out in symbols the first time each is used, before the numerical values are supplied. Design formulas and equations shall also be referenced to the appropriate codes and/or text (except for commonly used, widely accepted formulas). All calculations shall be accurate and carried to an appropriate level of precision. All answers shall be identified by dimensional units. Complete design calculations shall be required for all original designs. The calculations shall be presented in a clear and legible form, incorporating a title page, table of contents, and a tabulation showing all design loads and conditions. Pages shall be numbered consecutively and identified in the table of contents. Cross referencing shall be clear. The source of loading conditions, formulas, and references will be identified. Superseded areas of computations must be ruled out. All computations shall be given a complete numerical and theoretical check within the designer's office. Calculation sheets shall carry the names or initials of the designer and the checker, and the dates of calculations and checking. No portion of a design calculations shall be computed and checked by the same individual.

4.1.5 Calculations Made by Programmable Pocket or Desk Calculators. When programmable pocket or desk calculators are used, sufficient information shall be provided so that a reviewer can reproduce the steps with a non-programmable calculator. For simple cases where one or more formulas are solved, writing down the formulas in symbol form with explanations of all symbols, or giving one long-hand example will generally be sufficient information. In more complicated cases, such as continuous beam or frame analysis, complete explanations and supplemental diagrams and sketches shall be provided. Simply including output tapes without explanation will not be acceptable.

4.1.6 Computer Calculations Submittals. All applicable input and output data shall be included in readable printed form as part of the design calculations. Continuous paper such as that used in computer terminals shall be cut into individual pages and shall not be submitted in a

continuous roll form. Since all such data is part of the design calculations and therefore will be reviewed, it shall be presented in such a manner that it can easily be interpreted by any reviewer that has a knowledge of structural analysis and design. In order to ensure reviewability, all input and output data shall include as a minimum the following requirements. Features listed below which are not automatically generated by the program shall be added by hand.

4.1.6.1 A brief synopsis of the computer program(s) stating required input, method of solution, approximations used, codes and specifications used, output generated, extent of previous usage or certification of the program(s), and program author(s). Generalized flow chart(s) may be used to supplement description of solution process, if desired.

4.1.6.2 Identification by number, indexing and cross- referencing of all calculation sheets, including supplemental long-hand calculation sheets.

4.1.6.3 Fully identified, dimensioned, and annotated diagrams of each member or structure being considered. A separate diagram shall be provided for each load case, such as dead plus live, dead plus wind, etc.

4.1.6.4 Clear identification and printing of all input and output values including intermediate values, if such values are necessary for evaluation of the submittal.

4.1.7 Availability of Precast Concrete Units. Where precast concrete units of particular cross section(s) and concrete strength become a part of the structural design, verification of their availability from precast producers in the project vicinity shall be documented. Acceptable documentation consists of letters from the producers or a written statement by the A-E identifying the name and address of the precaster(s), description of units and concrete strength(s) available, date when availability was verified, and name of A-E's staff member who obtained the verification.

4.1.8 Identification of Pre-Engineered Metal Building Used for Design. For designs which include a pre-engineered metal building, the complete identification (manufacturer, building type, eave height, loading designation) of the particular building used for foundation design shall be provided.

4.2 Final Design, Structural Drawings. Final drawings shall be complete and accurate, fully reflecting the design. Except as indicated below for pre-engineered metal buildings and other structures to be contractor designed, the drawings shall be complete with all plan views, sections, details, schedules, diagrams, and notes necessary for the bidding and construction of the project. For structural steel framing, the drawings shall meet the requirements for design drawings set forth in the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. For structural concrete, the drawings shall conform to the standards for engineering (design) drawings set forth in the ACI Detailing Manual-1980 (SP-66). Additionally, those items described below which are applicable to the design shall be incorporated in the drawings.

4.2.1 Grid Systems, Dimensions, and Floor Elevations.

4.2.1.1 Grid System. Each foundation plan, floor plan, and other structural plan shall have an alpha-numeric grid system aligned with the columns, or with load bearing and non-load bearing walls, as applicable. The same grid system shall be used for all plan views.

4.2.1.2 Dimensions. Each view shown shall have all necessary dimensions. On plan views, the dimensions shall define the location of grid lines, offsets, and all structural elements, as well as the overall sizes of buildings and structures. Modular dimensioning shall not be used on structural drawings.

4.2.1.3 Finish Elevation of the first floor shall be used as the reference elevation for the building or structure and elevations for other floors, foundations, and roofs shall be referenced to this basic elevation. This elevation shall be coordinated with the other design disciplines and indicated as 100’-0" in IP units or 10000 in metric.

4.2.2 Plan Views.

4.2.2.1 Foundation Plan shall show the size and location of all foundation elements, such as foundation walls, grade beams, piers, footings, piles and pile caps, drilled piers, and/or foundation drains, which are included in the design. Elevations for footings, pile caps and foundation drains shall be indicated on the plan. See subsequent paragraphs: "Schedules and Diagrams" and "Notes" for other data to be included on the foundation drawing.

4.2.2.2 Floor Slab Plan for building slabs-on-grade and exterior slabs at building entrances shall show location and type of joints, slab thicknesses and reinforcing, elevation of slab surfaces, and any other design features, such as drain trenches, equipment bases, and/or recessed slab areas which affect the slab design. Also, indicate whether slabs are placed over vapor barrier and capillary water barrier.

4.2.2.3 Framing Plans. A separate framing plan shall be provided for each structural floor and roof. Plans shall show the size, spacing, and location of all floor/roof framing members, their supporting columns or walls, and all auxiliary members such as bracing, bridging, and sag rods. Also, the size and location of all major openings through floors and roofs shall be shown. See subsequent paragraphs: "Schedules and Diagrams" and "Notes" for additional data to be placed on framing plans.

4.2.3 Elevation Views, Sections, and Details necessary to fully illustrate the structural system design shall be provided. All members, elements and connections that are a part of the main vertical and/or lateral force resisting system must be completely detailed. Some requirements peculiar to the various structural materials are described below.

4.2.3.1 Structural Concrete. Include elevation views as necessary, plus sections and details to show the outlines of concrete cross-sections, reinforcing bar arrangements, concrete cover for rebars, installation of embedded items, and joint construction. All lap splice and

embedment lengths for reinforcing bars shall be clearly indicated on the drawings.

4.2.3.2 Slabs-on-Grade. A sill detail for each foundation condition at exterior and interior doors shall be provided, and may be shown on the architectural door details. For heavy-duty slabs, joint details conforming to TM 5-809-12 shall be shown on the drawings. These details shall be added to the final drawings, as appropriate.

4.2.3.3 Foundation Drains shall be shown on the views which portray the foundation construction.

4.2.3.4 Masonry. Brick expansion joints shall be located and identified on plan or elevation views. Where brick expansion joints do not follow a continuous vertical line, the expansion joints shall be shown on elevation views. Horizontal brick expansion joints shall be shown on elevation views. Structural masonry wall elevations shall be included to clarify the construction requirements for masonry reinforcement, especially the reinforcement around wall openings. Elevations of all masonry walls showing all openings, lintels, bond beams, horizontal and vertical reinforcement, wall stiffeners, and control joints shall be shown on the structural drawings, including horizontal and vertical dimensions of wall panels, openings, etc. Elevations shall indicate all portions of the masonry wall that are piers or columns as defined in TI 809-04, and indicate the required details. The minimum scale for masonry wall elevations shall be ... = 1 -0 (1:50 for metric jobs). Details applicable to the immediate project shall be shown on the structural drawings. Listed below are some frequently required masonry details, most of which are shown in TM 5-809-3 and TI 809-04. Details may be extracted from these sources as required and incorporated in the final drawings. Electronic CADD versions of some of the typical masonry details are available via the TECHINFO internet site http://www.hnd.usace.army.mil/techinfo/. All details shall be selected and fully edited to reflect the specific requirements of the immediate project. Supplemental details shall be added as necessary to complete the design.

Masonry Details Frequently Used

Typical Control Joint (CJ).
Typical Brick Expansion Joint (BEJ).
Control Joint at Bond Beam.
Bond Beam Corner Reinforcement.
Seismic Reinforcement Around Wall Openings.
Wall Stiffeners Details for l- and/or 2-bar stiffeners.
Doweled or Other Connection of Masonry to Foundation, Floor, Roof or Bond Beam.
Bond Beam (or Steel) Lintels.
Column and/or pier reinforcing detail.
Lateral Support Detail for Tops of Masonry Partitions. (Plan location of lateral supports must be shown elsewhere, preferably on the Architectural reflected ceiling plan.)

4.2.3.5 Structural Steel, Steel Joists, and Steel Decking. The detailing of structural steel framing, including connections, shall be complete. All weld types, weld sizes,

bolting layouts, bolt sizes, connection plates and members sizes and locations and stiffener plates sizes and locations shall be shown. Elevations of steel frames used in the lateral load resisting system shall be shown on the contact drawings. When AISC standard connections are used, at least one typical connection detail identifying the AISC type of connection and all connecting materials shall be shown on the drawings. All special and non-standard connections shall be fully detailed. Also, the anchorage of beams, trusses, joists, and steel deck to walls or other bearings, and the extra framing or reinforcement required at deck openings shall be detailed. Welded connections shall be detailed using standard weld symbols illustrated in AWS D1.1. All applicable weld sizes, spacing, types, contours and finishes shall be shown.

4.2.4 Schedules and Diagrams.

4.2.4.1 On the Foundation Plan. A footing schedule, or column and footing schedule, which indicates the column loads, column sizes, footing sizes and reinforcing, and actual footing contact pressures shall be included. Where load bearing walls are used to support roof and/or floor loads, footing loads per lineal foot of load bearing wall shall be tabulated for each condition.

4.2.4.2 On Framing Plans. For concrete framing, beam and column schedules shall conform to the requirements of the ACI Detailing Manual. For structural steel framing, provide a column schedule complete with design loads at splices and at column bases, plus a tabulation of the loads, shears, moments and/or axial loads to be resisted by the beams and their connections.

4.2.4.3 Load Diagrams. The required joist loading diagrams for both upward and downward loading, computed in accordance with the Loading Criteria General Requirements and Specific Requirements paragraphs of the Kansas City District Structural Design Controlling Criteria (SDCC) document, must be shown on the Contract Drawings. All concentrated loads shall also be shown on the joist loading diagrams. Additionally, where floors or roofs are framed with steel joists, a note on each framing plan shall state: "The Contractor shall coordinate the location and spacing of steel joists and bridging with all other related work. He shall provide extra joists as necessary to clear mechanical and electrical equipment without exceeding the joist spacing shown, and at no additional cost to the Government."

4.2.5 Notes. The drawings shall contain in the General Notes a list of the design loading criteria, a list of actual design loads, a list of the strengths of the engineering materials used, the design soil values and any other data that would be pertinent to remodeling and/or future additions. Also, a description of the building structural system shall be given so that the construction contractor will know when the building is self supporting.

4.2.6 Pre-Engineered Metal Buildings. The foundation and floor slab shall be completely illustrated on the drawings. Superstructure steel framing shall be shown only to the extent necessary to define the location and sizes of any members normally not furnished by a metal building manufacturer, such as special framing at doors, supports for roof supported mechanical

equipment, or auxiliary framing at roof openings. See the Kansas City District Structural Design Controlling Criteria (SDCC) document for additional information and requirements.

4.2.7 Standing Seam Metal Roofing System with Concealed Fasteners. See the Kansas City District Structural Design Controlling Criteria (SDCC) document for requirements.

4.2.8 Baghouses, Elevated Water Tanks, and other structures which are likely to be Contractor designed or redesigned. For such structures, the drawings shall provide:

4.2.8.1 A drawn-to-scale graphical representation of the completed structure, including any dimensional requirements or limitations.

4.2.8.2 Complete drawings of the foundations and, where applicable, of the aboveground supports.

4.2.8.3 A tabulation of all loading and other criteria which the Contractor is to use for design or completion of design.

4.2.8.4 A statement of the design codes and material designations and strengths to be employed in the Contractor's design.

4.3 Final Design, Specifications. Specifications for final design shall be prepared in accordance with the instructions in chapter: Specifications.

4.3.1 Fly Ash. All references to fly ash shall remain in each concrete specification, regardless of project size. If fly ash is not desired for a technical reason, other than availability or cost, the technical backup must be detailed in the Design Analysis.

4.3.2 Requirements for editing U.S. Army Corps of Engineers Guide Specifications, including instructions for changes, are provided in the Kansas City District Structural Design Controlling Criteria (SDCC) document.

CHAPTER 11

MECHANICAL

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CHAPTER 11

MECHANICAL

1. GENERAL. This chapter covers general instructions for the design of plumbing, heating, ventilation, air conditioning, refrigeration, gas distribution, heat distribution, fuel storage and other miscellaneous items described hereinafter. Mechanical designs shall be economical, maintainable and energy conservative with full consideration given to the functional requirements and planned life of the facility. Consideration shall also be given to heat reclamation, outside air usage and other energy conservation measures for mechanical systems. Additional criteria, in addition to specific references, are included in the scope of work. Design shall be in accordance with the latest HQUSACE AEI and all applicable technical manuals, technical letters, etc.

1.1 Heating.

1.1.1 Hot water systems at Whiteman AFB and hot water systems having snow melting coils, combustion air, preheat, or makeup air coils with an entering air temperature of 40 degrees F, or lower, shall employ an ethylene glycol solution. Strength of the solution shall be in accordance with the design temperature and the recommendations of the current ASHRAE Handbooks. Circulating pumps, converters, radiators, etc., shall be increased in their size and capacity to handle ethylene glycol solution. System makeup shall be by means of a pipe-mounted hand-operated vane-type pump located over a solution mixing drum. Include a note on the drawings or a paragraph in the specs requiring final fill to be by actual measurement and that the ethylene glycol is to be Contractor furnished. A preferred option to using ethylene glycol in preheat, combustion air or makeup air coils is to provide these coils with continuous water flow. Coils shall be integral face and bypass type with single pass water side circuiting.

1.1.2 Steam distributing nonfreeze-type coils shall be used for combustion air, makeup air, or preheat coils, in steam systems.

1.1.3 Boilers shall be sized in accordance with TM 5-810-1 and space requirements.

1.1.4 Boiler piping shall be detailed on the drawings.

1.1.5 In buildings heated by radiators, indicate on the drawings the mounting height from bottom of radiator cover to floor. Height shall be coordinated with installation of electrical outlets to prevent any interferences. Where necessary to clear electrical receptacles, fin-tube radiators will be installed with the bottom of the radiator cover 16 inches above the floor, space permitting. Space allocation shall be carefully coordinated with architectural design where radiation is installed in toilet rooms.

1.1.6 Design of boiler connection and auxiliary equipment shall conform to the requirements of ASME Boiler Code, where applicable.

1.2 Fuels.

1.2.1 Refer to TM 5-848-2/AFM 88-12, Chapter 2 for design of fuel facilities.

1.2.2 All Federal, State, and local air, water, and land pollution regulations will be met. A report of this will be made in the Design Analysis. This includes such items as coal pile run-off, fugitive dust, oil spillage, hydrocarbon emissions, etc.

1.3 Mechanical Room Space Requirements. Determine that rooms are of sufficient size and have headroom to accommodate specified equipment. Ample space shall be provided for entry, servicing, and maintenance. Provisions for installation and future replacement of equipment shall be coordinated with the architectural design. Space provided in rooms for service and/or replacement of coils, tubes, motors, and other equipment items shall be dimensioned on the drawings. Door and window arrangements, sidewalks, and access roads shall be designed to facilitate such service. Piping connections to converter, hot water generators, water chillers, and all other equipment containing tube bundles shall be arranged to facilitate removal of tube bundles without disassembling piping. Arrangement shall be coordinated with electrical work to provide dedicated space for location of panels, conduit, switches, etc. Clearance required by NEC above and in front of electrical panels shall be provided.

1.4 Chimneys and Stacks. Stack height and size requirements shall be in accordance with TM 5-810-1, and Federal, State and local EPA regulations.

1.5 Ventilation. All ventilation systems shall be designed to conform to the requirements of NFPA Standards Nos. 90A, 90B, and 91.

1.6 Air Conditioning.

1.6.1 All air conditioning systems shall be designed to conform to NFPA Standards Nos. 90A and 90B.

1.6.2 Chilled water systems at Whiteman AFB shall employ an ethylene glycol solution. Strength of the solution shall be in accordance with the winter design temperature and the recommendations of the current ASHRAE Handbooks. Circulating pumps, chillers, and coils shall be increased in their size and capacity to handle the ethylene glycol solution. System make-up shall be by means of a pipe-mounted, hand-operated vane type pump located over a solution mixing drum. Include a note on the drawings or a paragraph in the specifications requiring final fill to be by actual measurement and that the ethylene glycol is to be Contractor-furnished.

1.7 Controls. Controls shall be in accordance with TM 5-815-3.

1.8 Gas Fitting.

1.8.1 Gas piping inside the building shall be designed in accordance with TM 5-810-6/AFM 88-8, Chapter 5, ANSI Z223.1 and NFPA 58. Gas piping will be indicated on the plumbing plan.

1.8.2 L.P. gas systems shall comply with ANSI Z223.1 and NFPA 58.

1.9 Gas Distribution Systems. Gas distribution systems shall be designed in accordance with TM 5-848-1/AFM 88-12, Chapter 1.

1.10 Steam and High Temperature Hot Water Distribution Systems.

1.10.1 Heat distribution systems shall be designed wherever possible with expansion loops, bends, and offsets, instead of expansion joints to reduce maintenance and eliminate manholes in underground lines.

1.10.2 Provide shutoff valves on both supply and return lines together with a drip trap for each building and branch mains. Valves shall be installed on building side of drip trap to prevent freezing in case of building deactivation. Heat distribution lines shall terminate within the building wall.

1.10.3 Branch takeoffs from mains shall be at points of minimum movement and expansion (i.e., near anchors or at center of expansion loops).

1.11 Air Pollution Control. Air pollution control shall be incorporated in ALL design, as applicable, from Federal, State, and local regulations and Standards, and as specifically instructed for the project. The most stringent of all regulations and standards, whether Federal, state, local, Using Service, or special instructions, shall be implemented into the design.

1.12 Seismic Design Requirements for Mechanical Piping and Equipment shall be in accordance with TM 5-809-10/AFM 88-3, Chap. 13.

2. PROJECT DEFINITION DESIGN (AIR FORCE PROJECTS ONLY).

2.1 Design Analysis shall consist of a narrative of the proposed mechanical systems. The narrative shall include an estimate of the heating and cooling loads and a preliminary selection of the type and size of mechanical equipment. The preliminary equipment selection shall be used to ensure adequate mechanical equipment room size and a reasonably accurate mechanical system cost estimate.

2.2 All Exterior Utilities shall be indicated on a drawing. This drawing shall indicate all new utilities, including tie-in points, and existing utilities which are to be removed or abandoned.

3. PRELIMINARY DESIGN (AIR FORCE PROJECTS ONLY).

3.1 Drawings. Floor plans of the mechanical systems shall be developed sufficiently to permit a meaningful evaluation of the proposed systems. See the Final Design paragraph for specific drawing requirements.

3.2 Design Analysis. A draft of the final design analysis will be prepared and will include the information required for the Final Design Analysis.

4. CONCEPT DESIGN (ARMY PROJECTS ONLY).

4.1 Drawings. Show on architectural drawings, plumbing fixtures and all major items of mechanical equipment, including boilers, boiler room equipment, equipment layout, air handling units, etc., as required, to determine proper space allocation within the intent of the architectural layout requirements. Separate mechanical drawings shall be prepared. Separate large scale mechanical plans may be necessary to show complex systems and/or functional diagrams. Basic design calculations must be made to determine selection of major items or equipment and/or systems for purposes of functional adequacy, location, space allocation, and estimating. Air distribution systems may be indicated using single line ducts.

4.2 Design Analysis.

4.2.1 The Design Analysis shall carry a complete narrative on the following items: criteria listing for basis of design; design conditions for basis of design; type of system; kind of equipment; outline of control description (if not on drawings); description and justification for connection to existing systems; and general calculations for determination of capacity of systems and/or major items of equipment. The Design Analysis shall also include air pollution control, listing of all regulations and criteria, interpretations, and work required for conformation thereto. List all required equipment with description of operation. Design shall be sufficiently complete to allow thorough review, not only by the District Office, but by the Using Agency and EPA.

4.2.2 Design statements and calculations shall be given in sufficient detail to enable the reviewing authority to get a clear picture and understanding of all included work so that approval will be specific.

4.2.3 Certain projects will require special design considerations to cover items unique to the individual case and full coverage of these items should be included in the Design Analysis.

5. FINAL DESIGN.

5.1 Drawings.

5.1.1 Design will be an extension of the concept submittal, incorporating all approved comments and any revised criteria, as directed by the District. All conflicts, lack of specific criteria, and/or direction, inconsistencies, ambiguities, and lack of thorough understanding of the nature and scope of work shall be resolved prior to starting final design work.

5.1.2 Do not show all mechanical phases on one floor plan unless nonconflicting. Plans, elevations, and sections shall be developed sufficiently to insure that major equipment items, piping, and ductwork cause no interference with structural members, electrical equipment, etc. Ducts shall be shown double line to indicate the full width of the ducts. All ductwork and piping shall be concealed or furred-in in housing, recreational, school, and administrative buildings, and in medical facilities except in equipment, utility, storage, boiler, and other rooms of this nature. Care shall be exercised that no heating or plumbing piping or ducts are located over transformers, panelboard, or other electrical equipment. For buildings where future expansion is contemplated, run piping, ducts, etc., where there will be a minimum of future revisions.

5.1.3 Provide sufficient details, control diagrams, sequence of control operation description, air flow diagrams, schedules, riser diagrams, piping diagrams and isometrics, etc., as necessary for a thorough design. Heating plans or schedules shall have necessary notes indicating entering air temperature, steam pressure, entering and leaving hot water temperature, mounting height and/or other information required to enable the Contractor to make proper selection of radiation, unit heaters, heating coils, or other equipment. The entering air temperature for sizing fin-tube radiation and unit heaters shall be the room design temperature.

5.1.4 Coordinate the plans with the specification and design analysis. Coordinate with architectural design for provision of access panels for all concealed valves, traps and air vents, etc.

5.1.5 Requirements for pipe sleeves and other openings as necessary for pipe, duct, and equipment penetrations through walls, floors, ceilings, and roofs shall be carefully coordinated with architectural and structural drawings and specifications.

5.1.6 In runs of pipe 50 feet and longer, or in shorter runs where required, indicate on project plans the location of all anchors, bends, loops, and expansion joints, to adequately limit and provide for pipe expansion. Do not use expansion joints in piping unless absolutely necessary and justified.

5.1.7 Where electrical apparatus and wiring are installed in hazardous area, as defined by Article 500 of the National Electrical Code, a note shall be shown on the mechanical drawings reading "See Electrical Drawings for hazardous area classification."

5.1.8 Indicate by means of light lines, the outline of all electrical panels and switchgear in the mechanical equipment and boiler rooms to eliminate the possibility of equipment interferences.

5.1.9 Location of ceiling diffusers, grilles, and registers shall be coordinated with electrical and architectural design to be included in the reflected ceiling plan.

5.1.10 Gas piping shall be shown on plumbing drawings. Gas distribution (external beyond 5-foot line) shall be shown on civil drawings.

5.1.11 The location of existing exterior utilities shall be thoroughly checked and indicated on plans and profiles to prevent interference with new utilities.

5.1.12 Detailed HVAC system sequence of control, schematics and diagrams are required to be placed on drawings.

5.2 Design Analysis.

5.2.1 The final design analysis shall be complete for every item of every system covered in the design, and will include, but not be limited to, the following:

5.2.1.1 List of design criteria.

5.2.1.2 Design conditions.

5.2.1.3 Type, selection, and capacity of system and kind of equipment, with operation description.

5.2.1.4 Basis of equipment and material selections.

5.2.1.5 List of manufacturer's make, model, and capacity (three required) for typical manufacturer's products, which may be supplied for each major item of equipment including selection of one used for space determination and capacity and efficiency ratings.

5.2.1.6 Control and operation description, with diagrams if not placed on drawings.

5.2.1.7 Complete design calculations and computations for all systems, including energy conservation measures considered, such as:

5.2.1.7.1 Plumbing. Determination of number of fixtures, cold water demand, hot water demand, pipe material selection, pipe sizing, equipment selection, etc.

5.2.1.7.2 Heating. Heat loss calculations, radiator sizing and selection, boiler sizing and selection, equipment and pipe sizing, pipe expansion considerations, etc.

5.2.1.7.3 Ventilation. Calculations, duct sizing, equipment sizing and selection, etc.

5.2.1.7.4 Air Conditioning. Cooling load calculations, total requirements, psychometric charts, basis and calculations of sizing and selecting compressors, equipment, systems, piping, etc.

5.2.1.7.5 Refrigeration. Load calculations, total requirements, selection and sizing of equipment and piping, etc.

5.2.1.7.6 Steam and High Temperature Water Distribution. Percolation tests for conduit determination, pressure drops, pipe sizing, expansion calculations, system justification, if required, system hydraulics, routing justification, load and flow calculations, zone control, etc.

5.2.1.7.7 Gas Distribution. Total loads, pressure drops, operating pressures, pipe sizing, system loading, justification, etc.

5.2.1.7.8 Air Pollution Control. Contaminant removal calculations, equipment selection, type of contaminant and removal requirements, Federal, State, and local regulation analysis, EPA testing requirements, justification for type of equipment, operational requirements, etc.

5.2.1.7.9 Fire Protection. Complete determination of requirements and design calculations.

5.2.2 Other pertinent information of value for future use in construction contract administration, substantiation of design methods, or permanent record shall be included.

5.3 Specifications shall be prepared in accordance with chapter: Specifications of this manual.

5.3.1 Air pollution control.

5.3.1.1 Necessary testing to prove conformance to EPA, state, and local standards and regulations shall be included in the contract specifications. Method of testing required by these regulations shall be specified.

5.3.1.2 Monitoring instrumentation as required by Federal, state, and local regulations and standards, and special instructions, shall be provided (i.e., smoke density recorders when a boiler burns coal or Grade No. 6 fuel-oil).

Chapter 12

ELECTRICAL

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Attachment:
12.1 Electrical Design Analysis Guide

CHAPTER 12

ELECTRICAL

1. GENERAL. This chapter covers instructions for the design of interior and exterior lighting and power systems, fire alarm systems, communications systems, lightning protection systems, energy monitoring and control systems, TV antenna systems, seismic considerations, cathodic protection and energy conservation features. The electrical design should be based on good design practices, ensure a safe system for the user, be economical and maintainable. For guidance on the design analysis and drawings, etc., see respective chapter on same. An ELECTRICAL DESIGN ANALYSIS GUIDE is attached.

1.1 Current Publications. Where reference is made to any publication, standard or code, or paragraph therein, the current issue, including any changes (Paragraph changes or additions) shall apply without further notice. See chapter: General Instructions, paragraph: Design Criteria, Regulations, Manuals and Standards.

1.2 Cross References in Design Documents. Duplication or repeating information or details from the specifications to the drawings or from drawing to drawing generally should be avoided. Where it is essential to call attention to information on another drawing or in the specifications, it is better to reference the drawing or specifications without repeating the information.

1.3 Computations. Computations shall include all formulas, data, assumptions and criteria used. Computations shall be presented in a logical, sequential format for ease of review. Computerized computations shall include a description of method, printout format, abbreviations, symbols, etc., to facilitate checking. Sufficient data must be included to allow calculations or spot checks to be performed by alternate manual or computerized methods. If the computation printout is lengthy, results shall be summarized and submitted with the printouts. See chapter: General Instructions, paragraph: Use of Computer-Aided Analytical Programs, and chapter: Design Analysis, paragraph: Preparation.

1.4 Interface Work. A site visit to verify site conditions and to collect (and corroborate) as-built drawings and data is required. Supplement with field sketches, notes, photos, video tapes where as-builts are incomplete or unavailable. Any work that requires connection to, or modification of, existing equipment or utilities, or interfacing with special systems or equipment shall be clearly identified in contract documents. It is the designer's responsibility to define the work so that it can be bid without a Contractor's site visit and such that it is not subject to interpretation. Capacities of existing equipment to support added burden shall be verified. Locations, quantities, sizes, conditions, types, etc., shall be shown on the plans. (Also see paragraph 8, Rehabilitation.)

1.5 Supplemental Legends. Additional symbols may be developed if the standard electrical legend sheet is not sufficient. If a supplemental legend is used, include cross-references on the standard legend sheet.

1.6 References Used. References are made in this section to other chapters, to guide

specifications or to other publications. Efforts have been made to verify that information is current, however, it is probable that some material will have been revised or reissued by the time design of a given project is underway. Unless directed otherwise, the latest criteria shall be used.

2. REQUIREMENTS FOR PRELIMINARY DESIGN STAGES.

2.1 Project Definition.

2.1.1 Utility Layout Sheet. Electrical work will typically be contained on a common sheet with other utilities. Show transformer location, routing of primary distribution and routing of communications service. Secondary distribution and lighting may be addressed by note in lieu of showing tentative layouts. Tentative transformer size should be identified.

2.1.2 Design Analysis Narrative. Electrical work should be described to the extent necessary to identify scope, proposed configurations, and tentative sizes of major equipment such that funding costs can be verified. The narrative should address exterior power distribution, exterior lighting, exterior communications, interior power, interior lighting, emergency power, communications systems, fire alarm systems, lightning protection systems, energy monitoring and control systems, TV antenna systems, cathodic protection, seismic and energy conservation considerations. General statements of intent are acceptable (Examples: Illumination in parking lots with 0.5 footcandle average from 150 W HPS roadway luminaries. Receptacle configurations will consist of conventional duplex outlets throughout administrative areas, single 20 A floor outlets at 40 foot spacing in corridors.) Designers intentions relative to special requirements or unique design features should be defined more specifically or in greater depth. Such areas might involve 400 Hz power, hazardous environments, security lighting, intrusion detection, UPS equipment, single point grounding, tempest vaults, filtered power lines, EMCS, surge protection, seismic treatment, etc.

2.2 Concept Design.

2.2.1 Interior Drawings. Interior Drawings shall show the following:

2.2.1.1 Typical lighting layout of each different type of illumination. An office, corridor, stairwell, utility room, bedroom and laundry room are examples of different types of illumination. The type of fixture shall be indicated on the drawing. Do not use manufacturer's names with "or approved equal" in schedules or notes. Standard Corps of Engineer fixtures should be used to the extent possible. A description or detail will be necessary for other fixtures.

2.2.1.2 Receptacle layout showing spacing and types of outlets.

2.2.1.3 Power equipment and layout such as switchgear, substations, large motor driven items, shop machinery, kitchen equipment, etc.

2.2.1.4 Power one line diagram shall be shown to indicate arrangement of the system.

2.2.1.5 Communications shall be briefly shown to indicate the designers estimate of requirements.

2.2.1.6 Miscellaneous details of special equipment and systems to indicate understanding of construction.

2.2.2 Exterior Drawings. Exterior drawings shall show the following:

2.2.2.1 Existing powerline(s) applicable to the facility.

2.2.2.2 Route of new line(s).

2.2.2.3 Location of new transformer.

2.2.2.4 Primary voltage of the system.

2.2.2.5 Secondary voltage to facility.

2.2.2.6 Indicate where overhead or underground construction is intended.

2.2.2.7 Show typical layout of lighting system with the pole and fixture type indicated.

2.2.2.8 General description of other appropriate items.

2.2.3 Design Analysis. See chapter: Design Analysis and attached "ELECTRICAL DESIGN ANALYSIS GUIDE."

3. REQUIREMENTS FOR FINAL DESIGN.

3.1 Drawings.

3.1.1 Interior Work. Drawings shall be complete and accurate in every detail and shall include arrangements and types of light fixtures, receptacles, switching, location of special features, necessary details, including legends, fixture schedule, panel schedules, one-line diagrams, layout or functional diagrams for each of the various systems, riser diagrams, connected load and estimated maximum demand for each panel and for the entire building, and any other information needed to develop a set of plans which will be clear, concise and correct. Except for smaller facilities, the power one-line diagram shall be on a dedicated sheet. All rooms must be identified by name and/or number. Full size plans shall be carefully laid out to avoid congested linework and notes that will be difficult or impossible to distinguish at half-size. Floor plans shall be developed on 1/4" scale, unless otherwise approved in writing, by the District. Separate floor plans must be provided for lighting, power, communications, and fire alarm systems. (Exceptions will be permitted for smaller facilities, with floor plans scaled at 3/8" = 1' or greater, larger facilities (such as warehouses) consisting of expansive areas with minimal electrical work, or for preliminary design.) If the design is complex

or involves several systems, consider separate plans for the special systems, and/or blowups of given areas, equipment elevations, installation details, functional layouts, etc.

3.1.2 Exterior Work. Drawings shall be complete and accurate in all details and shall include the alignment of overhead and underground systems, locations of poles, manholes and other important features in conformance with this chapter.

3.2 Design Analysis. See chapter: Design Analysis and attached "ELECTRICAL DESIGN ANALYSIS GUIDE." The design analysis shall contain a description and analysis of the electrical portions of the design. Special features, unusual requirements, etc., shall be noted. Any necessary deviations from criteria shall be explained either in the body or in an appendix. The format of the referenced "ELECTRICAL DESIGN ANALYSIS GUIDE" can be revised and the material consolidated into a narrative format rather than an outline if desired.

3.3 Specifications. See chapter: Specifications. If the referenced guide specifications are not sufficient to adequately define the electrical work, the designer shall prepare supplementary material. If the resultant supplementary provisions are not extensive, they may be inserted at appropriate locations into the standard guides; if not, as many new sections as necessary shall be developed in the format of the standard guides. If the amount of exterior work is minor, the guide specification pertaining to aerial and underground distribution may be combined, at the designer's option, into a single specification on exterior electrical work.

3.4 Presentation of Electrical Data.

3.4.1 General Requirements. When an extensive amount of design data is necessary to define electrical work, it should be organized into a tabular format (schedules, tables, etc.) if possible. The format should be easy to follow and remain legible when reduced to half (or 3/8) size and through several stages of reproduction (especially through several iterations of amendment/modification changes superimposed in succession on the previous revisions). Titles and headings should be informative and readily distinguishable (use larger, bold face type and/or different type styles) from the data itself. For electrical work, the minimum acceptable size for lettering on full size drawings is 5/32-inch with the line weight indicated in the chapter: Presentation of Data. The combined upper/lower case format is the standard format normally required for electrical notes, upper case lettering for titles or headings. However, it will not be mandatory that upper case notes be reworked if they are done at 1/8-inch minimum size, if text is not lengthy, and if notes do not include titles, names, brands, abbreviations, catalog codes or special designations that could be confused (i.e. Emergency Hotline, RAPCON, Sealtite conduit, USE cable, mW, MVA, etc.)

3.4.2 Typewritten Data - Specifications and Design Analysis. If typed data is to be inserted into specifications or design analyses, the original or a first generation copy must be used. Multicycled copies are not normally acceptable. Use of computer printouts, verbatim, should be limited to the appendix/calculations portions of design analyses. Since the hard copy off a typical dot matrix printer uses lightweight print, it is recommended that a darkened-up copy be made and inserted in lieu of the original. Original printouts from laser or bubble-jet printers may normally be

used. Input data and pertinent results contained within a mass of data must be flagged by underlining, boxing in, annotating, keying to numbers, or symbols, etc. (in addition to the requirement for summary sheets in Paragraphs 1.3 and 4.1.1.)

3.4.3 Typewritten Data - Drawings. When typewritten data is used on drawings, it must have a font and point characteristic so as to be easily readable. The determining criterion is that when formats containing typewritten data are used, the lettering quality must not be diminished when appearing in the half-size drawing folios (i.e. the size and line weight must be equal to or better than the typewritten technical provisions of the contract specifications.)

4. INTERIOR WORK. As a minimum, designs shall comply with the National Fire Protection Association (NFPA) Codes. Applicable criteria contained in Technical Manuals, ETL's, AEI, Military Handbook, etc., may exceed the provisions contained in the codes. The most stringent requirements shall be used.

4.1 Lighting Design. Lighting design shall be in accordance with the "Lighting Handbook", published by the Illumination Engineering Society, the "Architectural and Engineering Instructions, Design Criteria" (AEI) for Army Projects or Interim Military Handbook 1190, "Facility Planning and Design Guide" for Air Force projects published by the by HQUSACE, and the following criteria.

4.1.1 General Illumination. It is recommended that computations be based on the lumen method. The lighting system designed must be effective with the least efficient fixture that would comply with plans and specifications. If it is necessary to be restrictive on efficiency (such as requiring the use of a lamp with a "minimum" lumen rating) the plans and specifications shall be carefully prepared to insure that this result will be achieved. Fixtures shall be scheduled in the plans using a schedule similar to the one accompanying Standard Drawing 40-06-04, Appendix A. Computations may be done manually or by computer assisted techniques. Include calculations for each room in the Design Analysis.

4.1.2 Level of Illumination. For applications, use criteria and tables of AEI or Mil Hdbk 1190.

4.1.3 Luminaire Selection. Corps of Engineers standard fixture types as contained in standard drawing series 40-06-04 are to be used whenever possible. Applicable standard drawing sheet numbers are to be inserted in the guide specification. A legible copy of each sheet shall be included in the "proof" copy of specifications used for reproduction. Non-Corps of Engineers light fixture types may be used if a Corps type is not available or is not suitable.

4.1.4 Energy Efficient Lighting.

4.1.4.1 Application Requirements. Refer to the conservation requirements in Chapter 12 of the AEI and to current ETLs. Fluorescent and high pressure sodium vapor lamps should be specified except in cases where color rendition is critical. Avoid the use of incandescent lamps, low efficiency mercury vapor lamps and low efficiency ballasts. Consider the use of low

energy ballasts, and multiple switching of lamps, ballasts, or fixtures. See chapter: Energy Conservation, for coordination of energy conservation requirements. Use
34 watt energy saving fluorescent lamps with matching energy efficient ballasts in lieu of using the conventional 4-foot 40-watt lamp. Energy saving lamps shall not be used for applications involving temperatures below 60°F., strong drafts, low line voltages, emergency lighting systems (inverter supplied), or dimming systems. Energy saving fluorescent lamps must not be retrofitted into fixtures manufactured prior to 1978 since the ballasts will be stressed beyond design limits and will fail at an accelerated rate. If energy efficient lamps are to be used, the existing ballast must be replaced with an energy saving type or a conventional 40-watt ballast that is rated for use with either standard 40-watt lamps or the 32/34-watt energy saving type.

4.1.4.2 Design Calculations. Corps of Engineers Guide Specification 16415 requires rapid start type fluorescent lamps having standard cool white color characteristics. Use lamp lumens in the design calculations corresponding to this type of lamp (for example: 34WT12CW lamps having approximately 2850 initial lumens) unless other criteria requires color characteristics differing from cool white. If it does, indicate what criteria requires it and coordinate the requirement with the specifications. Provide lamp data with the design calculations.

4.1.5 Branch circuit loading supplying light fixtures shall not exceed 80 percent of the circuit capacity.

4.1.6 Emergency and Egress Lighting.

4.1.6.1 General. Emergency lighting systems, egress lighting, and exit signs shall be provided in accordance with the requirements of NFPA 101. Illumination at points of egress must be a minimum of one foot-candle. Use fluorescent fixtures whenever possible. Fixtures containing radioactive materials are not acceptable.

4.1.6.2 Backup Power Provisions. Usually, fixtures with self-contained battery/inverter backup or battery operated emergency light sets will be used. (Coordinate type with user.) Central battery invertor systems (see Paragraph 4.14) may be used in facilities where it is economically justified and it is agreeable with the user. Generator supplied power can be substituted for battery backup when authorized in the project and if the generator would be capable of supporting the load within 10 seconds of a loss of normal power and if terminals or a receptacle were provided to connect a temporary alternate source during a maintenance shutdown.

4.1.7 Self-ballasted mercury vapor lamps shall not be used in new design.

4.2 Power Receptacles.

4.2.1 Single and duplex receptacles for general purpose applications shall be 15 or 20 amp, 125 volt, 2-pole, 3-wire grounding type. In general, a maximum of nine (9) duplex receptacles may be connected to a receptacle circuit, however, 5-8 receptacles is the preferred range for most circuits. Where a circuit is designed for shop type equipment (such as electric drills,

soldering irons, woodworking tools, etc.) maintenance equipment, appliances, test instrumentation, medical apparatus, etc., as few as one or two receptacles might be acceptable. The number of receptacles per circuit shall be the designer's judgment, based on economics and the above generalities. Receptacle circuits shall not supply lighting loads. Receptacles shall be located where required by specific design criteria. In offices, receptacles on walls shall be twelve (12) feet maximum on centers. In other areas, if not specified by the NEC or other criteria, receptacles may be up to twenty (20) feet on centers.

4.2.2 Other receptacles (including special purpose or heavy-duty) of twenty (20) amps or more shall be designed to suit the equipment served. Floor cleaning receptacles (simplex configuration, 20 A, 120 V, 1600 W load) should be furnished in larger facilities (10,000 sq. ft.) and considered for smaller buildings. Place at 40 foot maximum intervals in corridors.

4.3 Miscellaneous Apparatus.

4.3.1 Fixed Equipment. Circuit conductors and over current protection shall conform to applicable NEC requirements.

4.3.2 Heating Appliances. Electric heating will be limited to supplemental uses unless specifically authorized.

4.3.3 Transformers. General purpose dry type transformers should be sized so that the maximum continuous load would not exceed 80 percent nameplate.

4.4 Motors and Related Equipment.

4.4.1 Sizes and capacities shall be based on the most efficient equipment currently available.

4.4.2 Reduced Voltage Controllers. Use shall be based on motor locked rotor current. See CEGS 16415 for criteria to use for determining the need for reduced voltage controllers.

4.4.3 Calculations. For projects that will have a number of motors, a recap sheet should be included.

4.5 Panelboards. Panelboards schedules shall be shown on the drawings.

4.5.1 The following minimum information shall be shown on the schedules: The circuit numbers, size (amperes), number of poles, load (volt-amps), a description of the load, connected load, estimated maximum demand load, panel nomenclature, voltage characteristics, amperes characteristic, main circuit breaker or main lugs only, integrated short circuit rating, enclosure type, ground bus (if required), and any special features such as shunt trips, GFCI, SWD duty, etc.

4.5.2 Sizing Calculations. Size the panel boards based on estimated maximum demand plus spare demand. The demand factors in the NEC may be used as applicable. TM 5-811-2 provides some demand factors that may be used, as applicable. Generally, spare capacity should not

exceed 20% unless otherwise authorized. Panelboard neutrals should be double size when supplying harmonic current loads.

4.5.3 Design of Panelboards shall result in a balanced panel, as near as practicable.

4.5.4 Spare Circuits shall be provided as follows: Schools, Office, Dormitory, Mess Hall, one spare for six (6) active. Shops, manufacturing, hangars, etc., one spare for four (4) active. Flush mounted panels that are inaccessible for future addition of wiring may have empty conduits stubbed above ceilings to allow additional circuits to be installed.

4.6 Feeders and Branch Circuits.

4.6.1 Sizing - General. Sizes shall be based on the load supplied (Panelboard EMD) and voltage drop.

4.6.2 Neutral Sizing. The use of full size neutrals shall be standard practice. Include back-up data in the Design Analysis for all cases where reduced neutrals have been permitted. For all applications involving discharge type lighting (fluorescent, HID) or other harmonics generating equipment (invertor, variable frequency drives, other solid state apparatus), the neutral must be treated as a current carrying conductor (see NEC Table 310-16. In 4 wire 3 phase systems supplying harmonic current loads, the neutral conductor should be sized not less then 173% of the phase current. For single phase to ground loads, a separate neutral conductor should be provided for each phase conductor in its respective branch circuit. Refer to CEGS 16415 and to ETLs for additional harmonic load design information and recommendations.

4.7 Service and Metering Equipment.

4.7.1 The use of a Main Distribution Panel is the recommended design practice in lieu of separate switches interconnected with wireway and/or conduit and wire.

4.7.2 Ground fault protection shall be provided in accordance with NEC 230-95.

4.7.3 Location. Service equipment and disconnecting means shall be readily accessible (NEC 230-70). Equipment shall be located in rooms dedicated exclusively to such equipment (AEI - Chapter 12, Paragraph 2(g)(1)).

4.7.4 Emergency and Security Systems. See appropriate paragraphs concerning "Emergency Power Supply" (4.14) and NEC 700. When a tap is made upstream of the facility main disconnecting means, a disconnect for the emergency system must be located within 10 feet of the tap (or 25 feet maximum if the ampacity of the cable to the switch is at least 33 percent of the service size). Provide current limiting fuses in the disconnects for all taps.

4.7.5 Three phase design shall be provided where the service is large and/or equipment to be served is designed for three-phase power.

4.7.6 Secondary Voltages Over 250 Volts. Where the load exceeds approximately 112-

1/2 KVA, the designer should consider 480Y/277V (or 480V) systems. The 480V and 277V loads must predominate over 120V loads. Dry-type transformers shall be used to supply 120-, 240-, or 208-volt single-phase loads. Ungrounded secondary systems shall not be used unless required by project criteria or approved in writing. Ungrounded secondary systems shall only be used where it is essential that service to critical operations or processes not be interrupted. Provide 'K' rated Delta-wye transformers when the harmonic loads warrant their use. Refer to ETLs for information and recommendations on determining the k-factor rating.

4.7.7 Service Entrance Conductor. Size per Paragraph 4.6.1 above.

4.8 Short Circuit Analysis (Low Voltage). (Coordinate with requirements of paragraph 6.10.)

4.8.1 Basic Requirement. Short circuit computations shall be provided with the Design Analysis.

4.8.2 Calculation Procedures. Computations shall be performed in accordance with standard engineering practices using a method chosen by the designer. Calculations shall show maximum available fault current at the service equipment and downstream to verify interrupting device capacities and equipment bracing requirements. Computations should be based on an infinite bus source unless the source is verified by the local utility company. The source as verified by the local utility company should include forecasted growth of the utility system.

4.8.3 Interrupting Ratings. Equipment ratings shall be determined based on results of the above analysis. Minimum standard interrupting ratings shall be identified on the plans in panel schedules. The designer shall identify variables (such as equipment impedances) which could affect available short circuit current and ascertain that equipment acceptable under contract plans and specifications would not permit fault current levels higher than the specified interrupting ratings. The Contractor could also be given the option to furnish equipment with lower impedances subject to upgrading equipment ratings in accordance with a detailed fault analysis prepared by the Contractor and approved by the District.

4.9 Protective Coordination. The proposed electrical distribution design must be analyzed to determine the most advantageous locations, sizes, settings for overcurrent devices, relays, ground fault equipment, etc. as applicable. The scheme must be compatible with primary system coordination (see paragraph 6.10). Requirements shall be defined by the designer. The Contractor will be assigned responsibility to verify the configuration by performing a short circuit and coordination study based on the specific electrical and mechanical equipment he selects. If connection is made to, or will affect, existing installations, the scope of the evaluation must include the existing system or equipment.

4.10 Voltage Drop.

4.10.1 Primary (over 600 volts) distribution system design shall be based on a maximum of 2% voltage drop.

4.10.2 Secondary (600 volts or less) distribution and branch circuit system design shall be based on a maximum of 5% voltage drop from the transformer to the utilization equipment. This should be split such that there will be 2% or less voltage drop from the transformer (service drop, service entrance, etc.) to the branch circuit panelboard (proportioned most economically between the service and feeder conductors) and 3% voltage drop or more on branch circuits.

4.11 Communications.

4.11.1 Provide complete riser diagram for each system. Identify location of components by room number. Identify equipment, raceways, and conductors types and sizes.

4.11.2 Telephone/Data. The communication system design shall comply with TM 5-811-9, NEC ART 800, Corps of Engineers Specifications, AF ETL 87-9 (Air Force projects), and applicable regulations. The design for Air Force and Army projects shall form a complete communications system, including, but not limited to, wires, terminations, raceway, cabinets, and outlets, as determined by the criteria for each project. The designer shall consult with the Using Agency to verify communication requirements.

4.11.2.1 Outlets, Cabinets, Distribution Frames, or Backboard Protectors, etc. Locations prior to final design shall be provided in accordance with designer's best estimate of the communications requirement. This is necessary for cost estimation. Final locations should be furnished, or agreed to, by the Using Agency prior to final plan submittal.

4.11.2.2 Wiring. All raceways, cabinets, backboards, distribution frames and outlets will be designed with necessary wiring for a complete communication path.

4.11.2.3 Raceway System. The communications systems wiring shall be installed in raceways and cable trays in conformance with criteria.

4.11.3 Public address systems, when required, shall be provided in accordance with Guide Specification 16770.

4.12 Fire Detection and Alarm System shall generally be provided for all facilities in accordance with AEI for Army projects and Mil Hdbk 1190 for Air Force projects. Also see paragraph: Fire Protection of this chapter.

4.12.1 Drawings shall show the disconnect switch, control provisions (FAC), annunciation provisions (FAA), signal transmitting provisions (FST), manual fire alarm stations, signaling devices, and detecting devices. Interconnecting wiring shall normally not be shown on the floor plan. Provide a riser diagram showing interconnection and the location of the above components.

4.12.2 Disconnect Switch. The fused disconnect switch(es) shall be marked, located, and identified in accordance with NFPA 72.

4.12.2.1 If the building service is less than 250 volts, provide a current limiting fused switch connected ahead of (not within) the Service Equipment.

4.12.2.2 If the building service is 480Y/277V, provide a current limiting fused switch connected ahead of (not within) the Service Equipment, supplying a (277 volt to 120 volt) dry type transformer connected to provide 120V single phase to the fire alarm system, via a fused switch or panelboard.

4.13 Low Voltage Power Switchgear and Switchboards. Power distribution equipment shall be provided in accordance with Guide Specification 16415, paragraph entitled "Power-Switchgear Assemblies." For details of design, refer to the NEMA Standards Publications, PB-2 and SG5, current editions, and appropriate manufacturer's catalog and specifications. In general, switchboards should not be used for loads of less than 800 amperes. Drawings showing plan and elevation view and one-line diagrams of all switchgear with dimensions are recommended. The designer should verify equipment dimensions to ensure that required working space and safety clearances can be maintained with any manufacturers equipment. If in doubt, identify dimensional limitations.

4.14 Emergency Power Supply shall be either the instantaneous emergency AC power battery inverter type, or automatic standby AC generator.

4.14.1 Battery Powered Equipment. Individual built-in battery unit type fixtures (Emergency Light Sets) and integral battery/inverter emergency units within lighting fixtures may be used for emergency lighting (see paragraph 4.1.6.2). Battery inverters supplying emergency panels should be sized on the basis of connected load (including spare circuits if any). An overcurrent breaker, fuse, or relay sized to trip on continuous loading exceeding 97 percent of rated inverter output shall be installed at the inverter or panel. If it would be physically possible to insert a higher amperage device, include a label stating the maximum permissible size. The system shall have normal AC power supplied from a fused switch connected ahead of the main service equipment, not within the service disconnecting means (NEC 700-12(e)). Ventilation shall be provided as necessary, to prevent the build up of gases resulting from the charging of batteries.

4.14.2 Standby Generators. Where automatic standby AC generated power is authorized or available, a battery system will not normally be required (see paragraph 4.1.6.2).

4.15 Hazardous Applications. The type (Class, Group, Division, Maximum Temperature) of hazardous environment applicable should be identified on the plans and the boundaries of the area(s) delineated.

4.16 Aluminum Conductor Option. Sizing of wiring, conduit, and related items is to be based on copper conductors; however, project documents should permit substitution of the ampacity equivalent in aluminum sizes for all copper sizes #6 AWG and larger for all projects, except Air Force and hospital projects. For Air Force projects, the aluminum option shall be restricted to the ampacity equivalents of #4 copper and larger. Aluminum conductors shall not be installed in hospitals.

4.17 Raceway. Raceway sizes shall be determined using the tables in Chapter 9 of the NEC. To reduce the possibility of insulation damage, it may be necessary for some long runs or runs with more than two bends, to size the raceways one or two sizes larger than the NEC minimums. Underground conduit shall be sized on the basis of type USE cable.

4.18 Equipment Rooms or Spaces. Equipment shall be located in rooms or space dedicated exclusively to such equipment (NEC 384-4). The dedicated rooms or space shall be coordinated with other disciplines and shall be indicated as such on the drawings. Refer to AEI, chapter 12, paragraph 2.g.1. The electrical designer must verify that adequate ventilation is available particularly when electrical apparatus is added to existing equipment rooms or is to be placed in closets.

4.19 Data Processing Applications. Provide capability of shutting off service to computer equipment by means of a shunt trip main circuit breaker controlled by pushbuttons (or similar arrangement) located at the exits of the computer equipment area (NEC - Article 645). Emergency Power OFF (EPO) pushbuttons shall be of the extended guard style, and shall have a safety cover to prevent accidental disconnection.

5. EXISTING PRIMARY DISTRIBUTION SYSTEM VOLTAGE shall be obtained by contacting the Using Service or the local power company.

6. EXTERIOR SYSTEMS. As a minimum, the designs shall comply with the American National Standard "National Electrical Safety Code," ANSI C2, and the "National Electrical Code," NFPA No. 70. Applicable criteria contained in Technical Manuals, ETL's, AEI, Military Handbook, etc., may exceed the provisions contained in the codes. The most stringent requirements shall be used.

6.1 Secondary Services. Secondary services (less than 600V) shall be designed as directed or as follows:

6.1.1 Underground services should be used in most instances. Conductor size shall be based on the building estimated maximum demand (EMD).

6.1.2 Overhead services (service drop 600 volts or less) should be used in industrial-type areas where appearance is not a significant factor or when underground service is too costly. Conductor size shall be based on the building estimated maximum demand (EMD). Normally aerial secondary conductors will be the neutral supported secondary and service drop type. Refer to CEGS 16370.

6.2 Primary Service. Primary service (over 600 volts) to a building normally will not be used because transformer installations in doors cost more than those installed outdoors; however, secondary feeder lengths may require an interior location or make interior transformer installations economical in some cases. Therefore, unless an economic analysis can support an indoor service transformer location, or it can be justified by an approved engineering analysis, the installation must be located on the exterior of the building.

6.3 Transformer Stations. Transformer stations shall be shown on the drawings. Selection and application shall conform to Chapter 8 of TM 5 811-1, the National Electrical Code (NFPA 70), the National Electrical Safety Code (ANSI C2), MIL-HDBK-1008B, and CEGS 16370 & 16375.

6.4 Overhead Distribution. Design shall be based on the National Electrical Safety Code, Guide Specification 16370, TM 5-811-1 and as follows:

6.4.1 REA standard drawings for line construction may be used, as applicable. Structure details shall be shown on the construction drawings in lieu of referencing the REA details. Do not show manufacturer's names on details or in schedules of materials.

6.4.2 Poles shall be of the wood species shown in Guide Specification 16370. All wood options shall be retained in the specification. All poles shall be numbered for identification. A pole schedule must be shown on plans for projects having five or more poles, indicating pole number, pole length, pole class, and other descriptive details, as applicable. Guy strengths shall be shown on the plans.

6.4.3 Computations for pole length and class, and guy strengths shall be included in the Design Analysis.

6.4.4 Communications Space shall be provided on all poles, except as directed otherwise.

6.4.5 Communication System. The system (cables, structures, etc.,) shall comply with the U.S. Department of Agriculture, Rural Electrification Administration Specifications, where applicable. Communications conductors or cable shall be included in the project unless specifically directed otherwise,

6.4.6 Transmission Line Design (voltages in excess of 15 KV). The design of these lines shall comply with applicable REA Bulletins and Forms.

6.4.7 Overcurrent protection shall be provided at aerial to underground transitions in a distribution system to avoid reclosing on a fault in an underground cable.

6.4.8 REA Publications are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20013.

6.5 Underground Distribution. Design shall be based on the National Electrical Safety Code, TM 5-811-1, Guide Specification 16375 and as follows:

6.5.1 Primary cables shall be installed as specified in Guide Specification 16375.

6.5.1.1 Direct burial installations shall not be specified unless directed in writing.

6.5.1.2 Installations shall be in concrete-encased duct banks or rigid steel (heavy

wall) conduits.

6.5.1.3 Manhole design shall conform to TM 5-811-1 and CEGS 16375. The designer shall provide manholes adequately sized for the intended purpose.

6.5.1.4 Conductor insulation shall be cross-linked polyethylene with option of polyvinyl or polyethylene jacket or jacketed ethylene propylene where electrical characteristics are more significant than physical durability. Insulation level shall be 133%.

6.5.1.5 Conductor size shall be #2 AWG minimum for 15 KV class, #6 AWG minimum for 5 KV class. Design documents shall permit the use of single conductor cable rather than being restricted to the multiconductor construction.

6.5.1.6 Shielded conductors shall be provided in accordance with Guide Specification 16375. Potheads shall not be specified to the exclusion of other type of terminations.

6.5.2 Duct Bank. Conduits shall be specified as shown in Guide Specification 16375. Retain all allowable material options in specification.

6.5.2.1 Configuration shall be shown on the drawings.

6.5.2.2 Reinforced concrete encased duct banks are required under Aircraft Paving and Railroads. Where reinforced concrete is required, it shall be designated on the drawings.

6.5.2.3 Manhole spacing shall be not more than 500 feet. Manholes shall not be installed in aircraft paving.

6.5.2.4 Existing aircraft paving or railroad. When paving or railroads are in place, the options for conduit installation shall be: a carrier pipe drilled or augered under; pushing of pipe or conduit under; or paving cut and replacement where approved.

6.5.3 Secondary Cable. Utilize type USE cable for underground installations whether in conduit or direct buried. For direct burial depth, verify frost depth applicable to the area.

6.6 Exterior Illumination. Design shall be based on Guide Specifications 16528 and the IES Manual.

6.6.1 Luminaire Selection. Light fixtures shall be enclosed in lieu of open type. See Paragraph 4.1.3 "Luminaire Selection" for guidance. Insert applicable sheet number of standard drawing series 40-06-04 in the specifications.

6.6.2 Lamps shall generally be high intensity discharge or fluorescent, in lieu of incandescent.

6.6.3 Circuit Configurations. The supply circuit shall be multiple type for new facilities,

series should be limited to rehabs or expansions of existing.

6.6.4 Street (Roadway) Lighting. If power lines run parallel to a roadway, it is preferred that luminaries be installed on the distribution poles. Where power poles are not available or use is restricted, separate poles should be provided. See Paragraph 6.6.5.2 below.

6.6.5 Area Lighting.

6.6.5.1 General. Area lighting type luminaries shall be provided in areas where general illumination is desired and walkway, parking lot, and/or street lighting is not considered sufficient. Luminaries mounted on the exterior of a building may be used as part of, or to supplement, area lighting. Illumination level should not exceed an average of 0.5 footcandle without specific direction.

6.6.5.2 Pole Design. It shall be coordinated with each facility to determine the type, material, color, etc. of poles and fixtures that coordinate with their facility comprehensive plan.

6.6.6 Parking Lot Lighting. Illumination shall be provided for all parking areas unless directed otherwise. Target level should be 0.5 footcandles average (horizontal) except at handicapped spaces where 1-2 footcandles is desirable.

6.6.7 Walkway Lighting. Provide if other lighting is not adequate for walks.

6.6.8 Concrete footings for luminaire standards shall be a part of the design and detailed on the drawings.

6.7 Surge Arrestors. Standard practice shall be to require arrestors at all overhead to underground transition poles and at transformers. Arrestor sizes are to be shown on plans. Refer to TM 5-811-1 for sizing arresters.

6.8 Cathodic Protection.

6.8.1 Cathodic protection design shall be prior to advertisement of the project in accordance with ETL 91-6 for Air Force projects and ETL 1110-3-440 for Army projects. Refer to TM 5-811-7 for additional design guidance.

6.8.2 Cathodic protection design shall be accomplished by a NACE certified specialist. The corrosion specialists accreditation must have been obtained in the field of cathodic protection. In lieu of the NACE accreditation the person doing the design must have at least 5 years of experience in the design of cathodic protection systems and be qualified by having a state license or certification to perform such design. The designer's qualifications should be furnished with the design calculations in the design analysis.

6.9 Metering. On Army and Air Force projects, kWh meters with 15-minute demand register

shall be installed on all new buildings with capability of connection to EMCS equipment. On Army projects, kWh meters with 15-minute demand register will be installed at each substation, at each feeder leaving the substation, and at large unique structures such as commissaries, medical facilities, and dining facilities. Coordinate with each facility to determine EMCS requirements for a specific project.

6.10 Short Circuit Analysis and Protective Coordination (Medium Voltage). Short circuit calculations should be performed for the exterior portions of the distribution system as part of or similar to the analysis performed on the interior portions (See paragraph Short Circuit Analysis (Low Voltages)). Sizes, settings, locations of protective devices should be determined based on a coordination study that considers the total system both interior and exterior (see Paragraph Protective Coordination). The sizes and settings selected by the designers will be tentative until the final configuration is determined from a short circuit/coordination study performed by the Contractor after equipment has been selected and approved (see Guide Specifications 16370/16375).

6.11 Grounding of Guy Wires. Guy wires connected to structures supporting conductors with a potential of more than 300 volts shall be effectively grounded as follows:

6.11.1 In soils with resistivity of 30,000 ohm-cm or greater, guy wires may be connected to the system neutral if the system neutral is solidly grounded. Guys may also be grounded through the pole ground wire if the pole ground wire is connected to a grounded neutral (preferred method). In either case, the connection to the guy wire itself should be coated with a silicone grease or other water inhibitor.

6.11.2 In soils with a resistivity of less than 30,000 ohm-cm and where corrosion of underground structures is a problem, galvanized anchors and guys should not be connected to copper grounding systems since severe corrosion may result. Strain insulators should be installed in the guy wire in lieu of grounding. Insulators may be either the cross-connected porcelain type ("Johnny ball") or the fiberglass rod type, however, the flash over rating (wet) must be equal to the phase-to-phase voltage of the electrical circuit.

6.11.3 On systems where a grounded neutral is not present, the above mentioned guy insulators should be installed. If this is not possible, then the guy must be grounded and galvanized ground rods must be used.

6.12 Lightning Protection System.

6.12.1 Ammunition plant design shall comply with AMCR 385-100 Safety Manual as directed by the Using Service.

6.12.2 In general, other facilities will require protection as determined by the criteria in Army TM 5-811-3 or when so directed by the Using Service.

6.12.3 Storage tanks shall be grounded. They will not require air terminals if the cover is more than 3/16-inch thick.

7. MASTER TELEVISION ANTENNA SYSTEMS shall comply with Guide Specification 16781, except as follows:

7.1 Outlet Location shall be shown on the drawings.

7.2 Guide Specifications shall be edited to provide a performance specification.

7.3 Design Details or Computations shall not be provided by the designer.

7.4 Antenna Location shall be determined by the installer in the field for best reception.

7.5 Channel Selection shall be coordinated with the Using Agency and shall include educational stations, provisions for stations under construction, and future additions.

8. REHABILITATION (INTERIOR AND/OR EXTERIOR).

8.1 Field Survey. Design shall be based on a complete field survey.

8.2 Power Study. An electrical power study shall be made to determine the existing system load (Estimated Maximum Demand (EMD)).

8.3 Equipment Removal.

8.3.1 Existing wiring shall be removed and not reinstalled.

8.3.2 Light fixtures removed and reinstalled shall be cleaned and relamped.

8.3.3 Conduit shall not be reused unless verified suitable for use.

8.3.4 Switches and Receptacles (wall and duplex) under 30 amps shall not be reused.

8.4 Government Property. Equipment and material removed and not reinstalled shall be coordinated for proper disposition and the drawings and specification prepared to agree.

8.5 As-Built Plans used for design shall be verified in the field, and where used to show removal or new work, the existing legend symbols, details, etc., shall be revised or added to as directed or required.

9. ENERGY MONITORING AND CONTROL SYSTEM (EMCS). All projects on posts or bases that have an EMCS in operation or a proposed system, shall be designed for inclusion in the EMCS and shall be specified to have the proper connection points, terminals and/or contacts necessary for tie-in to the EMCS. Refer to CEGS 13814 for building preparation for EMCS.

10. FIRE PROTECTION. For fire protection criteria refer to AEI, chapter 9. For fire pump applications, electrical service, sizing of transformers, etc., must conform to NFPA-20.

11. STANDBY GENERATORS. Generators shall be derated for altitude in the same manner specified for motors in CEGS 16415, Electrical Work Interior. Generators shall also be derated, per manufacturer's recommendations for supply harmonic current loads. Diesel-Generator sets, stationary, shall be specified in accordance with Guide Specification CEGS 16263 for 100 to 2500 kw sizes and Guide Specification CE 16264 for 10-99kw sizes.

12. ENERGY CONSERVATION.

12.1 Components, Materials, System Configurations, Etc., Selection. In the selection of components, materials, system configurations, etc., the designer must include energy conservation in addition to first cost reliability, safety, and other factors which influence engineering decisions. The design analysis must address energy conservation as a specific topic and indicate the extent to which the following may have been implemented or considered:

12.1.1 Use of current AEI and Mil Hdbk 1190 illumination levels for basis of design.

12.1.2 Photoelectric devices, occupancy sensors or time switches to control duration of lighting.

12.1.3 Efficient luminaries, ballasts or switching arrangements.

12.1.4 Timers, thermostats, etc. to control cycling of water heaters or other electric appliances, power factor correction, demand monitoring, energy monitoring equipment.

12.2 Energy Conservation Checklist. If an Energy Conservation Checklist is included in the design package and it includes electrical items, reference may be made to the checklist rather than repeating specific items.

13. SEISMIC CONSIDERATIONS. All electrical work must have the capability to support seismic loading. The seismic zone applicable to a given facility should be determined from Table 3-1 of TM 5-809-10, "Seismic Design For Buildings." All facilities must conform to the seismic requirements of the applicable zone as defined in TM 5-809-10 and CEGS 13080 "Seismic Protection for Mechanical, Electrical Equipment."

ELECTRICAL DESIGN ANALYSIS GUIDE

INSTRUCTIONS TO DESIGNER

1. It is intended that this guide be used as a basic editing text for preliminary plans, in progress plans, basis for design, final plans, etc. The format is not mandatory, see Paragraph Design Analysis of Chapter: Electrical.

2. Edit each paragraph (if necessary) by deleting or adding to make paragraph apply. Cross out unwanted options and phrases. Add additional system descriptions as required.

3. On Preliminaries, Basis for Design, or In-Progress documents, include lighting fixture standards or other details as an attachment to Design Analysis.

4. Limited design details shall be included from the appropriate guide specs.

ELECTRICAL DESIGN ANALYSIS

1. General. This design is based on, but not limited to the following publications, codes, specifications, etc.; (List only references not included in General Section of Design Analysis) (Date all references).

1.1 National Electrical Code NFPA No. 70. 19

1.2 Life Safety Code NFPA No. 101. 19

1.3 National Electrical Safety Code (ANSI) C2-19

1.4 Air Force Military Handbook 1190

1.5 HQUSACE Architectural and Engineering Instructions - Design Criteria, latest version.

1.6 Project Development Booklet (PDB)

1.7 Criteria furnished by Using Service.

1.8 Field Survey Report.

1.9 Other appropriate references.

2. Scope. This design will generally consist of the following:

2.1 Interior.

2.1.1 Illumination.

2.1.2 Raceway systems and conductors

2.1.3 Power systems for special equipment and standard receptacles.

2.1.4 Emergency power systems (Battery Operated Invertor AC power system)

2.1.5 Fire Alarm. (Describe zoning concepts and operation of system and interfaces to other systems such as HVAC. Include description of transmission system to the Central Fire Station)

2.1.6 Television System.

2.1.7 Public Address System.

2.1.8 Intercommunication System.

2.1.9 Communication System.

2.1.10 Standby Emergency Generator.

2.1.11 Seismic Requirements.

2.1.12 Lightning Protection.

2.1.13 Energy Monitoring and Control System (EMCS).

2.2 Exterior.

2.2.1 Primary (overhead) (underground) service and distribution.

2.2.2 Secondary (overhead) (underground)

2.2.3 Illumination (Street) (Parking) (Walkway)

2.2.4 Transformer Station.

2.2.5 Substation.

2.2.6 Cathodic Protection of underground ferrous metal pipes and tanks.

3. Interior Work.

3.1 Illumination will be as follows:

Light Fixture Schedule

Rm Name and No.	Description	Lamp type	Design Foot Candles

3.2 Provide description of illumination.

3.2.1 Provide complete computation of intensity for each room or area.

3.2.2 Egress illumination (See NFPA 101) will be provided in corridors, stairwells (list other applicable areas) etc.

3.2.3 Exit sign illumination (See NFPA 101) will be provided over exterior entrance doors, corridor intersections, stairwell entrances, etc. (list other appropriate locations). Describe source of power.

3.3 Raceway System will be as follows:

3.3.1 Intermediate Metal Conduit (IMC)

3.3.2 Electric Metallic Tubing (EMT).

3.3.3 Rigid Metal Conduit (Heavy Wall).

3.3.4 Rigid Nonmetallic Conduit (Plastic).

3.3.5 Surface Raceways (Wiremold).

3.3.6 Underfloor Raceways.

3.3.7 Cellular (Metal)(Concrete) Raceways.

3.3.8 Wireways.

3.3.9 Busways.

3.3.10 Cable Tray.

3.4 Conductors design will be based on copper.

3.4.1 Conductor identification in systems shall be color coded. The color of the insulation of the ungrounded conductors of different voltage systems shall be as follows:

120/208 volt, 3-phase: black, red, and blue; phases A, B, & C, respectively
277/480 volt, 3-phase: brown, orange, and yellow; phases A, B, & C, respectively
120/240 volt, single phase: red and black; phases A and B.

When 120/208 volt and 120/240 volt systems exist in the same project, colors other than red and black for the 120/240 volt single phase system will be used.

3.4.2 Nonmetallic Sheathed Cable will be used in the following areas _____.

3.4.3 Wire size based on 60°C Ampacity Column, for No. 1 AWG and smaller and 75°C Ampacity Column for larger than No. 1 AWG.

3.5 Receptacles will be as follows:

3.5.1 Grounding Type (15) (20) Ampere, 125 volts, three-wire.

3.5.2 Switched receptacles ( ), ( ).

3.5.3 Weatherproof receptacles ( ), ( ).

3.5.4 List other receptacles required through 50 amps.

3.5.5 List Special Purpose or Heavy Duty Receptacles.

3.6 Wall switches will be rated 120 volt (15 or 20 ampere) 277 volt (15 or 20 ampere).

3.7 Service equipment and disconnecting means shall be of the fusible switch or circuit breaker type.

3.8 Panelboards.

3.8.1 Lighting and appliance branch-circuit panelboards will be circuit breaker type.
3.8.2 Distribution, power and feeder panelboards will be fusible switch type.

3.8.3 Load-center Panelboards will not be used, except for residential applications.

3.9 Switchboards (NEMA Standard PB2 Dead Front Distribution Switchboards). Enclosures shall be freestanding ventilated general purpose type. Buses will be optional copper or aluminum. (Provide additional description as may be required).

3.10 (Underground service) (Overhead service drop) to the building will be provided.

3.11 Motors, Motor Control, and Control Center. (Provide brief description.) Reduced voltage controllers. (Reduced voltage controllers will be required when the locked rotor current of motors exceeds the full-load rating of supply transformers or supply conductors.)

3.12 Transformers of the dry type will be used to provide (120/208V)(120/240) volt from a 480 volt source.

3.13 Ground Fault Circuit Interrupters (Personnel Protection See NEC 210-8) will be provided as follows:

3.13.1 Receptacles in toilets (in living quarters as opposed to offices or shops.)

3.13.2 Receptacles in kitchens.

3.13.3 Receptacles exposed to the weather.

3.13.4 Receptacles in wet locations.

3.13.5 Other (describe).

3.14 Ground Fault Protection of Equipment will comply with NEC paragraph 230-95. (Grounded wye systems of more than 150 volts to ground and 1000 amps or more).

3.15 Electric Heat will be of the following type:

3.15.1 Unit Heater

3.15.2 Cabinet Type Unit Heaters

3.15.3 Convector-Type Heaters

3.15.4 Heating Cable

3.16 Standby Emergency Generator will be _____kW. The unit will be provided with (automatic transfer) (Manual transfer) switching (Provide additional electrical description as required.)

3.17 Hazardous areas (See NEC 500, 501, 502, 503) shall be described with justification of classification.

4. Exterior Electrical.

4.1 A new circuit breaker will be installed in the base substation. A new (4160Y/2400V) (12470Y/72 etc., 3-phase line will be installed along _____ road to the _____ area (building, etc.).

The distribution system will consist of a new (single)(three) phase (aerial) (underground) extension from the existing (4160Y/2400) (12470Y/7200) etc., line at the _____ location.

The existing (4160Y/2400) (12470Y/7200)etc., line at the _____ location will be (removed) (abandoned) (recoppered) (underbuilt) etc.

4.2 The Street Lighting System will consist of an extension from the existing system at the _____ location. A new Multiple Street Lighting System will be installed along the new roads; connections to an existing circuit will be made as shown on the drawings.

4.3 The complete exterior system shall include the following material and equipment.

4.3.1 Transformers.

4.3.1.1 (Single phase) (three phase).

4.3.1.2 (Cluster or radial bracket) (Pad mounted compartmentalized) (Integral load-center).

4.3.2 Aerial line conductor.

4.3.2.1 (Primary) (street light).

4.3.2.2 Size.

4.3.2.3 Type (hard drawn copper) (ACSR) (Other, describe).

4.3.3 Underground conductors.

4.3.3.1 (Primary) (street light) (in duct).

4.3.3.2 Size. (AWG)

4.3.3.3 (Ethylene-propylene-rubber with nonmetallic jacket)
(Cross-linked polyethylene with nonmetallic jacket)

(Other, describe).

4.3.4 Secondary conductors.

4.3.4.1 Aerial (neoprene) (polyethylene) (polyvinyl chloride) (messenger supported).

4.3.4.2 Voltage.

4.3.5 Surge arresters.

4.3.6 Down guys and anchors.

4.3.7 Insulators.

4.3.8 Terminations - Molded elastomer, taped, heat shrinkable elastomer, wet-process porcelain, prestretched elastomer.

4.3.9 Duct banks.

4.3.9.1 (Primary) (street lighting) (secondary) (communication) (EMCS).

4.3.9.2 (Fiber) (fire clay cement)

4.3.9.3 (Concrete encased) (without encasement)

4.3.9.4 Reinforced concrete encasement shall be provided under railroads and aircraft paving.

4.3.10 Floodlights-(enclosed) (open) (reflector-lamp)

4.3.11 Street light.

4.3.11.1 Standards-(wooden pole) (aluminum - steel pole) (Concrete pole).

4.3.11.2 Luminaries-(series)(multiple)(enclosed)(open)(filament) (lamp type)

4.3.11.3 Control-(group) (individual) (new) (existing)(manual) (photoelectric).

4.3.11.4 Regulator.

4.3.12 Parking Lot Lighting.

4.3.13 Walkway Lighting.

4.3.14 Exterior Building Lighting.

4.3.15 Manholes (combination) (power) (communications) type.

4.3.16 Primary fuse cutouts.

4.3.17 Pole top switches.

4.3.18 (Add items as needed).

4.4 Provide brief description of other features.

4.5 Cathodic protection (will) (will not) be provided for (gas line) (fuel tank) (steam line). (If not, describe why not.)

4.6 Attach calculations for (pole and guy sizes), (feeders sizes), (short circuit current), (connected load), (demand load or diversity factors), (transformer sizes), (voltage drop), (lighting), and (cathodic protection).

4.7 Communications. (Describe how telephone system hooks up to Base System).

4.8 EMCS. (Describe how data transmission media connects to base system).

4.9 Harmonic Loads. (Describe special features to accommodate harmonic loads).

5. Deviations. Provide brief description of any deviations or alternative types of systems or equipment considered, with explanation (See chapter: Electrical, Paragraph: Standardized Format). Also include a description of any reports or studies required to complete design.

6. Coordination. Coordination with Installation or Outside Agencies.

7. Guide Specifications. List applicable military guide specifications.

CHAPTER 13

FIRE PROTECTION

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CHAPTER 13

FIRE PROTECTION

1. GENERAL. This chapter covers general instructions for the fire protection design for permanent, semipermanent, and temporary constructed facilities. Fire protection design requirements shall be determined by personnel of the A-E firm familiar with and capable of implementing criteria furnished with the scope of work and other instructions stated herein.

1.1 Installed Fire Protection Systems.

1.1.1 CO2 and HALON 1301 fire protection equipment will not be included in the project unless specifically instructed.

1.1.2 Standpipes and hose stations shall be designed in accordance with Military Handbook MIL-HDBK-1008B, and NFPA Standard No. 14.

1.1.3 Sprinkler systems shall be designed in accordance with MIL-HDBK-1008B and NFPA Standard No. 13. Sprinkler system water service shall be provided with a double check back flow preventer.

1.1.3.1 Permanently heated buildings requiring sprinklers shall have wet pipe systems unless required otherwise by the scope of work.

1.1.3.2 Standard 2-1/2-inch fire department hose connections shall be provided for all automatic sprinkler installations.

1.1.3.3 Zoning of fixed fire protection systems shall be coordinated with the base or post fire chief. Each zone shall be separately alarmed for water flow with a signal to the fire alarm panel.

1.1.4 In general, sprinkler system layout will not be shown on the drawings. Show riser size and location, zone boundaries, appropriate valve details, available static pressure and residual pressure and flow rate, location of inspections test, and all other information needed by the Contractor to design and layout the system.

1.1.5 All deluge sprinkler systems shall be hydraulically designed.

1.2 Alarm and Detection Systems. Fire alarm and detection system shall generally be provided for all facilities in accordance with MIL-HDBK-1008B. In addition, the AEI shall be used for Army projects and Military Handbook 1190, "Facility Planning and Design Guide," for Air Force projects.

1.2.1 Drawings shall show the disconnect switch, control panel, annunciator panel, transmitter, manual fire alarm stations, signaling devices, etc., except that the fire detecting equipment and interconnecting wiring shall not be shown. Provide a one-line diagram that includes the location of the above components. In general detectors shall be indicated only as representative of the type with exact location and quantity to be determined by the performance requirements of the specifications. The intent of guide specification 16721 is to identify performance wherever practicable in lieu of specifying extensive physical details. Some projects may require a complete design of the fire detection system, and if so, you will be directed in writing to do so.

1.2.2 Disconnect Switch.

1.2.2.1 If the building service is less than 250 volts, provide a separate one pole, solid neutral current limiting fused switch connected ahead of the Service Equipment.

1.2.2.2 If the building service is 480Y/277V, provide a separate one-pole plus solid neutral current limiting fused switch connected ahead of the Service Equipment, and supplying one single phase (277 volt to 120 volt) dry type transformer connected to provide 120V 2-wire single phase to the fire alarm system.

1.2.3 When a tap is made upstream of the facility main disconnecting means, a disconnect for the fire alarm system must be located within 10 feet of the tap (or 25 feet maximum if the ampacity of the cable to the switch is at least 33 percent of the service size). Provide current limiting fuses in the disconnects for all taps.

1.3 Life Safety. Safety and fire protection shall be an integral part of every building design. Recognized codes and accepted safety standards shall be followed for the design of all facilities. Of the various codes and safety standards, the National Fire Protection Association's "Life Safety Code" (NFPA document 101) shall take precedence. All applicable requirements of the Life Safety Code shall be incorporated into the design. Special attention shall be given to the application of fire codes as they relate to Life Safety. Features of Fire Protection such as area separation walls, smoke stop barriers, automatic operating devices, and exiting must be clearly defined and properly coordinated.

1.3.1 Features of Fire Protection. Features of Fire Protection of appropriate rating, such as partitions or doors, shall be coordinated and provided to protect property and inhabitants from the hazards of fire occurrence. These features shall especially address the isolation of hazardous spaces or materials, the protection of egress components, and the coordination of such features with other (e.g. security) unusual functions connected with them. All such components of the fire protection shall be clearly indicated in the contract and review documents.

1.3.2 Exiting for Inhabitants. Emergency exits, equipped with exit devices, shall be provided for personnel safety in hazardous areas and places of public assembly. Design of these exits must facilitate rapid egress in accordance with the requirements of NFPA 101, Life Safety Code.

1.3.3 Special Coordination. The interrelationship between the requirements for Fire Protection, Life Safety, Tempest Shielding, Sound Control and Physical Security must be carefully studied. For example, individual doors that will satisfy more than a single requirement are generally not available. This can often mean that multiple doors in about the same location are necessary to cover any group of differing requirements, and unless they are correctly placed, can in turn interfere with one another's operation.

1.4 Types of Construction. Types of construction shall conform to the Uniform Building Code (UBC). Fire area limitations and allowable building height shall conform to UBC. Increases to allowable fire areas and building height shall conform to UBC.

1.5 Exterior water sources for building fire protection shall conform to the requirements of chapter: Water and Wastewater Facilities.

1.6 Heating, Ventilating and Air-Conditioning Systems.

1.6.1 All ventilation systems shall be designed to conform to the requirements of NFPA Standards Nos. 90A, 90B, and 91.

1.6.2 Ductwork which pierce 1-, 2-, and 4-hour fire-rated elements of a structure such as walls, partitions, floors and ceilings must be provided with fire-doors or fire-dampers. Fire-dampers are not required for 1-hour rated walls or partitions which have personnel doors with less than 45-minute fire rating. The type and location of these fire protection devices must be shown on the drawings to avoid misinterpretation of NFPA requirements by the Contractor.

2. PROJECT DEFINITION DESIGN (AIR FORCE PROJECTS ONLY).

2.1 Design Analysis shall consist of a narrative of the fire protection features. The narrative shall include a description of occupancy of the facility, type of construction, suppression system(s), and fire alarm and detection system(s).

2.2 All exterior water lines required for fire protection of the facility shall be indicated on a drawing. Drawing shall indicate new, including tie-in points, and existing which are to be removed or abandoned.

3. CONCEPT (ARMY)/PRELIMINARY (AIR FORCE) DESIGN.

3.1 Drawings. Features of Fire Protection, their ratings, and the hazards requiring them, shall be clearly indicated. Sprinkler and fire alarm/detection areas shall also be clearly indicated. When other functions coexist with the fire protection functions, their integration shall be clearly indicated, with an analysis that describes how both functions will be served. Provide a separate, composite type floor plan which makes an accurate presentation of these various features and functions. By authorized written permission, where the building and features being shown are unusually simple, this information may be included on other drawings.

3.2 Design Analysis. The concept Design Analysis shall include a separate fire protection report containing, but not limited to, review statements and/or comments on the following items, where applicable.

3.2.1 Location and rating of fire walls and fire partitions.

3.2.2 Column, floor, and roof protection.

3.2.3 Path of travel for emergency egress and operation of panic exits.

3.2.4 Access to building for fire fighting.

3.2.5 Design and placement of fire and smoke stop doors.

3.2.6 Fire escapes.

3.2.7 Stair towers, protected.

3.2.8 Labeled windows, where required.

3.2.9 Venting of smoke.

3.2.10 Placement of hand fire extinguisher cabinets.

3.2.11 Type and adequacy of sprinkler system.

3.2.12 Building exterior fire protection facilities and building clearances.

3.2.13 Type and adequacy of special fire extinguishing systems.

3.2.14 Ventilation and/or other treatment for areas for storage of flammable liquids or materials.

3.2.15 Type of occupancy.

3.2.16 Zoning of fixed fire protection systems.

3.2.17 Type and adequacy of fire alarm and detection systems.

3.2.18 Zoning of fire alarm and detection systems.

3.2.19 Number of zones of alarm and detection systems that are separately transmitted to the base or installation fire department.

4. FINAL DESIGN (FOR ARMY AND AIR FORCE).

4.1 Drawings. Design will be an extension of the concept submittal, incorporating all comments thereto and any revised criteria, all as specifically directed by the District. All conflicts, lack of specific criteria, and/or direction, inconsistencies, ambiguities, and lack of thorough understanding of the nature and scope of work shall be resolved prior to starting final design work.

4.2 Design Analysis. The final design analysis will be an extension of the concept design analysis and shall be complete for every item covered in the design and will include, but not be limited to, the following:

4.2.1 List of design criteria.

4.2.2 Design conditions.

4.2.3 Design calculations.

4.2.4 Complete description of system alarm zones.

4.2.5 Other pertinent information of value for future use in construction contract administration, substantiation of design methods, or permanent record shall be included.

4.3 Specifications shall be prepared in accordance with chapter: Specifications.

CHAPTER 14

ENERGY CONSERVATION

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CHAPTER 14

ENERGY CONSERVATION

1. GENERAL. This chapter covers general instructions for the consideration of energy conservation. Energy efficient designs shall be used for all facilities which will consume any form of energy in their operation or utilization. Energy conserving innovative designs are encouraged; however, unproven methods or devices shall be avoided.

1.1 Energy Evaluation. A calculation of annual energy consumption (Energy Budget) and evaluation of HVAC alternatives are required as outlined in the scope of work and the AEI.

1.2 Solar Energy. A solar energy feasibility study shall be included in either the concept or early preliminary design phase when stipulated in the scope of work. The analysis shall comply with the requirements of the AEI, chapter: Energy Conservation Criteria.

1.3 Metering. All energy supplied to a facility shall have metering (continuous monitoring of quantities used) provisions as required by the using service.

1.4 Energy Monitoring and Control System. Requirements for a new, an interface to existing, or an interface for future Energy Monitoring and Control System (EMCS) shall be as required in the scope of work.

1.5 Automatic Temperature Set Back. Automatic temperature set back requirements shall be as stated in the AEI, chapter: Air-Conditioning, Dehumidification, Evaporative Cooling, Heating, Mechanical Ventilating, and Refrigeration.

2. CONCEPT DESIGN.

2.1 Drawings. Show facility siting with existing topographic features and any prominent energy conservation features proposed for the facility. This information can be shown on architectural, mechanical, electrical, structural, location, and/or site drawings.

2.2 Design Analysis.

2.2.1 Design statements and calculations shall be given in sufficient detail to enable the reviewer to get a clear picture and understanding of all included work. The Design Analysis shall include and/or discuss any of the following items which apply to the project:

2.2.1.1 Yearly heating and cooling degree days and design temperatures.

2.2.1.2 Unit heat loss and/or gain for ceilings and/or roofs, walls, windows, doors, floors of upper stories or over crawl spaces, if a fifteen (15) degree fahrenheit temperature difference exists, amount of infiltration, amount of ventilation, to include discussion on energy recovery from exhaust systems, foundation (perimeter) or slab on grade insulation and unit heat loss.

2.2.1.3 Fossil fired heating devices, use of waste heat (exhaust, blowdown, etc.) recovery devices, use of intermittent ignition devices, use of temperature setback devices.

2.2.1.4 Net operating efficiencies of mechanical equipment and electrical motors, use of outside air for economy cooling cycles, automatic start-up and shutdown of ventilation and cooling equipment.

2.2.1.5 Energy conservation features which apply to interior and/or exterior lighting.

2.2.1.6 Architectural features (wind screens, awnings or recessed doorways and windows, entry ways, building and roof configuration, etc.) used for energy conservation, including decorating features (shades, curtains, colors, surface textures, etc.) and weather seals and caulking. Discuss types and useful life of weather seals and caulking.

2.2.1.7 Any energy conservation features, not previously noted, which save or conserve a significant amount of energy.

2.2.1.8 Solar energy feasibility study.

2.2.1.9 Energy budget (annual energy in BTU use per square foot of floor space) calculations and summary. See paragraph: "Energy Analysis" hereinafter for additional energy budget criteria.

3. FINAL DESIGN.

3.1 Drawings.

3.1.1 Design shall be an extension of the concept submittal, incorporating all approved comments and any revised criteria, as specifically directed by the District. All conflicts, lack of specific criteria, and/or direction, inconsistencies, ambiguities, and lack of thorough understanding of the nature and scope of work shall be resolved prior to starting final design work.

3.1.2 Energy conservation items shall be detailed on drawings which are related to their appropriate engineering discipline, i.e., architectural energy conservation features on architectural drawings, mechanical energy conservation features on mechanical drawings, etc.

3.1.3 Provide sufficient details to completely describe each energy conservation item.

3.1.4 Coordinate the plans with the specification and design analysis.

3.2 Design Analysis.

3.2.1 The final design analysis shall discuss every energy conservation item included in

the project and cover but not be limited to the following:

3.2.1.1 All energy conservation items noted in the "Concept/Early Preliminary Design" paragraph of this chapter and included in the final design of the project. These energy conservation items shall be completely described and justified.

3.2.1.2 Complete design calculations to determine energy saved by energy conservation items.

3.2.1.3 Revised energy budget to determine all energy consumed by the project as finally designed. Energy budget summary shall be presented in two parts. One part shall include only net (excluding process) building energy consumption (use) limitations. The second part of the energy budget summary shall include both net and process building loads which will predict metered energy consumption to the building.

3.2.2 Other pertinent information of value for future use in construction contract administration, substantiation of design methods, or permanent record shall be included.

3.3 Specifications. Specifications shall be prepared in accordance with chapter: Specifications of this manual.

4. ENERGY ANALYSIS. The energy analysis shall be a separately bound document with a cover sheet similar to that required for the design analysis. The format for the energy analysis shall be as stated below. All energy conserving features of building systems, electrical systems and mechanical systems shall be described in the energy analysis.

4.1 General. State building name and location in this paragraph. Also, indicate the computer program or method used to determine the yearly energy budget.

4.2 Applicable Criteria.

4.3 Energy Budget. State the region the building is in based on heating and cooling degree-days, the "Category Code" of the building, and the allowable energy budget.

4.4 Input Parameters. State the general parameters used in the input such as: Inside design temp-occupied, inside design temp-unoccupied, hours occupied, hours unoccupied, domestic hot water load, area of total building, area and description of each building zone input into the programs to include floor plan with zones identified, description of the HVAC system for each alternative, schedule of equipment operating hours, lighting load and schedule of lighting operation, and any other pertinent input data.

4.5 Energy Analysis Results. State the energy consumption of the building in total Btu's per year and also Btu/sq.ft./year. The percent over or under the allowable energy budget shall be given. In addition, the energy consumed by the following systems shall be listed: lighting energy, fan

energy, cooling energy, heating energy, and domestic hot water heating energy. The energy consumed by these subsystems shall be given in terms of BTUs per each month, BTUs per year, and percent of total. Also list the space heating, cooling, ventilation, lighting, and domestic hot water EBF's plus the process load EBF's and corresponding operating hours per day and days per week. All Computer Printout Data shall be included as an attachment to the narrative portion. Include all input data and supporting hand calculations.

CHAPTER 15

DESIGN ANALYSIS

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CRITERIA FOR PREPARATION OF CONCEPT SUBMITTALS (DESIGN ANALYSIS)

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Attachment D, etc. - List and indicate drawings, sketches, charts, etc.

1. DIRECTIVE AUTHORIZATION. Give job number, directive authorization number and date, item category code number, nomenclature, directive scope, programmed dollars and cost limitation dollars.

2. APPLICABLE CRITERIA. Design is in accordance with the following instructions: (List such as DD Form 1391 date, definitive drawings if applicable, and all other drawings or data furnished for design of project.) State whether new design or site adapted from (location and FY).

3. PURPOSE AND FUNCTION. State project operational function.

4. DESIGN SCOPE. State design scope. Authorized scope will not be exceeded. For all buildings show computations for square footage even though the authorized scope may be "man," "1 Ea." or other units.

5. SITE VISIT NOTES. Visits to the project site must be made by all disciplines involved in the particular project in order to establish criteria for the design. Reports of these visits will be included as enclosures to the report.

6. GOVERNMENT-FURNISHED EQUIPMENT. List any known equipment to be furnished and/or installed by the Using Agency. List any known equipment to be Government furnished/contractor installed.

7. CONSTRUCTION PHASING. Indicate any known or anticipated phasing requirements.

8. WASTE AND BORROW AREAS AND HAUL ROUTES. State whether or not they have been furnished if required.

9. AIR AND WATER POLLUTION CONTROL. State whether or not required, and if so, describe equipment and/or manner of meeting pollution abatement standards. Include brief description of calculations.

10. SPECIFIC DESIGN PROBLEMS. Cite any special problems encountered, with recommended solution.

11. INADEQUATE FUNDS. If it appears that the project cannot be constructed within allowable funds, the A-E shall recommend additive bid items, deletion of certain features of the work, or suggest other means of reducing the cost but still provide a usable facility within acceptable engineering standards.

12. WAIVERS. List any waivers that will be required, such as fire clearance, building spacing, airfield clearances, POL, ammunition/explosive areas, etc.

13. SECURITY PROVISIONS. State any overall security requirements relating to the project. This is in addition to those required in Chapter V, para 6, relating to requirements within or immediately adjacent to a building or structure.

1. NARRATIVE DESCRIPTION.

1.1 Existing site conditions.

1.2 Analysis of the most effective use and adaptation of the site for the proposed facility. Briefly explain reason for building orientation, set-back, horizontal and vertical location, driveway and sidewalk location and width, and parking area location and size.

1.3 Briefly explain other siting considerations such as reversal of standard plan, and functional and aesthetic relationship with surroundings.

2. LOCATION MAP. Base Layout.

3. SITE PLAN (structures, paving and drainage) Generally 1" - 30'0" (same scale as Final Site Plan):

3.1 Proposed facility superimposed on existing contours.

3.2 Finish contours where required to determine economical or questionable utilization of the site.

3.3 Show floor elevation and other critical spot elevations.

3.4 Drainage indicated by arrows, and approximate pipe sizes where required. Inlet, manhole, etc., details are not required.

3.5 Sidewalks, roads, loading docks, service and parking areas (number spaces) with ingress and egress.

3.6 Locate and identify existing buildings and facilities surrounding the area, if different than Base Layout.

3.7 Identify by title and building number facilities that are to be removed or relocated.

3.8 N-S orientation, including reference North.

4. SITE PLAN (Utilities).

4.1 Utilities shown on a separate site plan from buildings, grading, paving and drainage at same scale as Site Plan.

4.2 Show size, location and information of existing and proposed utilities properly identified as required by the individual chapters herein.

5. CRITERIA. List criteria needed to complete final data.

1. ROADS, STREETS, PARKING, HARDSTANDS, WALKS, ETC.

1.1 A statement of general soil condition with a brief outline of soil exploration and testing.

1.2 The type and volume of traffic, and class of roads, Design Index with justification for any deviation from criteria for those classes. Streets classified per TM 5-822-2. (AFM 88-7), Chapter 5).

1.3 The pavement section for vehicular traffic of streets, parking, service, etc., may be based on previous tests, and subject to minor changes after field tests are completed.

2. GRADING AND STORM DRAINAGE.

2.1 Propose types of materials to be specified for culverts and storm drains.

2.2 Proposed rainfall intensity runoff coefficients, ear and live loads to be used for design of culverts and sewers.

2.3 Proposed critical elevations and gradients.

2.4 Special structures: Describe.

2.5 Proposed gutter and parking area grades.

2.6 Proposed grades away from building or up-grade provisions for intercepting storm runoff.

2.7 Proposed longitudinal and transverse slopes on walkways.

3. FENCING. Type, height and justification for use.

4. RAILROADS.

4.1 Statement of type of service for which railroad track will be provided, anticipated volume and type of traffic, and the ruling grade.

4.2 Proposed type, source and thickness of ballast, weight of rail, source, treatment, and dimensions of ties proposed.

5. CRITERIA. List criteria needed to complete final design.

1. WATER SUPPLY. General explanation of the existing service. Where major extensions are required, describe system, indicating type, storage, condition, water pressures, and unsatisfactory elements.

1.1 Provide statement on type of construction, proposed materials, required flows or capacities, including designer's basic estimate of tentative pipe sizes. Where pump stations, storage, or treatment plants are involved, include tentative sizes and basic data (population, fire flows, etc.) which will be used in sizing equipment. Provide a description of the fire protection systems, flow test data, static and residual pressures. Approved computer modeling of the water distribution system may be used in lieu of flow test data.

1.2 List criteria needed to complete final design.

2. SANITARY SEWER SYSTEM.

2.1 Collection.

2.1.1 Explanation of existing system covering particularly the type, capacity, condition, degree of treatment, present flow and unsatisfactory elements of component parts for major extensions.

2.1.2 Describe type of proposed system, tentative sizes and grades, pipe materials, and contributing flows. Where lift stations are required, state type of construction, and tentative pump type and size.

2.2 Treatment Plant.

2.2.1 State type of waste involved, degree of treatment required, type of treatment plant proposed, and anticipated effluent quality. Describe receiving stream and anticipated effect of treatment plant effluent.

2.2.2 Provide a brief description of units involved, including basic data (population, flows, etc.) which will be used in sizing units.

2.2.3 State type of construction and materials which will be used.

2.3 List criteria needed to complete final design.

3. GAS LINES.

3.1 General explanation of the existing system, including gas pressures. Where major extensions are required, describe the unsatisfactory elements.

3.2 Provide statement on type of construction, proposed materials, required flows, pressure drop, and tentative pipe sizes.

3.3 List criteria needed to complete final design.

1. GENERAL DESCRIPTION. Give description as to number of stories, basement, etc., and include as applicable such items as loading docks, covered and/or uncovered porches, entrance ramps, recessed entries, etc.

2. CATEGORY AND TYPE OF CONSTRUCTION. State such as Permanent, Type N, unprotected, non-combustible, etc.

3. SPECIAL FIRE PROTECTION AND EXIT REQUIREMENTS. If not required, so state. The number of exits shall be based on the square foot allowance per person as stipulated in the National Fire Protection Association Pamphlet No. 101, Life Safety Code. The requirements for the various types of occupancy shall be covered, including all basic criteria used in arriving at these requirements. On floor plan required by paragraph 7a, indicate personnel occupancy for each room by symbol, such as: P10 within an ellipse; the figure representing number of people. Identify symbol on plan. Total building occupancy should equal that shown for Heating, Ventilating and Air Conditioning in Chapter 7, Mechanical.

4. ARCHITECTURAL DESIGN SOLUTION. In narrative form, designer should state reasons for basic solution proposed, choice of specific materials, architectural treatment, and brief statement on other solutions considered but rejected, with reasons therefore. Refer to drawings if needed.

4.1 Floor System. (Describe, such as slab on grade, joists, etc.)

4.2 Exterior Design. Describe walls, roofing, windows, doors, miscellaneous (sunshades, porches, entry, dock, canopies and wing walls, special treatment, etc.).

4.3 Interior Design. Describe partitions, doors, equipment.

4.4 Color Schedule. Develop a detail schedule of all colors for all surfaces and finished, i.e., painted surfaces, floor coverings, tile, countertops, etc. The detail schedule shall be based on the basic schedule and shall be incorporated into the contract drawings and specifications.

4.4.1 Miscellaneous or unusual features, such as special hardware, computer floors, sound control, clean-room, elevators, draft curtains, etc.

4.4.2 Provide a tabular Room Finish Schedule. Include floor, base, wainscot, walls, ceiling, and ceiling heights.

5. SECURITY PROVISIONS. Include requirements.

6. DRAWINGS. Show major dimensions for new designs.

6.1 Floor Plans. Single line, showing window and door openings and column locations for all floors including basement, etc., scaled to fit the entire floor plan on one sheet. (1/2" preferred). Show control joint location for masonry walls, partition, and expansion joints, if any.

6.2 Elevations. One eighth inch scale preferred (show control joint locations and expansion joints, if any).

6.3 Cross Section. One eighth inch scale preferred: show floor to ceiling heights.

6.4 Typical Wall Section(s). Three-fourth inch scale preferred.

7. SUGGESTED METHOD OF REDUCING EITHER CONSTRUCTION OR MAINTENANCE COST. List and/or explain. This should not be confused with requirements of Chapter 1, para II, which refers to projects exceeding allowable funds.

8. CRITERIA. List criteria needed to complete final design.

1. STRUCTURAL FRAMING SYSTEM. A general description of the structural framing system for the building including seismic considerations should be given with reasons for selection of the system used and including cost comparison. For example: (1) a system with load bearing walls and interior steel columns supporting steel girders and joists; (2) a steel rigid frame system supporting steel beams and joists; (3) a system with reinforced concrete beams, columns and pan joists.

2. ROOF AND FLOOR SYSTEM. General method of framing and type of deck including options. Cost comparisons shall be furnished to justify system selected.

3. WALLS AND PARTITIONS. Describe composition and general range of thicknesses, seismic design when used, and location of load bearing and shear walls.

4. FOUNDATION SYSTEM. Foundation design data or assumptions and description of type of foundation system to be used.

5. CONTROL JOINTS. Show location for slab on grade floors and for CMU walls.

6. DESIGN LOADS. Roof and floor live loads, wind and seismic lateral loads, and unusual dead loads should be given.

7. UNUSUAL DESIGN FEATURES. Those which might be controversial should be clearly presented in such a manner that definite approval can be given.

8. SITE ADAPTING STANDARD WORKING DRAWINGS. When site adapting standard working drawings or designs used at other locations, the data required herein should be limited to design changes resultig from loading, climatic and soil conditions at the new site and/or updating for conformance to curent criteria.

9. CRITERIA. List criteria needed to complete final design.

1. HEATING, VENTILATING, AND AIR CONDITIONING.

1.1 Basic Analysis.

1.1.1 Basic criteria manuals

1.1.2 Design conditions

1.1.2.1 Inside and outside

1.1.2.2 Personnel load

1.1.2.3 Equipment heat release (if any)

1.1.2.4 Ventilation requirements

1.1.2.5 U Factors

1.1.2.6 Other special conditions, such as alterations and additions.

1.1.3 Type of systems with full description

1.1.3.1 Justification for selection

1.1.3.2 Zoning and control description

1.1.3.3 Description and justification for connection to existing system.

1.1.4 If proposed design capacity exceeds that indicated, explain or justify.

1.2 Calculations.

1.2.1 Summary of heat gain and equipment sizing calculations should be submitted, including the method for handling diversities in the air conditioning load and method of sizing the boilers.

1.2.2 Provide typical air conditioning load calculations, preferably the building peak load. Do not submit detailed calculations until the final submission.

1.3 Equipment.

1.3.1 Brief description of various items of equipment.

1.3.2 Operating temperatures and capacities.

1.4 Piping Systems. Brief description (include type of pipe, whether insulated, concealed or exposed). Calculations or pipe sizes need not be included until the final submission.

1.5 Equipment Installation Layouts (final submission). Contract drawings shall include scale line plans showing the layout and arrangement of all mechanical equipment rooms and spaces in which building service equipment (heating, ventilating, plumbing, electrical, air conditioning, etc.) is to be installed. Plans shall be drawn at scales of 1/4" or 3/8" equals l' (smaller scales will require the approval of the Contracting Officer), and shall show all equipment at true size and location together with all utility lines and connections, and the relationship of such equipment and utility lines and connections with walls, ceilings, floors, doors, and windows. Sections shall also be included as necessary to delineate the equipment arrangement properly and the accessibility thereof for operation and maintenance. Equipment shall be located so that there is proper room for safety and servicing.

1.6 Air Distribution Systems. Brief description of design method used, including maximum velocities and pressure drop per 100 feet in ducts.

1.7 Drawings.

1.7.1 On plan view show equipment layout of following items:

1.7.1.1 Chillers or refrigeration compressors

1.7.1.2 Boilers

1.7.1.3 Pumps

1.7.1.4 Condensers or cooling towers

1.7.1.5 Air handling units

1.7.1.6 Air distribution duct layout - single line

1.7.2 Do not show air quantities, duct sizes, or piping.

1.7.3 Other items of major equipment required for the facility.

1.7.4 Show piping layout in the final submittal.

1.7.5 Show exterior heat distribution on the Utility Plan.

1.8 List criteria needed to complete final design.

2. PLUMBING.

2.1 Basic Analysis.

2.1.1 Basic criteria manuals, codes, etc.

2.1.2 Fixture determination

2.1.2.1 Building population (male and female)

2.1.2.2 Men's toilet (quantity and type of fixture identified by Federal

Specification)

2.1.2.3 Women's toilet (quantity and type of fixture identified by Federal Specification)

2.1.2.4 Other (drinking water fountains, service sinks, etc.) (quantity and type of fixture identified by Federal Specification)

2.2 Hot Water Generator and Storage Tank.

2.2.1 Capacity and type (gas, electric, boiler water)

2.2.2 Insulation

2.3 Piping.

2.3.1 Type and location (concealed or exposed)

2.3.2 Insulation

2.4 Calculations. Only as necessary to determine number of fixtures and cold and hot water capacity requirements.

2.5 Miscellaneous.

2.5.1 Compressed air system -- brief description as to capacity, pressure, piping, location of air outlets, etc.

2.5.2 Roof drainage system -- brief description

2.5.3 Fire protection -- brief description as to type, areas covered, etc.

2.5.4 Gas system -- brief description as to pressure, quantity, and equipment to be served

2.5.5 Other special system -- brief description

2.5.6 List guide specifications to be used

2.6 Drawings.

2.6.1 On plan view show plumbing fixture layout, floor and area drains, equipment layout (hot water generator, storage tank, air compressor, etc.). Show location of gas, vacuum, and other outlets.

2.6.2 Show piping and a piping identification system on the final submittal.

3. SITE ADAPTING. When site adapting standard working drawings or designs used at other locations, the data required herein should be limited to only design changes and/or updating for conformance to current criteria.

4. SPECIAL CONSIDERATIONS.

4.1 Some projects will require supplemental justification or explanatory data. These data will normally be requested by specific instructions for submittal. Typical examples as follows:

4.1.1 Government-furnished equipment

4.1.2 Economic studies

4.1.3 Fuel studies and determination

4.1.4 Equipment testing for rehabilitation

4.1.5 Unusual or unique energy consumption requirements

4.2 Site Adapting Drawings. List only the changes required or conformance to latest criteria.

4.3 List criteria needed to complete final design.

1. INTERIOR ELECTRICAL DISTRIBUTION SYSTEM.

1.1 Indicate electrical characteristics (phase, voltage and number of wires) or circuits.

1.2 Provide a brief description of the lighting system, together with a tabulation showing:

1.2.1 Room name and number.

1.2.2 Lighting intensity for each room (state design basis, such as I.E.S., Definitive Drawings, etc.).

1.2.3 Type of fixture, either by standard drawing number or description.

1.3 Type of wiring system, such as, rigid conduit, electrical metallic tubing, non-metallic sheathed cable, etc., and where proposed to use.

1.4 A paragraph describing proposed additions and alterations or special items of design, such as, specialized equipment, special receptacles, etc.

1.5 Describe any special communication or electronic requirements.

1.6 Type of signal and fire alarm systems.

1.7 Telephone layout will be as provided by Using Service.

1.8 Define any hazardous areas; if none, so state.

1.9 Describe lightning protection system; if none, so state.

1.10 Describe static grounding system to be installed, if required.

1.11 Any questions or problems or deviations concerning criteria should be enumerated.

1.12 Voltage drop for service entrance, panel feeders and branch circuit.

1.13 List guide specifications that will be used.

2. EXTERIOR ELECTRICAL DISTRIBUTION SYSTEM.

2.1 Statement relative to the adequacy of the primary supply at the point of take-off. If primary source is inadequate, state measures proposed to correct the deficiency.

2.2 Electrical characteristics of the primary and secondary service.

2.3 Estimate of total connected load and resulting kilowatt demand load by applying proper demand and diversity factors, if a group of loads is involved.

2.4 Basis for selection of primary and/or secondary distribution voltage.

2.5 Type of conductors, such as, copper or aluminum, and where proposed to use.

2.6 A statement describing pertinent standards of design, such as, voltage drop, physical characteristics of overhead or underground circuits, type of lighting units, lighting intensities, and type of transformers.

2.7 A statement describing street lighting, security lighting, parking lot lighting, or sidewalk lighting requirements.

2.8 List guide specifications that will be used.

2.9 Statement pertaining to installations of cathodic protection system and design values.

2.10 List criteria needed to complete final data.

3. DRAWINGS.

3.1 Exterior Electrical - to be shown on utility site plan.

3.1.1 Existing and new electrical lines both overhead and underground, properly identified.

3.1.2 Show removals and relocations, if any.

3.1.3 Indicate electrical characteristics, voltage, phase, conductor sizes, etc.

3.1.4 Show new construction and location of transformation.

3.1.5 Indicate the service to the facility and whether overhead or underground.

3.2 Interior Electrical.

3.2.1 Show an outline of the building, or a floor plan as required by the architectural.

3.2.2 Indicate the service and main electrical service equipment.

3.2.3 Show the location of all panels (power and communications) and special outlets.

3.2.4 Indicate lighting layout.

3.2.5 Show the proposed power riser diagram. Sizes of all conduits, wires, cables, panels, etc., need not be included.

4. SITE ADAPTION. When site adapting standard working drawings or designs used at other locations, the data required herein should be limited to only design changes and/or updating for conformance to current criteria.

1. EROSION CONTROL. State scope of work (acreage to receive turfing), proposed treatment, such as topsoil, fertilizing, seeding, sodding, watering, etc.

2. LANDSCAPING.

2.1 State scope of work, such as number and kind of trees and shrubs (not in contract).

2.2 Show existing trees that are to be protected and saved.

3. GUIDE SPECIFICATIONS. List guide specifications to be used.

4. CRITERIA. List criteria needed to complete final design.

ATTACHMENT A - SPECIFICATIONS

Provide a listing of the technical sections of specifications to be used in final design. Prepare one section of specifications in final format and develop an index for one section in order to evaluate the A-E's method of preparation. Concept drawings shall be coordinated with the outline specifications to indicate clearly the type and sizes of materials, utilities, etc., and specifically to list separately all Contractor-furnished equipment and all Government-furnished equipment to be installed by the Contractor.

CHAPTER 15

DESIGN ANALYSIS

1. GENERAL.

1.1 Requirements. A design analysis is required for all projects in accordance with the scope of work. Any exceptions to design analysis requirements will be covered in the scope of work.

1.2 Definition. A design analysis is a bound assembly, in one or more volumes, of all functional and engineering criteria, design information, and calculations applicable to the project. A design analysis serves for review, approval, user information and record purposes. It is also used in adapting design to other sites and for future reevaluation and modification of existing construction.

2. DESIGN ANALYSIS AT VARIOUS DESIGN STAGES. The design analysis shall be included with the submittal package which consists of drawings, cost estimate and specifications. The specific content of the design analysis for the various engineering/ architectural disciplines is covered in their respective chapters of this manual. All design analyses will be written in the past tense.

2.1 Preconcept and Concept Design Analyses.

2.1.1 General. The design analysis will be a narrative and graphic brochure-type presentation, reflecting a designer's interpretation of criteria furnished for design of a project. Items or details which cannot be adequately described in narrative form shall be graphically shown on sketches, tabulations or photographs bound in the brochure and on drawings appended thereto. An estimate of direct construction cost (code B) for the project shall also be included with the submission. Energy, life-cycle costs, and solar energry will be analyzed as directed. Computerized energy studies will have all input and output data prescribed. Studies will be complete to establish energy budgets and will verify that enough space has been allowed for mechanical and electrical equipment and that this space has been included in the budget data. The format and content required for the concept submission are outlined in attachment 15.1. Use the same chapter number for identification in the design analsis.

2.1.2 Attachments. The design analysis shall cover deviations from furnished criteria and shall discuss, in detail, problem areas and missing criteria that require resolution before design can be completed. Attachments shall include: calculations, conference minutes, outline specifications, pertinent correspondence relative to the design, and the Subsurface Investigation Report prepared by the District. All pages in the attachments shall be presented in clear and legible form. Each attachment shall be provided with a title page and table of contents (index). Pages shall be numbered consecutively for each attachment and identified in the table of contents. Cross-referencing shall be clear. The source of loading conditions, formulas and references shall be identified. Assumptions and conclusions shall be explained.

2.2 Final Design Analysis.

2.2.1 General. The final design analysis shall be a complete document within itself, containing all information pertinent to the design of the project. This document is not only used for review and substantiation of the design, but for record purposes. All applicable data contained in previous design analyses shall be repeated. Reference shall not be made to the previous analyses. The original sheets shall be furnished for the entire final design analysis including the attachments. The A-E shall submit a final design analysis which is 100 percent complete for review. The A-E shall incorporate revisions as a result of final review comments and submit the 100 percent complete final design analysis for record purposes.

2.2.2 Engineering Considerations and Instructions to Field Personnel. The final design analysis shall include a section for the use of the construction agent entitled "Engineering Considerations and Instructions to Field Personnel." This section will be prepared for all construction projects with a current working estimate (CWE) of $1,000,000 or greater; repair, evaluation, maintenance and rehabilitation with CWE of $500,000 or greater; and any lesser CWE where significant design assumptions or aspects are critical to successful project completion. The availability of this section will provide construction field personnel easy access to significant design assumptions or critical phases of the project. This section shall indicate assumed field conditions and all pertinent significant (geotechnical, materials, remediation processes, etc.) aspects of the project that are included as the basis of project design. The section will be modified as required by agreement between the A-E and construction agent.

2.2.2.1 Content of the section will vary according to the nature, complexity and importance of the project. As a minimum, however, the section will contain an explanation of significant design concepts including intent, assumptions and criticalness of the various features. Some of these items are not stated in the construction contract, and field knowledge of basis of design will enhance successful project completion. Field personnel will then be more able to recognize changed site conditions, invalid design assumptions, feasibility of contractor proposed work processes, and criticalness of certain features, allowing resolution of problems or conflicts at the earliest possible time.

2.2.2.2 The section will identify those areas requiring Government quality assurance testing (beyond normal contractor quality control testing), expected ranges for results of these tests, and recommended minimum frequencies of testing. The section will identify areas requiring special attention to contract details and/or inspection. Stages of the project where site visitation by A-E personnel is recommended also will be identified. Known sources of special materials will be indicated if they are not presented in the contract documents.

2.2.2.3 When the section is lengthy or significantly complex, appropriate members of A-E personnel will meet with the construction agent and contractor’s field personnel either at the preconstruction conference, partnering session, or later, but prior to starting work, as required in the scope of work.

2.2.3 Attachments. The attachments to the final design analysis shall include all those

used in the previous design analysis, as applicable to the final design. Attachments shall include: complete calculations, minutes of meetings of all review conferences, pertinent correspondence relative to design and the Subsurface Investigation Report prepared by the District. Do not include Outline Specifications in the final design analysis. All pages in the attachments shall be presented in clear and legible form. Each attachment shall be provided with a title page, table of contents (index), and a tabulation showing all design loads and conditions (calculations only). Pages shall be numbered consecutively for each attachment and identified in the table of contents.

2.2.4 Changes. Revisions to the final design documents as a result of final review, amendments during advertising or modification during construction, shall be incorporated into the original final design analysis, as applicable, and submitted with revised plans and specifications.

3. PREPARATION.

3.1 Size and Layout. The narrative portion of the design analysis shall be typewritten. The attachments of the design analysis may be typewritten, handprinted or a combination thereof, as long as it is legible and clearly expressed. All material shall be prepared in relation to an 8-1/2 x 11 inch standard sheet size paper. Larger sheets, folded to the prescribed size may be utilized when reduction is not feasible. Computer printouts shall be trimmed or reduced to the standard sheet size. All side, top, and bottom margins shall be 1-inch minimum to permit side binding and head to head duplication.

3.2 Organization. Generally the design analysis shall be assembled into a single volume with a complete table of contents (insofar as practicable). For projects with more than one major facility, the design analysis may be assembled into separate volumes for each. Each volume shall be numbered sequentially and assembled under a cover sheet indicating the volume number and total number of volumes for the project.

3.3 Classified Material. Every effort shall be made to prepare the design analysis as an unclassified document with the proper references to sources of classified material.

3.4 Design Calculations (Attachments). Calculation sheets shall carry the names or initials of the individual making the calculations and the individual checking them, and the dates of the calculation and the checking. No portion of a design calculation shall be computed and checked by the same individual. Each page of calculations shall have the project title and location indicated. Calculations shall be presented in clear and legible form, incorporating a tabulation showing all design loads and conditions. The source of loading conditions, formulas and references shall be identified. Assumptions and conclusion shall be explained. Cross-referencing shall be clear.

3.5 Automated Data Processing (ADP). When ADP is used, the design analysis shall include description of design methods, including assumptions, theories, and technical formulas employed. This description shall be sufficient to verify the validity of methods, assumptions, theories and formulas, but shall not require source code documentation or otherwise compromise proprietary programs.

3.6 Standard Designs. If a standard design or other design is being site adapted and a design analysis exists, the analysis for the new project shall include appropriate material from the existing analysis modified to incorporate site adaptations and other essential requirements.

4. FORMAT. The format shall be as follows, except where specific title information and format are furnished for special projects as required by the scope of work.

4.1 Cover Sheet. Covers shall be a durable material so that the printed information thereon is not easily effaced. The cover sheet shall contain the following information:

(Final) (Preliminary) (Concept) Design Analysis

(Project Title), (Project No., if applicable)
(Fiscal Year) (Program Funding Identification)

(Name of Installation), (Location)

Prepared By
(Name of Architect-Engineer)
(Location of A-E Office)

For
U.S. Army Engineer District, Kansas City
Kansas City, Missouri
(Month) (Year)

4.2 Table of Contents. The table of contents shall be similar to the table of contents shown in attachment 15.1. Page numbers shall be included for easy reference. The table of contents may be further broken down if the size of the design analysis so warrants.

4.3 Paragraphs. Each chapter shall be broken into paragraphs and paragraphs shall be numbered in sequence. Do not refer to a paragraph as "Not Used", but number as actually used. A decimal numbering system for paragraphs shall be used as illustrated in the numbering of paragraphs in this chapter of the A-E Instruction Manual.

5. REQUIREMENTS FOR OTHER FACILITIES. For projects of the types listed below, the design analysis shall include the information listed in addition to the requirements above.

5.1 Utility Projects. Information to be included in the design analysis for projects involving water-supply sources, treatment plants, storage tanks, reservoirs, pumping stations and distribution systems, gas distribution and storage, sanitary sewers, industrial waste sewers, pumping plants, sewage treatment works, industrial waste treatment plants, incinerators, sanitary landfills and resource recovery systems shall be as required by applicable parts of Technical Manuals in the series

numbered TM 5-800 through 5-899.

5.2 Electrical Distribution Systems. Computations shall be tabulated for determination of conductor, transformer, and switchgear sizes showing all pertinent factors such as mechanical strength, current-carrying capacities, voltage drop, and demand or diversity factors. Short circuit calculations and coordination of protective equipment shall be included in the final design analysis. Interrupting capacity of equipment, fuse/CB size, and relay settings shall be shown on the final drawings.

5.3 Central Boiler and/or Refrigeration Plants. The design analysis shall include:

5.3.1 Statement of basis for selection of type of system, with reference to pertinent criteria and background information.

5.3.2 Individual building loads for presently connected facilities, and facilities to be connected in the future for determining sizes of plant and auxiliary equipment.

5.3.3 Soil and ground-water conditions for underground distribution system, insulation and cathodic protection requirements.

5.3.4 Capacity and size calculations for major items of equipment such as boilers, refrigeration equipment, pumps, expansion tanks, firing devices, air pollution equipment, induced-draft fans, flash arresters, fuel and ash handling equipment, and fuel storage.

5.3.5 Fuel selection analysis.

5.3.6 Calculations for pipe-size and expansion considerations of the distribution system as required.

5.3.7 System analysis of all applicable factors and alternatives with sufficient support data to illustrate options considered, and to justify the design selected.

5.3.8 Evidence of compliance with environmental protection and enhancement regulations. Requirement for and treatment of visual screening shall be indicated.

5.3.9 Operational characteristics related to provisions for the efficient utilization and maintenance of the plant.

5.4 Roads, Streets and Paved Areas. The design analysis shall include the class and type of each road, street, parking and open-storage area, along with the basis for selection of design wheel load, material, and type of construction. Design calculations, as applicable, will be indicated.

5.5 Railroads. The design analysis shall include the basis for design live loads and classification of track, trestle, bridge, main line, yard, etc., as applicable, along with criteria used to

determine weight of rail, size of ties and class of roadbed. Include complete design calculations for trestles, culverts, and bridges. Nomenclature shall conform to TM 5-850-2, Railroad Design and Construction at Army and Air Force Installations.

5.6 Airfield and Heliport Paving. Information to be included in the design analysis shall be as required by applicable parts of TM 5-824-1, General Provisions for Airfield Design, and TM 5-818-1, Procedures for Foundation Design of Buildings and Other Structures (except Hydraulic Structures).

5.7 Special Facilities. Information to be included in design analysis for projects involving missile launch facilities, ammunition maintenance facilities, radiographic facilities, explosives storage facilities, hardened command posts, and facilities for handling nuclear weapons and hazardous substances will be provided by HQUSACE via design directive on a case-by-case basis. These directives will specify any requirements in addition to applicable requirements contained in this regulation, and will include need for criteria sources, references, design calculations and supporting data to justify design.

6. WHITEMAN AIR FORCE BASE DESIGN CHECKLIST. A checklist that has been prepared specifically for Whiteman Air Force Base will be furnished to the designer. The checklist must be completed by the designer and submitted for review with the Design Analysis.

CHAPTER 16

SPECIFICATIONS

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CHAPTER 16

SPECIFICATIONS

1. SCOPE. This section covers instructions for the preparation of bidding documents for fixed-price construction contracts.

2. PURPOSE. Instructions contained herein supplement, explain, and catalog instructions and policies of HQUSACE and are not to be construed as voiding standing instructions of HQUSACE. In the event of conflict between future instructions from HQUSACE and this manual, the instructions from HQUSACE will govern.

3. BIDDING DOCUMENTS. A complete set of bidding documents shall consist of a set of drawings and a bound volume of specifications. A bound specification shall be composed of the following parts in the order listed.

3.1 Front Cover	Prepared by District
3.2 Table of Contents	Prepared by A-E (Division 2 through 16)
3.3 S.F. 1442	Prepared by District with A-E Input Required
3.4 Caution Sheet	Prepared by District
3.5 Instructions to Bidders	Prepared by District
3.6 Representation and Certifications	Prepared by District
3.7 Contract Clauses	Prepared by District
3.8 Special Clauses	Prepared by District with A-E Input Required
3.9 Wage Rates	Furnished by District
3.10 Index Pages at Beginning of Each Division, 2 through 16	Prepared by A-E
3.11 Amendments	Prepared by District with A-E Input Required

4. A-E SUBMITTALS REQUIRED.

4.1 Concept Design Submittal (Army Projects). Submit a listing of the technical sections of the specifications to be used in the final design along with one edited guide specification section typed in final format.

4.2 Preliminary Design AF Projects Submittal. Submit annotated concept review comments, Table of Contents, a legible draft copy of the Technical Specifications consisting of marked-up copies of the printed guide specifications. Those deleted portions of the Guide Specifications shall be left legible so as to determine what has been eliminated; paragraphs shall be renumbered as required by deleted portions. Paragraphs modified to meet site or specific project conditions shall be spelled out and inserted in their proper place.

4.3 Prefinal Design Submittal. Submit the following:

4.3.1 A narrative description of work, suitable for publishing in the Commerce Business Daily.

4.3.2 Bid Schedule.

4.3.3 Table of Contents and Indices for Division 2 through 16.

4.3.4 Construction Schedule and Phasing Requirements.

4.3.5 Sheet number, title, and date for each drawing.

4.3.6 Site or job peculiar items limiting work.

4.3.7 Itemized list of Government furnished-Contractor Installed Equipment.

4.3.8 Itemized list of salvage equipment to be turned over to the Government.

4.3.9 Typed Specifications (Division 2 through 16).

4.4 Final Design Submittal. Submit all items required for the 95% submittal incorporating all review comments.

5. BID ITEMS (BID SCHEDULE).

5.1 General. Standard Form 1442, "Solicitation Offer and Award for Construction, Alteration or Repair," is completed by the District. Projects are usually bid on a lump sum basis (except drilled piers which are bid on a linear foot basis for each diameter). Building construction bid items are normally broken down as follows:

5.1.1 Building Construction. A separate bid item for each building described as follows:

"includes all required work within 5 feet outside the building lines, except drilled piers."

5.1.2 Drilled Piers. A separate bid item for each diameter described as follows: "includes all work required to provide piers per lineal footage established by the top and bottom elevations indicated and all work incidental thereto."

5.1.3 Site Improvements. Are described as "includes all required work beyond 5 feet outside of the building lines."

5.1.4 Projects Other than Building Construction. Bid items should be coordinated with the District. Bid Quantities are usually lump sum.

SAMPLE:

Project: Tactical Equipment Shop, Fort Riley, Kansas.

BIDDING SCHEDULE

BASE SCHEDULE

0001	Tactical Equipment Shop	Lump Sum	$_____
0002	Site Work	Lump Sum	$_____
	TOTAL (Base Schedule)		$_____

OPTIONS
(In order of priority)

0003	Exterior Drainage	Lump Sum	$_____
0004	Oak Trees	Lump Sum	$_____
	TOTAL (Base & Options)		$_____

5.2 Additive Bid Items (when funds are limited). Where additive items are required by any subsequent instructions, they shall be numbered consecutively (as per established priority) on the bid form and designated on the drawings using only the name (i.e., "Parking Lot - Additive"). Drawings shall clearly indicate condition with and without the additive work. The additives shall not be numbered on the drawings.

5.3 Option Bid Items. Items in the schedule may be identified as options. Such options need the approval of the Contracting Officer and shall be indicated on the drawings if required to make the option work clearer. The options may or may not be exercised. Drawings shall clearly indicate condition with and without the optional work. The options shall not be numbered on the drawings.

5.4 A-E Submittals Required. The A-E shall submit a narrative description for each bid item, and each additive or option bid item. Submittal is required with the Prefinal and Final Design Submittals.

5.5 Common Errors.

5.5.1 Labeling "Additives" as "Alternates" on the drawings.

5.5.2 Not deleting Measurement and Payment paragraphs from the Guide Specifications. (NOTE: Leave in requirement for Waybills).

5.5.3 Not including proposed bid schedule with the Prefinal Design Submittals.

6. TABLE OF CONTENTS AND INDEXES. See Attachments A, B and C. They give the form that shall be followed by A-Es in the preparation of the Table of Contents and Index pages. All Divisions and Sections within each Division shall be listed in the Table of Contents, and a detailed index shall be used at the front of each Division for the Sections in that Division.

6.1 Table of Contents. A-E submittal shall start with Division 2. See Attachment A.

6.2 Index Pages. The A-E submittal shall start with Division 2. All index pages start with the letter "D" followed by the Division Number, a dash and the page number (see Attachment B). Provide Index pages for Divisions not used (see Attachment C). Insert Index pages in the front of each Division.

6.3 Common Errors.

6.3.1 Not receiving the Table of Contents or Index Pages with the Specification submittal.

6.3.2 Submitting Index Pages that indicated "part numbers" rather than paragraph numbers.

7. SPECIAL CLAUSES (SECTION 00800).

7.1 Drawings. Typed listing of Sheet Numbers, drawing titles, and date of each drawing.

7.2 Salvage Equipment. Itemized List, including Quantity and Description, of salvage equipment to be delivered to the Government, and their delivery destination.

7.3 Construction Sequencing - Completion Time - Concurrent Construction. The A-E shall coordinate the recommended construction period with the Using Service and include any special interface or concurrent construction phasing that may be required in the SPECIAL CLAUSES section of the specifications. If the Using Service's completion requirements or concurrent construction needs affect the total project cost they should be advised of the extra cost involved and

the reasons therefor.

7.4 Government-Furnished Property. Itemized List including Quantity and Description of Government-furnished property, its location and method of furnishing.

7.5 Special Requirements i.e. protection of existing work, maintenance, asbestos removal and any other requirements unique to this specific job.

7.6 Shop Drawing Submittals. Reference SECTION 00800: Special Clause paragraph entitled SUBMITTALS.

7.7 Common Errors. A-E submission not received until after prefinal review.

8. TECHNICAL PROVISIONS.

8.1 A-E Submittals Required. See paragraph: A-E Submittals Required.

8.2 Special Instructions. Technical Provisions shall be prepared in accordance with the requirements of this section and paragraph: Typing. In applying the instructions, the overall objective is a professional-looking and professional-quality specifications.

8.3 References. HQUSACE Guide Specifications

HQUSACE Standard Specifications
ER 1110-345-1001
ER 1110-2-1200
ER 1110-345-720
Applicable Technical Manuals
Applicable Regulations

8.4 Division 1 - General Requirements. Division 1, General Requirements, will be prepared by the District for all projects.

9. GUIDE SPECIFICATIONS. Guide Specifications are issued by HQUSACE (Divisions 2 through 16) to promote uniformity of construction throughout the Corps, to provide requirements which coordinate with industry, and to serve as convenient worksheets for the preparation of contract specifications. HQUSACE guide specifications and abridged guide specifications are available from the District for small projects only. The files are available in a text or ASCII format and may be used in any word processing system. For larger projects with a substantial number of specification sections, a subscription service shall be used by the A-E to provide current HQUSACE guide specifications. Specification sections relative to earthwork and pavements will be provided by the District in accordance with the scope of work.

9.1 Use of Guide Specifications.

9.1.1 Notes to Designer. Notes on use of the guide specifications which occur at the end of all HQUSACE Guide Specifications shall be studied closely before starting on the section to be written. These instructions cover special considerations and directions to be followed in the use of the particular Guide Specification.

9.1.2 Military Projects. HQUSACE Guide Specifications marked "FOR MILITARY CONSTRUCTION" shall be used except for Paving, which shall be furnished by the District as indicated in the scope of work.

9.2 Editing the Guide Specifications. Prior to the guide specifications editing for the project, the A-E shall carefully read the instructions given in each guide specification. All work by the Contractor must be precisely delineated in the contract documents (specifications or drawings). The guide specifications are prepared for adaptation to major projects of varying types and at different locations in the continental United States. Guide specifications issued establish the form to be used and, as far as practicable, the specific requirements to be included. The guide specifications are intended to promote uniformity of construction throughout the Corps, provide requirements that have been coordinated with industry, and serve as convenient work sheets to be marked by the A-E preparing project specifications. Certain of the requirements in the guide specifications have general applicability to all projects, while other requirements that must vary from project to project have blanks to be filled in; alternative words, phrases, or paragraphs to be chosen; or special paragraphs to be added. Where parentheses or brackets are used to indicate alternative requirements, the parentheses or brackets shall be removed from the expression chosen to be a part of the contract specifications. When editing is complete and checked, the paragraphs and subparagraphs within each technical section of the specification shall be numbered in sequence. Do not use "Not Used" for a paragraph that has been deleted.

9.2.1 Deviations. The guide specifications will need to be tailored to fit the specific project under design. Tailoring a guide specification either by a deletion or by an addition is considered to be a deviation. The following deviations are authorized without further approval:

9.2.1.1 Changes required or permitted in the INSTRUCTIONS TO THE DESIGNER.

9.2.1.2 Deletion of inapplicable text material, as necessary to tailor the specifications to fit a specific project. After the specifications writer has deleted all inapplicable paragraphs, subparagraphs, and schedules from the body of the guide specification (including but not limited to the correction of lists in "Submittals," "Tests," and "Installation" paragraphs), he shall then delete all nonapplicable references listed in the preceding "Applicable Publications" and "Materials" paragraphs.

9.2.1.3 Additions. If the guide does not cover a feature that is in the project, new sentences and/or paragraphs shall be inserted in proper locations to adequately cover that feature of the work. If a new material is added, it shall be properly referenced in "Applicable Publications, "Materials," "Submittal," "Tests," and "Installation" paragraphs, as applicable.

9.2.1.4 For Air Force projects only, tailoring to comply with the requirements of Military Handbook 1190, "Facility Planning and Design Guide."

9.2.1.5 Changes to reduce requirements for submittals of technical data and samples, in accordance with the following: Submittals of shop drawings, test reports, certificates, and samples will not be required for noncritical items of relatively low value as compared to the cost of making the submittal; that is, a submittal will not be required when the cost will exceed the benefit to the job. Avoidance of such submittal requirements is particularly encouraged for small projects. However, under no circumstances should the cost of a test or the cost of the item being tested be considered as the sole criterion for determining the value of a test. Occasionally, the success or failure of a major portion of a project may be critically influenced by some small item; therefore, the overall benefit to the job should be used as the basis for determining the value of the test.

9.2.1.6 Changes to make testing the Contractor's responsibility, in accordance with the following: Except where applicable guide specifications explicitly state that testing will be the responsibility of the Government, all testing will be made the responsibility of the Contractor. However, in preparing detailed specifications making testing the Contractor's responsibility, the contract requirements shall be written in such way that the Contracting Officer may perform testing when deemed necessary.

9.2.2 Trade Names and Proprietary Items. As a general policy, the use of trade names, proprietary items, and the drafting of a specification by adopting a manufacturer's description of a particular commercial article shall be avoided. When it is necessary to specify materials or equipment other than by reference to a document generally known to and used by the industry, minimum requirements may be stated in one of the following ways: (1) in terms of physical characteristics, chemical composition, laboratory test results, performance in actual use, or any combination of these as applicable, in such manner as to insure full and free competition; or (2) by use of manufacturer's cut, catalog number or trade name, qualified with the words "or equal." However, experience indicates that a "brand name or equal" description is appropriate only in rare instances; therefore, before this method is used, guidance should be obtained by letter or phone from the District. Where it is necessary to specify or to employ a proprietary material, system, or process exclusively, the District should be consulted.

9.2.3 Labels. Hazardous items are required to bear the label of Underwriters' Laboratories, Inc., or similar organizations. Accordingly, the following wording shall be used in specifications where such labels are required. "The Contractor shall submit proof that the (state item) which he proposes to furnish under this specification conforms to the standards of the (list appropriate testing organization(s)). The label of (listed testing organization(s)) shall be accepted as conforming to this requirement. In lieu of the label, the Contractor may submit a written certification from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the (state item) has been tested and conforms to the standards, including methods of test, of the (listed testing organization(s))."

9.2.4 Selecting Type, Grade and Class. Material, equipment and/or other items based on Mil. or Fed. Spec., Industrial specifications (ASTM, ANSI, etc.), or standards of other agencies shall

be identified by type, grade, class, etc., as applicable. A general reference to a particular publication is usually insufficient.

9.2.5 Cross Reference to other paragraphs, pages or sections of the specification by number designation is improper. Reference shall be made to paragraphs or sections by title in lieu of their respective numbers in order to prevent erroneous cross references due to renumbering.

9.2.6 References to Drawings. Information noted "as shown on the drawings" must be correlated with the drawing to assure such information is actually shown on the drawings. Phrases "or as shown on the drawing," "unless otherwise detailed," etc., shall be deleted unless the feature is actually shown or otherwise detailed.

9.3 Conflicts. Notes and details on the drawings that conflict with the specifications shall be corrected or deleted. Sizes, thicknesses, spacings, etc., must agree with the specifications. The guide specification will reflect the most current detail criteria except on items for which specific engineering instructions are furnished, in which case, the latter will prevail and the guide shall be altered accordingly.

9.4 Terminology used on drawings shall match that of the guide specifications. The specification requirements may not be binding if terminology used on the drawings and in the specifications is not consistent.

9.5 Standard Drawings (page size details attached to the guides) required for the project shall be listed in the Attachments under the Index of the specification section. Standard Drawings not applicable to the job shall be deleted from the list. For electrical work most of the standard details are furnished with the engineering instructions in lieu of being attached to the various electrical guides. All standard detail drawings listed in the "Attachments" shall be inserted at the end of the respective section by the A-E when the specification is assembled. All pages shall be numbered, and these details shall not be duplicated on the full size drawings. Schedules and tables at the end of the section, with pages numbered, are not to be listed as attachments and shall be edited and typed along with regular specification pages.

9.6 Third Party. References to a third party shall be avoided. Only the "Contractor" and the Contracting Officer" are involved. The terms "Other," "Owner," "Engineer," etc., and references solely to the subcontractor or any other third party shall not be used when stating any contract requirements.

9.7 Materials and Components. Technical Provisions shall specify materials by reference to Federal and Military Specifications and Standards, in that order, whenever these publications cover the desired materials. Interim Federal Specifications shall not be referenced in place of approved Federal Specifications, unless issued by an Army service or authorized by HQUSACE. Where Federal and Military Specifications and Standards are not applicable, suitable publications of individual Government departments may be used. Where none of these are applicable, widely used specifications of trade and professional organizations may be used. Where none of these are applicable the minimum requirements will be stated in terms of physical characteristics, chemical

composition laboratory test results, performance in actual use, or otherwise in such a manner as to assure full and free competition.

9.8 Bridges and Railroads. Technical Provisions for highway bridges shall conform to the standard specifications of the American Association of State Highway Officials or to those of the State Highway Department concerned. Technical Provisions for railroads and railroad bridges should conform to the general specifications of the American Railway Engineering Association or to the applicable specifications and standards of the railroad system involved.

9.9 Format.

9.9.1 Arrangement of Paragraphs within a Section. The Technical Provisions consist of one or more sections describing materials, methods of construction and quality of workmanship required for the job. Although no change is required in guide specification arrangement, each section usually consists of the following paragraph or groupings: applicable publications list, general requirements, materials, installation.

9.9.1.1 Applicable Publications. The publications list shall include only the publications referred to in the subsequent parts of the specifications. The publications listed shall be checked against the latest index or HQUSACE Notices to insure that only the current publications are being used.

9.9.1.2 General requirements are used in a section to state requirements that apply to all work in the section, and in military jobs this paragraph would include any information that would otherwise be included in a scope paragraph.

9.9.1.3 Materials shall list the standards for material referred to in subsequent parts of the section by the name of the material only.

9.9.1.4 Installation shall define the methods of construction and the quality of workmanship required. Sufficient detail should be given.

9.9.1.5 Payment shall define the payment items that are to reflect the cost of performing the work covered by the section. This part shall be omitted in cases where all costs in connection with the item are to be included in one lump sum Bid item. Payment (except drilled piers) is usually omitted from Military Projects.

9.9.2 Arrangement of Sections Within the Specifications. The Construction Specifications Institute (CSI) Format for Construction Specifications shall be used for the Technical Provisions. The contractual-legal provisions of CSI shall not be used. The CSI Format consist of a system of sixteen divisions and an established pattern of sections which, when they are used, would always appear in the same division. Arrangement within a division is flexible to permit typing before the sequence of all sections has been determined and to permit the inclusion of additional sections as the need arises.

9.9.3 Numbering.

9.9.3.1 Parts. Part I shall include the Special Clauses (prepared by the District with A-E input) and Part II shall include the Technical Provisions.

9.9.3.2 Divisions used in the CSI Format for the Technical Provisions are numbered and titled as follows:

Division 1 - General Requirements
Division 2 - Site Work
Division 3 - Concrete
Division 4 - Masonry
Division 5 - Metals: Structural and Miscellaneous
Division 6 - Carpentry
Division 7 - Moisture Protection
Division 8 - Doors, Windows, and Glass
Division 9 - Finishes
Division 10 - Specialties
Division 11 - Equipment
Division 12 - Furnishings
Division 13 - Special Construction
Division 14 - Conveying Systems
Division 15 - Mechanical
Division 16 - Electrical

For jobs with work in 8 or more divisions, all 16 divisions are to be included in each specification; and where no work is included in a division, the words "NOT USED" are to be typed in the middle of the page. (See Attachment C) For jobs with work in less than 8 divisions, only the divisions used are to be included in the specifications, and the statement "(ALL WORK INCLUDED IN DIVISIONS , , , , , and)" is to be included in the Table of Contents.

9.9.3.3 Sections shall be designated as shown in Attachments A and B.

9.9.3.4 Paragraphs. The number-period system shall be used. Paragraphs are numbered in sequence (1., 2., 3., etc.). Subparagraphs shall be designated as follows: first tier - 1.1, 1.2, 1.3, etc.; second tier - 1.1.1, 1.1.2, 1.1.3, etc.; third tier - 1.1.1.1, 1.1.1.2, 1.1.1.3, etc. Lists or enumerations of items or descriptions in sequence shall be identified by lower case letters, and if unavoidable by letters in parenthesis below that. Paragraphing below the third tier should be avoided whenever possible. The numbered period system is used in this chapter.

9.9.3.5 Pages should be numbered with the section number followed by a dash and the sequence number. (02050-1, 02050-2, etc)

9.9.4 Titles and Underlining. Titles shall be used for each part, section, paragraph, and to the maximum extent practicable for each subparagraph. Main paragraph titles shall be in capital

letters. First tier subparagraph titles shall be caps and lower case without underline. Where the first word or words of the paragraph or subparagraph are the title, never use a separate title then start the paragraph with the title words. Be sure the titled used accurately describes the contents of the paragraph or subparagraph. Example follows:

1. ALL CAPITAL LETTERS.

1.1 Caps and lower case without underline.

1.1.1 Caps and lower case without underline.

9.9.5 Paragraphing. When subparagraphs are used, care shall be taken to include at least two subparagraphs within each tier used. When it is impossible to have at least two subparagraphs within a particular tier, the provisions of the single subparagraph shall be included in another part of the basic paragraph.

9.9.6 Word forms.

9.9.6.1 The words "Contractor," "Contracting Officer," "Federal," and "Government" are always capitalized.

9.9.6.2 Reference to conditions stated in Part I shall be made as the "SPECIAL CLAUSES", Section 00800. Reference to clauses of the Contract Clauses shall be made as "CONTRACT CLAUSES," Section 00700.

9.9.6.3 Reference to another section shall be made as "SECTION: CONCRETE."

9.9.6.4 Reference to a paragraph in the same section shall be made as "paragraph: FINISHING." Reference to a subparagraph in the same section shall be made as "subparagraph: Broom finish." Do not make reference to paragraphs in other sections; make reference to the section in which the paragraph occurs.

9.9.6.5 Except where used in tables, the words "inches" and "feet" shall be used instead of their abbreviations.

9.9.6.6 When referring to publications, the words "Federal Specifications" shall be spelled out and the words "ASTM Standard" or "ASTM Specification" shall be used instead of "ASTM Designation."

9.9.6.7 Use the word "shall" when the Contractor is to perform.

9.9.6.8 Use the word "will" when the Government has the option to perform.

9.9.7 Use of numbers. Whole numbers less than 10 shall be spelled out and all other

numbers shall be expressed as figures.

9.10 Common Errors.

9.10.1 Not reading instructions given in guide specifications prior to editing.

9.10.2 Using out-of-date-guide specifications.

9.10.3 Using brand names when specifying materials.

9.10.4 Not editing out all inapplicable portions of guide specifications, i.e., paragraph measurement, pavement, and bracket phrases, etc.

9.10.5 Using similar job specification as a guide specification (always start from updated guides if available).

9.10.6 Not giving typist the instructions contained in the typing section.

9.10.7 Using subparagraphs in index instead of just main paragraphs (paragraphs will be listed in the index pages).

9.10.8 Using Guide Specification for minor item of work (i.e., 30 pages of concrete specifications for 10 cubic yards of concrete).

9.10.9 Submitting final specifications without IFB number (see paragraph: TYPING).

10. TYPING. The paper used by the Government measures 8-1/2 by 11 inches as used commercially. A sample of Print Quality should be submitted at 35 percent Review. Single Pass Dot Matrix is unacceptable. The use of unassigned sections, "NOT USED" paragraphs, "A" pages (except amendments), and blanked out paragraphs is not permitted. The hard copy of the final design review specifications shall be printed in near letter quality, 12 pitch (elite) type. In order for all District guide specifications to be consistent, a predetermined set of standard formats have been established. Page and paragraph numbering, line spacing, capitalizing, bolding, margin widths, format, etc., are part of the preset format. It is required that the A-E keep the preestablished format. Typed specifications which do not conform to this format will be returned for retyping. Cutting and splicing of the "original" copy of specifications is not allowed for making corrections. Standard drawings listed as attachments shall be included at the end of the respective sections as required. The specifications shall be proofread prior to submittal. No pen and ink changes are allowed on the specifications. Do not add any additional headers or footers to the specifications.

10.1 Spacing shall be as follows:

10.1.1 Top line with "Invitation for Bid" number is started on line 4.

10.1.2 Bottom line of text is ended on line 55, except a maximum of three lines lower is

permitted when additional lines are used to complete a paragraph.

10.1.3 Page number is centered on line 58, except a maximum of three lines lower is permitted when additional lines are used to complete a paragraph.

10.1.4 Text is always single spaced.

10.1.5 Paragraph numbers are always indented two spaces. Two spaces occur between paragraph numbers and paragraph titles.

10.2 Paragraph Titles shall be all caps. Subparagraph titles shall be upper and lower case.

10.3 Margins shall be as follows:

10.3.1 Odd-numbered pages shall have a left margin of 1-1/4 inches and a right margin of 3/4 inch.

10.3.2 Even-numbered pages shall have a left margin of 3/4 inch and a right margin of 1-1/4 inches.

10.3.3 Second and subsequent lines of paragraphs and subparagraphs are always returned to the left margin.

10.4 Hyphenation. Words are hyphenated according to syllables; however, no division is made when there are less than three characters on either side of hyphen. Words should not be hyphenated between pages.

10.5 IFB/RFP Number. Each page shall carry the "Invitation for Bid" or "Request for Proposal" number, not A-E Contract number. The invitation or request number shall be located on line 4 in the following manner: on even-numbered pages the left outer corner at margin, and on odd-numbered pages the right outer corner ending at 3/4-inch margins. The number will not be established until just prior to final typing and should be requested at that time from the project manager. In the event the number has not been established prior to final typing, the number will be added by the District at the time of advertising.

10.6 End of Section shall be designated by six asterisks placed in a row two lines below the last line of the last paragraph and with a single space between each asterisk.

10.7 Submittal Register. As a part of the specifications, the A-E shall complete the "Submittal Register" at Design Complete. The Submittal Register will become a part of the specifications, SECTION: 01305. The system whereby the Contractor can maintain effective scheduling, control, and processing of submittals required by the contract in order to regulate the timely flow of materials to be incorporated into the construction is addressed in
ER 415-1-10, dated 30 June 1991.

10.8 Common Errors.

10.8.1 Not giving these instructions to typist.

10.8.2 Not giving these instructions to A-E subcontractors.

10.8.3 Not switching margins for odd- and even-numbered pages.

10.8.4 Not denoting end of section.

10.8.5 Not completing index pages and Table of Contents.

10.8.6 Using A-E contract number rather than "Solicitation" number.

10.8.7 Submitting Final Specifications without (IFB) number.

11. AMENDMENTS TO PROJECT. Amendments will be issued by the District. After a project is advertised for bids, revisions or corrections to specifications and drawings may be necessary. The A-E is required to prepare amendment type revisions to complete and correct the advertised documents.

11.1 Scheduling. The amendment revisions shall be prepared and submitted under a strict time schedule as directed in order that the revisions can be issued to bidders at approximately the midpoint in the advertising period.

11.2 Transmitting. Regular U.S. Mail shall not be used to transmit amendment revisions to this office. The District shall be consulted to determine what urgent delivery system will be acceptable.

11.3 Specification Revisions shall be marked on loose pages taken from an unbound set of the advertised specifications to show exact corrections and the pages so marked shall be submitted. New sections and pages of specifications to be added by amendment shall be furnished in hard copy. This office will prepare the specifications portion of the amendment in its final format. Do not renumber pages, paragraphs, or subparagraphs when making additions or deletions by amendment.

11.3.1 New Pages. If changes on any given page are so extensive that it becomes necessary to insert more than one page, the additional pages shall be numbered as "a" or "b" pages. The numbers of the existing page and the following unrevised pages shall remain the same. New pages of specifications to be added by amendment shall be furnished in hard copy.

11.3.2 New Paragraphs or subparagraphs should always be inserted at the most logical chronological place between existing paragraphs or subparagraphs. For example, after Paragraph 3, the inserted paragraph shall be numbered 3A.

11.3.3 New Section. If an entire new section of specifications is to be inserted, it shall be typed on bond paper. New sections of specifications to be added by amendment shall be

furnished in hard copy.

11.3.4 General Changes. Revised specification pages in typed form will be submitted by the A-E in all cases. Double asterisks are to be placed in the margins before and after lines or paragraphs changed from the previous issue in order that the changes can be easily identified.

11.4 Drawing Changes. Design changes, dimensional changes, etc. to drawings shall only be made by issuing a revised drawing or insert 8-1/2 by 11 inch drawing. Notes for clarification purposes may be added to the drawings by narrative description. The required narrative changes shall be furnished to the District by the A-E in typed form for inclusion in the amendment.

11.5 Common Errors.

11.5.1 Narrative changes to Specifications rather than revising the affected specification page.

11.5.2 Not providing double asterisks in the margins to denote the changes from the previous issue of the specification page.

11.5.3 Narrative changes to drawing that should be made by revising the drawings (i.e. design changes, dimensions, etc.).

11.5.4 Receipt of Amendment information in the District later than 5 days prior to issue date.

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CHAPTER 17

CHECKING GOVERNMENT APPROVED SUBMITTALS (SHOP DRAWINGS)

1. GENERAL. The A-E should be familiar with the current Section 01305, Submittal Procedures, of the contract specifications. The Resident Engineer is responsible for the prosecution of the construction contract so official approval action on submittals will be taken only by the Resident Engineer. The A-E's approval of a submittal will be the basis for official approval by the Resident Engineer.

1.1 Definition. The term "submittals" as used herein shall mean all items identified on the submittal register and in the contract specifications as GOVERNMENT APPROVED SUBMITTALS. Should there be any inconsistencies in the contract specifications in regard to the submittals as defined, or if the approved action is not identified, contact the District immediately. These items include drawings by the Contractor of structural steel, reinforcing steel, mechanical or electrical systems, sprinkler irrigation systems, and other items requiring special drawings. Also included are equipment lists of hardware, plumbing, heating, air conditioning and electrical items, sewage and water treatment equipment. Submittals may include actual samples when so required by the specifications to be submitted for approval. Submittals of some equipment may be catalog cuts and descriptive data as required by the specifications.

1.2 Purpose. Submittals provide the means for defining in detail the manner in which materials, equipment, and workmanship are proposed to be furnished by the Contractor to meet the requirements of the plans and specifications. These requirements cannot be changed by approval of submittals. "Approval" of submittals means approval of details, methods, and procedures within the contract requirements. The approval of inadequate or incorrect submittals may give rise to claims and appeals; therefore, care and good judgment must be exercised in processing these items to insure that the action taken is complete, correct, and that it will not impede, in any way, the progress of the project.

1.3 For Information Only Submittals which are inadvertently sent to the A-E shall be forwarded to the Resident Engineer involved with no approval action taken.

1.4 Parts List and operating and maintenance manuals for equipment items are not to be reviewed for approval, as such, unless they are an integral part of the descriptive data for the item concerned. Where such lists and manuals are separate from other descriptive data, they shall be considered For Information Only items.

1.5 Material. Equipment and test certifications are not to be considered submittals or treated as such, except as follows:

1.5.1 When specifications specifically state that certifications are to be submitted for "approval."

1.5.2 When certifications contain descriptive information or data not otherwise presented, and which is considered essential in determining compliance with the specifications.

1.6 Certifications of a general nature that do not come under the preceding classifications shall be forwarded to the Resident Engineer involved with no approval action taken. Samples included with submittals shall be forwarded to the Resident Engineer involved.

2. PROCESSING PROCEDURE. The A-E may receive all submittals directly from the Construction Contractor and will return submittals to the Resident Engineer or contractor as directed. The A-E may affix a stamp of his choice on all copies of the Transmittal Form indicating the firm's name and date of receipt.

2.1 Time Frame. All submittals are to be processed through the A-E's office within ten (10) working days after receipt. The Resident Engineer shall be promptly notified in each case where this time is expected to be exceeded. Because of extremely large submittals, complicated design, or other valid reasons, additional time may be allowed to permit complete and adequate review. In all cases, time required for review shall be held to an absolute minimum. A delayed, incomplete, or otherwise deficient submittal from the Contractor which might adversely affect the timely prosecution of the construction contract shall immediately be brought to the attention of the Resident Engineer. Submittals pertinent to early stages of construction, especially structural steel and reinforcing steel, and other items requiring fabrication should be approved, approved with minor corrections, or disapproved and returned as promptly as possible so that fabrication of those items may proceed.

2.2 Transmittal and Disposition. All specifications issued by this office require the Construction Contractor to use a standard Submittal Form, Engineering Form 4025, in transmitting its submittals for approval. The A-E will receive several sets of all drawings, catalog data, descriptive literature, specifications, etc. All but one of the annotated copies of shop drawings, catalog data, descriptive literature, specifications, etc., shall be forwarded to the Resident Engineer. All actions taken shall be noted in the "FOR CE USE CODE" column of the Submittal Form, which shall be forwarded to the Resident Engineer along with any additional information or statements by the Contractor in support of his selection of equipment. All submittals and correspondence shall be transmitted by the most expeditious means. One (1) copy of all submitted drawings and data shall be retained in the A-E's files.

3. CHECKING THE SUBMITTAL. The A-E will check the submittal to verify that the item meets all the requirements of the contract plans and specifications with all amendments and modifications currently posted. The submittal form will show the section and paragraph that require the submittal. If this information is not shown or is incorrectly shown, it shall be added or corrected. The total count of materials and accuracy to assure field fit is not the A-E's responsibility, although reasonable attention should be given to this aspect.

3.1 Cross-Checking. All submittals for individual pieces of equipment weighing 200 lbs, or more and groups of equipment with a total weight of more than 200 lbs. shall also be furnished to

the A-E for the purpose of cross-checking applicable structural designs of the buildings. Where equipment has any type of electrical supply, control, contact, or connection, it must also be cross-checked for compliance with the electrical drawings and specifications.

3.2 Checklist shall include the following:

3.2.1 Structural steel drawings should be checked for the size and weight of each different member and the design of structural connections must be verified.

3.2.2 Reinforcing steel must be checked for the size and spacing of bars, proper lap and positioning of steel.

3.2.3 Material stress grade for items to be furnished, coats of shop paint, shop finish on laminated wood beams, and similar items shall be verified and checked against requirements in the plans and specifications.

3.2.4 Fire Protection drawings shall be checked for compliance with NFPA Standards and no deviations are to be approved, except to conform to the local authority's interpretation of these standards, or the deviations set forth on the plans and specifications.

4. ACTION AND COMMENTS ON SUBMITTALS. When specifications require submittals on control systems, wiring diagram, piping layouts, or other items of this nature, approval shall not be given to component parts of the system until the required drawings and data in complete detail are submitted. If the A-E discovers that submittals have been inadvertently approved that do not comply with the plans and specifications, the A-E will take immediate action to notify the Resident Engineer.

4.1 Types of Action. The "FOR CE USE CODE" column of the Submittal Form shall be filled out per letter codes listed on the back of the Form. No actions are to be made or stamped on any of the drawings or catalog data. The following seven (7) action codes are applicable, and no other variations shall be used:

4.1.1 "A" - Straight Approval Only. Items meeting all requirements of the plans and specifications.

4.1.2 "B" - Approved, subject to corrections noted on submitted data and/or Comments on an attached sheet. Corrections shall be made on all copies of drawings and data submitted for approval. This action should be taken only when it is possible for the supplier to accomplish the correction without major revision to the submitted item.

4.1.3 "C" - Approved, subject to corrections noted on submitted data and/or comments on attached sheet. Resubmission required. Corrections shall be made on all copies of drawings and all data submitted for approval. This action should be taken when there is a major revision to the submitted item, but because of a short construction schedule, long lead time, or the need for fabrication, it is felt that the submittal should be approved.

4.1.4 "D" - Will be returned by separate correspondence. This action should be taken when the submittal is large enough that it will take several days to mark up and process the submittal and the contractor needs to know approval actions for fabrication purposes.

4.1.5 "E" - Disapproved, with corrections noted on the drawings and/or catalog data or reasons on an attached sheet. Reasons for Action "E" may be as follows:

4.1.5.1 Data submitted from more than one manufacturer for a single item shall be returned "Disapproved" through the Resident Engineer with the request that the Contractor resubmit one make, since approval can be given to only one. Substitutions submitted at a later date shall not be approved unless the Contractor gives a valid reason, such as delayed delivery, discontinuance of manufacture, etc., which has been verified by the Resident Engineer.

4.1.5.2 Equipment or materials which do not meet all requirements of the plans and specifications will not be approved. Substitute equipment and materials submitted by the Contractor will be given no consideration and will be returned "Disapproved" through the Resident Engineer unless accompanied by a full explanation by the Contractor, describing all points in which it differs from the requirements of the specifications, how its substitution will affect other items, and the reasons for submittal. If material is submitted in this manner by the Contractor, and if in the opinion of the A-E the substitute has merit and should be considered, the entire submittal together with comments and recommendations will be forwarded to the Resident Engineer for action and distribution.

4.1.5.3 The Contractor is responsible for field fit and dimensions; therefore, when drawings are received asking for verification of dimensions, they should be returned to the Contractor through the Resident Engineer as "Disapproved" and noted "Contractor shall verify field fit and dimensions."

4.1.6 "F" - Receipt acknowledged. This action should be used when receiving a submittal that requires no action. A submittal "For Information Only" is a typical example.

4.1.7 "G" - Other (Specify). This action should be taken when used in conjunction with other actions. A written statement specifying what the action code means shall be included in the space provided for "Remarks".

4.2 Changes to the Construction Contract Affecting Submittals.

4.2.1 Submittals affected by changes to the Construction Contract made by modification will be checked and approved on the basis of the current status of the plans and specifications. Submittals will not be categorically disapproved based on a pending modification, except on specific instructions from the District. In rare instances when it appears there would be a major savings in overall costs and when the full scope of the modification is known and the date of issue is firm and very near, the A-E may be instructed to note affected items for resubmittal "in accordance with

forthcoming Modification No. ____." If in doubt, consult the Resident Engineer.

4.2.2 When the Contractor's submittal proposes a change, this information (all marked-up copies of the submitted data, including a narrative description of the change), together with comments, recommendations, and an estimate will be transmitted immediately to the Resident Engineer for necessary action.

4.2.3 When it has been determined by the A-E as a result of the review of submittals (submitted in accordance with contract specifications), that a change to the contract is necessary, the submittals together with the A-E's recommended changes, comments, and an estimate of cost should be forwarded immediately to the Resident Engineer for necessary action.

4.3 Comments on Submittal Material.

4.3.1 All corrections and all comments possible should be placed on the drawings or other submitted data. All corrections made to the reproducible drawings shall be encircled with a cloud symbol so the Contractor can easily identify the changes made. Corrections made on all other submitted data shall be made in "red". No markings indicating Action are to be made on any of the drawings or other submitted data. Other comments should be placed on a sheet of paper attached to the submittal form. Comments made on an attached sheet or by letter should be cross-referenced on the submitted data showing where made, e.g., "See comments on attached sheet," or "… in attached letter."

4.3.2 Comments on partially approved submittals shall be clear in regard to items not approved and shall give proper instruction for resubmittal.

5. CONTACT WITH THE CONTRACTOR. The A-E is not authorized to make direct contact with the Construction Contractor. All contacts will be made through the Resident Engineer.

6. APPLICABLE REFERENCED PUBLICATIONS. Checking of submittals requires that A-E's performing this service procure copies of or have access to specifications, standards, and pamphlets referenced in the project specifications. Specifications and standards cited in the Project Specifications are available as indicated below:

6.1 Unclassified Federal, Military, and Other Departmental Specifications and Standards (excluding the Corps of Engineers Handbook for Concrete and Cement (CRD-C Series) and Commercial). Submit request on DD Form 1425, Specifications and Standards Requisitions, or in letter form to:

Standardization Document
Order Desk, Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Telephone (215) 697-3321

Requests may be submitted in letter form indicating the specification title, number, and date, and any applicable amendment thereto by number and date.

6.2 Corps of Engineers Specifications of the CRD-C series may be obtained from: U.S. Army Engineer Waterways Experiment Station, ATTN: Publications Distribution Information Services Branch, P.O. Box 631, Vicksburg, MS 39180, and are also on file and available for review in this office.

6.3 Commercial Specifications and Standards are not available from District sources. They may be obtained from the publishers.

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CHAPTER 18

ESTIMATING GUIDE

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CHAPTER 18

ESTIMATING GUIDE

1. GENERAL. The purpose of this guide is to outline the requirements for preparing estimates for military projects. All MILCON-funded projects will utilize the Corps' Micro based Computer Aided Cost Estimating System (MCACES-Gold) for estimate preparation. Any deviations from this requirement will be specifically granted by the District and included in the scope of work.

2. REFERENCES.

2.1 General. The A-E shall prepare a cost estimate for the project at the various stages of design, as specified in the scope of work. Estimates shall be prepared in conformance with the following manuals:

2.1.1 TM 5-800-2, Cost Estimates, Military Construction, June 1985, published by Headquarters, Department of the Army.

2.1.2 EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, published by HQUSACE.

2.1.3 AR 415-17, Construction Cost Estimating for Military Programming.

2.2 Contradictions. WHERE CONTRADICTIONS EXIST BETWEEN THIS MANUAL AND THE TM 5-800-2, THIS MANUAL SHALL GOVERN. Questions concerning the interpretations of these requirements shall be directed to the District.

3. TYPES OF ESTIMATES: Current Working Estimates (CWE) are designated as either Code A, Code B or Code C. These estimates are used not only as a basis for Congress to appropriate funds, but once funds are appropriated, to maintain cost control during the design process, and to assure that the cost stays within the funds available.

4. CODE B ESTIMATES:

4.1 General. Code B estimates are submitted with their respective design documents when design is from 25 percent to 65 percent complete. To the extent possible, the procedures for Code C estimates shall be used. If the design is unrefined at the time of submittal, more general methods may be used, e.g., use of system approach, unit prices which include labor plus materials, not itemizing indirect costs, etc.

4.2 Degree of Detail. The degree of detail to be provided is directly related to the amount of design completed when the estimate is prepared. The more refined the design, the more detailed the estimate should be. At the 65 percent Code B stage, the estimate should more closely resemble a Code C estimate.

4.3 Example Code B Estimate. Use the Example Code B estimate, Appendix C, TM 5-800-2 (June 1985) as a guide. The prices and percentages shown are for illustration only. The estimator shall determine the proper prices and percentages for a specific project.

4.4 Format.

4.4.1 Costs shall be divided into the following major categories: Each new building to 5 feet beyond exterior building surface; each building addition to the 5-foot line; alterations to each existing building; and exterior work. The major categories shall be further subdivided in accordance with the Work Breakdown Structure (WBS).

4.4.2 Unusual foundation cost (such as drilled piers, the removal of unsatisfactory material and replacement with suitable material, rock excavation, or high water table); separately funded items identified in the scope of work (such as O&M or multi-agency funded work); and optional, alternative or additive designs shall be kept separate.

4.4.3 Asbestos removal costs shall be kept separate.

4.4.4 Exterior work shall be divided into electric service; water, sewer, and gas; steam and/or chilled water distribution; paving, walks, curbs and gutters; storm drainage; site improvements/demolition; communications; and other work.

4.5 Unit Costs.

4.5.1 Indicate source(s) of unit costs.

4.5.2 Line items shall be described sufficiently to clearly identify them, including such information as size, thickness, gauge, rating, etc. Explanatory notes shall be incorporated into the estimate to clarify all aspects and assumptions.

4.6 Subcontractor Overhead. Preferably as a separate line item. Mark all line items with overhead included in unit cost and indicate the percentage included.

4.7 Subcontractor Profit. Preferably as a separate line item. Mark all line items with overhead included in unit cost and indicate the percentage included.

4.8 Prime Contractor Indirect Cost (Overhead). Add as a separate line item.

4.9 Prime Contractor Profit. Add as a percentage by separate line item.

4.10 Design Contingency. This is an amount which may be added by separate line item to the estimate to allow for missing items and missing costs due to the immature state of the project design. The amount of design contingency , usually expressed as a percentage, should decrease along with the progressive refinement of the design. The estimator should make the decision as to whether a contingency should be added and how much it should be. Because some portions of the design may need a design contingency while others may not, it is best to apply the percentage at an intermediate summary sheet rather than only once at the project summary sheet.

4.11 Cost Level Date. The "cost level date" is the effective date of the prices used in the estimate, i.e., the average date for which the prices are valid. The cost level date may be different than the date of estimate submission.

4.12 Cost Growth (Escalation). An allowance for anticipated labor, equipment and material price increases from the cost level date to the midpoint of the project construction period shall be included in the estimate. The allowance shall be added as a single line item on the "Estimate Detail Summary Sheet" as a percentage. Show the method of arriving at the percentage increase.

4.13 Reserve for Contingencies. This is an amount of money set aside for change orders and contract modifications after award of the contract. It is normally 5 percent of the contract cost for new construction and 10 percent for alterations to existing construction. The preponderance of the work determines which figure is used. A weighted average is not used.

4.14 Supervision and Administration (S&A or SIOH). This is an amount of money set aside for Government supervision and administration of the contract. It is normally 6.0 percent (7.5 percent on Operation & Maintenance-funded work) of the total of the contract cost plus the contingency reserve.

4.15 Current Working Estimate (CWE). This is the grand total of all elements discussed above.

5. PREPARATION OF CODE C ESTIMATES.

5.1 General. Code C estimates are based on final drawings and specifications of a design more than 65 percent complete. Code C estimates shall conform not only to all requirements for Code B estimates but also to the additional requirements described in this section. These estimates shall be prepared on the basis that the District is bidding in competition with private contractors. All reasonable, anticipated expenses that would be incurred by the contractor shall be included in the estimate.

5.2 Method of Preparation. Code C estimates shall be prepared using MCACES-Gold, unless specific written permission is received from the Cost Engineering Branch authorizing a waiver. Refer to CACES current version Users Manual and additional instructions and information supplied by the District.

5.3 Format. In addition to the requirements for Code B estimates, Code C estimates shall have each line item of work divided into separate unit costs for labor, equipment, and material. Refer to TM 5-800-2.

5.3.1 When asbestos removal is required, the selected method of removal shall be fully explained. Specific contract specifications requirements for asbestos removal shall be itemized and priced in detail.

5.3.2 For hazardous, toxic and radioactive waste (HTRW) remediation projects, fully explain the method of cleanup, assumptions, qualifying or limiting factors involved, crew composition and crew productivity. Specifically address 'level of protection' required and the resultant crew (labor and equipment) inefficiencies.

5.4 Labor Unit Cost. The labor unit cost shall be based on local wage rates, but not less than the Davis-Bacon rate determination for the area. The estimate shall contain a listing of the wage rates utilized. DA Form 5420-R with applicable entries, shall be used for this purpose, for non-MCACES estimates. The labor unit cost shall be based on the "burdened" labor rate, i.e., the "Total Hourly Cost" as calculated in column k of DA Form 5420-R. The rate shall include the basic hourly wage plus normal fringe benefits (pension, health and welfare, vacation, apprentice training, etc.), insurance and tax on labor (workmen's compensation and employer's liability, social security and Federal and State unemployment tax) and, where applicable, overtime and travel or subsistence.

5.5 Equipment Unit Cost. Each line item of work, when applicable, shall contain a unit cost and extended cost for the contractor's construction equipment.

5.6 Material Unit Cost. The estimate shall contain a detailed material breakdown. The

material cost for each line item shall show the unit cost and the extended cost. The material unit cost shall be the current local cost and include transportation delivered to the job site. Sales tax and material taxes, as applicable, shall be applied to the summation of material by discipline or other estimate heading.

5.7 Unit Cost Support.

5.7.1 All sources, such as quotations, estimating manuals, and catalogues from which labor unit costs, equipment unit costs, and material unit costs are taken or derived shall be identified. With respect to labor unit costs and equipment unit costs, specifically identify work crews used, equipment used, labor rates equipment rental rates, and work crew productivity.

5.7.2 For crew composition and crew productivity, use DA Forms 5419-R and 5421-R (refer to TM 5-800-2) for non-MCACES estimates.

5.7.3 For heavy and highway construction, refer to Attachment 2, Code C estimate, of this chapter.

5.7.4 When a unit cost is taken from an identified source but has been adjusted, the reason for the adjustment and the adjustment factor shall be given. The "cost level date" (the date for which the unit costs are valid) for each data source shall be given.

5.8 Subcontractor Work. Subcontractor work shall be itemized and summarized separate from prime contractor work with overhead and profit added by separate line items. Indicate those line items for which subcontract quotations are received. Quotation sources should be identified.

5.9 Prime Contractor Work. Prime contractor work shall be itemized and summarized separately. The policy of the District is that no less than 20% of the actual work shall be performed by the prime contractor's own forces.

5.10 Insurance and Tax on Labor (Workman's Compensation and Employer's Liability, Federal and State Unemployment Tax, and Social Security). Refer to paragraph: Labor Unit Cost.

5.11 Overtime, Travel Cost, Subsistence Cost. Refer to the discussion in paragraph: Labor Unit Cost.

5.12 Sales Tax and Other Material Taxes. These taxes may be added by separate line item. However, if they are included in material prices a statement to that affect shall be given in the estimate.

5.13 Quotations. When quotes for special materials or construction are used in the estimate they shall be flagged and their sources identified by indicating company name and address as well as point-of-contact by name and telephone number.

5.14 Subcontractor Indirect Cost. A subcontractor's indirect cost (overhead) is usually limited to the costs pertaining to one phase of the work. Since such overhead bears a fairly stable relationship to that phase of the work, it may be estimated on a percentage basis. However, if desired, the subcontractor indirect cost may be developed in the same manner as the prime contractor indirect cost. For a reasonable percentage the estimator should rely on his own experience or historical data records, or refer to cost estimating publications.

5.15 Subcontractor Profit. Subcontractor profit may be estimated as a percentage of subcontractor costs. For a reasonable percentage, the estimator should rely on his own experience or historical data records, or refer to cost estimating publications.

5.16 Prime Contractor Indirect Cost.

5.16.1 This cost is also called prime contractor overhead cost. The prime contractor's indirect cost is not a fixed percentage of the prime contractor's work, or of an entire job, but depends upon the amount of job supervision required, the nature of the temporary facilities, and the amount of work that is subcontracted. Therefore, attempts to assess such costs as a percentage of the total cost of a project may lead to errors. The estimator shall itemize the prime contractor indirect costs.

5.16.2 For a detailed indirect cost checklist refer to TM 5-800-2, Appendix E.

5.16.3 Prime contractor indirect costs (Overhead) shall be transformed into a percentage and distributed over the cost of all basic bid items. For additive bid items apply the following prime contractor indirect costs: (1) a percentage for home office overhead, (2) the cost for additional mobilization and demobilization specifically attributable to the additive work, and (3) additional job overhead expenses.

5.17 Prime Contractor Profit (Weighted Guideline Method).

5.17.1 Cost estimates shall contain a reasonable percentage for prime contractor profit. A percentage for profit shall be separately estimated using the following table. Refer to TM 5-800-2, Chapter 12, for additional details on selection of Weight. Also refer to Appendix of this guide.

Factor	Rate	X	Weight	=	Value
Degree of Risk	20				
Relative Difficulty of Work	15				
Size of Job	15				
Period of Performance	15				
Contractor's Investment	5				
Assistance by Government	5				

Degree of Risk	20
Relative Difficulty of Work	15
Subcontracting	25
	100%

5.18 The prime contractor's performance and payment bond shall be added by separate line item. Refer to Attachment 1 for bond rate tables.

5.19 Cost Level Date. See paragraph: Code B Estimates.

5.20 Cost Growth (Escalation). See paragraph: Code B Estimates.

5.21 Reserve for Contingency. See paragraph: Code B Estimates.

5.22 Supervision and Administration. See paragraph: Code B Estimates.

5.23 Bid Items. When the Bid Schedule for a project will be composed of more than one Bid Item, the estimate shall be summarized to produce an estimated construction cost for each Bid Item.

6. SECURITY OF THE CODE C ESTIMATE.

6.1 Access to the estimate and its contents shall be limited to personnel whose duties require that they have knowledge of the subject. The 100 percent Final Design Estimate shall be furnished separately in a double-sealed envelope with the outer envelope marked:

"FINAL COST ESTIMATE
FOR OFFICIAL USE ONLY"

6.2 Signature Sheet. All individuals who have had access to the total amount of the Code C estimate shall sign this sheet. Refer to TM 5-800-2 (June 1985), par. 2-5b, page 2-2.

7. HEAVY AND HIGHWAY CONSTRUCTION.

7.1 General. Where all or most of the project is heavy or highway construction, a different estimate format for direct costs shall be used, which better relates to this type of construction. The unit costs for this type of work are usually unique for each project. For example, for earthwork projects costs will vary depending on haul distances, terrain, haul equipment, excavation equipment, type of materials, weather conditions, moisture conditions, placement and compaction requirements, the construction period, congestion of the worksite, labor rates, etc. Therefore, costs for this type of work must be supported with an estimate for equipment, labor, and material showing in detail the work crew composition, equipment used, technique used, production rates, equipment rental or

ownership costs, equipment payloads, material shrinkage factors, etc. The estimate should be logically presented with each phase fully described including the items and distribution sheet.

7.2 Site Improvements. When the site improvements associated with a building construction project are a relatively minor part of the total project cost, as they usually are, they may be priced using the same unit cost format as for the building construction part of the project.

7.3 Example Estimates. Attachment 2 illustrates documentation of crew composition and productivity for an earthwork operation. See TM 5-800-2 for other examples.

8. CONTRACT MODIFICATION ESTIMATES: Modification estimates will be prepared in the detail required for Code C estimates. Additional costs for removals, restocking, or other lost effort shall be identified separately. Impact costs will be determined by the District.

9. CHECKLIST FOR REVIEW OF DETAILS AND FORMAT PRIOR TO FINALIZING THE ESTIMATE:

The estimator is encouraged to use this checklist in the final review of his estimate as an aid in identifying potential errors.

9.1 Legibility and Trackability. Is the estimate trackable? Does it progress logically and clearly from a listing of quantities with unit prices through summary sheets and application of overhead, profit, and other markups to the final bid price? Can the reviewer follow all steps mathematically?

9.1.1 Are the pages of estimate numbered serially?

9.1.2 Are sheet numbers from which amounts are brought forward indicated on summary sheets?

9.2 Descriptions and Supporting Details:

9.2.1 Are line items described in enough detail, such as size, thickness, gauge, material, type, rating, etc., to adequately identify them so that the reviewer can evaluate them? Examples of some line item descriptions are as follows:

Unacceptable	Acceptable
4" pipe	4" type K copper pipe
vinyl asbestos tile	vinyl asbestos tile, 1/16"
unit heater	unit heater, gas-fired, 100 MBH
sheet piling	sheet piling, 38 psf
fence	chain link fence, 9 ga., 6 ft.
painting	paint CMU, 2 coats, latex
insulation	batt insulation, fiberglass, R11
5" steel pipe	5" pipe, blk steel sch. 40, threaded

9.2.2 Are the sizes and types of construction equipment indicated? Has equipment been designated as company owned or rented? Is the length of the rental period given?

9.2.3 Are large lump sum costs supported in detail?

9.2.4 Are direct cost contingencies incorrectly included in a Code C estimate?

9.2.5 Are undefined terms such as "markup," "labor burden," "bare cost," and "supervision," used? All such terms should be defined.

9.3 Labor.

9.3.1 When man-hours are used for labor, has an allowance for supervision been included?

9.3.2 Should the estimate include overtime and if so have overtime costs been properly identified?

9.3.3 Does hot or cold weather impact on labor efficiency and on the time required to complete the work?

9.3.4 Is asbestos removal required? Are such costs listed separately? Has the cost impact of asbestos removal on other work in progress on the same project been clearly explained and included?

9.3.5 Does the estimate identify by separate line items labor inefficiencies and additional costs due to hazardous or toxic waste removal and disposal requirements?

9.4 Wage Rates.

9.4.1 Have the proper wage rates been used? Building Construction rates; Heavy and Highway Construction rates; Family Housing Construction rates; Service Contract rates?

9.4.2 Has a tabulation of the wage rates used in the estimate been included (DA Form 5420-R)?

9.5 Insurance and Tax on Labor.

9.5.1 If Insurance and Tax on Labor has not been included in the man-hour rates, has it been included by separate line item?

9.5.2 If the Insurance and Tax on Labor is greater than 20 percent, is it itemized in detail?

9.5.3 Has Insurance and Tax on Labor been correctly applied only to the cost of labor?

9.6 Subcontractor Work.

9.6.1 Has subcontractor work been identified?

9.6.2 Have subcontractors' overheads been added as separate line items?

9.7 Prime Contractor Work.

9.7.1 Has prime contractor work been identified?

9.7.2 Is prime contractor work at least 20% of the project?

9.7.3 Have prime contractor indirect cost been itemized in detail?

9.7.4 Has the prime contractor's home office overhead been included?

9.7.5 Has the prime contractor's overhead incorrectly been added as a percentage though it was already included in the form of an itemized breakdown (a double entry)?

9.8 Profit.

9.8.1 Have Subcontractors' Profits and Prime Contractor's Profit been added by separate line items?

9.8.2 Has the Prime Contractor Profit for Code C estimates been computed by using the "O.C.E. Weighted Guidelines Formula?"

9.9 Cost Growth.

9.9.1 Has cost growth inadvertently been added twice? Was it allowed for in unit costs and a second time by separate line item on the summary sheet?

9.9.2 Has cost growth been added as a separate line item?

9.9.3 Has the cost growth index used for the cost growth computation been identified?

9.10 Other.

9.10.1 Has the math been checked?

9.10.2 Has a percentage for bond been added?

9.10.3 Has a "PROJECT SUMMARY (DD FORM 1391 FORMAT)" been included?

9.10.4 Has a "reserve for contingency" percentage been added to the finalized construction cost estimate (5 percent for new work, 10 percent for remodeling work)?

9.10.5 Has a percentage been added to the construction cost estimate for District supervision and administration of the contract? Use 6.0 percent for Military Construction Army and Army Family Housing work and 7.5 percent for operations and maintenance work.

27 July 1989

PERFORMANCE AND PERFORMANCE PAYMENT BOND RATES
LUMP SUM AND UNIT FIXED PRICE CONTRACTS

1. The rate per $1,000 of contract price using Surety Association of America standard advisory rate (non-deviating) is as follows:

Amount of Contract Price	Class B:	Class A:	Class A1:
First $ 100,000	$ 25.00/M	$ 15.00/M	$ 9.40/M
Next 400,000	15.00	10.00	7.20
Next 2,000,000	10.00	7.00	6.00
Next 2,500,000	7.50	5.50	5.00
Next 2,500,000	7.00	5.00	4.50
Over 7,500,000	6.50	4.50	4.00

2. The rate per $1,000 of contract price may deviate with eachcompany depending on competition, contractor's time in profitable business, and net worth. The following rates are typical of large contractors having a "preferred" rate structure:

Amount of Contract Price	Class B:	Class A:	Class A1:
First $ 100,000	$ 9.00/M	$ 7.00/M	$ 4.70/M
Next 400,000	7.00	5.25	4.20
Next 2,000,000	6.25	4.75	3.90
Next 2,500,000	5.25	4.20	3.65
Next 2,500,000	4.75	3.65	3.35
Over 7,500,000	4.20	3.10	2.85

3. Rules governing the application of the above rates:

a. If the contract is susceptible to two classifications which take different rates, apply the higher rate.

b. Separate contracts take the same classification as a general contract. Neither the classification nor the rate is changed by subdividing the work or by the Government's providing certain materials.

c. Subcontracts take the same classifications and rate as general contracts.

d. When using the standard advisory rates, if the stipulated

time for completion is over 12 months or 365 calendar days, add 1 percent of the basic premium for each month in excess of 12 months. When using the preferred rates, if the stipulated time for completion is over 24 months or 731 calendar days, add 1 percent of the basic premium for each month in excess of 24 months.

3. Extras

a. If the consent of the surety is not required and given for changes or extras, first and renewal premiums for the additional cost thus caused are computed at manual rates from the date of the bond.

b. If the consent of the surety is required and given for changes or extras, premium for the additional cost thus caused is computed at manual rates from the date of such surety's consent.

4. Minimum premium charge is $ 25.00.

5. Some contractors may use rates between the standard(non-deviating) and "preferred" rates, sometimes referred to as"merit" rates.

Amount of Contract Price		Class B:		Class A:		Class A1:	
First	$ 100,000	$ 10.00/M	$	U/M		$	U/M
Next	400,000	8.00		N		N	
Next	2,000,000	7.00		K		K	
Next	2,500,000	6.00		N		N	
Next	2,500,000	5.00		O		O	
Over	7,500,000	4.00		W		W	
				N		N	

a. When using the "merit" rates, if the stipulated time for completion is over 12 months or 365 calendar days, add 1/2 percent of the basic premium for each month in excess of 12 months, up to and including 24 months. If the stipulated time for completion is over 24 months or 731 calendar days, add 1/2 percent of the basic premium for each month in excess of 12 months, plus add 1 percent of the basic premium for each month in excess of 24 months.

Site Improvements	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	TOTAL COST	UNIT COST

Excavate, Haul, Place for Ramp

Assume topsoil will be hauled 3 miles. Assume truck can make 3 trips per hour. Therefore crew productivity is 6 x 3 x 12 = 216 CY/hr. This would be loose soil. To convert to placed volume 216/1.47= 147 CY/hr
Time required = 115,000 CY / 147 CY/hr = 782.31 hours.

Outside Equip. Op. (Foreman)			0.00	10.09	0.00	0.00	10.09
	782.31 HR	0	7,895	0	0	7,895	10.09
Laborer (2)			0.00	9.79	0.00	0.00	9.79
	1564.63 HR	0	15,320	0	0	15,320	9.79
Eq Oper, Medium (4)			0.00	9.30	0.00	0.00	9.30
	3129.25 HR	0	29,088	0	0	29,088	9.30
Truck Drivers, Heavy, 6 Ea.			0.00	10.70	0.00	0.00	10.70
	4693.88 HR	0	50,237	0	0	50,237	10.70
LDR,FE,CRWLR, 2.5 CY, 963			0.00	0.00	46.16	0.00	46.16
	782.31 HR	0	0	36,110	0	36,110	46.16
Small Tools			0.00	0.00	1.42	0.00	1.42
	782.31 HR	0	0	1,109	0	1,109	1.42
TRUCK OPT,REAR DUMP BODY, 12 CY			0.00	0.00	2.47	0.00	2.47
6 Each	4693.88 HR	0	0	11,613	0	11,613	2.47
TRK, HWY, 3 AXLE, 41000 GVW, 6X4			0.00	0.00	19.65	0.00	19.65
	4693.88 HR	0	0	92,246	0	92,246	19.65
DOZER,CWLR,D-7H,PS,(ADD BLADE)			0.00	0.00	54.19	0.00	54.19

	782.31 HR	0	0	42,395	0	42,395	54.19	
BLADE, UNIVERSAL,HYDR,FOR D7				0.00	0.00	5.28	0.00	5.28
	782.31 HR	0	0	4,132	0	4,132	5.28	
LNDFL COMPACTOR,TF				0.00	0.00	65.06	0.00	65.06
51"Dia. X 44"L, W/BLD	782.31 HR	0	0	50,894	0	50,894	65.06	
TRK,HWY,4X4,F250,3/4T,8800 GVW				0.00	0.00	7.10	0.00	7.10
(Pickup for Foreman)	782.31 HR	0	0	5,551	0	5,551	7.10	

PROJECT FROPI2: OVERPASSES & INTERSECTION - CAMP FUNSTON RAILROAD

DETAILED ESTIMATE Government Estimate 95% (35% RR) DETAIL PAGE 29

01. E STREET OVERPASS

Site Improvements	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	TOTAL COST	UNIT COST
Disc	0.00		0.00	7.73	0.00	7.73		
	782.31	HR	0	0	6,047	0	6,047	7.73
GRADER,MOTOR,CAT12-G, ARTIC			0.00	0.00	26.46	0.00	26.46	
ARTICULATED FRAME, POWERSHIFT	782.31	HR	0	0	20,697	0	20,697	26.46
Excavate, Haul, Place for Ramp	115000	CY	0	102,540	270,793	0	373,334	3.25
Heavy Construction	1.00	EA	8,079	265,955	301,704	338,882	906,541	906541.03

LABOR ID: FR0893 EQUIP ID: RG0592 Currency in DOLLARS CREW ID: NAT92A UPB ID: NAT92A

CHAPTER 19

CONTRACT PAYMENT PROCEDURES

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CHAPTER 19

CONTRACT PAYMENT PROCEDURES

1. GENERAL. Contract payment provisions are discussed in the Contract Clauses under clause: "Method of Payment" and "Payment" for A-E and Indefinite Delivery Type (IDT) A-E contract services, respectively. Billings shall be submitted on Payment Estimate - Contract Performance Form ENG 93, dated 1 March 1978. Several copies of ENG 93 and ENG 93a, are provided to the A-E at the time of contract award. This chapter discusses the general procedures to follow in preparing these forms. The discussion is limited to A-E contracts and A-E Indefinite Delivery-Type contract payments.

2. ADDRESS FOR SUBMITTING PAY ESTIMATES (ENG 93). All military design payment estimate submittals (ENG 93) shall be mailed to the following address:

U.S. Army Engineer District, Kansas City
601 E. 12th Street, 757 Federal Building
Kansas City, MO 64106
ATTN: CEMRK-CT-M

3. PAY ESTIMATE COPIES REQUIRED. Pay estimates shall be attached to a forwarding letter of transmittal and submitted in duplicate, with original signatures on both copies.

4. ISSUANCE OF PAYMENT. Payments are made on a continual basis, Monday through Thursday, of each week. No checks will be issued the last three working days of the month. Normally, thirty days are required to complete all processing after receipt of ENG 93. Pursuant to the Prompt Pay Act, 30 days will be taken regardless of the time required to process the estimate.

5. REFERENCED PAYMENT DOCUMENTS.

5.1 Payment Estimate - Contract Performance, ENG 93. Form on which all pay estimates shall be submitted and approved for payment.

5.2 Payment Estimate - Contract Performance (Continuation), ENG 93a. Continuation sheet to ENG 93 for listing additional contract performance work items.

6. INSTRUCTIONS FOR PREPARING ENG FORM 93 ("C" Contracts). The important elements of this form which should be filled in completely are:

6.1 Block 1, Date: Date when form is prepared. Must be the current date and it should match the date in Block 12.

6.2 Block 2, Contractor and Address: Complete firm name and address as shown on

original contract or as changed by modification.

6.3 Block 3, Contract Number: The DACA41 or DACW41 number as shown on the original contract.

6.4 Block 4, District: The District from which the contract is administered (usually Kansas City).

6.5 Block 5, Description of Work: Brief description of the work taken from the original contract document, e.g., 'Design of EMCS, Fort Riley, KS.'

6.6 Blocks 6, 7 and 10: Leave blank.

6.7 Block 8, Location: The Location of the project, such as Fort Riley or Kansas City District.

6.8 Block 9, Period Covered by This Estimate: Period of time estimate is covering (through date must not be later then the date shown in Block 1).

6.9 Block 11, Estimate Number: Starting with number 1, number each estimate sequentially. All phases of work, completed as well as work in progress, are to appear on every estimate as contract is based on running totals.

6.10 Block 11a, Item Number: Each phase of work should be requested under a separate item number. A separate line item is required for each modification. Also, Shop Drawing Review and Engineering and Design During Construction shall be listed as separate line items and billed separately even if awarded as one contract modification.

6.11 Block 11b, Description: A brief description of the work as outlined in the modification, i.e., P00001, Additional Site Work, Fort Leavenworth. Description must include the modification number and the project manager's name.

6.12 Block 11c and 11d: Leave blank.

6.13 Block 11e, Amount: This is the total amount negotiated for each phase of work as outlined in the Payment section of each modification.

6.14 Block 11f, Quantity and Unit: This is the percentage of work completed to date.

6.15 Block 11g:

6.15.1 Amount: This is the extension of 11e multiplied by 11f. Be sure to round to the nearest whole dollar amount, i.e., $55.50 = $56.00, $34.27 = $34.00.

6.15.2 Includes Modification Thru: Leave blank; this information is included in the description block (11b).

6.15.3 Total Contract: This is the total contract amount awarded to date. This must show the total of all modifications included on the ENG 93.

6.15.4 Total Earnings to Date: This is the total of column 11g.

6.16 Block 12: The contractor's name shall appear in the box marked 'Payee' and an original signature of an authorized individual shall appear in the box marked 'Per.' The date signed is to appear in the 'Date' block and the title of the signer shall be shown in the block marked 'Title.'

6.17 Block 13: The name of the District's project manager is to be typed in the block marked 'signature' and the title 'project manager' should be in the next block. Do not enter a date as the project manager will add the date the day the estimate is signed. The 'Contracting Officer Approval' section should be left blank and will be filled in at the processing office.

6.18 Block 14a, Previous Deductions other than Retained Percentage: Usually blank.

6.19 Block 14b, Previous Retained Percentage: Leave blank on first pay estimate. For estimate 2 and any estimates thereafter, the amount shall be the cumulative total of 14f (found in block 15 of the previous pay estimate).

6.20 Block 14c, Previous Payments: Leave blank on first pay estimate. For estimate 2 and any estimates thereafter, the amount shall be the total dollar amount of all checks issued to the contractor. This amount must equal the 'Total Paid' amount in block 15 of the previous pay estimate.

6.21 Block 14d, Previous Earnings: The total of blocks 14a, b and c.

6.22 Block 14e, Earnings This Period: The total earnings to date minus 14d.

6.23 Block 14f, Less Retained Percentage: The total dollar amount of retained percentage to be withheld from this estimate. Retained percentage is calculated at 10% of the amount earned this period (14e). For all pay estimates, the retained percentage is ascertained by multiplying the earnings this period (14e) by 10% and rounding that figure to the nearest whole dollar. This amount is placed in block F and subsequently in block H. (For further information on retention, see Payment Clause of the Contract Clauses. The 10% figure may be reduced at the option of the Contracting Officer if the work is progressing as scheduled or ahead of schedule. The 10% figure may also be increased at the option of the Contracting Officer if work is not progressing as scheduled.)

6.24 Block 14g, Less Deduction Other Then Retained Percentage For: Usually blank.

6.25 Block 14h, Total Deductions This Period: The total of 14f and 14g.

6.26 Block 14i, Retainage Refunded: A refund may be requested as each phase of work is 100% complete. This amount will be the total amount of retained percentage withheld for that particular phase.

6.27 Block 14j, Other Refunds: Usually blank.

6.28 Block 14k, Total Refunds This Period: The total of 14i and 14j.

6.29 Block 14l, Amount Due Contractor: The total dollar amount the check will be written for. This is calculated by subtracting 14h from 14e and adding 14k.

6.30 Block 15, Recapitulation: Total retained percentage is calculated by adding 14b and 14f, then subtracting 14i. Total Paid is found by adding 14c and 14l. The total of these two amounts MUST add up to the Total Earnings to Date.

7. INSTRUCTIONS FOR PREPARING ENG FORM 93 (Indefinite Delivery Type Contracts, (IDT)), "D" Contracts. The important elements of this form which should be filled in completely are:

7.1 Block 1, Date: Date when form is prepared.

7.2 Block 2, Contractor and Address: Complete firm name and address as shown on original contract or as changed by modification.

7.3 Block 3, Contract Number: The DACA41 or DACW41 number as shown on the original contract.

7.4 Block 4, District: The District from which the contract was administered (usually Kansas City).

7.5 Block 5, Description of Work: Brief description of the work taken from the original contract document, e.g., 'Indefinite Delivery Type Contract for Drafting Services.'

7.6 Blocks 6 and 7: Leave blank.

7.7 Block 8, Location: The location of the project, such as Fort Riley or Kansas City District.

7.8 Block 9, Period Covered by This Estimate: Period of time this estimate is covering (through date must not be later then the date shown in Block 1).

7.9 Block 10, Job Order Number: The delivery order number(s) for work you wish to be paid.

7.10 Block 11, Estimate Number: Starting with number 1, number each estimate sequentially for the entire contract, not for each delivery order. Do not submit separate estimates for individual delivery orders, except as directed for splitting military and civil funded delivery orders. All phases of work, completed as well as work in progress, are to appear on every estimate as contract is based on running totals.

7.11 Block 11a, Item Number: Each phase of work should be requested under a separate item number. A separate line item is required for each delivery order/modification. Also, Shop Drawing Review and Engineering and Design During Construction shall be listed as separate line items and billed separately even if awarded as one contract modification.

7.12 Block 11b, Description: A brief description of the work as outlined in the delivery order/modification, i.e., DO 1, Concept Design, Renovate Building 223, Fort Leavenworth; P00001, Additional Site Work, Renovate Building 223, Fort Leavenworth. Description must include the modification and/or delivery order number.

7.13 Block 11c and 11d: Leave blank.

7.14 Block 11e, Amount: This is the total amount negotiated for each phase of work as outlined in the Payment section of each delivery order or modification.

7.15 Block 11f, Quantity and Unit: This is the percentage of work completed to date.

7.16 Block 11g:

7.16.1 Amount: This is the extension of 11e multiplied by 11f. Be sure to round to the nearest whole dollar amount, i.e., $55.50 = $56.00, $34.27 = $34.00.

7.16.2 Includes Modification Thru: Leave blank; this information is included in the description block (11b).

7.16.3 Total Contract: This is the total contract amount awarded to dated. This must show the total of all delivery orders and modification included on the ENG 93.

7.16.4 Total Earnings to Date: This is the total of column 11g.

7.17 Block 12: The contractor's name shall appear in the box marked 'Payee' and an original signature of an authorized individual shall appear in the box marked 'Per.' The date signed is to appear in the 'Date' block and the title of the signer shall be shown in the block marked 'Title.'

7.18 Block 13: The name of the District's project manager is to be typed in the block marked 'signature' and the title 'project manager' should be in the next block. If more than one project manager is involved, leave this block blank. Do not enter a date as the project manager will insert the date the day the estimate is signed. The 'Contracting Officer Approval' section should be left blank and will be filled in at the processing office.

7.19 Block 14a, Previous Deductions other than Retained Percentage: Usually blank.

7.20 Block 14b, Previous Retained Percentage: Leave blank on first pay estimate. For estimate 2 and any estimates thereafter the amount shall be cumulative of 14f (found in block 15 of the previous pay estimate).

7.21 Block 14c, Previous Payments: Leave blank on first pay estimate. For estimate 2 and any estimates thereafter the amount shall be the total dollar amount of all checks issued to the contractor. This amount must equal the 'Total Paid' amount in block 15 of the previous pay estimate.

7.22 Block 14d, Previous Earnings: The total of blocks 14a, b and c.

7.23 Block 14e, Earnings This Period: The total earnings to date minus 14d.

7.24 Block 14f, Less Retained Percentage: The total dollar amount of the retained percentage to be withheld from this estimate. Retained percentage is calculated at 10% of the amount earned this period (14e). For all pay estimates, the retained percentage is ascertained by multiplying the earnings this period (14e) by 10% and rounding that figure to the nearest whole dollar. This amount is placed in block F and subsequently in block H. (For further information on retention, see Payment Clause of the Contract Clauses. The 10% figure may be reduced at the option of the Contracting Officer if the work is progressing as scheduled or ahead of schedule. The 10% figure may also be increased at the option of the Contracting Officer if work is not progressing as scheduled.)

7.25 Block 14g, Less Deduction Other Then Retained Percentage For: Usually blank.

7.26 Block 14h, Total Deductions This Period: The total of 14f and 14g.

7.27 Block 14i, Retainage Refunded: A refund may be requested as each phase of work is 100% complete. This amount will be the total amount of retained percentage withheld for that particular phase.

7.28 Block 14j, Other Refunds: Usually blank.

7.29 Block 14k, Total Refund This Period: The total of 14i and 14j.

7.30 Block 14l, Amount Due Contractor: The total dollar amount the check will be

written for. This is calculated by subtracting 14h from 14e and adding 14k.

7.31 Block 15, Recapitulation: Total retained percentage is calculated by adding 14b and 14f, then subtracting 14i. Total Paid is found by adding 14c and 14l. The total of these two amounts MUST add up to the Total Earnings to Date.

8. FINAL PAYMENT ESTIMATE AND CONTRACT CLOSE-OUT. Upon completion of the contract requirements, the final payment estimate shall include the word "Final" after the number in Item 11 of ENG 93. A Release of Claims must accompany or precede the final ENG 93 in order for payment to be made.

9. COMMON PAYMENT ESTIMATE ERRORS. Most frequent errors are:

9.1 Mathematical errors.

9.2 Including contract modifications not signed by Contracting Officer.

9.3 Signature in the wrong block or unsigned.

9.4 Payment estimate signed by an unauthorized person.

9.5 Item 14H and/or Item 14K left blank.

ATTACHMENT 2

PRELIMINARY GEOTECHNICAL REPORTS

Geotechnical Engineering Services Report

Proposed Ellis Heights and O'Donnell Heights Housing Additions Fort Riley, Kansas

PSI Project No.
338-35131-2

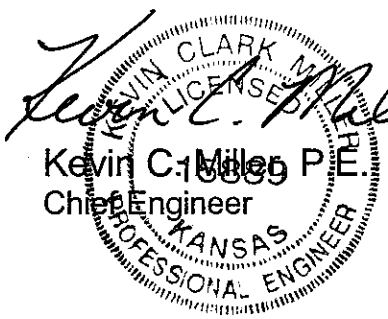
PREPARED FOR

Gould Evans
4041 Mill Street
Kansas City, Missouri 64111

April 1, 2004

BY

Professional Service Industries, Inc.



Kevin C. Miller P.E. 4/1/04
Chief Engineer

Nicholas J. Roth, E.I.T.
Staff Engineer
Geotechnical Services

Kelly E. Rotert, P.E.
Vice President

Information To Build On
Engineering • Consulting • Testing

May 10, 2004

Gould Evans
4041 Mill Street
Kansas City, Missouri 64111

Attention: Mr. Jim Schraeder

Re: Addendum to
Proposed Ellis Heights and O'Donnell Heights Housing Additions
Fort Riley, Kansas
PSI Project No. 338-35131-3

Dear Mr. Jim Schraeder:

Professional Service Industries, Inc. is pleased to transmit the addendum to the PSI's Geotechnical Report Dated April 1, 2004 for Ft. Riley 04 Family Housing". This addendum report includes the limited responses to the original comments dated May 3, 2004, from Jacob W. Owen. PSI's limited responses are listed below.

1. Strip footings can be used on the South O'Donnell site. Strip footings can also be used on the Ellis Heights sites bearing in mind the heave potentials given on page 12 of the April 1, 2004 report. Strip footings used at Ellis Heights should have structurally reinforced foundation stem walls (i.e., a grade beam) so that if localized swelling occurs at a given location under a strip footing, the stiffness of the stem wall will allow a greater portion of the weight of the structure to react against the uplift. It would also be possible to isolate portions of the strip footing with commercially available cardboard spacers that would concentrate the loading transferred from the structural stem wall to a smaller bearing footprint.
2. The minimum depth of the footings is dependent upon the applied loading and the tolerable amount of heave. Refer to the table giving the calculated heave potential for given applied loads at various depths. Depending upon what the structure can tolerate, different depths will be applicable.
3. On page 11, line 24, there is a missing number. The sentence should read: "Calculating the settlement for the profile at EH03-7 indicates that the square footings will have a calculated settlement of $^{3}/_{8}$ inch and the strip footing at 2,000 psf has a calculated settlement of ¼ inch."

PSI appreciates the opportunity to provide this addendum in response to comments and looks forward to continuing our participation during the design and construction phases of this project. If you have questions pertaining to this report, or if we may be of further service, please contact us at your convenience.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Kevin Miller, P.E.
Chief Engineer

Kelly Rotert
Vice President

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PROJECT INFORMATION

Project Authorization

The following table summarizes, in chronological order, the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI).

PROJECT TITLE: ELLIS HEIGHTS AND O'DONNELL HEIGHTS RESIDENTIAL HOUSING AT FORT RILEY, KANSAS			
Document and Reference Number	**Date**	**Source of Request**	**Author or Agent & Title**
Request for Proposal	11/11/2003	Gould Evans	Mr. Jim Schraeder
PSI Proposal Number: 338-350162	11/14/2003	PSI	Mr. Kelly Rotert
Notice to Proceed Ellis Heights	11/20/2003	Gould Evans	Mr. Jim Schraeder
Notice to Proceed O'Donnell Heights	11/20/2003	Gould Evans	Mr. Jim Schraeder
PSI Report Number 338-35131-1	2/12/2004	PSI	Mr. Kevin Miller
35% Review Comments from COE	Faxed 3/1/04	Gould Evans	Mr. Jim Schraeder
Teleconference on PSI response to 35% review	3/22/04	Corps of Engineers Gould Evans PSI	Mr. Jacob Owen Mr. Jim Schraeder Mr. Kevin Miller

Project Description

The following table lists the material and information provided for this project:

DESCRIPTION OF MATERIAL	PREPARED BY	DATE
Ellis Heights Topographic Map (V7N154Topo.dwg)	Schwab-Eaton, P.A.	12/2003
O'Donnell Heights Topographic Map (V7N154Topo.dwg)	Schwab-Eaton, P.A.	12/2003
Amended Scope of Work, DACA41-03-D-0013 TASK ORDER-0001	US Army COE	11/3/2003
Boring Location Plan, Borelogs, and Laboratory Testing from 1991 study in Ellis Heights area	US Army COE	9/1992

PSI reviewed the boring location plan, boring logs, and laboratory testing for the Ellis Heights area that was performed during the summer of 1992 and supplied to us by Gould Evans. PSI's review of this information and comparison with the soils information obtained by PSI showed both sets of data to be substantially comparable in findings and subsurface interpretation.

PSI understands the proposed construction will be two series of slab on grade, two-story residences. The first series of houses will be located on the southwest corner of the existing Ellis Heights residential area. The second series of houses will be located on the southeast corner of the existing O'Donnell Heights residential area.

The following table lists the structural loads and site features that are required for or are the design basis for the conclusions contained in this report:

STRUCTURAL LOAD/PROPERTY	REQUIREMENT/DESIGN BASIS	
BUILDING		
Maximum/Minimum Column Loads	25 Kips	B
Maximum/Minimum Wall Loads	3 Kips per linear foot	B
Finish Floor Elevation and type	Within 2 feet of present grade; Slab on Grade Construction	B
Maximum Floor Loads	130 psf	B
Settlement Tolerances	1" total ¾" Differential	B

B = Report has been prepared based on this parameter or loading in the absence of client supplied information at the time of this report.

The geotechnical recommendations presented in this report are based on the available project information, building location, and the subsurface materials described in this report. If the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to prepare recommendations for foundation and pavement systems for the proposed construction. PSI's scope of services included drilling a total of 14 soil test borings, 8 soil borings at Ellis Heights and 6 soil borings at O'Donnell Heights, to a depth of approximately 20 feet below the ground surface, select laboratory testing, and preparation of this geotechnical report. This report briefly outlines the project description, presents available project information, testing procedures, describes the site and subsurface conditions, and presents recommendations regarding the following:

- Geotechnical Discussion of the Project Site
- Grading procedures for site development.
- Foundation types, depths, allowable bearing capacities, and calculated settlements.
- Seismic coefficients for use in seismic design (IBC 2000).
- Comments regarding factors that will impact construction and performance of the proposed construction.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on, or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. Prior to further development of this site, an environmental assessment is advisable.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

Summary of 35% Review Comments

The 35% Review Comments contained 20 comments pertaining to PSI's February 12, 2004 submittal. In general, the comments pertained to information that was missing on the boring logs, comments pertaining to the moisture condition of the on site soils, comments addressing the swell potential of the on site soils, construction difficulties associated with the on site soils, comments on the foundation recommendations as they relate to the swell potentials and comments pertaining to the effects of landscaping on these types of soils. These comments were addressed in written form to Gould Evans and discussed with the Corps of Engineers prior to being incorporated into this report. It should be noted that during the March 22, 2004 teleconference meeting it was agreed that pavement issues were not to be addressed in the Geotechnical Report other than to describe the types and physical characteristics of the soils.

Ellis Heights

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site for the proposed housing additions is located on the southwest section of the existing Ellis Heights residences at Fort Riley, Kansas. The site is located at the northeast corner of the intersection of 1st Division Road and Williston Point Road. The general site latitude and longitude is approximately N 39° 05' 46" and W 96° 47' 43", respectively.

The property is bordered by trees and a residence to the north, a fence along Williston Point Road to the south, residences to the east, 1st Division Road to the west. At the time of drilling, the site was covered with grass. It is PSI's understanding that residences have been removed from the southern portion of this project site. The topography of the site generally consisted of rolling hills that generally drained from the south, east and west towards a depression on the north-northwestern section of the site.

Subsurface Conditions

The site subsurface conditions were explored with 8 soil test borings within the proposed building area. Boring depths were extended to approximately 20 feet below the existing ground surface. The boring locations and depths were suggested by PSI and reviewed with the client prior to drilling. PSI personnel staked the borings in the field by measuring distances from available surface features. Elevations and distances from temporary benchmarks were surveyed at the completion of each boring. The temporary benchmarks were later surveyed and used to determine the location of each boring. The surface elevations at the borings were referenced to a series of temporary benchmarks listed below.

TBM	TYPE	USGS ELEVATION (FEET)
1	Sewer Cover	1307.91
2	Sewer Cover	1309.41
3	Sewer Cover	1306.88
4	Sewer Cover	1306.43
5	Light Poles	1305.2*
6	Light Poles	1308.5*

*Estimated based on Schwap-Eaton Topographic Map

The borings were advanced utilizing hollow stem auger drilling methods and soil samples were routinely obtained during the drilling process. Select soil samples were later tested in PSI's laboratory to document material properties to be used in the recommendations. Drilling, sampling, and laboratory testing was accomplished generally in accordance with ASTM procedures.

The subsurface conditions below the 4 to 8 inches of topsoil, as identified by the 8 borings primarily include approximately 3 feet of high plasticity clay fill underlain by a brown,

high plasticity clay. This brown clay stratum is underlain weathered shale material.

The following table briefly summarizes the range of results from the field and laboratory testing programs. Please refer to the attached boring logs and laboratory data sheets for more specific information:

PROPERTY DESCRIPTION / SOIL STRATA TYPE	RANGE OF PROPERTY VALUES					
	Standard Penetration, N	Moisture Content, %	Dry Unit Weight, pcf	Unconfined Compressive Strength, Qu (tsf)	Liquid Limit, %	Plastic Limit, %
High Plasticity Clay (Fill)	14-20	21	---	---	---	---
Medium to High Plasticity Clay	10-24	15-23	96-114	3.5 - 5.2	48 - 62	14 - 21
Weathered Shale	22-50+	7-32	---	---	49	17
Shale	39-50+	14-18	---	---	---	---

The swell testing in these soils were loaded to a range that indicates that the soils exhibit a high degree of preconsolidation. These preconsolidation pressures can be noted on the swell test data sheets in Appendix IV.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in Appendix I should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Water Level Measurements

The borings did not collect free groundwater during the drilling operations or within 24 hours of completion of the individual borings, indicating that groundwater at the site at the time of the exploration was either below the terminated depths of the borings, or that the soils encountered are relatively impermeable. The degree of saturation in the laboratory samples at this site ranged from 74 to 90 percent. Due to the inclement weather at the time of the borings, the near surface soils behaved as saturated soils. The close proximity of a shale bedrock surface can also behave as a relative impermeable zone that

could perch groundwater during periods of high infiltration of water. Groundwater can be present within the depths explored during other times of the year depending upon climatic and rainfall conditions. The water level measurements presented in this report are the levels that were measured at the time of the PSI field activities.

EVALUATION AND RECOMMENDATIONS

Geotechnical Discussion

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

There are four primary geotechnical related concerns at this site, which will effect the performance of the foundations for these structures. The following summarizes those concerns:

1. High Plasticity clays were encountered in the exploration that will require remediation for the swell potential with the direct bearing of lightly loaded foundations.
2. Soils were encountered in the near surface areas of the borings that displayed sensitivity to wet conditions and equipment mobility difficulty should be anticipated.
3. Moisture conditioning of some of the on-site soils should be anticipated to achieve proper compaction during grading.
4. Landscaping vegetation can have an adverse effect on structures constructed on high plastic soils

High Plasticity Clay

Potentially expansive high plasticity "fat" clays are present in the project area and will have a significant impact on the proposed construction. High plastic clays typically have the capacity to hold large volumes of water while still behaving as a solid. High plasticity clays have the potential for volume change with changes in the soil moisture content. These volume changes include both swelling and shrinkage depending upon the relative change in moisture content and the initial state of the soil. The effects of either the swelling or the shrinkage will depend on the extent of the volume of soil that has a relative moisture change. The deeper the bearing surface is in the high plastic soil, the less the effects of change in moisture have on the foundation element. In severe cases, movement and distress to footings and foundation walls can occur. Remedial measures should be performed in the described select areas of the site to reduce the swell potential.

Remediation should include replacing the high plasticity clay soils where they occur within a depth of three feet or more beneath proposed slabs and replacing this material with a low plasticity compacted soil or a dense graded crushed stone. Alternatively, lime-treatment of the high plastic clay can be accomplished to reduce the plasticity index, improve workability, promote drying, and reduce swell potential. The remediation process should also

include a continuous maintenance of drainage features to limit the change in moisture content of the soils within the bearing or load application areas within the high plastic clay soils. PSI understands that this alternative may not be cost effective, but is presented as a possible alternative. PSI believes it would be more effective to place column footings at depth, create a controlled environment crawl space, provide maintenance type measures to reduce the potential changes in moisture content of the high plastic soils, and disturb the site minimally during construction.

Equipment Mobility

The upper fine-grained soils will be sensitive to increases in moisture content. Therefore, during wetter portions of the year, increased difficulty in grading should be anticipated.

Depending on weather and soil conditions at the time of construction, methods for accomplishing grading can be expected to include the use of wide-track, low-contact-pressure type equipment to perform site grading during periods of inclement weather conditions. The determination of the proper equipment for use in excavation will depend on the condition of the soils at the time of construction and the prevailing weathered conditions. Narrow track equipment and rubber tired vehicles will experience difficulty moving about the site and in wet conditions will increase the deterioration of otherwise suitable soils. Typically, increases of more than 4% to 5% wet of the insitu moisture, as measured during this exploration, can be expected to increase the difficulty of working the insitu soils.

Site Compaction

Since this site predominantly consists of medium and high plasticity clays, the site will become difficult to compact the soils if the moisture contents of the insitu soils is allowed to significantly increase or decrease during the construction period. Due to compaction and grading difficulties that can occur while working with these soils, the extend and limits of the disturbed excavation areas should limited to only those areas that are necessary for construction.

Landscaping

Trees and large bushes can develop an intricate root system that can draw moisture from the subgrade, resulting in shrinkage of the bearing soil material during extended dry periods of the seasonal year. Desiccation of bearing material below foundations can result in settlement of foundations, walls, and slabs. Therefore, landscaping and irrigation should be limited adjacent to the proposed building areas to reduce the potential for relatively large moisture changes in the soil that can extend below load bearing surfaces.

Site Preparation

The topsoil, vegetation, roots, soft, organic, unsuitable soils, pre-existing foundations in the construction areas should be stripped from the site and either wasted or stockpiled for later use in landscaping or non-load bearing areas. Depths of topsoil in the borings ranged from 4 to 8 inches. Typically, topsoil thicknesses vary from these values. A representative of

the geotechnical engineer should determine the depth of removal at the time of construction.

Foundations of existing structures should not be undermined during construction. If it is necessary to excavate below existing foundations, the owner's engineer should review the contractor proposed excavation procedures, prior to its implementation.

After stripping and excavating to the proposed subgrade level, as required, the building should be proof-rolled with a loaded tandem axle dump truck or similar piece of heavy rubber tired vehicle (typically with an axial load greater than 9-tons). Soils that are observed to rut or deflect excessively (typically greater than 1-inch) under the moving load should be undercut and replaced with properly compacted fill. The proofrolling and undercutting activities should be observed and documented by a qualified geotechnical professional representative designated by the owner and should be performed during a period of dry weather. The subgrade soils should be scarified and compacted to at least 90% of the materials' modified Proctor maximum dry density, in accordance with ASTM D-1557 procedure, to a depth of at least 6-inches below the surface.

Highly plastic clays that will directly support foundations, pavements, or walls should be remediated prior to placement of new structural fill. The high plastic clays should be remediated or replaced as discussed earlier in this report. A qualified geotechnical professional representative designated by the owner should observe and document the preparation of the subgrade soils, perform plasticity index tests, and estimate the approximate extent of the high plasticity clays. Modification of the high plasticity clays with a lime product, should have the lime concentration levels be determined by conducting a lime series test with the actual soils and additives that will be used. A qualified geotechnical professional representative designated by the owner should observe and document the remediation procedures for compliance with the project plans and specifications.

Moisture content changes in the highly plastic soils should not be permitted during or after construction. Increases in moisture content can cause swelling of the high plasticity soils. Exposed high plasticity clays that become inundated or desiccated should be removed prior to new fill placement. Ideally, excavation should be performed during a period of dry weather.

After subgrade preparation and observation have been completed, fill placement required to establish grade may begin. Fill materials should be free of organic or other deleterious materials, have a maximum particle less than 3-inches, and have a liquid limit less than 45 and plasticity index less than 25. The on site soils that have been modified are suitable for use as structural fill, but moisture and lime conditioning will be needed to achieve compaction. If the fill is too dry, water should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Close moisture content control will be required to achieve the recommended degree of compaction.

Permeable fill such as sand or clean stone used on this site should be given careful consideration. These permeable materials should not be placed within three feet of high plasticity clays. Even though the excavation may be essentially dry during construction, and

no groundwater is anticipated over time, these permeable pockets will eventually collect water through condensation and therefore promote soil swelling and heaving. If moderately permeable fill is used the fill should be drained grading the soil surface and using draintile or other appropriate means.

Fill should be placed in maximum loose lifts of 8-inches and compacted to at least 90% of the materials' modified Proctor, ASTM D1557, maximum dry unit weight, and within 2% of the optimum moisture content as determined in accordance with the ASTM procedure. Each lift of compacted-engineered fill should be tested by a qualified geotechnical professional representative designated by the owner prior to placement of subsequent lifts. The edges of compacted fill should extend 5-feet beyond the edges of buildings prior to sloping. In addition to structural fills, utility trenches within the building areas should be compacted as outlined above.

Clear or screened rock can be used as select fill, but a geo-fabric separator (typically a 6 oz/syd, non-woven) would be needed where it is placed adjacent to fine grained soils. This type of fill and backfill should be tracked or tamped to achieve densification.

The fill placed shall be tested by a qualified geotechnical professional representative designated by the owner and directed by the project engineer to evaluate the placement of the fill materials. The following table summarizes the recommended compactive effort for various types of engineered fills.

MATERIAL TESTED	PROCTOR TYPE	MIN % DRY DENSITY	MOISTURE CONTENT RANGE	FREQUENCY OF TESTING[*-2]
Structural Fill (Cohesive)	Modified	90%	-2 to +2 %	1 per 1,000 cy of fill placed
Structural Fill (Granular)	Modified	90%	-2 to +2 %	1 per 1,000 cy of fill placed
Optional Structural Fill (Granular)	Relative Density*	75%	>95% Saturation	1 per 1,000 cy of fill placed
Random Fill (non-load bearing)	Modified	88%	-3 to +3 %	1 per 3,000 cy of fill placed
Utility Trench Backfill / Wall Backfill	Modified	90%	-2 to +2 %	1 per 200 cy of fill placed

*Relative Density as determined in general accordance with ASTM D4253 and D4254

The test frequency for the laboratory reference should be one laboratory Proctor or Relative Density test for every 5 field density tests for the first 25 field tests and for every 10 field density tests thereafter for each material used on the site. If the borrow or source of fill material changes, a new reference moisture/density test should be performed.

After the first 5 reference moisture/density tests have been performed for the same material, a 1-point proctor test can be used at an interval of one for every 10 field density tests to extend the full reference test cycle to one for every 25 field density tests. One-point proctor tests must be compacted within -2 and 0 % dry of the calculated optimum moisture content as based on the family of optimum determined from the first 5 reference moisture density tests.

Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner or the Owner's designated representative. A re-test of that area should be performed after the Contractor performs remedial measures.

Foundation Recommendations

It is PSI's understanding that the residential structures will be designed with a crawl space with a mud slab and controlled environment. Based on this understanding the foundation recommendation given are based upon column supports with the floors being supported by grade beams between these column supports. Grade beams should have a minimum of 3 inches of clear space or collapsible cardboard forms under them to reduce the influence of pressure produced by the underlying soils.

The planned construction can be supported on conventional spread-type footing foundations bearing on either competent naturally deposited soils or compacted-engineered fill. Spread footings for building columns and continuous footings for bearing walls have been calculated to have a net allowable soil bearing pressures of 8,600 pounds per square feet (psf) and 7,200 psf, respectively, based on dead load plus design live load. These bearing capacities were calculated with CBEAR. The net allowable bearing capacity was calculated by taking the ultimate bearing capacity divided by a factor of safety of 3.0 and subtracting the overburden pressure. The minimum dimension of 24-inches for square footings and 18-inches for continuous footings should be used to minimize the possibility of a local bearing capacity failure. Using the minimum dimensions and the report basis design loads, the actual foundation stresses will be 6,000 psf and 2,000 psf, respectively. Calculating the settlement for the profile at EH03-7 indicates that the square footings will have a calculated settlement of inch and the strip footing at 2,000 psf has a calculated settlement of ¼ inch. Therefore, based on calculated settlement and bearing capacity the following allowable bearing capacities should be used:

Square Footings	6,000 psf
Strip Footings	2,000 psf

Strip Footings are not recommended due to the limited amount of loading that will exist on these types of foundations and this would make them more susceptible to movements resulting from swelling or shrinking conditions.

Exterior footings and footings in unheated areas should be located at a depth of 36-inches or deeper below the final exterior grade to provide adequate frost protection. However, the foundations may need to be placed at a deeper depth to reduce the effects of potential swell pressure.

Individual column footings should be supported on only one type of bearing material. If continuous footings are used and transition from different types of material cannot be avoided, the design plans include either a construction joint to separate the effects or provide for the footings in those areas be provided with additional reinforcing steel to bridge the

potential differential strains.

The foundation excavations should be observed and documented by a qualified geotechnical professional representative designated by the owner prior to steel or concrete placement to assess that the foundation materials are consistent with the materials discussed in this report. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of competent naturally deposited soils or properly compacted structural fill as directed by the geotechnical engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with lean concrete or dense graded compacted crushed stone.

After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, the soils in the excavation should be protected to reduce evaporation or entry of moisture.

Swell testing was performed on 2 samples at Ellis Heights using ASTM D 4546 method C. Based on the explored subsurface conditions and site geology, laboratory testing and past experience, properly designed and constructed footings supported on the site materials should experience total and differential settlements between adjacent columns of less than 1-inch and ¾-inch, respectively.

Based on the laboratory testing, the swell pressure of the material ranges between 3,300 psf and 18,500 psf with maximum swell potentials ranging between 3.7% and 4.4% respectively. The average swell pressure at this site was 6,950 psf. Using the average swell potential at different depths for different footing pressures resulted in the swell potential graphs included in the engineering calculation section of Appendix III. These calculations show that beginning at an applied net bearing pressure of 3,000 psf a percent heave of 1.5% is achieved. With higher net applied bearing pressures than 3,000 psf there is a diminishing return in increasing the applied pressure. Therefore, at the following net applied bearing pressures and depths of footings, it is calculated that following percent heave is possible:

HEAVE POTENTIAL BASED ON LOAD AND DEPTH			
Net Bearing Pressure	3 feet below grade	5 feet below grade	7 feet below grade
2,000 psf	1.9%	1.7%	1.5%
4,000 psf	0.8%	0.7%	0.6%
6,000 psf	0.15%	0.08%	0.01%

As an example, for every foot of saturation below a footing placed at a depth of 5 feet with a net applied load of 4,000 psf, the calculated swell would be 1/16 inch. Therefore, due to the limited amount of soil under the proposed foundation, it is PSI's opinion that foundations with a net bearing pressure greater than 4,000 psf and bearing at a depth between 3 and 7 feet below grade will have potential rise less than 1 inch, and if at a depth of 5 feet or more less than ¾ inch.

Earthquake and Seismic Design Consideration

The 2000 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soil type (i.e., depth of soil and strata types). Based on the depth to rock and the estimated shear strength of the soil at the boring locations, Site Class "C" is recommended. The USGS-NEHRP probabilistic ground motion values near latitude 39.0964° and longitude -90.7956°, which is approximately 0.6 kilometers from the registries nearest grid point, are as follows:

Period (seconds)	2% Probability of Event in 50 years * (% g)
PGA	14.53
0.2	32.46
1.0	11.85

* At the nearest grid point (lat: 39.100.0, long: -90.80)

Floor Slab

It is PSI's understanding that only the driveways and sidewalks will be grade supported slabs. These structures will have a greater tendency to move with variations in the moisture content of the supporting soils. PSI recommends that allowances be made to allow these slabs to move independently from the residential structures. PSI also recommends that measures be taken to control the changes in moisture content under these structures. This measures would include, but not be limit to, providing positive drainage under the slab structure, providing positive surface drainage away from these slabs, provide measures such that the roof drains will not discharge in the immediate vicinity of the slabs, and route water bearing utility line in areas that do not traverse under the slabs.

Alternatively, the floor slab can be grade supported on the remediated natural soil, or properly compacted/engineered lean clay or cohesionless fill. Proofrolling, as discussed earlier in this report, should be accomplished to identify soft or unstable soils that should be removed from the floor slab area prior to fill placement and/or floor slab construction. High plasticity clays below slabs placed on grade should be remediated, as discussed earlier.

A minimum six-inch thick free draining granular mat should be placed beneath grade supported floor slabs to enhance drainage and provide a capillary break. The granular layer should have a top size of ¾ inch and be relatively well graded through the No. 40 sieve and have less than 5% passing the No. 200 sieve. The soils beneath a grade supported slab should be graded to drain away from the structure prior to placing the granular layer. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with moisture sensitive equipment or product such as tile, wood, carpet, etc., as directed by the design engineer. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill should be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions and the potential effects of slab curling and cracking. The floor slabs should have

an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction, *k* value, of 140 pounds per cubic inch (pci) may be used in the grade slab design based on a 1 ft. x 1 ft. plate load test. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohessionless soil:

Modulus of Subgrade Reaction, $k_s = (\frac{k}{B})$ for cohesive soil and

$$k_s = k(\frac{B+1}{2B})^2 \text{ for cohessionless soil}$$

where: k_s = coefficient of vertical subgrade reaction for loaded area,
k = coefficient of vertical subgrade reaction for 1x1 square foot area, and
B = width of area loaded, in feet

Below-Grade Retaining Walls

Below grade retaining walls should be designed to resist lateral earth pressures. Lateral earth pressure is developed from the soils present within a wedge formed by the vertical below-grade retaining wall and an imaginary line extending up and away from the bottom of the wall at an approximate 45° angle. The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K. If the walls are rigidly attached to the structure and not free to rotate or deflect at the top, PSI recommends designing the walls for the "at-rest" lateral earth pressure condition using K_o. Walls that are permitted to rotate and deflect at the top can be designed for the active lateral earth pressure condition using K_a. Passive pressure can be determined using K_p, with a factor of safety of 2.0. Recommended parameters for use in below grade walls are as follows:

Recommended Parameters for use in Retaining Wall Design			
Material Type	Drained Friction Angle (ϕ')		
High plasticity Clay (in-situ)	20°		
High plasticity Clay (conditioned and compacted)	24°		
Granular Soils (clean crushed limestone)	35°		
Total Soil Density (pcf)	125		
Cohesion for Clay Soils (psf) (undrained, $\phi = 0$)	4,400		
Maximum Toe Pressure on Firm Soil (psf)	6,250		
Groundwater Elevation	At bottom of the wall		
Parameters specific to soil type	**Fat Clay**	**Mod. Fat Clay**	**Crushed L.S.**
Friction Factor for Base	0.27	0.30	0.47 *
Coefficient of Active Pressure (K_a) **	0.45	0.42	0.27 *
Coefficient of Passive Pressure (K_p) **	2.2	2.37	3.7 *
Coefficient of At-Rest Pressure (K_o) **	0.63	0.59	0.43 *

* These values may be used for design only if the crushed limestone backfill extends back from the wall certain distances. These are a horizontal distance approximately equal to or greater than the total height of the wall at the surface, and at least one-foot beyond the heel of the wall footing.

** Earth pressure coefficients valid for level backfill conditions with no surcharge

The values presented above were calculated assuming positive foundation drainage is provided to prevent the buildup of hydrostatic pressure. If surface loads are placed near the walls, such as traffic loads, they should be designed to resist an additional uniform lateral load of one-half of the vertical surface loads.

The retaining wall and below-grade wall backfill should be provided with drainage. This drainage system should include:

1) A 4 or 6-inch diameter perforated drain tile at the bottom of the backfill to collect seepage water with the tile connected to a suitable means of disposal.
2) Clean 1/2-inch or 1-inch gravel classified as "GP" and containing less than 5% passing a #200 sieve surrounding the draintile.
3) Non-woven 4 ounce per square yard geotextile between the drainage material and the on-site soils to prevent infiltration of fine grained soils into the draintile, granular drainage blanket, or granular backfill.

Below-Grade Retaining Wall Backfill and Compaction

Backfill of the proposed below-grade retaining walls should consist of low plastic soils or granular material. PSI suggests using granular material to provide improved drainage and to reduce lateral pressures on the walls.

Clean rock of a uniform particle size no greater than 1-inch should provide proper drainage. However, with the large amount of void space inherent in this material, a synthetic filter fabric should be placed between the backfill and the exposed finer grained soils. The filter fabric should reduce potential intrusion of the fine-grained soils and plugging of the draintile.

Backfill should be placed in thin lifts and mechanically compacted to at least 90% of the materials' maximum dry density as determined by the modified Proctor test. Compaction of backfill within 3 feet or the height of the wall, whichever is greater, should be compacted with hand compaction equipment. Lift thicknesses within the hand compaction zone should be thinned as required to achieve uniform specified compaction in that lift. Field density tests should be performed on the backfill to monitor compliance with the recommendations provided. Care should be exercised during the backfilling operation to prevent overstressing and damaging the walls.

O'Donnell Heights

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site for the proposed housing additions is located on the southwest portion of the existing O'Donnell Heights residential area at Fort Riley, Kansas. The site is located approximately a ½ mile south from the intersection of Jackson Avenue and 1st Division Road. The general site latitude and longitude is approximately N 39° 05' 11" and W 96° 48' 03", respectively.

The property is bordered by residential housing to the north, a densely vegetated area to the south and west and 1st Division Road to the east. At the time of drilling, the site was covered with grass and a walking path was paved through the center of the site running east to west. The terrain was generally flat on the northeast portion of the site and sloped towards the south and the west with the slope inclination gradually increasing across the site.

Subsurface Conditions

The site subsurface conditions were explored with 6 soil test borings within the proposed building area. Boring depths ranged from 6 feet to 20 feet. The boring locations and depths were suggested by PSI and reviewed with the client prior to drilling. PSI personnel staked the borings in the field by measuring distances from available surface features. Elevations and distances from temporary benchmarks were surveyed at the completion of each boring. The temporary benchmarks were later surveyed and used to determine the location of each boring. The surface elevations at the borings were referenced to a series of temporary benchmarks listed below.

TBM	TYPE	USGS ELEVATION (FEET)
1	Trail Post/Blocker	1293.5*
2	Power/Telephone Poles	1295.2*
3	Power/Telephone Poles	1295.9*
4	Power/Telephone Poles	1292.0*
5	Power/Telephone Poles	1284.4*

*Estimated based on Schwap-Eaton Topographic Map

The borings were advanced utilizing hollow stem auger drilling methods and soil samples were routinely obtained during the drilling process. Select soil samples were later tested in PSI's laboratory to document material properties to be used in the recommendations. Drilling, sampling, and laboratory testing was accomplished generally in accordance with ASTM procedures.

The subsurface conditions below the 4 to 8 inches of topsoil, as identified by the 6 borings primarily include a Brown medium to high plasticity clay that varies in thickness from 4 ½ feet at boring OD'03-3 to 17 feet at boring OD'03-5. The high plasticity clay is underlain by weathered shale layer which is underlain a weathered limestone.

The following table briefly summarizes the range of results from the field and laboratory testing programs. Please refer to the attached boring logs and laboratory data sheets for more specific information:

PROPERTY DESCRIPTION / SOIL STRATA TYPE	RANGE OF PROPERTY VALUES					
	Standard Penetration, N	Moisture Content, %	Dry Unit Weight, pcf	Unconfined Compressive Strength, Qu (tsf)	Liquid Limit, %	Plastic Limit, %
Brown Medium to High Plasticity Clay	12-13	12-21	---	---	58-73	14-16
Gray High Plasticity Clay	18	24	---	---	---	---
Brown High Plasticity Residual Clay	50+	6-13	---	---	---	---
Weathered Shale	50+	4-13	---	---	---	---
Weathered Limestone	50+	4-13	---	---	---	---
Shale	50+	10	---	---	---	---

The swell testing in these soils were loaded to a range that indicates that the soils exhibit a high degree of preconsolidation. These preconsolidation pressures can be noted on the swell test data sheets in Appendix IV.

Auger refusal materials were encountered within 5 of the 6 borings at depths ranging from about 6 feet at borings OD'03-4 and OD'03-6 to 14 feet at boring OD'03-2. Refusal is a designation applied to material that cannot be further penetrated by the power auger with ordinary effort and is normally indicative of a very hard or very dense material, such as boulders or lenses or the upper surface of bedrock. Rock coring was beyond the scope of this exploration; therefore, the character and continuity of the refusal materials could not be determined.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in Appendix I should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Water Level Measurements

The borings did not collect free groundwater during the drilling operations or within 24 hours of the completion of the boring, indicating that groundwater at the site at the time of the exploration was either below the terminated depths of the borings, or that the soils encountered are relatively impermeable. Based on PSI's experience and moisture content measurements, the ground water table at the time of the field exploration was estimated to be below the depths explored. Although free water was not encountered at this time, water can be present within the depths explored during other times of the year depending upon climatic and rainfall conditions. Additionally, discontinuous zones of perched water may exist within the overburden materials and/or at the contact with bedrock. The water level measurements presented in this report are the levels that were measured at the time of the PSI field activities.

EVALUATION AND FINDINGS

Geotechnical Discussion

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

There are five primary geotechnical related concerns at this site, which will effect the performance of the foundations for this structure. The following summarizes those concerns:

1. High Plasticity clays were encountered in the exploration that will require remediation.
2. Relatively wet and sensitive soils were encountered in the upper parts of the borings and equipment mobility difficulty should be anticipated.
3. Drying of some of the on site soils will be required to achieve proper compaction during grading.
4. Close surface proximity of rock.
5. Landscaping vegetation can have an adverse effect on structures constructed on high plastic soils.

High Plasticity Clay

Potentially expansive high plasticity "fat" clays are present in the project area and will have a significant impact on the proposed construction. High plastic clays typically have the capacity to hold large volumes of water while still behaving as a solid. High plasticity clays have the potential for volume change with changes in the soil moisture content. These volume changes include both swelling and shrinkage depending upon the relative change in moisture content and the initial state of the soil. The effects of either the swelling or the shrinkage will depend on the extent of the volume of soil that has a relative moisture change. The deeper the bearing surface is in the high plastic soil, the less the effects of change in moisture have on the foundation element. In severe cases, movement and distress to footings and foundation walls can occur. Remedial measures should be performed in the

described select areas of the site to reduce the swell potential.

Remediation should include replacing the high plasticity clay soils where they occur within a depth of three feet or more beneath proposed slabs and replacing this material with a low plasticity compacted soil or a dense graded crushed stone. Alternatively, lime-treatment of the high plastic clay can be accomplished to reduce the plasticity index, improve workability, promote drying, and reduce swell potential. The remediation process should also include a continuous maintenance of drainage features to limit the change in moisture content of the soils within the bearing or load application areas within the high plastic clay soils. PSI understands that this alternative may not be cost effective, but is presented as a possible alternative. PSI believes it would be more effective to place column footings at depth, create a controlled environment crawl space, provide maintenance type measures to reduce the potential changes in moisture content of the high plastic soils, and disturb the site minimally during construction.

Equipment Mobility

The upper fine-grained soils will be sensitive to increases in moisture content. Therefore, during wetter portions of the year, increased difficulty in grading should be anticipated.

Depending on weather and soil conditions at the time of construction, methods for accomplishing grading can be expected to include the use of wide-track, low-contact-pressure type equipment to perform site grading during periods of inclement weather conditions. The determination of the proper equipment for use in excavation will depend on the condition of the soils at the time of construction and the prevailing weathered conditions. Narrow track equipment and rubber tired vehicles will experience difficulty moving about the site and in wet conditions will increase the deterioration of otherwise suitable soils. Typically, increases of more than 4% to 5% wet of the insitu moisture, as measured during this exploration, can be expected to increase the difficulty of working the insitu soils.

Site Compaction

Since this site predominantly consists of medium and high plasticity clays, the site will become difficult to compact the soils if the moisture contents of the insitu soils is allowed to significantly increase or decrease during the construction period. Due to compaction and grading difficulties that can occur while working with these soils, the extend and limits of the disturbed excavation areas should limited to only those areas that are necessary for construction.

Close Proximity to Rock

Soft to hard Shales and Limestone was encountered at the following depths:

Boring Number	Depth to Rock (feet)
OD-03-1	10.5
OD-03-2	11.0
OD-03-3	6.3
OD-03-4	4.5
OD-03-5	17.0 (Weathered Shale at 5.0)
OD-03-6	0.7

Excavations and installation of utility trenches and utility services will encounter rock or weathered rock in the upper 6 feet in the vicinity of borings 3 through 6 at this site.

Landscaping

Trees and large bushes can develop an intricate root system that can draw moisture from the subgrade, resulting in shrinkage of the bearing soil material during extended dry periods of the seasonal year. Desiccation of bearing material below foundations can result in settlement of foundations, walls, and slabs. Therefore, landscaping and irrigation should be limited adjacent to the proposed building areas to reduce the potential for relatively large moisture changes in the soil that can extend below load bearing surfaces.

Site Preparation

The topsoil, vegetation, roots, soft, organic, unsuitable soils in the construction areas should be stripped from the site and either wasted or stockpiled for later use in landscaping or non-load bearing areas. Depths of topsoil in our borings ranged from 4 to 8 inches. Typically, topsoil thicknesses vary from these values. A representative of the geotechnical engineer should determine the depth of removal at the time of construction.

Foundations of existing structures should not be undermined during construction. If it is necessary to excavate below existing foundations, the owner's engineer should review the contractor proposed excavation procedures, prior to its implementation.

After stripping and excavating to the proposed subgrade level, as required, the building should be proof-rolled with a loaded tandem axle dump truck or similar piece of heavy rubber tired vehicle (typically with an axial load greater than 9-tons). Soils that are observed to rut or deflect excessively (typically greater than 1-inch) under the moving load should be undercut and replaced with properly compacted fill. The proofrolling and undercutting activities should be observed and documented by a qualified geotechnical professional representative designated by the owner and should be performed during a period of dry weather. The subgrade soils should be scarified and compacted to at least 90% of the materials' modified Proctor maximum dry density, in accordance with ASTM D-1557 procedure, to a depth of at least 6-inches below the surface. If final grading provides minimum of 4 feet of low plastic material under the footings and a floor slabs, PSI should be

consulted for the possible use of conventional slab on grade and shallow foundation construction.

Highly plastic clays should be remediated prior to placement of new fill. The high plastic clays should be remediated or replaced as discussed earlier in this report. A qualified geotechnical professional representative designated by the owner should observe and document the preparation of the subgrade soils, perform plasticity index tests, and estimate the approximate extent of the high plasticity clays. Modification of the high plasticity clays with a lime product, should have the lime concentration levels be determined by conducting a lime series test with the actual soils and additives that will be used. A qualified geotechnical professional representative designated by the owner should observe and document the remediation procedures for compliance with the project plans and specifications.

Moisture content changes in the highly plastic soils should not be permitted during or after construction. Increases in moisture content can cause swelling of the high plasticity soils. Exposed high plasticity clays that become inundated or desiccated should be removed prior to new fill placement. Ideally, excavation should be performed during a period of dry weather.

After subgrade preparation and observation have been completed, fill placement required to establish grade may begin. Fill materials should be free of organic or other deleterious materials, have a maximum particle less than 3-inches, and have a liquid limit less than 45 and plasticity index less than 25. The on site soils that have been modified are suitable for use as structural fill, but moisture and lime conditioning will be needed to achieve compaction. If the fill is too dry, water should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Close moisture content control will be required to achieve the recommended degree of compaction.

Permeable fill such as sand or clean stone used on this site should be given careful consideration. These permeable materials should not be placed within three feet of high plasticity clays. Even though the excavation may be essentially dry during construction, and no groundwater is anticipated over time, these permeable pockets will eventually collect water through condensation and therefore promote soil swelling and heaving. If moderately permeable fill is used the fill should be drained grading the soil surface and using draintile or other appropriate means.

Fill should be placed in maximum loose lifts of 8-inches and compacted to at least 90% of the materials' modified Proctor, ASTM D1557, maximum dry unit weight, and within 2% of the optimum moisture content as determined in accordance with the ASTM procedure. Each lift of compacted-engineered fill should be tested by a qualified geotechnical professional representative designated by the owner prior to placement of subsequent lifts. The edges of compacted fill should extend 5-feet beyond the edges of buildings prior to sloping. In addition to structural fills, utility trenches within the building areas should be compacted as outlined above.

Clear or screened rock can be used as select fill, but a geo-fabric separator (typically a 6 oz/syd, non-woven) would be needed where it is placed adjacent to fine grained soils.

This type of fill and backfill should be tracked or tamped to achieve densification.

The fill placed shall be tested by a qualified geotechnical professional representative designated by the owner and directed by the project engineer to evaluate the placement of the fill materials. The following table summarizes the recommended compactive effort for various types of engineered fills.

MATERIAL TESTED	PROCTOR TYPE	MIN % DRY DENSITY	MOISTURE CONTENT RANGE	FREQUENCY OF TESTING[*-2]
Structural Fill (Cohesive)	Modified	90%	-2 to +2 %	1 per 1,000 cy of fill placed
Structural Fill (Granular)	Modified	90%	-2 to +2 %	1 per 1,000 cy of fill placed
Optional Structural Fill (Granular)	Relative Density[*]	75%	>95% Saturation	1 per 1,000 cy of fill placed
Random Fill (non-load bearing)	Modified	88%	-3 to +3 %	1 per 3,000 cy of fill placed
Utility Trench Backfill / Wall Backfill	Modified	90%	-2 to +2 %	1 per 200 cy of fill placed

[*]Relative Density as determined in general accordance with ASTM D4253 and D4254

The test frequency for the laboratory reference should be one laboratory Proctor or Relative Density test for every 5 field density tests for the first 25 field tests and for every 10 field density tests thereafter for each material used on the site. If the borrow or source of fill material changes, a new reference moisture/density test should be performed.

After the first 5 reference moisture/density tests have been performed for the same material, a 1-point proctor test can be used at an interval of one for every 10 field density tests to extend the full reference test cycle to one for every 25 field density tests. One-point proctor tests must be compacted within -2 and 0 % dry of the calculated optimum moisture content as based on the family of optimum determined from the first 5 reference moisture density tests.

Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner or the Owner's designated representative. A re-test of that area should be performed after the Contractor performs remedial measures.

Foundation Recommendations

It is PSI's understanding that the residential structures will be designed with a crawl space with a mud slab and controlled environment. Based on this understanding the foundation recommendation given are based upon column supports with the floors being supported by grade beams between these column supports. Grade beams should have a minimum of 3 inches of clear space or collapsible cardboard forms under them to reduce the influence of pressure produced by the underlying soils.

The planned construction can be supported on conventional spread-type footing foundations bearing on either competent naturally deposited soils or compacted-engineered fill. Spread footings for building columns and continuous footings for bearing walls have been calculated to have a net allowable soil bearing pressures of 11,900 pounds per square feet (psf) and 9,900 psf, respectively, based on dead load plus design live load. These bearing capacities were calculated with CBEAR. The net allowable bearing capacity was calculated by taking the ultimate bearing capacity divided by a factor of safety of 3.0 and subtracting the overburden pressure. The minimum dimension of 24-inches for square footings and 18-inches for continuous footings should be used to minimize the possibility of a local bearing capacity failure. Using the minimum dimensions and the report basis design loads, the actual foundation stresses will be 6,000 psf and 2,000 psf, respectively. Calculating the settlement for the profile at OD-03-1 indicates that the square footings will have a calculated settlement of ¼ inch and the strip footing at 2,000 psf has a calculated settlement of <¼ inch. Therefore, based on calculated settlement and bearing capacity the following allowable bearing capacities should be used:

Square Footings	6,000 psf
Strip Footings	2,000 psf

Strip Footings are not recommended due to the limited amount of loading that will exist on these types of foundations and this would make them more susceptible to movements resulting from swelling or shrinking conditions.

Exterior footings and footings in unheated areas should be located at a depth of 36-inches or deeper below the final exterior grade to provide adequate frost protection. However, the foundations may need to be placed at a deeper depth to reduce the effects of potential swell pressure.

Individual column footings should be supported on only one type of bearing material. If continuous footings are used and transition from different types of material cannot be avoided, the design plans include either a construction joint to separate the effects or provide for the footings in those areas be provided with additional reinforcing steel to bridge the potential differential strains.

The foundation excavations should be observed and documented by a qualified geotechnical professional representative designated by the owner prior to steel or concrete placement to assess that the foundation materials are consistent with the materials discussed in this report. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of competent naturally deposited soils or properly compacted structural fill as directed by the geotechnical engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with lean concrete or dense graded compacted crushed stone.

After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If it

is required that footing excavations be left open for more than one day, the soils in the excavation should be protected to reduce evaporation or entry of moisture.

Swell testing was performed on 2 samples at O Donnell using ASTM D 4546 method C. Based on the explored subsurface conditions and site geology, laboratory testing and past experience, properly designed and constructed footings supported on the site materials should experience total and differential settlements between adjacent columns of less than1-inch and ¾-inch, respectively.

Based on the laboratory testing, the swell pressure of the material ranges between 2,400 psf and 6,000 psf with maximum swell potential averaging 3.2%. The average swell pressure at this site was 4,200 psf. Using the average swell potential at different depths for different footing pressures resulted in the swell potential graphs included in the engineering calculation section of the appendix. These calculations show that beginning at an applied net bearing pressure of 1,700 psf a percent heave of 1.5% is achieved. With higher net applied bearing pressures than 1,700 psf there is a diminishing return in increasing the applied pressure. Therefore, at the following net applied bearing pressures and depths of footings, it is calculated that following percent heave is possible:

HEAVE POTENTIAL BASED ON LOAD AND DEPTH			
Net Bearing Pressure	3 feet below grade	5 feet below grade	7 feet below grade
2,000 psf	0.8%	0.7%	0.5%
4,000 psf	~0	~0	~0

As an example, for every foot of saturation below a footing placed at a depth of 5 feet with a net applied load of 2,000 psf, the calculated swell would be 1/16 inch. Therefore, due to the limited amount of soil under the proposed foundation, it is PSI's opinion that foundations with a net bearing pressure greater than 2,000 psf and bearing at a depth between 3 and 7 feet below grade will have potential rise less than ¾ inch.

Earthquake and Seismic Design Consideration

The 2000 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soil type (i.e., depth of soil and strata types). Based on the depth to rock and the estimated shear strength of the soil at the boring locations, Site Class "C" is recommended. The USGS-NEHRP probabilistic ground motion values near latitude 39.0869° and longitude -90.7997°, which is approximately 1.5 kilometers from the registries nearest grid point, are as follows:

Period (seconds)	2% Probability of Event in 50 years * (% g)
PGA	14.53
0.2	32.46
1.0	11.85

* At the nearest grid point (lat: 39.1, long: -90.80)

Floor Slab

It is PSI's understanding that only the driveways and sidewalks will be grade-supported slabs. These structures will have a greater tendency to move with variations in the moisture content of the supporting soils. PSI recommends that allowances be made to allow these slabs to move independently from the residential structures. PSI also recommends that measures be taken to control the changes in moisture content under these structures. This measures would include, but not be limit to, providing positive drainage under the slab structure, providing positive surface drainage away from these slabs, provide measures such that the roof drains will not discharge in the immediate vicinity of the slabs, and route water bearing utility line in areas that do not traverse under the slabs.

Alternatively, the floor slab can be grade supported on the remediated natural soil, or properly compacted/engineered lean clay or cohesionless fill. Proofrolling, as discussed earlier in this report, should be accomplished to identify soft or unstable soils that should be removed from the floor slab area prior to fill placement and/or floor slab construction. High plasticity clays below slabs placed on grade should be remediated, as discussed earlier.

A minimum six-inch thick free draining granular mat should be placed beneath grade supported floor slabs to enhance drainage and provide a capillary break. The granular layer should have a top size of ¾ inch and be relatively well graded through the No. 40 sieve and have less than 5% passing the No. 200 sieve. The soils beneath a grade-supported slab should be graded to drain away from the structure prior to placing the granular layer. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with moisture sensitive equipment or product such as tile, wood, carpet, etc., as directed by the design engineer. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill should be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions and the potential effects of slab curling and cracking. The floor slabs should have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction, *k* value, of 140 pounds per cubic inch (pci) may be used in the grade slab design based on a 1 ft. x 1 ft. plate load test. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohessionless soil:

Modulus of Subgrade Reaction, $k_s = (\frac{k}{B})$ for cohesive soil and

$$k_s = k(\frac{B+1}{2B})^2 \text{ for cohessionless soil}$$

where: k_s = coefficient of vertical subgrade reaction for loaded area,
k = coefficient of vertical subgrade reaction for 1x1 square foot area, and
B = width of area loaded, in feet

Below-Grade Retaining Walls

Below grade retaining walls should be designed to resist lateral earth pressures. Lateral earth pressure is developed from the soils present within a wedge formed by the vertical below-grade retaining wall and an imaginary line extending up and away from the bottom of the wall at an approximate 45° angle. The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K. If the walls are rigidly attached to the structure and not free to rotate or deflect at the top, PSI recommends designing the walls for the "at-rest" lateral earth pressure condition using K_o. Walls that are permitted to rotate and deflect at the top can be designed for the active lateral earth pressure condition using K_a. Passive pressure can be determined using K_p, with a factor of safety of 2.0. Recommended parameters for use in below grade walls are as follows:

Recommended Parameters for use in Retaining Wall Design			
Material Type	Drained Friction Angle (ϕ')		
High plasticity Clay (in-situ)	20°		
High plasticity Clay (conditioned and compacted)	24°		
Granular Soils (clean crushed limestone)	35°		
Total Soil Density (pcf)	125		
Cohesion for Clay Soils (psf) (undrained, $\phi = 0$)	4,400		
Maximum Toe Pressure on Firm Soil (psf)	6,250		
Groundwater Elevation	At bottom of the wall		
Parameters specific to soil type	**Fat Clay**	**Mod. Fat Clay**	**Crushed L.S.**
Friction Factor for Base	0.27	0.30	0.47 *
Coefficient of Active Pressure (K_a) **	0.45	0.42	0.27 *
Coefficient of Passive Pressure (K_p) **	2.2	2.37	3.7 *
Coefficient of At-Rest Pressure (K_o) **	0.63	0.59	0.43 *

* These values may be used for design only if the crushed limestone backfill extends back from the wall certain distances. These are a horizontal distance approximately equal to or greater than the total height of the wall at the surface, and at least one-foot beyond the heel of the wall footing.

** Earth pressure coefficients valid for level backfill conditions with no surcharge

The values presented above were calculated assuming positive foundation drainage is provided to prevent the buildup of hydrostatic pressure. If surface loads are placed near the walls, such as traffic loads, they should be designed to resist an additional uniform lateral load of one-half of the vertical surface loads.

The retaining wall and below-grade wall backfill should be provided with drainage. This drainage system should include:

1) A 4 or 6-inch diameter perforated drain tile at the bottom of the backfill to collect seepage water with the tile connected to a suitable means of disposal.
2) Clean 1/2-inch or 1-inch gravel classified as "GP" and containing less than 5% passing a #200 sieve surrounding the draintile.
4) Non-woven 4 ounce per square yard geotextile between the drainage material and the on-site soils to prevent infiltration of fine grained soils into the draintile, granular drainage blanket, or granular backfill.

Below-Grade Retaining Wall Backfill and Compaction

Backfill of the proposed below-grade retaining walls should consist of low plastic soils or granular material. PSI suggests using granular material to provide improved drainage and to reduce lateral pressures on the walls.

Clean rock of a uniform particle size no greater than 1-inch should provide proper drainage. However, with the large amount of void space inherent in this material, a synthetic filter fabric should be placed between the backfill and the exposed finer grained soils. The filter fabric should reduce potential intrusion of the fine-grained soils and plugging of the draintile.

Backfill should be placed in thin lifts and mechanically compacted to at least 90% of the materials' maximum dry density as determined by the modified Proctor test. Compaction of backfill within 3 feet or the height of the wall, whichever is greater, should be compacted with hand compaction equipment. Lift thicknesses within the hand compaction zone should be thinned as required to achieve uniform specified compaction in that lift. Field density tests should be performed on the backfill to monitor compliance with the recommendations provided. Care should be exercised during the backfilling operation to prevent overstressing and damaging the walls.

CONSTRUCTION CONSIDERATIONS

A qualified geotechnical professional should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project.

Moisture Sensitive Soils/Weather Related Concerns

Disturbances to the area being constructed should be minimized. The upper fine-grained soils encountered at this site may be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Drainage and Groundwater Considerations

The Contractor should determine the actual groundwater levels at the site at the time of the construction activities to assess the impact groundwater may have on construction. Water should not be allowed to collect in the foundation excavation, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

While groundwater was not encountered at the time the field exploration was conducted, it is possible that seasonal variations will cause fluctuations or a water table to be present in the upper soils. Additionally, perched water may be encountered in discontinuous zones within the overburden or near the contact with bedrock. Water should be removed from excavations by pumping. Should excessive and uncontrolled amounts of seepage occur, a qualified geotechnical engineer should be consulted.

Excavations

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better enhance the safety of workers entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is PSI's understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties compliance with local, state, and federal safety or other regulations.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding section constitutes PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and reference during this evaluation, and PSI's experience in working with these conditions.

REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by PSI. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

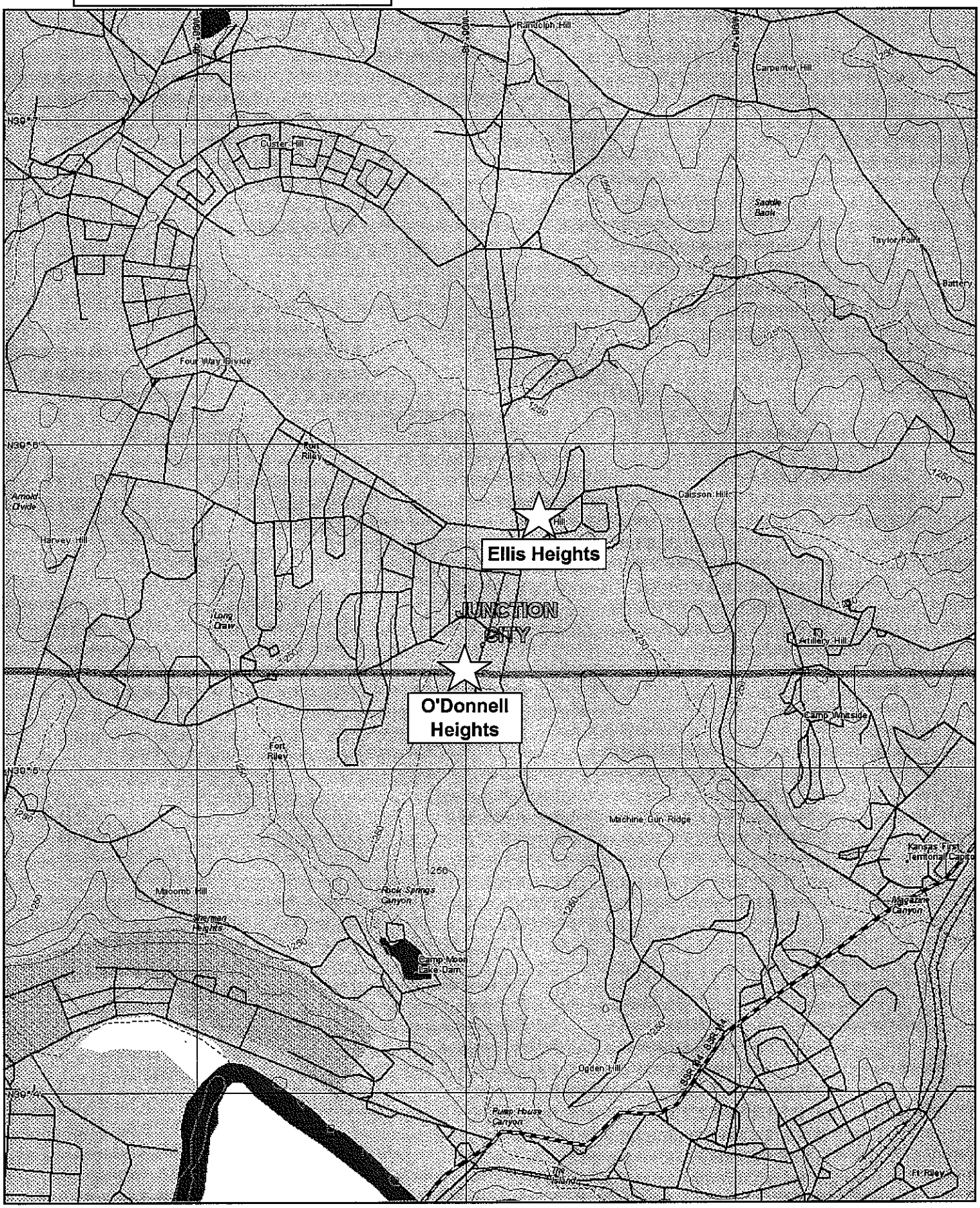
The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Gould Evans for the specific application to the proposed Ellis Heights & O'Donnell Heights Housing at Fort Riley, Kansas

Appendix I

General Location I-1
Ellis Heights Location Sketch I-2
Ellis Heights Boring Location Sketch I-3
Ellis Heights Surveying Results I-4
Ellis Heights Boring Logs I-5
O'Donnell Heights Location Sketch I-13
O'Donnell Heights Boring Location Sketch I-14
O'Donnell Heights Surveying Results I-15
O'Donnell Heights Boring Logs I-16
Boring Symbols I-22
USCS Symbols I-23

Professional Service Industries, Inc.

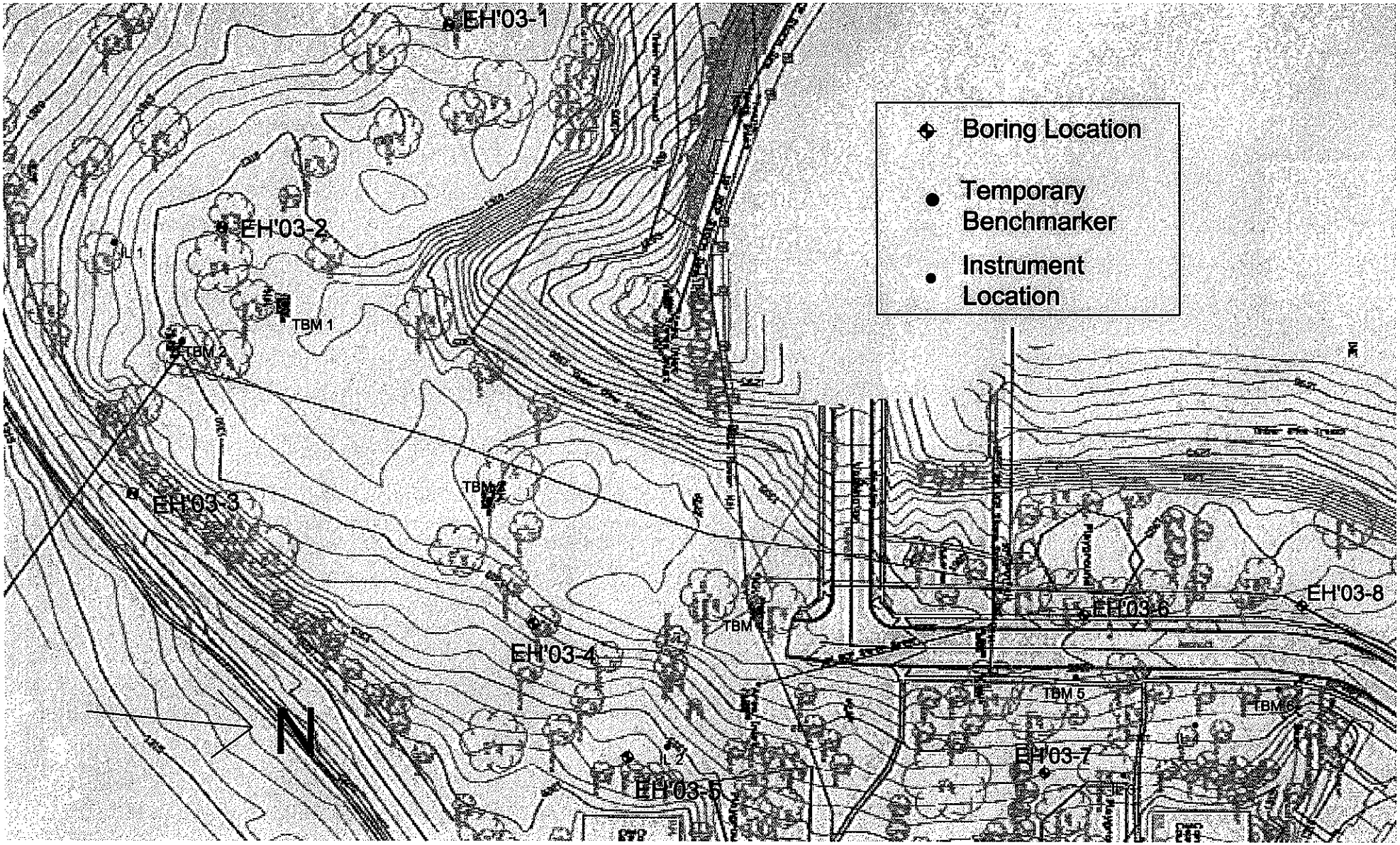


USGS Topographic Map **7.5' Quadrangle** **Date:** **Revised:**	**Site Vicinity Map** **Propose Construction Sites** **Ellis Heights & O'Donnell Heights** **Fort Riley, Kansas**	**PSI Project No.:**	**338-35131**
		Date: **1/30/2004**	**Drawn By:** **NJR**

Professional Service Industries, Inc.

USGS Topographic Map 7.5' Quadrangle Date: Revised:	Site Vicinity Map Propose Construction Site Ellis Heights Fort Riley, Kansas	PSI Project No.:	338-35131
		Date: 1/30/2004	Drawn By: NJR

Professional Service Industries, Inc.



Project Name: Proposed Ellis Heights Fort Riley, Kansas PSI Project No.: **338-35131-1**	Boring Location Sketch	psi Information To Build On Engineering • Consulting • Testing 4106 N.W. Riverside Drive Riverside, Missouri 64150 Ph. 816-741-6466 Fx. 816-587-2993

Ellis Heights Boring Survey Results

Location	Relative Height Reading (ft)*	Distance from Instrument (ft)**	Instrumentation Angle (deg)***
Instrument Location 1			
Boring EH'03-1	3.21	346	5
Boring EH'03-2	8.73	94	30
Boring EH'03-3	1.73	218	124
TBM 1	11.23	157	58
TBM 2	9.73	104	94
Instrument Location 2			
Boring EH'03-4	10.05	159	101
Boring EH'03-5	3.32	37	42
TBM 3	11.78	266	113
TBM 4	9.62	145	183
Instrument Location 3			
Boring EH'03-6	11.94	126	313
Boring EH'03-7	5.05	77	238
TBM 5	11.93	105	302
TBM 6	9.62	174	28
Instrument Location 4			
Boring EH'03-8	8.03	157	119
TBM 5	9.14	126	9
TBM 6	6.14	89	144

* Difference in the height of the location and the site of the instrument

** Based on Stadia measurements

*** Arbitrary angle from instrument (positive measurements clockwise)

Hole No. EH'03-1

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): Ellis Heights; N 39° 05' 50" W 96° 47' 44"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. (As shown on drawing title and file number): EH'03-1
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14.0
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/23/2003; COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE: +1315.9
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
+1315.5	0.4		5" of topsoil			
			Dark Brown, High Plasticity **Clay (fill)**	61	1 1.0 2.5	Split Spoon w%=21 N=14 (9, 6, 8)
+1312.9	3.0		Reddish Brown, High Plasticity **Clay**	8	2 3.0 5.0	Shelby Tube w%=15 LL=58 PL=16 Qu=9982 psf DD=114 pcf Cc=0.15 Cs=0.066 Cr=0.00 Cv=4.0x10^{-3} in^2/min
				100	3 6.0 7.5	Split Spoon w%=21 N=14 (5, 6, 8)
				94	4 8.5 10.0	Split Spoon w%=23 N=10 (2, 4, 6)
+1301.9	14.0		Gray, Weathered **Shale**	100	5 13.5 15.0	Split Spoon w%=27 N=22 (4, 7, 15)
+1295.9	20.0			100	6 18.5 20.0	Split Spoon w%=18 N=35 (6, 15, 20)
			Termination of Boring at 20 feet			

Hole No. EH'03-2

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT	O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station)	Ellis Heights; N 39° 05' 48" W 96° 47' 41"
3. DRILLING AGENCY	PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*	EH'03-2
5. NAME OF DRILLER	Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	8.0
8. DEPTH DRILLED INTO ROCK	0.0
9. TOTAL DEPTH OF HOLE	20.0
10. SIZE AND TYPE OF BIT	3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	TBM
12. MANUFACTURER'S DESIGNATION OF DRILL	CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 5 / UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	Not detected 0hr/24hr
16. DATE HOLE	STARTED 12/23/2003 / COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE	+1310.4
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. GEOLOGIST	Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g
+1309.8	0.6		7" of Topsoil			
			Dark Brown, High Plasticity **Clay** (fill)	67	1 1.0 2.5	Split Spoon 7 w%=21 10 N=20 10
+1307.4	3.0		Reddish Brown, High Plasticity **Clay**			
				67	2 3.5 5.0	Split Spoon 6 w%=15 11 N=24 13
				100	3 6.0 8.0	Shelby Tube LL=57 PL=15 Cc=0.04 Cs=0.040 Cr=0.00 Cv=8.8x10^{-3} in^2/min
+1302.4	8.0		Reddish Brown, Weathered **Shale**			
				72	4 8.5 10.0	Split Spoon 6 w%=20 6 N=13 7
				100	5 13.5 15.0	Split Spoon 12 w%=13 24 N=50+ 29
				100	6 18.5 20.0	Split Spoon 10 w%=17 22 N=50+ 29
+1290.4	20.0		Boring Terminated at 20 feet			

Hole No. EH'03-3

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): Ellis Heights; N 39° 05' 48" W 96° 47' 38"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. (As shown on drawing title and file number): EH'03-3
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 9.0
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/23/2003; COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE: +1317.4
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g	
+1316.7	0.7		8" of Topsoil				
			Dark Brown, High Plasticity **Clay** with pockets of Gray Clay (FILL?)	28	1 1.0 2.5	Split Spoon w%=20 N=14	3 6 8
+1314.9	2.5		Dark Brown, High Plasticity **Clay**				
				92	2 3.0 4.0	Shelby Tube w%=18 LL=51 PL=16 Qu=10244 psf DD=108 pcf	
				100	3 6.0 7.5	Split Spoon w%=23 Qu=7609 psf DD=96 pcf N=41	9 20 21
+1308.4	9.0		Gray, Sandy, Weathered **Shale**	100	4 8.5 9.5	Split Spoon w%=7 N=50+	40 50/5"
				100	5 13.5 14.5	Split Spoon w%=11 N=50+	22 50/6"
				78	6 18.5 20.0	Split Spoon w%=14 N=50+	8 35 50/4"
+1297.4	20.0		Boring Terminated at 20 feet				

Hole No. EH'03-4

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): Ellis Heights; N 39° 05' 51" W 96° 47' 37"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*: EH'03-4
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 0.3
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/23/2003; COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE: +1308.6
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g	
+1308.4	0.3		8" of Topsoil				
			Reddish Brown, Mottled Gray Weathered **Shale**	61	1 1.0 2.5	Split Spoon w%=20 N=17	5 6 11
				56	2 3.5 5.0	Split Spoon w%=14 N=50+	8 32 23
				100	3 6.0 7.5	Split Spoon w%=13 N=44	9 17 27
				33	4 8.0 9.0	Shelby Tube w%=32 LL=49 PL=17 Cc=0.12 Cs=0.02 Cr=0.00 Cv=2.1x10^{-3} in^2/min	
				100	5 13.5 15.0	Split Spoon w%=18 N=50+	5 25 50/5"
				100	6 18.5 20.0	Split Spoon w%=26 N=22	9 9 13
+1288.6	20.0		Boring Terminated at 20 feet				

Hole No. EH'03-5

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): Ellis Heights; N 39° 05' 52" W 96° 47' 36"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. (As shown on drawing title and file number): EH'03-5
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 5.0
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/23/2003; COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE: +1315.3
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g	
+1315.0	0.3		4" of Topsoil				
			Reddish Brown, Medium to High Plasiticity **Clay**	44	1 1.0 2.5	Split Spoon w%=19 N=9	4 3 6
				100	2 3.0 4.0	Shelby Tube w%=18 LL=48 PL=14 Qu=8603 psf DD=104 pcf Cc=0.23 Cs=0.090 Cr=0.00 Cv=4.0x10^{-3} in^2/min	
+1310.3	5.0		Gray and Reddish Brown Mottled **Shale**	100	3 6.0 7.5	Split Spoon w%=17 N=39	7 16 23
				75	4 8.5 9.5	Split Spoon w%=14 N=50+	24 50/3"
				83	5 13.5 14.5	Split Spoon w%=17 N=50+	12 50/4"
				100	6 18.5 20.0	Split Spoon w%=17 N=47	12 23 24
+1295.3	20.0		Boring Terminated at 20 feet				

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): Ellis Heights; N 39° 05' 56" W 96° 47' 37"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. (As shown on drawing title and file number): EH'03-6
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 9.0
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/23/2003; COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE: +1306.2
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g	
+1305.8	0.4		5" of Topsoil				
			Dark Brown, High Plasiticity **Clay**	56	1 1.0 2.5	Split Spoon w%=16 N=18	6 8 10
				44	2 3.5 5.0	Split Spoon w%=16 N=19	7 9 10
				67	3 6.0 7.0	Shelby Tube w%=14 LL=62 PL=21 Qu=10365 psf DD=110 pcf Cc=0.22 Cs=0.080 Cr=0.00 Cv=1.7x10^{-3} in^2/min	
+1297.2	9.0			89	4 8.5 10.0	Split Spoon w%=9 N=35	7 18 17
			Light Brown to Gray Weathered **Shale**	83	5 13.5 15.0	Split Spoon w%=10 N=32	10 15 17
				83	6 18.5 20.0	Split Spoon w%=15 N=36	7 16 20
+1286.2	20.0		Boring Terminated at 20 feet				

Hole No. EH'03-7

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): Ellis Heights; N 39° 05' 56" W 96° 47' 35"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*: EH'03-7
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 16.0
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5 UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/23/2003 COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE: +1313.1
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g	
+1312.8	0.3		4" of Topsoil				
			Reddish Brown, High Plasiticity **Clay**	44	1 1.0 2.5	Split Spoon w%=14 N=14	6 7 7
				58	2 3.0 5.0	Shelby Tube w%=18 LL=63 PL=14 Qu=7094 psf DD=105 pcf Cc=0.21 Cs=0.093 Cr=0.00 Cv=3.5x10^{-3} in^2/min	
				61	3 6.0 7.5	Split Spoon w%=16 N=17	8 8 9
				78	4 8.5 10.0	Split Spoon w%=17 N=15	4 6 9
+1303.1	10.0		Reddish Brown, High Plasiticity, Residual **Clay**				
				94	5 13.5 15.0	Split Spoon w%=19 N=46	6 17 29
+1297.1	16.0		Brown Weathered **Shale**				
				94	6 18.5 20.0	Split Spoon w%=14 N=50+	9 24 26
+1293.1	20.0		Boring Terminated at 20 feet				

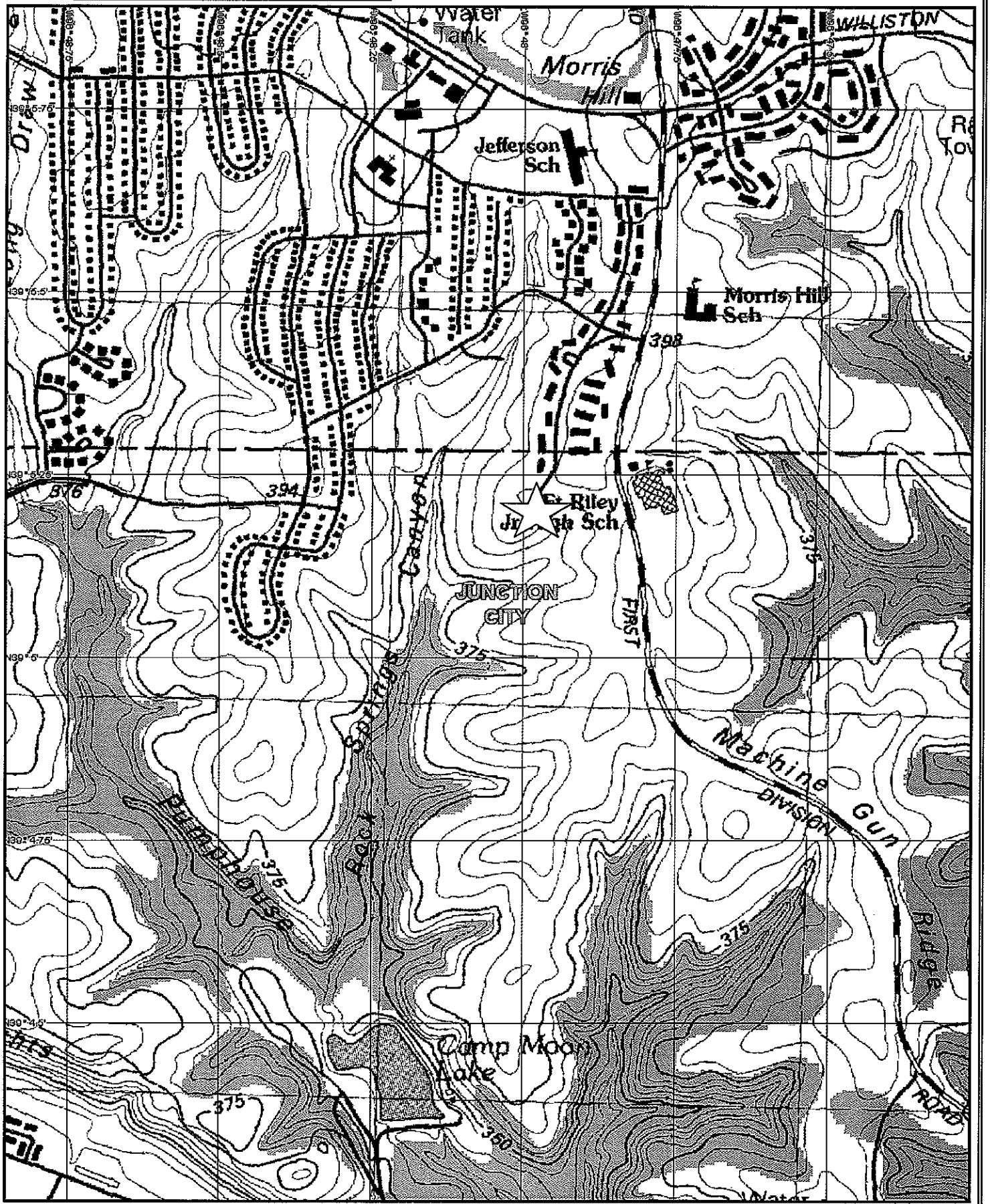
Hole No. EH'03-8

DRILLING LOG	DIVISION: NW Division - Kansas City (NWK)	INSTALLATION: Fort Riley, Kansas	SHEET 1 OF 1 SHEETS

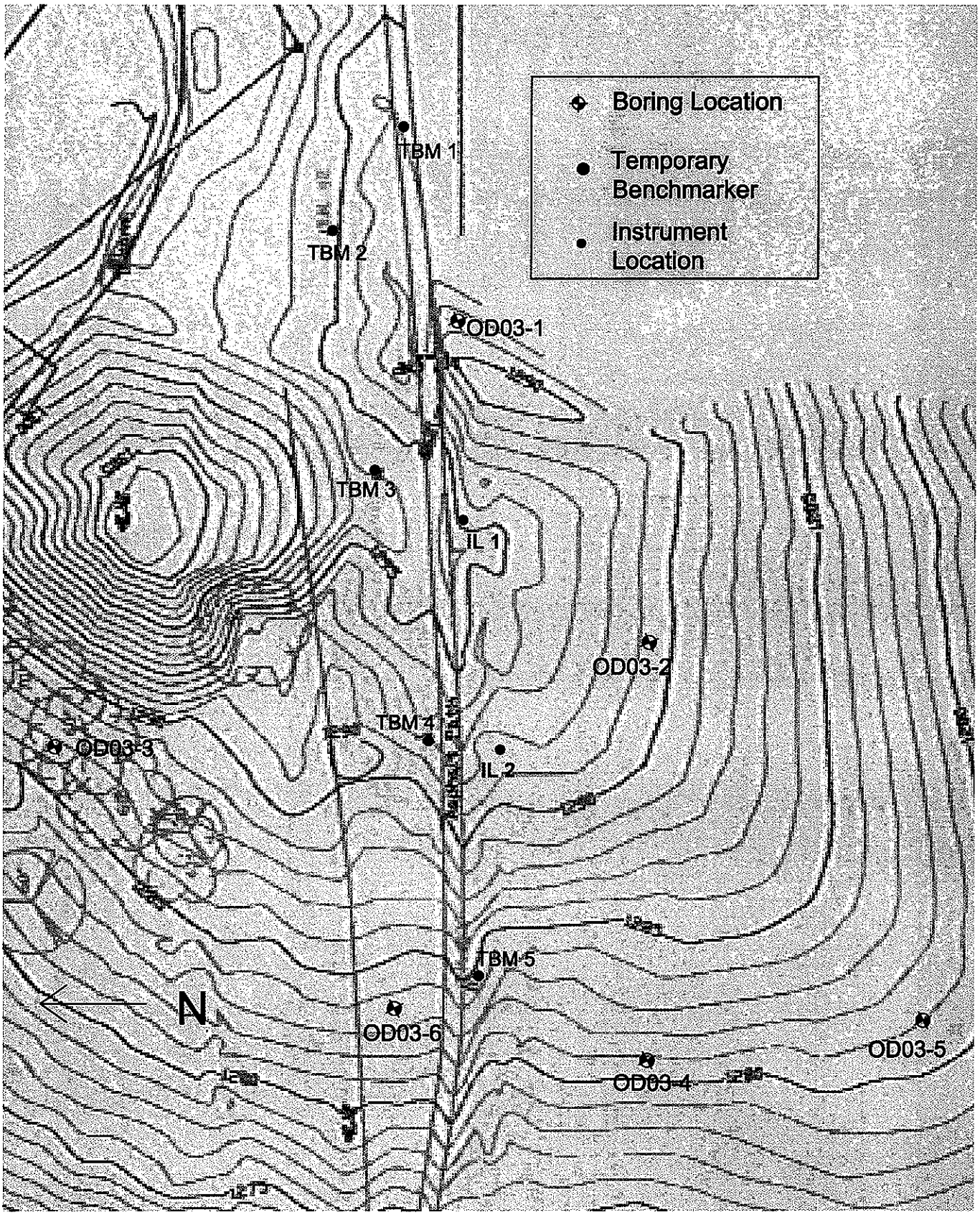
1. PROJECT	O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station)	Ellis Heights; N 39° 05' 58" W 96° 47' 38"
3. DRILLING AGENCY	PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*	EH'03-8
5. NAME OF DRILLER	Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	18.0
8. DEPTH DRILLED INTO ROCK	0.0
9. TOTAL DEPTH OF HOLE	20.0
10. SIZE AND TYPE OF BIT	3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	TBM
12. MANUFACTURER'S DESIGNATION OF DRILL	CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 5 / UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	Not detected 0hr/24hr
16. DATE HOLE	STARTED 12/23/2003 / COMPLETED 12/23/2003
17. ELEVATION TOP OF HOLE	+1306.6
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. GEOLOGIST	Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
+1306.2	0.4		5" of Topsoil			
			Brown, High Plasiticity **Clay**	39	1 1.0 2.5	Split Spoon 4 5 6 w%=14 N=11
				33	2 3.5 5.0	Split Spoon 4 5 8 w%=19 N=13
					3 6.0 8.0	Shelby Tube w%=17 Qu=10177 psf DD=106 pcf
				100	4 8.5 10.0	Split Spoon 4 5 7 w%=23 N=12
+1292.6	14.0					
			Light Brown, High Plasiticity, Residual **Clay**	100	5 13.5 15.0	Split Spoon 4 4 7 w%=25 N=11
+1288.6	18.0					
			Light Brown, Sandy **SHALE**	100	6 18.5 20.0	Split Spoon 4 6 10 w%=22 N=16
+1286.6	20.0					
			Boring Terminated at 20 feet			

Professional Service Industries, Inc.



USGS Topographic Map **7.5' Quadrangle** **Date:** **Revised:**	**Site Vicinity Map** **Propose Construction Site** **O'Donnell Heights** **Fort Riley, Kansas**	**PSI Project No.:** **338-35131** **Date:** **1/30/2004** **Drawn By:** **NJR**



Project Name: Proposed O'Donnell Heights Fort Riley, Kansas PSI Project No.: **338-35131-1**	Boring Location Sketch	psi Information To Build On Engineering • Consulting • Testing 4106 N.W. Riverside Drive Riverside, Missouri 64150 Ph. 816-741-6466 Fx. 816-587-2993

O'Donnell Heights Boring Survey Results

Location	Relative Height Reading (ft)*	Distance from Instrument (ft)**	Instrumentation Angle (deg)***
Instrument Location 1			
OD'03-1	10.58	123	19
OD'03-2	10.96	137	144
TBM 1	5.95	243	11
TBM 2	5.55	193	356
TBM 3	3.92	61	322
TBM 4	7.84	120	213
Instrument Location 2			
OD'03-3	11.15	276	268
OD'03-4	17.72	213	152
OD'03-5	17.19	310	120
OD'03-6	14.05	172	200
TBM 4	4.14	42	275
TBM 5	12.99	135	183

* Difference in the height of the location and the site of the instrument

** Based on Stadia measurements

*** Arbitrary angle from instrument (positive measurements clockwise)

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT	O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station)	O'Donnell Heights; N 39° 05' 14" W 96° 47' 57"
3. DRILLING AGENCY	PSI, Inc.
4. HOLE NO. (As shown on drawing title and file number)	OD'03-1
5. NAME OF DRILLER	Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	10.5
8. DEPTH DRILLED INTO ROCK	0.0
9. TOTAL DEPTH OF HOLE	10.8
10. SIZE AND TYPE OF BIT	3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	TBM
12. MANUFACTURER'S DESIGNATION OF DRILL	CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 4 / UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	Not detected 0hr/24hr
16. DATE HOLE	STARTED 12/22/2003 / COMPLETED 12/22/2003
17. ELEVATION TOP OF HOLE	+1290.2
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. GEOLOGIST	Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
+1289.8	0.4		5" of Topsoil			
			Reddish Brown, Medium to High Plasiticity **Clay**	39	1 1.0 2.5	Split Spoon w%=15 N=13
					2 3.0 5.0	Shelby Tube LL=58 PL=16 DD=100 pcf w% =13% Cc=0.04 Cv=6.9x10^{-3} in^2/min Cs=0.019
				33	3 6.0 7.5	Split Spoon w%=13 N=12
+1280.6	9.6			72	4 9.0 10.5	Split Spoon w%=24 N=18
+1279.7	10.5		Gray, High Plasiticity, Residual **Clay**			
+1279.1	11.1		Gray Weathered Limestone	97	5 10.5 11.1	Split Spoon w%=13 N=50+
			Auger Refusal at 11.1 feet			

5 6 7 — 7 5 7 — 4 11 7 — 11 50/1"

Hole No. OD'03-2

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT	O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station)	O'Donnell Heights; N 39° 05' 13" W 96° 47' 59"
3. DRILLING AGENCY	PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*	OD'03-2
5. NAME OF DRILLER	Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	11.0
8. DEPTH DRILLED INTO ROCK	0.0
9. TOTAL DEPTH OF HOLE	13.7
10. SIZE AND TYPE OF BIT	3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	TBM
12. MANUFACTURER'S DESIGNATION OF DRILL	CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 4 / UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	Not detected 0hr/24hr
16. DATE HOLE	STARTED 12/22/2003 / COMPLETED 12/22/2003
17. ELEVATION TOP OF HOLE	+1289.8
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. GEOLOGIST	Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g	
+1289.4	0.4		5" of Topsoil				
			Dark to Reddish Brown, High Plasiticity **Clay**	78	1 1.0 2.5	Split Spoon w%=21 N=23	6 10 13
				54	2 3.0 5.0	Split Spoon w%=15 N=17	10 9 8
					3 6.0 7.5	Shelby Tube w%=17 LL=73 PL=14 DD=102pcf w%= 18% Cc=0.22 Cs=0.090 Cr=0.00 Cv=1.4x10^{-3} in^2/min	
				100	4 8.5 10.0	Split Spoon w%=21 N=12	6 5 7
+1278.8	11.0		Light Brown, Weathered **Shale**				
+1276.5	13.3			83	5 13.0 13.7	Split Spoon w%=12 N=50+	32 50/2"
+1276.1	13.7		Weathered Limestone Auger Refusal at 13.7 feet				

Hole No. OD'03-3

DRILLING LOG

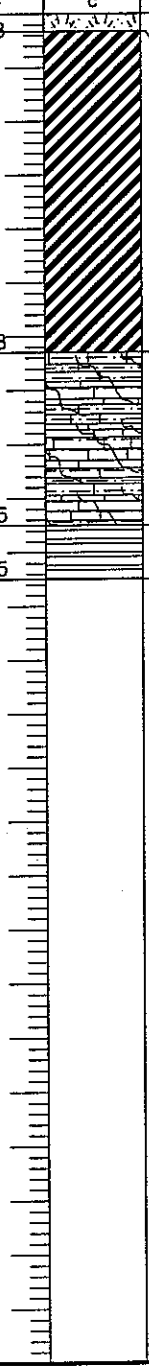
DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): O'Donnell Heights; N 39° 05' 16" W 96° 48' 00"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*: OD'03-3
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 6.3
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 10.5
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 4; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/22/2003; COMPLETED 12/22/2003
17. ELEVATION TOP OF HOLE: +1285.0
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
+1284.7	0.3		4" of Topsoil			
			Dark Brown, High Plasiticity **Clay**	22	1 1.0 2.5	Split Spoon 8 w%=19 12 N=23 11
					2 3.0 5.0	Shelby Tube w%=15
+1278.7	6.3		Highly Weathered **Limestone** with seams of High Plasticity, Residual **Clay** interbedded	67	3 6.0 7.5	Split Spoon 12 w%=4 LL=61 PL=13 29 N=50+ 50/3"
+1275.5	9.5		Light Brown **Shale**	78	4 8.5 10.0	Split Spoon 9 w%=15 11 N=50+ 40
+1274.5	10.5		Auger Refusal at 10.5 feet	83	5 10.0 10.5	Split Spoon 50/5" w%=10 N=50+



Hole No. OD'03-4

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT	O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station)	O'Donnell Heights; N 39° 05' 14" W 96° 48' 03"
3. DRILLING AGENCY	PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*	OD'03-4
5. NAME OF DRILLER	Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	4.5
8. DEPTH DRILLED INTO ROCK	0.0
9. TOTAL DEPTH OF HOLE	6.1
10. SIZE AND TYPE OF BIT	3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	TBM
12. MANUFACTURER'S DESIGNATION OF DRILL	CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 4 / UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	Not detected 0hr/24hr
16. DATE HOLE	STARTED 12/22/2003 / COMPLETED 12/22/2003
17. ELEVATION TOP OF HOLE	+1278.4
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. GEOLOGIST	Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
+1278.1	0.3		4" of Topsoil			
			Dark Brown, High Plasiticity **Clay**	72	1 1.0 2.5	Split Spoon 7 w%=18 9 N=18 9
+1275.7	2.7					
			Light Brown, Sandy, High Plasiticity, Residual **Clay**	39	2 3.0 4.5	Split Spoon 50 w%=6 50/2" N=50+
+1273.9	4.5					
			Weathered **Limestone** with seams of High Plasticity, Residual **Clay** interbedded	56	3 4.5 6.0	Split Spoon 18 46 N=50+ 21
+1272.3	6.1					
			Auger Refusal at 6.1 feet	0	4 6.0 6.1	Split Spoon 50/1" w%=9 N=50+

Hole No. OD'03-5

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT: O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station): O'Donnell Heights; N 39° 05' 13" W 96° 48' 02"
3. DRILLING AGENCY: PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*: OD'03-5
5. NAME OF DRILLER: Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 17.0
8. DEPTH DRILLED INTO ROCK: 0.0
9. TOTAL DEPTH OF HOLE: 20.0
10. SIZE AND TYPE OF BIT: 3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: TBM
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 1
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not detected 0hr/24hr
16. DATE HOLE: STARTED 12/22/2003; COMPLETED 12/22/2003
17. ELEVATION TOP OF HOLE: +1279.0
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. GEOLOGIST: Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g	
+1278.3	0.7		8" of Topsoil				
			Dark Brown, High Plasiticity **Clay**; with limestone fragments	100	1 1.0 2.5	Split Spoon 27 w%=17 N=50+	11 49
				4	2 3.0 5.0	Shelby Tube w%=1	
+1274.0	5.0		Light Brown, Sandy, High Plasiticity, Residual **Clay**				
				22	3 6.0 7.5	Split Spoon w%=13 N=50+	50/5"
				11	4 8.5 10.0	Split Spoon w%=13 N=50+	50/2"
+1262.0	17.0		Light Brown, High Plasiticity, Weathered **Shale**	78	5 13.5 15.0	Split Spoon w%=12 N=50+	33 34 50/5"
				67	6 18.5 20.0	Split Spoon w%=13 N=50+	13 50/5"
+1259.0	20.0		Boring Terminated at 20 feet				

Hole No. OD'03-6

DRILLING LOG

DIVISION: NW Division - Kansas City (NWK)

INSTALLATION: Fort Riley, Kansas

SHEET 1 OF 1 SHEETS

1. PROJECT	O'Donnell Heights and Ellis Heights
2. LOCATION (Coordinates or Station)	O'Donnell Heights; N 39° 05' 11" W 96° 48' 01"
3. DRILLING AGENCY	PSI, Inc.
4. HOLE NO. *(As shown on drawing title and file number)*	OD'03-6
5. NAME OF DRILLER	Joe Carmen & Brian Jasnoch
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	5.5
8. DEPTH DRILLED INTO ROCK	0.0
9. TOTAL DEPTH OF HOLE	6.0
10. SIZE AND TYPE OF BIT	3 1/4" Hollow Stem Auger
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	TBM
12. MANUFACTURER'S DESIGNATION OF DRILL	CME 550
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 3 / UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	Not detected 0hr/24hr
16. DATE HOLE	STARTED 12/22/2003 / COMPLETED 12/22/2003
17. ELEVATION TOP OF HOLE	+1282.1
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. GEOLOGIST	Nicholas Roth

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g	
+1281.4	0.7		8" of Topsoil				
			Brown Weathered **SHALE**	94	1 1.0 2.5	Split Spoon w%=4 N=50+	28 45 50
				33	2 3.0 5.0	Split Spoon w%=8 N=50+	42 50/2"
+1276.6	5.5						
+1276.1	6.0		Highly Weathered **LIMESTONE**				
			Auger Refusal at 6 feet	11	3 6.0 7.5	Split Spoon w%=4 N=50+	50/5"

KEY TO SYMBOLS

Topsoil

USCS High Plasticity Clay

Weathered Limestone

Weathered Shale

Shale

Weathered Limestone with Clay Seams

Fill (made ground)

HSA = Hollow Stem Auger

CFA = Continuous Flight Auger

SS = Split-spoon Sampler

ST = Shelby Tube Sampler

RC = Rock Core

DD = Dry Density

LL = Liquid Limit

PL = Plastic Limit

Qu = Unconfined Compressive Strength

Qp = Pocket Penetrometer

RQD = Rock Quality Designation

REC'D = Rock Core Recovery Percentage

PID = Photo Ionic Detector (ppm)

MR* = Unable to determine depth of water due to mud rotary drilling methods

The borings were advanced into the ground using hollow stem augers. At regular intervals throughout the boring depths, soil samples were obtained with either a 1.4-inch I.D., 2.0-inch O.D., split-spoon sampler or a 3-inch diameter Shelby tube. The split-spoon sampler was first seated 6-inches to penetrate any loose cuttings and then driven an additional foot where possible with blows of a 140 pound hammer falling 30-inches. The number of hammer blows required to drive the sampler each 6-inch increment is recorded in the field. The penetration resistance "N-value" is redesignated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split-spoon sampling procedures used during this exploration are in general accordance with ASTM Designation D 1586.

Relatively undisturbed Shelby tube samples were obtained by forcing a section of 3-inch diameter steel tubing into the soil at the desired sampling levels. This sampling procedure was in general accordance with ASTM Designation D 1587. Each tube, together with the encased soil, was carefully removed from the ground, sealed and transported to the laboratory for testing.

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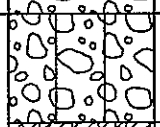
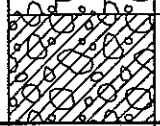
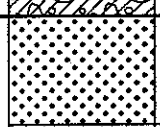
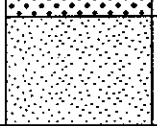
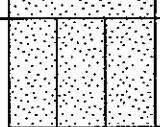
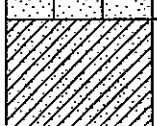
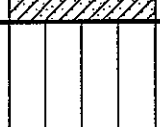
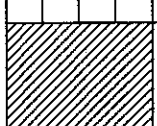
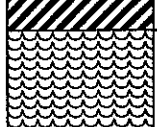
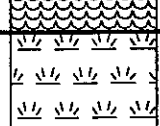
PSI Job No.: 338-35131
Project: O'Donnel Heights and Ellis Heights
Location: Fort Riley, Kansas

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

psi

APPENDIX II

SITE PREPARATION REQUIREMENTS

General

The site at the time of the geotechnical exploration was partially covered with surface vegetation. The in-situ high plasticity, clayey soils which may be exposed as part of site development are susceptible to pumping and rutting if exposed to moisture increases and/or disturbance from construction activities. The following site preparation requirements for building foundations and slab areas as well as pavement areas are the responsibility of the contractor.

Building Area

1. The surface vegetation and topsoil shall be stripped and removed from the site as directed by the owner.

2. After stripping and excavating to the proposed subgrade level, as required, the building areas should be proof-rolled with a loaded tandem axle dump truck or similar piece of heavy rubber tired vehicle (typically with an axial load greater than 9-tons). Soils that are observed to rut or deflect excessively (typically greater than 1-inch) under the moving load should be undercut and replaced with properly compacted fill. The proof-rolling and undercutting activities should be witnessed by a representative of the geotechnical engineer and should be performed during a period of dry weather. The subgrade soils should be scarified and compacted to at least 90% of the modified Proctor maximum dry unit weight, in general accordance with ASTM procedures, to a depth of at least 6-inches below the surface.

3. Highly plastic fat clays that will remain within 3-feet of floor slabs and foundations should be remediated prior to placement as new fill or in the surcharge load. The fat clays should be remediated as discussed earlier in the geotechnical engineering report. A qualified geotechnical representative designated by the owner should observe and document the preparation of the subgrade soils, perform plasticity index tests, and estimate the approximate extent of the fat clays. If the fat clays are modified with a lime product, the amount of lime amendment be estimated by conducting a lime series test well in advance of placement.. The qualified geotechnical representative designated by the should observe and document that the remediation procedures are in compliance with the project plans and specifications. Moisture content changes in the highly plastic soils should not be permitted during or after construction. Increases in moisture content can cause swelling of the high plasticity soils. If the exposed fat clays become inundated or desiccated, they should be removed prior to new fill placement. Ideally, excavation should be performed during a period of dry weather.

4. After proof-rolling and compaction, and/or undercutting have been completed, fill placement can proceed. Fill materials shall be free of organic or other deleterious materials, have a maximum particle size of 3 inches, and have a liquid limit less than 45 and plasticity index less than 25. Fill shall be placed in maximum lifts of eight (8) inches of loose material and shall be compacted within the range of two (2) percentage points below to two (2) percentage points above the optimum moisture content value as determined by the modified Proctor test, ASTM D1557. If water must be added, it shall be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each

completed lift of fill shall be compacted to a firm and unyielding condition and a minimum density of 90% of the modified Proctor dry unit weight as described above prior to placement of subsequent lifts of fill.

5. Permeable fill materialssuch as sand or clean stone used on this site should be given careful consideration. These permeable materials should not be placed within three feet of unmodified high plasticity clays. Even though the excavation may be dry, and no groundwater is anticipated, these permeable pockets will eventually collect water through condensation and therefore promote soil swelling and heaving. If any permeable fill is used, it should be drained through the use of sloped grading of the underlying solids and draintile or other appropriate means.

6. After utility installation and prior to placement of slab reinforcement and soil treatment, the floor slab areas for the entire building footprint shall be recompacted to a firm and unyielding condition and a minimum density of 90 percent of the soils modified Proctor maximum dry unit weight, as tested for a minimum depth of 12 inches and the full depth of all backfill over utility and plumbing trenches.

Foundation Requirements

1. Exterior footings and footings in unheated areas should be located at a depth of 36-inches or deeper below the final exterior grade to provide adequate frost protection. If the building is to be constructed during the winter months or if footings will likely be subjected to freezing temperatures after foundation construction, then interior and exterior footings should be protected from freezing. Otherwise, interior footings can be located at nominal depths compatible with architectural and structural considerations.

2. Individual column footings should be supported on only one type of bearing material. Where continuous footings transition from different types of material, the design plans should include a construction joint and that the footings in those areas be provided with additional reinforcing steel.

3. After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Care should be taken not to disturb the bottom of excavation during the placement of the forms, reinforcement, and the concrete.

4. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, the soils in the excavation should be protected to reduce evaporation or entry of moisture.

5. The foundation excavations should be observed and documented by a qualified geotechnical representative designated by the owner prior to steel or concrete placement to assess that the foundation materials are consistent with the materials and descriptions

discussed in this report. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of competent naturally deposited soils or properly compacted structural fill as directed by the project engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with lean concrete or dense graded compacted crushed stone.

APPENDIX III

ENGINEERING CALCULATIONS

Ellis Heights Rectangular Footing Bearing Capacity..... III-1
Ellis Heights Continuous Footing Bearing Capacity..... III-2
O'Donnell Heights Rectangular Footing Bearing Capacity III-3
O'Donnell Continuous Footing Bearing Capacity..... III-4
Ellis Heights Rectangular Footing Settlement..... III-5
Ellis Heights Continuous Footing Settlement..... III-6
O'Donnell Heights Rectangular Settlement III-7
O'Donnell Continuous Footing Settlement Bearing Capacity III-8
Swell Potential Calculations..... III-9
Heave vs. Applied Loading III-10

Federal Highway Administration

CBEAR/PC - BEARING CAPACITY ANALYSIS
Using Meyerhof (1963)

Project Name	: Ellis Heights	Client	: US Army Corp
File Name	: Ellis.cbr	Project Manager	: Kevin Miller
Date	: 2/12/10	Computed by	: Nicholas Roth

FOUNDATION AND SOIL DESCRIPTIONS

* FOUNDATION GEOMETRY WIDTH = 2.00 LENGTH = 2.00

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
3.00	0.00	3.00	2.00

FOUNDATION TYPE : RECTANGULAR

* SOIL DATA

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
10.00	0.00	10.00	30.00

FRICTION ANGLE (deg)	COHESION (psf)	TOTAL UNIT WEIGHT (psf)
0.00	2500.00	130.00

* SURCHARGE DESCRIPTION

SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)	SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)
1	*******	***	2	*******	***

* WATER TABLE DESCRIPTION

WATER TABLE ELEVATION : ***** (ft)

UNIT WEIGHT OF WATER : ***** (pcf)

* APPLIED LOAD DESCRIPTION

APPLIED LOAD	:	25.0	(Kips)
X-COORD. of LOAD	:	1.0	(ft)
Z-COORD. of LOAD	:	1.0	(ft)
ANGLE of INCLINAT.	:	0.0	(deg.)

* EFFECTIVE BASE DIMENSIONS : WIDTH = 2.00 LENGTH = 2.00

*** SUMMARY OF BEARING CAPACITY FACTORS ***

FACTORS	FNC	FNQ	FNG	BEARING CAPACITY (Ksf)	
BEARING CAP.	5.1400	1.0000	0.0000	13.7600	
SHAPE - CONC.	1.2000	1.0000	1.0000	16.3300	SELECTED
SHAPE ECC.	1.0000	1.0000	1.0000	16.3300	NOT SEL.
INCLINATION	1.0000	1.0000	1.0000	16.3300	NOT SEL.
BASE TILT	1.0000	1.0000	1.0000	16.3300	NOT SEL.
GROUND SLOPE	1.0000	1.0000	1.0000	16.3300	NOT SEL.
EMBEDMENT	1.7000	1.0000	1.0000	27.1240	SELECTED

	FNC	+	FNQ	+	FNG	=	Q	
COMBINE EFFECTS of FACTORS	26.214		0.910		0.000		27.124	(Ksf)

Federal Highway Administration

CBEAR/PC - BEARING CAPACITY ANALYSIS
Using Meyerhof (1963)

Project Name	: Ellis Heights	Client	: US Army Corp
File Name	: Ellis.cbr	Project Manager	: Kevin Miller
Date	: 2/12/10	Computed by	: NJR

FOUNDATION AND SOIL DESCRIPTIONS

* FOUNDATION GEOMETRY WIDTH = 2.00 LENGTH = ******

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
3.00	0.00	3.00	2.00

FOUNDATION TYPE : CONTINUOUS

* SOIL DATA

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
10.00	0.00	10.00	30.00

FRICTION ANGLE (deg)	COHESION (psf)	TOTAL UNIT WEIGHT (psf)
0.00	2500.00	130.00

* SURCHARGE DESCRIPTION

SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)	SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)
1	*******	***	2	*******	***

* WATER TABLE DESCRIPTION

WATER TABLE ELEVATION : ***** (ft)

UNIT WEIGHT OF WATER : ***** (pcf)

* APPLIED LOAD DESCRIPTION

APPLIED LOAD	:	3.0	(Kips)
X-COORD. of LOAD	:	1.0	(ft)
Z-COORD. of LOAD	:	2.0	(ft)
ANGLE of INCLINAT.	:	0.0	(deg.)

* EFFECTIVE BASE DIMENSIONS : WIDTH = 2.00 LENGTH = 1.00

*** SUMMARY OF BEARING CAPACITY FACTORS ***

FACTORS	FNC	FNQ	FNG	BEARING CAPACITY (Ksf)	
BEARING CAP.	5.1400	1.0000	0.0000	13.7600	
SHAPE - CONC.	1.0000	1.0000	1.0000	13.7600	SELECTED
SHAPE ECC.	1.0000	1.0000	1.0000	13.7600	NOT SEL.
INCLINATION	1.0000	1.0000	1.0000	13.7600	NOT SEL.
BASE TILT	1.0000	1.0000	1.0000	13.7600	NOT SEL.
GROUND SLOPE	1.0000	1.0000	1.0000	13.7600	NOT SEL.
EMBEDMENT	1.7000	1.0000	1.0000	22.7550	SELECTED
	FNC +	FNQ +	FNG =	Q	
COMBINE EFFECTS of FACTORS	21.845	0.910	0.000	22.755	(Ksf)

Federal Highway Administration

CBEAR/PC - BEARING CAPACITY ANALYSIS
Using Meyerhof (1963)

Project Name	: O'Donnell Heights	Client	: US Army Corp
File Name	: ODhieghts.in	Project Manager	: Kevin Miller
Date	: 2/12/10	Computed by	: NJR

FOUNDATION AND SOIL DESCRIPTIONS

* FOUNDATION GEOMETRY WIDTH = 2.00 LENGTH = 2.00

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
3.00	0.00	3.00	2.00

FOUNDATION TYPE : RECTANGULAR

* SOIL DATA

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
10.00	0.00	10.00	30.00

FRICTION ANGLE (deg)	COHESION (psf)	TOTAL UNIT WEIGHT (psf)
0.00	3450.00	130.00

* SURCHARGE DESCRIPTION

SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)	SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)
1	*******	***	2	*******	***

* WATER TABLE DESCRIPTION

WATER TABLE ELEVATION : ***** (ft)

UNIT WEIGHT OF WATER : ***** (pcf)

* APPLIED LOAD DESCRIPTION

APPLIED LOAD	:	25.0	(Kips)
X-COORD. of LOAD	:	1.0	(ft)
Z-COORD. of LOAD	:	1.0	(ft)
ANGLE of INCLINAT.	:	0.0	(deg.)

* EFFECTIVE BASE DIMENSIONS : WIDTH = 2.00 LENGTH = 2.00

*** SUMMARY OF BEARING CAPACITY FACTORS ***

FACTORS	FNC	FNQ	FNG	BEARING CAPACITY (Ksf)	
BEARING CAP.	5.1400	1.0000	0.0000	18.6430	
SHAPE - CONC.	1.2000	1.0000	1.0000	22.1896	SELECTED
SHAPE ECC.	1.0000	1.0000	1.0000	22.1896	NOT SEL.
INCLINATION	1.0000	1.0000	1.0000	22.1896	NOT SEL.
BASE TILT	1.0000	1.0000	1.0000	22.1896	NOT SEL.
GROUND SLOPE	1.0000	1.0000	1.0000	22.1896	NOT SEL.
EMBEDMENT	1.7000	1.0000	1.0000	37.0853	SELECTED
	FNC +	FNQ +	FNG =	Q	
COMBINE EFFECTS of FACTORS	36.175	0.910	0.000	37.085	(Ksf)

Federal Highway Administration

CBEAR/PC - BEARING CAPACITY ANALYSIS
Using Meyerhof (1963)

Project Name	: O'Donnell Heights	Client	: US Army Corp
File Name	: ODhieghts.in	Project Manager	: Kevin Miller
Date	: 2/12/10	Computed by	: NJR

FOUNDATION AND SOIL DESCRIPTIONS

* FOUNDATION GEOMETRY WIDTH = 2.00 LENGTH = ******

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
3.00	0.00	3.00	2.00

FOUNDATION TYPE : CONTINUOUS

* SOIL DATA

LEFT SIDE: ELEV. (ft)	X-COORD. (ft)	RIGHT SIDE: ELEV. (ft)	X-COORD. (ft)
10.00	0.00	10.00	30.00

FRICTION ANGLE (deg)	COHESION (psf)	TOTAL UNIT WEIGHT (psf)
0.00	3450.00	130.00

* SURCHARGE DESCRIPTION

SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)	SURCH. NO.	SURFACE ELEVATION (ft)	UNIT WEIGHT TOTAL (pcf)
1	*******	***	2	*******	***

* WATER TABLE DESCRIPTION

WATER TABLE ELEVATION : ***** (ft)

UNIT WEIGHT OF WATER : ***** (pcf)

* APPLIED LOAD DESCRIPTION

APPLIED LOAD	:	3.0	(Kips)
X-COORD. of LOAD	:	1.0	(ft)
Z-COORD. of LOAD	:	1.0	(ft)
ANGLE of INCLINAT.	:	0.0	(deg.)

* EFFECTIVE BASE DIMENSIONS : WIDTH = 2.00 LENGTH = 1.00

*** SUMMARY OF BEARING CAPACITY FACTORS ***

FACTORS	FNC	FNQ	FNG	BEARING CAPACITY (Ksf)	
BEARING CAP.	5.1400	1.0000	0.0000	18.6430	
SHAPE - CONC.	1.0000	1.0000	1.0000	18.6430	SELECTED
SHAPE ECC.	1.0000	1.0000	1.0000	18.6430	NOT SEL.
INCLINATION	1.0000	1.0000	1.0000	18.6430	NOT SEL.
BASE TILT	1.0000	1.0000	1.0000	18.6430	NOT SEL.
GROUND SLOPE	1.0000	1.0000	1.0000	18.6430	NOT SEL.
EMBEDMENT	1.7000	1.0000	1.0000	31.0561	SELECTED
	FNC +	FNQ +	FNG =	Q	
COMBINE EFFECTS of FACTORS	30.146	0.910	0.000	31.056	(Ksf)

Ellis Heights Settlement

Ref: Das (1990) Section 3.19

Profile EH'03-7

Q=	25000	B=	2
q=	6250	L=	2
		D=	3

Depth	gamma total	sig(v)	water	pore pressure	sig'(v)	sig'(p)	delta sig(v)	sig'(v)+ delta sig	e(0)	C(r)	C(c)	strain1	strain2	strain	settle-ment
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	121	121	0	0	121	0	0	121	0.543	0	0	#NUM!	#DIV/0!	0	0
2	121	242	0	0	242	0	0	242	0.543	0	0	#NUM!	#DIV/0!	0	0
3	126	368	62.4	62.4	305.6	17,000	6250	6555.6	0.543	0.01	0.21	0.008629	0	0.008629	0
4	126	494	62.4	124.8	369.2	17,000	2777.78	3146.978	0.543	0.01	0.21	0.006031	0	0.006031	0.00733
5	126	620	62.4	187.2	432.8	17,000	1562.5	1995.3	0.543	0.01	0.21	0.004301	0	0.004301	0.005166
6	124	744	62.4	249.6	494.4	17,000	1000	1494.4	0.543	0.01	0.21	0.003113	0	0.003113	0.003707
7	124	868	62.4	312	556	17,000	694.444	1250.444	0.543	0.01	0.21	0.002281	0	0.002281	0.002697
8	124	992	62.4	374.4	617.6	17,000	510.204	1127.804	0.543	0.01	0.21	0.001695	0	0.001695	0.001988
9	130	1122	62.4	436.8	685.2	17,000	390.625	1075.825	0.543	0.01	0.21	0.00127	0	0.00127	0.001482
10	130	1252	62.4	499.2	752.8	17,000	308.642	1061.442	0.543	0.01	0.21	0.000967	0	0.000967	0.001118
11	130	1382	62.4	561.6	820.4	17,000	250	1070.4	0.543	0.01	0.21	0.000749	0	0.000749	0.000858
12	130	1512	62.4	624	888	17,000	206.612	1094.612	0.543	0.01	0.21	0.000589	0	0.000589	0.000669
13	130	1642	62.4	686.4	955.6	17,000	173.611	1129.211	0.543	0.01	0.21	0.00047	0	0.00047	0.000529
14	130	1772	62.4	748.8	1023.2	17,000	147.929	1171.129	0.543	0.01	0.21	0.00038	0	0.00038	0.000425
15	130	1902	62.4	811.2	1090.8	17,000	127.551	1218.351	0.543	0.01	0.21	0.000311	0	0.000311	0.000346
16	130	2032	62.4	873.6	1158.4	17,000	111.111	1269.511	0.543	0.01	0.21	0.000258	0	0.000258	0.000285

Spreadsheet From: Thomas Wolff "Spreadsheet Applicationsin Geotechnical Engineering"
PWS Publishing Co., Boston, MA, 1995

Total (ft) = 0.026601

Ellis Heights Settlement

Ref: Das (1990) Section 3.19

Profile EH'03-7

Q=	80000	B=	1.5
q=	2667	L=	20
		D=	3

Depth	gamma total	sig(v)	water	pore pressure	sig'(v)	sig'(p)	delta sig(v)	sig'(v)+ delta sig	e(0)	C(r)	C(c)	strain1	strain2	strain	settle-ment
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	121	121	0	0	121	0	0	121	0.543	0	0	#NUM!	#DIV/0!	0	0
2	121	242	0	0	242	0	0	242	0.543	0	0	#NUM!	#DIV/0!	0	0
3	126	368	62.4	62.4	305.6	17,000	2666.67	2972.267	0.543	0.01	0.21	0.006403	0	0.006403	0
4	126	494	62.4	124.8	369.2	17,000	1523.81	1893.01	0.543	0.01	0.21	0.004601	0	0.004601	0.005502
5	126	620	62.4	187.2	432.8	17,000	1038.96	1471.761	0.543	0.01	0.21	0.003445	0	0.003445	0.004023
6	124	744	62.4	249.6	494.4	17,000	772.947	1267.347	0.543	0.01	0.21	0.002649	0	0.002649	0.003047
7	124	868	62.4	312	556	17,000	606.061	1162.061	0.543	0.01	0.21	0.002075	0	0.002075	0.002362
8	124	992	62.4	374.4	617.6	17,000	492.308	1109.908	0.543	0.01	0.21	0.00165	0	0.00165	0.001862
9	130	1122	62.4	436.8	685.2	17,000	410.256	1095.456	0.543	0.01	0.21	0.001321	0	0.001321	0.001485
10	130	1252	62.4	499.2	752.8	17,000	348.584	1101.384	0.543	0.01	0.21	0.001071	0	0.001071	0.001196
11	130	1382	62.4	561.6	820.4	17,000	300.752	1121.152	0.543	0.01	0.21	0.000879	0	0.000879	0.000975
12	130	1512	62.4	624	888	17,000	262.726	1150.726	0.543	0.01	0.21	0.000729	0	0.000729	0.000804
13	130	1642	62.4	686.4	955.6	17,000	231.884	1187.484	0.543	0.01	0.21	0.000611	0	0.000611	0.00067
14	130	1772	62.4	748.8	1023.2	17,000	206.452	1229.652	0.543	0.01	0.21	0.000517	0	0.000517	0.000564
15	130	1902	62.4	811.2	1090.8	17,000	185.185	1275.985	0.543	0.01	0.21	0.000441	0	0.000441	0.000479
16	130	2032	62.4	873.6	1158.4	17,000	167.189	1325.589	0.543	0.01	0.21	0.000379	0	0.000379	0.00041

Spreadsheet From: Thomas Wolff "Spreadsheet Applicationsin Geotechnical Engineering"
PWS Publishing Co., Boston, MA, 1995

Total (ft) = 0.023381

O'Donnell Heights Settlement

Ref: Das (1990) Section 3.19

Q=	25000	B=	2
q=	6250	L=	2
		D=	3

Profile OD'03-1

Depth	gamma total	sig(v)	water	pore pressure	sig'(v)	sig'(p)	delta sig(v)	sig'(v)+ delta sig	e(0)	C(r)	C(c)	strain1	strain2	strain	settle-ment
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	121	121	0	0	121	0	0	121	0.536	0	0	#NUM!	#DIV/0!	0	0
2	121	242	0	0	242	0	0	242	0.536	0	0	#NUM!	#DIV/0!	0	0
3	126	368	0	0	368	10,800	6250	6618	0.536	0.01	0.04	0.00817	0	0.00817	0
4	126	494	0	0	494	10,800	2777.78	3271.778	0.536	0.01	0.04	0.005345	0	0.005345	0.006758
5	126	620	0	0	620	10,800	1562.5	2182.5	0.536	0.01	0.04	0.003558	0	0.003558	0.004452
6	124	744	0	0	744	10,800	1000	1744	0.536	0.01	0.04	0.002409	0	0.002409	0.002984
7	124	868	62.4	62.4	805.6	10,800	694.444	1500.044	0.536	0.01	0.04	0.001758	0	0.001758	0.002083
8	124	992	62.4	124.8	867.2	10,800	510.204	1377.404	0.536	0.01	0.04	0.001308	0	0.001308	0.001533
9	130	1122	62.4	187.2	934.8	10,800	390.625	1325.425	0.536	0.01	0.04	0.000987	0	0.000987	0.001148
10	130	1252	62.4	249.6	1002.4	10,800	308.642	1311.042	0.536	0.01	0.04	0.000759	0	0.000759	0.000873
11	130	1382	62.4	312	1070	10,800	250	1320	0.536	0.01	0.04	0.000594	0	0.000594	0.000676
12	130	1512	62.4	374.4	1137.6	10,800	206.612	1344.212	0.536	0.01	0.04	0.000472	0	0.000472	0.000533
13	130	1642	62.4	436.8	1205.2	10,800	173.611	1378.811	0.536	0.01	0.04	0.000381	0	0.000381	0.000426
14	130	1772	62.4	499.2	1272.8	10,800	147.929	1420.729	0.536	0.01	0.04	0.000311	0	0.000311	0.000346
15	130	1902	62.4	561.6	1340.4	10,800	127.551	1467.951	0.536	0.01	0.04	0.000257	0	0.000257	0.000284
16	130	2032	62.4	624	1408	10,800	111.111	1519.111	0.536	0.01	0.04	0.000215	0	0.000215	0.000236

Spreadsheet From: Thomas Wolff "Spreadsheet Applicationsin Geotechnical Engineering"
PWS Publishing Co., Boston, MA, 1995

Total = 0.022331

O'Donnell Heights Settlement

Ref: Das (1990) Section 3.19

Q=	80000	B=	1.5
q=	2667	L=	20
		D=	3

Profile OD'03-1

Depth	gamma total	sig(v)	water	pore pressure	sig'(v)	sig'(p)	delta sig(v)	sig'(v)+ delta sig	e(0)	C(r)	C(c)	strain1	strain2	strain	settle-ment
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	121	121	0	0	121	0	0	121	0.536	0	0	#NUM!	#DIV/0!	0	0
2	121	242	0	0	242	0	0	242	0.536	0	0	#NUM!	#DIV/0!	0	0
3	126	368	62.4	62.4	305.6	10,800	2666.67	2972.267	0.536	0.01	0.04	0.006432	0	0.006432	0
4	126	494	62.4	124.8	369.2	10,800	1523.81	1893.01	0.536	0.01	0.04	0.004622	0	0.004622	0.005527
5	126	620	62.4	187.2	432.8	10,800	1038.96	1471.761	0.536	0.01	0.04	0.003461	0	0.003461	0.004041
6	124	744	62.4	249.6	494.4	10,800	772.947	1267.347	0.536	0.01	0.04	0.002662	0	0.002662	0.003061
7	124	868	62.4	312	556	10,800	606.061	1162.061	0.536	0.01	0.04	0.002084	0	0.002084	0.002373
8	124	992	62.4	374.4	617.6	10,800	492.308	1109.908	0.536	0.01	0.04	0.001657	0	0.001657	0.001871
9	130	1122	62.4	436.8	685.2	10,800	410.256	1095.456	0.536	0.01	0.04	0.001327	0	0.001327	0.001492
10	130	1252	62.4	499.2	752.8	10,800	348.584	1101.384	0.536	0.01	0.04	0.001076	0	0.001076	0.001201
11	130	1382	62.4	561.6	820.4	10,800	300.752	1121.152	0.536	0.01	0.04	0.000883	0	0.000883	0.000979
12	130	1512	62.4	624	888	10,800	262.726	1150.726	0.536	0.01	0.04	0.000733	0	0.000733	0.000808
13	130	1642	62.4	686.4	955.6	10,800	231.884	1187.484	0.536	0.01	0.04	0.000614	0	0.000614	0.000674
14	130	1772	62.4	748.8	1023.2	10,800	206.452	1229.652	0.536	0.01	0.04	0.00052	0	0.00052	0.000567
15	130	1902	62.4	811.2	1090.8	10,800	185.185	1275.985	0.536	0.01	0.04	0.000443	0	0.000443	0.000482
16	130	2032	62.4	873.6	1158.4	10,800	167.189	1325.589	0.536	0.01	0.04	0.000381	0	0.000381	0.000412

Spreadsheet From: Thomas Wolff "Spreadsheet Applicationsin Geotechnical Engineering"
PWS Publishing Co., Boston, MA, 1995

Total = 0.023488

Ellis Heights Swell Potential Calculations

EH'03 – 1

2,000psf Applied Pressure

$$\%heave = \frac{0.690 - 0.667}{1 + 0.667} = 1.4\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

EH'03 – 2

2,000psf Applied Pressure

$$\%heave = \frac{0.556 - 0.517}{1 + 0.517} = 2.5\%$$

6,500psf Applied Pressure

$$\%heave = \frac{0.536 - 0.517}{1 + 0.517} = 1.3\%$$

EH'03 – 4

2,000psf Applied Pressure

$$\%heave = \frac{0.663 - 0.655}{1 + 0.655} = 0.5\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

EH'03 – 5

2,000psf Applied Pressure

$$\%heave = \frac{0.590 - 0.583}{1 + 0.583} = 0.4\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

EH'03 – 6

2,000psf Applied Pressure

$$\%heave = \frac{0.660 - 0.651}{1 + 0.651} = 0.5\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

EH'03 –7

2,000psf Applied Pressure

$$\%heave = \frac{0.570 - 0.543}{1 + 0.543} = 1.7\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

O'Donnell Heights Swell Potential Calculations

OD'03 – 1

2,000psf Applied Pressure

$$\%heave = \frac{0.544 - 0.536}{1 + 0.536} = 0.5\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

OD'03 – 2

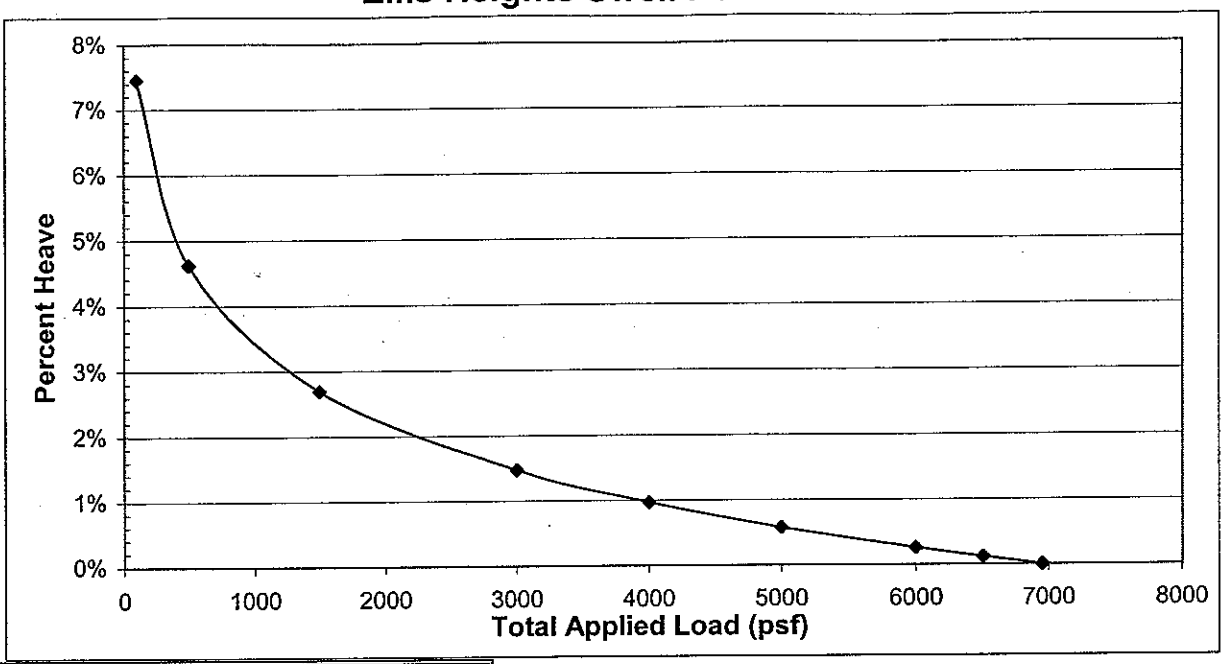
2,000psf Applied Pressure

$$\%heave = \frac{0.654 - 0.653}{1 + 0.653} = 0.0\%$$

6,500psf Applied Pressure

Applied Load Exceeds the swell pressure

Ellis Heights Swell Potental

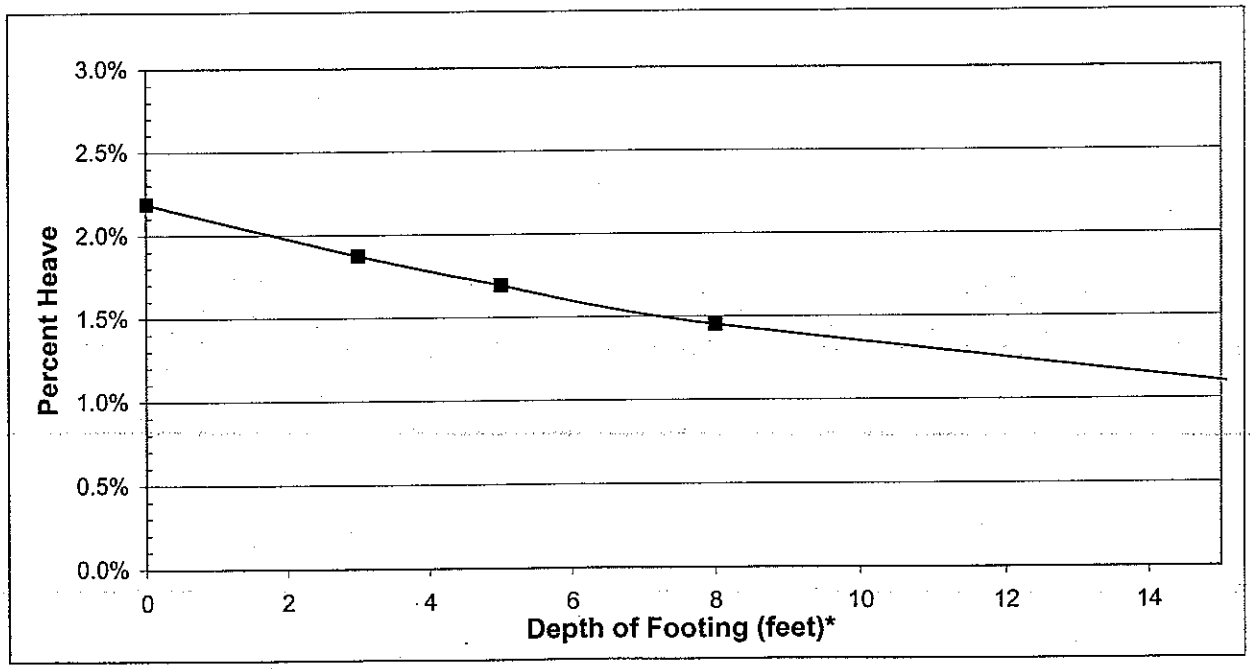


Average Swell Pressure (psf)	6950
Average C_s	0.065
Average Initial Void Ratio	0.603

Applied Load (psf)	e_{vo}	Δe	%heave
100	0.72242	0.11942	7.45%
500	0.67711	0.07411	4.62%
1500	0.64617	0.04317	2.69%
3000	0.62666	0.02366	1.48%
4000	0.61856	0.01556	0.97%
5000	0.61227	0.00927	0.58%
6000	0.60714	0.00414	0.26%
6500	0.60488	0.00188	0.12%
6950	0.603	0	0.00%

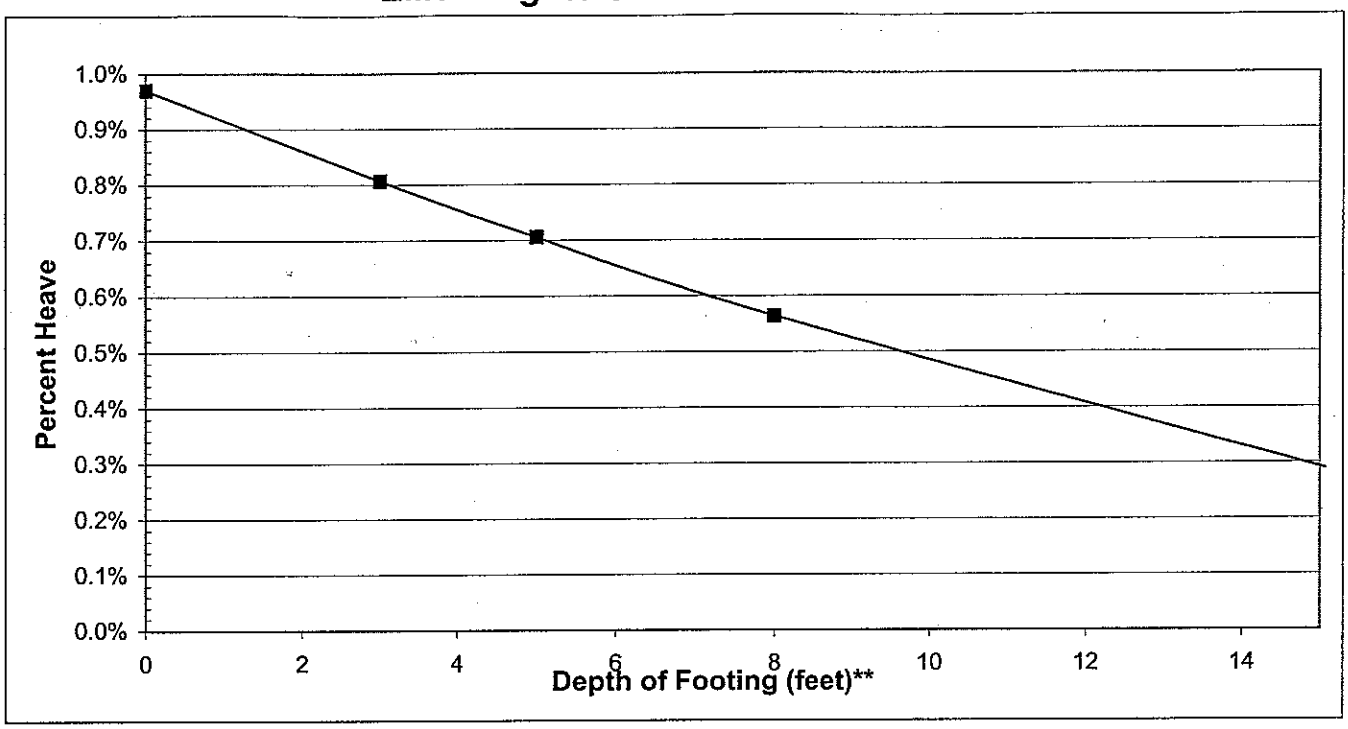
Applied Footing load	2000	psf
Unit Weight of Soil	130	pcf

Depth of Footing (ft)	Total Applied Load (psf)	e_{vo}	Δe	%heave
0	2000	0.63807	0.035	2.19%
3	2390	0.63306	0.030	1.87%
5	2650	0.63015	0.027	1.69%
8	3040	0.62628	0.023	1.45%
37	6810	0.60357	0.001	0.04%

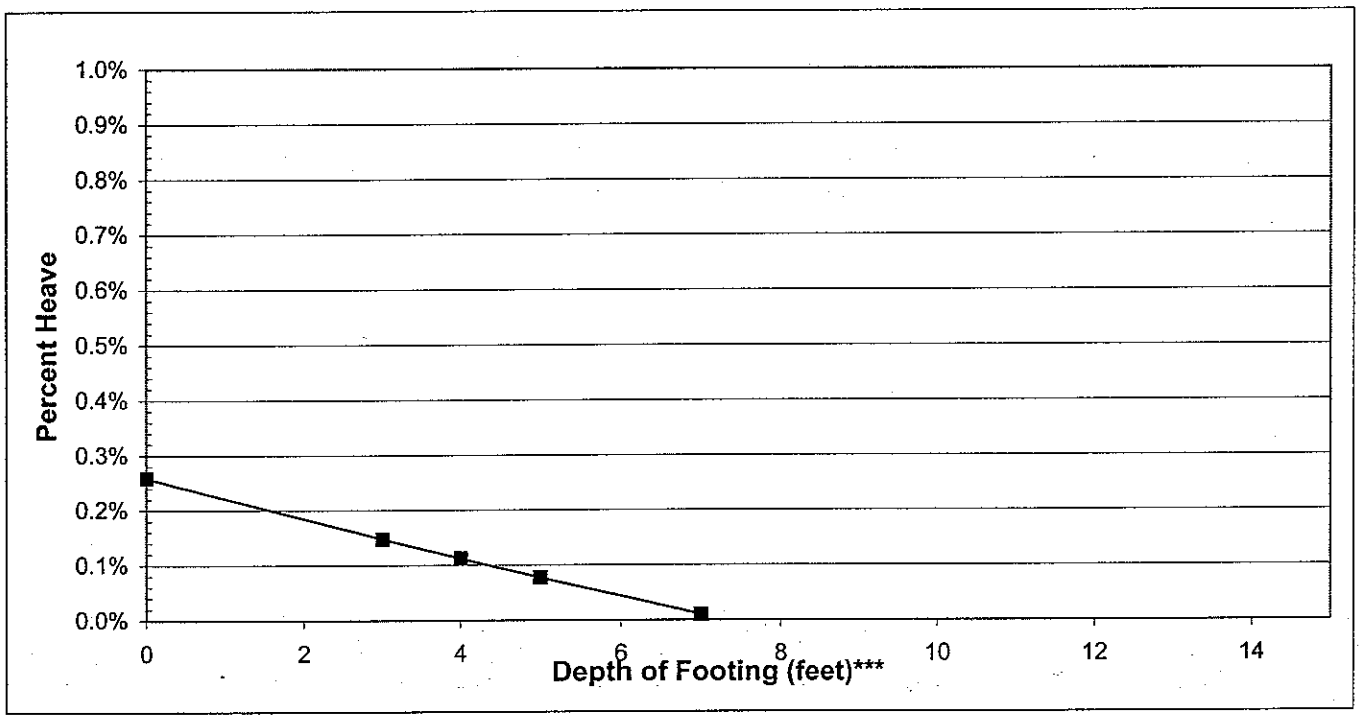


*Based on an Applied Footing Pressure of 2000 psf

Ellis Heights Swell Potental



**Based on an Applied Footing Pressure of 4000 psf

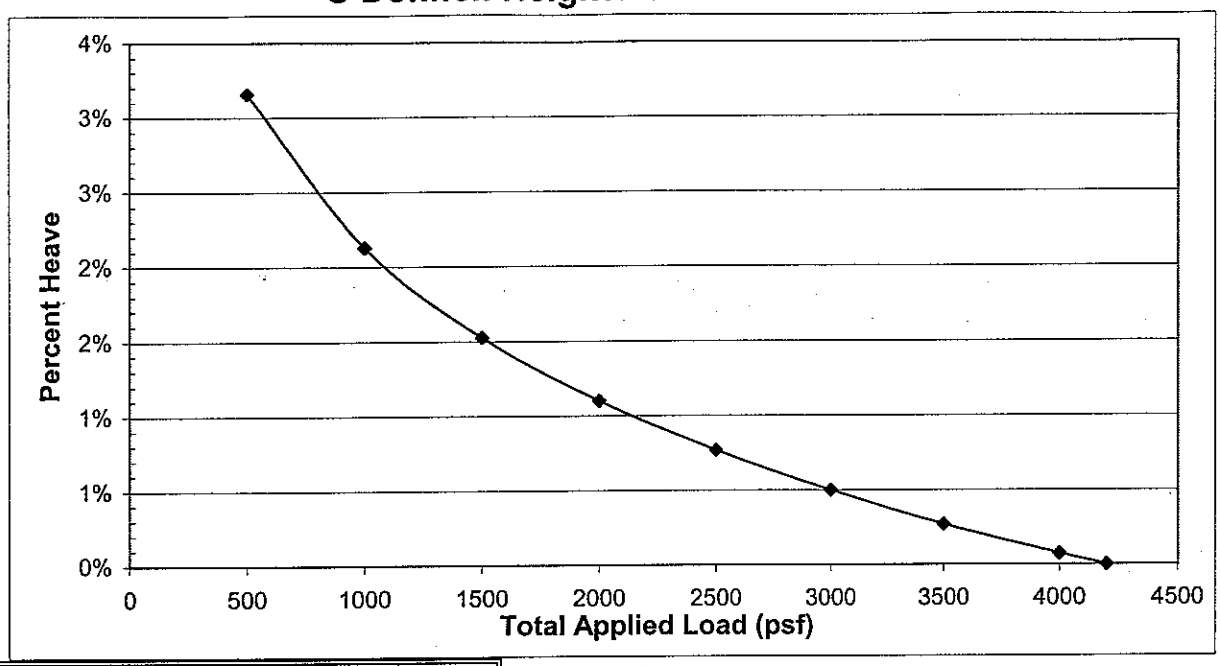


***Based on an Applied Footing Pressure of 6000 psf

Applied Footing load	4000	psf		
Unit Weight of Soil	130	pcf		
Depth of Footing (ft)	Total Applied Load (psf)	e_{vo}	Δe	%heave
0	4000	0.6186	0.016	0.97%
3	4390	0.6159	0.013	0.81%
5	4650	0.6143	0.011	0.71%
8	5040	0.612	0.009	0.56%
22	6860	0.6034	0.000	0.02%

Applied Footing load	6000	psf		
Unit Weight of Soil	130	pcf		
Depth of Footing (ft)	Total Applied Load (psf)	e_{vo}	Δe	%heave
0	6000	0.60714	0.00414	0.26%
3	6390	0.60537	0.00237	0.15%
4	6520	0.6048	0.0018	0.11%
5	6650	0.60424	0.00124	0.08%
7	6910	0.60316	0.00016	0.01%

O'Donnell Heights Swell Potental

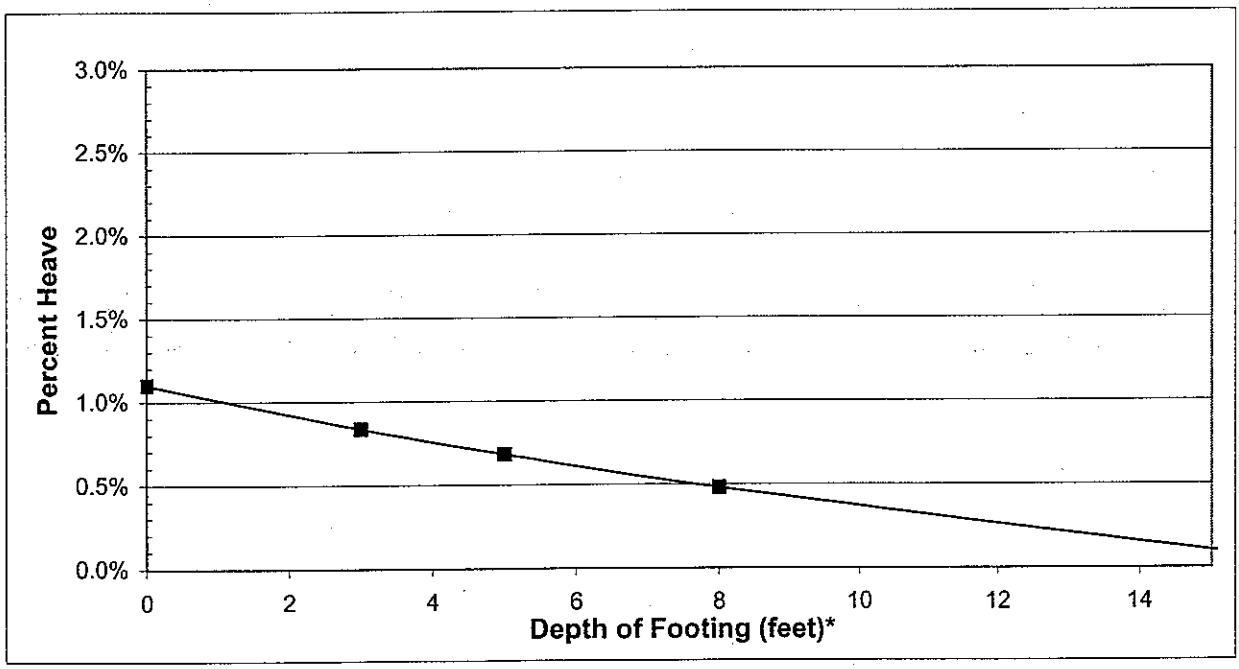


Average Swell Pressure (psf)	4200
Average C_s	0.055
Average Initial Void Ratio	0.595

Applied Load (psf)	e_{vo}	Δe	%heave
500	0.64537	0.05037	3.16%
1000	0.62897	0.03397	2.13%
1500	0.61937	0.02437	1.53%
2000	0.61256	0.01756	1.10%
2500	0.60728	0.01228	0.77%
3000	0.60296	0.00796	0.50%
3500	0.59932	0.00432	0.27%
4000	0.59615	0.00115	0.07%
4200	0.595	0	0.00%

Applied Footing load	2000	psf
Unit Weight of Soil	130	pcf

Depth of Footing (ft)	Total Applied Load (psf)	e_{vo}	Δe	%heave
0	2000	0.61256	0.018	1.10%
3	2390	0.60834	0.013	0.84%
5	2650	0.6059	0.011	0.68%
8	3040	0.60265	0.008	0.48%
17	4210	0.59494	0.000	0.00%



*Based on an Applied Footing Pressure of 2000 psf

APPENDIX IV

Laboratory Results

General Summary of Laboratory Results IV-1
Unconfined Compression Results IV-3
Atterberg Limits' Results IV-5
Swell Tests
- EH'03-1 Sample 2 ..... IV-6
- EH'03-2 Sample 3 ..... IV-14
- EH'03-4 Sample 4 ..... IV-23
- EH'03-5 Sample 2 ..... IV-33
- EH'03-6 Sample 3 ..... IV-43
- EH'03-7 Sample 2 ..... IV-52
- OD'03-1 Sample 2 ..... IV-64
- OD'03-2 Sample 3 ..... IV-74

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Qu (psf)	%<#4 Sieve	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Remarks
EH03-1	1.0							21.3		
EH03-1	3.0	58	16	41	9982			14.7	113.6	
EH03-1	6.0							21.0		
EH03-1	8.5							23.2		
EH03-1	13.5							26.5		
EH03-1	18.5							18.2		
EH03-2	1.0							21.3		
EH03-2	3.5							15.1		
EH03-2	6.5	57	15	42						
EH03-2	8.5							20.3		
EH03-2	13.5							12.8		
EH03-2	18.5							16.7		
EH03-3	1.0							20.4		
EH03-3	3.0	51	16	35	10244			18.0	108.3	
EH03-3	6.0				7609			22.9	96.2	
EH03-3	8.5							6.8		
EH03-3	13.5							10.8		
EH03-3	18.5							14.0		
EH03-4	1.0							20.3		
EH03-4	3.5							14.4		
EH03-4	6.0							13.1		
EH03-4	8.5	49	17	33				31.5		
EH03-4	13.5							17.7		
EH03-4	18.5							25.8		
EH03-5	1.0							19.3		
EH03-5	3.0	48	14	35	8603			17.6	104.2	
EH03-5	6.0							16.7		
EH03-5	8.5							13.9		
EH03-5	13.5							17.2		
EH03-5	18.5							17.1		
EH03-6	1.0							15.8		
EH03-6	3.5							16.4		
EH03-6	6.0	62	21	41	10365			14.1	110.1	
EH03-6	8.5							9.1		
EH03-6	13.5							10.0		
EH03-6	18.5							14.9		
EH03-7	1.0							14.3		
EH03-7	3.0	63	14	49	7094			18.1	105.4	
EH03-7	6.0							15.5		
EH03-7	8.5							16.8		
EH03-7	13.5							18.9		
EH03-7	18.5							14.0		

psi
4106 NW Riverside Dr.
Riverside, MO 64150
Phone: 816/741-9466
Fax: 816/587-2996

Summary of Laboratory Results

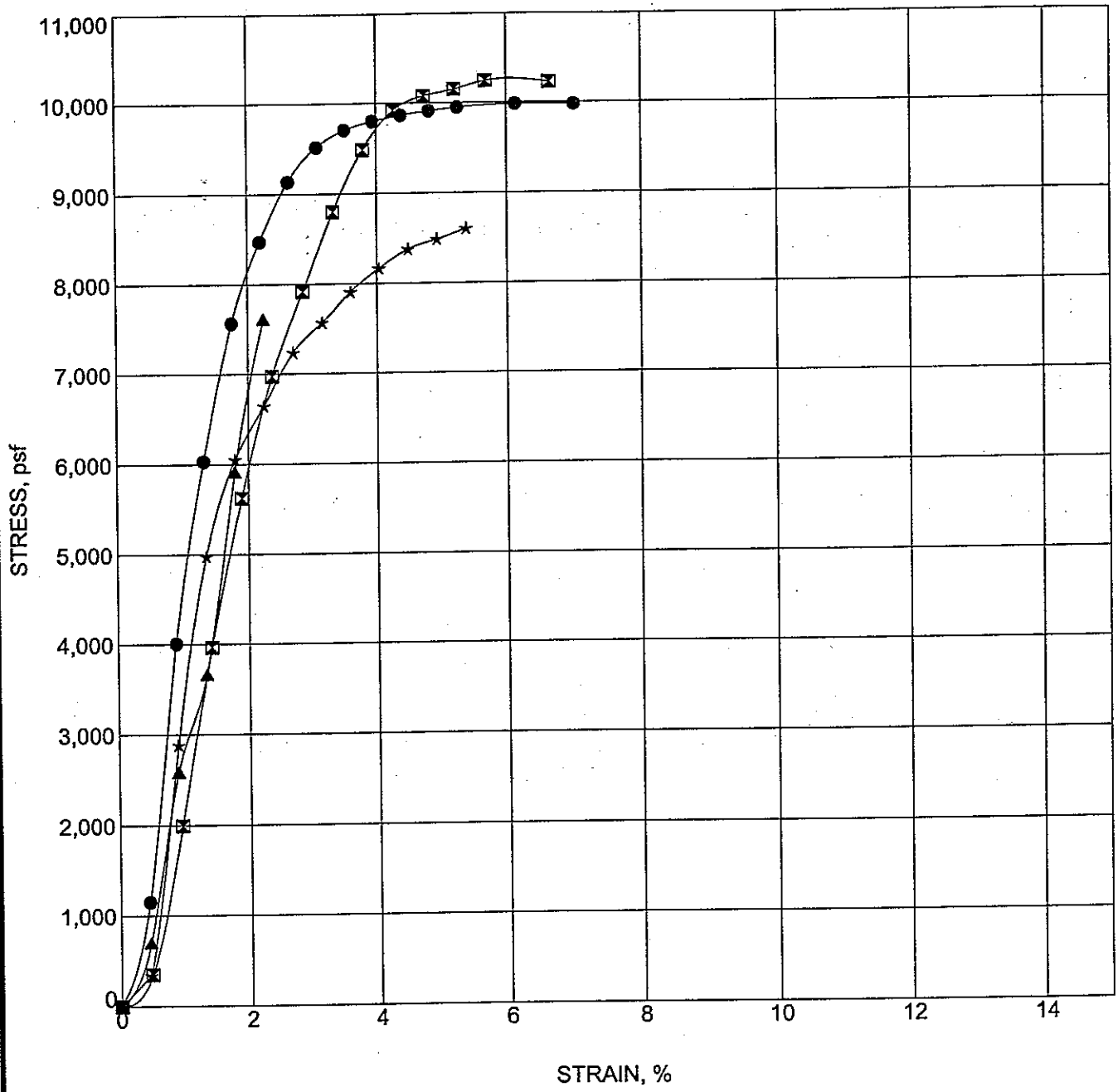
PSI Job No.: 338-35131
Project: Family Housing Replacement
Location: Ft. Riley, Kansas

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Qu (psf)	%<#4 Sieve	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Remarks
EH03-8	1.0							14.4		
EH03-8	3.5							19.2		
EH03-8	6.0				10177			17.1	105.9	
EH03-8	8.5							22.7		
EH03-8	13.5							24.5		
EH03-8	18.5							22.0		
OD03-1	1.0							14.6		
OD03-1	3.0	54	14	40						
OD03-1	6.0							12.9		
OD03-1	8.5							23.7		
OD03-1	10.5							12.8		
OD03-2	1.0							21.0		
OD03-2	3.5							14.7		
OD03-2	6.0	73	14	59				16.9		
OD03-2	8.5							21.4		
OD03-2	13.0							11.9		
OD03-3	1.0							18.9		
OD03-3	3.0							15.1		
OD03-3	6.0	61	13	47				4.0		
OD03-3	8.5							14.6		
OD03-3	10.0							9.9		
OD03-4	1.0							17.9		
OD03-4	3.5							5.6		
OD03-4	6.0							8.7		
OD03-5	1.0							17.2		
OD03-5	3.0							1.0		
OD03-5	6.0							12.9		
OD03-5	8.5							12.5		
OD03-5	13.5							11.9		
OD03-5	18.5							12.5		
OD03-6	1.0							4.3		
OD03-6	3.5							7.8		
OD03-6	6.0							3.6		

4106 NW Riverside Dr.
Riverside, MO 64150
Phone: 816/741-9466
Fax: 816/587-2996

Summary of Laboratory Results

PSI Job No.: 338-35131
Project: Family Housing Replacement
Location: Ft. Riley, Kansas

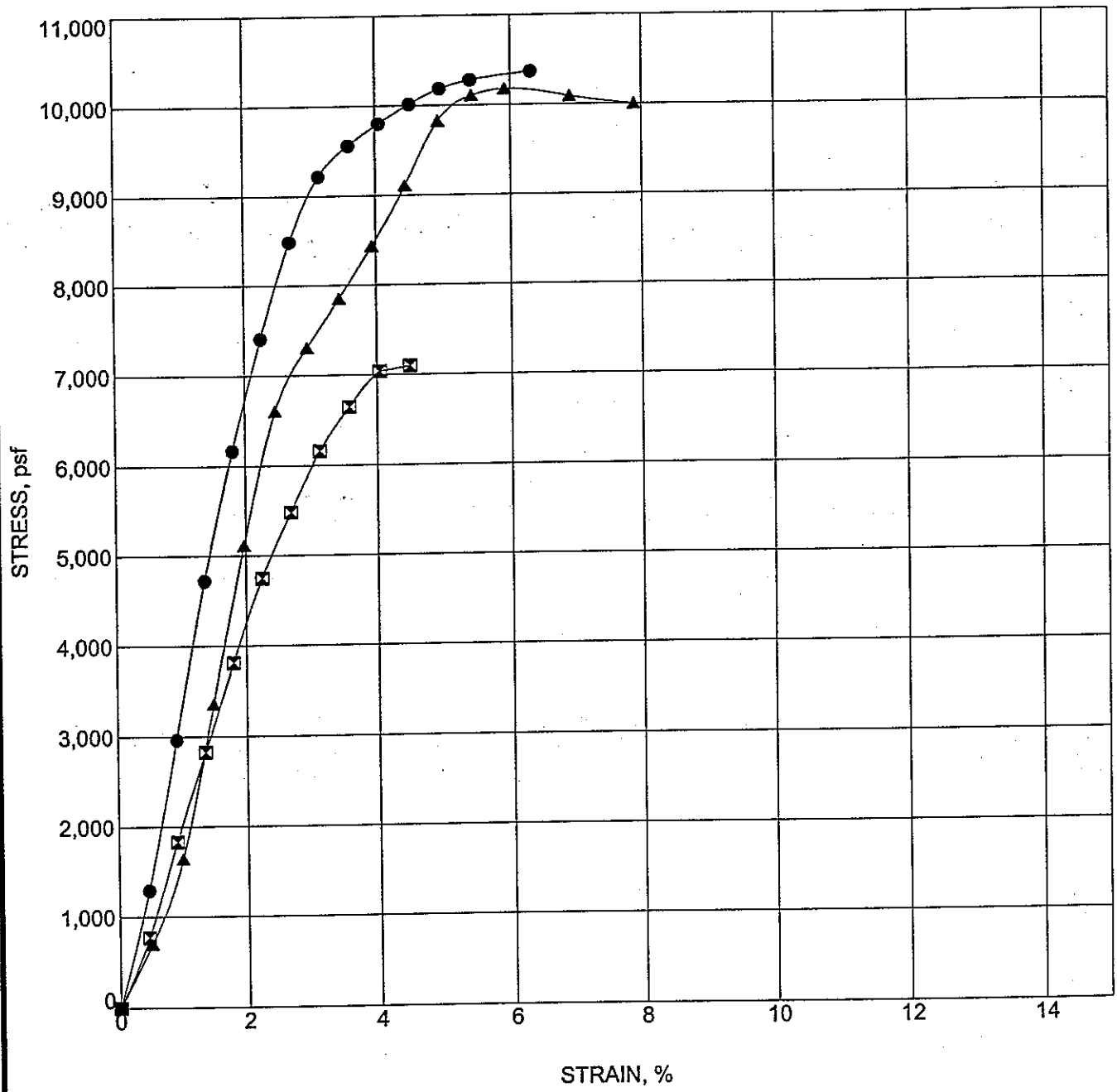


	Boring	Depth	Classification	γ_d (pcf)	MC%	Qu (psf)
●	EH03-1	3.0		114	15	9982
⊠	EH03-3	3.0		108	18	10244
▲	EH03-3	6.0		96	23	7609
★	EH03-5	3.0		104	18	8603

4106 NW Riverside Dr.
Riverside, MO 64150
Phone: 816/741-9466
Fax: 816/587-2996

UNCONFINED COMPRESSION TEST

PSI Job No.: 338-35131
Project: Family Housing Replacement
Location: Ft. Riley, Kansas



	Boring	Depth	Classification	γ_d (pcf)	MC%	Qu (psf)
●	EH03-6	6.0		110	14	10365
⊠	EH03-7	3.0		105	18	7094
▲	EH03-8	6.0		106	17	10177

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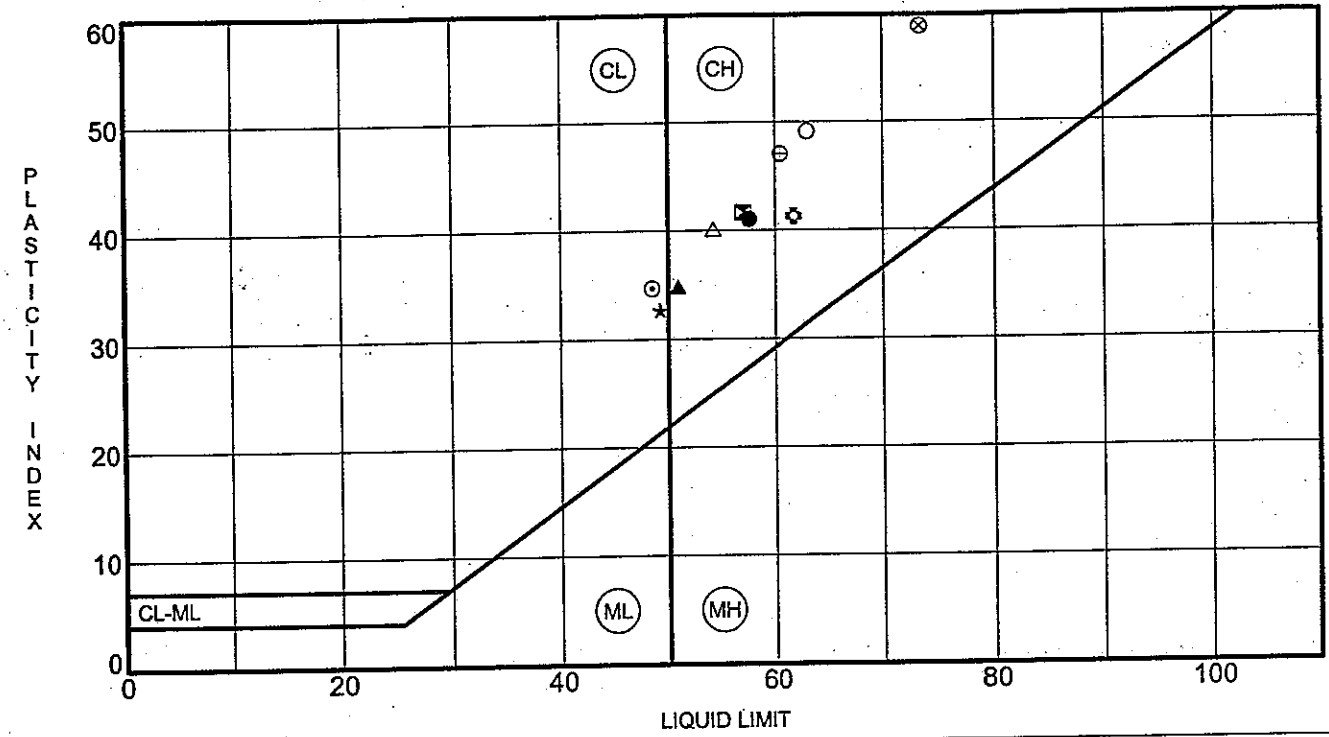

	Boring	Depth (ft)	LL	PL	PI	Fines	Classification (*Visual)
●	EH03-1	3.0	58	16	42		
⊠	EH03-2	6.5	57	15	42		
▲	EH03-3	3.0	51	16	35		
★	EH03-4	8.5	49	17	32		
⊙	EH03-5	3.0	48	14	34		
✿	EH03-6	6.0	62	21	41		
○	EH03-7	3.0	63	14	49		
△	OD03-1	3.0	54	14	40		
⊗	OD03-2	6.0	73	14	59		
⊕	OD03-3	6.0	61	13	48		

4106 NW Riverside Dr.
Riverside, MO 64150
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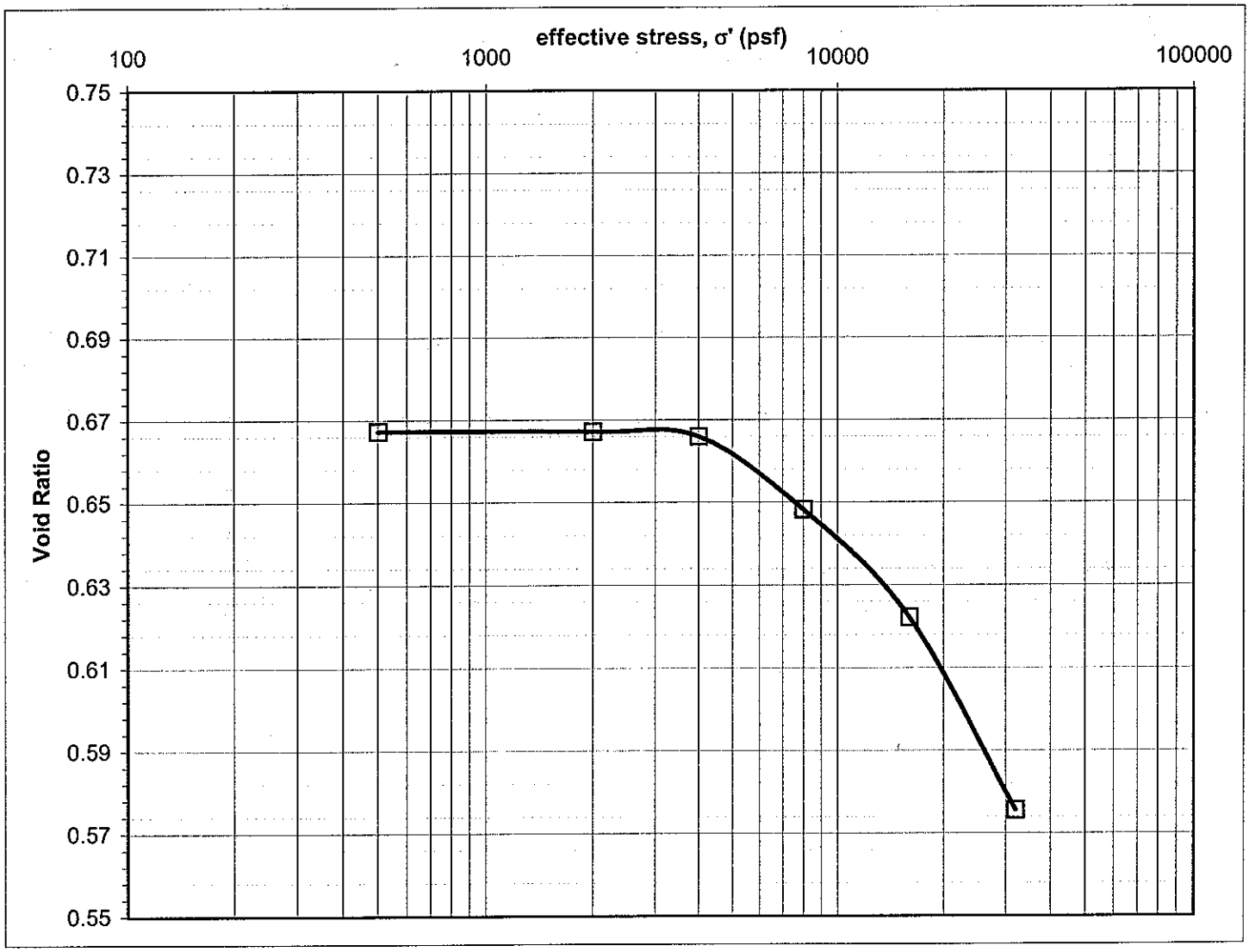
ATTERBERG LIMITS' RESULTS

PSI Job No.: 338-35131
Project: Family Housing Replacement
Location: Ft. Riley, Kansas

Professional Service Industries, Inc.

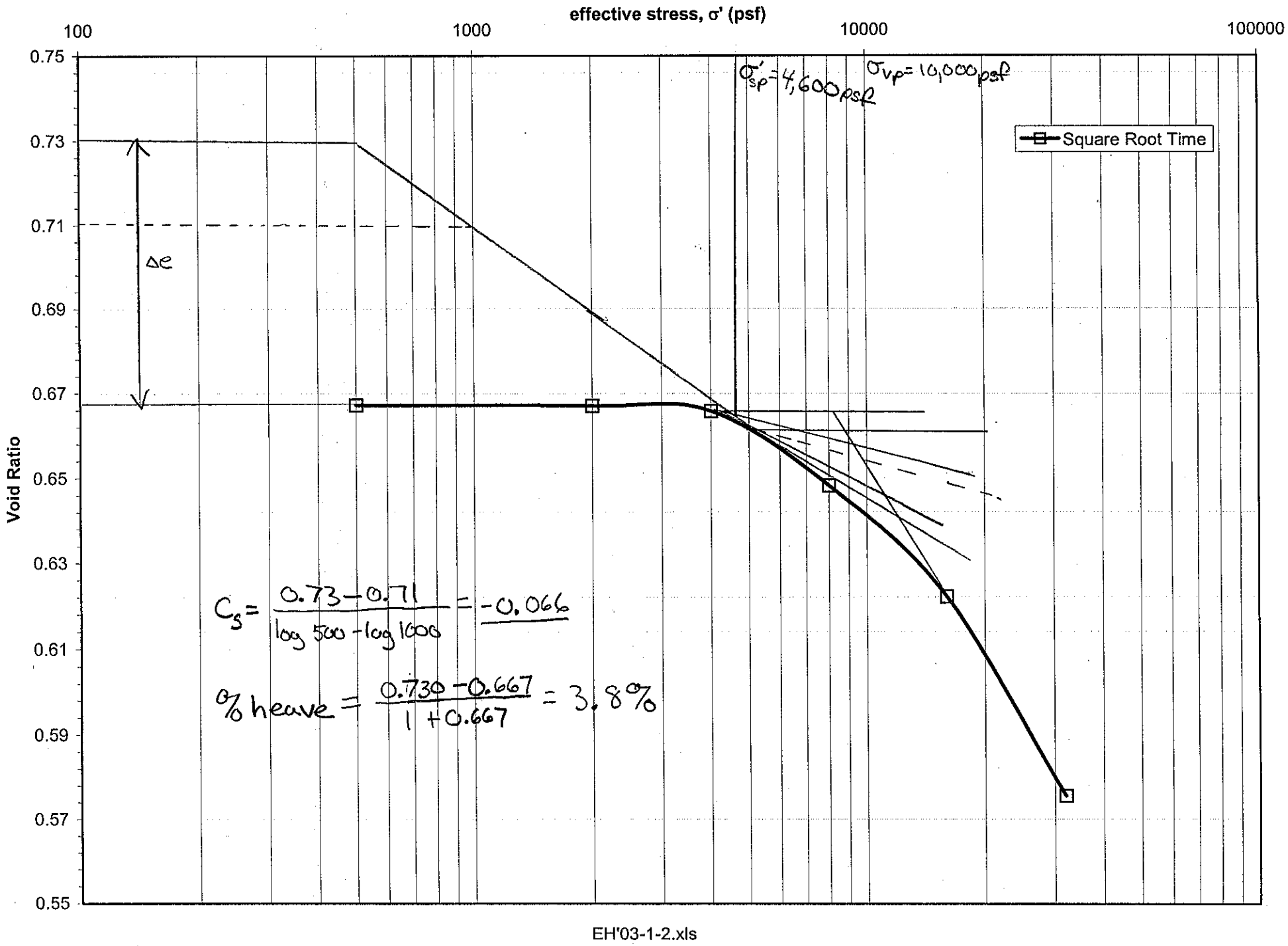


Properties	Initial	Final
Saturation	59.5%	77%
Void Ratio	0.67	0.58
Moisture Content	14.7%	16.3%
Dry Unit Weight (pcf)	101	107

Consolidation Index, C_C	0.15
Maximum Past Pressure (psf)	10,000
Swell Pressure (psf)	4,600
Therical Maximum Percent Heave	3.8%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring EH'03-1 Sample 2


effective stress, σ' (psf)
100
1000
10000
100000
0.75
0.73
0.71
0.69
0.67
0.65
0.63
0.61
0.59
0.57
0.55
Void Ratio
Square Root Time
Δe
σ'sp = 4,600 psf
σvp = 10,000 psf
Cs = (0.73 − 0.71) / (log 500 − log 1000) = −0.066
% heave = (0.730 − 0.667) / (1 + 0.667) = 3.8%
EH'03-1-2.xls

Lab Set-up

Weight of ring (g)	528.04	Diameter of Sample (in)	2.5	e_o	0.668
Weight of ring & soil (g)	677.40	Area of Sample (in^2)	4.90873852	initial S_r (%)	59.5%
Weight of soil (g)	149.36	Area of Sample (ft^2)	0.03408846		
Moisture content		Initial height of sample (in)	1.000		
Weight of tin	31.5	Initial height of sample (ft)	0.08333333		
Weight of tin+ wet soil	172.94	Specific Gravity	2.70		
Weight of tin+ dry soil	154.81	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	14.7%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)	
	0	Air	0.00046106	
			0.001137278	
0.3291894	0.042196016	Water	0.000676218	0.00284
	0.286993424	Soil	0.001703427	

	Stress (psf)			Root Time				Log Time			
Load Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.600	0.0002	1.000	0.000	0.667	0.0002	1.000	0.000	0.667
Swell	500	2000	0.600	0.0001	1.000	0.000	0.667	0.0001	1.000	0.000	0.667
2	2000	4000	0.600	0.0007	0.999	0.001	0.666	-0.0008	1.001	-0.001	0.668
3	4000	8000	0.600	0.0106	0.989	0.018	0.648	-0.0008	1.001	-0.001	0.670
4	8000	16000	0.600	0.0157	0.973	0.026	0.622	0.0101	0.991	0.017	0.653
5	16000	32000	0.600	0.0279	0.945	0.047	0.576	-0.0008	0.992	-0.001	0.654

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	2000	4000	1.000	1.001	0.0000	0.0000	0.0000	0.0	1.000	0.500	#DIV/0!
3	4000	8000	1.001	1.001	0.0000	0.0000	0.0000	0.0	1.001	0.500	#DIV/0!
4	8000	16000	1.001	0.991	0.0284	0.0393	0.0339	0.0	0.996	0.498	#DIV/0!
5	16000	32000	0.991	0.992	0.0000	0.0000	0.0000	0.0	0.992	0.496	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	2000	4000	1.000	1.001	0.0042	0.0057	0.0050	7.6	1.000	0.500	0.0065
3	4000	8000	1.001	1.001	0.0112	0.0226	0.0169	9.0	1.001	0.500	0.0055
4	8000	16000	1.001	0.991	0.0283	0.0448	0.0365	6.3	0.996	0.498	0.0078
5	16000	32000	0.991	0.992	0.0524	0.0811	0.0668	68.1	0.992	0.496	0.0007

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	2000	4000	0.667	0.668	-6.67E-07	-4.00E-07	62.4	#DIV/0!	#DIV/0!
3	4000	8000	0.668	0.670	-3.34E-07	-2.00E-07	62.4	#DIV/0!	#DIV/0!
4	8000	16000	0.670	0.653	2.11E-06	1.26E-06	62.4	#DIV/0!	#DIV/0!
5	16000	32000	0.653	0.654	-8.34E-08	-5.04E-08	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	2000	4000	0.667	0.666	6.09E-07	3.65E-07	62.4	0.0065	5.24E-10
3	4000	8000	0.668	0.648	5.06E-06	3.03E-06	62.4	0.0055	3.66E-09
4	8000	16000	0.670	0.622	5.96E-06	3.57E-06	62.4	0.0078	6.15E-09
5	16000	32000	0.653	0.576	4.84E-06	2.93E-06	62.4	0.0007	4.58E-10

Final

Moisture content	
Weight of tin	31.5
Weight of tin+ wet soil	194.12
Weight of tin+ dry soil	171.27
Moisture content (%)	16.3%
Void Ratio	0.576
Dry Unit Weight	106.933
Saturation	77%
Stress 1	16000
Stress 2	32000
Void Ratio 1	0.622
Void Ratio 2	0.576
Crompression Index	0.15

Initilal Load (psf)	0	DR Initial	0.0020	ΔM	0.0008
Final Load (psf)	500	DR Final	0.0030	ΔH	0.0002

Initilal Load (psf)	500
Final Load (psf)	2000

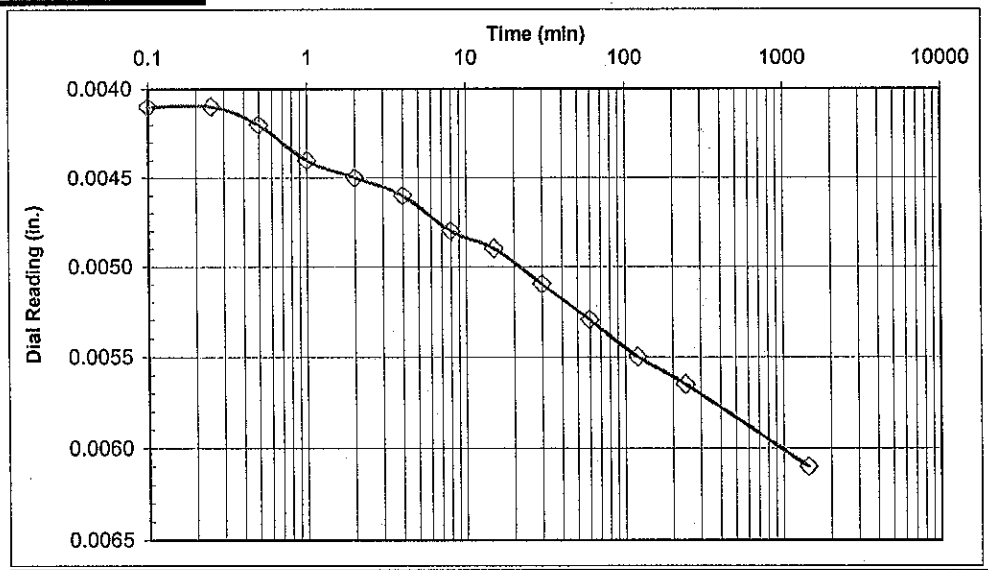
Final Displacemnt	0.0010
ΔM	0.0009
ΔH	0.0001

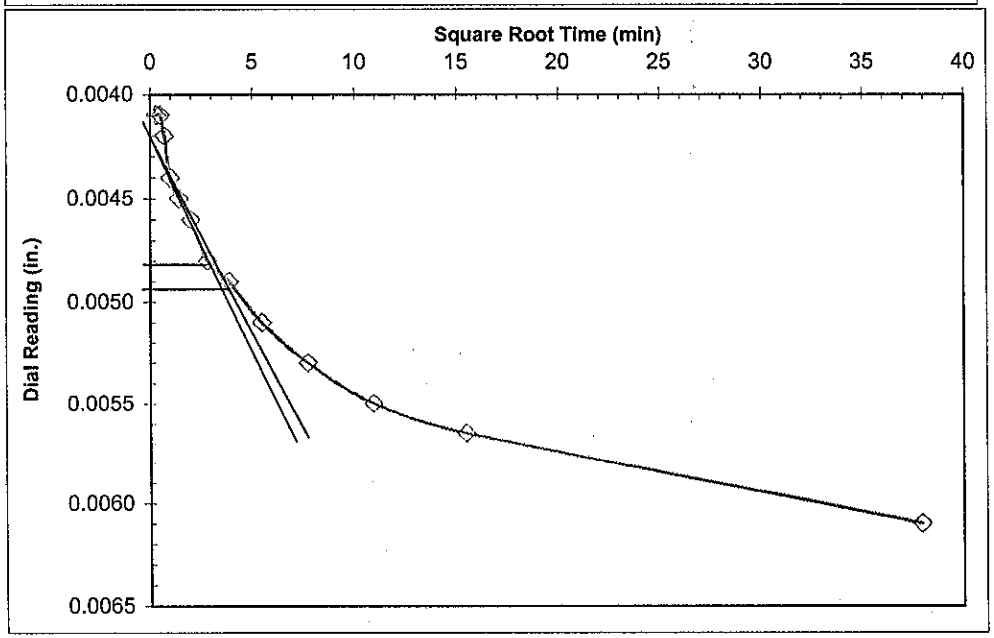
Loading

Time	Load	Dial Reading
	500	0.0030
		0.0030
		0.0031
		0.0031
		0.0032
		0.0033
	1000	0.0035
		0.0036
	1500	0.0036
		0.0338
	2000	0.0040
		0.0040

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	2000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	0.001	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0040
		0.1	0.3162	0.0041
		0.25	0.5	0.0041
		0.5	0.7071	0.0042
		1	1	0.0044
		2	1.4142	0.0045
		4	2	0.0046
		8	2.8284	0.0048
		15	3.873	0.0049
		30	5.4772	0.0051
		60	7.746	0.0053
		120	10.954	0.0055
		240	15.492	0.0057
		1440	37.947	0.0061
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



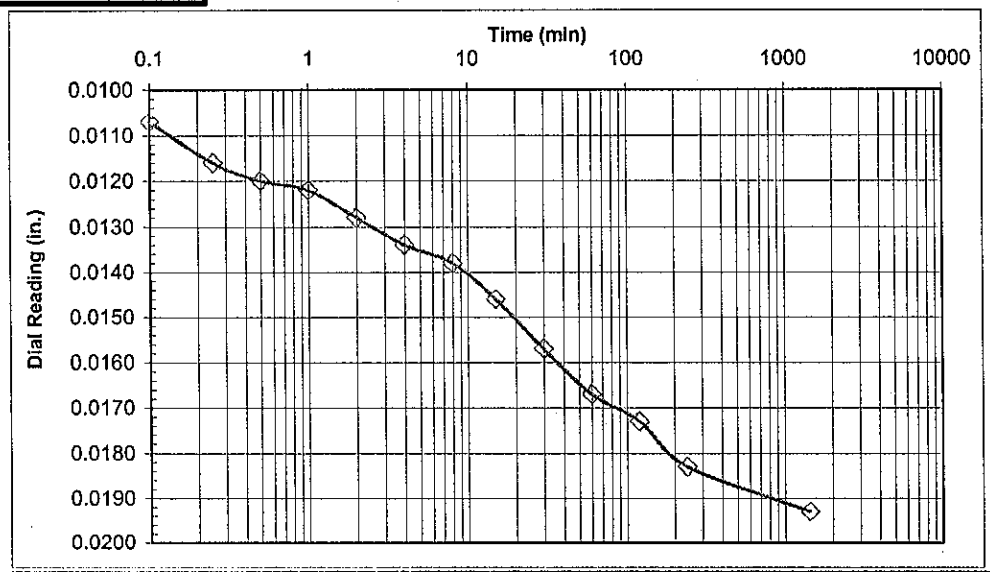


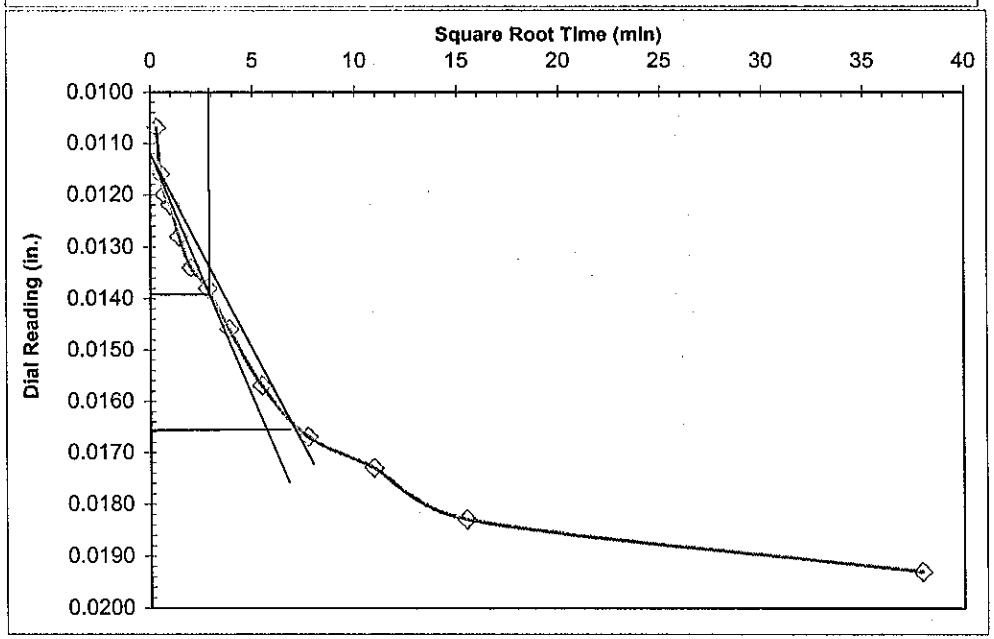
Sq. Root Time			
sqrt. t_{50}	2.75	D -Line	
S_0	0.0042	slope	0.00018972
S_{50}	0.0048	0.000	0.0042
S_{90}	0.0049	2.75	0.00472174
S_{100}	0.0057	t_{50}	7.5625

Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.011	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0100
		0.1	0.3162	0.0107
		0.25	0.5	0.0116
		0.5	0.7071	0.0120
		1	1	0.0122
		2	1.4142	0.0128
		4	2	0.0134
		8	2.8284	0.0138
		15	3.873	0.0146
		30	5.4772	0.0157
		60	7.746	0.0167
		120	10.954	0.0173
		240	15.492	0.0183
		1440	37.947	0.0193
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	3	D -Line	
S_0	0.0112	slope	0.00075362
S_{50}	0.0138	0.000	0.0112
S_{80}	0.0166	3	0.01346087
S_{100}	0.0226	t_{50}	9



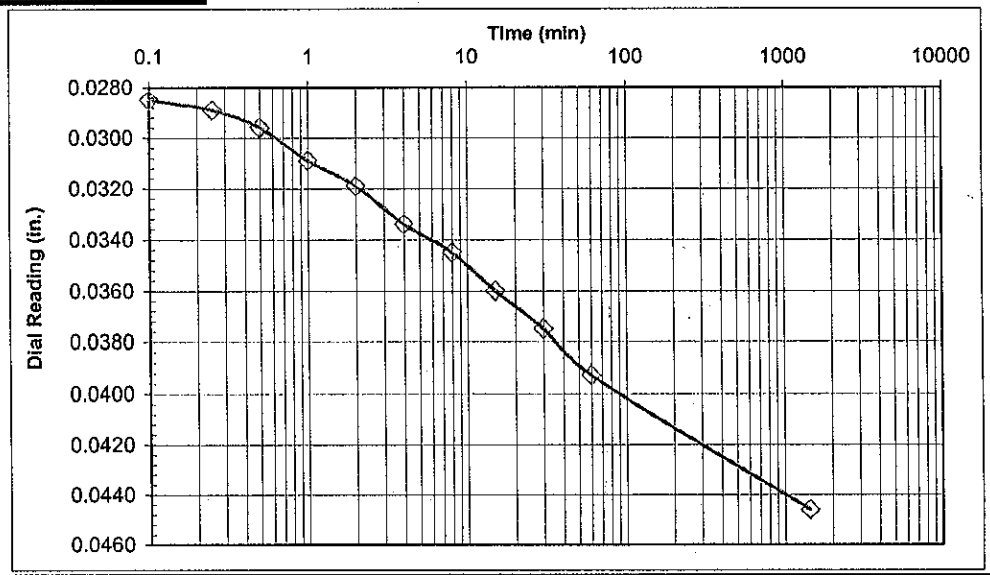


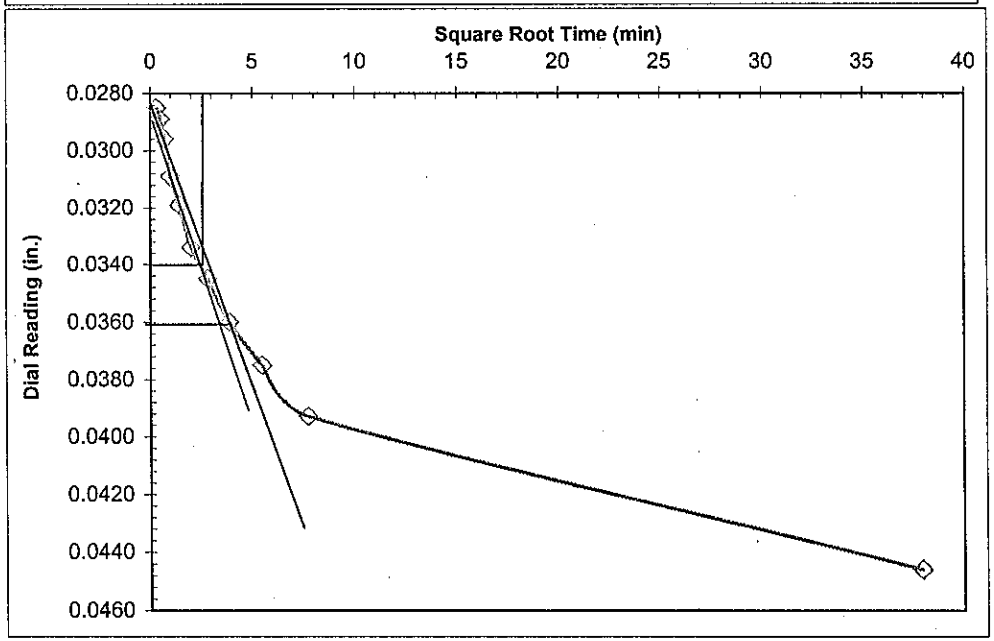
EH'03-1-2

Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	0.0284
Initial Stress (psf)	8000	(Log time) ΔH (in)	0.010	S_{50}	0.03385
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.016	S_{100}	0.0393

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0280
		0.1	0.3162	0.0285
		0.25	0.5	0.0289
		0.5	0.7071	0.0296
		1	1	0.0309
		2	1.4142	0.0319
		4	2	0.0334
		8	2.8284	0.0345
		15	3.873	0.0360
		30	5.4772	0.0375
		60	7.746	0.0393
		1440	37.947	0.0446
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

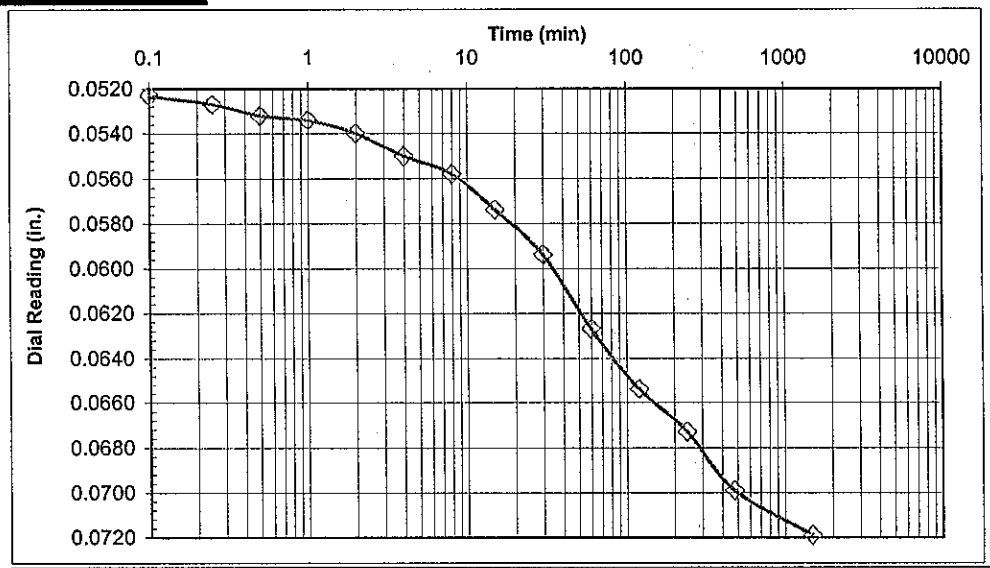
Sq. Root Time			
sqrt. t_{50}	2.5	D -Line	
S_0	0.0283	slope	0.00198261
S_{50}	0.0340	0.000	0.0283
S_{90}	0.0361	2.5	0.03325652
S_{100}	0.0448	t_{50}	6.25

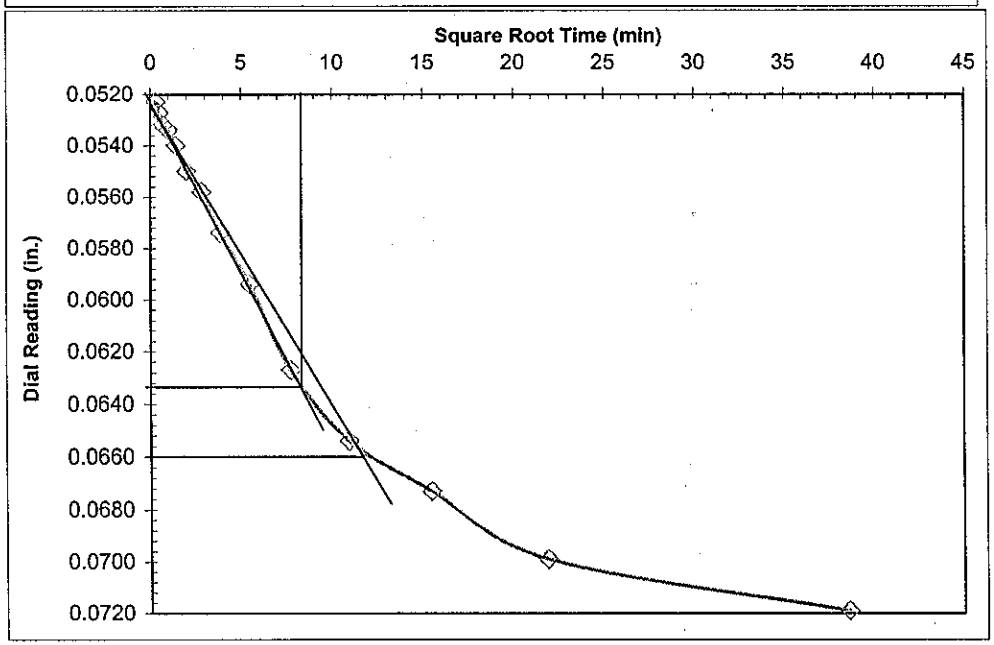




Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.028	S_{100}	

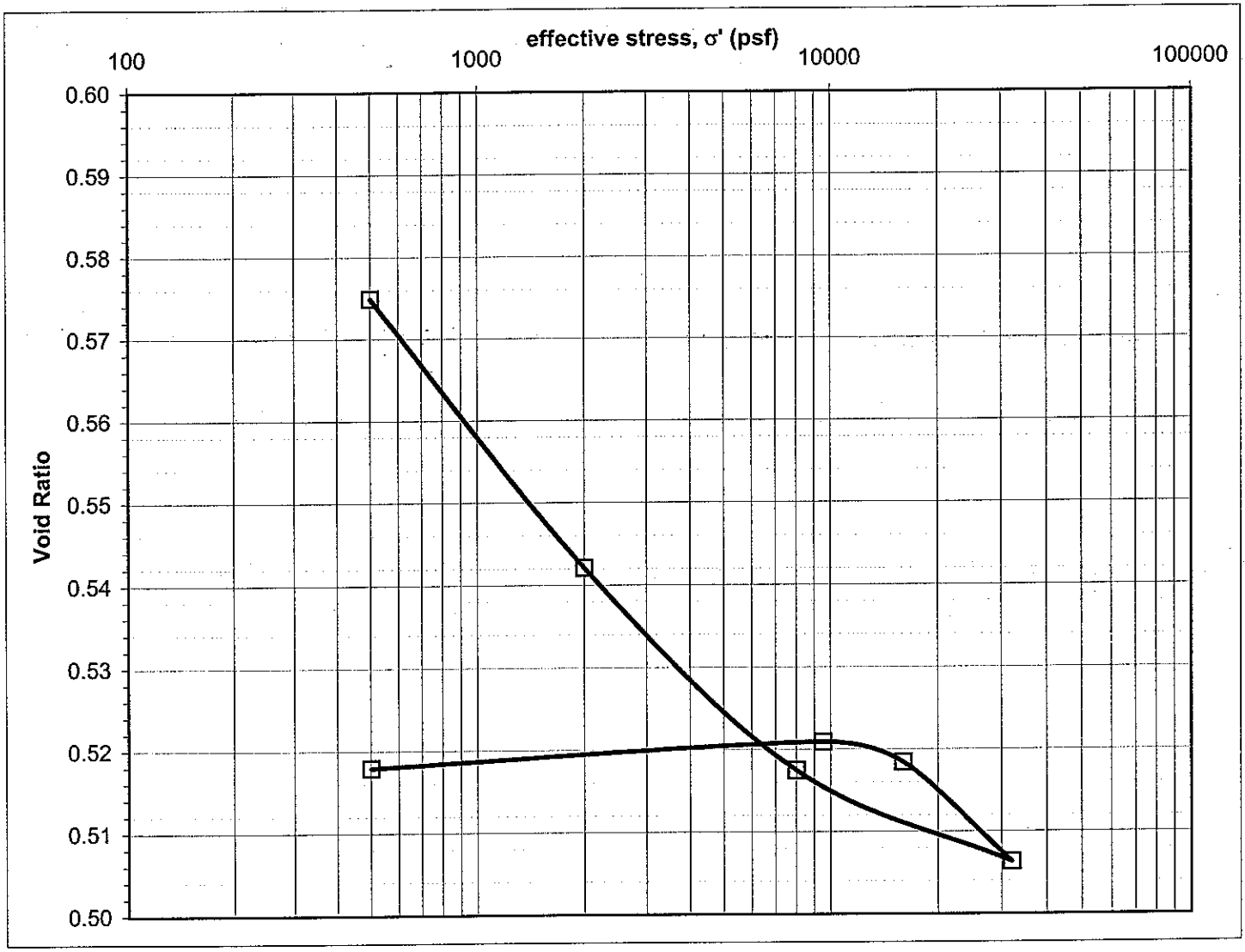
Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0518
		0.1	0.3162	0.0523
		0.25	0.5	0.0527
		0.5	0.7071	0.0532
		1	1	0.0534
		2	1.4142	0.0540
		4	2	0.0550
		8	2.8284	0.0558
		15	3.873	0.0574
		30	5.4772	0.0594
		60	7.746	0.0627
		120	10.954	0.0654
		240	15.492	0.0673
		480	21.909	0.0699
		1493	38.639	0.0719
			0	
			0	
			0	
			0	
			0	
			0	
			0	





Sq. Root Time			
sqrt. t_{50}	8.25	D -Line	
S_0	0.0524	slope	0.00115942
S_{50}	0.0634	0.000	0.0524
S_{90}	0.0660	8.25	0.06196522
S_{100}	0.0811	t_{50}	68.0625

Professional Service Industries, Inc.

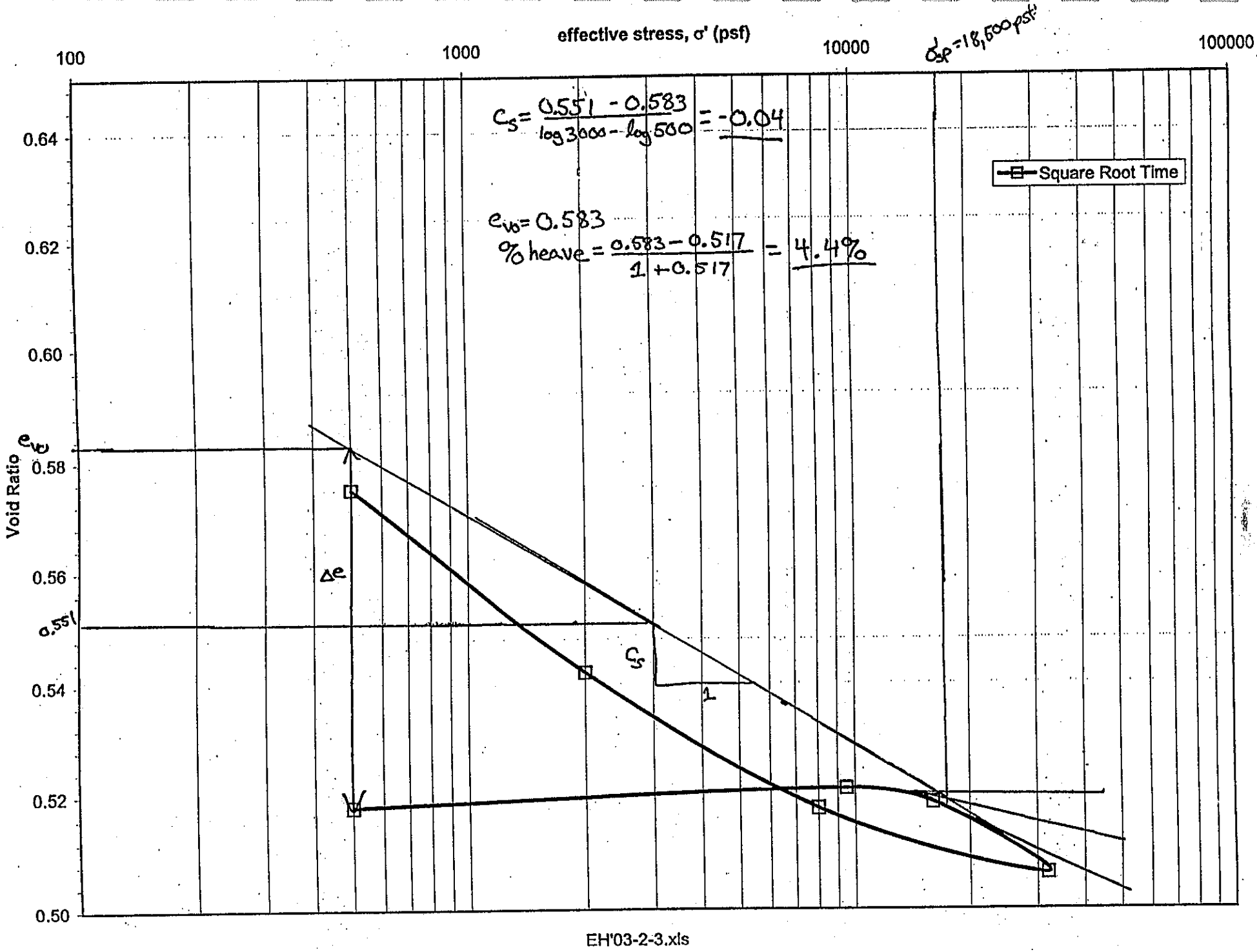


Properties	Initial	Final
Saturation	86.0%	97%
Void Ratio	0.52	0.57
Moisture Content	16.5%	20.6%
Dry Unit Weight (pcf)	111	107

Consolidation Index, C_c	0.04
Maximum Past Pressure (psf)	---
Swell Pressure (psf)	18,500
Therical Maximum Percent Heave	4.4%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring EH'03-2 Sample 3


effective stress, σ' (psf)
100
1000
10000
100000
σ_{sp} = 18,500 psf
$C_s = \frac{0.551 - 0.583}{\log 3000 - \log 500} = -0.04$
$e_{vo} = 0.583$
% heave $= \frac{0.583 - 0.517}{1 + 0.517} = 4.4\%$
Square Root Time
Void Ratio e_v
0.64
0.62
0.60
0.58
0.56
0.551
0.54
0.52
0.50
Δe
C_s
1
EH'03-2-3.xls

Lab Set-up

Weight of ring (g)	87.58	Diameter of Sample (in)	2.5	e_o	0.517
Weight of ring & soil (g)	211.97	Area of Sample (in^2)	4.90873852	initial S, (%)	86.0%
Weight of soil (g)	124.39	Area of Sample (ft^2)	0.03408846		
Moisture content		Initial height of sample (in)	0.746		
Weight of tin	31.88	Initial height of sample (ft)	0.06216667		
Weight of tin+ wet soil	88.12	Specific Gravity	2.70		
Weight of tin+ dry soil	80.17	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	16.5%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)	
	0	Air	0.000100899	
				0.00072196
0.2741556	0.038754209	Water	0.000621061	0.00212
	0.235401351	Soil	0.001397207	

Load Step	Stress (psf) Before	After	Hs (in)	Root Time ΔH (in)	H_f (in)	Δe	e_f	Log Time ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.492	-0.0006	0.746	-0.001	0.518	-0.0006	0.747	-0.001	0.518
Swell	500	9500	0.492	-0.0014	0.747	-0.003	0.521	-0.0014	0.748	-0.003	0.521
2	9500	16000	0.492	0.0012	0.746	0.002	0.518	-0.0008	0.749	-0.002	0.523
3	16000	32000	0.492	0.0060	0.740	0.012	0.506	-0.0008	0.750	-0.002	0.524
4	32000	8000	0.492	-0.0055	0.746	-0.011	0.517	-0.0062	0.756	-0.013	0.537
5	8000	2000	0.492	-0.0121	0.758	-0.025	0.542	-0.0008	0.757	-0.002	0.538
6	2000	500	0.492	-0.0161	0.774	-0.033	0.575	-0.0008	0.757	-0.002	0.540

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	9500	16000	0.746	0.749	0.0000	0.0000	0.0000	0.0	0.747	0.374	#DIV/0!
3	16000	32000	0.749	0.750	0.0000	0.0000	0.0000	0.0	0.749	0.375	#DIV/0!
4	32000	8000	0.750	0.756	0.1698	0.1644	0.1671	0.0	0.753	0.376	#DIV/0!
5	8000	2000	0.756	0.757	0.0000	0.0000	0.0000	0.0	0.756	0.378	#DIV/0!
6	2000	500	0.757	0.757	0.0000	0.0000	0.0000	0.0	0.757	0.379	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	9500	16000	0.746	0.749	0.1616	0.1636	0.1626	1.0	0.747	0.374	0.0275
3	16000	32000	0.749	0.750	0.1686	0.1754	0.1720	2.0	0.749	0.375	0.0141
4	32000	8000	0.750	0.756	0.1692	0.1645	0.1669	14.4	0.753	0.376	0.0019
5	8000	2000	0.756	0.757	0.1600	0.1487	0.1543	85.6	0.756	0.378	0.0003
6	2000	500	0.757	0.757	0.1475	0.1322	0.1398	225.0	0.757	0.379	0.0001

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	9500	16000	0.521	0.523	-2.50E-07	-1.65E-07	62.4	#DIV/0!	#DIV/0!
3	16000	32000	0.523	0.524	-1.02E-07	-6.68E-08	62.4	#DIV/0!	#DIV/0!
4	32000	8000	0.524	0.537	5.25E-07	3.45E-07	62.4	#DIV/0!	#DIV/0!
5	8000	2000	0.537	0.538	2.71E-07	1.76E-07	62.4	#DIV/0!	#DIV/0!
6	2000	500	0.538	0.540	1.08E-06	7.05E-07	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	9500	16000	0.521	0.518	3.77E-07	2.48E-07	62.4	0.0275	1.50E-09
3	16000	32000	0.523	0.506	1.01E-06	6.64E-07	62.4	0.0141	2.06E-09
4	32000	8000	0.524	0.517	-2.79E-07	-1.83E-07	62.4	0.0019	-7.79E-11
5	8000	2000	0.537	0.542	8.94E-07	5.82E-07	62.4	0.0003	4.22E-11
6	2000	500	0.538	0.575	2.44E-05	1.58E-05	62.4	0.0001	4.37E-10

Final

Moisture content	
Weight of tin	0.789
Weight of tin+ wet soil	150.78
Weight of tin+ dry soil	125.16
Moisture content (%)	20.6%
Void Ratio	0.575
Dry Unit Weight	106.978
Saturation	97%
Stress 1	16000
Stress 2	32000
Void Ratio 1	0.518
Void Ratio 2	0.506
Crompression Index	0.04

Initilal Load (psf)	0	DR Initial	0.1583	ΔM	0.0008
Final Load (psf)	500	DR Final	0.1585	ΔH	-0.0006

Initilal Load (psf)	500
Final Load (psf)	9500

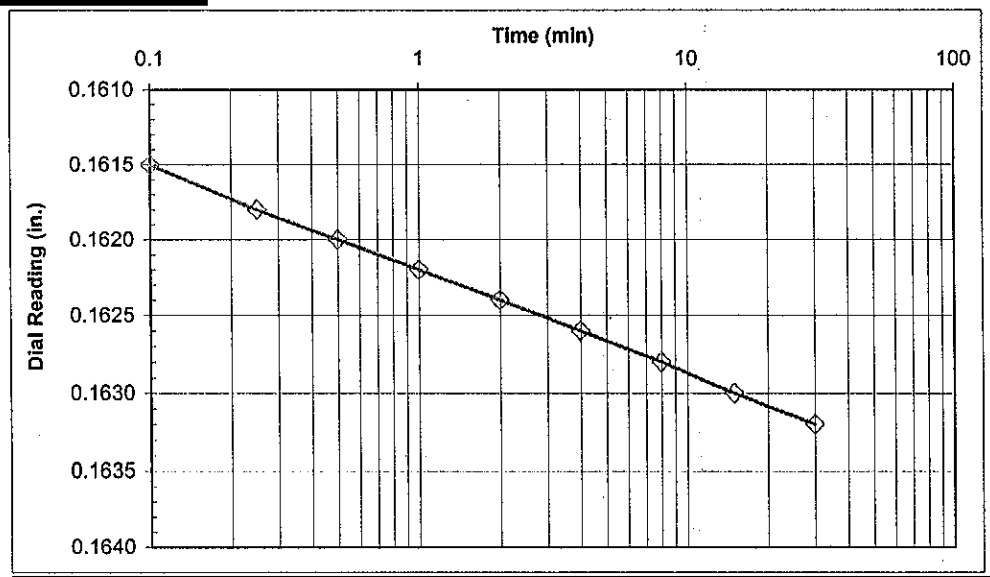
Final Displacemnt	0.0007
ΔM	0.0022
ΔH	-0.0014

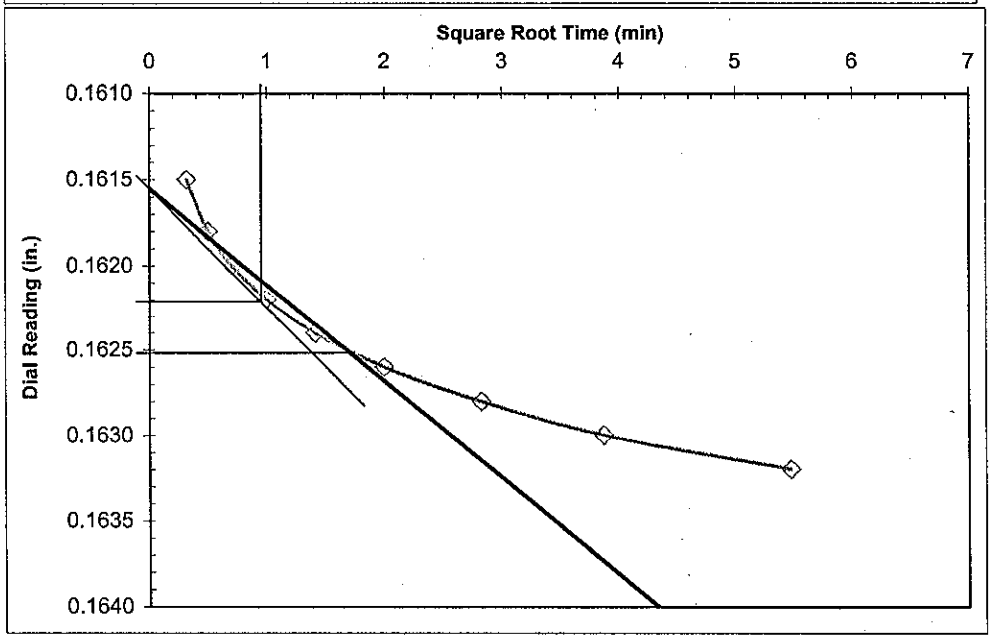
Loading

Time	Load	Dial Reading
	500	0.1581
	1000	0.1585
		0.1576
	1500	0.1579
	2000	0.1584
		0.1582
	2500	0.1585
		0.1583
	3000	0.1585
		0.1584
	3500	0.1587
		0.1587
		0.1586
	4000	0.1586
	4500	0.1589
		0.1589
		0.1585
	5500	0.1592
		0.1590
		0.1592
		0.1585
	6000	0.1589
	6500	0.1591
		0.1595
	7000	0.1591
		0.1590
		0.1589
	7500	0.1590
		0.159
		0.1586
	8000	0.1584
	9000	0.1589
		0.1592
		0.1592
		0.1592
		0.1591
		0.1591
		0.1590
	9500	0.1592
		0.1592
		0.1592
		0.1592

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	9500	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.001	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1592
		0.1	0.3162	0.1615
		0.25	0.5	0.1618
		0.5	0.7071	0.1620
		1	1	0.1622
		2	1.4142	0.1624
		4	2	0.1626
		8	2.8284	0.1628
		15	3.873	0.1630
		30	5.4772	0.1632
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

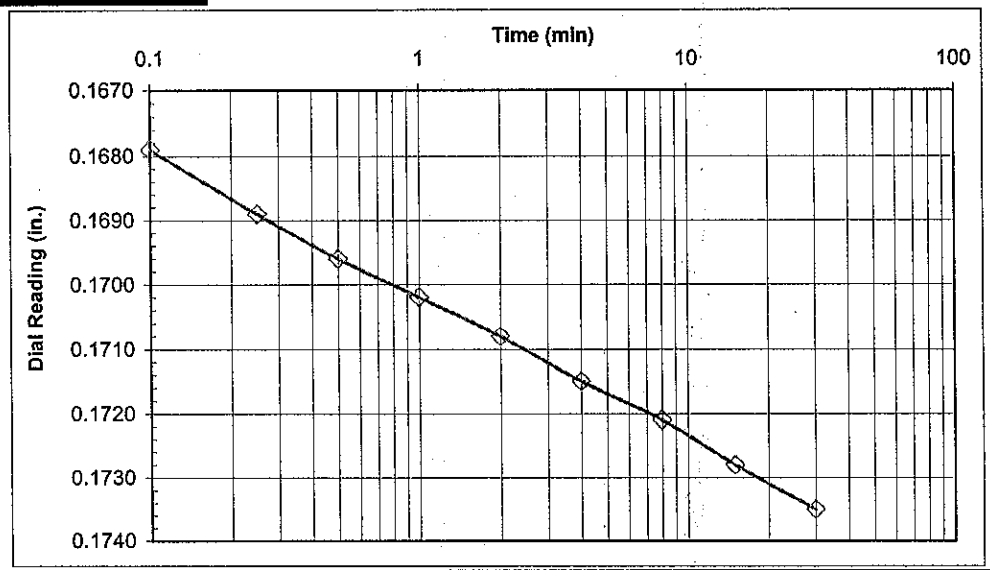




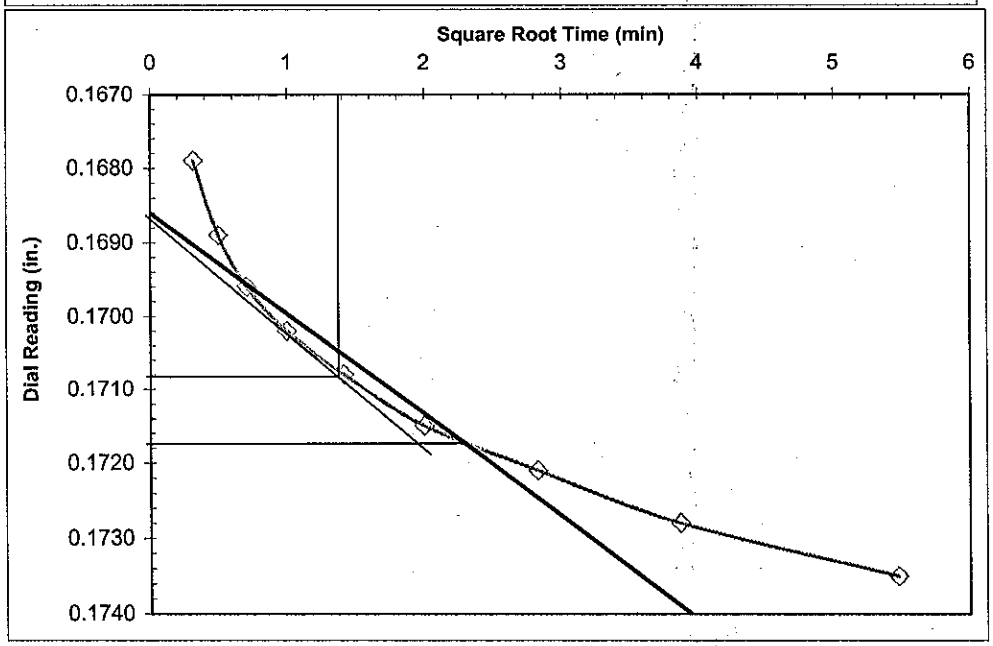
Sq. Root Time			
sqrt. t_{50}	1	D -Line	
S_0	0.1616	slope	0.00056522
S_{50}	0.1622	0.000	0.16155
S_{90}	0.1625	1	0.16211522
S_{100}	0.1636	t_{50}	1

Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.006	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1632
		0.1	0.3162	0.1679
		0.25	0.5	0.1689
		0.5	0.7071	0.1696
		1	1	0.1702
		2	1.4142	0.1708
		4	2	0.1715
		8	2.8284	0.1721
		15	3.873	0.1728
		30	5.4772	0.1735
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



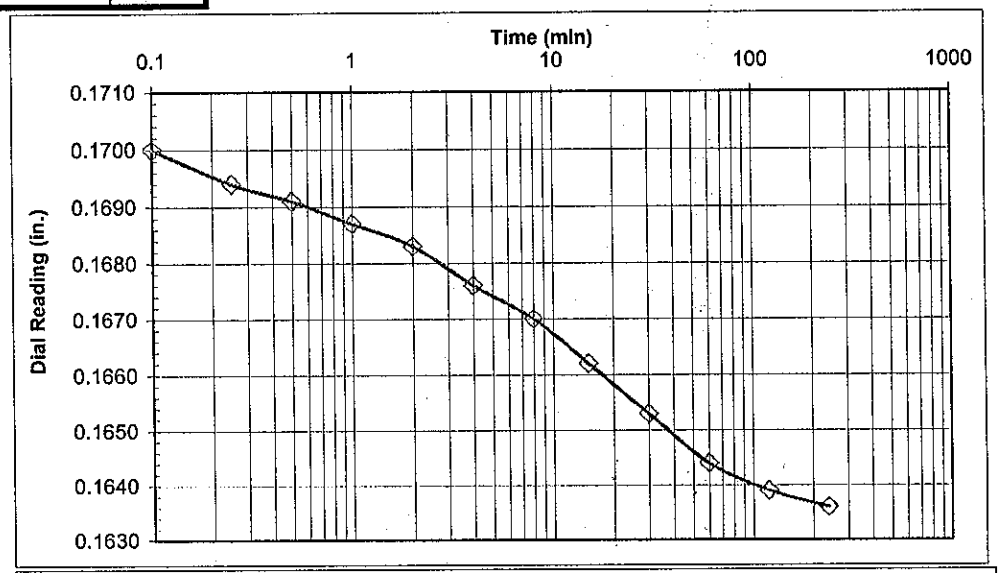
Sq. Root Time			
sqrt. t_{50}	1.4	D -Line	
S_0	0.1686	slope	0.00136646
S_{50}	0.1708	0.000	0.1686
S_{90}	0.1718	1.4	0.17051304
S_{100}	0.1754	t_{50}	1.96

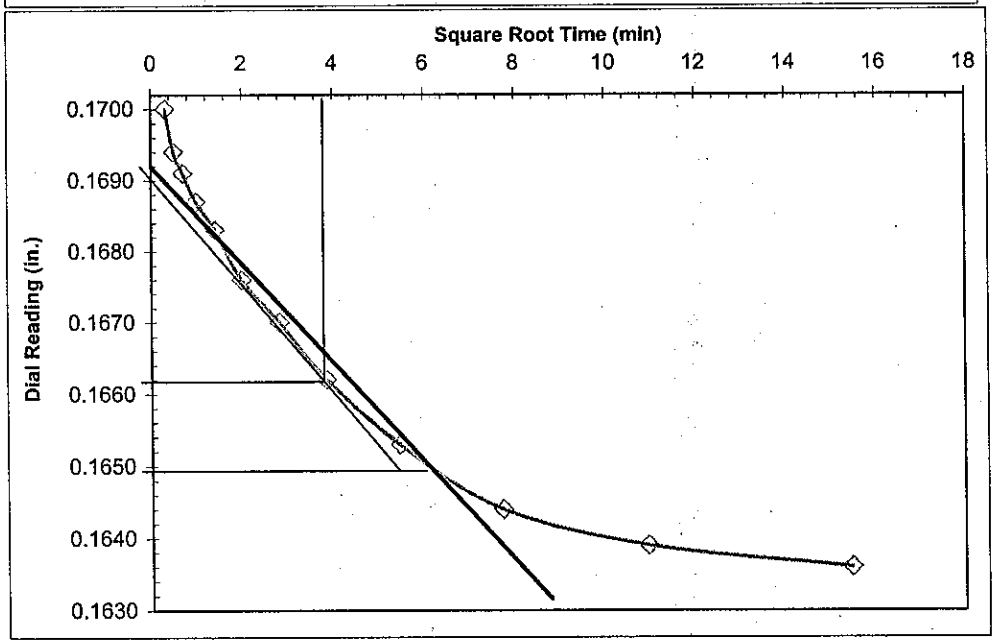


Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	0.1698
Initial Stress (psf)	32000	(Log time) ΔH (in)	-0.006	S_{50}	0.1671
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	-0.005	S_{100}	0.1644

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1735
		0.1	0.3162	0.1700
		0.25	0.5	0.1694
		0.5	0.7071	0.1691
		1	1	0.1687
		2	1.4142	0.1683
		4	2	0.1676
		8	2.8284	0.1670
		15	3.873	0.1662
		30	5.4772	0.1653
		60	7.746	0.1644
		120	10.954	0.1639
		240	15.492	0.1636
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

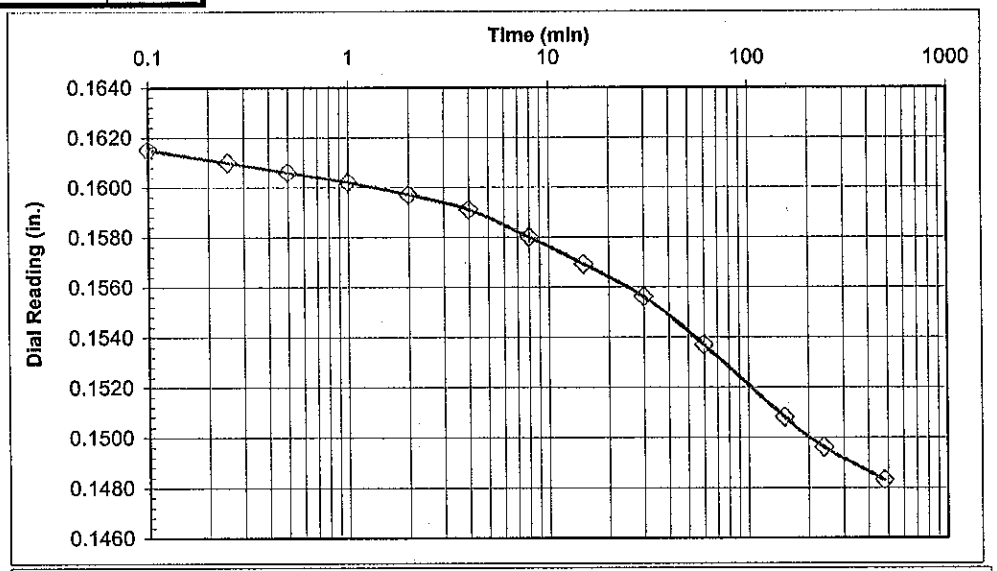
Sq. Root Time			
sqrt. t_{50}	3.8	D -Line	
S_0	0.1692	slope	-0.0006865
S_{50}	0.1662	0.000	0.1692
S_{90}	0.1650	3.8	0.1665913
S_{100}	0.1645	t_{50}	14.44

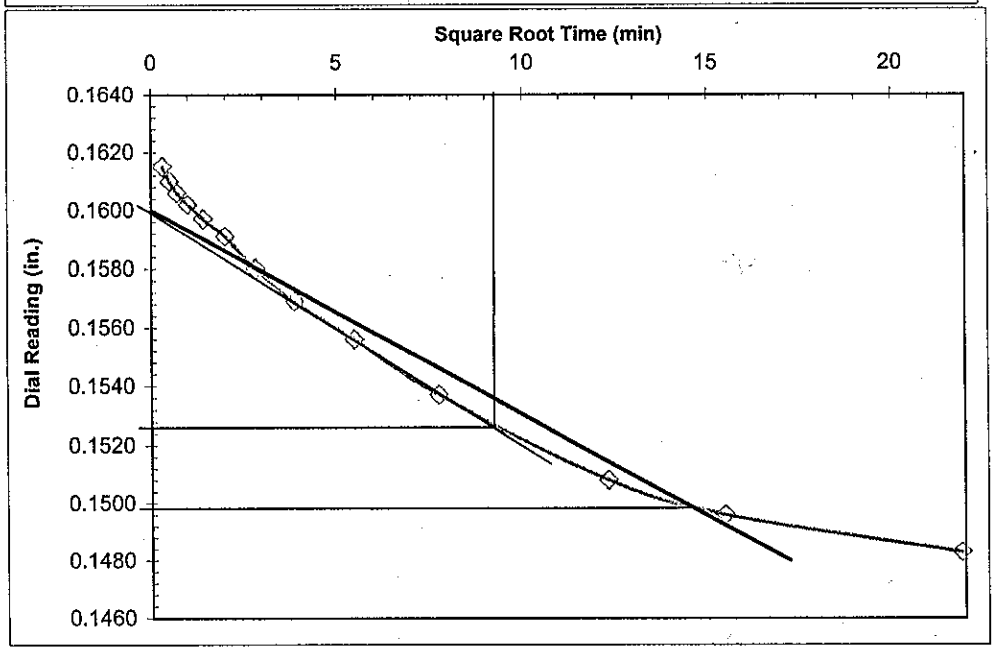




Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	2000	(sq.rt. time) ΔH (in)	-0.012	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1632
		0.1	0.3162	0.1615
		0.25	0.5	0.1610
		0.5	0.7071	0.1606
		1	1	0.1602
		2	1.4142	0.1597
		4	2	0.1591
		8	2.8284	0.1580
		15	3.873	0.1569
		30	5.4772	0.1556
		60	7.746	0.1537
		152	12.329	0.1508
		240	15.492	0.1496
		480	21.909	0.1483
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

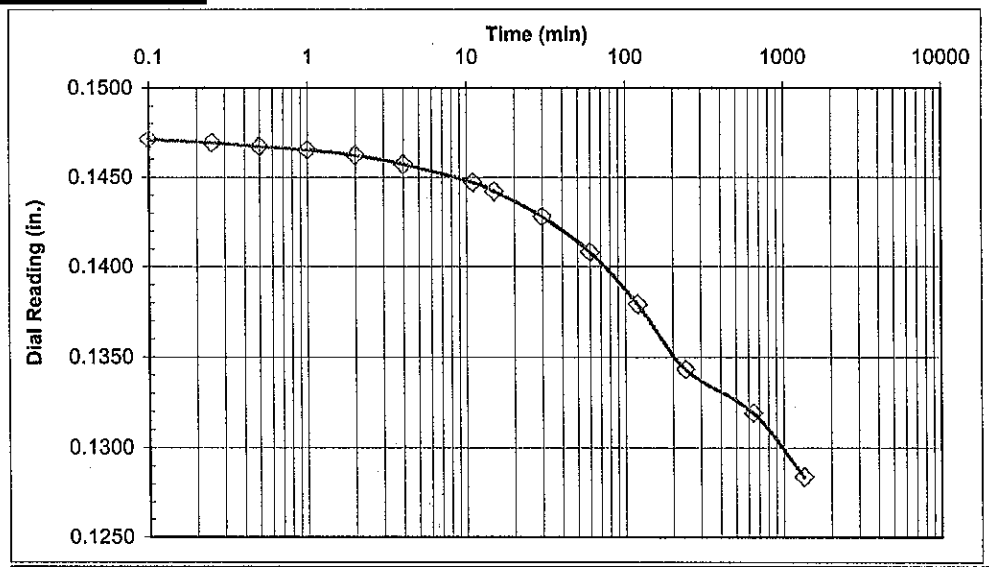


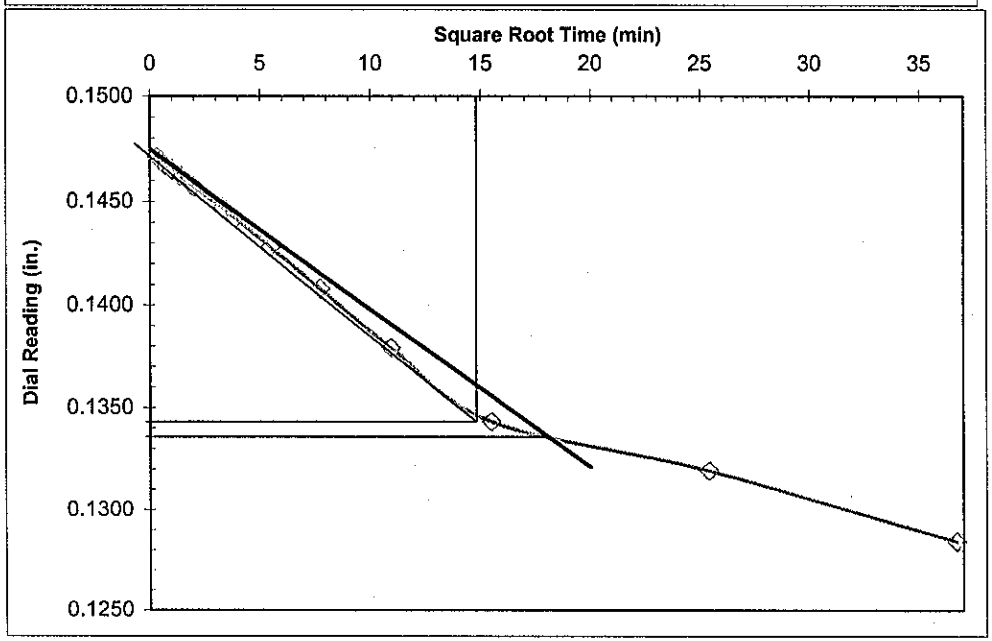


Sq. Root Time			
sqrt. t_{50}	9.25	D -Line	
S_0	0.1600	slope	-0.0006957
S_{50}	0.1526	0.000	0.16
S_{90}	0.1498	9.25	0.15356522
S_{100}	0.1487	t_{50}	85.5625

Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	2000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	500	(sq.rt. time) ΔH (in)	-0.016	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1483
		0.1	0.3162	0.1471
		0.25	0.5	0.1469
		0.5	0.7071	0.1467
		1	1	0.1465
		2	1.4142	0.1462
		4	2	0.1457
		11	3.3166	0.1447
		15	3.873	0.1442
		30	5.4772	0.1428
		60	7.746	0.1408
		120	10.954	0.1379
		240	15.492	0.1343
		646	25.417	0.1319
		1347	36.701	0.1284
			0	
			0	
			0	
			0	
			0	
			0	
			0	





Sq. Root Time			
sqrt. t_{50}	15	D -Line	
S_0	0.1475	slope	-0.000771
S_{50}	0.1342	0.000	0.1475
S_{90}	0.1337	15	0.13593478
S_{100}	0.1322	t_{50}	225

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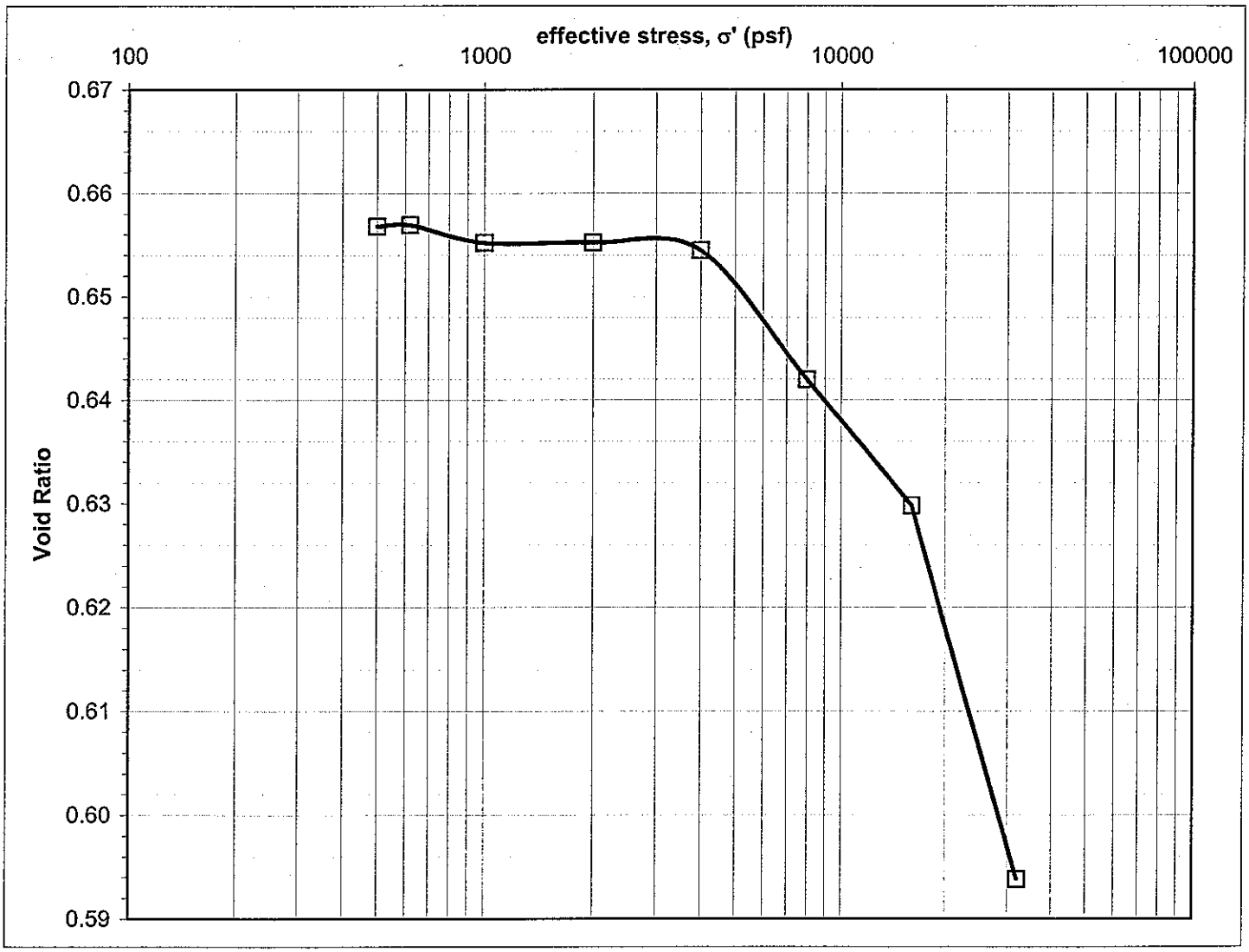
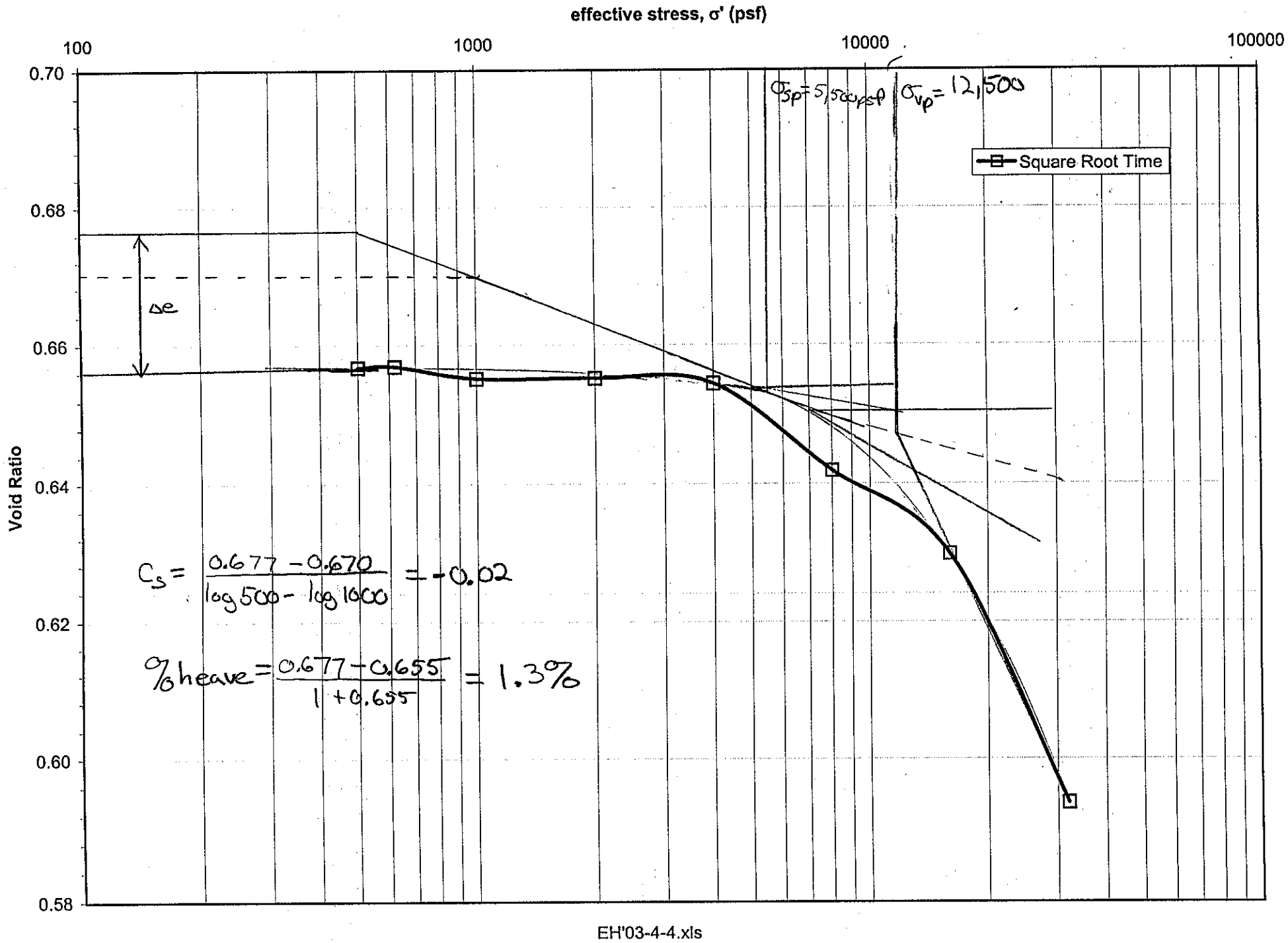


Properties	Initial	Final
Saturation	82.3%	82%
Void Ratio	0.66	0.59
Moisture Content	20.0%	17.9%
Dry Unit Weight (pcf)	102	106

Consolidation Index, C_c	0.12
Maximum Past Pressure (psf)	12,500
Swell Pressure (psf)	5,500
Therical Maximum Percent Heave	1.3%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring EH'03-4 Sample 4


effective stress, σ' (psf)
100
1000
10000
100000
0.70
0.68
0.66
0.64
0.62
0.60
0.58
Void Ratio
Δe
σsp = 5,500 psf
σvp = 12,500
Square Root Time
Cs = (0.677 − 0.670) / (log 500 − log 1000) = −0.02
%heave = (0.677 − 0.655) / (1 + 0.655) = 1.3%
EH'03-4-4.xls

Lab Set-up

Weight of ring (g)	528	Diameter of Sample (in)	2.495	e_o	0.655
Weight of ring & soil (g)	686.62	Area of Sample (in^2)	4.8891232	initial S_r (%)	82.3%
Weight of soil (g)	158.62	Area of Sample (ft^2)	0.03395224		
Moisture content		Initial height of sample (in)	1.012		
Weight of tin	31.44	Initial height of sample (ft)	0.08433333		
Weight of tin+ wet soil	160.66	Specific Gravity	2.70		
Weight of tin+ dry soil	139.15	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	20.0%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)
	0	Air	0.000201098
			0.001133699
0.3495985	0.058194268	Water	0.0009326
			0.00286
	0.291404212	Soil	0.001729607

	Stress (psf)			Root Time				Log Time			
Load Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.611	-0.0008	1.012	-0.001	0.657	-0.0008	1.013	-0.001	0.657
Swell	500	620	0.611	-0.0001	1.012	0.000	0.657	-0.0001	1.013	0.000	0.657
2	620	1000	0.611	0.0011	1.011	0.002	0.655	-0.0008	1.014	-0.001	0.658
3	1000	2000	0.611	0.0000	1.011	0.000	0.655	-0.0008	1.014	-0.001	0.660
4	2000	4000	0.611	0.0005	1.011	0.001	0.654	0.0005	1.014	0.001	0.659
5	4000	8000	0.611	0.0076	1.003	0.013	0.642	-0.0008	1.015	-0.001	0.660
6	8000	16000	0.611	0.0074	0.996	0.012	0.630	-0.0008	1.016	-0.001	0.661
7	16000	32000	0.611	0.0220	0.974	0.036	0.594	-0.0008	1.016	-0.001	0.663

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	620	1000	1.012	1.014	0.0000	0.0000	0.0000	0.0	1.013	0.506	#DIV/0!
3	1000	2000	1.014	1.014	0.0000	0.0000	0.0000	0.0	1.014	0.507	#DIV/0!
4	2000	4000	1.014	1.014	0.0083	0.0096	0.0090	0.0	1.014	0.507	#DIV/0!
5	4000	8000	1.014	1.015	0.0000	0.0000	0.0000	0.0	1.014	0.507	#DIV/0!
6	8000	16000	1.015	1.016	0.0000	0.0000	0.0000	0.0	1.015	0.508	#DIV/0!
7	16000	32000	1.016	1.016	0.0000	0.0000	0.0000	0.0	1.016	0.508	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	620	1000	1.012	1.014	0.0028	0.0047	0.0037	121.0	1.013	0.506	0.0004
3	1000	2000	1.014	1.014	0.0054	0.0061	0.0057	100.0	1.014	0.507	0.0005
4	2000	4000	1.014	1.014	0.0090	0.0103	0.0096	30.3	1.014	0.507	0.0017
5	4000	8000	1.014	1.015	0.0176	0.0260	0.0218	30.3	1.014	0.507	0.0017
6	8000	16000	1.015	1.016	0.0398	0.0480	0.0439	10.6	1.015	0.508	0.0048
7	16000	32000	1.016	1.016	0.0715	0.0943	0.0829	14.1	1.016	0.508	0.0036

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	620	1000	0.657	0.658	-3.44E-06	-2.08E-06	62.4	#DIV/0!	#DIV/0!
3	1000	2000	0.658	0.660	-1.31E-06	-7.89E-07	62.4	#DIV/0!	#DIV/0!
4	2000	4000	0.660	0.659	4.09E-07	2.46E-07	62.4	#DIV/0!	#DIV/0!
5	4000	8000	0.659	0.660	-3.27E-07	-1.97E-07	62.4	#DIV/0!	#DIV/0!
6	8000	16000	0.660	0.661	-1.64E-07	-9.85E-08	62.4	#DIV/0!	#DIV/0!
7	16000	32000	0.661	0.663	-8.18E-08	-4.92E-08	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	620	1000	0.657	0.655	4.55E-06	2.75E-06	62.4	0.0004	2.53E-10
3	1000	2000	0.658	0.655	3.01E-06	1.81E-06	62.4	0.0005	2.02E-10
4	2000	4000	0.660	0.654	2.54E-06	1.53E-06	62.4	0.0017	5.64E-10
5	4000	8000	0.659	0.642	4.19E-06	2.53E-06	62.4	0.0017	9.32E-10
6	8000	16000	0.660	0.630	3.78E-06	2.28E-06	62.4	0.0048	2.40E-09
7	16000	32000	0.661	0.594	4.22E-06	2.54E-06	62.4	0.0036	2.02E-09

Final

Moisture content	
Weight of tin	31.86
Weight of tin+ wet soil	170.27
Weight of tin+ dry soil	149.23
Moisture content (%)	17.9%
Void Ratio	0.594
Dry Unit Weight	105.709
Saturation	82%
Stress 1	16000
Stress 2	32000
Void Ratio 1	0.630
Void Ratio 2	0.594
Crompression Index	0.12

Initilal Load (psf)	0	DR Initial		ΔM	0.0008
Final Load (psf)	500	DR Final		ΔH	-0.0008

Initilal Load (psf)	500
Final Load (psf)	620

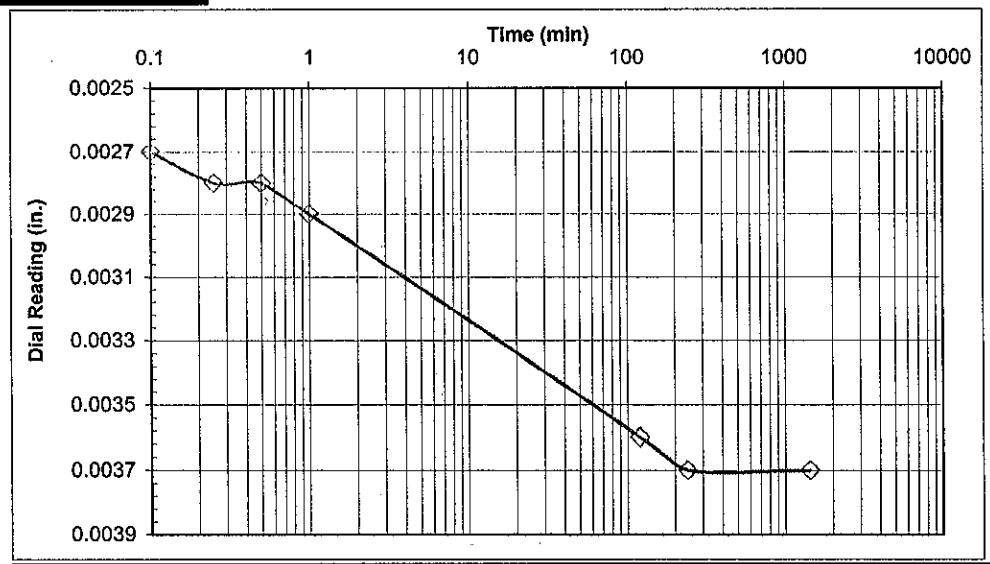
Final Displacemnt	0
ΔM	0.0001
ΔH	-0.0001

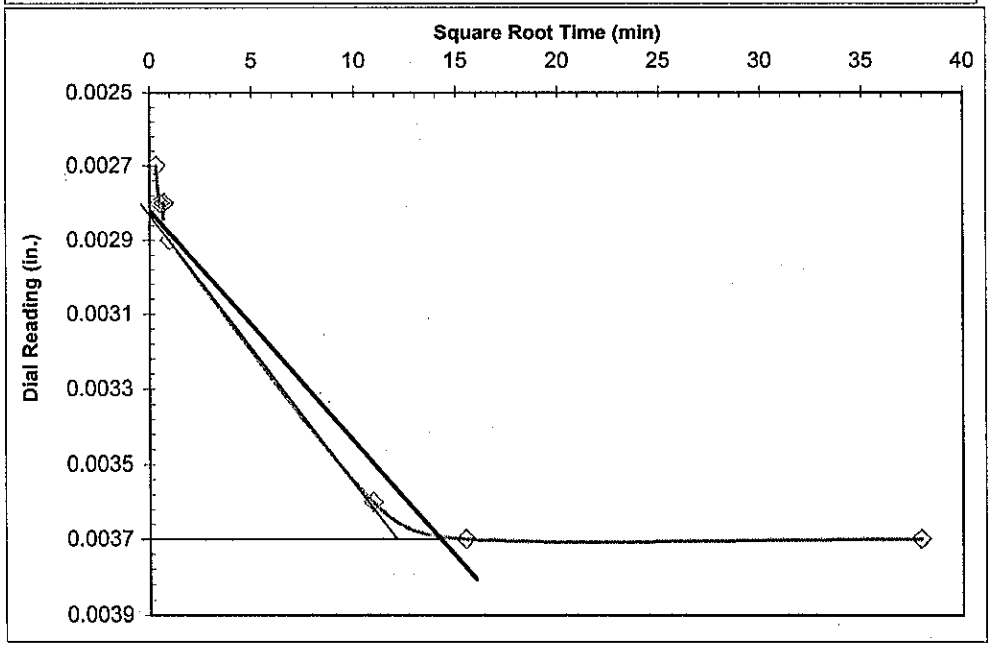
Loading

Time	Load	Dial Reading
	500	0.0023
		0.0023
		0.0023
		0.0023
		0.0023
	620	0.0023
		0.0023
		0.0023
		0.0023
		0.0023

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0339522			S_0	
Initial Stress (psf)	620	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	1000	(sq.rt. time) ΔH (in)	0.001	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0026
		0.1	0.3162	0.0027
		0.25	0.5	0.0028
		0.5	0.7071	0.0028
		1	1	0.0029
		120	10.954	0.0036
		240	15.492	0.0037
		1440	37.947	0.0037
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



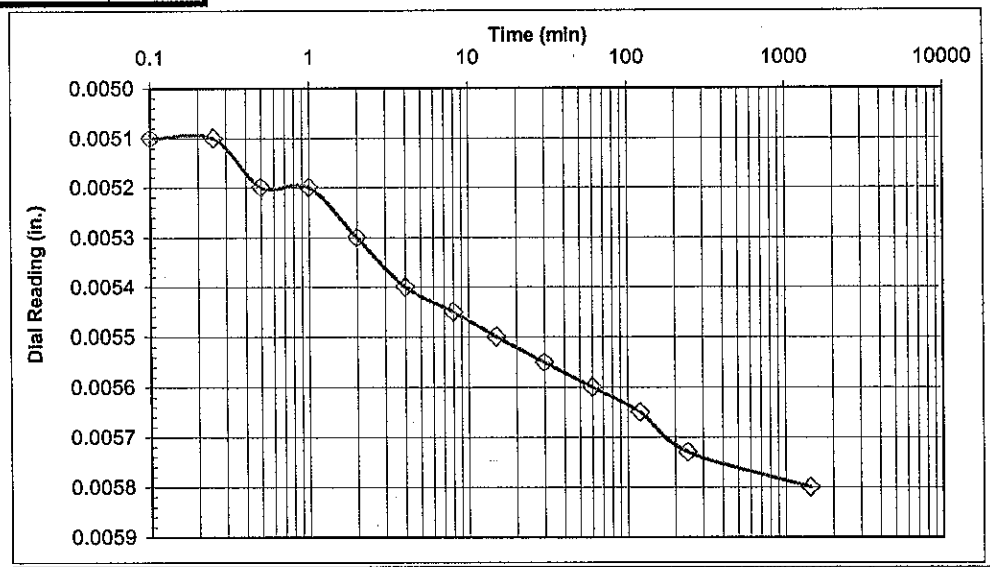


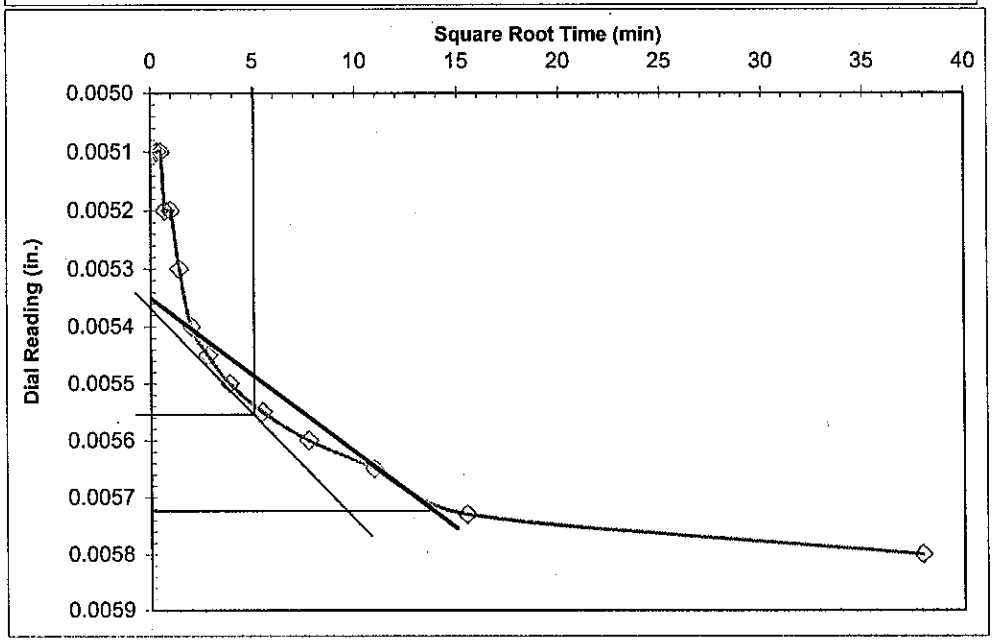
Sq. Root Time			
sqrt. t_{50}	11	D -Line	
S_0	0.0028	slope	6.166E-05
S_{50}	0.0036	0.000	0.00282
S_{90}	0.0037	11	0.00349826
S_{100}	0.0047	t_{50}	121

Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0339522			S_0	
Initial Stress (psf)	1000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	2000	(sq.rt. time) ΔH (in)	0.0000	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0050
		0.1	0.3162	0.0051
		0.25	0.5	0.0051
		0.5	0.7071	0.0052
		1	1	0.0052
		2	1.4142	0.0053
		4	2	0.0054
		8	2.8284	0.0055
		15	3.873	0.0055
		30	5.4772	0.0056
		60	7.746	0.0056
		120	10.954	0.0057
		240	15.492	0.0057
		1440	37.947	0.0058
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	10	D -Line	
S_0	0.0054	slope	2.6957E-05
S_{50}	0.00566	0.000	0.00535
S_{90}	0.0057	10	0.00561957
S_{100}	0.0061	t_{50}	100

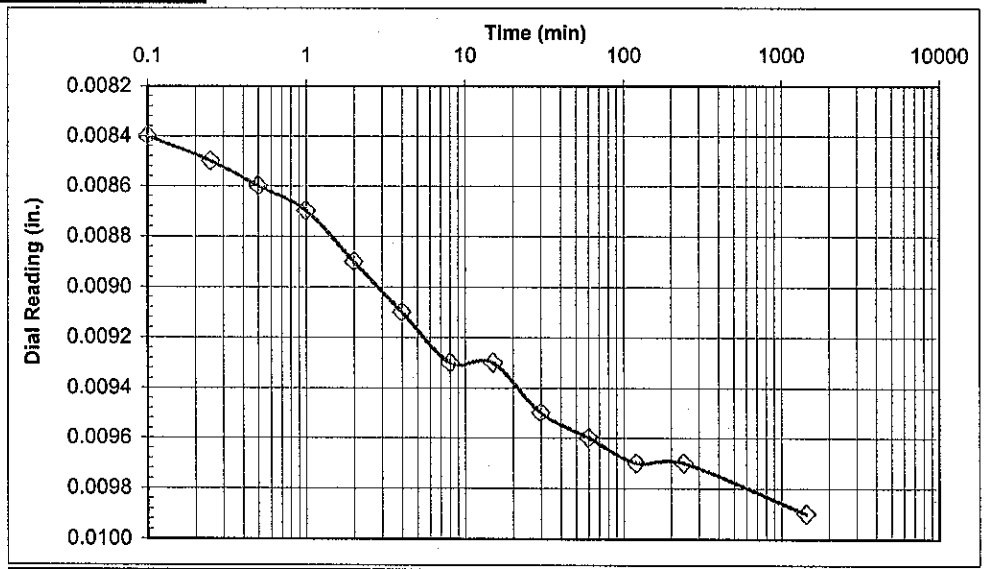


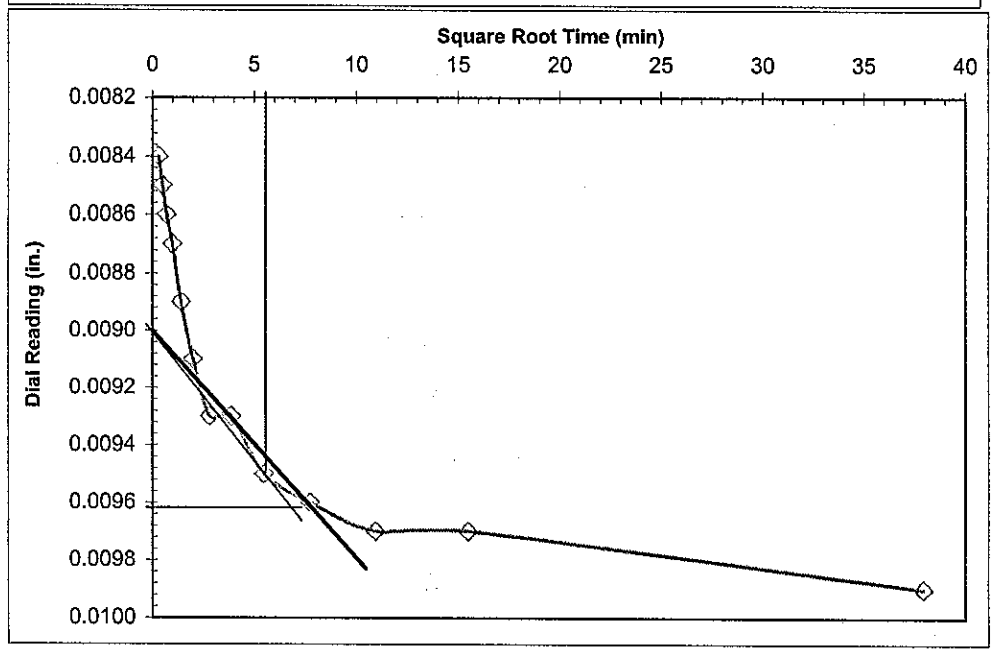


Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0339522			S_0	0.0083
Initial Stress (psf)	2000	(Log time) ΔH (in)	0.001	S_{50}	0.00895
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	0.000	S_{100}	0.0096

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0082
		0.1	0.3162	0.0084
		0.25	0.5	0.0085
		0.5	0.7071	0.0086
		1	1	0.0087
		2	1.4142	0.0089
		4	2	0.0091
		8	2.8284	0.0093
		15	3.873	0.0093
		30	5.4772	0.0095
		60	7.746	0.0096
		120	10.954	0.0097
		240	15.492	0.0097
		1440	37.947	0.0099
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	5.5	D -Line	
S_0	0.0090	slope	7.9051E-05
S_{50}	0.0095	0.000	0.009
S_{90}	0.0096	5.5	0.00943478
S_{100}	0.0103	t_{50}	30.25

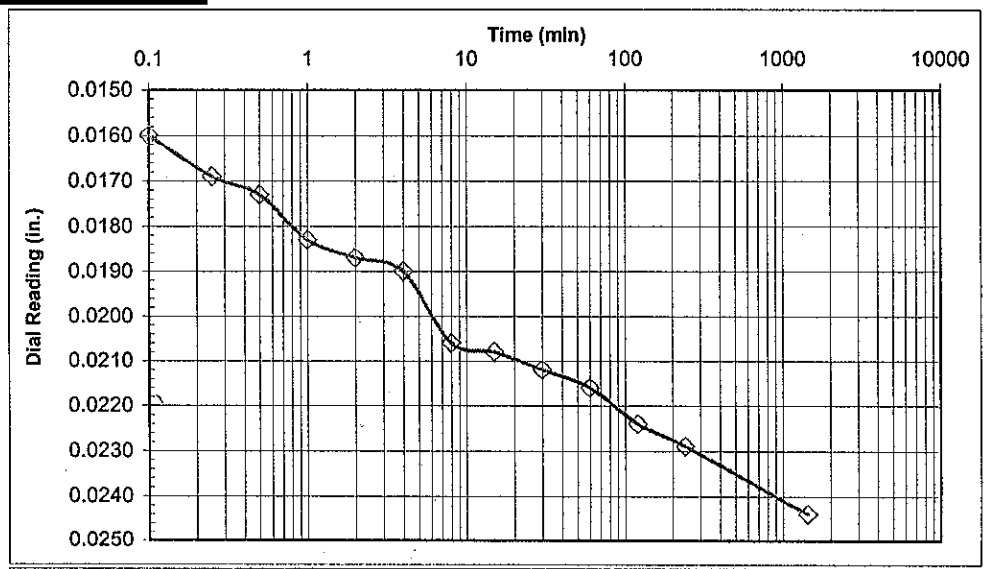


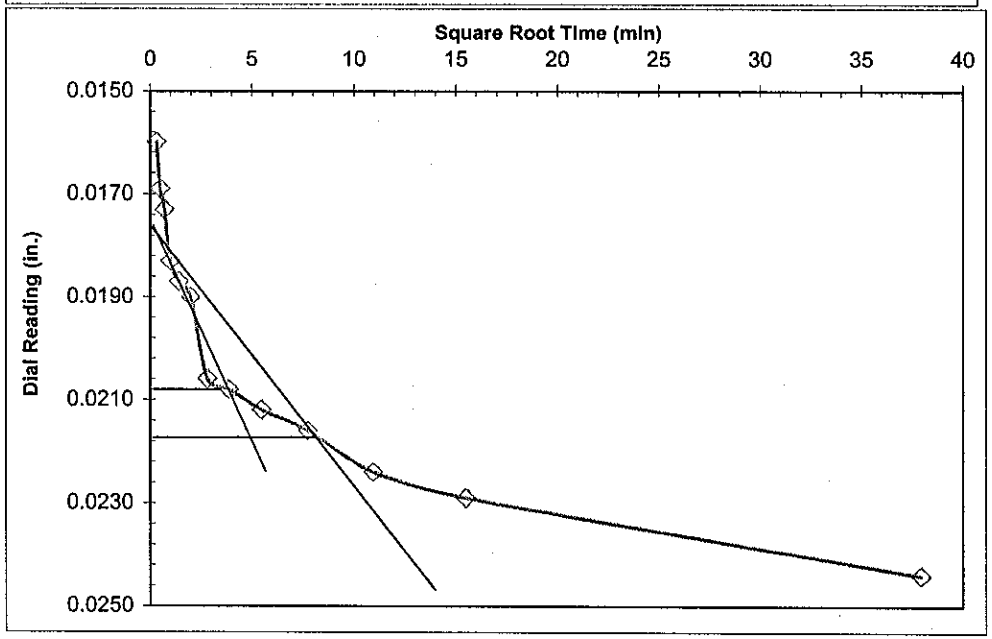


Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0339522			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.008	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0155
		0.1	0.3162	0.0160
		0.25	0.5	0.0169
		0.5	0.7071	0.0173
		1	1	0.0183
		2	1.4142	0.0187
		4	2	0.0190
		8	2.8284	0.0206
		15	3.873	0.0208
		30	5.4772	0.0212
		60	7.746	0.0216
		120	10.954	0.0224
		240	15.492	0.0229
		1440	37.947	0.0244
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	5.5	D -Line	
S_0	0.0176	slope	0.00050593
S_{50}	0.0208	0.000	0.0176
S_{90}	0.0216	5.5	0.02038261
S_{100}	0.0260	t_{50}	30.25



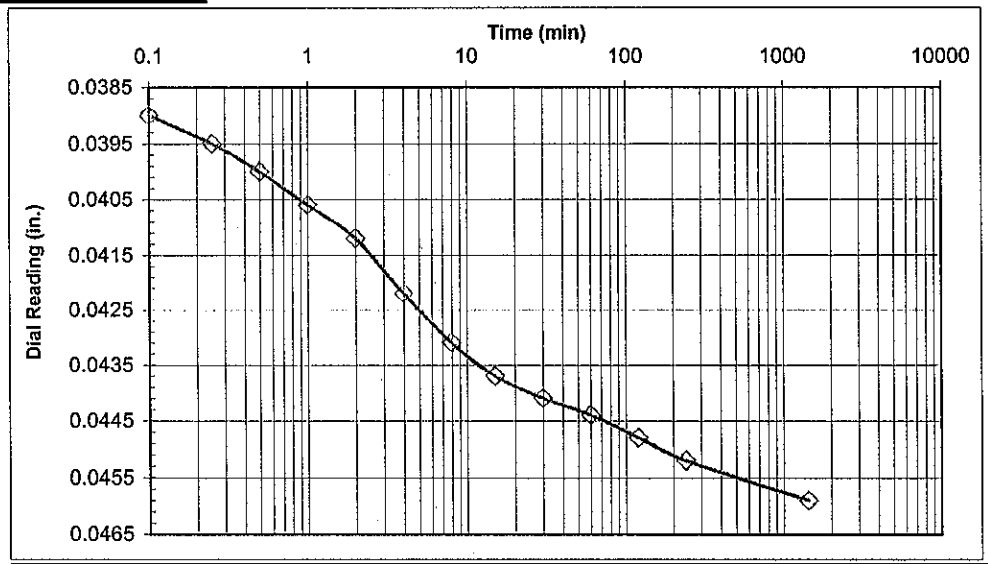


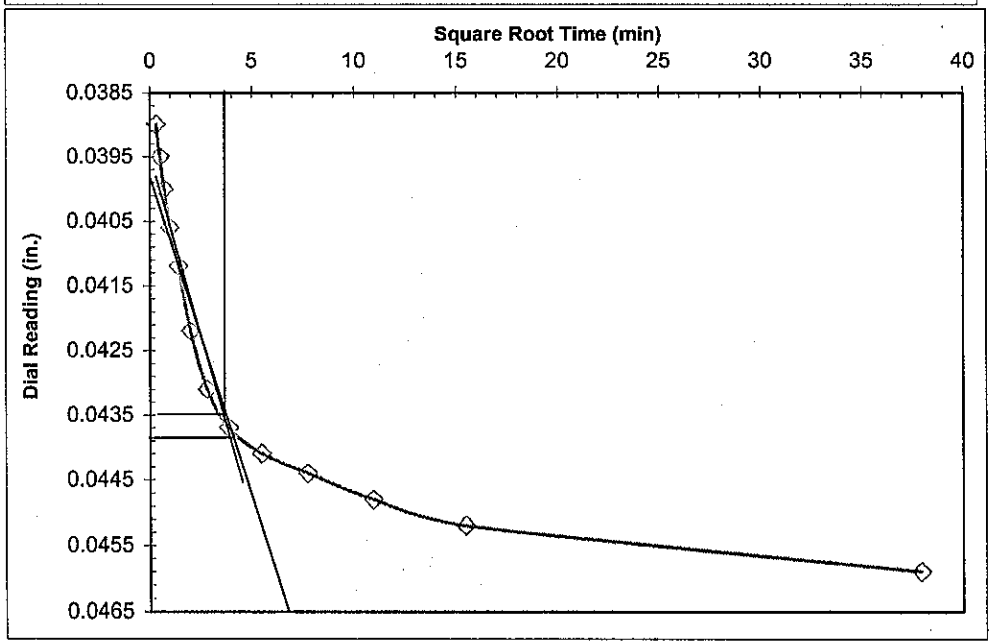
EH'03-4-4

Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0339522			S_0	
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.007	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0385
		0.1	0.3162	0.0390
		0.25	0.5	0.0395
		0.5	0.7071	0.0400
		1	1	0.0406
		2	1.4142	0.0412
		4	2	0.0422
		8	2.8284	0.0431
		15	3.873	0.0437
		30	5.4772	0.0441
		60	7.746	0.0444
		120	10.954	0.0448
		240	15.492	0.0452
		1440	37.947	0.0459
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

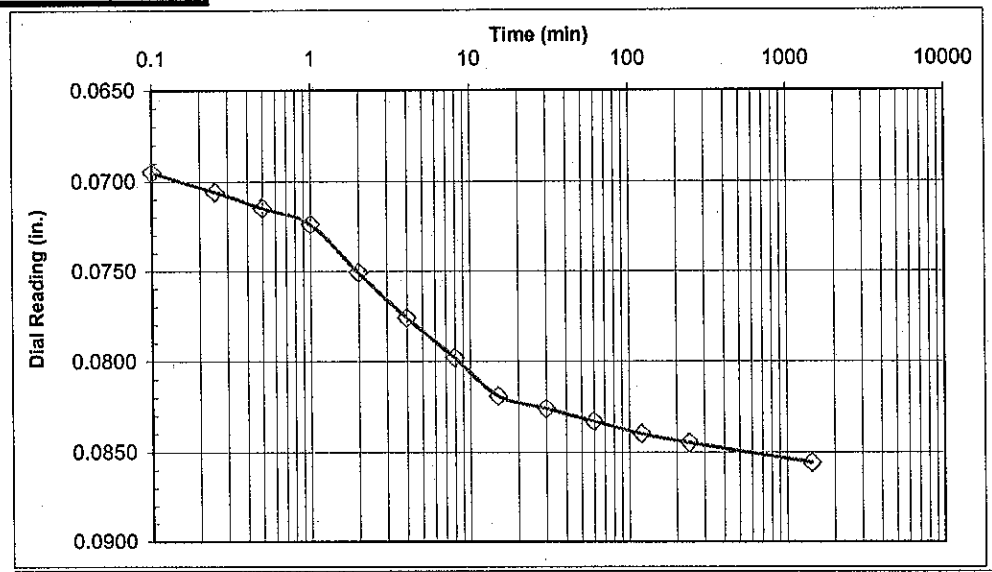
Sq. Root Time			
sqrt. t_{50}	3.258	D -Line	
S_0	0.0398	slope	0.00098754
S_{50}	0.0435	0.000	0.0398
S_{90}	0.0437	3.258	0.04301739
S_{100}	0.0480	t_{50}	10.614564

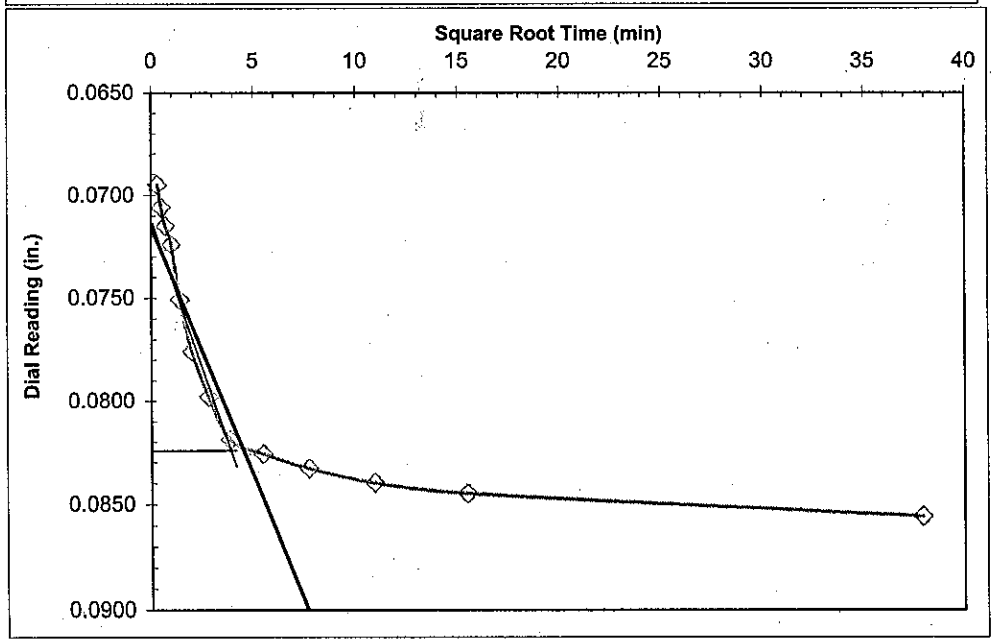




Load #	7	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0339522			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.022	S_{100}	

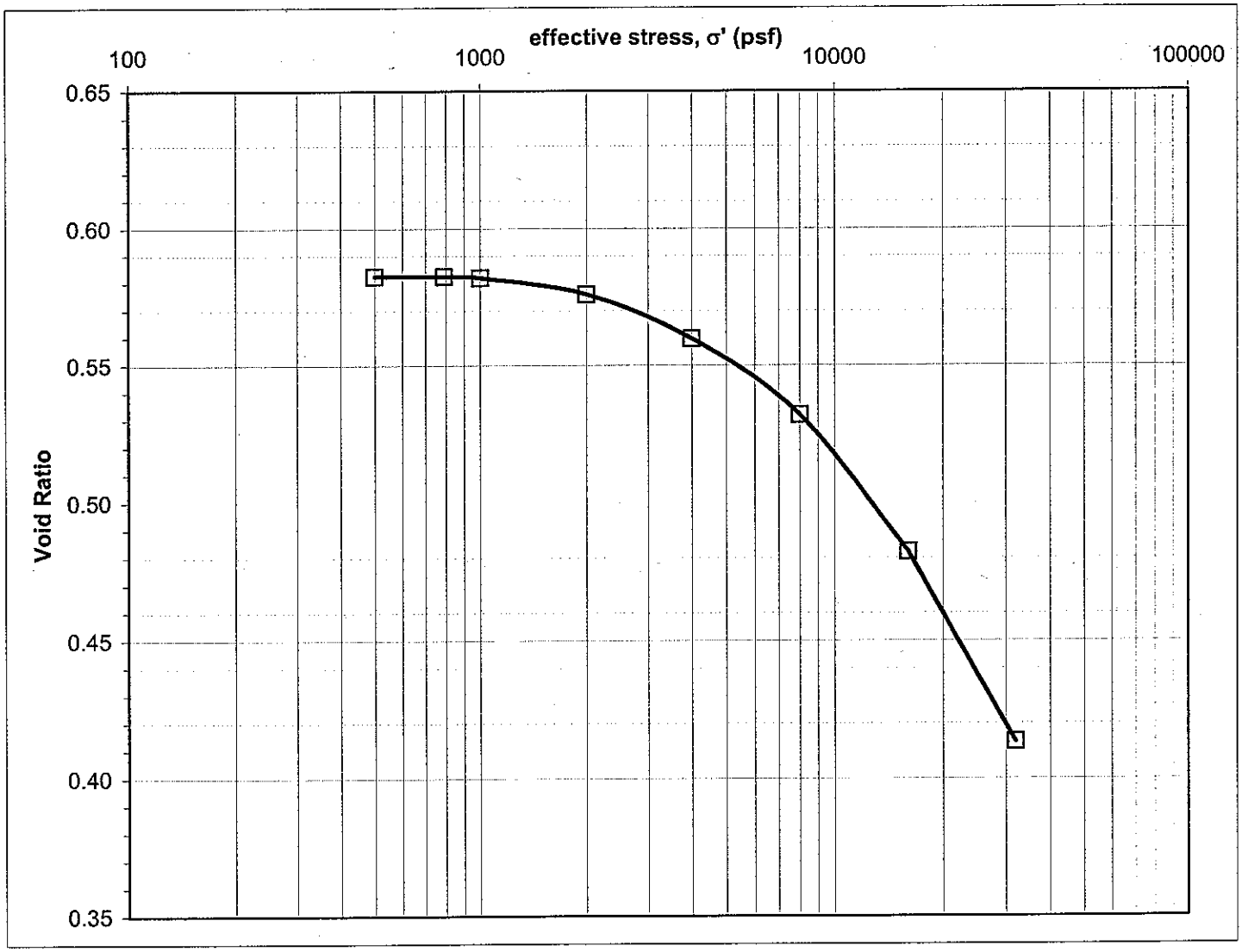
Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0459
		0.1	0.3162	0.0695
		0.25	0.5	0.0706
		0.5	0.7071	0.0715
		1	1	0.0724
		2	1.4142	0.0751
		4	2	0.0776
		8	2.8284	0.0798
		15	3.873	0.0819
		30	5.4772	0.0826
		60	7.746	0.0833
		120	10.954	0.0840
		240	15.492	0.0845
		1440	37.947	0.0856
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	





Sq. Root Time			
sqrt. t_{50}	3.75	D -Line	
S_0	0.0715	slope	0.00241159
S_{50}	0.0819	0.000	0.0715
S_{90}	0.0823	3.75	0.08054348
S_{100}	0.0943	t_{50}	14.0625

Professional Service Industries, Inc.

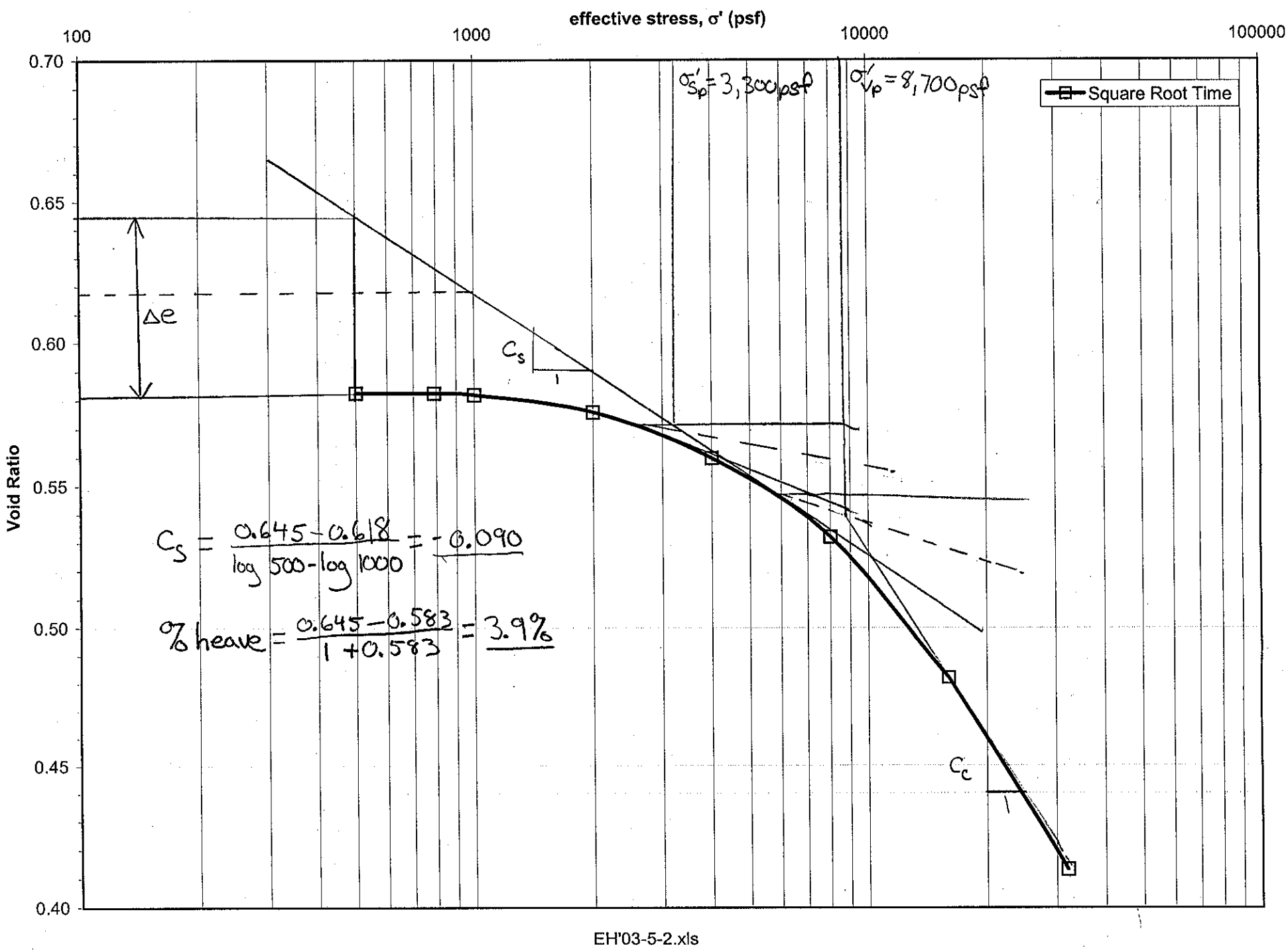


Properties	Initial	Final
Saturation	80.2%	109%
Void Ratio	0.58	0.41
Moisture Content	17.7%	17.0%
Dry Unit Weight (pcf)	104	117

Consolidation Index, C_C	0.23
Maximum Past Pressure (psf)	8,700
Swell Pressure (psf)	3,300
Therical Maximum Percent Heave	3.9%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring EH'03-5 Sample 2


effective stress, σ' (psf)
100
1000
10000
100000
0.70
0.65
0.60
0.55
0.50
0.45
0.40
Void Ratio
σ'_{sp} = 3,300 psf
σ'_{vp} = 8,700 psf
Square Root Time
Δe
C_s
1
C_c
1
$C_s = \frac{0.645 - 0.618}{\log 500 - \log 1000} = -0.090$
$\%\ \text{heave} = \frac{0.645 - 0.583}{1 + 0.583} = 3.9\%$
EH'03-5-2.xls

Lab Set-up

Weight of ring (g)	528.04	Diameter of Sample (in)	2.5	e_o	0.583
Weight of ring & soil (g)	686.43	Area of Sample (in^2)	4.90873852	Initial S, (%)	80.2%
Weight of soil (g)	158.39	Area of Sample (ft^2)	0.03408846		
Moisture content		Initial height of sample (in)	1.000		
Weight of tin	31.12	Initial height of sample (ft)	0.08333333		
Weight of tin+ wet soil	154.3	Specific Gravity	2.65		
Weight of tin+ dry soil	135.81	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	17.7%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)
	0	Air	0.00020674
			0.001046493
0.3490916	0.052400576	Water	0.000839753 0.00284
	0.296690984	Soil	0.001794213

	Stress (psf)			Root Time				Log Time			
Load Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.632	0.0004	1.000	0.001	0.583	0.0004	1.000	0.001	0.583
Swell	500	790	0.632	0.0001	1.000	0.000	0.583	0.0001	1.000	0.000	0.583
2	790	1000	0.632	0.0004	1.000	0.001	0.582	-0.0008	1.000	-0.001	0.584
3	1000	2000	0.632	0.0038	0.996	0.006	0.576	-0.0008	1.001	-0.001	0.585
4	2000	4000	0.632	0.0102	0.986	0.016	0.560	-0.0008	1.002	-0.001	0.586
5	4000	8000	0.632	0.0176	0.968	0.028	0.532	-0.0008	1.003	-0.001	0.588
6	8000	16000	0.632	0.0314	0.937	0.050	0.482	-0.0008	1.004	-0.001	0.589
7	16000	32000	0.632	0.0435	0.893	0.069	0.413	-0.0008	1.004	-0.001	0.590

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	790	1000	1.000	1.000	0.0000	0.0000	0.0000	0.0	1.000	0.500	#DIV/0!
3	1000	2000	1.000	1.001	0.0000	0.0000	0.0000	0.0	1.001	0.500	#DIV/0!
4	2000	4000	1.001	1.002	0.0000	0.0000	0.0000	0.0	1.002	0.501	#DIV/0!
5	4000	8000	1.002	1.003	0.0000	0.0000	0.0000	0.0	1.002	0.501	#DIV/0!
6	8000	16000	1.003	1.004	0.0000	0.0000	0.0000	0.0	1.003	0.502	#DIV/0!
7	16000	32000	1.004	1.004	0.0000	0.0000	0.0000	0.0	1.004	0.502	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	790	1000	1.000	1.000	0.0039	0.0051	0.0045	4.0	1.000	0.500	0.0123
3	1000	2000	1.000	1.001	0.0108	0.0154	0.0131	15.0	1.001	0.500	0.0033
4	2000	4000	1.001	1.002	0.0232	0.0342	0.0287	15.0	1.002	0.501	0.0033
5	4000	8000	1.002	1.003	0.0460	0.0644	0.0552	16.0	1.002	0.501	0.0031
6	8000	16000	1.003	1.004	0.0698	0.1019	0.0858	30.0	1.003	0.502	0.0017
7	16000	32000	1.004	1.004	0.0980	0.1423	0.1202	84.6	1.004	0.502	0.0006

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	790	1000	0.583	0.584	-6.03E-06	-3.81E-06	62.4	#DIV/0!	#DIV/0!
3	1000	2000	0.584	0.585	-1.27E-06	-8.00E-07	62.4	#DIV/0!	#DIV/0!
4	2000	4000	0.585	0.586	-6.33E-07	-4.00E-07	62.4	#DIV/0!	#DIV/0!
5	4000	8000	0.586	0.588	-3.17E-07	-2.00E-07	62.4	#DIV/0!	#DIV/0!
6	8000	16000	0.588	0.589	-1.58E-07	-9.97E-08	62.4	#DIV/0!	#DIV/0!
7	16000	32000	0.589	0.590	-7.92E-08	-4.98E-08	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	790	1000	0.583	0.582	2.72E-06	1.72E-06	62.4	0.0123	4.66E-09
3	1000	2000	0.584	0.576	7.93E-06	5.00E-06	62.4	0.0033	3.62E-09
4	2000	4000	0.585	0.560	1.27E-05	7.98E-06	62.4	0.0033	5.79E-09
5	4000	8000	0.586	0.532	1.36E-05	8.57E-06	62.4	0.0031	5.83E-09
6	8000	16000	0.588	0.482	1.32E-05	8.30E-06	62.4	0.0017	3.02E-09
7	16000	32000	0.589	0.413	1.10E-05	6.91E-06	62.4	0.0006	8.91E-10

Final

Moisture content	
Weight of tin	31.83
Weight of tin+ wet soil	193.93
Weight of tin+ dry soil	170.34
Moisture content (%)	17.0%
Void Ratio	0.413
Dry Unit Weight	117.002
Saturation	109%
Stress 1	32000
Stress 2	16000
Void Ratio 1	0.413
Void Ratio 2	0.482
Crompression Index	0.23

Initilal Load (psf)	0	DR Initial	0.0022	ΔM	0.0008
Final Load (psf)	500	DR Final	0.0034	ΔH	0.0004

Initilal Load (psf)	500
Final Load (psf)	790

Final Displacemnt	0.0003
ΔM	0.000232
ΔH	6.8E-05

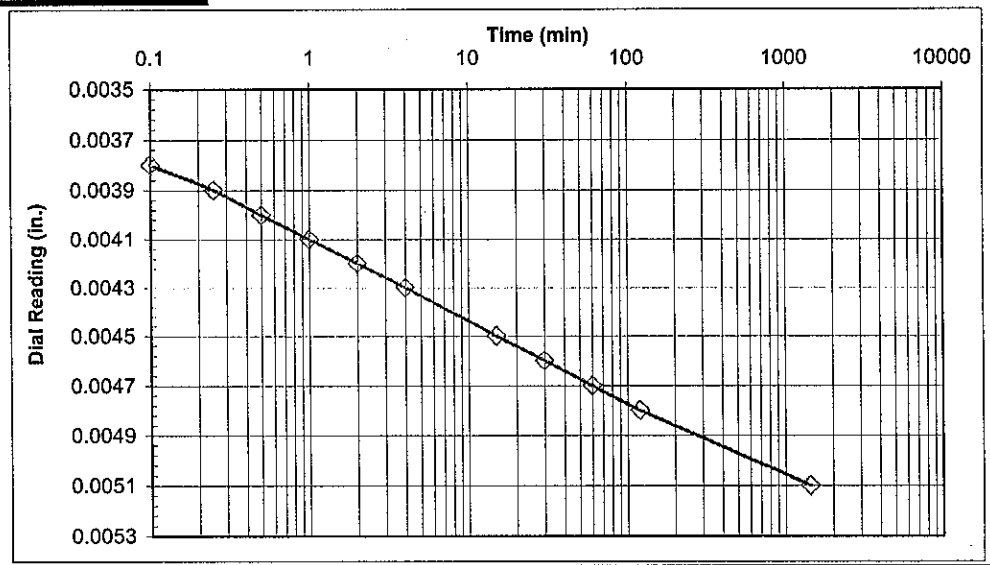
Loading

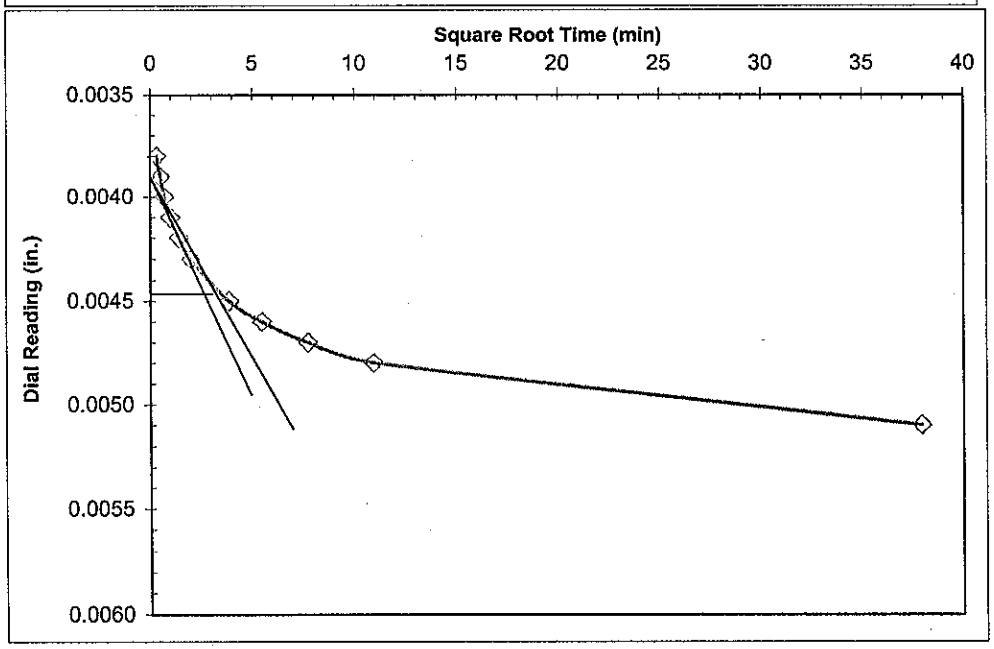
Time	Load	Dial Reading
	500	0.0034
	790	0.0031

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	790	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	1000	(sq.rt. time) ΔH (in)	0.000	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0036
		0.1	0.3162	0.0038
		0.25	0.5	0.0039
		0.5	0.7071	0.0040
		1	1	0.0041
		2	1.4142	0.0042
		4	2	0.0043
		15	3.873	0.0045
		30	5.4772	0.0046
		60	7.746	0.0047
		120	10.954	0.0048
		1440	37.947	0.0051
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

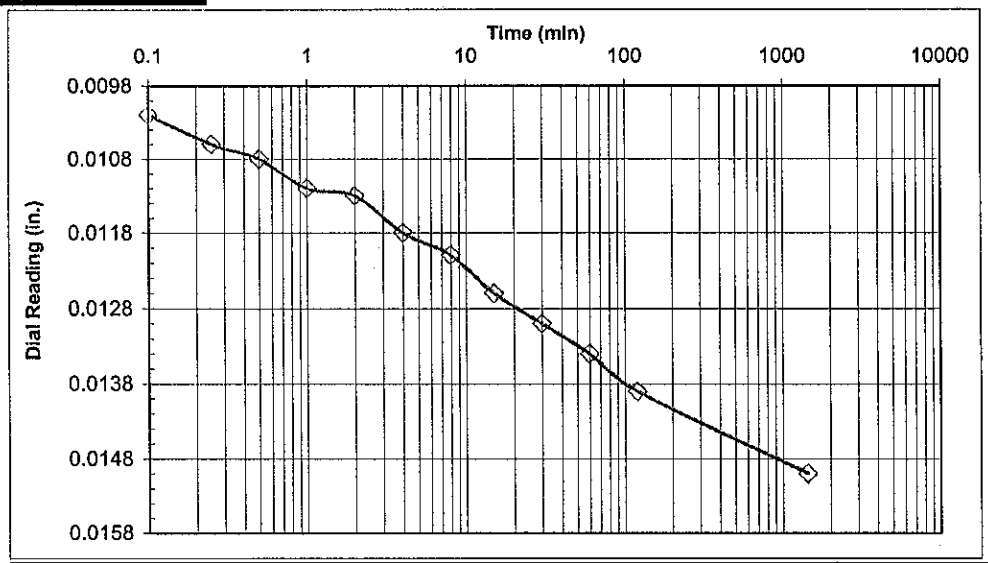
Sq. Root Time			
sqrt. t_{50}	2	D -Line	
S_0	0.0039	slope	0.00017391
S_{50}	0.0043	0.000	0.0039
S_{90}	0.0045	2	0.00424783
S_{100}	0.0051	t_{50}	4

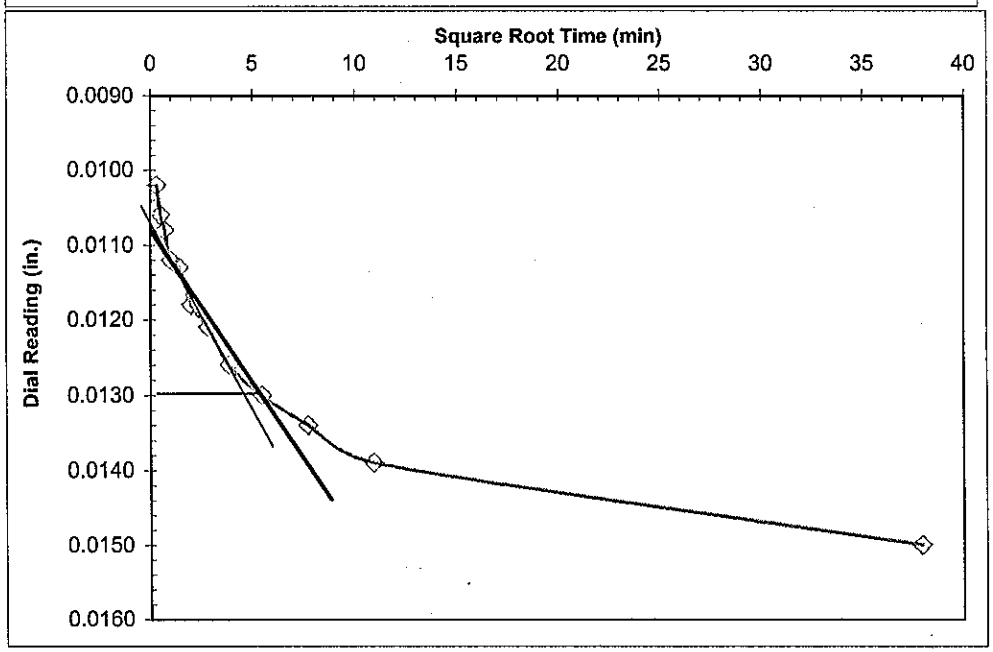




Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	1000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	2000	(sq.rt. time) ΔH (in)	0.004	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0098
		0.1	0.3162	0.0102
		0.25	0.5	0.0106
		0.5	0.7071	0.0108
		1	1	0.0112
		2	1.4142	0.0113
		4	2	0.0118
		8	2.8284	0.0121
		15	3.873	0.0126
		30	5.4772	0.0130
		60	7.746	0.0134
		120	10.954	0.0139
		1440	37.947	0.0150
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



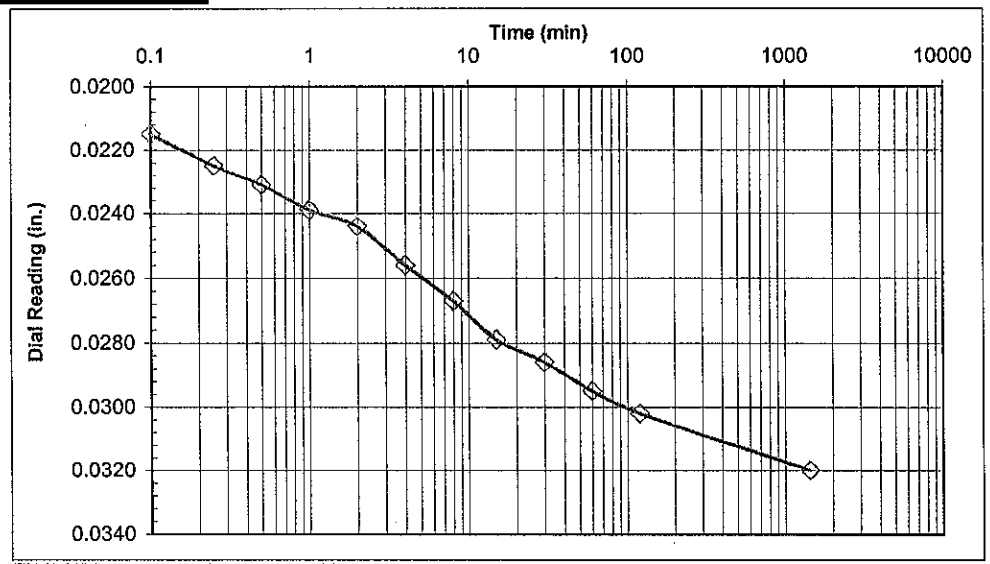


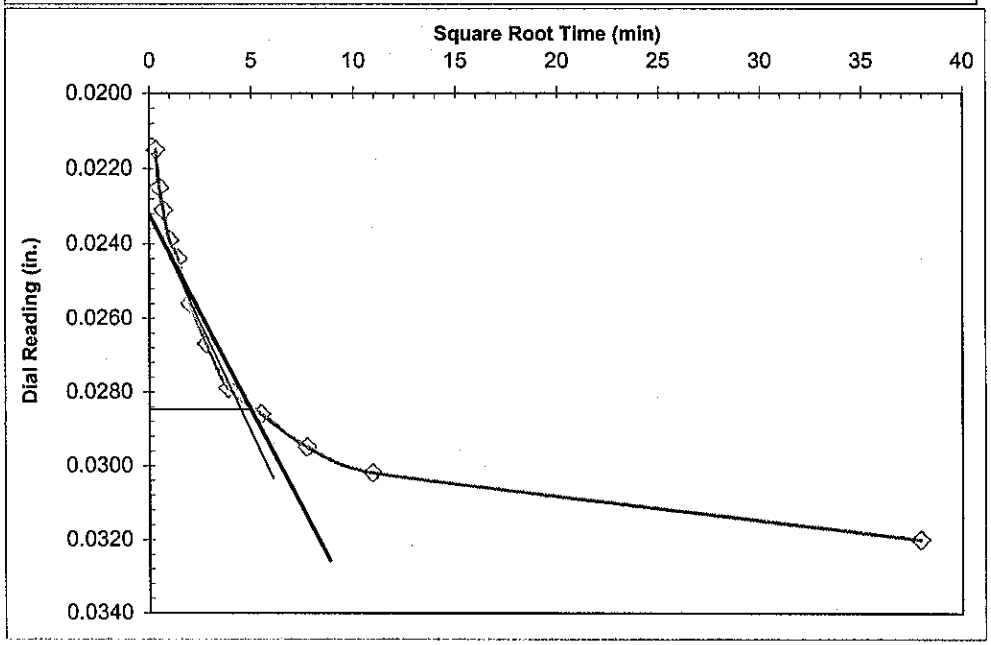
Sq. Root Time			
sqrt. t_{50}	3.872983	D -Line	
S_0	0.0108	slope	0.00040414
S_{50}	0.0126	0.000	0.0108
S_{90}	0.0130	3.873	0.01236522
S_{100}	0.0154	t_{50}	15

Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft²)	0.0340885			S_0	
Initial Stress (psf)	2000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	0.010	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0150
		0.1	0.3162	0.0215
		0.25	0.5	0.0225
		0.5	0.7071	0.0231
		1	1	0.0239
		2	1.4142	0.0244
		4	2	0.0256
		8	2.8284	0.0267
		15	3.873	0.0279
		30	5.4772	0.0286
		60	7.746	0.0295
		120	10.954	0.0302
		1440	37.947	0.0320
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	3.872983	D -Line	
S_0	0.0232	slope	0.00105525
S_{50}	0.0279	0.000	0.0232
S_{90}	0.0284	3.873	0.02728696
S_{100}	0.0342	t_{50}	15

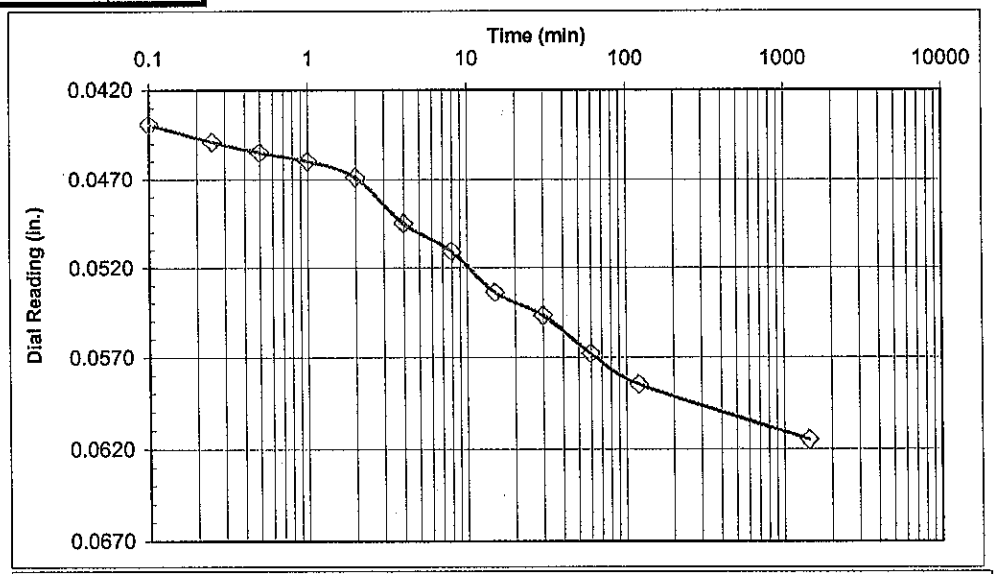


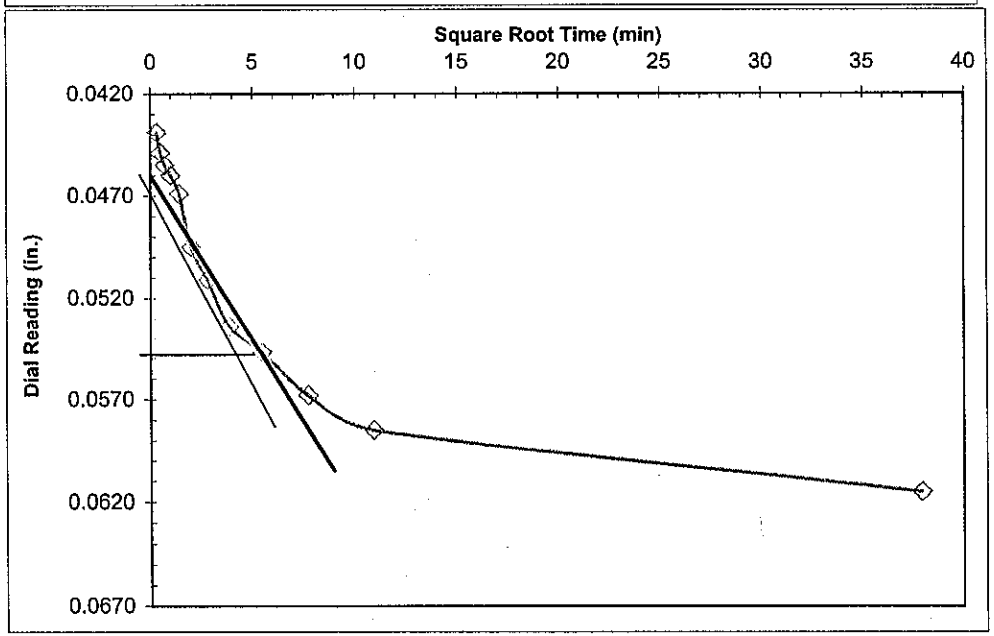


Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.018	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0320
		0.1	0.3162	0.0439
		0.25	0.5	0.0449
		0.5	0.7071	0.0455
		1	1	0.0460
		2	1.4142	0.0469
		4	2	0.0495
		8	2.8284	0.0511
		15	3.873	0.0534
		30	5.4772	0.0547
		60	7.746	0.0568
		120	10.954	0.0585
		1440	37.947	0.0615
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

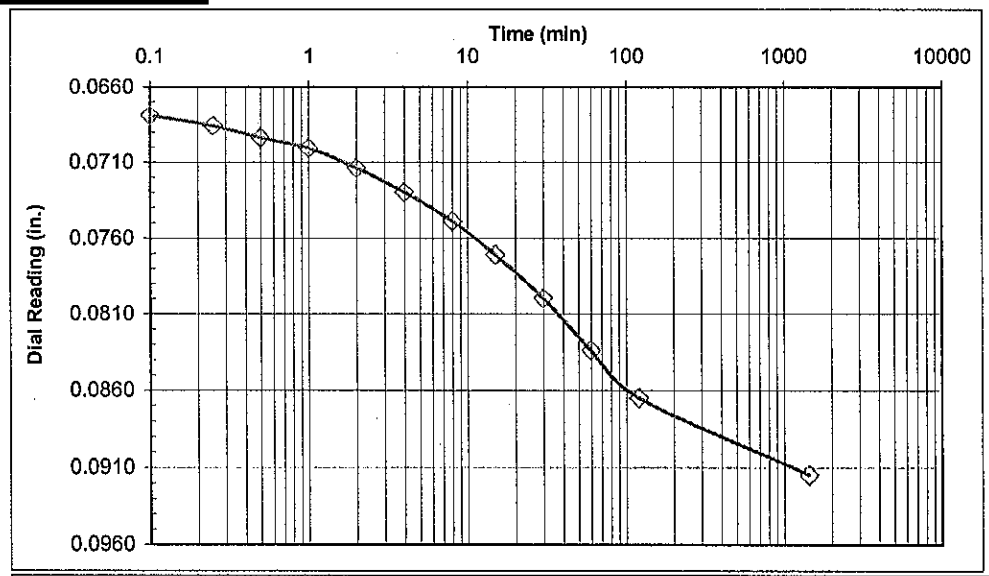
Sq. Root Time			
sqrt. t_{50}	4	D -Line	
S_0	0.0460	slope	0.0016087
S_{50}	0.0534	0.000	0.046
S_{90}	0.0547	4	0.05243478
S_{100}	0.0644	t_{50}	16

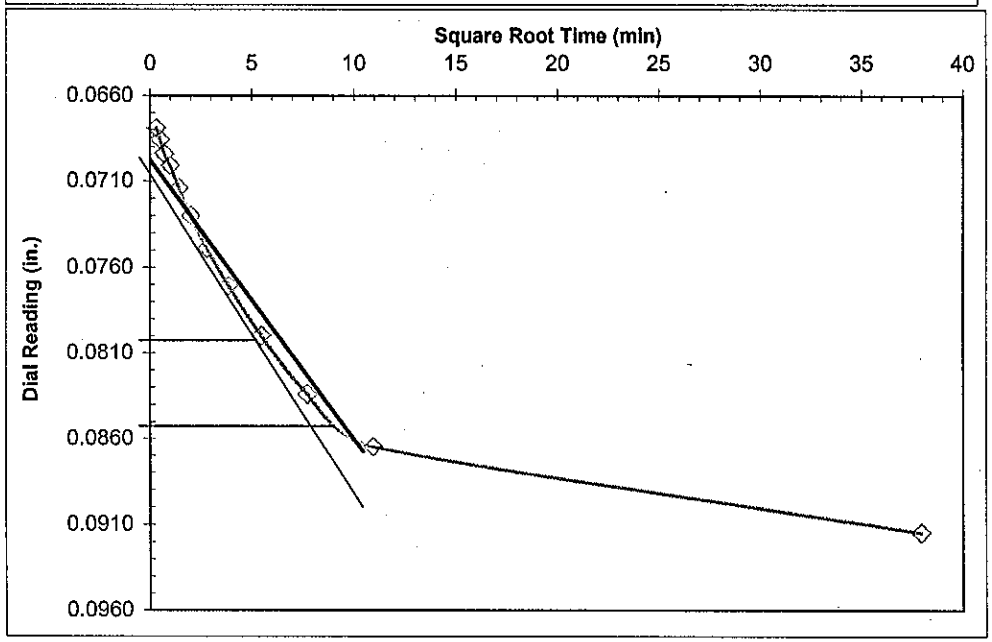




Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.031	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0615
		0.1	0.3162	0.0679
		0.25	0.5	0.0686
		0.5	0.7071	0.0694
		1	1	0.0701
		2	1.4142	0.0714
		4	2	0.0730
		8	2.8284	0.0749
		15	3.873	0.0771
		30	5.4772	0.0800
		60	7.746	0.0834
		120	10.954	0.0865
		1440	37.947	0.0915
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



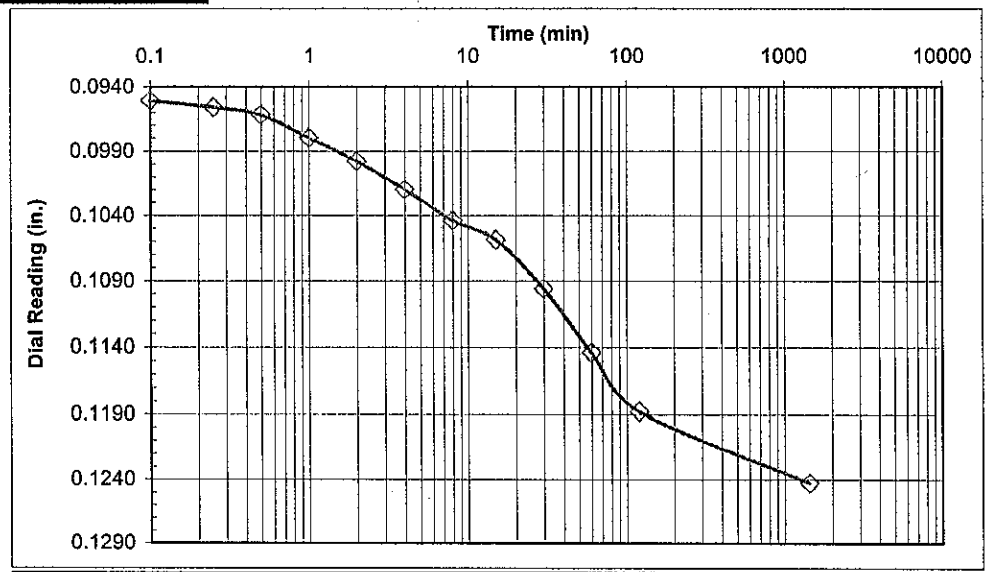


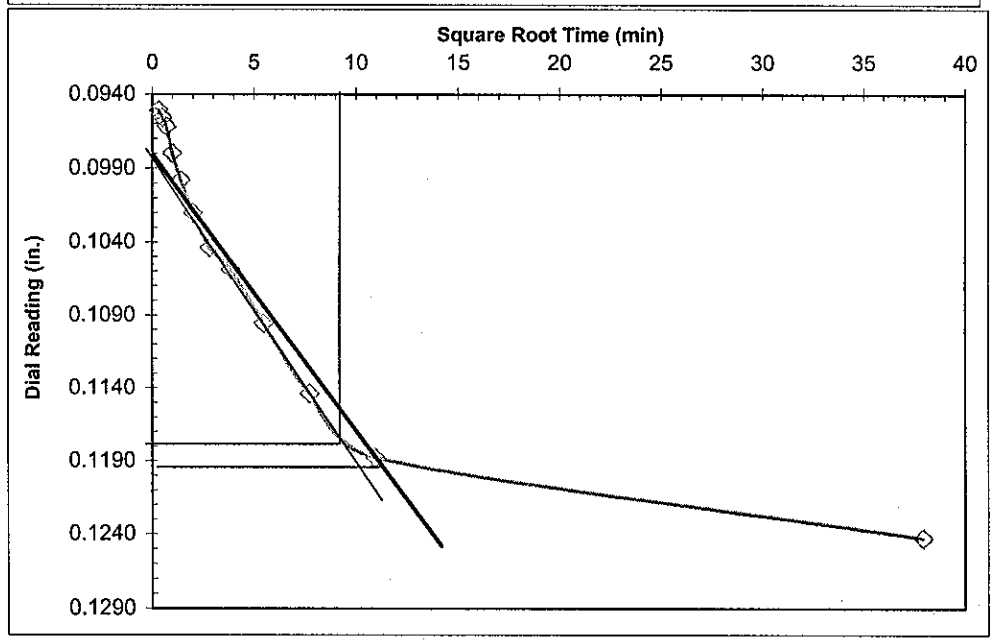
Sq. Root Time			
sqrt. t_{50}	5.477226	D -Line	
S_0	0.0698	slope	0.00162729
S_{50}	0.0800	0.000	0.06975
S_{90}	0.0850	5.4772	0.07866304
S_{100}	0.1019	t_{50}	30

Load #	7	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.044	S_{100}	

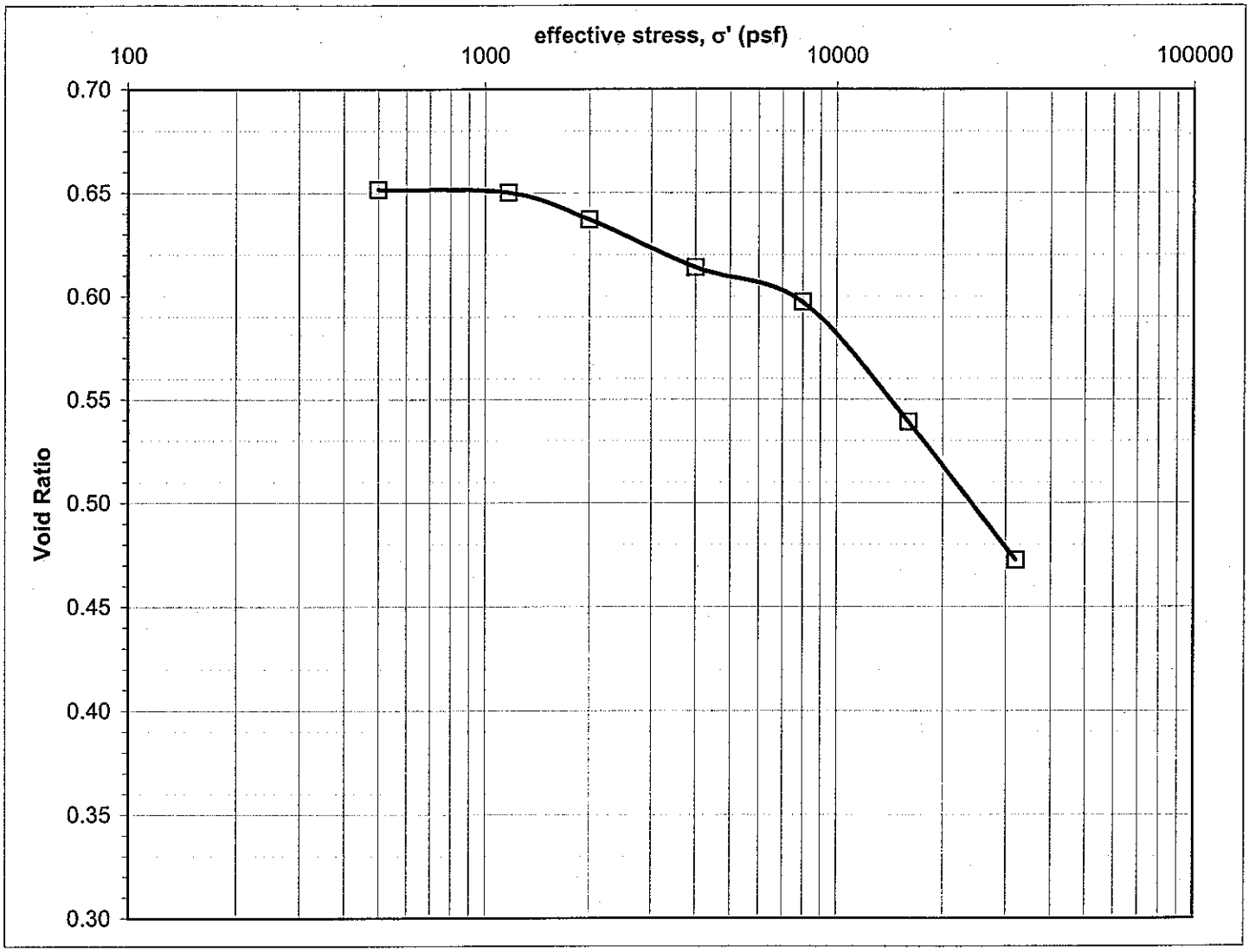
Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0915
		0.1	0.3162	0.0951
		0.25	0.5	0.0956
		0.5	0.7071	0.0962
		1	1	0.0980
		2	1.4142	0.0998
		4	2	0.1020
		8	2.8284	0.1044
		15	3.873	0.1059
		30	5.4772	0.1096
		60	7.746	0.1144
		120	10.954	0.1188
		1440	37.947	0.1243
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	9.2	D -Line	
S_0	0.0980	slope	0.00189036
S_{50}	0.1180	0.000	0.098
S_{90}	0.1190	9.2	0.1153913
S_{100}	0.1423	t_{50}	84.64





Professional Service Industries, Inc.

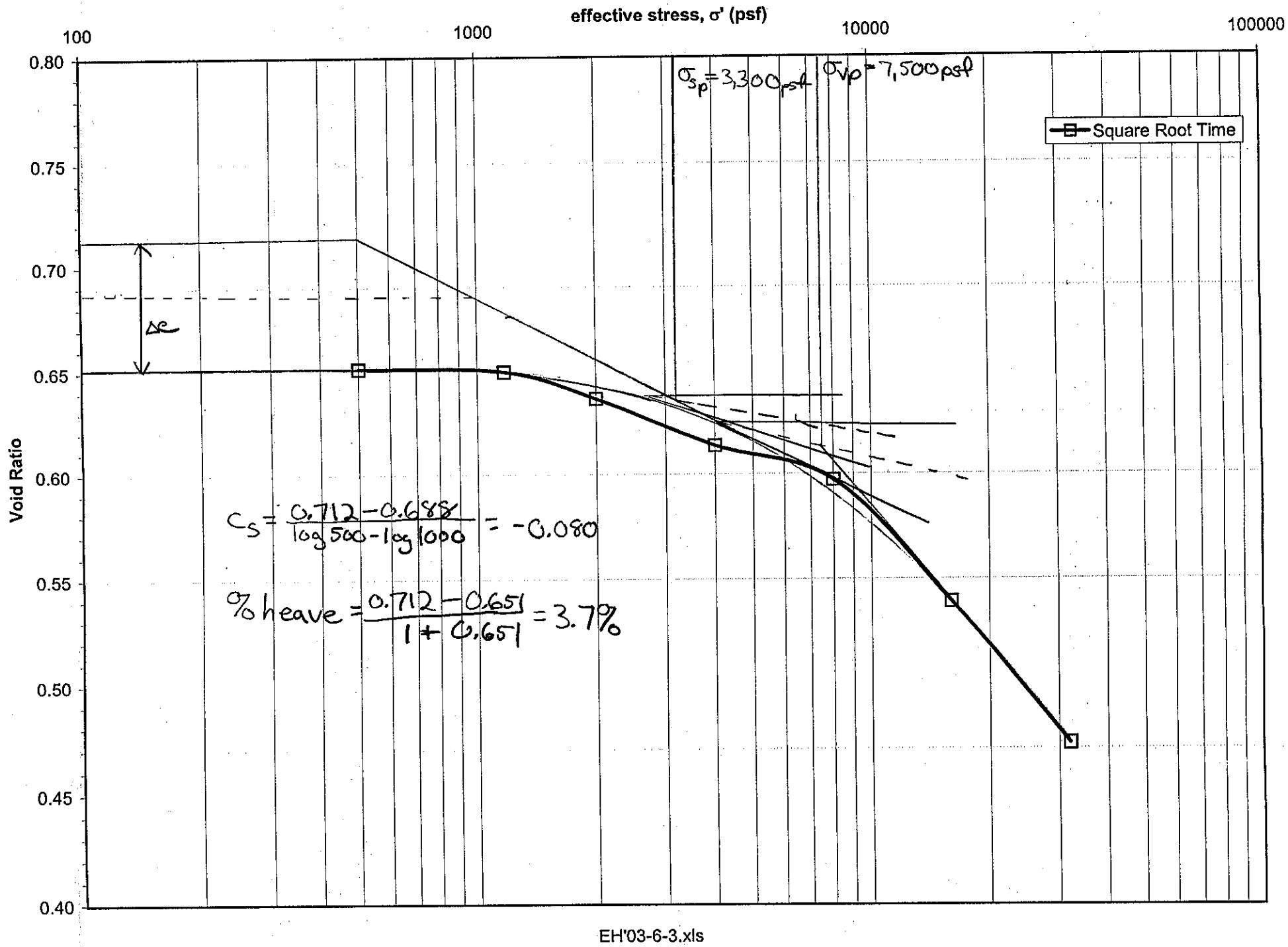


Properties	Initial	Final
Saturation	62.2%	105%
Void Ratio	0.651	0.47
Moisture Content	15.0%	18.4%
Dry Unit Weight (pcf)	102	114

Consolidation Index, C_C	0.22
Maximum Past Pressure (psf)	7,500
Swell Pressure (psf)	3,300
Therical Maximum Percent Heave	3.7%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring EH'03-6 Sample 3


effective stress, σ' (psf)
100
1000
10000
100000
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
Void Ratio
Δe
σ'sp = 3,300 psf
σ'vo = 7,500 psf
Square Root Time
Cs = (0.712 − 0.688) / (log 500 − log 1000) = −0.080
% heave = (0.712 − 0.651) / (1 + 0.651) = 3.7%
EH'03-6-3.xls

Lab Set-up

Weight of ring (g)	528.04	Diameter of Sample (in)	2.48	e_o	0.651
Weight of ring & soil (g)	676.87	Area of Sample (in^2)	4.83051286	Initial S_r (%)	62.2%
Weight of soil (g)	148.83	Area of Sample (ft^2)	0.03354523		
Moisture content		Initial height of sample (in)	1.000		
Weight of tin	30.78	Initial height of sample (ft)	0.08333333		
Weight of tin+ wet soil	164.5	Specific Gravity	2.70		
Weight of tin+ dry soil	147.05	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	15.0%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)	
	0	Air	0.000416572	
				0.00110256
0.3280213	0.042805654	Water	0.000685988	0.0028
	0.285215666	Soil	0.001692876	

	Stress (psf)			Root Time				Log Time			
Load Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.606	-0.0002	1.000	0.000	0.652	-0.0002	1.000	0.000	0.652
Swell	500	1170	0.606	0.0009	0.999	0.002	0.650	0.0009	0.999	0.002	0.650
2	1170	2000	0.606	0.0080	0.991	0.013	0.637	-0.0008	1.000	-0.001	0.651
3	2000	4000	0.606	0.0140	0.977	0.023	0.614	-0.0008	1.001	-0.001	0.653
4	4000	8000	0.606	0.0102	0.967	0.017	0.597	-0.0008	1.002	-0.001	0.654
5	8000	16000	0.606	0.0351	0.932	0.058	0.539	-0.0008	1.002	-0.001	0.655
6	16000	32000	0.606	0.0404	0.892	0.067	0.472	-0.0008	1.003	-0.001	0.657

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	1170	2000	1.000	1.000	0.0000	0.0000	0.0000	0.0	1.000	0.500	#DIV/0!
3	2000	4000	1.000	1.001	0.0000	0.0000	0.0000	0.0	1.000	0.500	#DIV/0!
4	4000	8000	1.001	1.002	0.0000	0.0000	0.0000	0.0	1.001	0.501	#DIV/0!
5	8000	16000	1.002	1.002	0.0000	0.0000	0.0000	0.0	1.002	0.501	#DIV/0!
6	16000	32000	1.002	1.003	0.0000	0.0000	0.0000	0.0	1.003	0.501	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	1170	2000	1.000	1.000	0.0025	0.0113	0.0069	175.6	1.000	0.500	0.0003
3	2000	4000	1.000	1.001	0.0395	0.0543	0.0469	8.0	1.000	0.500	0.0062
4	4000	8000	1.001	1.002	0.0560	0.0670	0.0615	45.6	1.001	0.501	0.0011
5	8000	16000	1.002	1.002	0.0920	0.1279	0.1099	120.0	1.002	0.501	0.0004
6	16000	32000	1.002	1.003	0.1255	0.1667	0.1461	120.0	1.003	0.501	0.0004

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	1170	2000	0.650	0.651	-1.59E-06	-9.65E-07	62.4	#DIV/0!	#DIV/0!
3	2000	4000	0.651	0.653	-6.61E-07	-4.00E-07	62.4	#DIV/0!	#DIV/0!
4	4000	8000	0.653	0.654	-3.30E-07	-2.00E-07	62.4	#DIV/0!	#DIV/0!
5	8000	16000	0.654	0.655	-1.65E-07	-9.98E-08	62.4	#DIV/0!	#DIV/0!
6	16000	32000	0.655	0.657	-8.26E-08	-4.99E-08	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	1170	2000	0.650	0.637	1.58E-05	9.60E-06	62.4	0.0003	5.93E-10
3	2000	4000	0.651	0.614	1.88E-05	1.14E-05	62.4	0.0062	1.54E-08
4	4000	8000	0.653	0.597	1.39E-05	8.42E-06	62.4	0.0011	2.01E-09
5	8000	16000	0.654	0.539	1.44E-05	8.69E-06	62.4	0.0004	7.88E-10
6	16000	32000	0.655	0.472	1.14E-05	6.91E-06	62.4	0.0004	6.28E-10

Final

Moisture content	
Weight of tin	14.19
Weight of tin+ wet soil	166.87
Weight of tin+ dry soil	143.13
Moisture content (%)	18.4%
Void Ratio	0.472
Dry Unit Weight	114.419
Saturation	105%
Stress 1	32000
Stress 2	16000
Void Ratio 1	0.472
Void Ratio 2	0.539
Crompression Index	0.22

Initilal Load (psf)	0	DR Initial	0.0021	ΔM	0.0008
Final Load (psf)	500	DR Final	0.0027	ΔH	-0.0002

Initilal Load (psf)	500
Final Load (psf)	1170

Final Displacemnt	0.0014
ΔM	0.0005
ΔH	0.0009

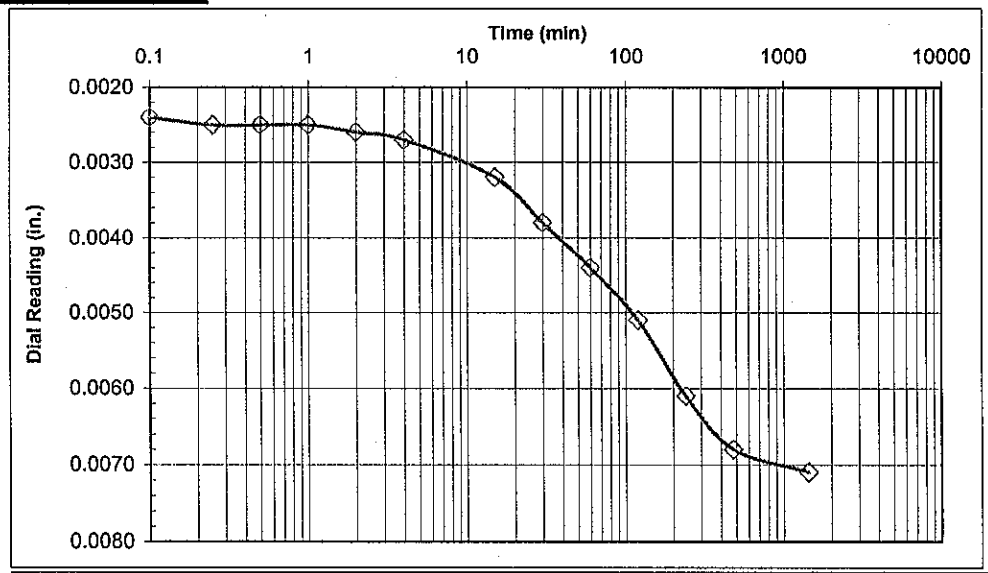
Loading

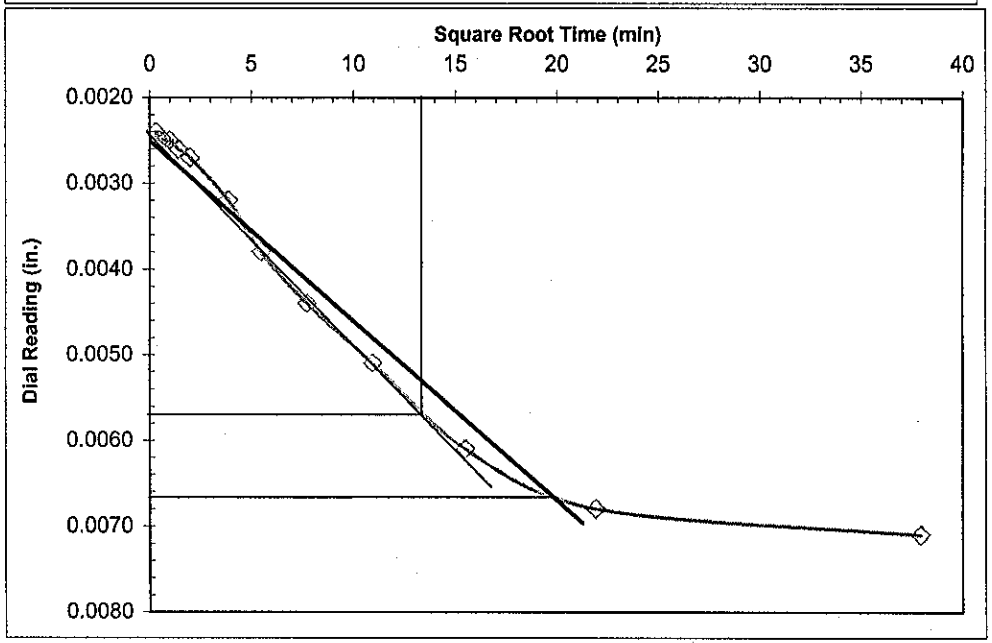
Time	Load	Dial Reading
	500	0.0027
	1170	0.0013

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0335452			S_0	
Initial Stress (psf)	1170	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	2000	(sq.rt. time) ΔH (in)	0.008	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0024
		0.1	0.3162	0.0024
		0.25	0.5	0.0025
		0.5	0.7071	0.0025
		1	1	0.0025
		2	1.4142	0.0026
		4	2	0.0027
		15	3.873	0.0032
		30	5.4772	0.0038
		60	7.746	0.0044
		120	10.954	0.0051
		240	15.492	0.0061
		480	21.909	0.0068
		1440	37.947	0.0071
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	13.25	D -Line	
S_0	0.0025	slope	0.00021001
S_{50}	0.0057	0.000	0.0025
S_{90}	0.0067	13.25	0.00528261
S_{100}	0.0113	t_{50}	175.5625

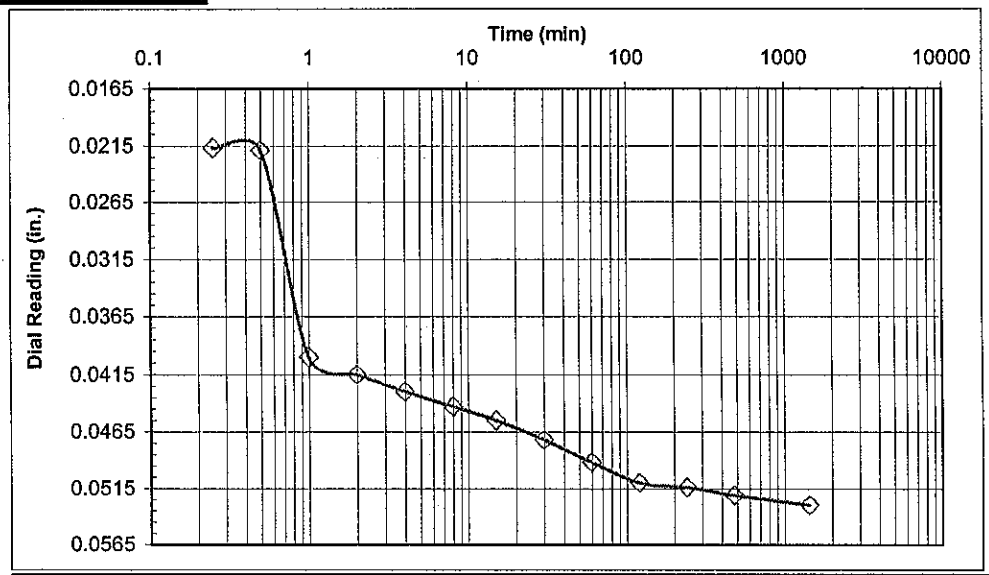


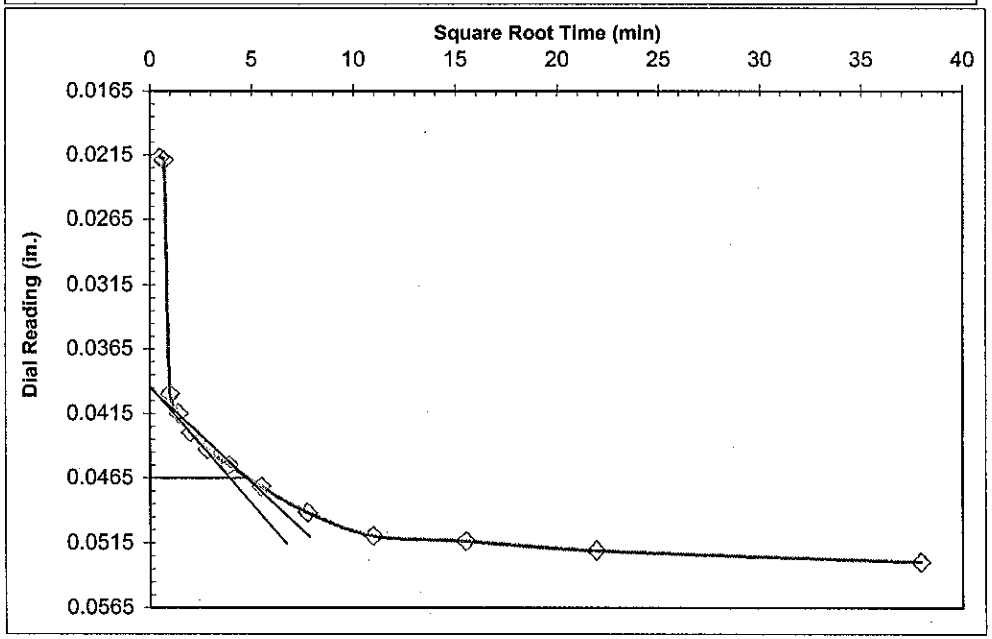


Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0335452			S_0	
Initial Stress (psf)	2000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	0.014	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0071
		0.25	0.5	0.0217
		0.5	0.7071	0.0219
		1	1	0.0400
		2	1.4142	0.0415
		4	2	0.0430
		8	2.8284	0.0443
		15	3.873	0.0455
		30	5.4772	0.0472
		60	7.746	0.0492
		120	10.954	0.0510
		240	15.492	0.0514
		480	21.909	0.0521
		1440	37.947	0.0530
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	2.828427	D -Line	
S_0	0.0395	slope	0.0014757
S_{50}	0.0443	0.000	0.0395
S_{90}	0.0465	2.8284	0.04367391
S_{100}	0.0543	t_{50}	8



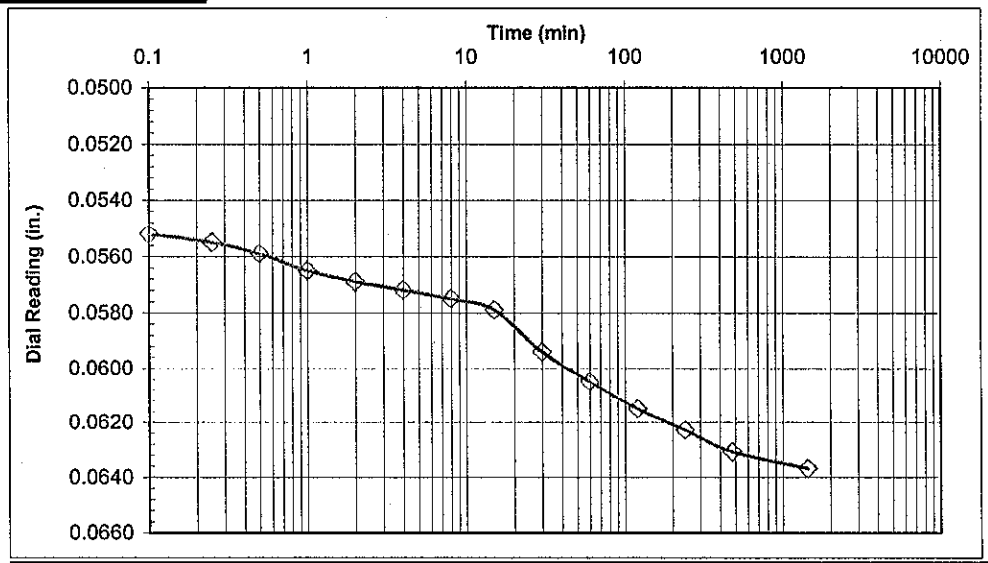


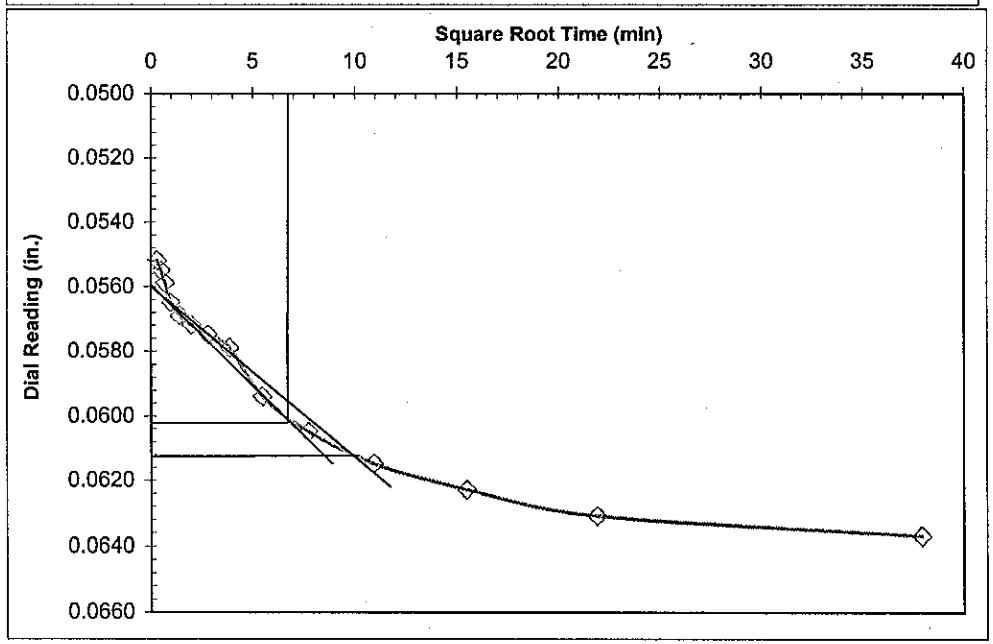
EH'03-6-3

Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0335452			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.010	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0530
		0.1	0.3162	0.0552
		0.25	0.5	0.0555
		0.5	0.7071	0.0559
		1	1	0.0565
		2	1.4142	0.0569
		4	2	0.0572
		8	2.8284	0.0575
		15	3.873	0.0579
		30	5.4772	0.0594
		60	7.746	0.0605
		120	10.954	0.0615
		240	15.492	0.0623
		480	21.909	0.0631
		1440	37.947	0.0637
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	6.75	D -Line	
S_0	0.0560	slope	0.00052818
S_{50}	0.0601	0.000	0.056
S_{90}	0.0612	6.75	0.05956522
S_{100}	0.0670	t_{50}	45.5625



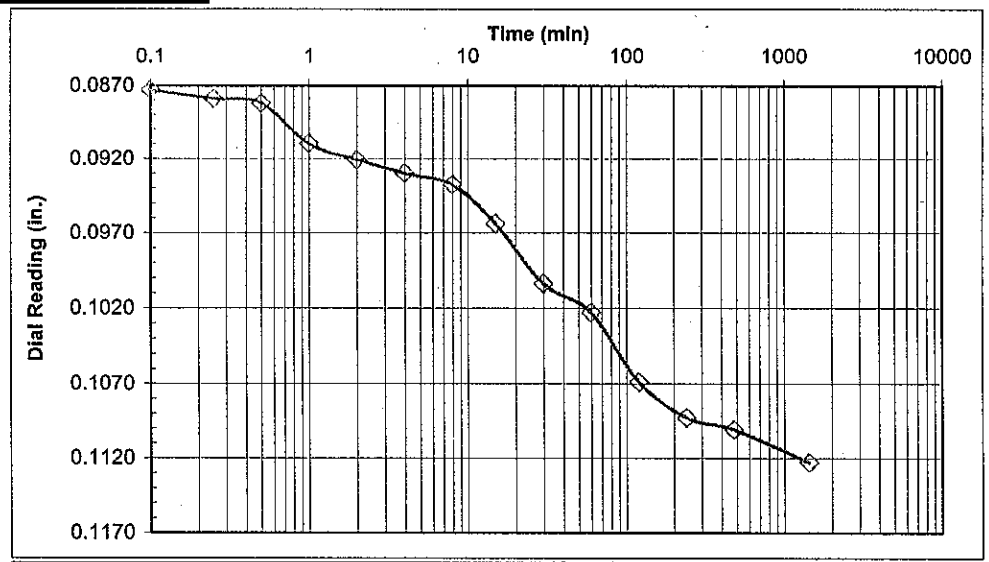


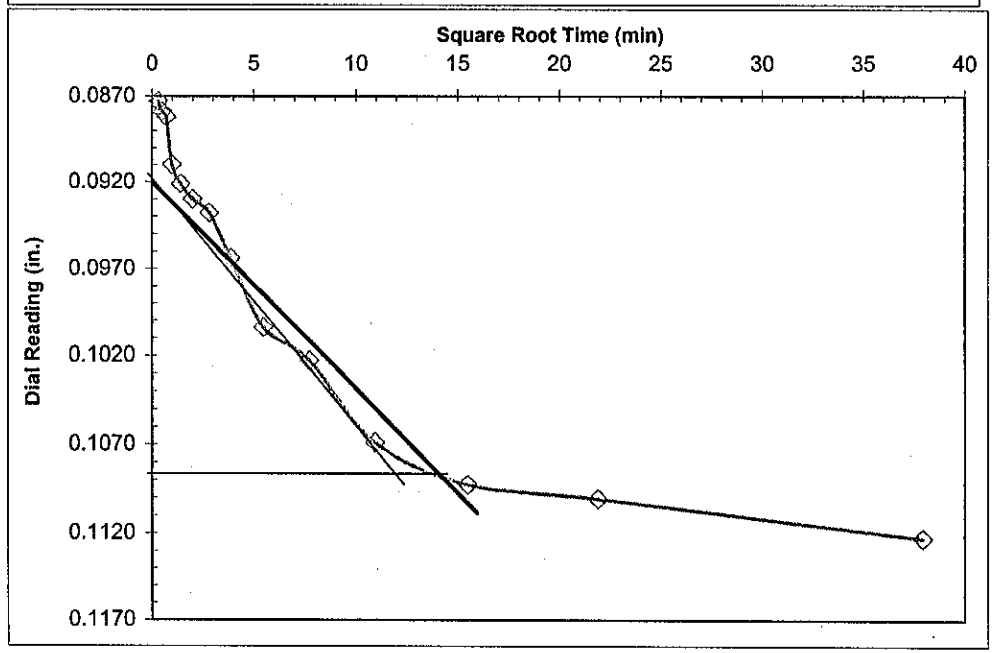
EH'03-6-3

Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0335452			S_0	
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.035	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0737
		0.1	0.3162	0.0873
		0.25	0.5	0.0879
		0.5	0.7071	0.0882
		1	1	0.0910
		2	1.4142	0.0921
		4	2	0.0930
		8	2.8284	0.0938
		15	3.873	0.0964
		30	5.4772	0.1004
		60	7.746	0.1023
		120	10.954	0.1069
		240	15.492	0.1093
		480	21.909	0.1101
		1440	37.947	0.1123
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	10.95445	D -Line	
S_0	0.0920	slope	0.00118276
S_{50}	0.1069	0.000	0.092
S_{90}	0.1090	10.954	0.10495652
S_{100}	0.1279	t_{50}	120



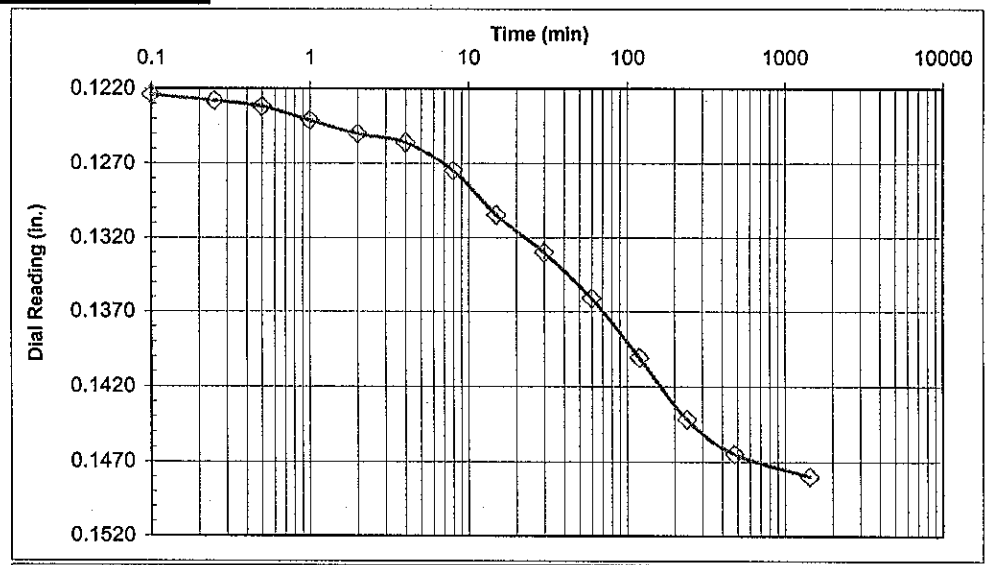


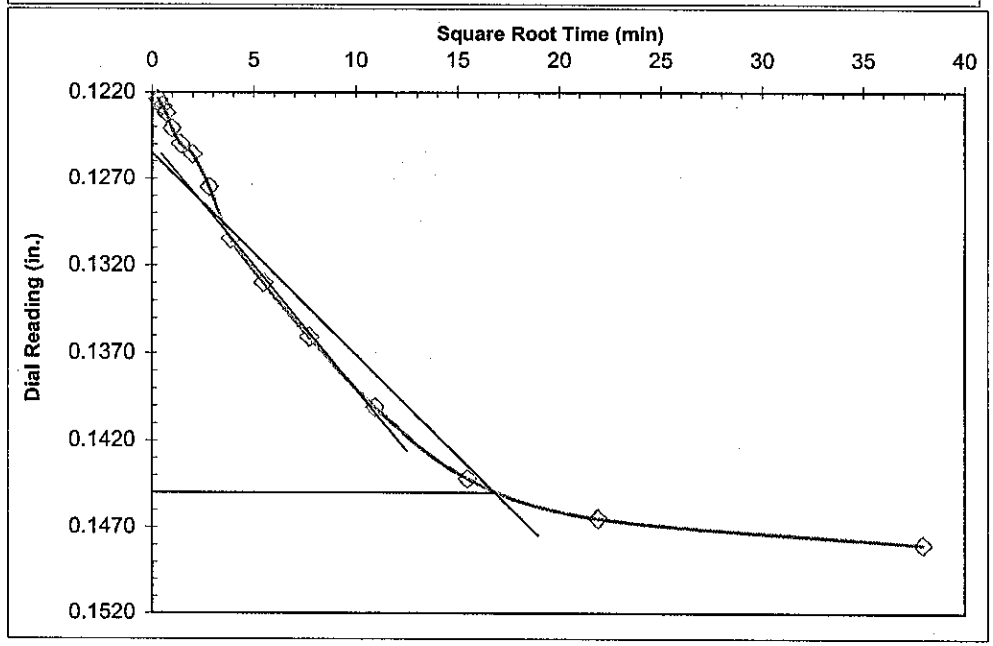
EH'03-6-3

Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0335452			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.040	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1123
		0.1	0.3162	0.1224
		0.25	0.5	0.1228
		0.5	0.7071	0.1232
		1	1	0.1241
		2	1.4142	0.1250
		4	2	0.1256
		8	2.8284	0.1275
		15	3.873	0.1305
		30	5.4772	0.1330
		60	7.746	0.1361
		120	10.954	0.1401
		240	15.492	0.1442
		480	21.909	0.1465
		1440	37.947	0.1480
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	10.95445	D -Line	
S_0	0.1255	slope	0.00115895
S_{50}	0.1401	0.000	0.1255
S_{90}	0.1450	10.954	0.13819565
S_{100}	0.1667	t_{50}	120





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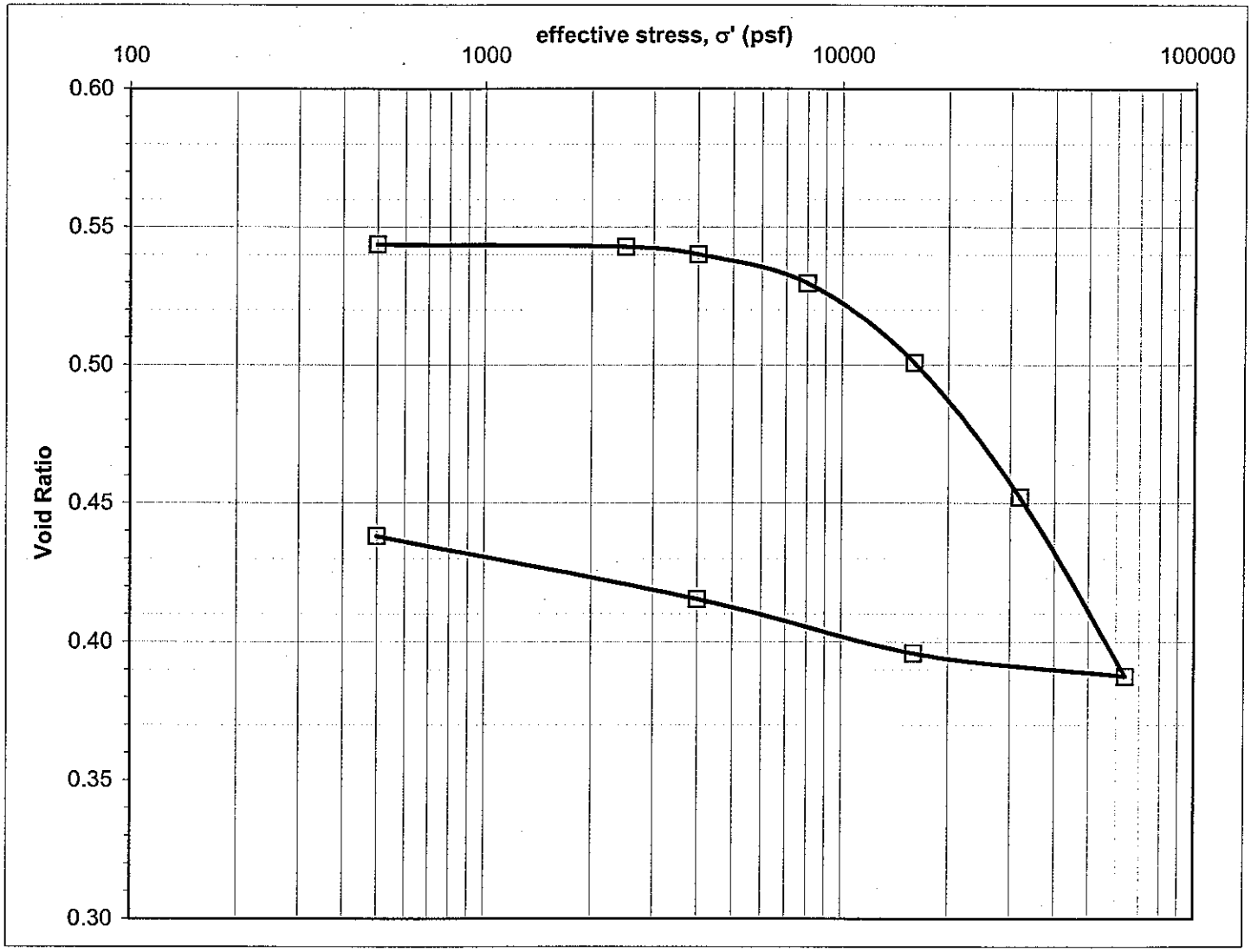
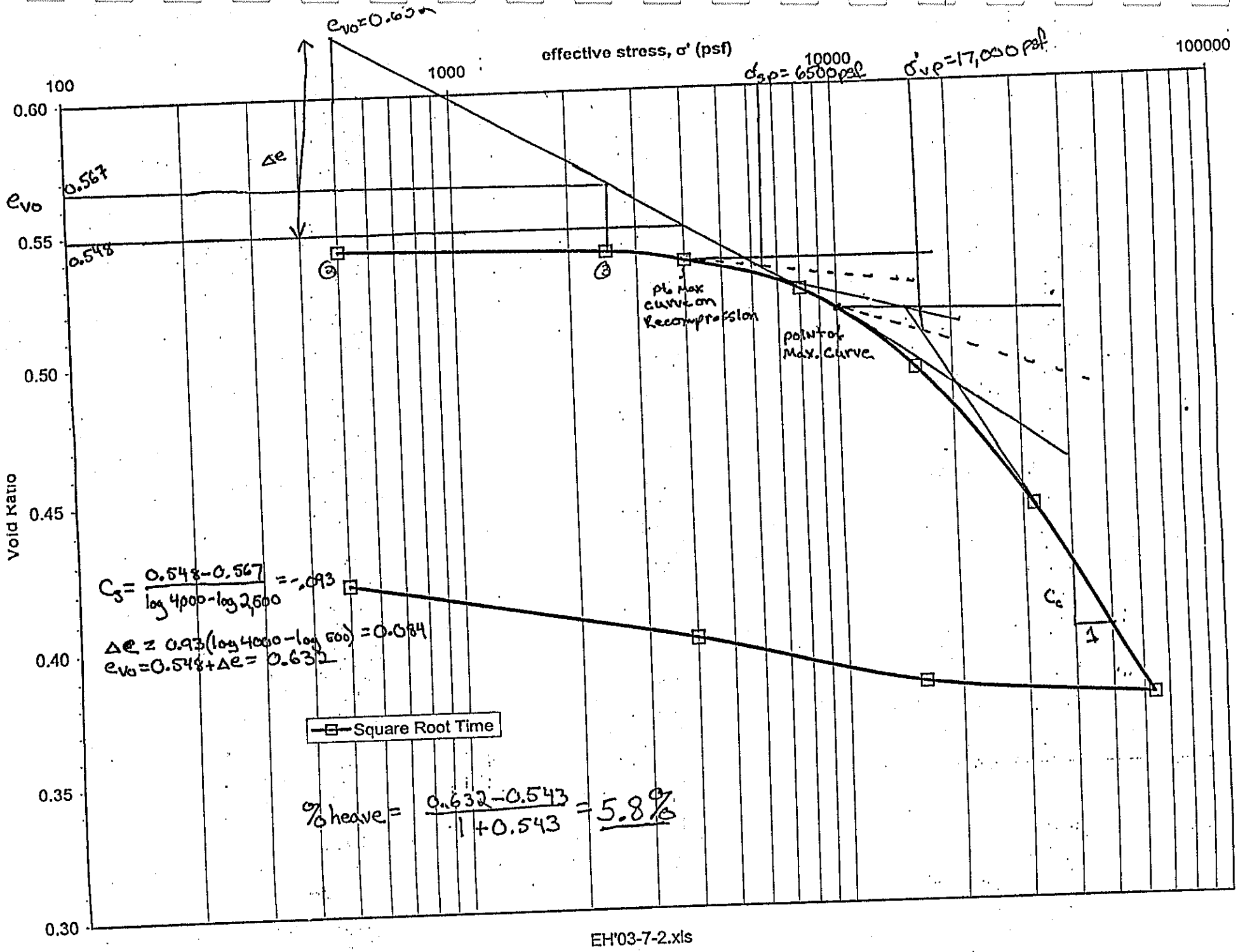


Properties	Initial	Final
Saturation	90.5%	119%
Void Ratio	0.54	0.44
Moisture Content	18.2%	19.3%
Dry Unit Weight (pcf)	109	117

Consolidation Index, C_c	0.21
Maximum Past Pressure (psf)	17,000
Swell Pressure (psf)	6,500
Therical Maximum Percent Heave	5.8%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring EH'03-7 Sample 2



effective stress, σ' (psf)
100
1000
10000
100000
0.60
0.55
0.50
0.45
0.40
0.35
0.30
Void Ratio
e_{vo}
0.567
0.548
e_{vo}=0.63
Δe
σ'_{sp}= 6500psf
σ'_{vp}=17,000 psf
pt. Max curve on Recompression
point of Max. Curve
C_c
1
Square Root Time
$C_s = \frac{0.548-0.567}{\log 4000 - \log 2,500} = -.093$
$\Delta e = 0.93(\log 4000 - \log 500) = 0.084$
$e_{vo} = 0.548 + \Delta e = 0.632$
$\%\text{heave} = \frac{0.632-0.543}{1+0.543} = 5.8\%$
EH'03-7-2.xls

b Set-up

eight of ring (g)	87.54	Diameter of Sample (in)	2.5	e_o	0.543
eight of ring & soil (g)	212.15	Area of Sample (in²)	4.9087385	Initial S_r (%)	90.5%
eight of soil (g)	124.61	Area of Sample (ft²)	0.0340885		
isture content		Initial height of sample (in)	0.749		
ight of tin	31.89	Initial height of sample (ft)	0.0624167		
eight of tin+ wet soil	90.13	Specific Gravity	2.70		
eight of tin+ dry soil	81.17	Unit Weight of Water (pcf)	62.4		
isture content (%)	18.2%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)	
	0	Air	7.12454E-05	
				0.00074837
0.27464	0.042252375	Water	0.000677121	0.00213
	0.232388065	Soil	0.001379321	

	Stress (psf)			Root Time				Log Time			
oad Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.486	-0.0005	0.749	-0.001	0.544	-0.0005	0.750	-0.001	0.544
Swell	500	2500	0.486	0.0004	0.749	0.001	0.543	0.0004	0.749	0.001	0.543
2	2500	4000	0.486	0.0013	0.747	0.003	0.540	-0.0008	0.750	-0.002	0.544
3	4000	8000	0.486	0.0051	0.742	0.011	0.530	-0.0008	0.751	-0.002	0.546
4	8000	16000	0.486	0.0140	0.728	0.029	0.501	0.0090	0.742	0.019	0.528
5	16000	32000	0.486	0.0237	0.705	0.049	0.452	-0.0008	0.743	-0.002	0.529
6	32000	64000	0.486	0.0313	0.673	0.064	0.388	-0.0008	0.743	-0.002	0.531
7	64000	16000	0.486	-0.0040	0.677	-0.008	0.396	-0.0008	0.744	-0.002	0.533
8	16000	4000	0.486	-0.0095	0.687	-0.019	0.415	-0.0008	0.745	-0.002	0.534
9	4000	500	0.486	-0.0110	0.698	-0.023	0.438	-0.0008	0.746	-0.002	0.536

Log time

ad Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in²/min)
2	2500	4000	0.749	0.750	0.0000	0.0000	0.0000	0.0	0.749	0.375	#DIV/0!
3	4000	8000	0.750	0.751	0.0000	0.0000	0.0000	0.0	0.750	0.375	#DIV/0!
4	8000	16000	0.751	0.742	0.2125	0.2223	0.2174	0.0	0.746	0.373	#DIV/0!
5	16000	32000	0.742	0.743	0.0000	0.0000	0.0000	0.0	0.742	0.371	#DIV/0!
6	32000	64000	0.743	0.743	0.0000	0.0000	0.0000	0.0	0.743	0.371	#DIV/0!
7	64000	16000	0.743	0.744	0.0000	0.0000	0.0000	0.0	0.744	0.372	#DIV/0!
8	16000	4000	0.744	0.745	0.0000	0.0000	0.0000	0.0	0.745	0.372	#DIV/0!
9	4000	500	0.745	0.746	0.0000	0.0000	0.0000	0.0	0.745	0.373	#DIV/0!

Square Root Time

oad Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in²/min)
2	2500	4000	0.749	0.750	0.1972	0.1993	0.1983	8.0	0.749	0.375	0.0035
3	4000	8000	0.750	0.751	0.2036	0.2095	0.2066	4.0	0.750	0.375	0.0069
4	8000	16000	0.751	0.742	0.2130	0.2278	0.2204	4.4	0.746	0.373	0.0062
5	16000	32000	0.742	0.743	0.2264	0.2509	0.2386	8.4	0.742	0.371	0.0032
6	32000	64000	0.743	0.743	0.2460	0.2781	0.2620	5.8	0.743	0.371	0.0047
7	64000	16000	0.743	0.744	0.2602	0.2570	0.2586	4.8	0.744	0.372	0.0056
8	16000	4000	0.744	0.745	0.2552	0.2465	0.2509	16.0	0.745	0.372	0.0017
9	4000	500	0.745	0.746	0.2428	0.2326	0.2377	90.3	0.745	0.373	0.0003

Log Time

oad Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft³)	C_v	k_{calc} (cm/s)
2	2500	4000	0.543	0.544	-1.10E-06	-7.12E-07	62.4	#DIV/0!	#DIV/0!
3	4000	8000	0.544	0.546	-4.12E-07	-2.67E-07	62.4	#DIV/0!	#DIV/0!
4	8000	16000	0.546	0.528	2.32E-06	1.50E-06	62.4	#DIV/0!	#DIV/0!
5	16000	32000	0.528	0.529	-1.03E-07	-6.74E-08	62.4	#DIV/0!	#DIV/0!
6	32000	64000	0.529	0.531	-5.15E-08	-3.37E-08	62.4	#DIV/0!	#DIV/0!
7	64000	16000	0.531	0.533	3.43E-08	2.24E-08	62.4	#DIV/0!	#DIV/0!
8	16000	4000	0.533	0.534	1.37E-07	8.96E-08	62.4	#DIV/0!	#DIV/0!
9	4000	500	0.534	0.536	4.71E-07	3.07E-07	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

ad Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft³)	C_v	k_{calc} (cm/s)
2	2500	4000	0.543	0.540	1.80E-06	1.17E-06	62.4	0.0035	8.88E-10
3	4000	8000	0.544	0.530	3.72E-06	2.41E-06	62.4	0.0069	3.67E-09
4	8000	16000	0.546	0.501	5.66E-06	3.66E-06	62.4	0.0062	5.01E-09
5	16000	32000	0.528	0.452	4.72E-06	3.09E-06	62.4	0.0032	2.19E-09
6	32000	64000	0.529	0.388	4.43E-06	2.89E-06	62.4	0.0047	3.01E-09
7	64000	16000	0.531	0.396	-2.81E-06	-1.84E-06	62.4	0.0056	-2.28E-09
8	16000	4000	0.533	0.415	-9.76E-06	-6.37E-06	62.4	0.0017	-2.39E-09
9	4000	500	0.534	0.438	-2.75E-05	-1.79E-05	62.4	0.0003	-1.19E-09

Final

Moisture content	
Weight of tin	31.9
Weight of tin+ wet soil	156.2
Weight of tin+ dry soil	136.1
Moisture content (%)	19.3%
Void Ratio	0.438
Dry Unit Weight	117.158
Saturation	119%
Stress 1	64000
Stress 2	32000
Void Ratio 1	0.388
Void Ratio 2	0.452
Crompression Index	0.21

Initilal Load (psf)	0	DR Initial	0.1945	ΔM	0.0008
Final Load (psf)	500	DR Final	0.1948	ΔH	-0.0005

Initilal Load (psf)	500
Final Load (psf)	2500

Loading

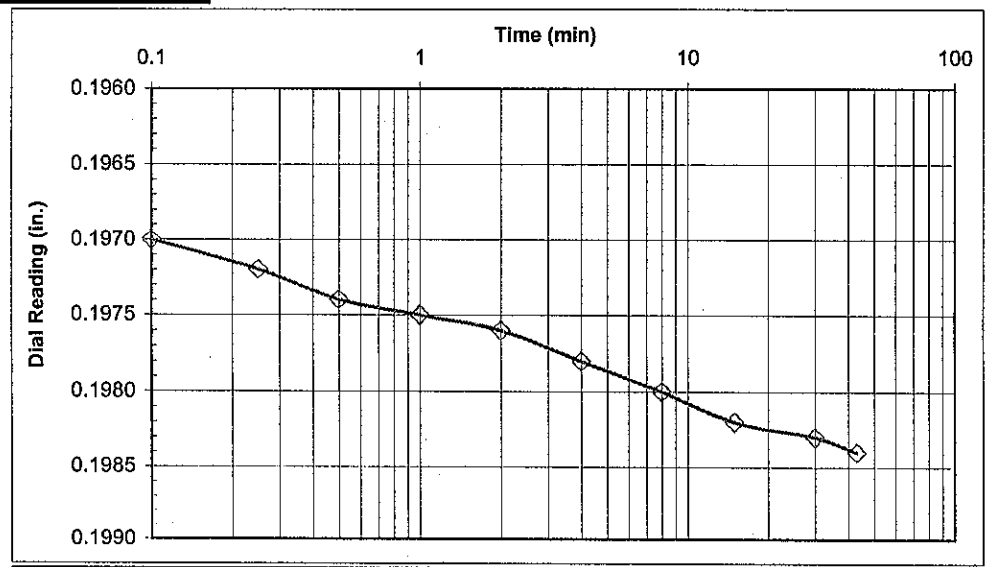
Time	Load	Dial Reading
	500	0.1948
		0.1949
	1000	0.1952
	1500	0.1953
	2000	0.1954
	2500	0.1959
		0.1961
		0.1961
		0.1962

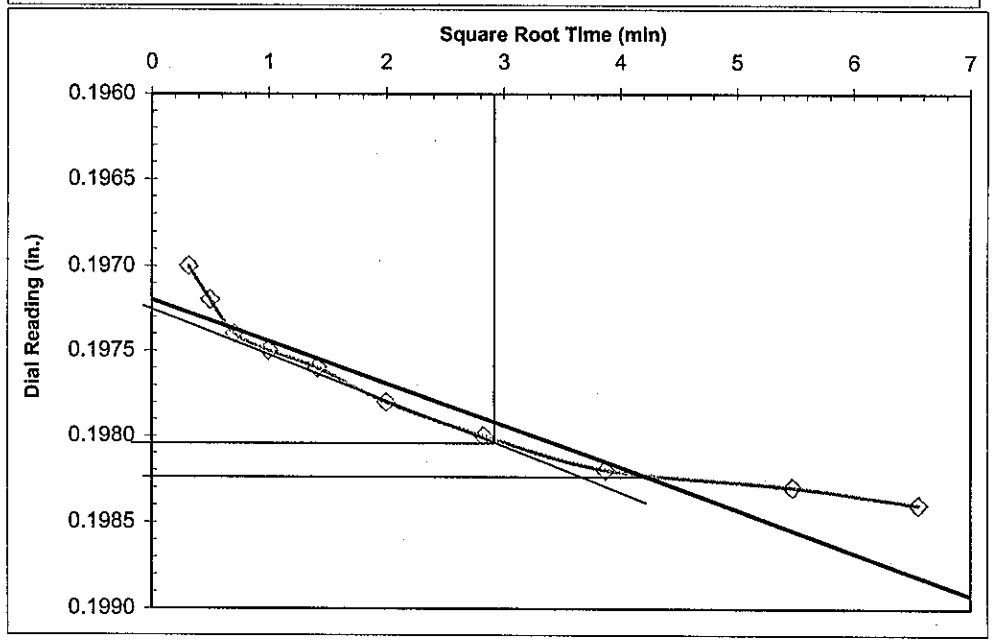
Final Displacemnt	0.0014
ΔM	0.001025
ΔH	0.000375

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	2500	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	0.001	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1962
		0.1	0.3162	0.1970
		0.25	0.5	0.1972
		0.5	0.7071	0.1974
		1	1	0.1975
		2	1.4142	0.1976
		4	2	0.1978
		8	2.8284	0.1980
		15	3.873	0.1982
		30	5.4772	0.1983
		43	6.5574	0.1984
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

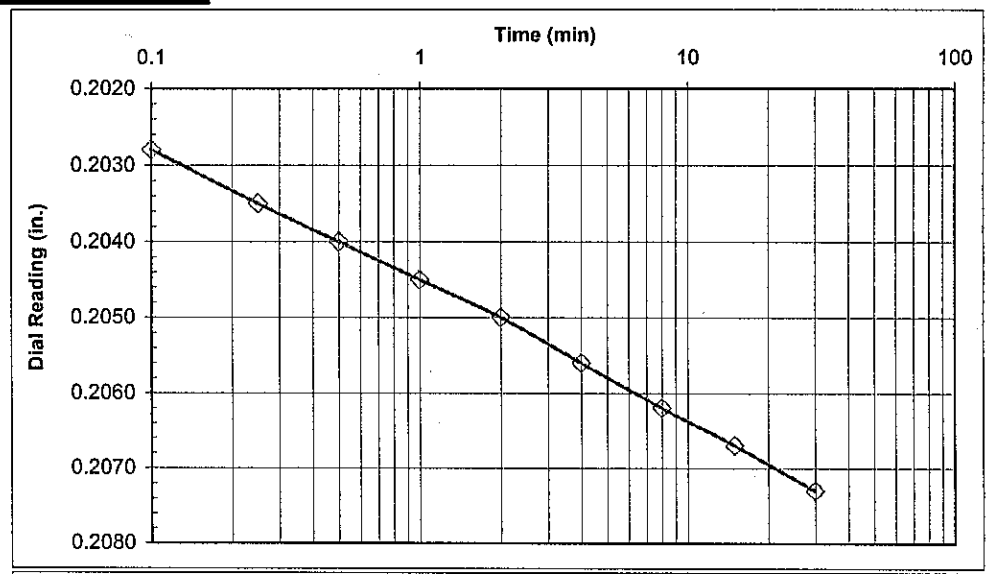
Sq. Root Time			
sqrt. t_{50}	2.828427	D -Line	
S_0	0.1972	slope	0.00024595
S_{50}	0.1980	0.000	0.1972
S_{90}	0.1982	2.8284	0.19789565
S_{100}	0.1993	t_{50}	8

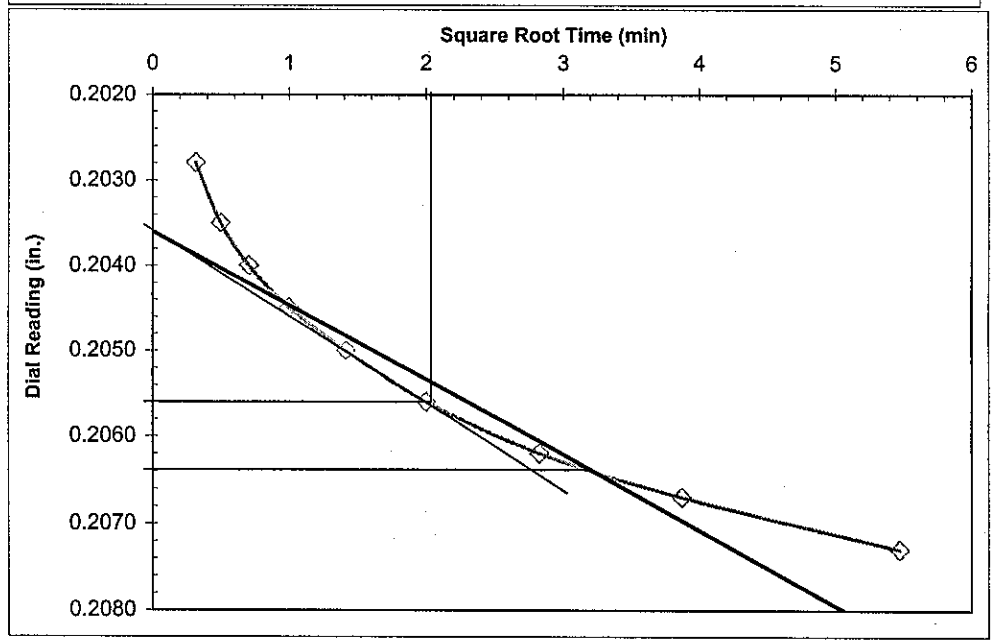




Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.005	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1984
		0.1	0.3162	0.2028
		0.25	0.5	0.2035
		0.5	0.7071	0.2040
		1	1	0.2045
		2	1.4142	0.2050
		4	2	0.2056
		8	2.8284	0.2062
		15	3.873	0.2067
		30	5.4772	0.2073
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



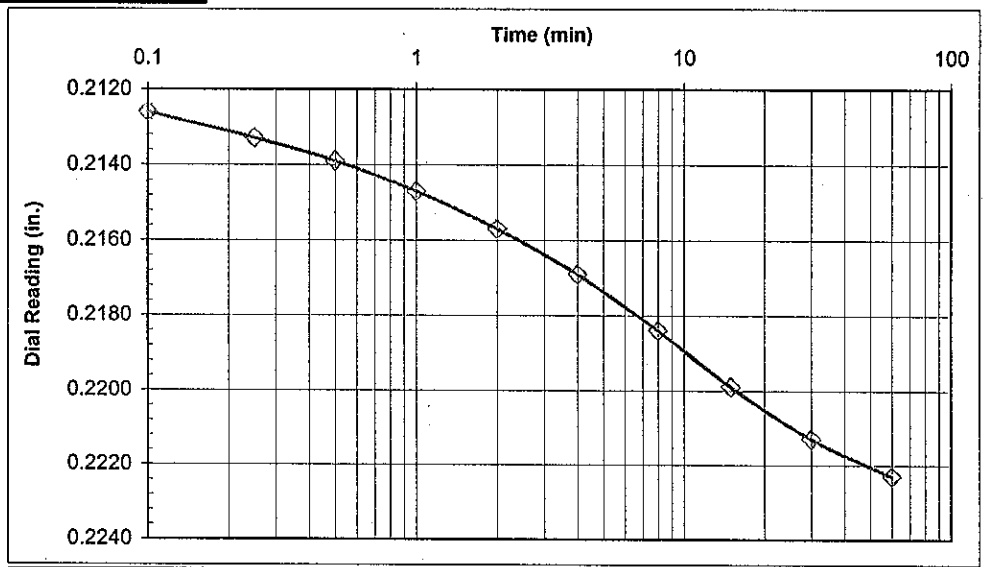


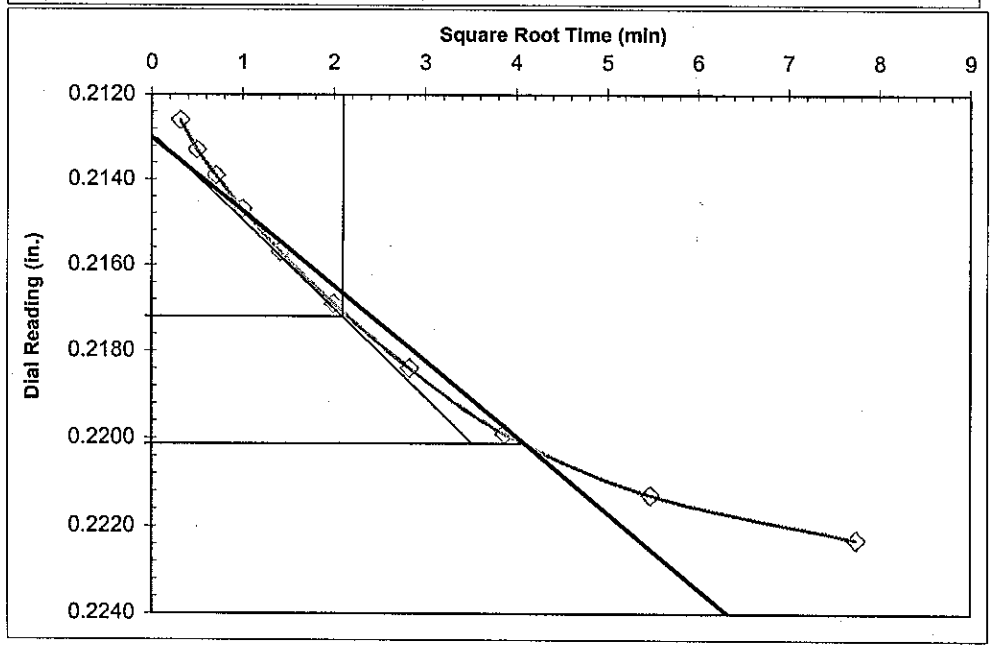
Sq. Root Time			
sqrt. t_{50}	2	D -Line	
S_0	0.2036	slope	0.00086957
S_{50}	0.2056	0.000	0.2036
S_{90}	0.2064	2	0.20533913
S_{100}	0.2095	t_{50}	4

Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	0.2125
Initial Stress (psf)	8000	(Log time) ΔH (in)	0.009	S_{50}	0.2174
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.014	S_{100}	0.2223

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.2073
		0.1	0.3162	0.2126
		0.25	0.5	0.2133
		0.5	0.7071	0.2139
		1	1	0.2147
		2	1.4142	0.2157
		4	2	0.2169
		8	2.8284	0.2184
		15	3.873	0.2199
		30	5.4772	0.2213
		60	7.746	0.2223
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

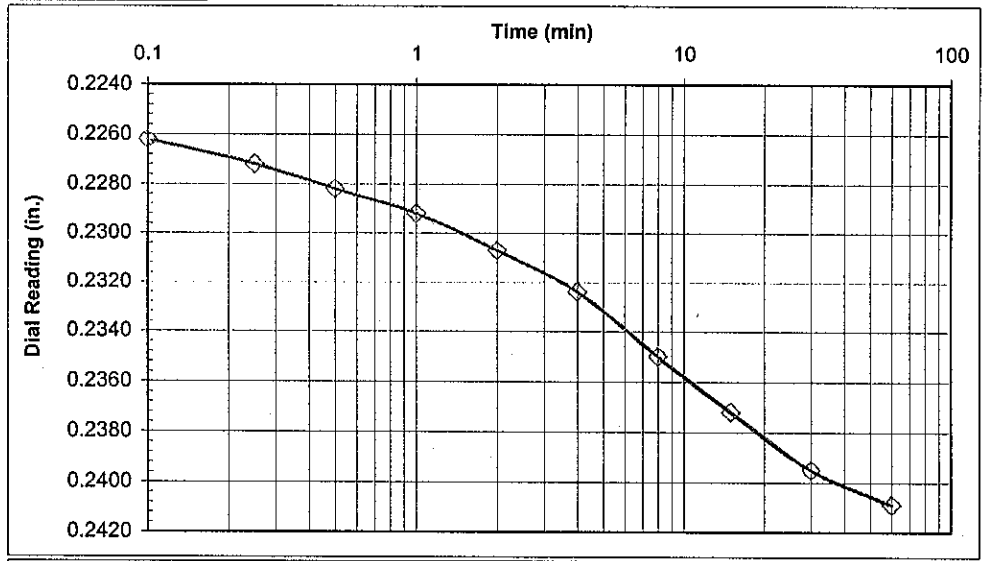
Sq. Root Time			
sqrt. t_{50}	2.1	D -Line	
S_0	0.2130	slope	0.00173913
S_{50}	0.2172	0.000	0.213
S_{90}	0.2200	2.1	0.21665217
S_{100}	0.2278	t_{50}	4.41

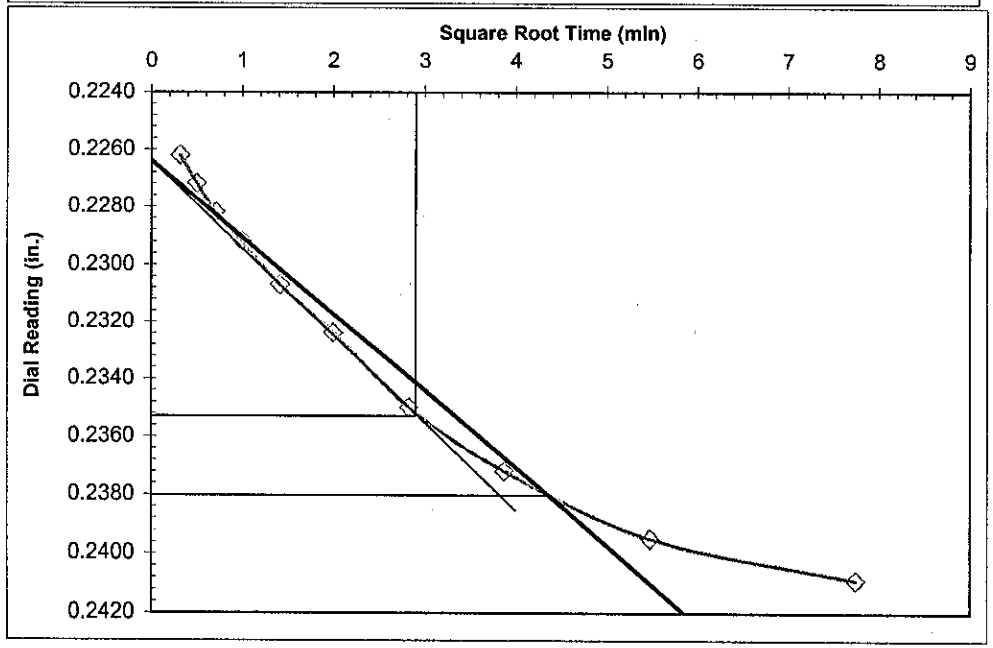




Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.024	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.2225
		0.1	0.3162	0.2262
		0.25	0.5	0.2272
		0.5	0.7071	0.2282
		1	1	0.2292
		2	1.4142	0.2307
		4	2	0.2324
		8	2.8284	0.2350
		15	3.873	0.2372
		30	5.4772	0.2395
		60	7.746	0.2409
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



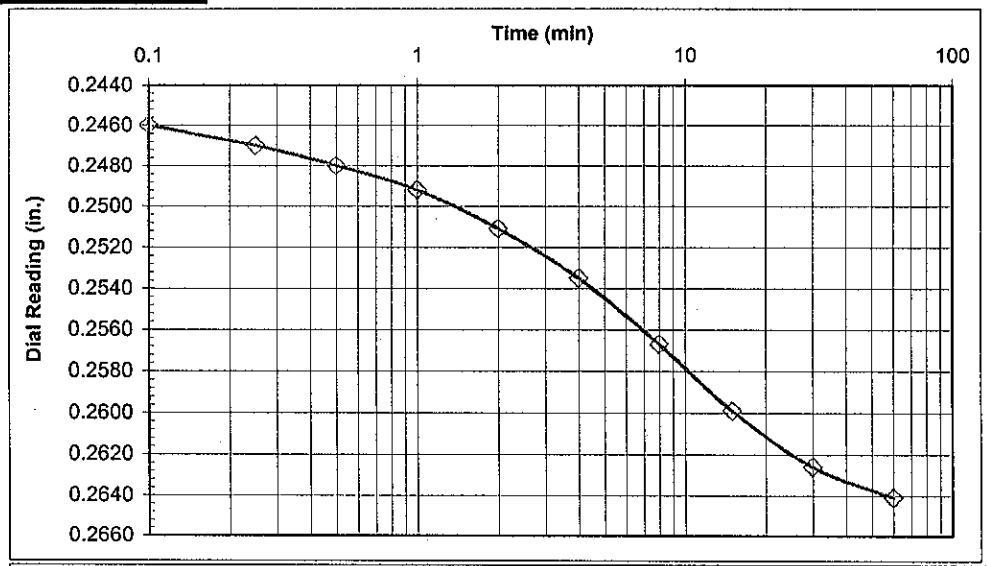


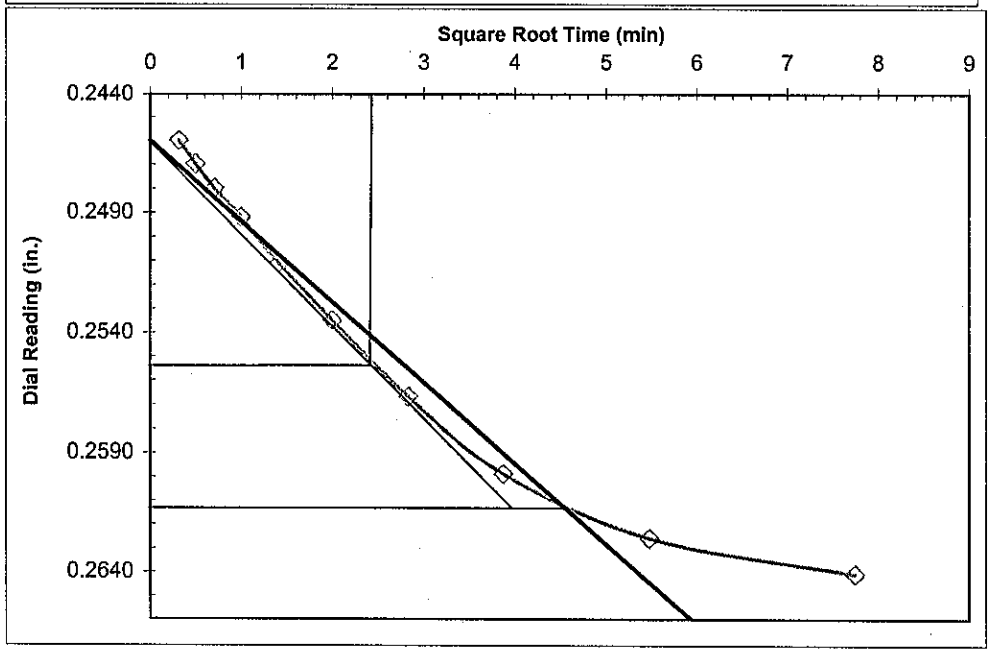
Sq. Root Time			
sqrt. t_{50}	2.9	D -Line	
S_0	0.2264	slope	0.00266867
S_{50}	0.2353	0.000	0.2264
S_{90}	0.2380	2.9	0.23413913
S_{100}	0.2509	t_{50}	8.41

Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	32000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	64000	(sq.rt. time) ΔH (in)	0.031	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.2409
		0.1	0.3162	0.2460
		0.25	0.5	0.2470
		0.5	0.7071	0.2480
		1	1	0.2492
		2	1.4142	0.2511
		4	2	0.2535
		8	2.8284	0.2567
		15	3.873	0.2599
		30	5.4772	0.2626
		60	7.746	0.2641
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	2.4	D -Line	
S_0	0.2460	slope	0.00336957
S_{50}	0.2553	0.000	0.246
S_{90}	0.2612	2.4	0.25408696
S_{100}	0.2781	t_{50}	5.76

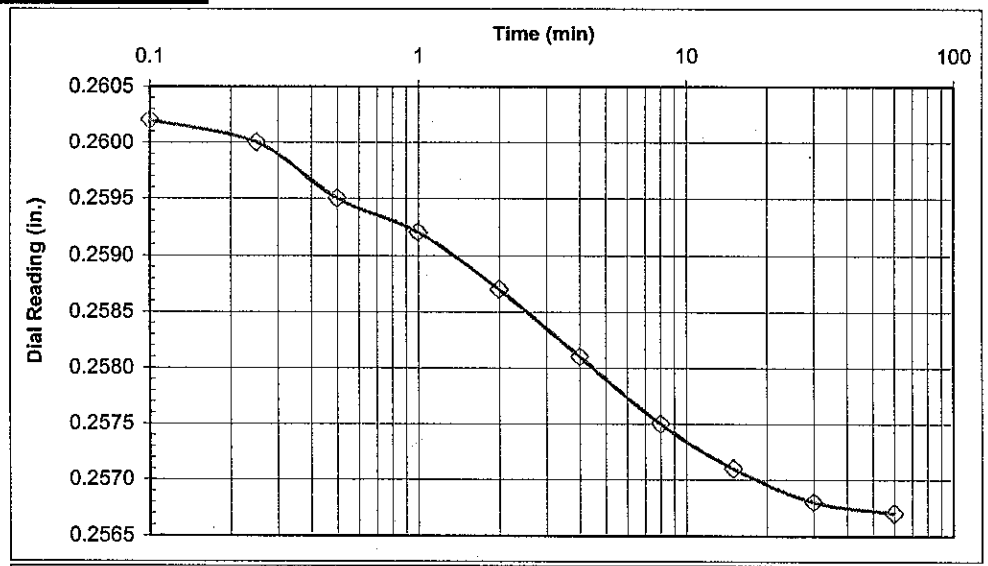


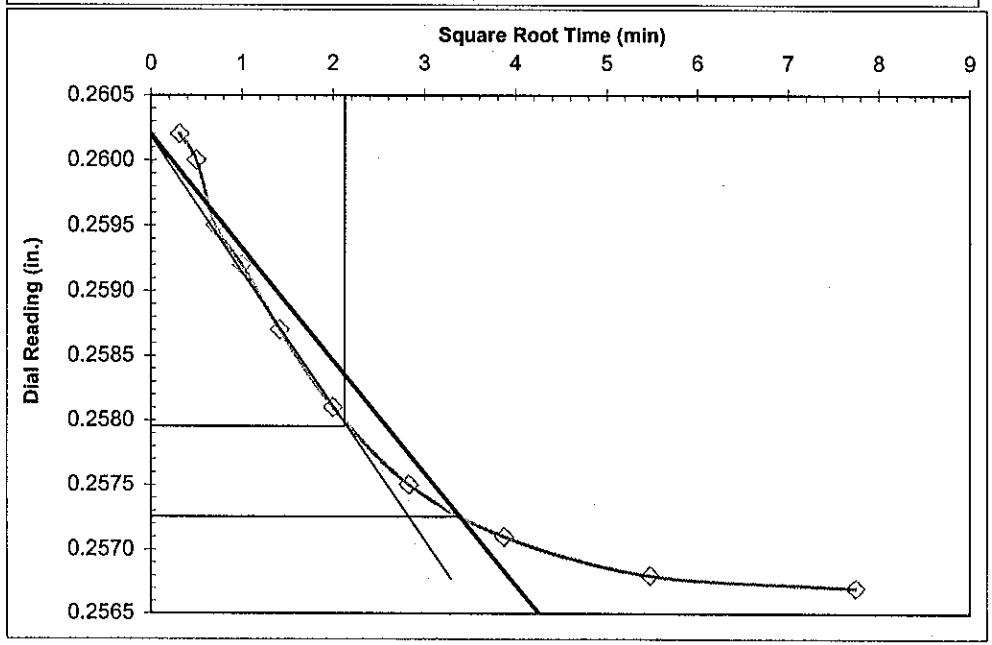


Load #	7	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	64000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	-0.004	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.2645
		0.1	0.3162	0.2602
		0.25	0.5	0.2600
		0.5	0.7071	0.2595
		1	1	0.2592
		2	1.4142	0.2587
		4	2	0.2581
		8	2.8284	0.2575
		15	3.873	0.2571
		30	5.4772	0.2568
		60	7.746	0.2567
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	2.2	D -Line	
S_0	0.2602	slope	-0.0008696
S_{50}	0.2580	0.000	0.2602
S_{90}	0.2573	2.2	0.25828696
S_{100}	0.2570	t_{50}	4.84

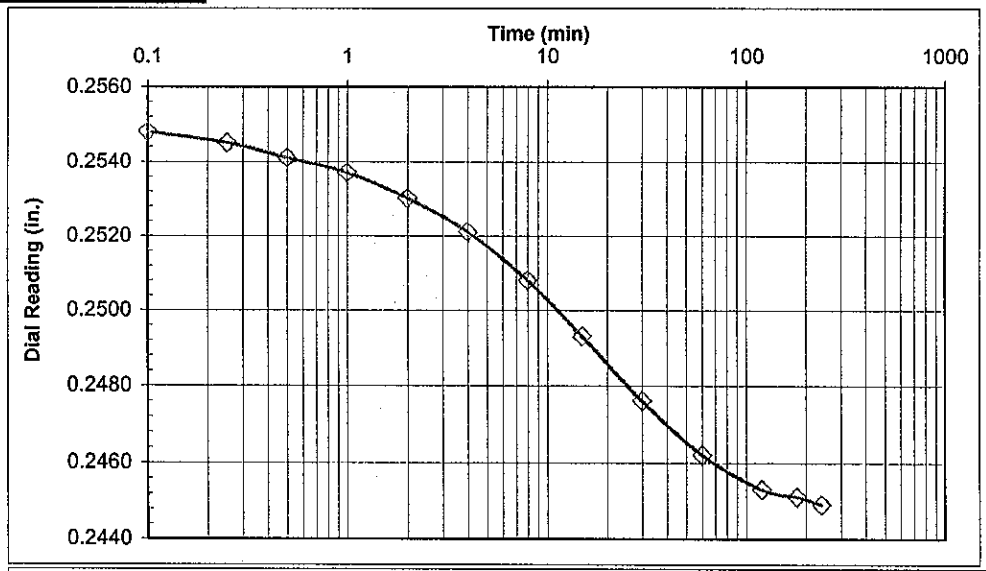


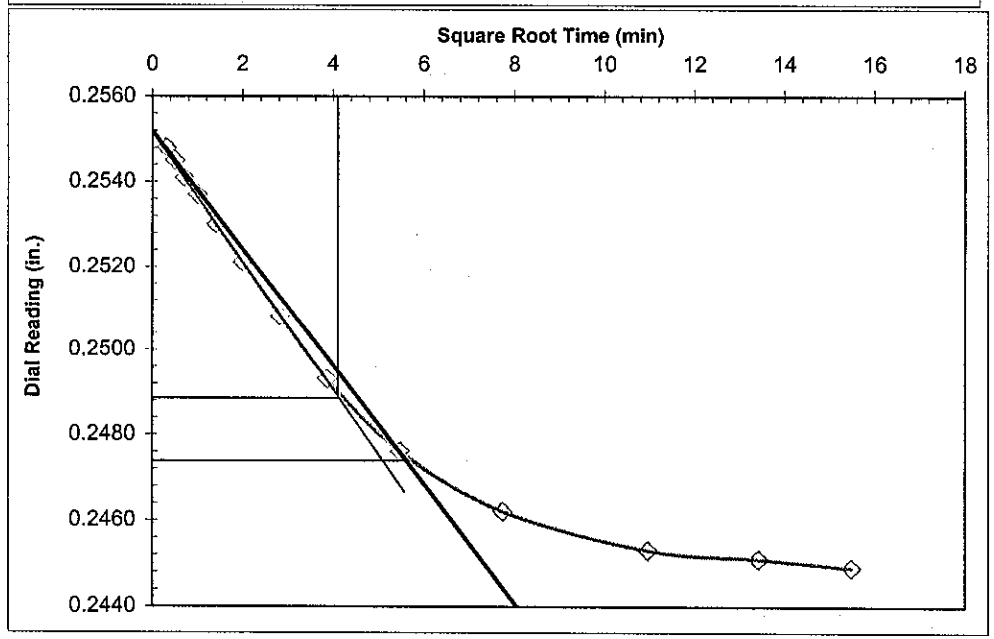


EH'03-7-2

Load #	8	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	-0.009	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.2567
		0.1	0.3162	0.2548
		0.25	0.5	0.2545
		0.5	0.7071	0.2541
		1	1	0.2537
		2	1.4142	0.2530
		4	2	0.2521
		8	2.8284	0.2508
		15	3.873	0.2493
		30	5.4772	0.2476
		60	7.746	0.2462
		120	10.954	0.2453
		180	13.416	0.2451
		240	15.492	0.2449
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

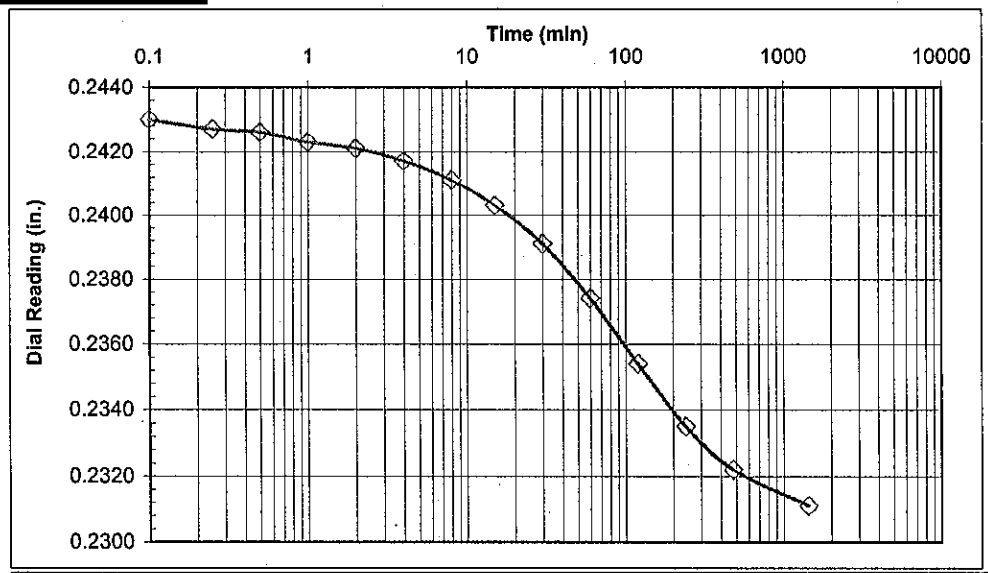


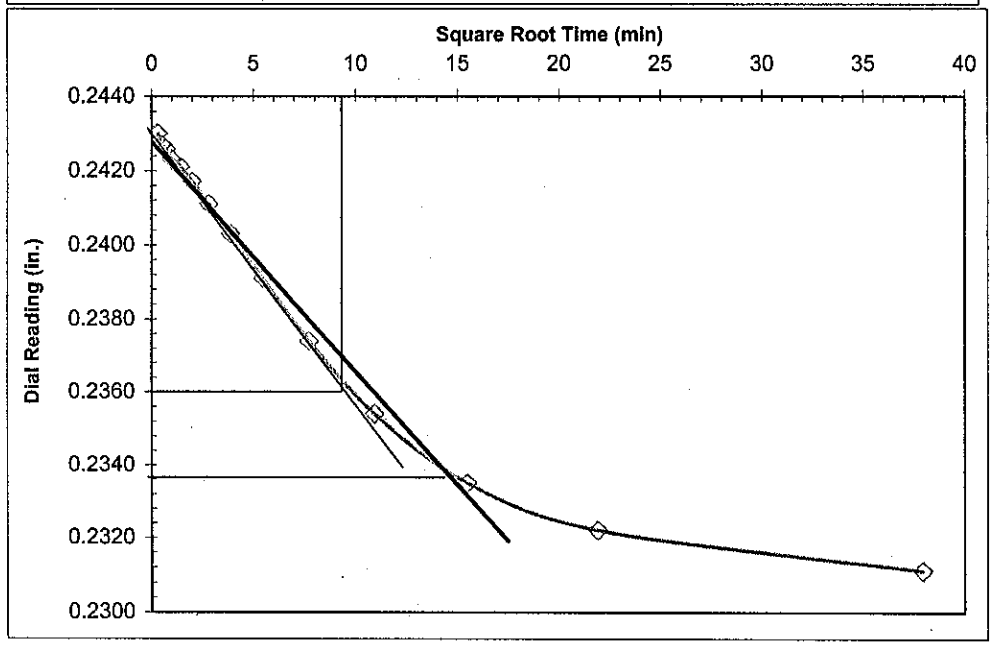


Sq. Root Time			
sqrt. t_{50}	4	D -Line	
S_0	0.2552	slope	-0.0013913
S_{50}	0.2488	0.000	0.2552
S_{90}	0.2474	4	0.24963478
S_{100}	0.2465	t_{50}	16

Load #	9	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	500	(sq.rt. time) ΔH (in)	-0.011	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.2441
		0.1	0.3162	0.2430
		0.25	0.5	0.2427
		0.5	0.7071	0.2426
		1	1	0.2423
		2	1.4142	0.2421
		4	2	0.2417
		8	2.8284	0.2411
		15	3.873	0.2403
		30	5.4772	0.2391
		60	7.746	0.2374
		120	10.954	0.2354
		240	15.492	0.2335
		480	21.909	0.2322
		1440	37.947	0.2311
			0	
			0	
			0	
			0	
			0	
			0	
			0	





Sq. Root Time			
sqrt. t_{50}	9.5	D -Line	
S_0	0.2428	slope	-0.0006224
S_{50}	0.2360	0.000	0.2428
S_{90}	0.2336	9.5	0.23688696
S_{100}	0.2326	t_{50}	90.25

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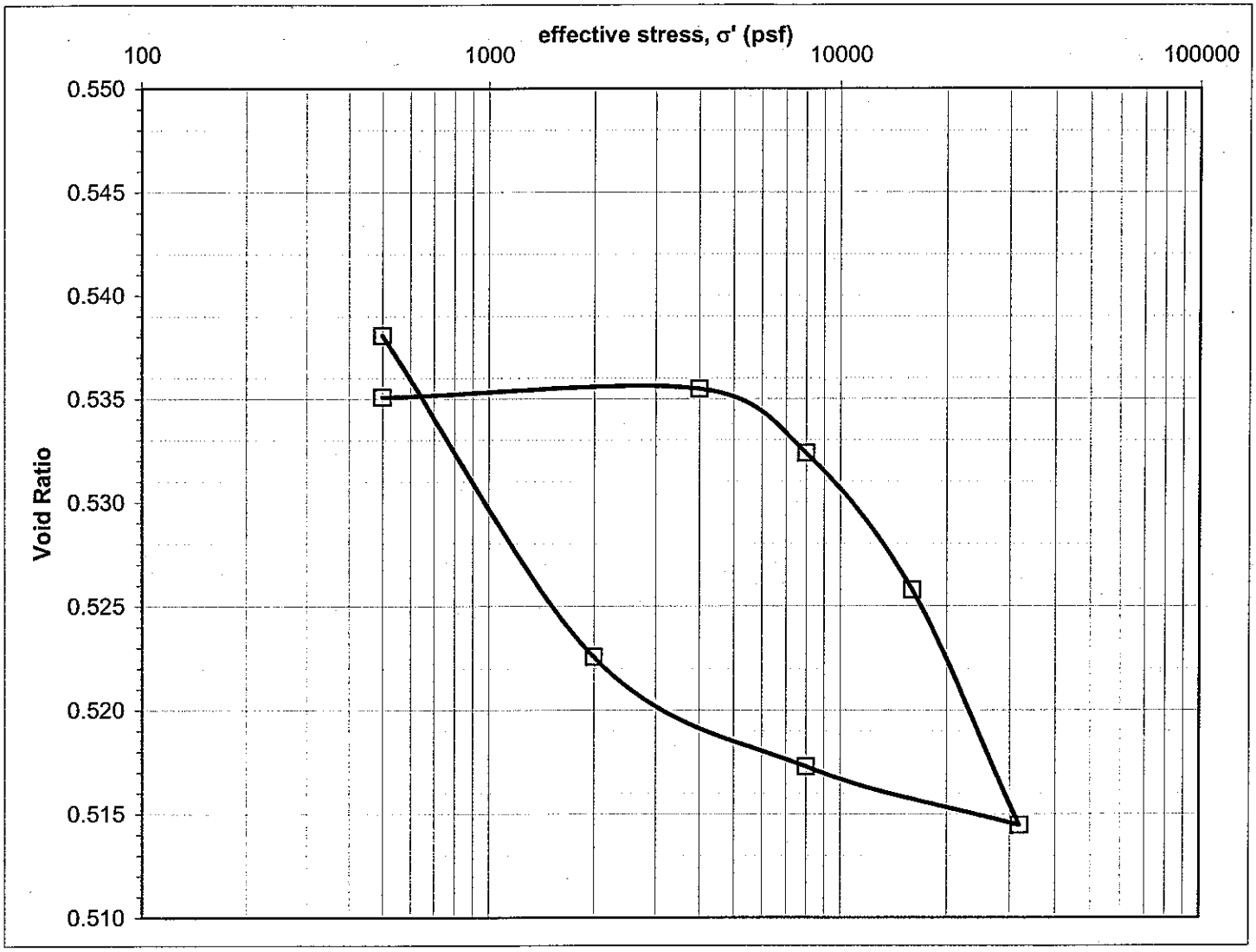
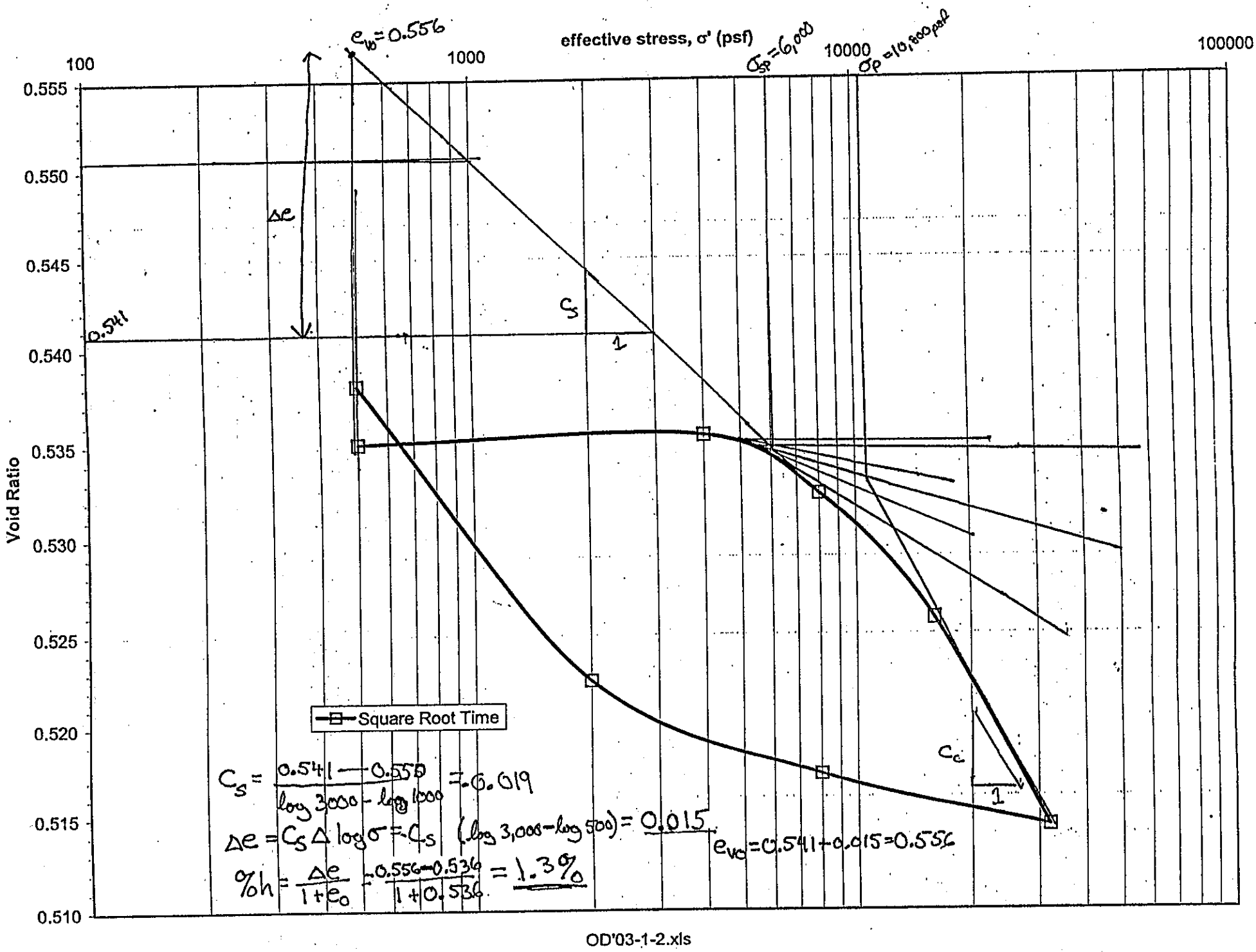


Properties	Initial	Final
Saturation	65.0%	95%
Void Ratio	0.536	0.538
Moisture Content	12.9%	18.9%
Dry Unit Weight (pcf)	110	110

Consolidation Index, C_C	0.04
Maximum Past Pressure (psf)	10,800
Swell Pressure (psf)	6,000
Therical Maximum Percent Heave	1.3%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring OD'03-1 Sample 2


effective stress, σ' (psf)
100
1000
10000
100000
e_{vo}=0.556
σ_{sp}=6,000
σ_p=10,800psf
0.555
0.550
0.545
0.540
0.535
0.530
0.525
0.520
0.515
0.510
Void Ratio
Δe
0.541
C_s
1
C_c
1
Square Root Time
$C_s = \frac{0.541 - 0.555}{\log 3000 - \log 1000} = -0.019$
$\Delta e = C_s \Delta \log \sigma = -C_s (\log 3{,}000 - \log 500) = 0.015$
$e_{vo} = 0.541 + 0.015 = 0.556$
$\%h = \frac{\Delta e}{1+e_o} = \frac{0.556 - 0.536}{1 + 0.536} = 1.3\%$
OD'03-1-2.xls

Lab Set-up

Weight of ring (g)	87.58	Diameter of Sample (in)	2.5	e_o	0.536
Weight of ring & soil (g)	207.29	Area of Sample (in^2)	4.90873852	initial S_r (%)	65.0%
Weight of soil (g)	119.71	Area of Sample (ft^2)	0.03408846		
Moisture content		Initial height of sample (in)	0.750		
Weight of tin	31.85	Initial height of sample (ft)	0.0625		
Weight of tin+ wet soil	71.3	Specific Gravity	2.70		
Weight of tin+ dry soil	66.79	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	12.9%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)	
	0	Air	0.000260173	
				0.000743551
0.2638408	0.030162793	Water	0.000483378	0.00213
	0.233678047	Soil	0.001386978	

	Stress (psf)			Root Time				Log Time			
Load Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.488	0.0005	0.750	0.001	0.535	0.0005	0.750	0.001	0.535
Swell	500	4000	0.488	-0.0002	0.750	0.000	0.535	-0.0002	0.750	0.000	0.535
3	4000	8000	0.488	0.0015	0.749	0.003	0.532	-0.0008	0.751	-0.002	0.537
4	8000	16000	0.488	0.0032	0.745	0.007	0.526	-0.1698	0.920	-0.348	0.885
5	16000	32000	0.488	0.0055	0.740	0.011	0.514	-0.0008	0.921	-0.002	0.887
6	32000	8000	0.488	-0.0014	0.741	-0.003	0.517	-0.0008	0.922	-0.002	0.888
7	8000	2000	0.488	-0.0026	0.744	-0.005	0.523	-0.0008	0.923	-0.002	0.890
8	2000	500	0.488	-0.0076	0.751	-0.016	0.538	-0.0008	0.924	-0.002	0.891

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
3	4000	8000	0.750	0.751	0.0000	0.0000	0.0000	0.0	0.750	0.375	#DIV/0!
4	8000	16000	0.751	0.920	0.1690	0.0000	0.0845	0.0	0.835	0.418	#DIV/0!
5	16000	32000	0.920	0.921	0.0000	0.0000	0.0000	0.0	0.921	0.460	#DIV/0!
6	32000	8000	0.921	0.922	0.0000	0.0000	0.0000	0.0	0.922	0.461	#DIV/0!
7	8000	2000	0.922	0.923	0.0000	0.0000	0.0000	0.0	0.922	0.461	#DIV/0!
8	2000	500	0.923	0.924	0.0000	0.0000	0.0000	0.0	0.923	0.462	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
3	4000	8000	0.000	0.751	0.1606	0.1629	0.1618	1.0	0.375	0.188	0.0069
4	8000	16000	0.751	0.920	0.1680	0.1720	0.1700	1.0	0.835	0.418	0.0344
5	16000	32000	0.920	0.921	0.1813	0.1876	0.1845	1.0	0.921	0.460	0.0417
6	32000	8000	0.921	0.922	0.1816	0.1810	0.1813	1.0	0.922	0.461	0.0418
7	8000	2000	0.922	0.923	0.1768	0.1750	0.1759	4.0	0.922	0.461	0.0105
8	2000	500	0.923	0.924	0.1708	0.1640	0.1674	60.0	0.923	0.462	0.0007

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
3	4000	8000	0.535	0.537	-4.10E-07	-2.67E-07	62.4	#DIV/0!	#DIV/0!
4	8000	16000	0.537	0.885	-4.35E-05	-2.83E-05	62.4	#DIV/0!	#DIV/0!
5	16000	32000	0.885	0.887	-1.02E-07	-5.43E-08	62.4	#DIV/0!	#DIV/0!
6	32000	8000	0.887	0.888	6.83E-08	3.62E-08	62.4	#DIV/0!	#DIV/0!
7	8000	2000	0.888	0.890	2.73E-07	1.45E-07	62.4	#DIV/0!	#DIV/0!
8	2000	500	0.890	0.891	1.09E-06	5.78E-07	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
3	4000	8000	0.535	0.532	7.79E-07	5.08E-07	62.4	0.0069	7.75E-10
4	8000	16000	0.537	0.526	1.42E-06	9.22E-07	62.4	0.0344	6.97E-09
5	16000	32000	0.885	0.514	2.32E-05	1.23E-05	62.4	0.0417	1.13E-07
6	32000	8000	0.887	0.517	-1.54E-05	-8.16E-06	62.4	0.0418	-7.51E-08
7	8000	2000	0.888	0.523	-6.09E-05	-3.23E-05	62.4	0.0105	-7.44E-08
8	2000	500	0.890	0.538	-2.34E-04	-1.24E-04	62.4	0.0007	-1.91E-08

Final

Moisture content	
Weight of tin	31.75
Weight of tin+ wet soil	156.39
Weight of tin+ dry soil	136.54
Moisture content (%)	18.9%
Void Ratio	0.538
Dry Unit Weight	109.54
Saturation	95%
Stress 1	16000
Stress 2	32000
Void Ratio 1	0.526
Void Ratio 2	0.514
Compression Index	0.04

Initilal Load (psf)	0	DR Initial	0.1539	ΔM	0.0008
Final Load (psf)	500	DR Final	0.1552	ΔH	0.0005

Initilal Load (psf)	500
Final Load (psf)	4000

Final Displacemnt	0.0012
ΔM	0.0014
ΔH	-0.0002

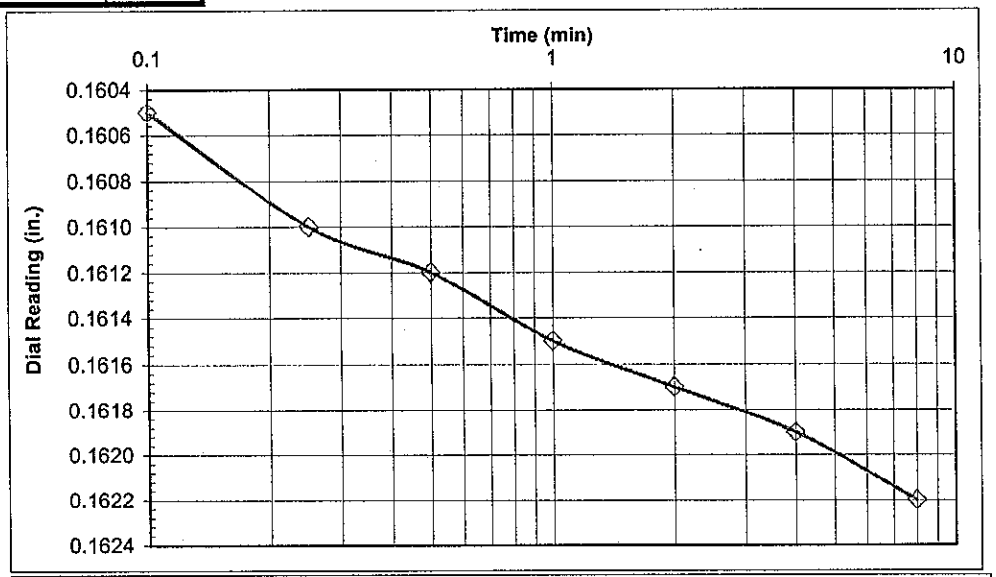
Loading

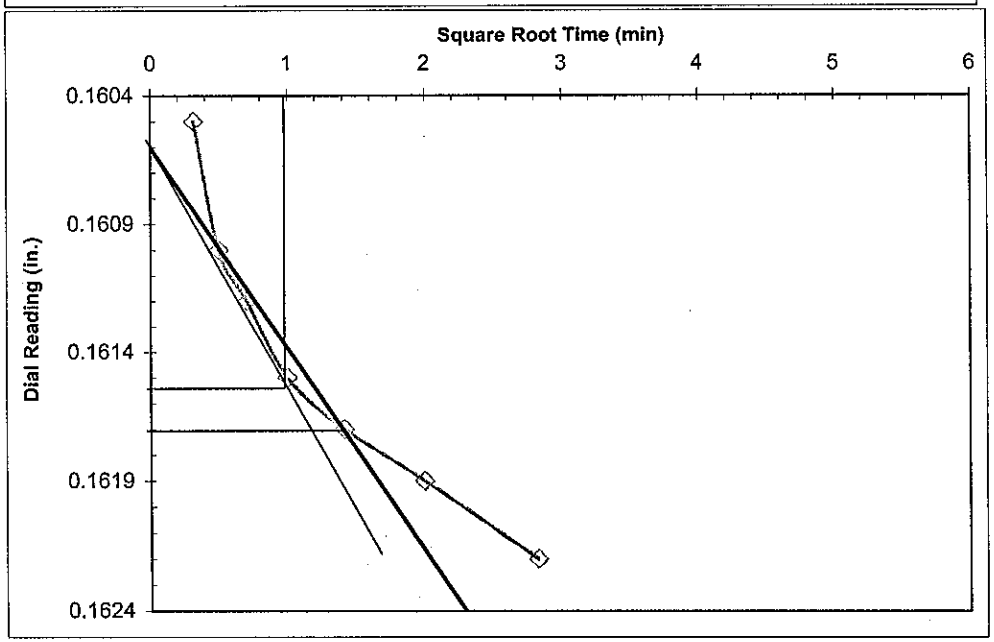
Time	Load	Dial Reading	
0	500	0.1552	
1		0.1570	
2		0.1563	
5		0.152	
6.5	1000	0.1551	
9	1500	0.1556	
13		0.1556	
18		0.1553	
0	2000	0.1553	
1		0.1554	
2		0.1555	
7		0.1554	
13		0.1553	
0	2500	0.1554	
10		0.153	
15		0.1552	
32		0.1549	
0	3000	0.155	
1.5		0.1556	
2		0.1557	
8		0.1559	
20		0.1559	
75		0.1559	
182		0.1559	
380		0.1559	
		0.1559	
0	4000	0.1559	* Orinigally ran as a consoildation point (Load 2)
0.1		0.1562	
0.25		0.1562	
0.5		0.1563	
1		0.1563	
2		0.1563	
4		0.1563	
10		0.1564	

Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.002	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1564
		0.1	0.3162	0.1605
		0.25	0.5	0.1610
		0.5	0.7071	0.1612
		1	1	0.1615
		2	1.4142	0.1617
		4	2	0.1619
		8	2.8284	0.1622
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

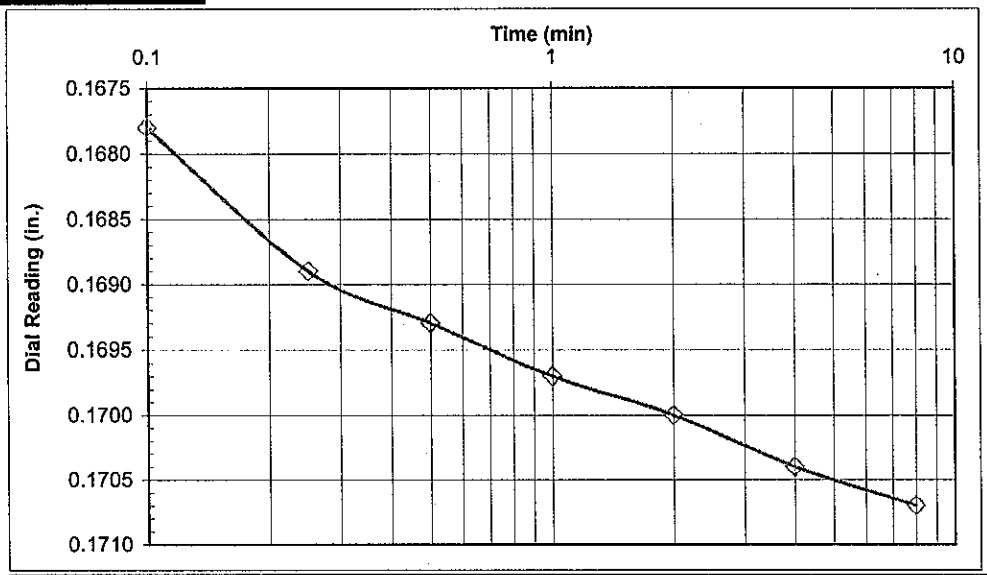
Sq. Root Time			
sqrt. t_{50}	1	D -Line	
S_0	0.1606	slope	0.00078261
S_{50}	0.1615	0.000	0.1606
S_{90}	0.1617	1	0.16138261
S_{100}	0.1629	t_{50}	1



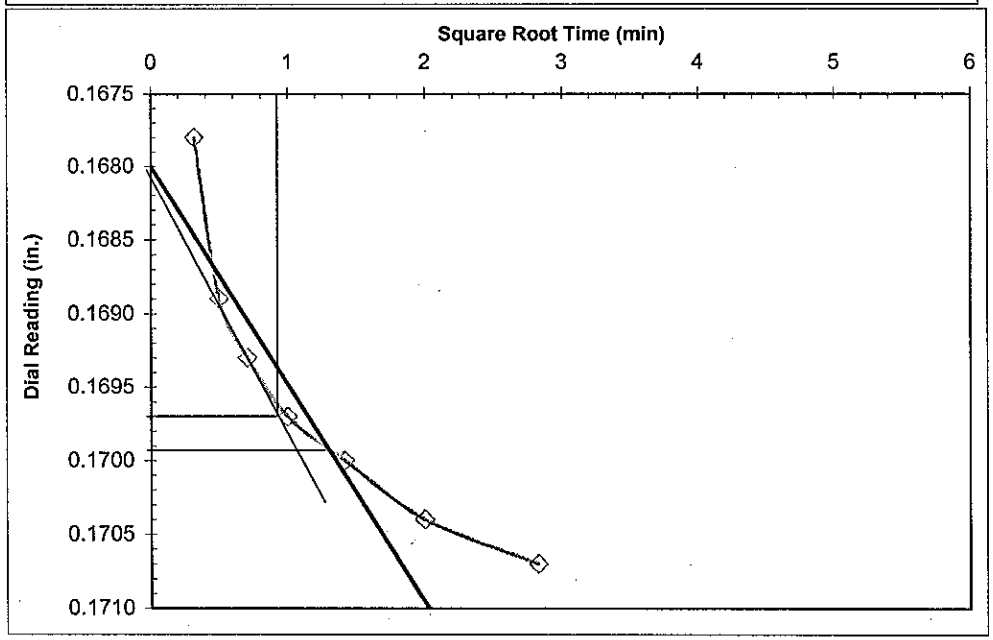


Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	0.1690
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.170	S_{50}	0.0845
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.003	S_{100}	0.0000

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1622
		0.1	0.3162	0.1678
		0.25	0.5	0.1689
		0.5	0.7071	0.1693
		1	1	0.1697
		2	1.4142	0.1700
		4	2	0.1704
		8	2.8284	0.1707
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



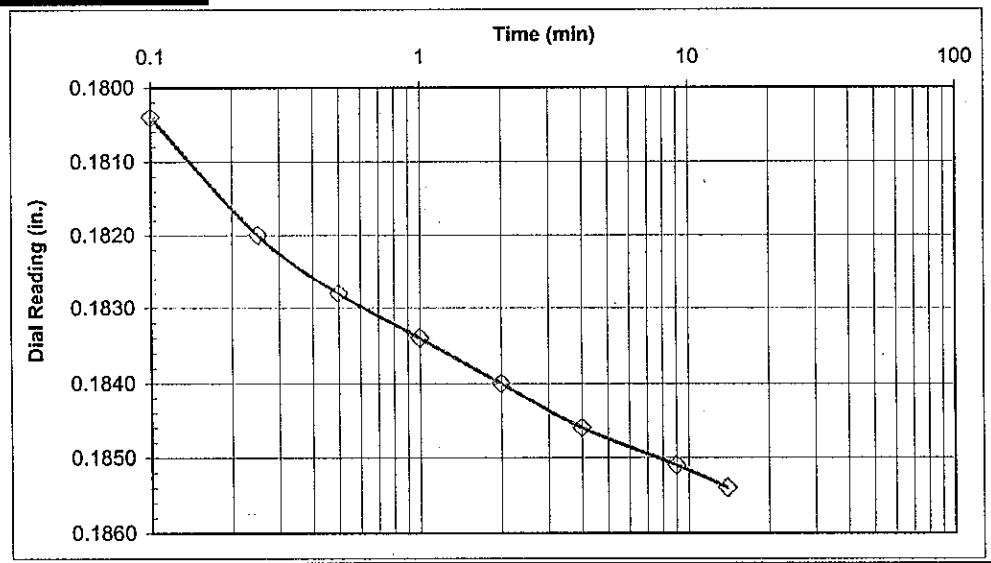
Sq. Root Time			
sqrt. t_{50}	1	D -Line	
S_0	0.1680	slope	0.00147826
S_{50}	0.1697	0.000	0.168
S_{90}	0.1699	1	0.16947826
S_{100}	0.1720	t_{50}	1

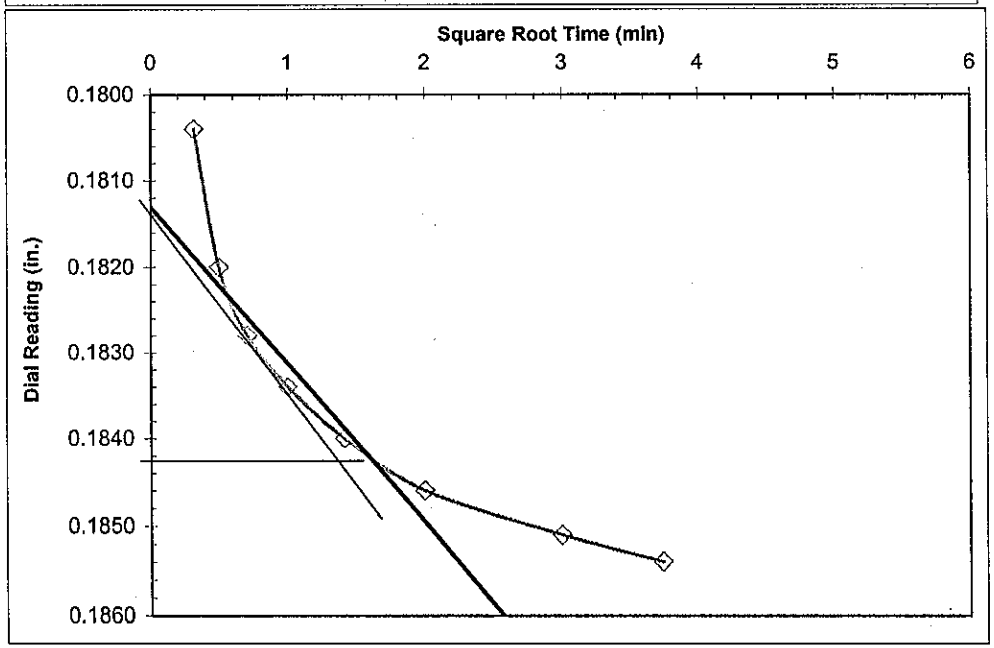


Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.006	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1707
		0.1	0.3162	0.1804
		0.25	0.5	0.1820
		0.5	0.7071	0.1828
		1	1	0.1834
		2	1.4142	0.1840
		4	2	0.1846
		9	3	0.1851
		14	3.7417	0.1854
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

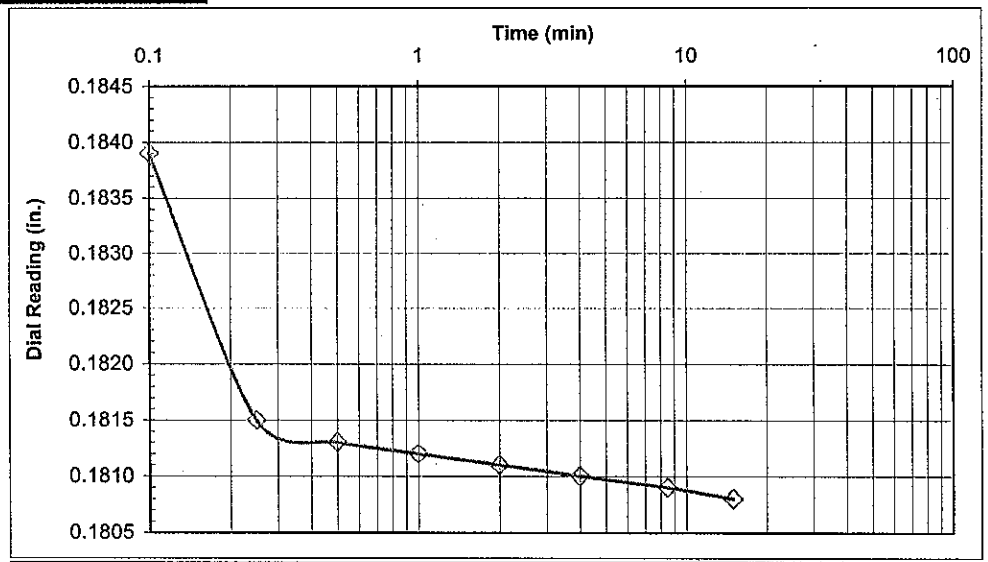
Sq. Root Time			
sqrt. t_{50}	1	D -Line	
S_0	0.1813	slope	0.00182609
S_{50}	0.1834	0.000	0.1813
S_{90}	0.1843	1	0.18312609
S_{100}	0.1876	t_{50}	1

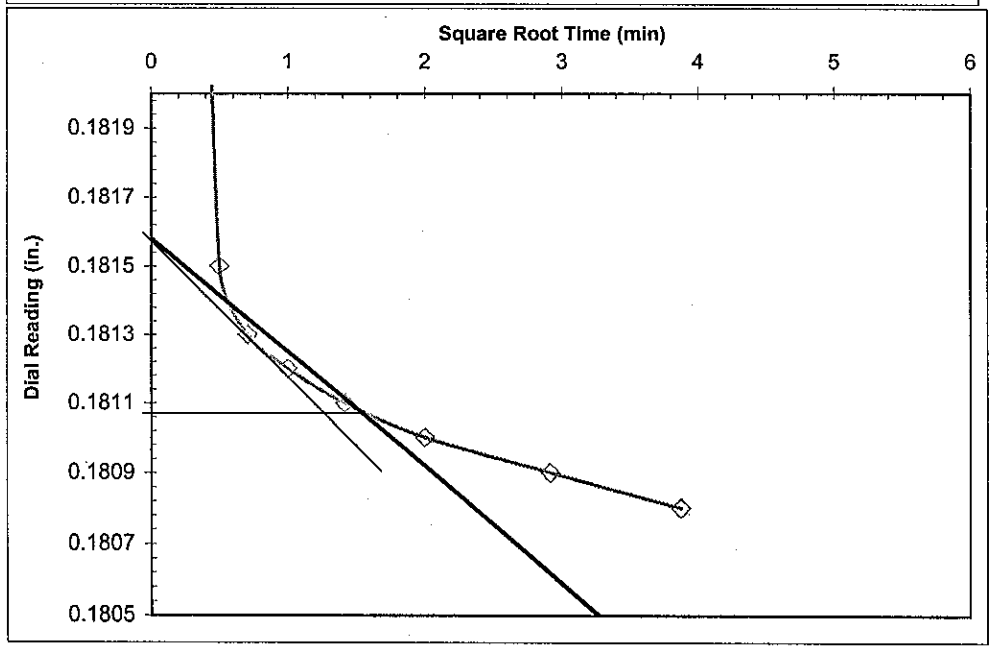




Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	32000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	-0.001	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1859
		0.1	0.3162	0.1839
		0.25	0.5	0.1815
		0.5	0.7071	0.1813
		1	1	0.1812
		2	1.4142	0.1811
		4	2	0.1810
		8.5	2.9155	0.1809
		15	3.873	0.1808
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

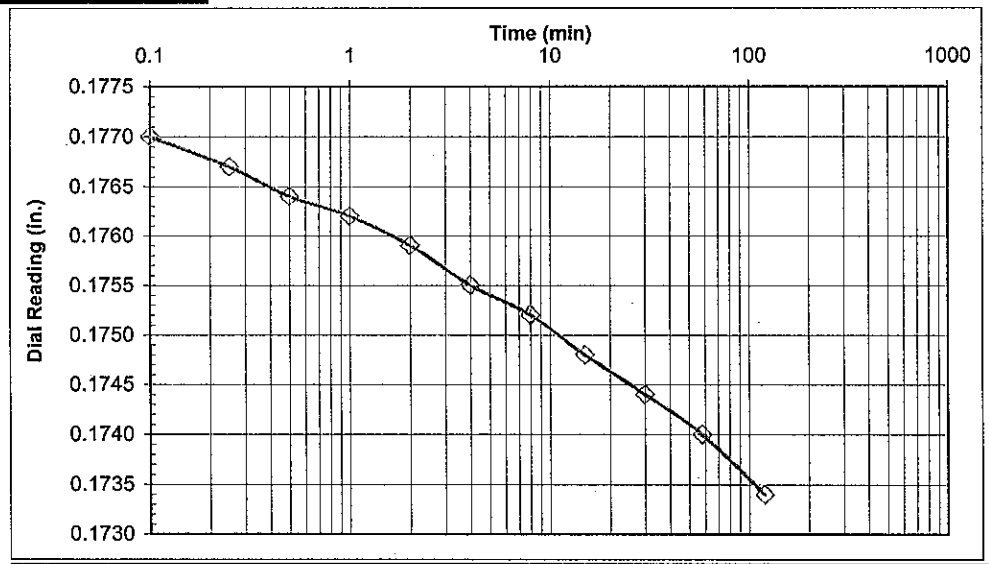


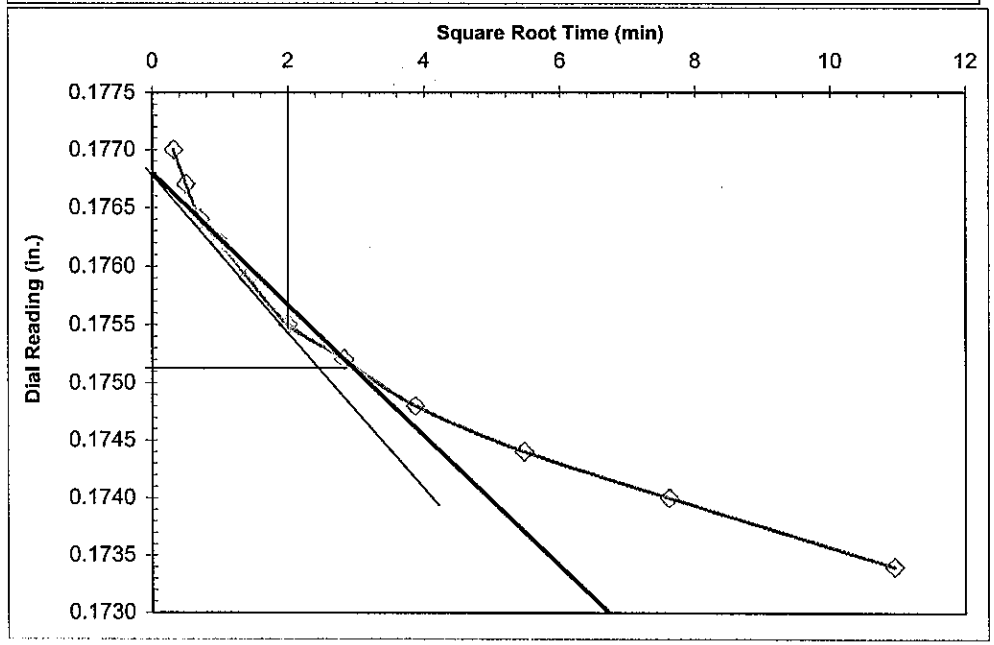


Sq. Root Time			
sqrt. t_{50}	1	D -Line	
S_0	0.1816	slope	-0.0003304
S_{50}	0.1812	0.000	0.18158
S_{90}	0.1811	1	0.18124957
S_{100}	0.1810	t_{50}	1

Load #	7	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	2000	(sq.rt. time) ΔH (in)	-0.003	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1808
		0.1	0.3162	0.1770
		0.25	0.5	0.1767
		0.5	0.7071	0.1764
		1	1	0.1762
		2	1.4142	0.1759
		4	2	0.1755
		8	2.8284	0.1752
		15	3.873	0.1748
		30	5.4772	0.1744
		58	7.6158	0.1740
		120	10.954	0.1734
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



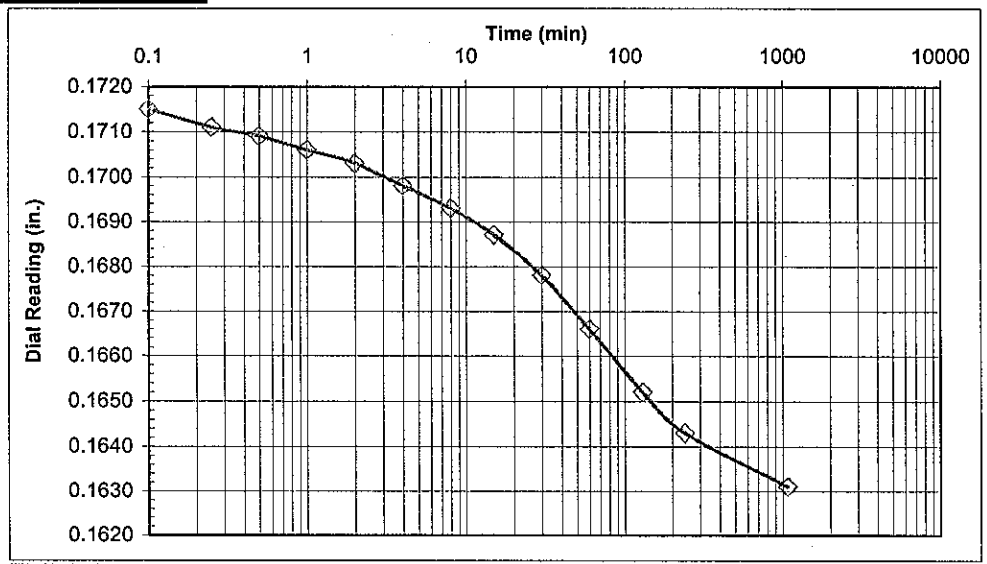


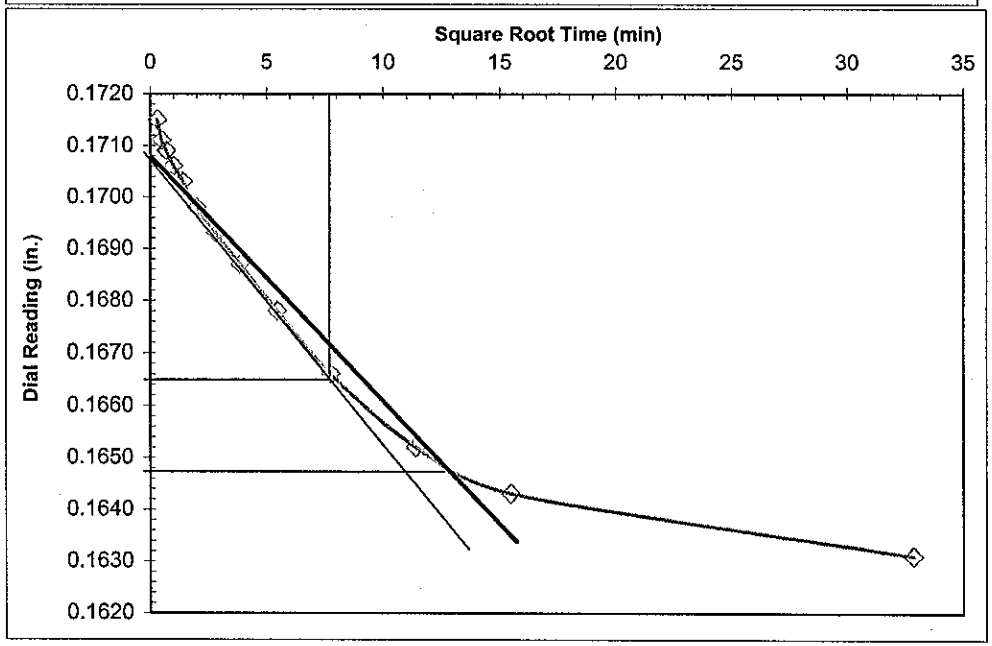
Sq. Root Time			
sqrt. t_{50}	2	D -Line	
S_0	0.1768	slope	-0.0005652
S_{50}	0.1755	0.000	0.1768
S_{90}	0.1752	2	0.17566957
S_{100}	0.1750	t_{50}	4

Load #	8	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	2000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	500	(sq.rt. time) ΔH (in)	-0.008	S_{100}	

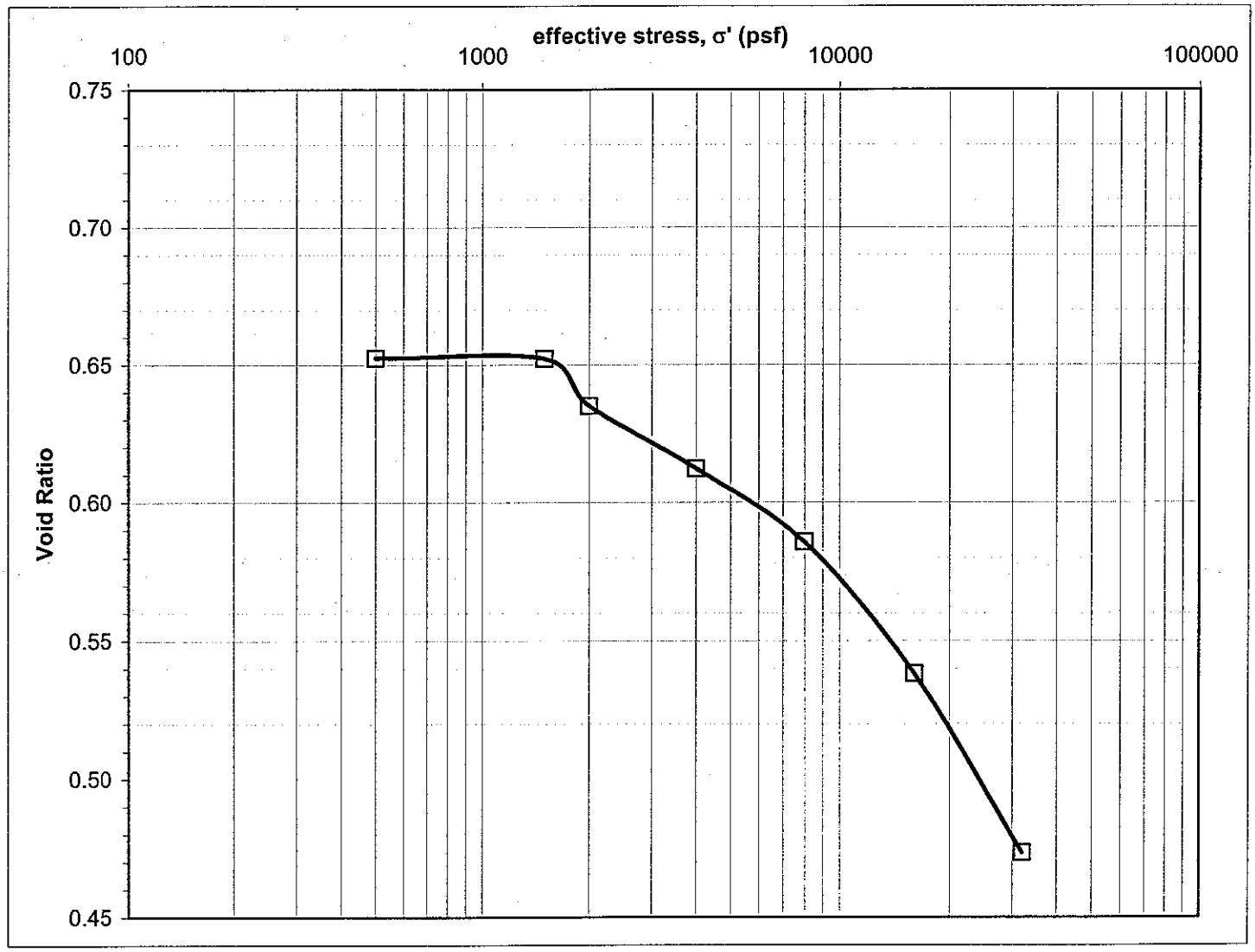
Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	
		0.1	0.3162	0.1715
		0.25	0.5	0.1711
		0.5	0.7071	0.1709
		1	1	0.1706
		2	1.4142	0.1703
		4	2	0.1698
		8	2.8284	0.1693
		15	3.873	0.1687
		30	5.4772	0.1678
		60	7.746	0.1666
		130	11.402	0.1652
		240	15.492	0.1643
		1080	32.863	0.1631
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	7.7	D -Line	
S_0	0.1708	slope	-0.0004715
S_{50}	0.1666	0.000	0.1708
S_{90}	0.1647	7.746	0.16714783
S_{100}	0.1640	t_{50}	60





Professional Service Industries, Inc.

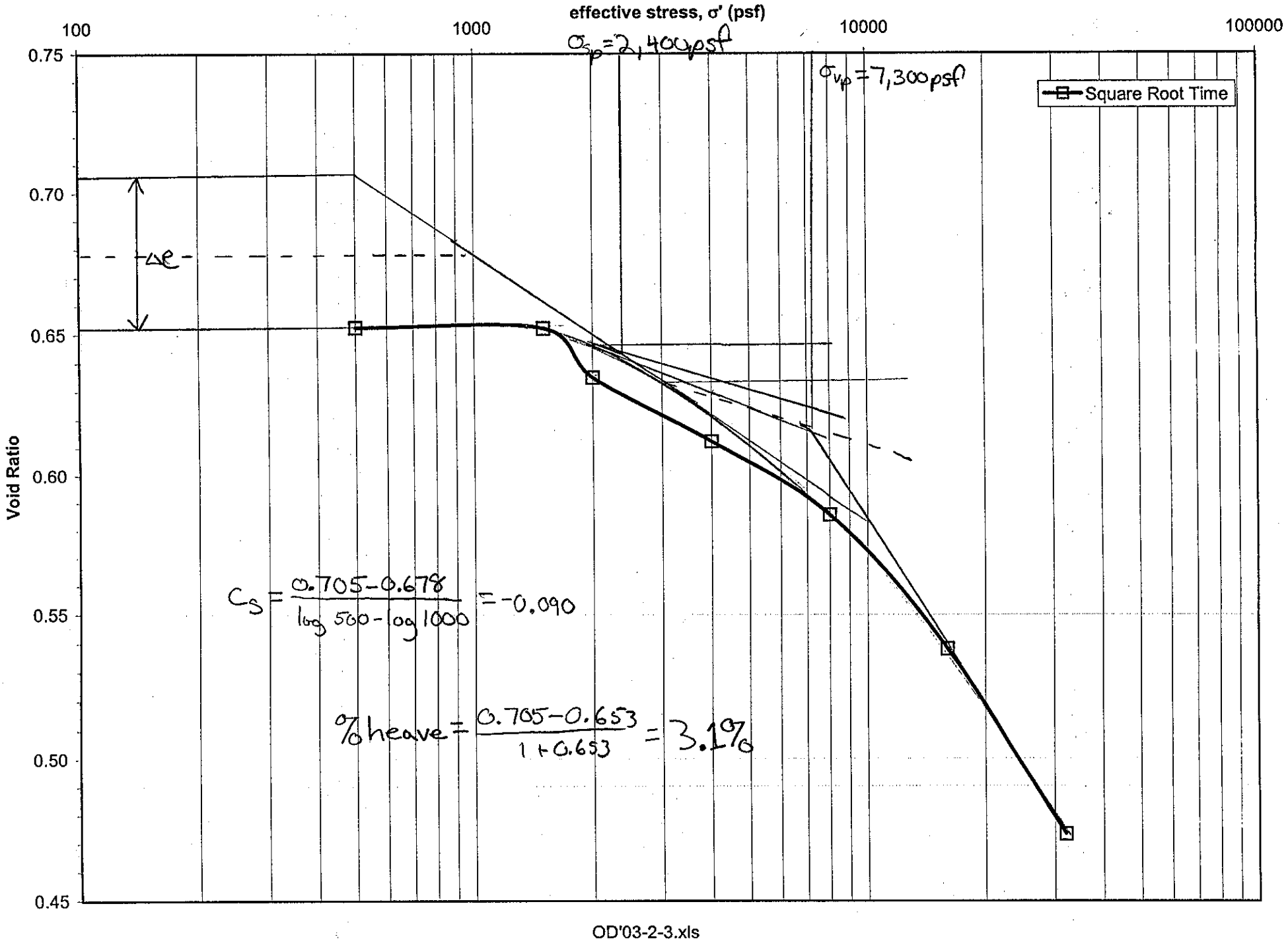


Properties	Initial	Final
Saturation	73.2%	122%
Void Ratio	0.65	0.47
Moisture Content	17.7%	21.3%
Dry Unit Weight (pcf)	102	114

Consolidation Index, C_C	0.22
Maximum Past Pressure (psf)	7,300
Swell Pressure (psf)	2,400
Therical Maximum Percent Heave	3.1%

Project Number: **338-35131**
Project Name: Fort Riley, Kansas

Boring OH'03-2 Sample 3


effective stress, σ' (psf)
100
1000
10000
100000
σ_{vp} = 2,400 psf
σ_{vp} = 7,300 psf
Square Root Time
0.75
0.70
0.65
0.60
0.55
0.50
0.45
Void Ratio
Δe
$C_S = \frac{0.705 - 0.678}{\log 500 - \log 1000} = -0.090$
$\%\,\text{heave} = \frac{0.705 - 0.653}{1 + 0.653} = 3.1\%$
OD'03-2-3.xls

Lab Set-up

Weight of ring (g)	523.66	Diameter of Sample (in)	2.5	e_o	0.653
Weight of ring & soil (g)	678.30	Area of Sample (in^2)	4.90873852	initial S, (%)	73.2%
Weight of soil (g)	154.64	Area of Sample (ft^2)	0.03408846		
Moisture content		Initial height of sample (in)	1.000		
Weight of tin	31.22	Initial height of sample (ft)	0.08333333		
Weight of tin+ wet soil	131.95	Specific Gravity	2.70		
Weight of tin+ dry soil	116.81	Unit Weight of Water (pcf)	62.4		
Moisture content (%)	17.7%				

Initial Block Diagram

Wt. (lbs)			Vol. (ft^3)	
	0	Air	0.000300862	
			0.00112181	
0.3408266	0.051227183	Water	0.000820948	0.00284
	0.289599377	Soil	0.001718895	

	Stress (psf)			Root Time				Log Time			
Load Step	Before	After	Hs (in)	ΔH (in)	H_f (in)	Δe	e_f	ΔH (in)	H_f (in)	Δe	e_f
Seating	0	500	0.605	0.0001	1.000	0.000	0.652	0.0001	1.000	0.000	0.652
Swell	500	1500	0.605	0.0001	1.000	0.000	0.652	0.0001	1.000	0.000	0.652
2	1500	2000	0.605	0.0104	0.989	0.017	0.635	-0.0008	1.001	-0.001	0.654
3	2000	4000	0.605	0.0138	0.976	0.023	0.612	-0.0008	1.001	-0.001	0.655
4	4000	8000	0.605	0.0161	0.960	0.027	0.586	-0.0008	1.002	-0.001	0.656
5	8000	16000	0.605	0.0288	0.931	0.048	0.538	-0.0008	1.003	-0.001	0.658
6	16000	32000	0.605	0.0393	0.892	0.065	0.473	-0.0008	1.004	-0.001	0.659

Log time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	1500	2000	1.000	1.001	0.0000	0.0000	0.0000	0.0	1.000	0.500	#DIV/0!
3	2000	4000	1.001	1.001	0.0000	0.0000	0.0000	0.0	1.001	0.500	#DIV/0!
4	4000	8000	1.001	1.002	0.0000	0.0000	0.0000	0.0	1.002	0.501	#DIV/0!
5	8000	16000	1.002	1.003	0.0000	0.0000	0.0000	0.0	1.003	0.501	#DIV/0!
6	16000	32000	1.003	1.004	0.0000	0.0000	0.0000	0.0	1.003	0.502	#DIV/0!

Square Root Time

Load Step	Before	After	Ho (in)	H_f (in)	S_0 (in)	S_{100} (in)	S_{50} (in)	t_{50} (min)	H_{avg} (in)	H_{dr} (in)	C_v (in^2/min)
2	1500	2000	1.000	1.001	0.0344	0.0456	0.0400	30.3	1.000	0.500	0.0016
3	2000	4000	1.001	1.001	0.0500	0.0646	0.0573	15.0	1.001	0.500	0.0033
4	4000	8000	1.001	1.002	0.0656	0.0825	0.0740	36.0	1.002	0.501	0.0014
5	8000	16000	1.002	1.003	0.0870	0.1166	0.1018	81.0	1.003	0.501	0.0006
6	16000	32000	1.003	1.004	0.1170	0.1571	0.1371	169.0	1.003	0.502	0.0003

Log Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	1500	2000	0.652	0.654	-2.64E-06	-1.60E-06	62.4	#DIV/0!	#DIV/0!
3	2000	4000	0.654	0.655	-6.61E-07	-4.00E-07	62.4	#DIV/0!	#DIV/0!
4	4000	8000	0.655	0.656	-3.31E-07	-2.00E-07	62.4	#DIV/0!	#DIV/0!
5	8000	16000	0.656	0.658	-1.65E-07	-9.98E-08	62.4	#DIV/0!	#DIV/0!
6	16000	32000	0.658	0.659	-8.26E-08	-4.99E-08	62.4	#DIV/0!	#DIV/0!

Sqrt. Time

Load Step	Before	After	e_0	e_f	a_v	m_v	γ_w (lb/ft^3)	C_v	k_{calc} (cm/s)
2	1500	2000	0.652	0.635	3.43E-05	2.08E-05	62.4	0.0016	7.45E-09
3	2000	4000	0.654	0.612	2.06E-05	1.25E-05	62.4	0.0033	9.03E-09
4	4000	8000	0.655	0.586	1.73E-05	1.04E-05	62.4	0.0014	3.16E-09
5	8000	16000	0.656	0.538	1.47E-05	8.91E-06	62.4	0.0006	1.20E-09
6	16000	32000	0.658	0.473	1.15E-05	6.95E-06	62.4	0.0003	4.49E-10

Final

Moisture content	
Weight of tin	30.6
Weight of tin+ wet soil	159.81
Weight of tin+ dry soil	137.11
Moisture content (%)	21.3%
Void Ratio	0.473
Dry Unit Weight	114.362
Saturation	122%
Stress 1	16000
Stress 2	32000
Void Ratio 1	0.538
Void Ratio 2	0.473
Crompression Index	0.22

Initilal Load (psf)	0	DR Initial	0.0276	ΔM	0.0008
Final Load (psf)	500	DR Final	0.0285	ΔH	0.0001

Initilal Load (psf)	500
Final Load (psf)	1500

Final Displacemnt	0.0008
ΔM	0.0007
ΔH	0.0001

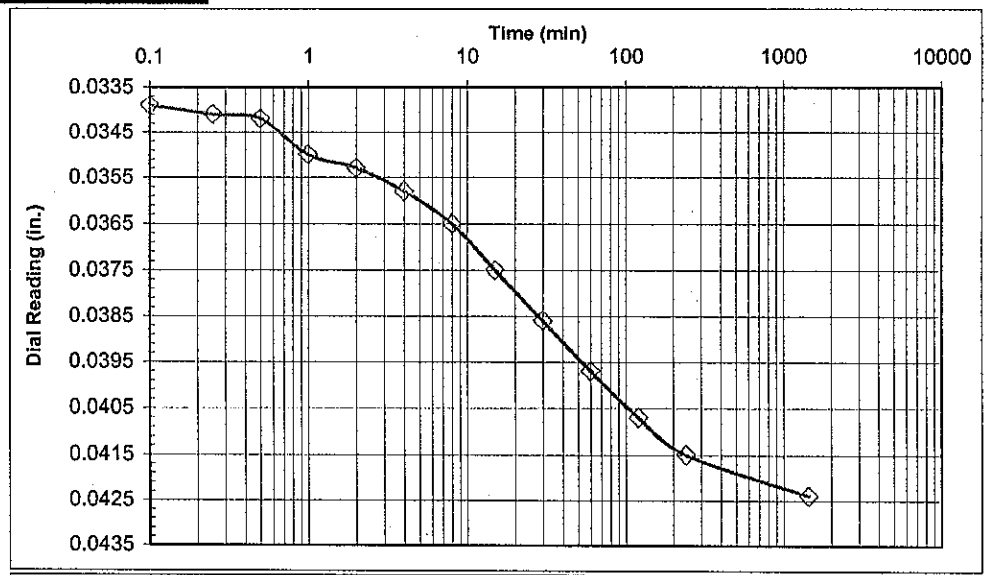
Loading

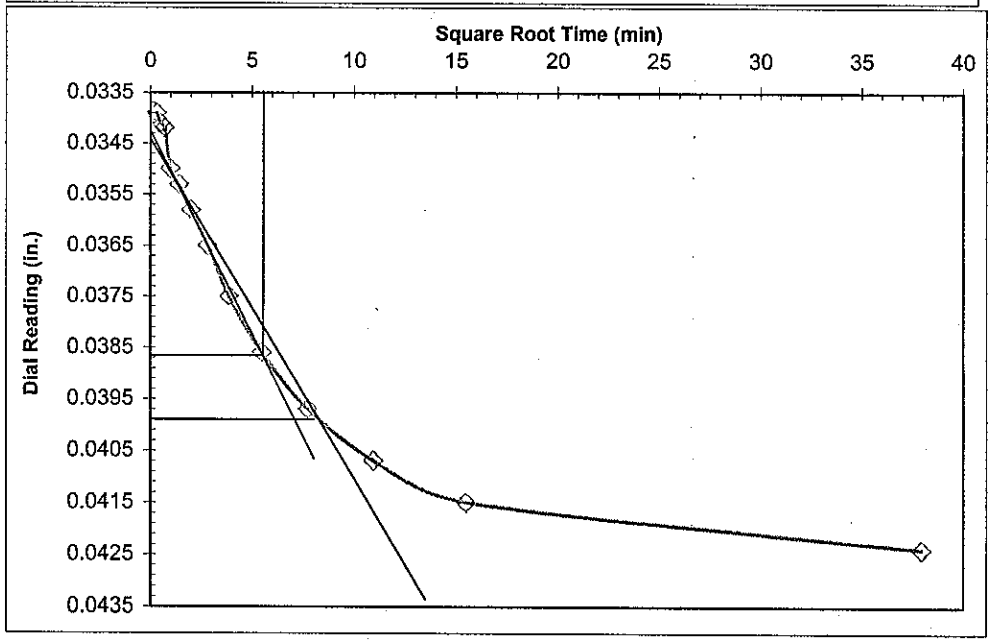
Time	Load	Dial Reading
	500	0.0285
		0.0285
		0.0286
	1000	0.0287
		0.0288
		0.0289
		0.0290
	1500	0.0291
		0.0293

Load #	2	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	1500	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	2000	(sq.rt. time) ΔH (in)	0.0104	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0293
		0.1	0.3162	0.0339
		0.25	0.5	0.0341
		0.5	0.7071	0.0342
		1	1	0.0350
		2	1.4142	0.0353
		4	2	0.0358
		8	2.8284	0.0365
		15	3.873	0.0375
		30	5.4772	0.0386
		60	7.746	0.0397
		120	10.954	0.0407
		240	15.492	0.0415
		1440	37.947	0.0424
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	5.5	D -Line	
S_0	0.0344	slope	0.00066403
S_{50}	0.0386	0.000	0.0344
S_{90}	0.0397	5.5	0.03805217
S_{100}	0.0456	t_{50}	30.25

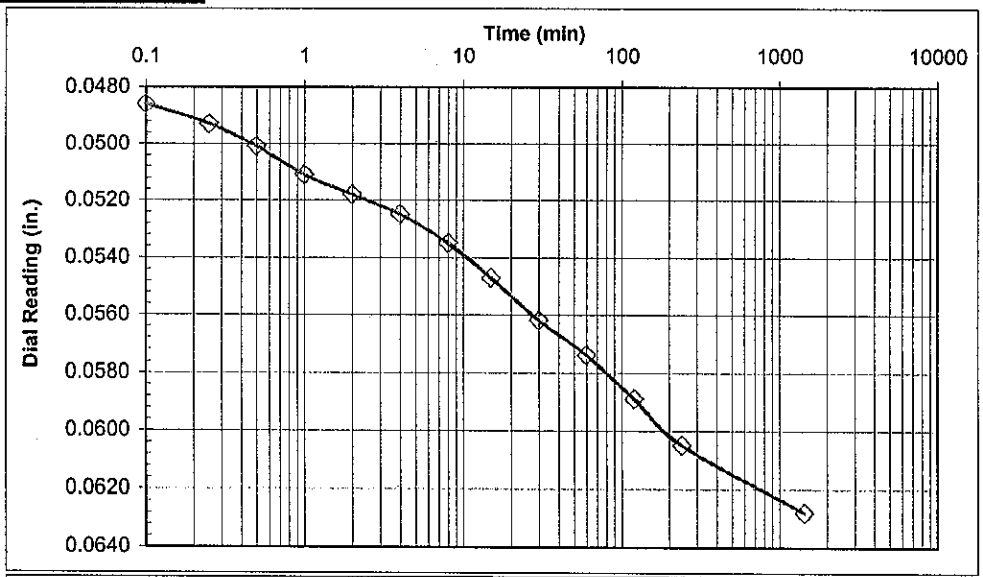


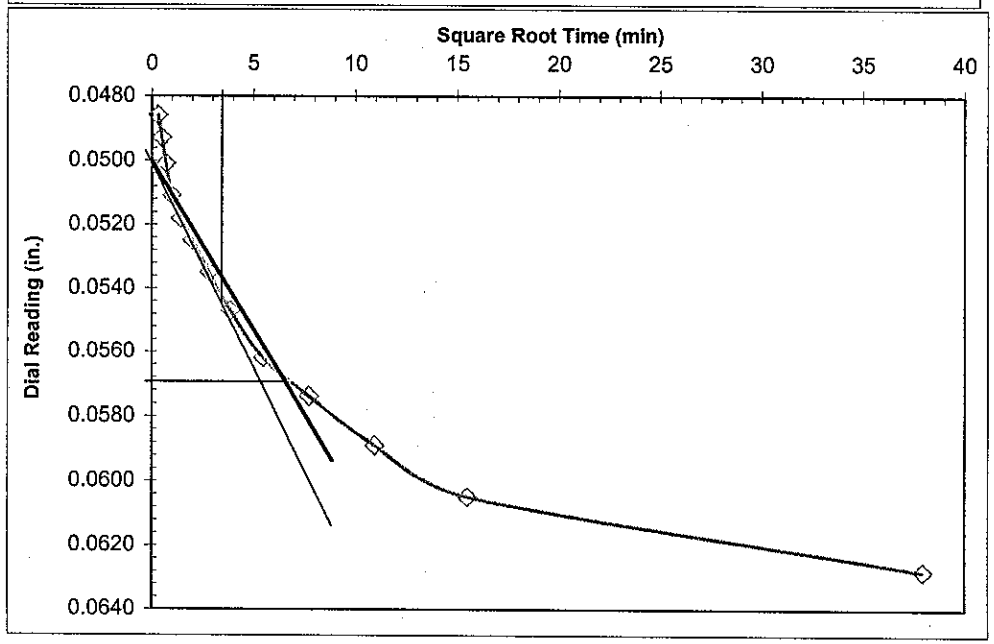


Load #	3	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	2000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	4000	(sq.rt. time) ΔH (in)	0.014	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0423
		0.1	0.3162	0.0486
		0.25	0.5	0.0493
		0.5	0.7071	0.0501
		1	1	0.0511
		2	1.4142	0.0518
		4	2	0.0525
		8	2.8284	0.0535
		15	3.873	0.0547
		30	5.4772	0.0562
		60	7.746	0.0574
		120	10.954	0.0589
		240	15.492	0.0605
		1440	37.947	0.0628
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	3.872983	D -Line	
S_0	0.0500	slope	0.00105525
S_{50}	0.0547	0.000	0.05
S_{90}	0.0569	3.873	0.05408696
S_{100}	0.0646	t_{50}	15

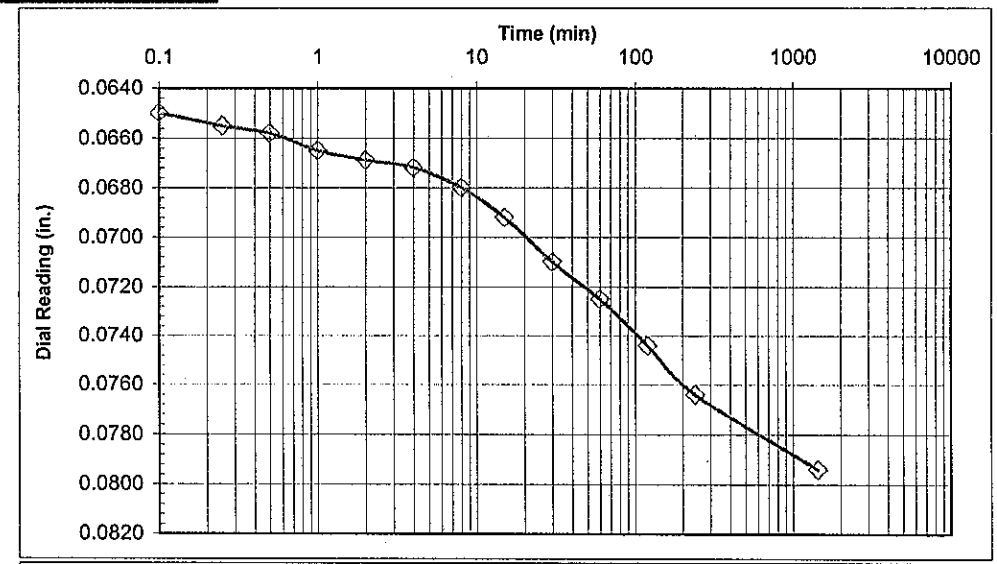


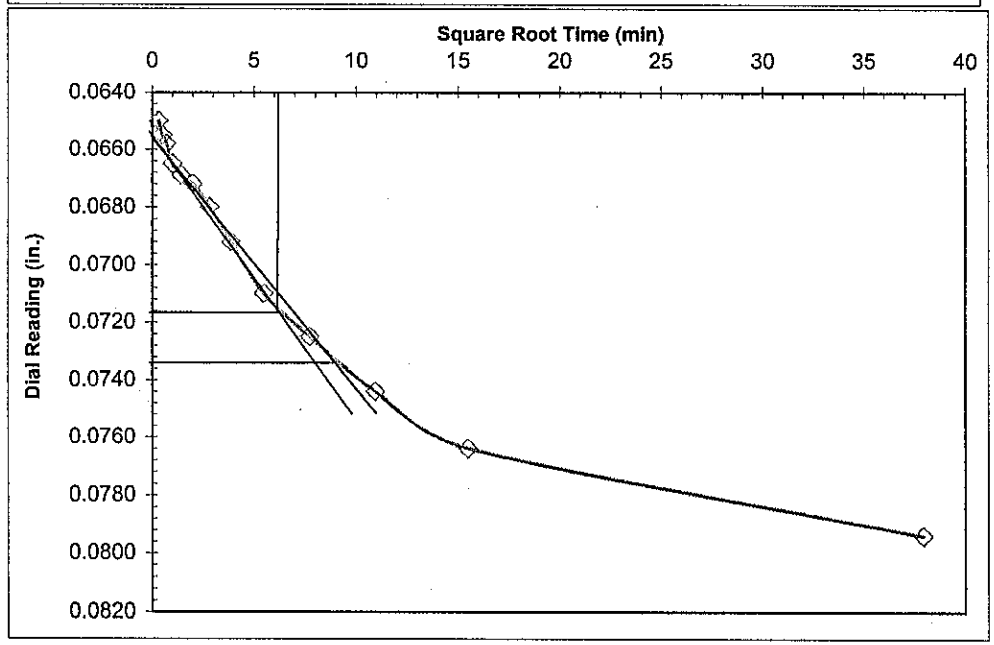


Load #	4	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	4000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	8000	(sq.rt. time) ΔH (in)	0.016	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0628
		0.1	0.3162	0.0650
		0.25	0.5	0.0655
		0.5	0.7071	0.0658
		1	1	0.0665
		2	1.4142	0.0669
		4	2	0.0672
		8	2.8284	0.0680
		15	3.873	0.0692
		30	5.4772	0.0710
		60	7.746	0.0725
		120	10.954	0.0744
		240	15.492	0.0764
		1440	37.947	0.0794
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

Sq. Root Time			
sqrt. t_{50}	6	D -Line	
S_0	0.0656	slope	0.00086957
S_{50}	0.0716	0.000	0.0656
S_{90}	0.0736	6	0.07081739
S_{100}	0.0825	t_{50}	36

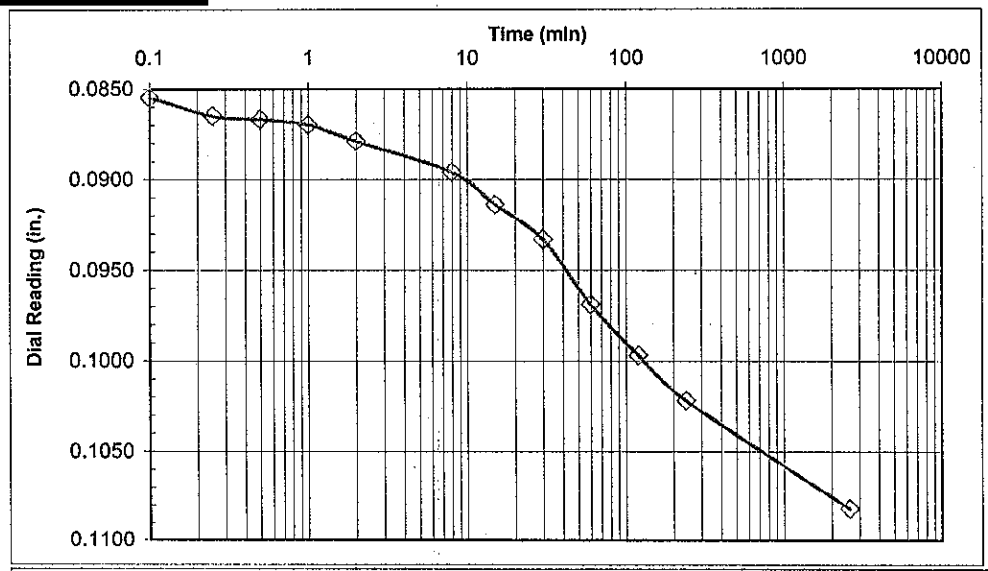


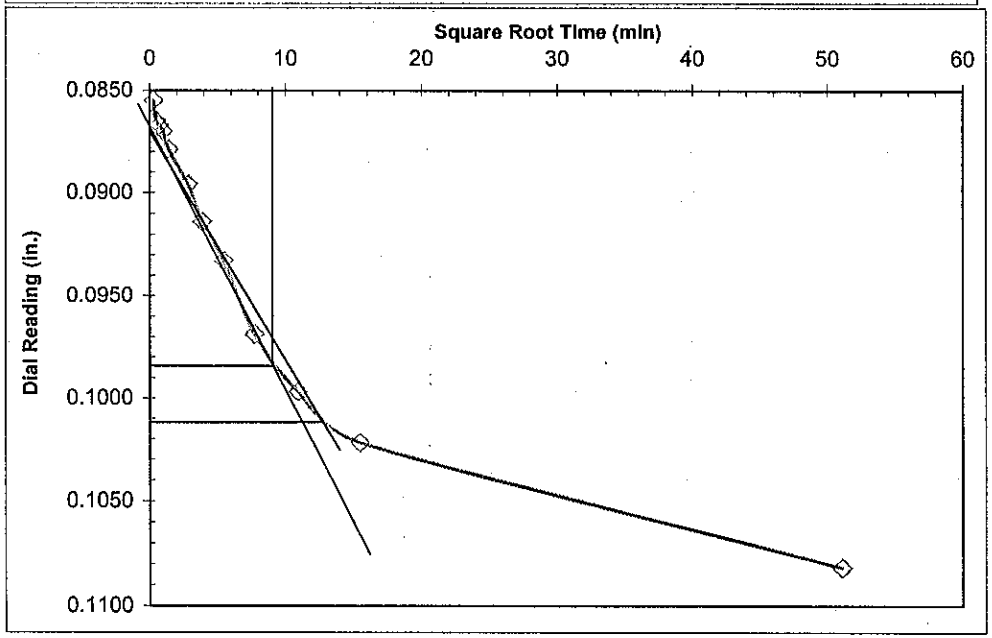


Load #	5	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	8000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	16000	(sq.rt. time) ΔH (in)	0.029	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.0794
		0.1	0.3162	0.0855
		0.25	0.5	0.0865
		0.5	0.7071	0.0867
		1	1	0.0870
		2	1.4142	0.0879
		8	2.8284	0.0896
		15	3.873	0.0914
		30	5.4772	0.0933
		60	7.746	0.0969
		120	10.954	0.0997
		240	15.492	0.1022
		2611	51.098	0.1082
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

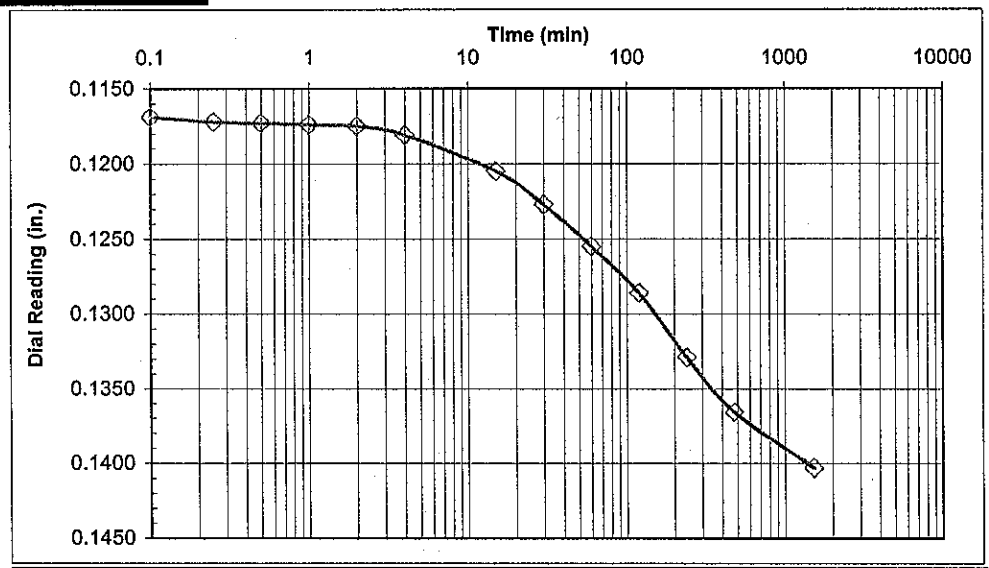
Sq. Root Time			
sqrt. t_{50}	9	D -Line	
S_0	0.0870	slope	0.00111111
S_{50}	0.0985	0.000	0.087
S_{90}	0.1010	9	0.097
S_{100}	0.1166	t_{50}	81



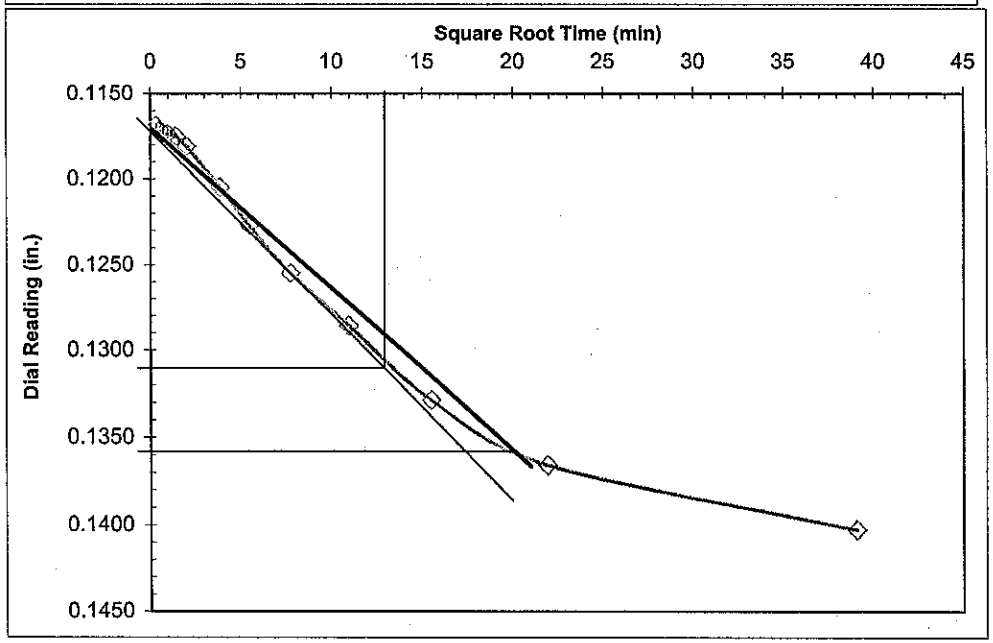


Load #	6	ΔM (in)	0.0008	t_{50}	
Area (ft^2)	0.0340885			S_0	
Initial Stress (psf)	16000	(Log time) ΔH (in)	-0.001	S_{50}	0
Final stress (psf)	32000	(sq.rt. time) ΔH (in)	0.039	S_{100}	

Date	Clock Time (min)	Time (min)	sq. root time	Gage Reading (in.)
		0	0	0.1168
		0.1	0.3162	0.1169
		0.25	0.5	0.1172
		0.5	0.7071	0.1173
		1	1	0.1174
		2	1.4142	0.1175
		4	2	0.1181
		15	3.873	0.1205
		30	5.4772	0.1227
		60	7.746	0.1255
		120	10.954	0.1286
		240	15.492	0.1329
		480	21.909	0.1366
		1527	39.077	0.1403
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	



Sq. Root Time			
sqrt. t_{50}	13	D -Line	
S_0	0.1170	slope	0.00093645
S_{50}	0.1310	0.000	0.117
S_{90}	0.1360	13	0.12917391
S_{100}	0.1571	t_{50}	169



ATTACHMENT 3

DRAWING FORMAT (TRI-SERVICE STANDARDS)

Tri-Service CADD Technology Center
Web Page

http://tsc.wes.army.mil/

Provided as required by Section 01100 Paragraph "As-Built Drawings"

ATTACHMENT 4

SAFETY AND HEALTH REQUIREMENTS MANUAL

(PROVIDED WITH THE RFP)

ATTACHMENT 5

DRAWINGS PROVIDED WITH RFP

ATTACHMENT 6

HOUSING QUALITY VERIFICATION CHECKLIST

HOUSING QUALITY VERIFICATION CHECKLIST
(Example of Definable Feature of Work)

Building Layout
(Examples of Quality Control Checks)
- Check building setback requirements.
- Verify Building elevations.
- Verify benchmark.

Strip Site
- Check for protection of existing utilities, vegetation, and structures before operations begin.
- Check segregation of topsoil from backfill.
- Check requirements for erosion control.

Foundation Excavation
- Check for contractor's location, identification and necessary protection of existing site utilities, vegetation, and existing structures before operations begin.
- Digging permits.
- Building setback.
- Removal of unsatisfactory materials.
- Check excavation, dewatering.
- Erosion control
- Use of satisfactory materials for backfill.
- Compliance with compaction requirements.
- Required testing of backfill.
- Condition of subgrade (compaction, moisture, finish).

Underslab Plumbing

Water Supply and Distribution
- Check that piping materials comply with requirement for under slab location.
- Check that there are no pipe joints below building slab.
- Check size and depth of water line service.
- Check sleeve requirements.
- Check separation requirements of sewer and water line.
- Test piping prior to follow-on work.

Sanitary Drainage
- Check that piping materials comply with requirement for under-slab location.
- Check size of waste line.
- Check slope.
- Check separation requirements of sewer and water line.
- Check for drainage pattern type fittings.
- Check requirements for building sewer clean-out.
- Test piping prior to follow-on work.

Radon Piping
- Check for approved materials.
- Check layout.
- Check penetrations thru foundation.

Soil Treatment
- Pesticide labels to bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).
- Check handling, mixing, application requirements of pesticide.
- Check disposal requirements of containers and residual pesticide.
- Check the requirement for soil poisoning under and around building structures.
- Check for approval of material to be used and watch specifically for required concentration.
- Check application for coverage and quantity of material used.
- Check EPA requirements.
- Check MSDA sheets.

Slab-on-grade
- Check capillary water barrier, gradation, depth, consolidation.
- Is vapor barrier membrane of specified thickness?
- Check vapor barrier edges for specified lap
- Check requirement for sealing the edges.
- Check that vapor barrier joints and penetrations are sealed with tape.
- Check reinforcing steel required by plans and/or shop drawings.
- Check reinforcing supports.
- Check forms.
- Check footing depth and width.
- Clearance of steel from forms and subgrade, and support material.
- Location and construction of contraction and expansion joints.

- Concrete tests-slump, entrained air content, temperature, strength.
- Concrete placement-vibration/consolidation.
- Concrete finish.
- Check form removal. Check patching.
- Check protection and curing of concrete.
- Check materials, dimensions, and installation of perimeter insulation.

Wall Framing & Ext. Sheathing

Lumber Grading
- Species and grade for particular use comply with the specifications.
- Check for grade stamp.
- Defects in material do not exceed grading rules.

Lumber Seasoning and Storage
- Check moisture content of wood.
- Check for proper storage of materials.

Fasteners
- Nailing complies with the AFPA Manual for Wood Frame Construction.

Protection Against Termites and Decay
- Check for pressure preservative treated wood where wood is resting on concrete which is in contact with the ground.
- Wood supports and nailers which support permanent structures and which are embedded in concrete in direct contact with earth or exposed to the weather, should be pressure preservative treated.
- Check that treated lumber in contact with concrete that contacts the ground is treated to a retention level of 0.40pcf. Check grade stamp.

Anchorage of Sills and Plates to Foundation
- Foundation plates or sills shall be bolted to the foundation or foundation wall with not less than 1/2-inch nominal diameter steel bolts embedded at least 7 inches into concrete and spaced not more than 6 feet apart. Check plans and specifications for other requirements.
- Check that there are a minimum of two bolts per piece with one bolt located within 12 inches of each end of each piece.
- Check for a properly sized nut and washer tightened on each bolt to the plate.
- Check special requirements for shear walls.
- Check hold down anchors.

Wall and Partition Framing
- Check stud spacing.
- Double top plates for bearing walls and bearing partitions.
- Horizontal blocking.
- All openings are framed.
- Solid blocking provided for hanging of fixtures, handrails, cabinets, baseboards, and similar items.
- Headers are sized properly.
- Top plate corners overlap.
- Top plate end joints offset as specified (or 48 inches by UBC).
- Check for defects in studs beyond allowable.
- Notches in exterior wall studs or bearing partition do not exceed 25 percent of its width.
- Notches in nonbearing partition do not exceed 40 percent of its width.
- Borings in any stud do not exceed 40 percent of its width.
- Borings are not greater than 60 percent of the width of the stud in nonbearing partitions or in any wall where each bored stud is doubled, and no more than two such successive doubled studs are so bored.
- The edges of bored holes are no closer than 5/8 inch to the edge of the stud and the hole is not located in the same section of stud as a cut or notch.
- Check special requirements for shear walls.
- Check hold down anchors.

Above grade Wood Framed Floor
- Notches or holes in joists are not cut in the middle one-third of the joist span.
- Notches in the outer sections of the span are no greater than one-sixth the joist depth.
- Notches at joist end for ledger support are no greater than one-fourth the joist depth.

- Holes in the outer joist sections are limited in diameter to one-third the joist depth and are cut with the edge of the hole no closer than 2 inches to the top or bottom edges.
- Where bearing partitions are parallel to floor joists, double joist should be directly under the partition.
- Where walls containing plumbing are parallel to floor joists, the joists underneath are doubled, spaced and blocked to permit the passage of pipes.
- Joist hangers and nails are the correct size for supported member.
- Joists on wood plates bear a minimum of 1-1/2 inches.
- Joists on concrete bear a minimum of 3 inches.
- Floor systems having joists framing from opposite sides over a bearing support are tied together by lapping a minimum of 3 inches.
- Ends of floor joists are blocked full depth.

Exterior Wall Sheathing

- Check for required diagonal bracing. Check sheathing against specification requirements for type material, thickness, width, and length.
- Nails and spacing as specified?
- Proper orientation of sheathing.
- End joints over framing members.
- Check requirements for air infiltration barrier.

Roof Trusses & Sheathing

Roof Trusses

- Check Requirements for storage, handling, and installation in accordance with TPI HIB-91.
- Check moisture content of wood.
- Ensure trusses are not field altered.
- Check shop drawings for bearing points of trusses. Trusses should not be nailed to interior partitions at non-load bearing locations.
- Are provisions to allow the bottom chord to float at interior walls required?. Check for truss clips.
- Check shop drawings for tie straps and hangers.
- Check shop drawings for bracing of top and bottom chords. Check bracing of web members.

Roof Sheathing

- Check sheathing for type, grade, and thickness required.
- Check for required space at plywood joints.
- Check sizes, lengths, and spacing of fasteners.
- Check that long dimension of structural panels is perpendicular to rafters with panel continuous over two or more spans.
- Check that joints are staggered.
- Check requirement for panel clips.

Roof Shingles

- Check for approved materials.
- Shingles are labeled as UL approved.
- Sheathing is smooth, firm, dry, and free from loose boards.
- Pipe and other roof penetrations are properly flashed.
- Flashing is installed or on hand to be installed concurrently with roofing.
- Ensure compliance with roofing manufacturer's instructions regarding: underlayment, fasteners (type and location), drip edge, starter course, successive courses, hip and ridge shingles, flashing, valley construction.
- Underlayment on top of metal drip edge at eaves.
- Metal drip edge on top of underlayment at rake.

Install HVAC Ducts

Fabrication and Erection

- Check that ductwork delivered to the site conforms with approved shop drawings
- Check sheet metal material type, thickness and shape
- Check flexible duct type and size..
- Check workmanship of lock seams of sheet metal ducts.
- Check gauge of dampers and splitters.
- Check for framed openings or duct sleeves in wall penetrations where required.

- Examine duct hangers for specified material, thickness, and spacing.
- Check flexible connections where required.
- Test ducts for air tight ness prior to follow-on work as required.

Insulation

- Check the type and thickness of insulation and requirements for vapor barrier.
- Check the method of fastening insulation to exterior or interior of duct. Check fasteners or adhesives.
- Check sealing requirements of insulation vapor retarder.
- Check for continuity of insulation through walls and floor, if required.
- Check materials for fire-retardant requirements.

Electrical and Communication Rough-In

General Requirements

- Notches in exterior wall studs or bearing partition do not exceed 25 percent of its width.
- Notches in nonbearing partition do exceed 40 percent of its width.
- Borings in any stud do not exceed 40 percent of the stud width.
- Borings are not greater than 60 percent of the width of the stud in nonbearing partitions or in any wall where each bored stud is doubled, and no more than two such successive doubled studs are so bored.
- The edges of bored holes are no closer than 5/8 inch to the edge of the stud and the hole is not located in the same section of stud as a cut or notch.
- Notches or holes in joists are not cut in the middle one-third of the joist span.
- Notches in the outer sections of the span are no greater than one-sixth the joist depth.
- Holes in the outer joist sections are limited in diameter to one-third the joist depth and are cut with the edge of the hole no closer than 2 inches to the top or bottom edges.
- Bored holes in wood wall framing: Check requirements for minimum distance of wire to edge of wood member (equal to or greater than 1-1/4 inches). Check requirements if minimum distance cannot be maintained.
- Notches in wood wall framing: Check requirements for protection of wires thru notches in wood members.
- Where a service raceway enters from an underground distribution system, check that it is sealed. (NEC 230-8)

General Purpose Circuits

- Check that outlet boxes comply with specifications for material.
- Check duplex receptacles for location and spacing.
- Check that hallways equal or greater than 10 feet have a receptacle.
- Check offset requirements of boxes on opposite sides of fire rated partitions and walls. Check fire sealing requirements on fire rated partitions and walls.
- Check requirements for clearance on non-insulated cover recessed light fixtures (3 inches from insulation, 1/2 inch to combustibles).
- Check support requirements for ceiling boxes for mounting lighting fixtures.
- Check mounting requirements of boxes in relation to finished surface of wall/ceiling.
- Check height of receptacles, switches, and HVAC controls. Check special height requirements for accessibility in accordance with the Uniform Federal Accessibility Standards.
- Check boxes are not overcrowded with conductors.

Utility

- Check requirements for hot water heater, heat pump, washer and dryer. Check conductors and circuits.
- Check that at least one 20-amp branch circuit is provided to the laundry (NEC 220-4c and 210-52f).

Kitchen Circuits

- Check spacing of outlets.
- Check requirements for 20-amp small appliance circuits.

Appliances

- Check electric range conductor.
- Check garbage disposal and dishwasher wiring.
- Outlet location for garbage disposal shall permit disposal cord to be less than 36 inches (minimum length of cord is 18 inches).
- Outlet location for dishwasher shall permit dishwasher cord to be less than 4 feet (minimum length of cord is 3 feet).
- Check that outlet locations for appliances are accessible

Wiring

- Check type of insulation and jacket, conductor material, conductor size and stranding in each circuit.
- Sheathing to extend no less than ? inch into box.
- Check that wire is clamped to box if required.
- Protective cable plates required where wires are within 1-1/4 inch of edge of stud.
- Check that wire is stapled within 12 inches of cabinets, boxes, and fittings and secured at intervals not to exceed 4'-6".
- Check that wire installed in attics is protected within 6 feet of the attic entrance.

Grounding Electrode System

- Check requirements for size and type of grounding electrode conductor.
- Check for approved clamp to water service.
- Check for approved rod connection for contact with soil.
- Check size, length, and material of ground rods or electrodes against contract drawings and specifications.
- Check special requirements for grounding of equipment.
- Check grounding resistance.

Meter Main

- Check for approved materials.
- Check meter height.

Panelboard

- Check that circuits are labeled.
- Check that breakers are make and model per panel labeling.
- Check that unused openings are properly closed.
- Check for required clearances in front of panel.
- Check that maximum breaker height does not exceed 6 feet 6 inches.

Windows/Exterior Doors

- Check for approved products.
- Check that door hardware complies with specifications.
- Verify manufacturer's installation requirements. Fasteners, sealant, and shims as required.
- Check that exterior door jambs are rabbeted from a solid board to provide an integral stop.
- Check door clearance, top, sides, and bottom.
- Check operation of doors and windows.
- Check for approved garage door and hardware. Check operation of garage door and hardware.
- Check for accessible doors where required. Doors to comply with the Uniform Federal Accessibility Standards.
- Check fire-rating requirement of door from garage to unit.

Plumbing Rough-in

General Requirements

- Notches in exterior wall studs or bearing partition do not exceed 25 percent of its width.
- Notches in nonbearing partitions do not exceed 40 percent of its width.
- Borings are not greater than 60 percent of the width of the stud in nonbearing partitions or in any wall where each bored stud is doubled, and no more than two such successive doubled studs are so bored.
- The edge of bored holes is no closer than 5/8 inch to the edge of the stud and the hole is not located in the same section of stud as a cut or notch.
- Notches or holes in joists are not cut in the middle one-third of the joist span.
- Notches in the outer sections of the span are no greater than one-sixth the joist depth.

- Holes in the outer joist sections are limited in diameter to one-third the joist depth and are cut with the edge of the hole no closer than 2 inches to the top or bottom edges.
- Where plumbing, heating or other pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than 0.058 inches (16 galvanized gauge) and 1-1/2 Inches wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.
- Check for fire sealing thru fire rated walls and partitions.
- Check supports for tub enclosure.
- Check piping and fixture supports.
- Test piping prior to follow-on work.

Water Supply and Distribution

- Check that piping materials comply with requirements.
- In multi-unit buildings, check that separate water shut off is provided for each unit. These valves shall be accessible in the unit that they control.
- Check that valves are oriented with stems in horizontal position or above. Check flow orientation of globe valves.
- Check for drain fitting at service entrance if required.
- Check required locations for water hammer arrestors and air chambers. Check for access to water hammer arrestors.
- Check for required air gaps and vacuum breakers.
- Check pipe joints.
- Check pipe sizes.

Sanitary Drainage

- Check that piping materials comply with requirements.
- Check for required cleanouts and traps.
- Check pipe joints.
- Check pipe and trap sizes.
- Check slopes.

Vents

- Check that piping materials comply with requirements.
- Check pipe sizes, joints, and slope.
- Check that vents rise vertically to a point not less than six (6) inches above the flood level rim of the fixture served before offsetting horizontally.
- Check that the plumbing fixture's maximum trap arm length will not be exceeded.
- Check minimum size of vent thru roof.
- Check height of vent above roof.
- Check location of vent thru roof in relation to windows and vertical surfaces.

Traps and Trap Arms

- Check pipe size, joints, slope, and trap size.
- Ensure that the vent opening is at or above the level of the weir of the trap it serves.
- Check that the plumbing fixture's maximum trap arm length will not be exceeded.

Ceiling and Wall Insulation

- Check that material has been submitted and approved.
- Check that other trades that might damage the insulation or vapor retarder are finished prior to installation of the insulation materials.
- Check for proper placement of vapor retarder. Lap and seal edges and ends of vapor retarder.
- Check loose fill insulation for required thickness.
- Where interior partitions abut exterior walls, check that insulation and vapor retarder is provided at intersection.

Hang Drywall on Wood Framing

Delivery and Storage

- Check that materials meet the specification and are in good condition.
- Gypsum wallboard should be stored flat, off the floor and supported to prevent sagging. Protect from moisture and damage.
- Framing members and wall assembly are to be protected from moisture.
- Check environmental pre-conditioning and installation requirements.

Ceiling Framing

- Check alignment of members.

- Check for required backing. All edges of gypsum wallboard are to be supported.
- Where truss uplift is a concern, check for backing/fasteners for floating corners at non-bearing interior walls and ceiling. Provide truss clips on bottom chord of truss where required to allow for movement.
- At ceiling joists where wiring passes through borings in wood members less than 1-1/4 Inches from the edge of the member, it shall be protected by a steel plate at least 1/16 inch thick. Holes are not allowed through truss members.

Wall Framing

- Where plumbing, heating or other pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than 0.058 inches (16 galvanized gauge) and 1-1/2 Inches wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.
- Where wiring passes through borings in wood members less than 1-1/4 Inches from the edge of the member, it shall be protected by a steel plate at least 1/16 inch thick.
- Check alignment of framing. Check that walls are straight and true.
- Check stud spacing and required blocking.
- Check for twisted studs, protruding blocking, soil pipes, and other items that would create an uneven surface.
- Check that moisture content of wood members does not exceed 15% at time of gypsum wallboard application.
- Check for drywall stops or corner blocking for fastening at interior corners.

Ceiling Installation

- Check for vapor barrier if required.
- Where moisture resistant gypsum wallboard is required, omit vapor barrier.
- Verify that material being used complies with specifications and requirements of fire or sound rating.
- Check for high strength gypsum wallboard if required.
- Make sure proper perpendicular or parallel application of board is used, and the end joints are staggered.
- Check fasteners and spacing. Check adhesive if required.
- Check for proper application of floating interior corners.
- Where truss uplift is a concern, check for proper attachment of gypsum wallboard to bottom chord of truss. Allow for floating interior corners.

Wall Installation

- Check for vapor barrier if required.
- Where moisture resistant gypsum wallboard is required, omit vapor barrier.
- Apply approved mastic to all cut or exposed panel edges at utility holes, joints, and intersections of moisture resistant gypsum wallboard.
- Verify that material being used complies with specifications and requirements of fire or sound rating.
- Make sure proper perpendicular or parallel application of board is used, and the end joints are staggered.
- Check fasteners and spacing. Check adhesive if required.
- Check that fasteners are at least 3/8 inch from edges and ends.
- Ensure that fasteners are applied starting from the center of board and working to ends and edges.
- Check for proper application of floating interior corners.

Finish Drywall

- Check that materials meet the specification (taping and embedding compound, joint tape, finishing compound, drywall corner bead, control joints).
- Check that corner beads are one piece.
- Check that surfaces to receive joint compound are free of dirt, oil and other materials that would effect bond.
- Check that joint tape is placed over sufficient joint compound to ensure bond.
- Check that at least two coats of finishing compound are applied after tapping and embedding compound.

Install Heat Pump and HW Heater

- Check for approved equipment
- Check BTU ratings, capacity, recovery, etc.
- Check for required locations of dielectric connections.
- Check for condensate requirements for size, trap, and air gap.
- Check for required disconnect switch.

Paint Interior Walls

- Test reports of submitted paints comply with specifications.
- Check requirements for storage of paint.
- Check for protection of unpainted adjacent surfaces.
- Worker protection controls are in place.
- Check surfaces prior to painting. Need to be clean and free of foreign matter.
- Exposed ferrous metals are spot primed
- Check that new gypsum wallboard is primed.
- Ensure gypsum wallboard compound has cured as required.
- Check ambient temperature
- Check preparation of previously painted surface.
- Check that required number of coats and thickness is obtained.
- Ensure uniform coverage.

Install and Paint Interior Doors and Trim

- Check for approved products.
- Check storage of products. Protect from extremes of temperature and humidity.
- Wood door edges to be sealed prior to shipment.
- Check that exterior door jambs are rabbeted free from a solid board to provide an integral stop.
- Check for required wedge blocking between frame and rough opening. Installation to comply with manufacturer's instructions and specifications.
- Check door clearance, top, sides, and bottom.
- Check finishes are applied in accordance with the specifications.
- Check that internal parts of electrical equipment are free from paint, plaster, or other materials. (NEC 110-12c)

Cabinets and Trim

- Check storage of cabinets.
- If required, check for KCMA Certification Seal.
- Check construction details of cabinets.
- Check finish of cabinets.
- Check alignment for level and plumb installation.
- Anchors and fasteners installed at required intervals and locations.
- Check counter laminate thickness.
- Check counter substrate thickness and material.
- Countertops attached at required locations

Install Plumbing Fixtures, HVAC Devices, Electrical Fixtures and Devices

Plumbing Fixtures

- Check for approved fixtures.
- Check condition of fixtures.
- Installation in accordance with specifications and installation instructions.

Traps and Trap Arms

- Check pipe size, joints, slope, and trap size.

Electrical Devices and Fixtures

- Check receptacles for compliance with the specifications.
- Check alignment of receptacles.
- Check for GFCI where required.
- Check for approved fixtures.
- Test fixtures.

Diffusers, Registers, and Grills

- Check for approved materials.
- Check for proper operation of registers and diffusers.

HVAC Balancing and Testing

- Perform air balancing and sound tests of HVAC system.
- Perform test of heat pump system.

Smoke Detectors

- Check for approved devices.
- Test operation of devices.

Resilient Floor and Carpet

Concrete Floor

- Check that concrete is smooth and level.
- Check that defects are repaired.
- Check for leveling compound where needed.
- Perform dryness test if required.

Framed floor

- Check for approved underlayment.
- Check material, grade, and thickness.
- Check for approved fasteners and spacing.
- Check that underlayment joints are offset from parallel subflooring joints.
- Check surfaces, including joints and fastener locations, are smooth for finish flooring.

Resilient Flooring and Base

- Check storage area for required temperature and low humidity.
- Check that resilient flooring, edge strips, and adhesive is approved.
- Check thickness and width of flooring material.
- Ensure required temperature is maintained prior to and after installation of flooring materials.
- Ensure that newly installed flooring is cleaned in accordance with the specifications.
- Provide protection of flooring from damage.

Carpet and Base

- Check for approved materials.
- Ensure required temperature is maintained prior to and after installation of flooring materials.
- Check thickness of carpet and carpet cushion.
- Check installation in accordance with manufacturer's instructions and CRI 104.
- Check orientation of seams.
- Ensure that newly installed carpet is cleaned in accordance with the specifications.
- Provide protection of carpet from damage.

Siding and Soffit

- Check for approved siding and accessories.
- Check storage of siding.
- Installation of accessories, starter strip, corners, trim.
- Check siding thickness.
- Verify flashing.
- Approved fasteners.
- Check for approved sealant.
- Siding installed in accordance with approved erection instructions and drawings.

Gutters and Downspouts

- Check materials against specification requirements for type of material, thickness, finish, size.
- Check slope of gutters to provide drainage to outlets.
- Check brackets and spacers for size, type, location, and spacing.

Paving and Sidewalks

- Removal of unsatisfactory materials.
- Check excavation, dewatering.
- Erosion control.
- Use of satisfactory materials for backfill.
- Compliance with compaction requirements.
- Required testing of backfill.
- Condition of subgrade (compaction, moisture, finish).
- Compaction of Aggregate Base
  Forms.
- Check reinforcing steel required by plans and/or shop drawings.
- Check footing thickness and width.
- Check thickness of sidewalks, porches and patios.
- Concrete mix – strength.
- Clearance of steel from forms and subgrade, and support material.
- Location and construction of contraction and expansion joints.
- Concrete Placement – slump, vibration, and finish.
- Concrete finish.
- Concrete curing.
- Location and care of imbedded items.

Exterior Paint

- Test reports of submitted paints comply with specifications.
- Check requirements for storage of paint.

- Check surfaces prior to painting. Need to be clean and free of foreign matter.
- Exposed ferrous metals are spot primed.
- Check that required number of coats and thickness is obtained.
- Ensure uniform coverage.
- Wood surfaces are prepared and finished in accordance with the specifications.

ATTACHMENT 7

CHAPTER 2 – PAVEMENT DESIGN ANALYSIS AND
MATERIALS RECOMMENDATIONS

CHAPTER 2

PAVEMENT DESIGN ANALYSIS AND MATERIALS RECOMMENDATIONS

1. PAVEMENT DESIGN.

1.1 Project Requirements.

The project is for the construction of Family Housing Ellis Heights and South O'Donnell Heights, Fort Riley. The project consists of the following facilities and pavements: (1) Asphalt concrete (AC) pavements for residential streets, (2) Portland cement concrete (PCC) paved residential driveways, (3) Portland cement concrete (PCC) sidewalks with curb and gutters. The Architect-Engineer shall design the project to ensure compliance with all listed design criteria and the recommendations of the project geotechnical report.

1.2 Geotechnical Requirements.

The geotechnical report was prepared by Professional Service Industries, Inc. (PSI). Reference: Report of Geotechnical Services, Proposed Ellis Heights and O'Donnell Heights Housing Additions, Fort Riley Kansas, dated 1 April 2004. The Geotechnical Report advised that the subgrade at Ellis Heights consists of highly plastic clays having a Liquid Limit of 48 to 62, and Plasticity Index of 34 to 41. The Ellis Heights subgrade soils have an approximate moisture content of 23 percent, and average density of 100 pounds per cubic foot (pcf). The subgrade at O'Donnell Heights consists of highly plastic clays having a Liquid Limit of 58 to 73, and Plasticity Index of 44 to 57. The O'Donnell Heights subgrade soils have an approximate moisture content of 21 percent. The subgrade consists of highly plastic clay. The subgrade soils are expected to have a marginal to high swelling potential, reference TM 5-822-14 Table 3-8.

1.3 Traffic Design Analysis.

Estimated Residential Area Traffic:
Estimated vehicle traffic on housing streets:
32 duplexes X 2 units X 2 pov's/unit X 4 passes/day X 365 days/year X 25 years = 4,672,000 passenger vehicle (pov) passes:

automobiles (80%) = 3,737,600 passes
light suv's and small trucks (10%) = 467,200 passes
large suv's and pickup trucks (10%) = 467,200 passes

Service truck, (2 axle truck) 1 pass/week X 52 wks/yr X 25 years = 1,300 passes

Garbage truck, (3 axle truck) 2 passes/week X 52 wks/yr X 25 years = 2,600 passes

School buses, (3 axle truck) 2 routes X 2 passes/day X 5 days /wk X 52 wks/yr X 25 years = 25,000 passes

Fire truck, (3 axle truck) 1 pass/wk X 52 wks/yr X 25 years = 1,300 passes

Moving Van/Truck, (4 axle truck) 64 passes/yr X 25 years = 1,600 passes

1.4 Subgrade Preparation.

The Geotechnical Report advises that the subgrade soils are weak and will require soil improvements. The subgrade surface shall be cleared and graded to remove all topsoil, weak, and organic soils, to expose the firm clay subgrade surface. The Geotechnical report recommends that the subgrade be over excavated and backfilled or treated with lime-modification. Lime modification of subgrades under vehicle pavements is standard design practice at Fort Riley. Historically lime-modified subgrade under sidewalks and residential driveways has not been utilized at Fort Riley. The customer advises that residential sidewalks and driveways are performing satisfactorily without requiring use of a lime-modified subgrade. Lime-modification shall be designed to conform to the requirements used for previous street and parking lot projects at Fort Riley. The subgrade surface under streets and curbs and gutters shall be lime modified to a depth of at least 8 inches. No lime-modification of the subgrade for driveways and sidewalks will be required.

The project site includes a low permeable clay subgrade, and is in an area subject to frost design conditions. Adequate drainage of the subgrade surface and aggregate courses should be provided to avoid creating a ponding condition in the aggregate courses. Subgrade surfaces should be graded and sloped to ensure drainage of the subgrade surface.

1.4.1 Lime-Modification of Subgrade Soils:

Ft Riley is in an area where frost design criteria are applicable in accordance with TM 5-822-5 Chapter 18. Lime-modification of pavement subgrade soils is used at this installation to reduce moisture sensitivity of the plastic soils and reduce potential expansive soil characteristics. Lime-modified subgrade provides a stable working platform for subsequent construction. The construction activity related to the use of insitu mixing for lime-modification may further contribute to subgrade uniformity as required in TM 5-822-5 paragraph 18-17. Lime-modified subgrade soil mixtures should be designed to conform to TM 5-822-14.

In order to be considered for use in satisfying part of the frost design structural section requirements, lime-modified subgrade soils should be evaluated for freeze-thaw durability in accordance with paragraph 18-14 b. These requirements are not used in road and parking lot construction projects at Ft Riley. Therefore, lime-modified subgrade will not be used to satisfy the structural design section thickness requirements. The amount of lime required varies depending on the Plasticity Index and gradation of the

subgrade soils, and should conform to TM 5-822-14, Chapter 3, paragraph 3-2, Figure 3-1. Lime addition rate based on the geotechnical report is expected to require at least 7 percent hydrated lime (5.25 percent granular quicklime) by dry weight of soil.

1.5 Aggregate Materials.

1.5.1 Subbase Course:

Subbase courses for pavements shall be designed to conform to TM 5-822-5 Chapter 5. An aggregate subbase course shall be used under streets. The aggregate subbase course provides a filter and separation between the lime-modified clay subgrade and the overlying base course. The subbase course gradation should be selected to meet filter criteria in order to protect the subgrade and overlying base course. Aggregates for subbase and base course at this location is typically produced from quarried limestone. Subbase course is generally more economical than graded base course materials, and is used to satisfy a portion of the design section thickness. The subbase course is required to conform to the frost design criteria, and be Non Frost Susceptible (NFS).

1.5.2 Base Course:

Base courses for pavements shall be designed to conform to TM 5-822-5 Chapter 6. Graded crushed aggregate base course is the common base course material available in the area. Base course materials are produced from limestone quarrying and processing operations. The locally available limestone is typically weak, soft, absorptive materials that exhibit a tendency for particle size degradation during handling, transporting, and placing. The estimated CBR value for lime rock is used rather than the value for graded crushed aggregate due to the qualities of the limestone available in the area. The base course shall be designed with a design CBR = 80, reference TM 5-822-5, Chapter 6, paragraph 6-4. The base course is required to conform to the frost design criteria, and be Non Frost Susceptible (NFS).

1.6 Compaction Requirements.

The lime-modified subgrade shall be compacted to at least 95 percent of ASTM D 1557 maximum density in accordance with TM 5-822-5, paragraph 4-2 and TM 5-822-14, chapter 4, paragraph 4-2.b.(4). The lime-modified subgrade soils shall be placed and compacted with a moisture content between +/- 2 percent of optimum as determined in accordance with ASTM D 1557. Subbase course and base course shall be placed and compacted to 100 percent of ASTM D 1557 maximum density in accordance with TM 5-822-5.

1.7 Pavement Design.

The pavements required for this project consist of asphalt concrete paved residential streets, and PCC paved residential driveways. The pavement structures shall be designed

in accordance with TM 5-822-2 and TM 5-822-5, and using the PCASE pavement design program.

1.7.1 Pavement Structure Offset Requirements: The lime-modified subgrade, aggregate subbase course, and crushed aggregate base shall be placed and compacted to extend at least 12 inches beyond the edge of the next overlying course in the pavement structure. Where curb and gutters are used the layers should extent at least 12 inches beyond back of curb and gutters.

1.7.2 Joints in Portland Cement Concrete (PCC) Slab on Grade: Pavement joint plan and joint details for Portland Cement Concrete pavements shall be designed by the Architect-Engineer to suit the pavement plan and geometry. The Architect-Engineer shall submit a complete detail drawing of joint plans and details for approval. Joint design shall conform to TM 5-822-5, paragraph 12-7 and chapter 15 and 16. Full depth expansion joints shall be installed between slabs on grade and vertical surfaces of structures. Full depth expansion joint shall be used between driveway slabs and buildings, driveway slabs and sidewalks, driveway slabs and curbs and gutters, etc. Fire hydrants, below grade valve boxes, and other vertical construction abutting sidewalks and slabs on grade shall be isolated from the sidewalk and slab on grade with a full depth expansion joint. Joint sealants shall conform to TM 5-822-5 paragraph 15-5.

1.7.3 Frost Design Requirements: Ft Riley is in a frost design area. TM 5-822-5 Chapter 18, paragraph 18-8 for pavements with a design index less than 4, use of State DOT specification materials may be used, subject to demonstrated satisfactory performance of State materials in the area. Since this project involves pavements with a design index = 3, use of Kansas State DOT specification materials may be permitted.

1.7.4 Asphalt Concrete (AC) Surfaced Streets:

Designed using PCASE 2.06, Design Index = 3, Class E, (soils classification = CH) subgrade FASSI = 3.5, clay subgrades under street pavements shall be lime-modified to reduce plasticity and swelling, and to provide a stable work platform for subsequent construction.

Minimum asphalt concrete pavement section for residential streets, TM 5-822-5 Chapters 1 through 8. (PCASE 2.06)

2-inches AC surface course
2-inches AC intermediate course
4-inches graded crushed aggregate base course
9.5-inches aggregate subbase course (rounded up to the nearest 1/2-inch increment)
8-inches lime-modified subgrade

1.7.5 Rigid Pavement Design, Residential Driveways:

TM 5-822-5 paragraph 12-7, TM 5-822-5 Table 18-2 subgrade frost group = F3 (soils classification = CH), TM 5-822-5 Figure 18-5 Frost Area Index of Reaction of F3 subgrade soils with 6 inches of graded crushed aggregate base course is approximately 35 psi/inch.

Minimum rigid pavement section for residential driveways, TM 5-822-5 paragraph 12-7:

6-inches pcc (with at least 0.05 percent crack control reinforcing steel)
6-inches graded crushed aggregate base course

1.7.6 Portland cement concrete sidewalks:

Portland cement concrete sidewalks shall conform to TM 5-822-5 paragraph 12-6. The minimum required thickness for PCC sidewalks is 4 inches, except at residential driveways the sidewalk shall conform to the requirements for driveways. Graded crushed aggregate base course is required in accordance with paragraph 12-6. Minimum design thickness for base courses is 4 inches in accordance with TM 5-822-5 paragraph 10-1. The base course thickness at residential driveways shall conform to the requirements for driveways. Joints in sidewalks shall conform to the requirements specified in TM 5-822-5 paragraph 12-6. Joints in curb and gutters shall be aligned and match the joints in the adjacent Portland cement concrete pavements and sidewalks.

Sidewalk Section: (TM 5-822-5 paragraph 12-6)

4-inches pcc, (6-inches pcc at residential driveways)
4-inches graded crushed aggregate base course, (6-inches pcc at residential driveways)

1.7.7 Portland cement concrete curb and gutters:

Concrete curb and gutters shall conform to TM 5-822-5 paragraphs 12-8, 8-8, and 8-11. Concrete curb and gutters shall be constructed on at least 4 inches of graded aggregate base or subbase. Joints in curb and gutters shall be aligned and match the joints in the adjacent Portland cement concrete pavements and sidewalks.

Minimum Required Curb & Gutter Section: (TM 5-822-5 paragraph 12-8, 8-8, and 8-11)

Portland cement concrete Curb & Gutters
4-inches graded crushed aggregate base course
8-inches lime-modified subgrade

2. MATERIALS DESIGN RECOMMENDATIONS.

2.1 Aggregate Materials.

Aggregate materials shall be produced and placed in accordance with the listed guide specifications. The aggregate base course and subbase course are required to conform to the requirements of TM 5-822-5. Aggregate base course shall conform to the requirements for graded-crushed aggregate base course (GCA) in UFGS O2722a Gradation number 2, including the frost design requirements. Aggregate subbase course shall conform to UFGS O2721a Gradation number 1, including the frost design requirements. The Kansas State Department of Transportation (KDOT) has evaluated numerous quarries in the area around Ft Riley. Aggregates of suitable quality, and sufficient quantity should be readily available from commercial sources in the area

2.2 Portland Cement Concrete (PCC).

All Portland cement concrete shall be air-entrained. Concrete shall have a maximum limit on water-cement ratio of 0.45 by mass. Concrete coarse aggregate shall have a ¾ inch maximum size. Concrete for structures shall conform to guide specification UFGS 03300, using the minimum compressive strength requirement of at least 4,000 psi at 28 days age. Concrete for sidewalks should conform to UFGS 02770a, and the requirements for concrete in UFGS 03300, with a minimum compressive strength requirement of at least 4,000 psi at 28 days age. Concrete and aggregates shall be tested by a laboratory conforming to ASTM C 1077. Concrete aggregates shall be hard, sound, free of deleterious coatings. The maximum percent loss on abrasion shall be less than 40 percent as determined by ASTM C 131. Concrete aggregates shall be tested in accordance with ASTM C 1260 and shall have an expansion of less than 0.08 percent at 16 days. Aggregates shall be obtained from a source with a satisfactory service record, or shall be tested in accordance with ASTM C 666 (Procedure A) and shall have a Durability Factor greater than 50. Aggregates tested in accordance with Kansas State DOT requirements for freeze-thaw durability within the last three years, and have been proven to meet KDOT pavement Class 2 requirements will be allowed in lieu of ASTM C 666 testing.

2.3 Formwork.

Formwork for concrete shall conform to UFGS 03100a. Class A formwork requirements shall be used for surfaces of structures which are required to remain permanently exposed to view where appearance is an important consideration. Class C formwork shall be used for exposed surfaces of building not subject to public view, foundations, and other surfaces where a high quality appearance is not required. Class D formwork requirements shall be used for surfaces, which are required to be permanently covered by backfill.

2.4 Joint Sealants.

Joint sealants for buildings and sidewalks shall conform to UFGS 03150a and UFGS 02770. Elastomeric joint sealants should conform to ASTM C 920. Joint sealants for

sidewalks, driveways, and pavements should conform to either ASTM C 920 or ASTM D 3405.

3. DESIGN CRITERIA.

Specific criteria for pavement and materials engineering and design shall be the latest editions of the following publications:

DG 1110-3-204	Design Guide for Army and Air Force Airfields, Pavements, Railroads, Storm Drainage, and Earthwork, 30 April 91
TM 5-822-2	General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas, 14 Jul 87
TM 5-822-5	Pavement Design for Roads, Streets, Walks, and Open Storage Areas, Jun 92
TM 5-822-14	Soil Stabilization for Pavements, 25 Oct 94
TM 5-830-3	Dust Control for Roads, Airfields and Adjacent Areas, 30 Sep 87

4. SPECIFICATIONS.

The following is a list of pavement and materials engineering design specifications for use in this project. Project specifications shall be prepared based on the latest edition of the Corps of Engineers Unified Facilities Guide Specifications (UFGS).

UFGS O2712a	Lime-Stabilized Base Course, Subbase, or Subgrade, dated 10/10/02
UFGS O2721a	Subbase Courses, dated 10/10/02
UFGS O2722a	Aggregate and/or Graded-Crushed Aggregate Base Course, dated 10/10/02
UFGS O2770a	Concrete Sidewalk and Curbs and Gutters, dated 10/10/02
UFGS 03100a	Structural Concrete Formwork, dated 11/12/02
UFGS 03150a	Expansion Joints, Contraction Joints, and Water stops, dated 10/10/02
UFGS 03200a	Concrete Reinforcement, dated 12/11/02
UFGS 03300	Cast-In-Place Structural Concrete, dated 11/23/01

ATTACHMENT 8

IN-HOUSE SHELTER (FEMA DRAWINGS)

IN–RESIDENCE SHELTER

INDEX OF DRAWINGS	DRAWING NO.	SHEET NO.	REVISION NO.
GENERAL NOTES	2	SHEET 2 OF 16	1
IN–GROUND SHELTERS–SECTIONS AND DETAILS	IG–1	SHEET 3 OF 16	
BASEMENT LEAN–TO	B–1	SHEET 4 OF 16	1
BASEMENT SHELTER–CORNER LOCATION	B–2	SHEET 5 OF 16	1
CMU/CONCRETE ALTERNATIVE PLANS	AG–1	SHEET 6 OF 16	1
CMU/CONCRETE WALL SECTIONS	AG–2	SHEET 7 OF 16	
CMU/CONCRETE SECTIONS CEILING ALTERNATIVES	AG–3	SHEET 8 OF 16	1
WOOD–FRAME SHELTER PLAN–PLYWOOD SHEATHING W/CMU IN–FILL	AG–4	SHEET 9 OF 16	1
WOOD–FRAME SHELTER PLAN–PLYWOOD AND STEEL WALL SHEATHING	AG–5	SHEET 10 OF 16	1
WOOD–FRAME SHELTER–FOUNDATION SECTIONS	AG–6	SHEET 11 OF 16	1
INSULATING CONCRETE FORM–PLANS	AG–7	SHEET 12 OF 16	NEW
INSULATING CONCRETE FORM–SECTIONS	AG–8	SHEET 13 OF 16	NEW
MISC. DETAILS	14	SHEET 14 OF 16	1
MATERIALS LISTS	15&16	SHEET 15&16 OF 16	1

LIMIT OF LIABILITY:

The designs in this booklet are based on extensive research of the causes and effects of windstorm damage to buildings. Shelters designed and built to these designs should provide a high degree of occupant protection during severe windstorms (hurricanes and tornadoes.) Any substitution of either materials or design concepts may decrease the level of occupant protection and/or increase the possibility of personal injury during a severe wind event.

Because it is not possible to predict or test all conditions that may occur during severe windstorms, or control the quality of construction, among other things, the designer does not warrant the design.

The designer neither manufactures nor sells shelters built from this design. The designers have not made and do not make any representation, warranty, or covenant, express or implied, with respect to the design, condition, quality, durability, operation, fitness for use, or suitability of the shelter in any respect whatsoever. Designers shall not be obligated or liable for actual, incidental, consequential, or other damages of or to users of shelters or any other person or entity arising out of or in connection with the use, condition, and/or performance of shelters built from this design or from the maintenance thereof.

INDEX SHEET

DRAWING NO.: 1	SHEET 1 OF 16
DATE: OCTOBER 1998	
REVISED: AUGUST 1999	REV. NO. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE WASHINGTON, DC

IN–RESIDENCE SHELTER

GENERAL NOTES

1. CONCRETE:
   A. ALL CONCRETE SHALL HAVE STONE AGGREGATE (NORMAL WEIGHT). 28-DAY COMPRESSIVE STRENGTH (f'c) SHALL BE 3000 PSI MINIMUM FOR CAST-IN-PLACE CONCRETE.
   B. REINFORCING BARS SHALL BE MILD STEEL WITH A MINIMUM YIELD STRENGTH OF 60 KSI.
   C. REINFORCING BAR PROTECTION:
      1. CONCRETE PLACED AGAINST EARTH . . . . . 3"
      2. CONCRETE PLACED IN FORMS . . . . . 1-1/2"
   D. REINFORCING BAR PLACMENT TOLERANCE IS 1/2" IN ANY DIRECTION.
   E. SPLICING OF REINFORCEMENT IS NOT PERMITTED EXCEPT AS SHOWN ON THE DRAWINGS. BARS SHALL BE LAP SPLICED AT ALL CORNERS. SPLICE LENGTHS AS FOLLOWS:
      1. #4 BARS . . . . . 24"
      2. #5 BARS . . . . . 30"
   F. WELDED WIRE REINFORCEMENT: LAP ONE AND ONE-HALF MESH SPACES AT SPLICES AND WIRE IN CONTACT.
   G. FIELD WELDING OF REINFORCEMENT IS NOT PERMITTED.
   H. ALL REINFORCING BAR BENDS SHALL BE MADE MECHANICALLY. HEAT-BENDING IS NOT PERMITTED.

2. MASONRY:
   A. MASONRY UNITS SHALL DEVELOP ULTIMATE COMPRESSIVE STRENGTH (f'm) OF 1500 PSI AT 28-DAYS.
   B. MORTAR TO BE TYPE M OR S PER ASTM C270-97
   C. REINFORCING BARS SHALL BE MILD STEEL WITH A MINIMUM YIELD STRENGTH OF 60 KSI.
   D. REINFORCING BAR PLACEMENT TOLERANCE IS 1/2" IN ANY DIRECTION.
   E. SPLICING OF REINFORCING BARS IS NOT PERMITTED EXCEPT AS SHOWN ON THE DRAWINGS. SPLICE LENGTHS AS FOLLOWS:
      1. #4 BARS . . . . . 24"
      2. #5 BARS . . . . . 30"
   F. HORIZONTAL TRELLIS (WIRE) REINFORCEMENT INSTALLED AT EVERY OTHER COURSE: LAP ONE AND ONE-HALF MESH SPACES AT SPLICES AND AT CORNERS.

3. WOOD:
   A. FRAMING LUMBER TO HAVE MODULUS OF ELASTICITY = 1,200,000 PSI MIN. AND F_b = 850 PSI MIN. FOR NORMAL DURATION LOADING. EXAMPLES OF ACCEPTABLE GRADE AND SPECIES OF FRAMING LUMBER INCLUDE #2 AND BETTER SOUTHERN PINE, DOUGLAS FIR, HEM-FIR, AND SPRUCE - PINE - FIR.
   B. PLYWOOD TO BE RATED SHEATHING SPAN RATING 24/16, MIN. 23/32 THICKNESS.
   C. ALL WOOD SILL PLATES TO BE .40 CCA P.T. LUMBER.
   D. NAILS TO BE COMMON WIRE NAILS.

4. COLD-FORMED (LIGHT-GAUGE) STEEL SHEATHING:
   A. YIELD STRENGTH FOR METAL IS 36 KSI MINIMUM.
   B. ALL METAL SHALL BE G60 GALVANIZED BY THE MANUFACTURER.

5. THE CONTRACTOR SHALL VERIFY AND COORDINATE ALL DIMENSIONS AND QUANTITIES PRIOR TO STARTING CONSTRUCTION.

6. THE CONSTRUCTION DRAWINGS SHALL NOT BE SCALED. DIMENSIONS APPLY.

7. IF THERE IS A CONFLICT AMONG THE GENERAL NOTES, SPECIFICATIONS, AND PLANS, THE ORDER OF PRECEDENCE IS NOTES, THEN SPECIFICATIONS, THEN PLANS.

8. THE CONSTRUCTION DRAWINGS REPRESENT THE FINISHED STRUCTURE. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ALL MEASURES NECESSARY TO ENSURE THAT THE STRUCTURE IS PROTECTED DURING CONSTRUCTION. THESE MEASURES INCLUDE (BUT ARE NOT LIMITED TO) SHORING AND BRACING FOR CONSTRUCTION LOADS AND WORKER SAFETY PURPOSES.

10. FOLLOW MANUFACTURER'S RECOMMENDATION'S FOR NAILING REQUIREMENTS OF UPLIFT/SHEAR RESISTANCE CONNECTORS.

11. ALL PLYWOOD JOINTS SHOULD BE SOLIDLY BLOCKED W/2X4'S

12. WALL & CEILING PENETRATIONS THROUGH THE MISSILE PROTECTION SHEATHING ARE TO BE MINIMIZED.

13. CONDUIT & OTHER VERTICAL RUNS IN WALLS SHOULD BE COLLECTED AND RUN IN THE CHASE.

14. DO NOT DRILL THROUGH WALL STUDS OR TOP AND BOTTOM PLATES FOR PLUMBING SUPPLY LINES OR VENTS. INSTALL ALL PLUMBING SUPPLY LINES AND VENTS IN PLUMBING CHASE.

15. VENTILATION IS TO BE PROVIDED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. VENTILATION MAY BE EITHER NATURAL OR MECHANICAL SUCH THAT MINIMUM VENTILATION IS 0.5 AIR CHANGES / HOUR.

16. THE DESIGNS SHOWN ARE COMPLIANT WITH THE 1997 NEHRP RECOMMENDED PROVISIONS.

17. TO ENSURE THE SHELTER PROVIDES THE DESIRED LEVEL OF PROTECTION, A PROFESSIONAL ENGINEER OR ARCHITECT MUST BE CONSULTED FOR ANY DESIGN CONDITIONS FOUND TO BE DIFFERENT FROM THOSE REPRESENTED BY THESE PLANS.

18. SEE SHEETS 15 AND 16 OF 16 FOR THE MATERIAL LIST FOR EACH SHELTER DESIGN.

19. TO OBTAIN AN EQUIVALENT LEVEL OF PROTECTION, SHELTER DESIGNS NOT MEETING THE SPECIFIC REQUIREMENTS OF THE DESIGNS IN THESE PLANS SHOULD BE DESIGNED TO MEET THE "NATIONAL PERFORMANCE CRITERIA FOR TORNADO SHELTERS" AVAILABLE AT THE FEMA WEBSITE AT http://www.fema.gov/library/npc_ts.htm. THE "NATIONAL PERFORMANCE CRITERIA FOR TORNADO SHELTERS" ALSO PROVIDES ADDITIONAL GUIDANCE ON DESIGNING LARGER PUBLIC SHELTERS.

20. THE DOORS SHOWN IN THESE PLANS WERE LABORATORY-TESTED FOR DEBRIS IMPACT FOR DOOR WIDTHS FROM 2'-6" TO 3'-0". FEMA STRONGLY ENCOURAGES INDIVIDUALS TO USE A MINIMUM DOOR WIDTH OF 2'-8" FOR WHEELCHAIR ACCESS.

DESIGN BASIS

1. LIVE LOADS USED IN DESIGN:
   A. WIND PRESSURES DEVELOPED FROM 250 - MPH 3-SEC. PEAK GUST IN ACCORDANCE WITH ASCE 7-95.
   B. WINDBORNE DEBRIS (MISSILE) IMPACT LOADS CREATED BY A 15-LB. 2X4 TRAVELING HORIZONTALLY AT 100 MPH, TRAVELING VERTICALLY AT 67 MPH, AND IMPACTING NORMAL TO WALL SURFACE.
2. SOIL BEARING CAPACITY OF 2000 PSF MIN. HAS BEEN ASSUMED.

ABBREVIATIONS

A.B.	– ANCHOR BOLT
CMU	– CONCRETE MASONRY UNIT
CONC.	– CONCRETE
DBL.	– DOUBLE
DIA.	– DIAMETER
E.W.	– EACH WAY
GA.	– GAUGE
GYP.	– GYPSUM
ICF	– INSULATING CONCRETE FORMS
MAX	– MAXIMUM
MH.	– MANHOLE
MIN.	– MINIMUM
N.T.S.	– NOT TO SCALE
O.C.	– ON CENTER
P.T.	– PRESSURE TREATED
REQD.	– REQUIRED
S.F.	– SQUARE FOOT
SYP	– SOUTHERN YELLOW PINE
TYP.	– TYPICAL
WWF	– WELDED WIRE FABRIC
W/	– WITH

LIMIT OF LIABILITY:

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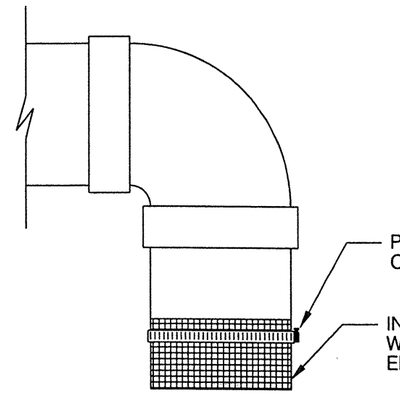
Because it is not possible to predict or test all conditions that may occur during severe windstorms, or control the quality of construction, among other things, the designer does not warrant the design.

The designer neither manufactures nor sells shelters built from this design. The designers have not made and do not make any representation, warranty, or covenant, express or implied, with respect to the design, condition, quality, durability, operation, fitness for use, or suitability of the shelter in any respect whatsoever. Designers shall not be obligated or liable for actual, incidental, consequential, or other damages of or to users of shelters or any other person or entity arising out of or in connection with the use, condition, and/or performance of shelters built from this design or from the maintenance thereof.

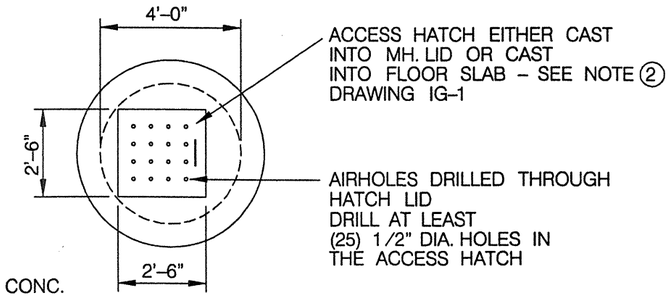
GENERAL NOTES

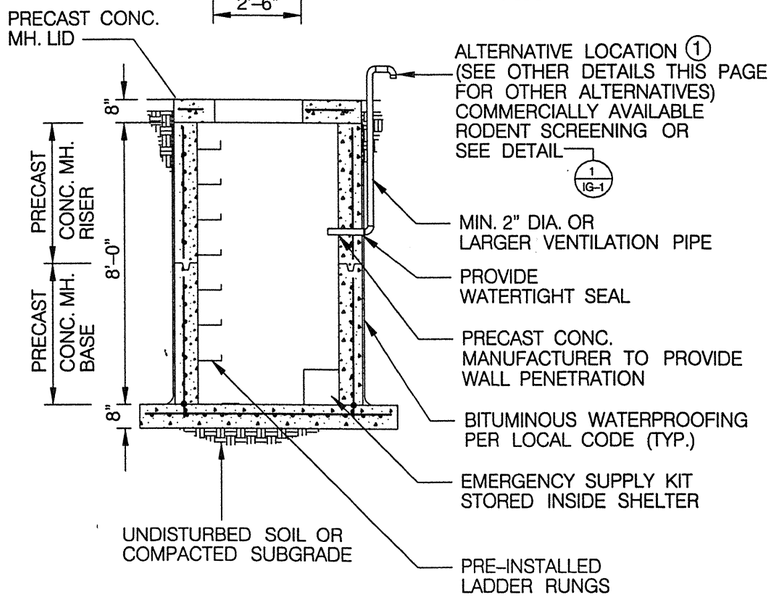
DRAWING NO.: 2	SHEET 2 OF 16
DATE: OCTOBER 1998	
REVISED: AUGUST 1999	REV. NO: 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE WASHINGTON, DC

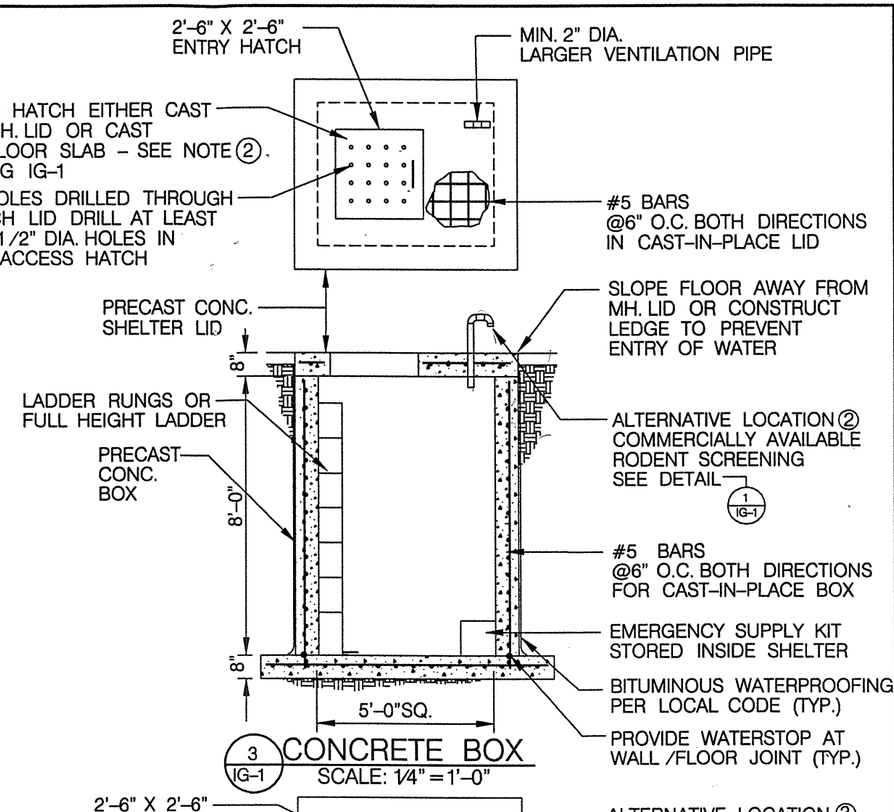


1 IG-1 RODENT SCREENING
SCALE: 1/4" = 1'-0"

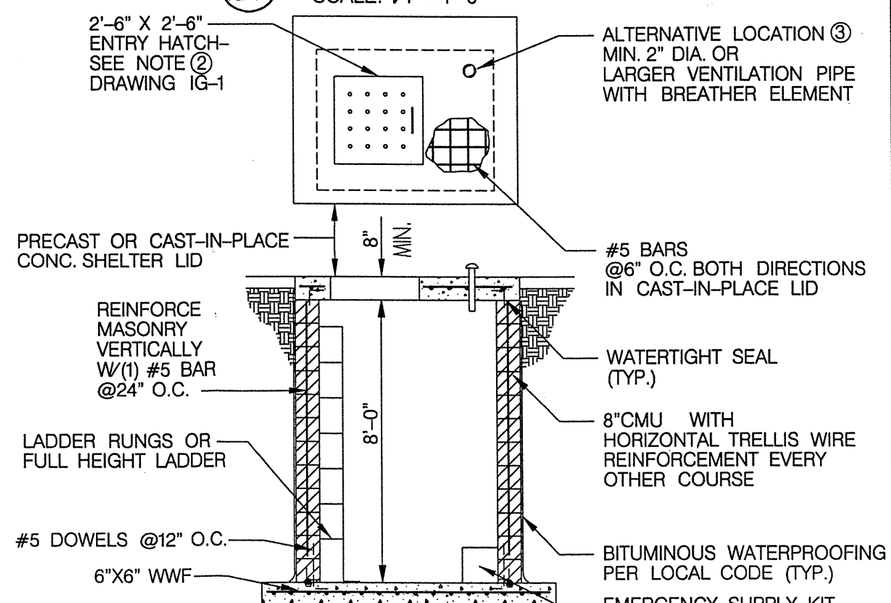




2 IG-1 PRECAST CONCRETE MANHOLE
SCALE: 1/4" = 1'-0"



3 IG-1 CONCRETE BOX
SCALE: 1/4" = 1'-0"



4 IG-1 8" MASONRY BOX SCALE: 1/4" = 1'-0"

NOTES:

1. SPACE REQUIRED INSIDE IN-GROUND SHELTER IS MIN. 5 S.F./ PERSON,
2. MODEL NOS. & MANUFACTURERS FOR HATCH COVERS INCLUDE:

MANUFACTURER	MODEL NO.
ACUDOR	FA150
BILCO	J4AL
BABCOCK-DAVIS	FB4700

NOTES:
BECAUSE NOT ALL CONTRACTORS ARE FAMILIAR WITH THE TYPE OF HATCH COVERS SHOWN IN THESE DRAWINGS, THE NAMES OF SOME COMPANIES THAT MANUFACTURE HATCH COVERS HAVE BEEN INCLUDED IN THIS TABLE. THE LIST OF COMPANIES IS NOT, HOWEVER, EXHAUSTIVE. ADDITIONALLY, THIS LIST IS NOT INTENDED TO EXPRESS A PREFERENCE FOR THOSE MANUFACTURERS AND/OR THEIR PRODUCTS BY THE UNITED STATES GOVERNMENT NOR IS IT AN ENDORSEMENT OF THOSE MANUFACTURERS AND/OR THEIR PRODUCTS.

CAUTION

DO NOT INSTALL IN-GROUND SHELTER IN AREAS OF EXPANSIVE CLAY OR HIGH WATER TABLE OR IN AREAS THAT ARE FLOODPRONE.

IN-GROUND SHELTERS– SECTIONS AND DETAILS

DRAWING NO.: IG-1 | SHEET 3 OF 16

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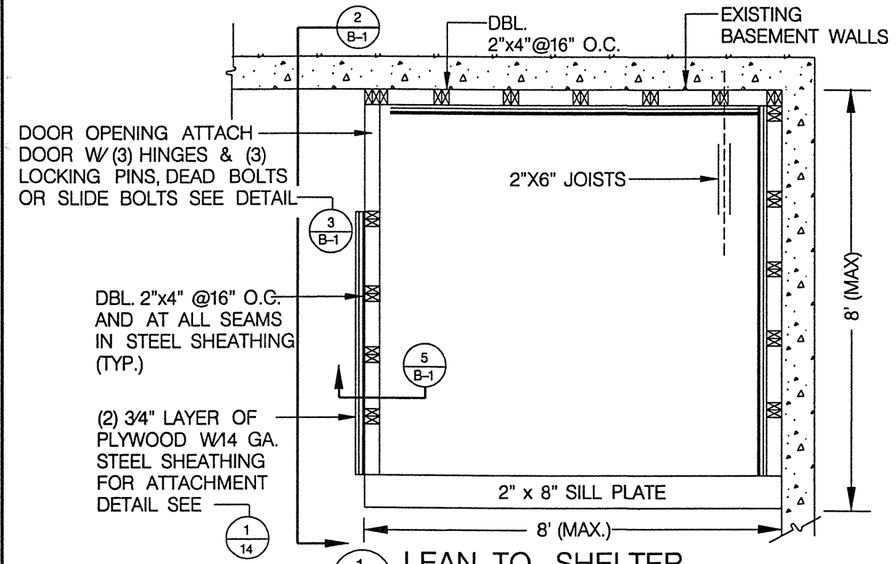
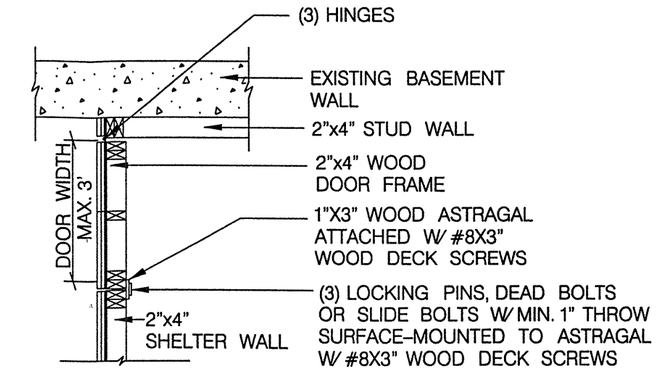


1 B–1 **LEAN–TO SHELTER PARTIAL BASEMENT PLAN**

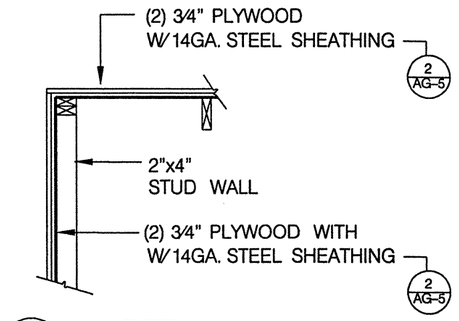
SCALE: 3/8" = 1'–0"



3 B–1 **DOOR FRAMING DETAIL**

TOP VIEW

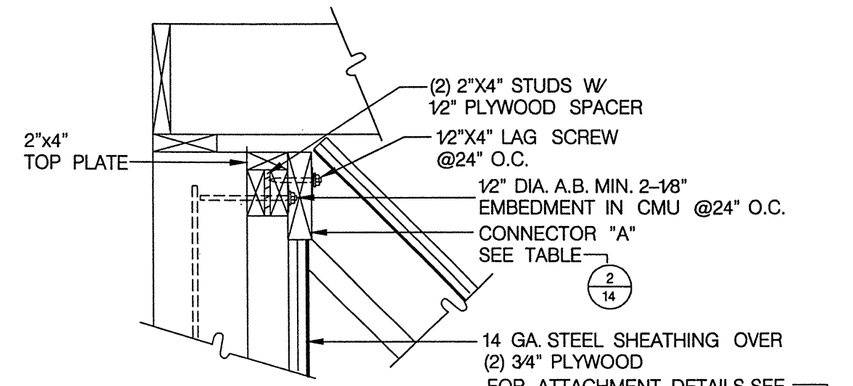
SCALE: 1/2" = 1'–0"



5 B–1 **DETAIL**

SIDE VIEW

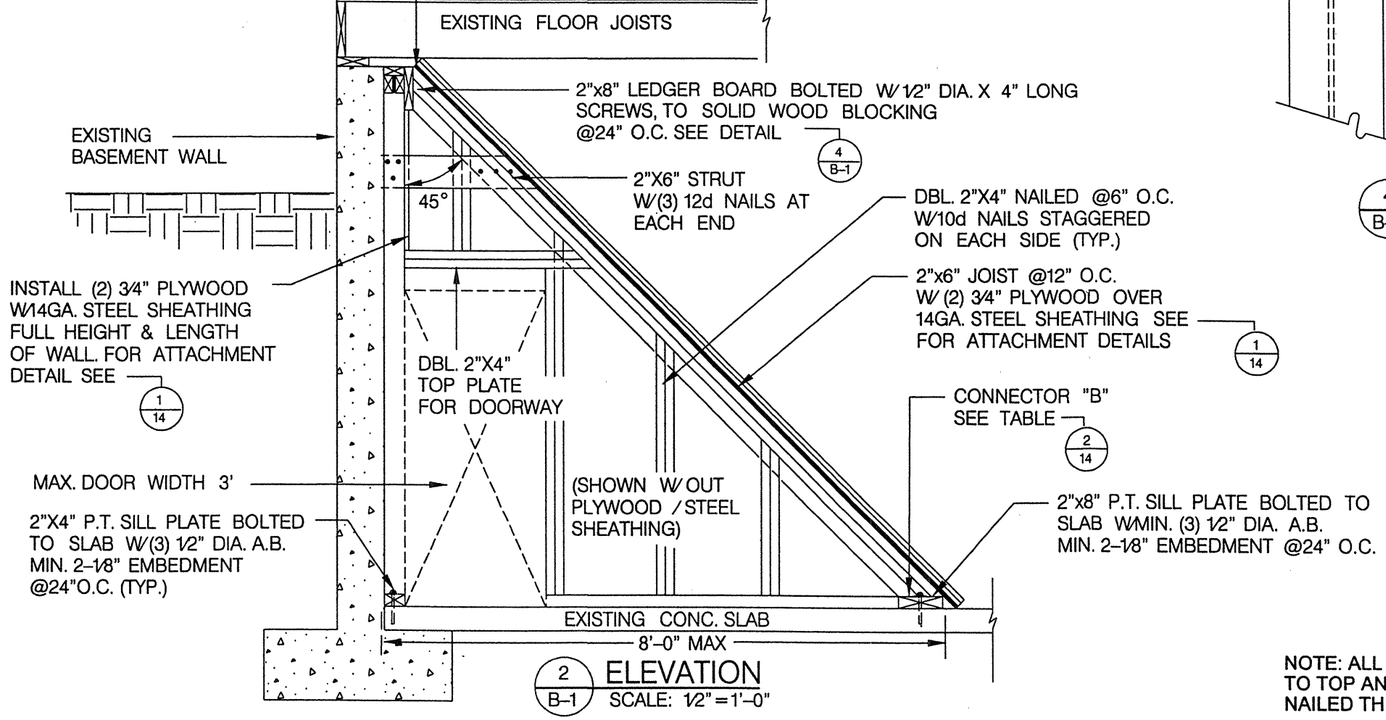
SCALE: 1/2" = 1'–0"



4 B–1 **DETAIL**

SIDE VIEW

SCALE: 1" = 1'–0"



2 B–1 **ELEVATION**

SCALE: 1/2" = 1'–0"

NOTE: ALL WALL STUDS TO BE ATTACHED TO TOP AND BOTTOM PLATES W/ (2) 16d NAILS NAILED THROUGH FROM OUTSIDE

BASEMENT LEAN–TO

DRAWING NO.: B–1	SHEET 4 OF 16
DATE: OCTOBER 1998	
REVISED: AUGUST 1999	REV. NO. 1

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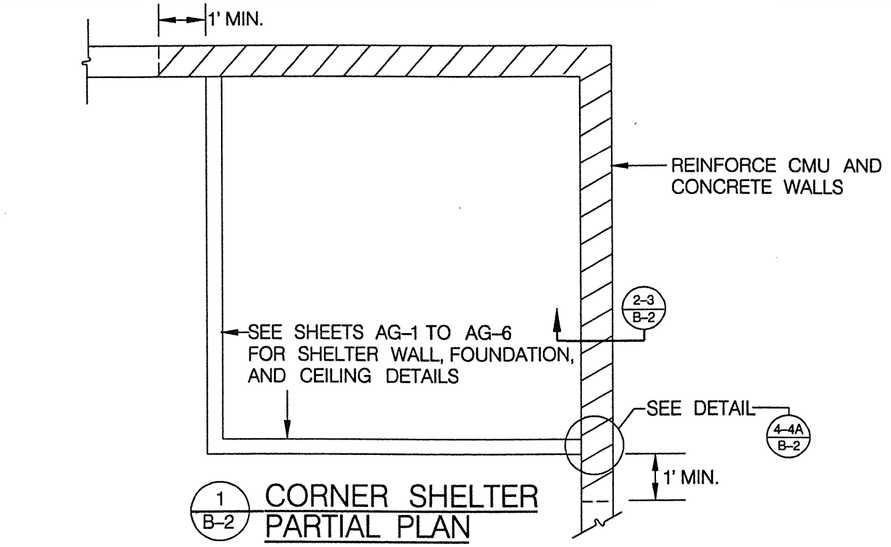
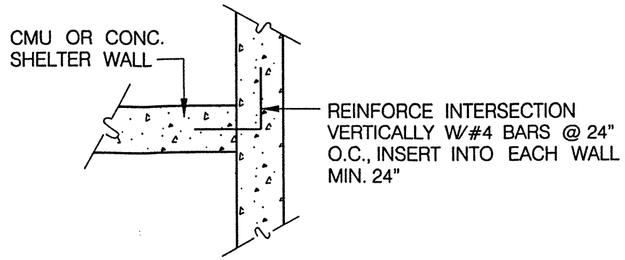
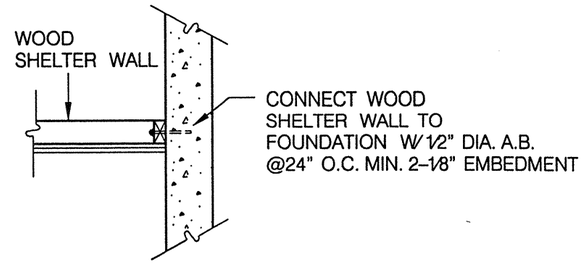


1 / B-2 CORNER SHELTER PARTIAL PLAN



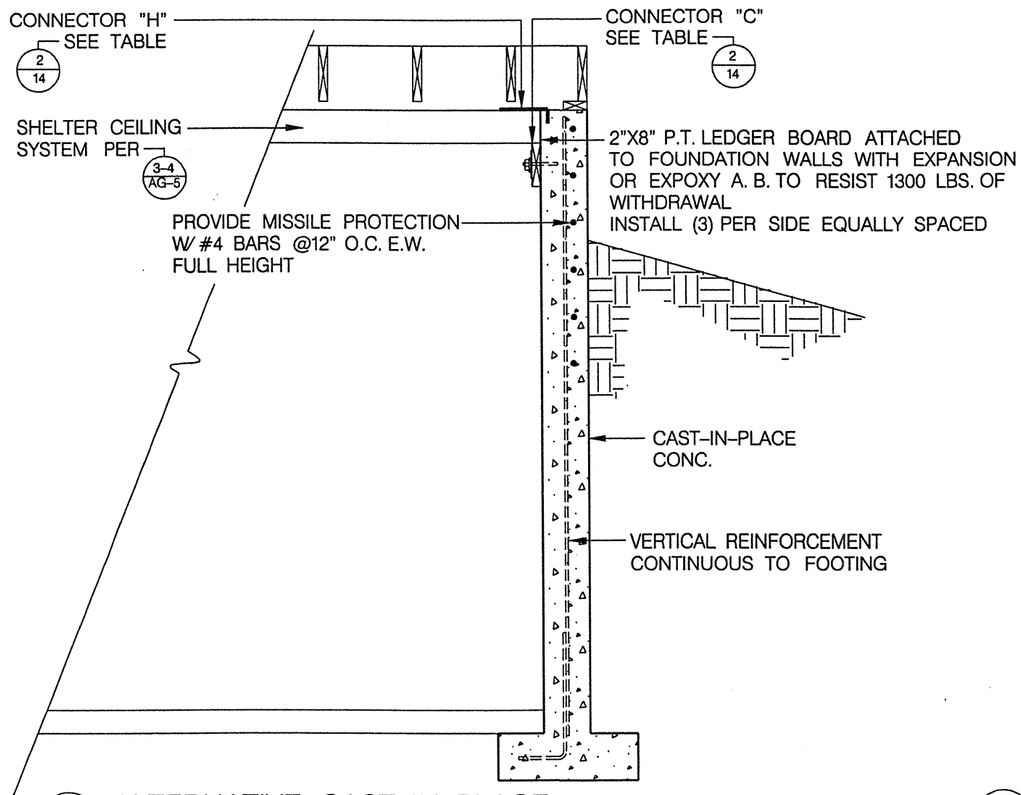
4 / B-2 ALTERNATIVE: CMU SHELTER TO FOUNDATION DETAIL

TOP VIEW
SCALE: 1/2" = 1'-0"



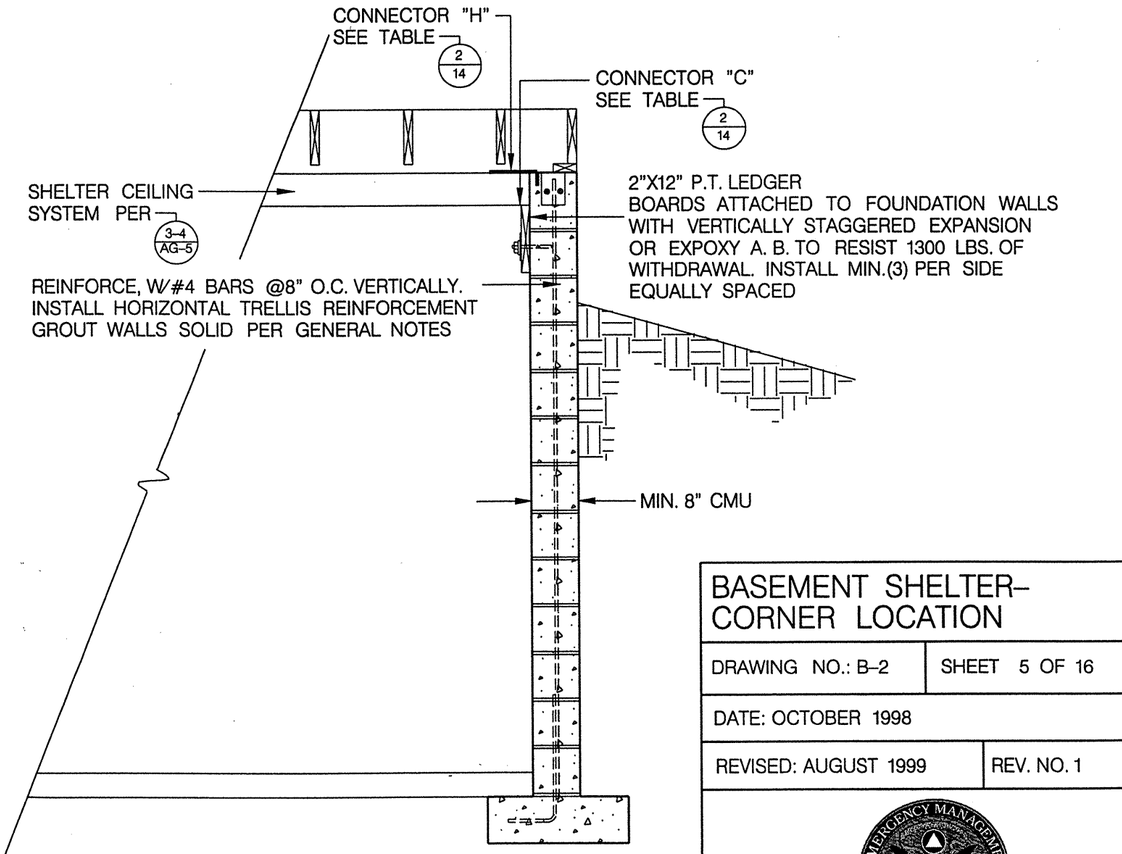
4A / B-2 ALTERNATIVE: WOOD SHELTER TO FOUNDATION DETAIL

TOP VIEW
SCALE: 1/2" = 1'-0"



2 / B-2 ALTERNATIVE: CAST-IN-PLACE CONCRETE FOUNDATION ELEVATION

SCALE: 1/2" = 1'-0"



3 / B-2 ALTERNATIVE: CMU FOUNDATION ELEVATION

SCALE: 1/2" = 1'-0"

BASEMENT SHELTER– CORNER LOCATION

DRAWING NO.: B-2	SHEET 5 OF 16
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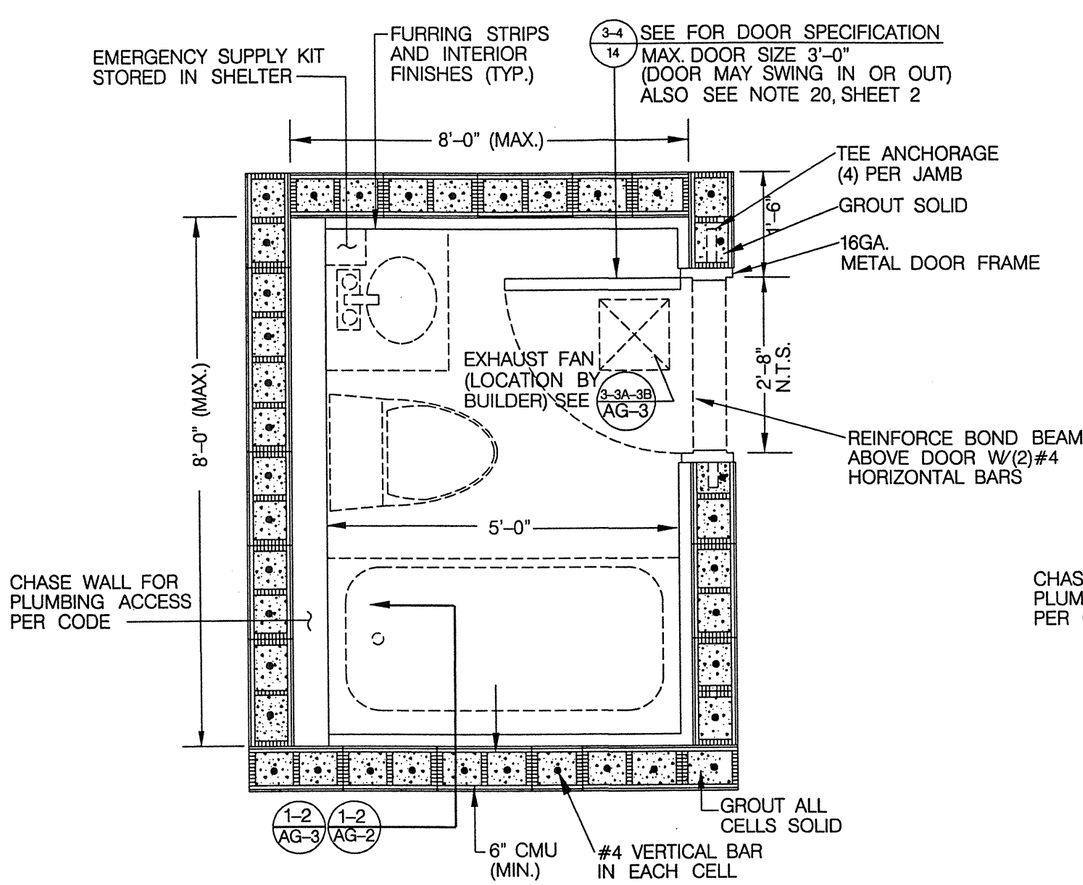
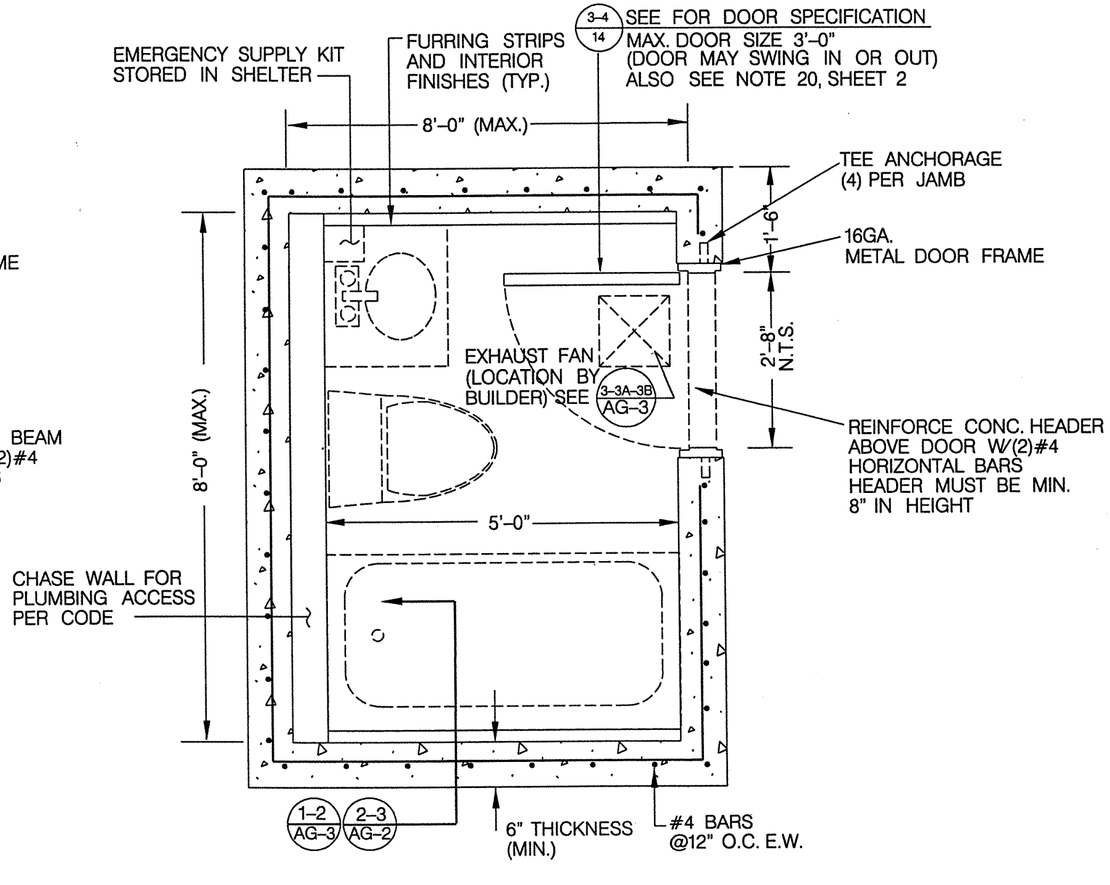


1 AG-1 TYPICAL PLAN VIEW (CMU)
(SHOWN AS BATH FOR ILLUSTRATION)
SCALE: 1/2" = 1'-0"



2 AG-1 TYPICAL PLAN VIEW (CONCRETE)
(SHOWN AS BATH FOR ILLUSTRATION)
SCALE: 1/2" = 1'-0"

NOTE: ICF MAY BE USED AS ALTERNATIVE TO CAST-IN-PLACE CONCRETE, SEE SHEETS 12 AND 13

CMU/CONCRETE ALTERNATIVE PLANS

DRAWING NO.: AG-1	SHEET 6 OF 16
DATE: OCTOBER 1998	
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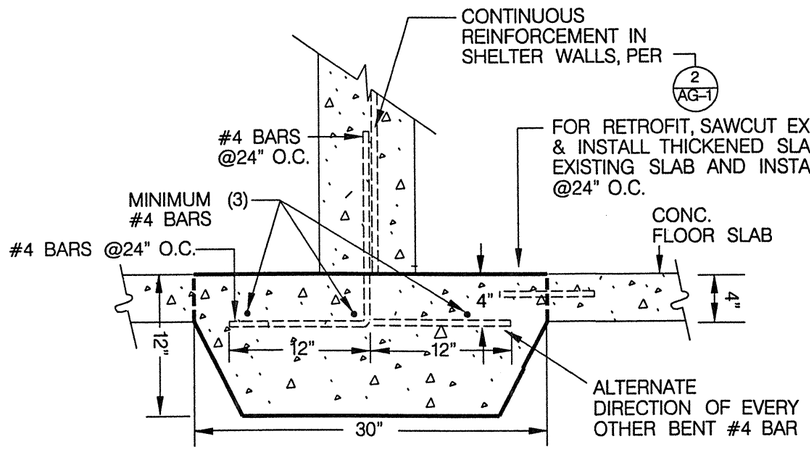
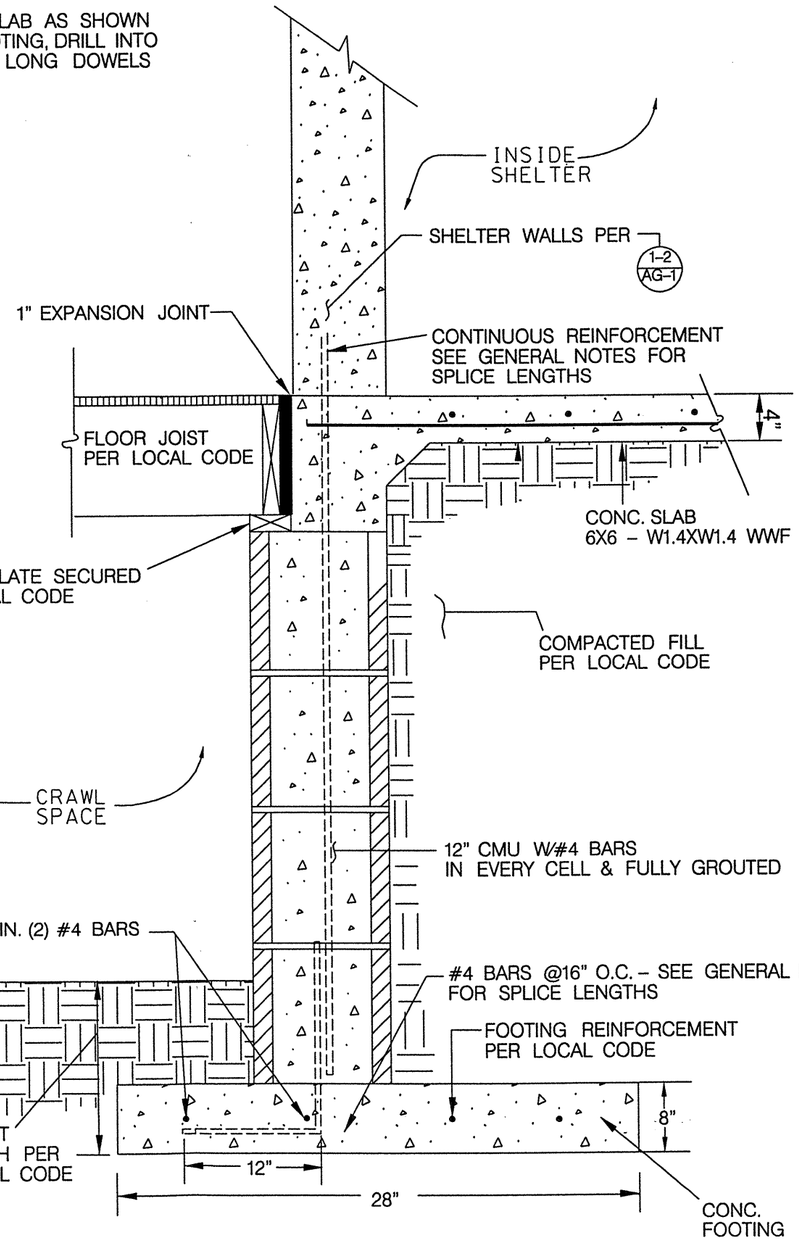


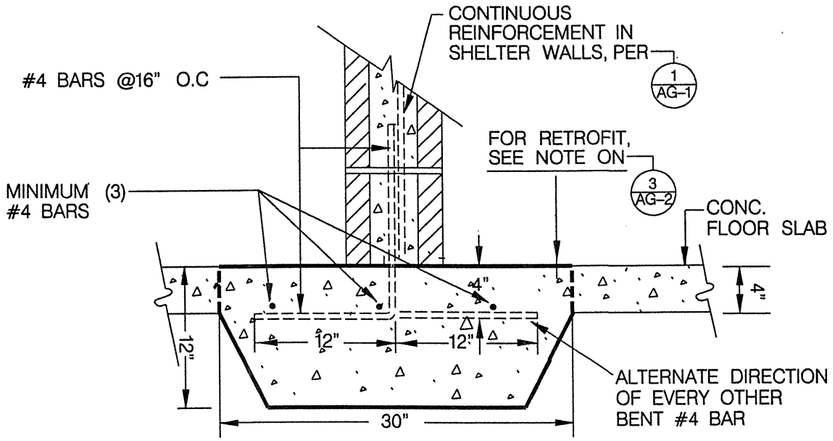
3/AG-2 TYPICAL ANCHOR DETAIL FOR CONCRETE WALL ON SLAB-ON-GRADE FOUNDATION

SCALE: 1" = 1'-0"



2/AG-2 TYPICAL ANCHOR DETAIL FOR CMU WALL CRAWL SPACE FOUNDATION

SCALE:1" = 1'-0"



1/AG-2 TYPICAL ANCHOR DETAIL FOR CMU WALL ON SLAB-ON-GRADE FOUNDATION

SCALE: 1" = 1'-0"

CMU/CONCRETE WALL SECTIONS

DRAWING NO.: AG-2 | SHEET 7 OF 16

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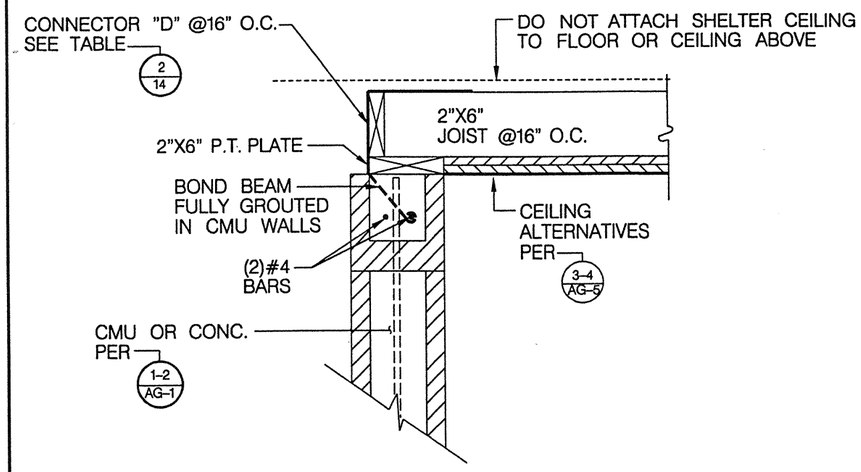
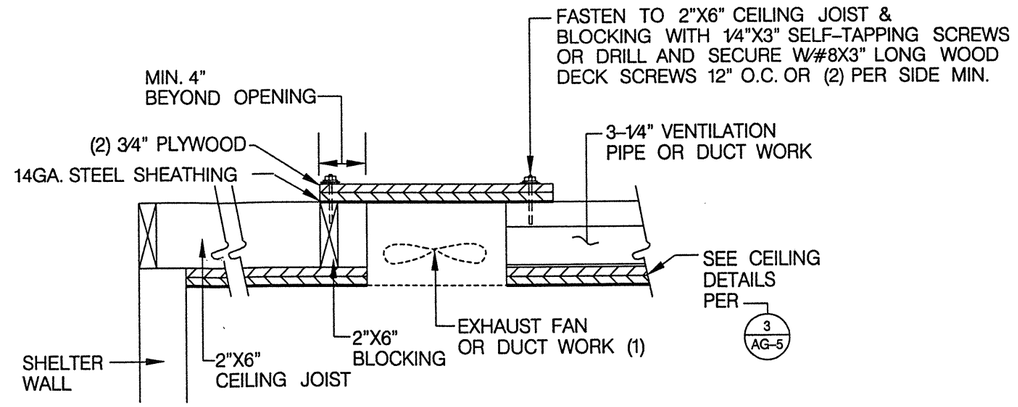
FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE WASHINGTON, DC



ALTERNATIVE 1 OF 2

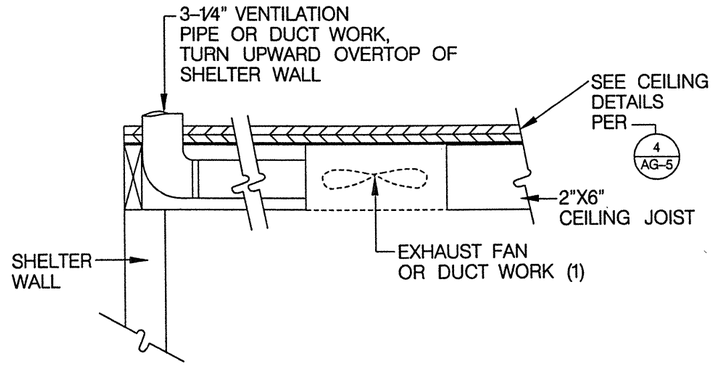
1/AG-3 TYPICAL WALL / CEILING CONNECTION WOOD FRAMING USING EMBEDDED ANCHOR STRAP

SCALE: 1" = 1'-0"



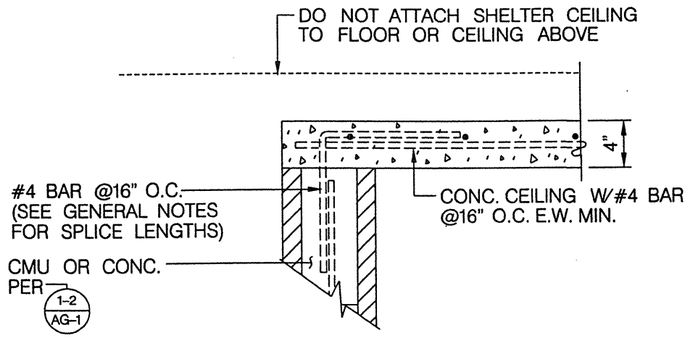
3/AG-3 CEILING EXHAUST FAN / HVAC DETAIL

SCALE: 1" = 1'-0"



3A/AG-3 CEILING EXHAUST FAN / HVAC DETAIL

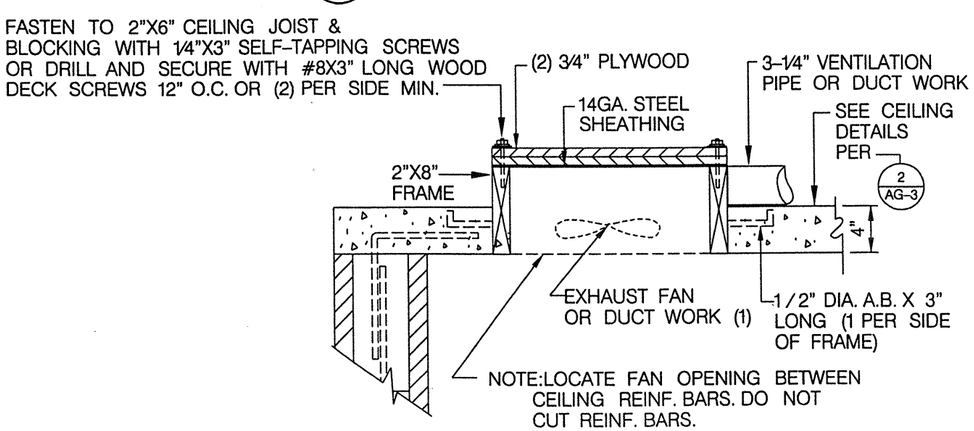
SCALE: 1" = 1'-0"



ALTERNATIVE 2 OF 2

2/AG-3 TYPICAL WALL / CEILING CONNECTION FOR CONCRETE CEILING

SCALE: 1" = 1'-0"



3B/AG-3 CEILING EXHAUST FAN / HVAC DETAIL

SCALE: 1" = 1'-0"

NOTE:
(1) INDICATES NORMAL EXHUAST VENTILATION OF BATHROOM OR HVAC DUCTWORK TO A ROOM. THE SHELTER DESIGN DOES NOT RELY ON THIS VENTILATION TO ENSURE OCCUPANT SAFETY.

CMU/CONCRETE SECTIONS CEILING ALTERNATIVES

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DATE: OCTOBER 1998	
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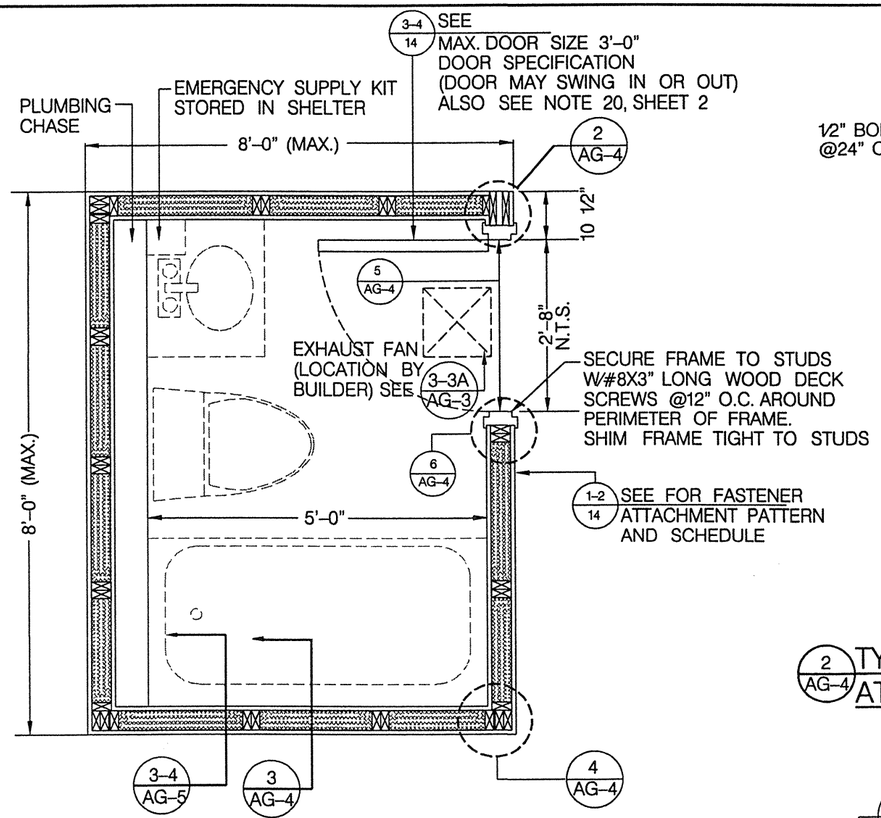
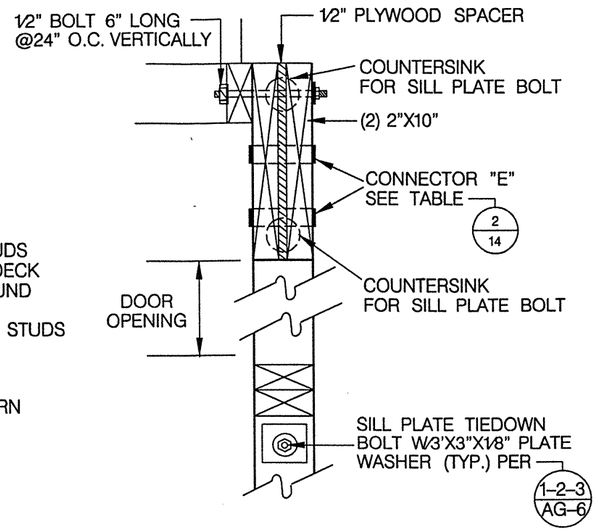
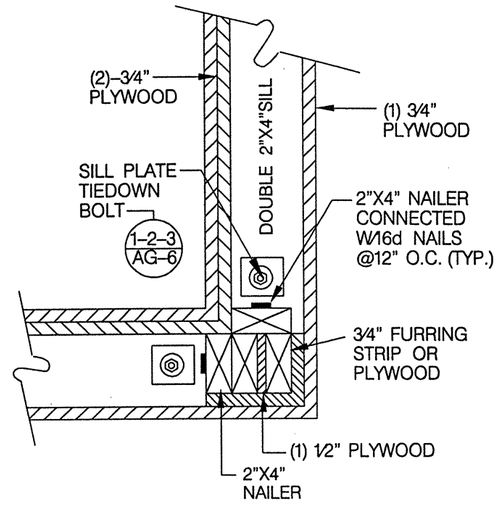


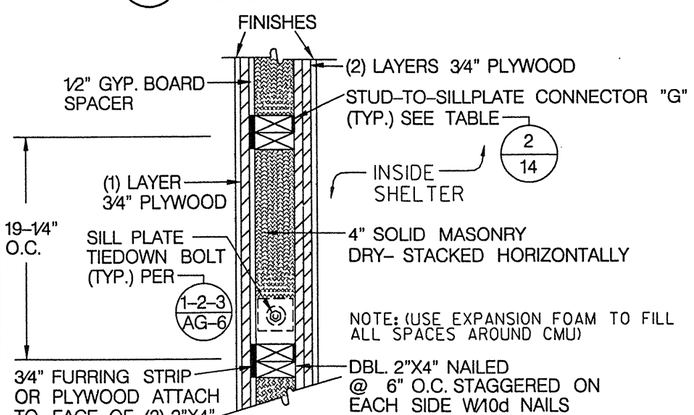
1 AG–4 TYPICAL PLAN
SCALE: 1/2" = 1'– 0"



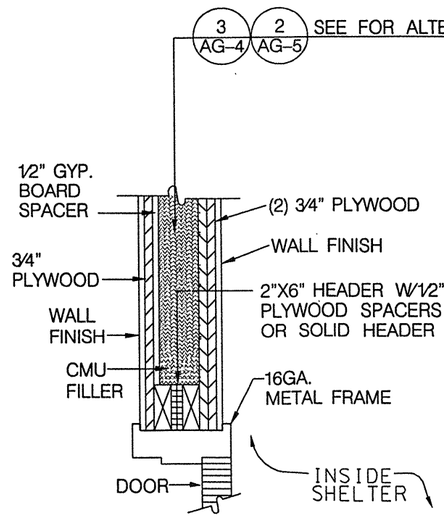
2 AG–4 TYPICAL HOLD DOWN ANCHOR DETAIL AT DOOR CORNER
TOP VIEW
SCALE: 1–1/2" = 1' –0"



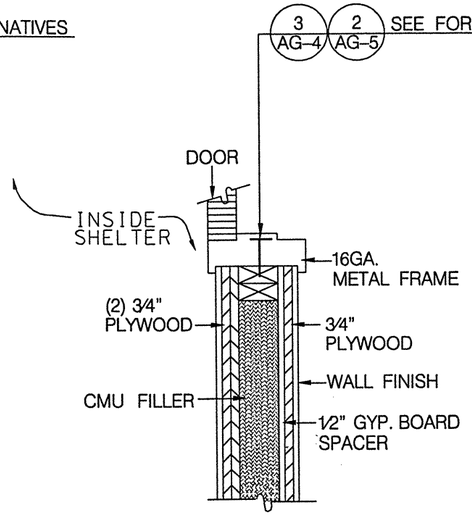
4 AG–4 TYPICAL WALL CORNER DETAIL
TOP VIEW
SCALE: 1–1/2 " = 1' –0"



3 AG–4 EXPANDED PLAN–MASONRY INFILL WALL ALTERNATIVE
TOP VIEW
SCALE:1" = 1' –0"



5 AG–4 DOOR HEAD SECTION
SCALE: 1" = 1'–0"



6 AG–4 DOOR JAMB
TOP VIEW
SCALE: 1" = 1'–0"

NOTE:
ALL WALL STUDS TO BE ATTACHED W/ (2) 16d NAILS TO SINGLE TOP AND BOTTOM PLATES, NAILED THROUGH FROM OUTSIDE, PRIOR TO ATTACHMENT OF SECOND TOP AND BOTTOM PLATES.

WOOD–FRAME SHELTER PLAN– PLYWOOD SHEATHING W/CMU INFILL

DRAWING NO.: AG–4	SHEET 9 OF 16
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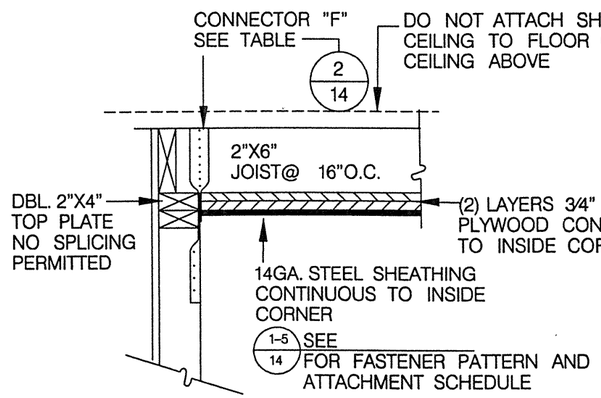
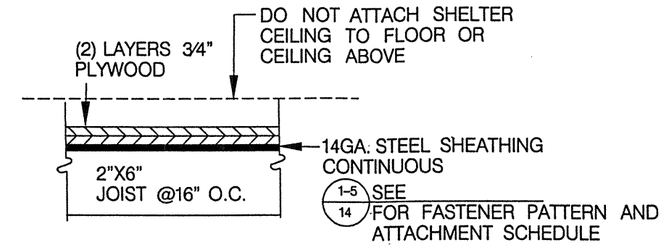


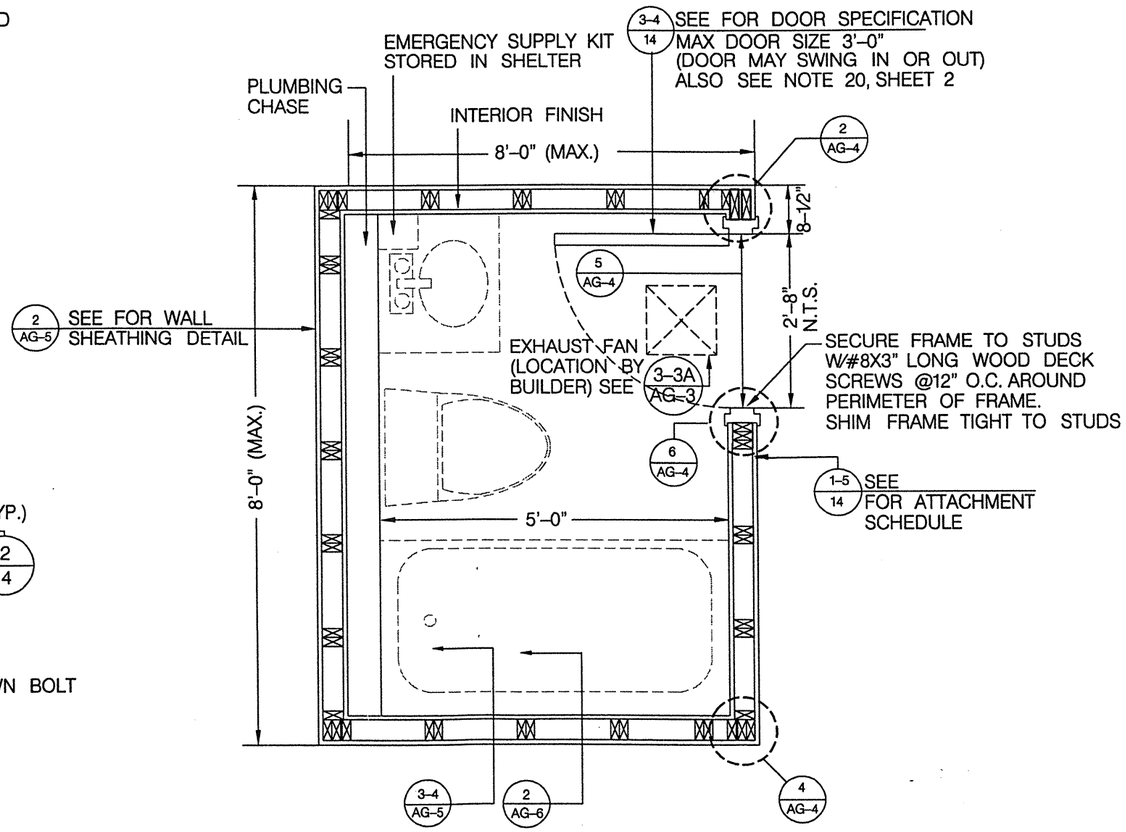
3 AG–5 ALTERNATIVE 1 CEILING PARTIAL–CEILING SECTION CONNECTION

SCALE: 1" = 1'–0"



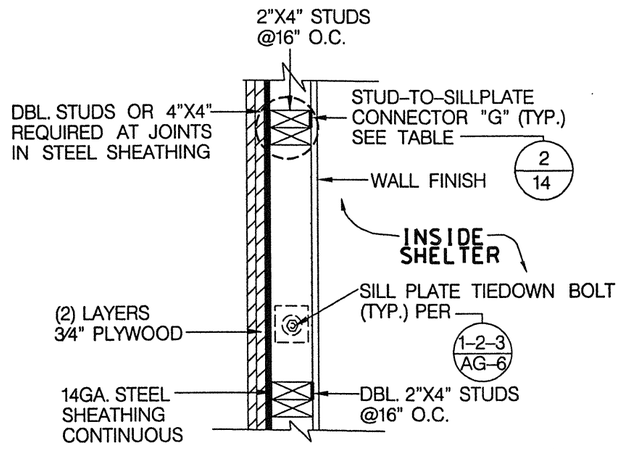
4 AG–5 ALTERNATIVE 2 CEILING

SCALE: 1" = 1'–0"



1 AG–5 TYPICAL PLAN VIEW

SCALE: 1/2" = 1'–0"



2 AG–5 WALL SECTION TOP VIEW

SCALE: 1" = 1'–0"

NOTES:

1. SHELTER W/ STEEL SHEATHING COVERED W/ GYP. BOARD FINISH OR OTHERWISE SEPARATED FROM CONTACT BY SHELTER OCCUPANTS NEED NOT BE GROUNDED.
2. SHELTER W/ STEEL SHEATHING UNCOVERED AND AVAILABLE FOR CONTACT BY SHELTER OCCUPANTS MUST BE GROUNDED AT A SINGLE LOCATION W/COPPER WIRE & GROUND ROD TO MEET NATIONAL ELECTRIC CODE & LOCAL REQUIREMENTS.
3. ALL WALL STUDS TO BE ATTACHED W/ (2) 16d NAILS TO SINGLE TOP AND BOTTOM PLATES, NAILED THROUGH FROM OUTSIDE, PRIOR TO ATTACHMENT OF SECOND TOP AND BOTTOM PLATES.

WOOD FRAME SHELTER PLAN–PLYWOOD AND STEEL WALL SHEATHING

DRAWING NO.: AG–5	SHEET 10 OF 16
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FEDERAL EMERGENCY MANAGEMENT AGENCY
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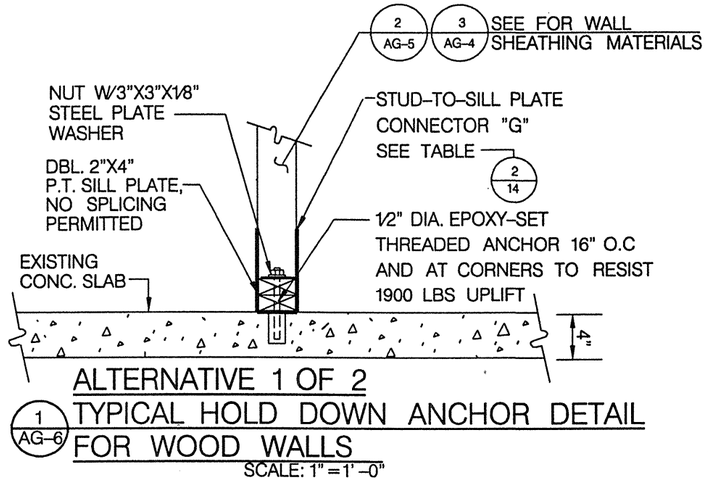
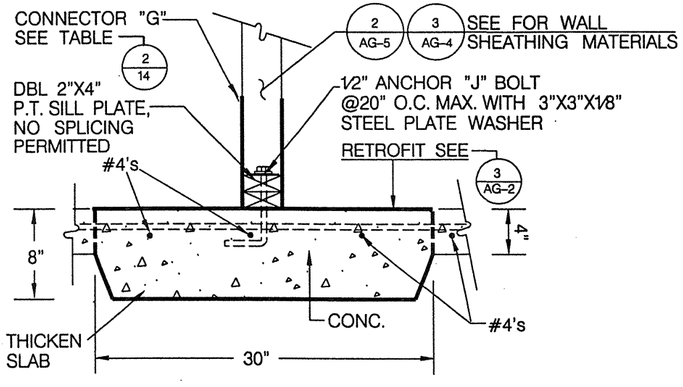


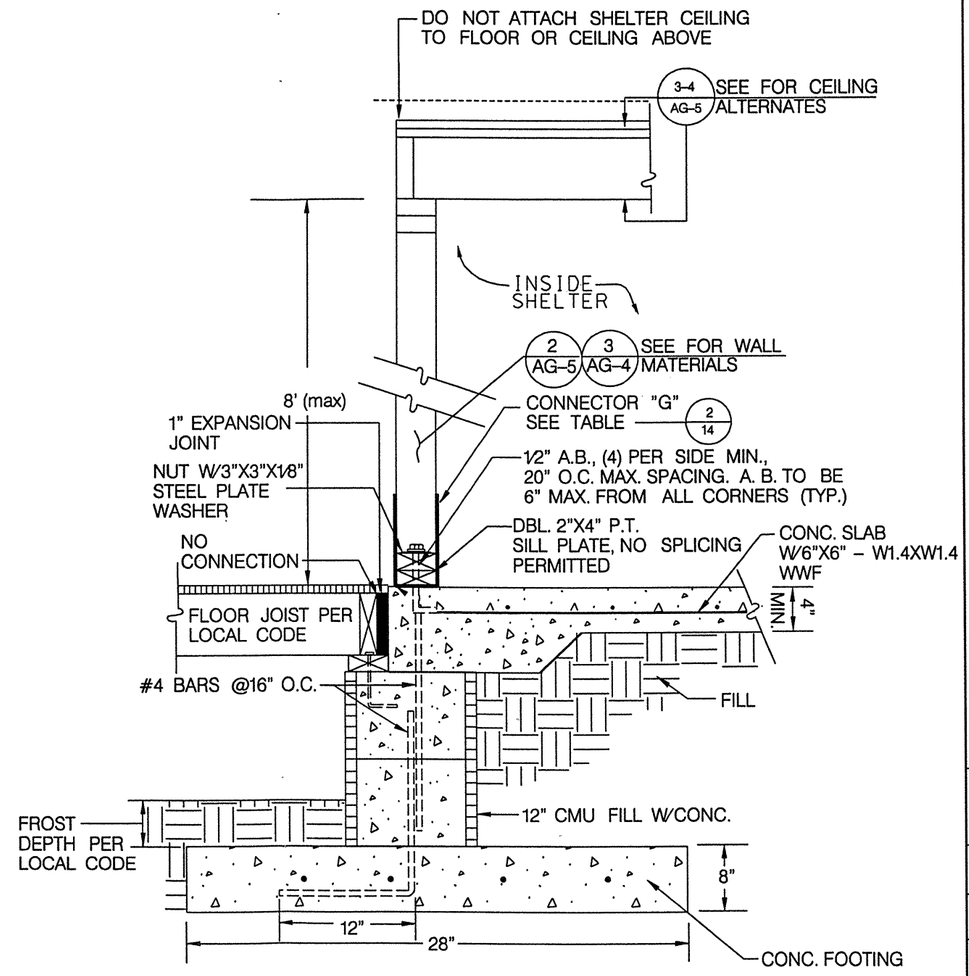
ALTERNATIVE 1 OF 2
1 AG–6 TYPICAL HOLD DOWN ANCHOR DETAIL FOR WOOD WALLS

SCALE: 1" = 1'–0"



ALTERNATIVE 2 OF 2
2 AG–6 TYPICAL ANCHOR DETAIL NEW SLAB–ON–GRADE FOUNDATION WITH WOOD WALLS

SCALE: 1" = 1'–0"



3 AG–6 ANCHOR DETAIL FOR CRAWL SPACE FOUNDATION WITH WOOD WALLS

SCALE: 1" = 1'–0"

NOTES:

1. TO OBTAIN FULL A.B. PULLOUT RESISTANCE, THE BOTTOM OF THE DRILLED HOLE FOR A.B. SHOULD BE NO CLOSER THAN 1/2" TO THE BOTTOM OF THE CONC. SLAB.
2. A PILOT HOLE SHOULD BE DRILLED TO DETERMINE THE MAX. EMBEDMENT LENGTH.

WOOD–FRAME SHELTER – FOUNDATION SECTIONS

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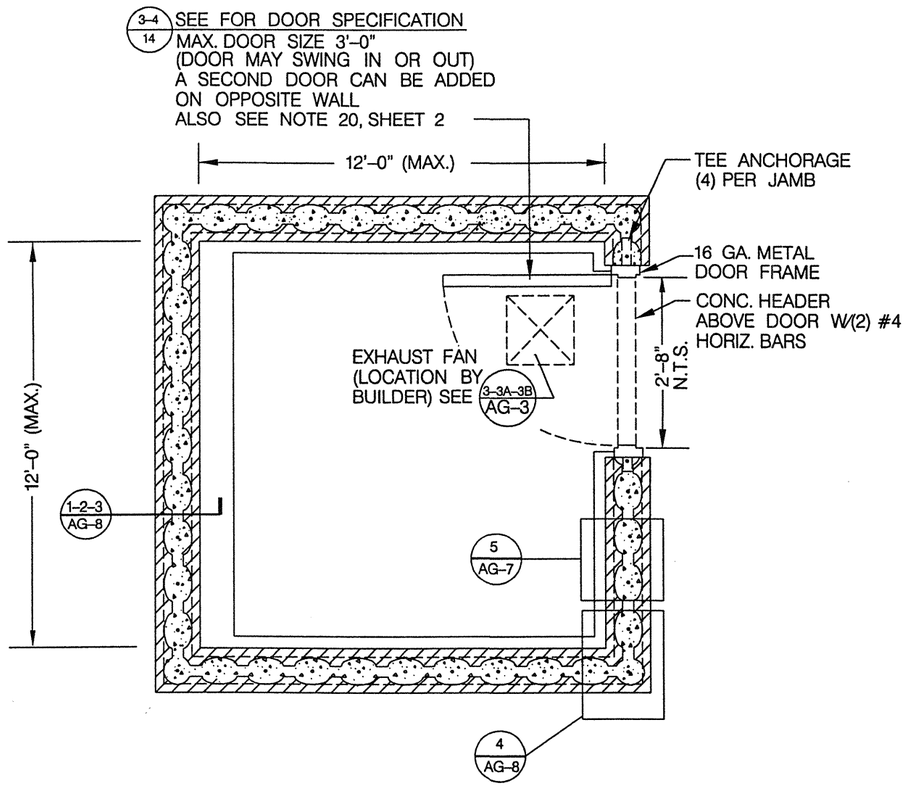
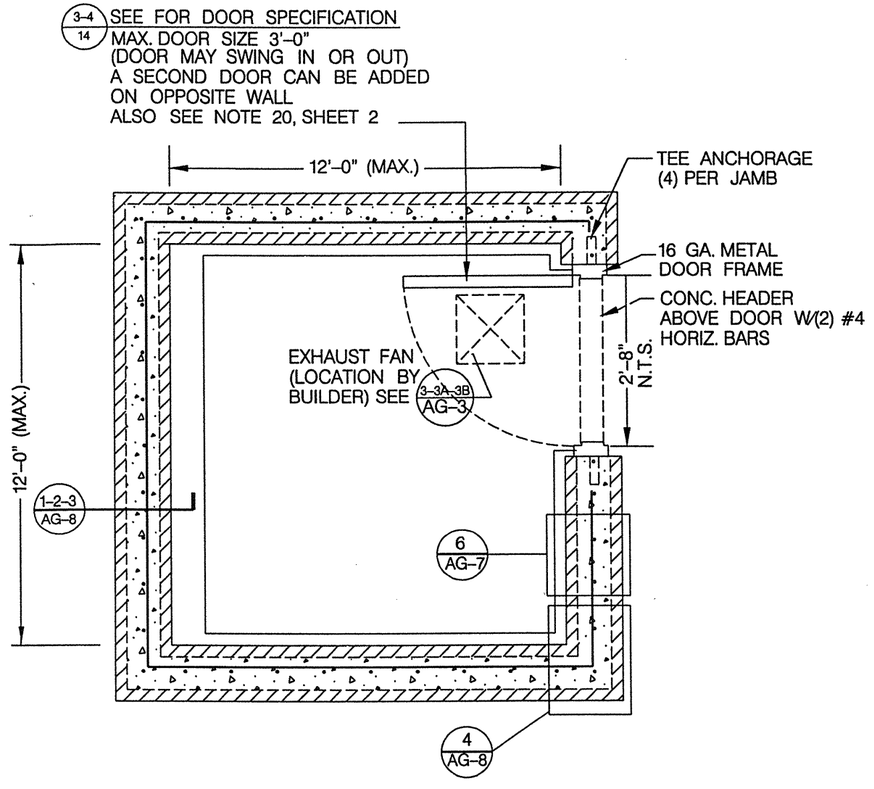
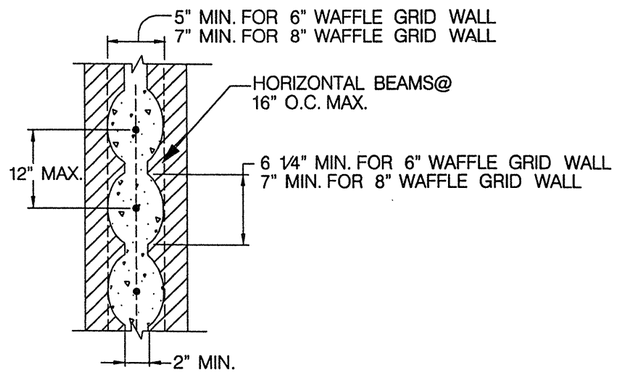
FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE WASHINGTON, DC



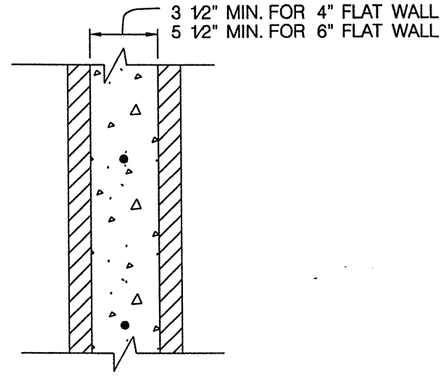
1 AG-7 WAFFLE GRID ICF SYSTEM PLAN
SCALE: 1/2" = 1'-0"



2 AG-7 FLAT WALL ICF SYSTEM PLAN
SCALE: 1/2" = 1'-0"



5 AG-7 WAFFLE GRID ICF
SCALE: 1" = 1'-0"

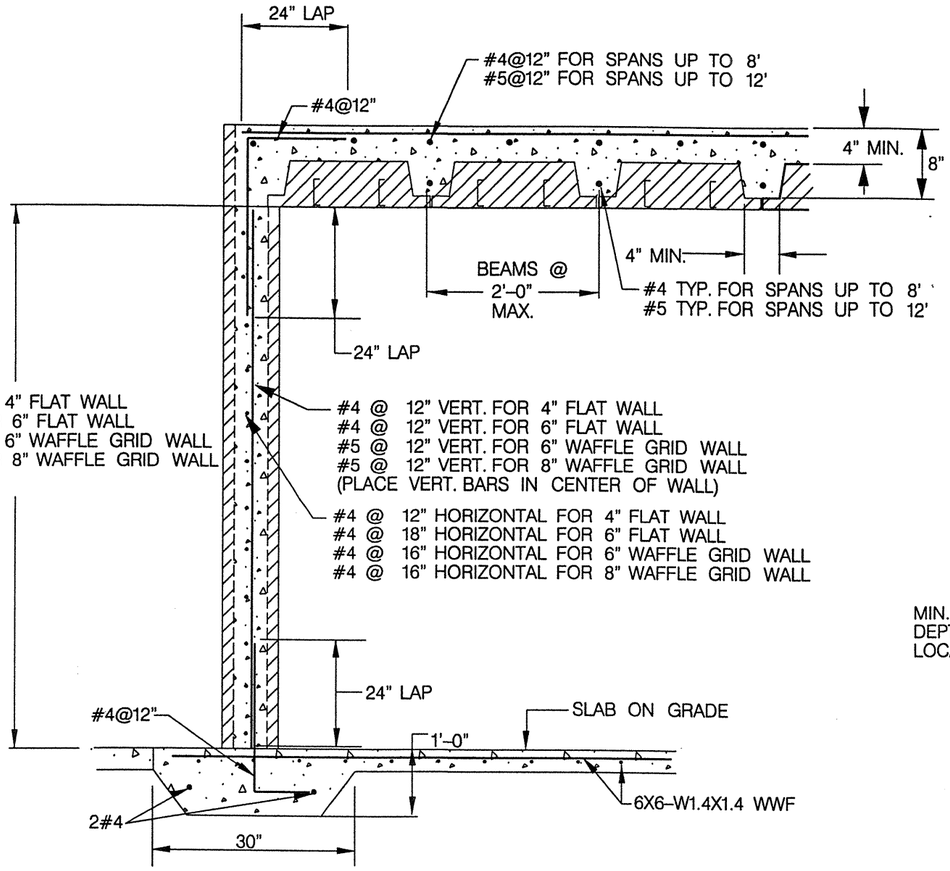


6 AG-7 FLAT WALL ICF
SCALE: 1" = 1'-0"

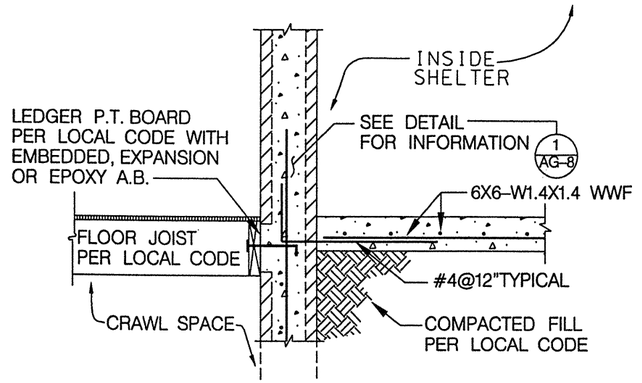
INSULATING CONCRETE FORM-PLANS

DRAWING NO.:AG-7	SHEET 12 OF 16
DATE: AUGUST 1999	

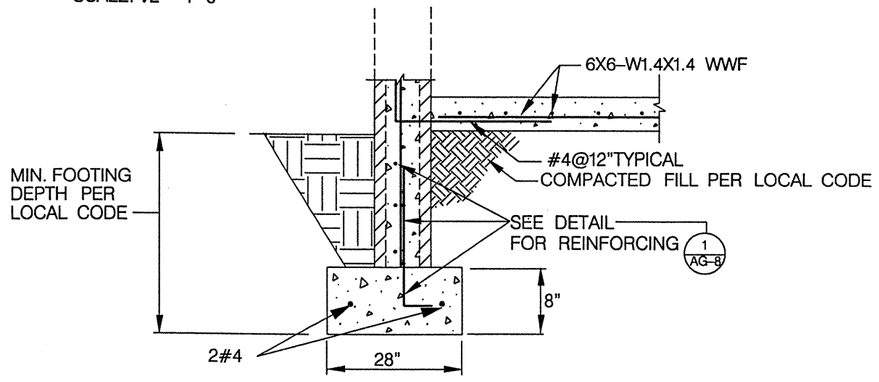
FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE WASHINGTON, DC



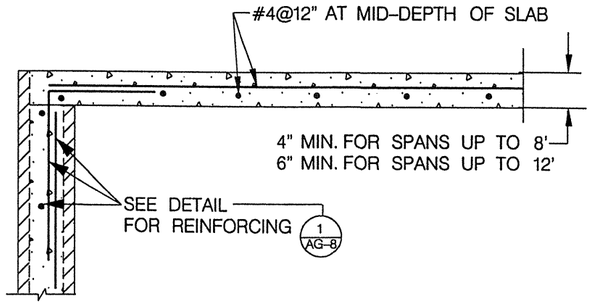
1 AG-8 INTERIOR WALL DETAIL
SCALE: 1/2" = 1'-0"



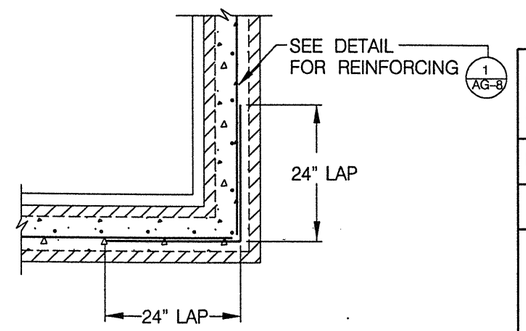
FLOOR CONNECTION DETAIL-CRAWLSPACE FOUNDATION
SCALE: 1/2" = 1'-0"



2 AG-8 FOOTING DETAIL - EXTERIOR WALLS
SCALE: 1/2" = 1'-0"



3 AG-8 ALTERNATIVE ROOF DETAIL
SCALE: 1/2" = 1'-0"



4 AG-8 TYPICAL CORNER DETAIL
SCALE: 1/2" = 1'-0"

INSULATING CONCRETE FORM-SECTIONS

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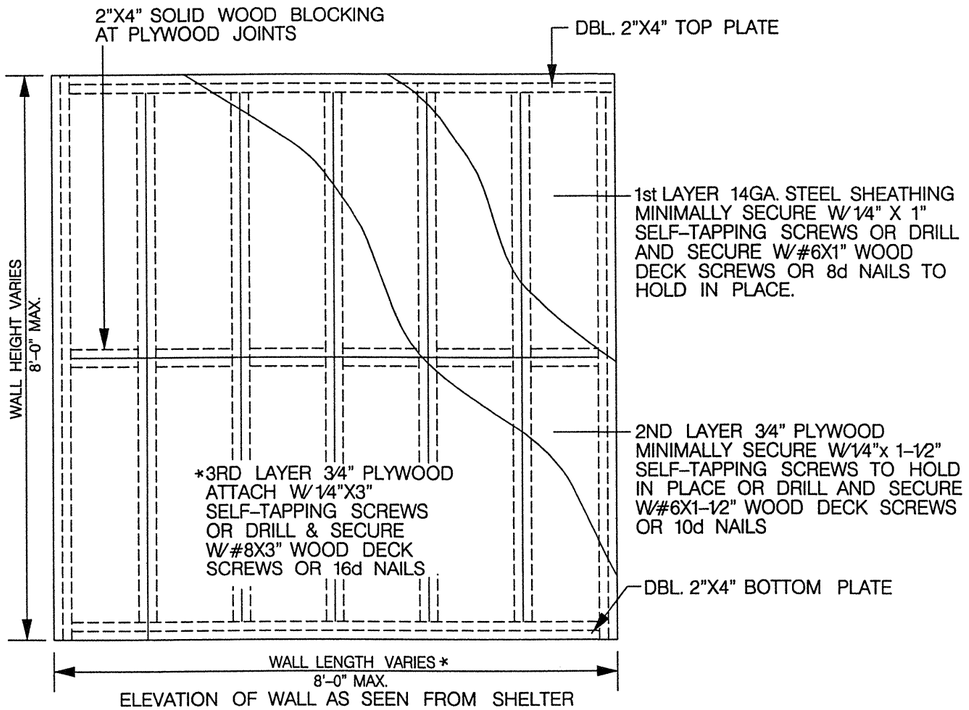


ELEVATION OF WALL AS SEEN FROM SHELTER EXTERIOR

1/14 PLYWOOD SHEATHING ATTACHMENT PATTERN

SCALE: 1/2" = 1'-0"

NOTES:

1. *ATTACHMENT SCHEDULE VARIES BASED ON WALL LENGTH SEE TABLE FOR ATTACHMENT SCHEDULE — 5/14
2. INSTALL PLYWOOD HORIZONTALLY
3. MINIMUM UNBROKEN WALL LENGTH IS 3'-6"

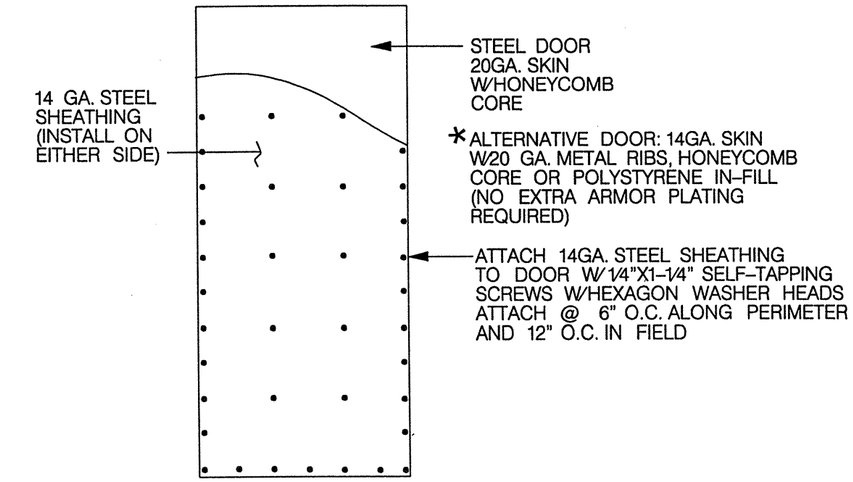
2/14 CONNECTOR SCHEDULE

LOCATION	REQUIRED UPLIFT CAPACITY(LB)	SIMPSON STRONG-TIE	SEMCO	KANT-SAG
A	375	H7	RTPGA814	RT20
B	375	LSTA15	RTP20812	LSTA15
C	1,700	H6	TPP4	SP2
D	2,750	PAHD42	RTP42	PAHD42
E	600	SP4	TPP4	SP2
F	1,700	H6	TPP4	SP2
G	1,700	H6	TPP4	SP2
H	1,700	PAI18		PA18

NOTES:
BECAUSE NOT ALL CONTRACTORS ARE FAMILIAR WITH THE TYPE OF STRUCTURAL CONNECTORS SHOWN IN THESE DRAWING, THE NAMES OF SOME COMPANIES THAT MANUFACTURE CONNECTORS HAVE BEEN INCLUDED IN THIS TABLE. THE LIST OF COMPANIES IS NOT, HOWEVER, EXHAUSTIVE. ADDITIONALLY, THIS LIST IS NOT INTENDED TO EXPRESS A PREFERENCE FOR THOSE MANUFACTURERS AND/OR THEIR PRODUCTS BY THE UNITED STATES GOVERNMENT NOR IS IT AN ENDORSEMENT OF THOSE MANUFACTURERS AND/OR THEIR PRODUCTS.

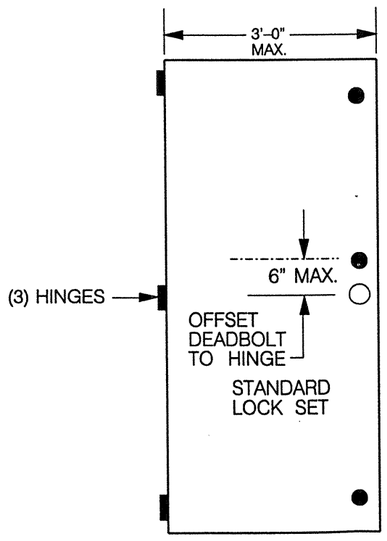
WALL LENGTH	16d NAILS	#8X3" WOOD DECK SCREWS	1/4" X 3" SELF TAPPING SCREWS
3'-6" TO 5'-0"	2" O.C. @ EDGES 6" O.C. IN FIELD	2" O.C. @ EDGES 6" O.C. IN FIELD	3" O.C. @ EDGES 6" O.C. IN FIELD
5'-1" TO 7'-0"	3" O.C @ EDGES 6" O.C. IN FIELD	3" O.C @ EDGES 6" O.C. IN FIELD	4" O.C @ EDGES 6" O.C. IN FIELD
7'-1" TO 8'-0"	4" O.C. @ EDGES 6" O.C. IN FIELD	4" O.C. @ EDGES 6" O.C. IN FIELD	6" O.C. @ EDGES 6" O.C. IN FIELD

5/14 ATTACHMENT SCHEDULE



4/14 DOOR – SHEET METAL ATTACHMENT PATTERN

SCALE: 1/2" = 1'-0"



(3) RESIDENTIAL STANDARD. QUALITY MORTISED DEADBOLTS WITH 3/8" MIN. DIA. PINS W/1" THROW LOCATE OPPOSITE HINGES

3/14 DOOR ATTACHMENT DETAILS

SCALE: 1/2" = 1'-0"

MISC. DETAILS

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SHELTER: LEAN-TO

WALL MATERIALS

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 4" X 8'	EACH	26	
SYP. LUMBER	2" X 4" X 12'	EACH	2	
P.T. LUMBER	2" X 4" X 8'	EACH	4	
P.T. LUMBER	2" X 6" X 8'	EACH	1	
SYP. LUMBER	2" X 8" X 8'	EACH	1	
SYP. LUMBER	2" X 6" X 12'	EACH	9	
PLYWOOD	3/4"	4' X 8' SHEET	11	
STEEL SHEATHING	14 GA.	4' X 8' SHEET	7	

HARDWARE

MATERIAL	DIAMETER	LENGTH	MEASURE	QUANTITY	REMARKS
DOOR			EACH	1	MADE ON SITE
HINGES		MIN. 3/1/2" LONG	EACH	3	SEE ITEM 3 ON SHEET 14
SLIDE BOLTS/ DEAD BOLTS			EACH	3	SEE ITEM 3 ON SHEET 14
ANCHOR BOLTS	1/2"	MIN. 2-1/8" EMBED.	EACH	20	SEE DETAIL 4 ON SHEET 4
TYPE "A" CONNECTORS			EACH	9	SEE ITEM 2 ON SHEET 14
TYPE "B" CONNECTORS			EACH	9	SEE ITEM 2 ON SHEET 14

SHELTER: CMU WALL ON SLAB-ON-GRADE

WALLS

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
HOLLOW CMU	6" X 8" X 16"	EACH	240	W/ CONCRETE GROUT
REINFORCING BAR	#4	LINEAR FEET	368	
MORTAR MIX	80 LB	BAG	10	

SLAB-ON-GRADE FOUNDATION

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
REINFORCING BAR	#4 X 3'	EACH	19	BENT 2' X 1'
REINFORCING BAR	#4 X 8"	LINEAR FEET	100	
CONCRETE		CUBIC YARDS	2	

ALTERNATIVE (1) REINFORCED CONCRETE CEILING

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
REINFORCING BAR	#4 X 4'	EACH	19	BENT 2' X 2'
REINFORCING BAR	#4 X 8'	LINEAR FEET	14	
CONCRETE		CUBIC YARDS	1	

ALTERNATIVE (2) WOOD-FRAME CEILING

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 6" X 8'	EACH	10	
PLYWOOD	3/4"	4' X 8' SHEET	4	
STEEL SHEATHING	14 GA.	4' X 8' SHEET	2	

HARDWARE

MATERIAL	MEASURE	QUANTITY	REMARKS
DEADBOLTS	EACH	3	SEE ITEM 3 ON SHEET 14
DOORFRAME	EACH	1	SEE DETAIL 1 ON SHEET 6
DOOR	EACH	1	SEE ITEMS 3 AND 4 ON SHEET 14
TYPE "D" CONNECTOR*	EACH	20	SEE ITEM 2 ON SHEET 14

* REQUIRED ONLY FOR ALTERNATIVE (2) WOOD-FRAME CEILING

CHASE WALL

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
P.T. LUMBER	2" X 6" X 8'	EACH	1	
SYP. LUMBER	2" X 6" X 8'	EACH	10	

SHELTER: CONCRETE WALL ON SLAB-ON-GRADE

WALLS

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
CONCRETE		CUBIC YARD	5	
REINFORCING BAR	#4	LINEAR FEET	520	

SLAB-ON-GRADE FOUNDATION

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
REINFORCING BAR	#4 X 3'	EACH	19	BENT 2' X 1'
REINFORCING BAR	#4 X 8'	LINEAR FEET	100	
CONCRETE		CUBIC YARD	2	

ALTERNATIVE (1) REINFORCED CONCRETE CEILING

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
REINFORCING BAR	#4 X 4'	EACH	19	BENT 2' X 2'
REINFORCING BAR	#4 X 8'	LINEAR FEET	14	
CONCRETE		CUBIC YARD	1	

ALTERNATIVE (2) WOOD-FRAME CEILING

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 6" X 8'	EACH	10	
PLYWOOD	3/4"	4' X 8' SHEET	4	
STEEL SHEATHING	14 GA.	4' X 8' SHEET	2	

HARDWARE

MATERIAL	MEASURE	QUANTITY	REMARKS
DEADBOLTS	EACH	3	SEE ITEM 3 ON SHEET 14
DOORFRAME	EACH	1	SEE DETAIL 2 ON SHEET 6
DOOR	EACH	1	SEE ITEMS 3 AND 4 ON SHEET 14
TYPE "D" CONNECTOR*	EACH	20	SEE ITEM 2 ON SHEET 14

* REQUIRED ONLY FOR ALTERNATIVE (2) WOOD-FRAME CEILING

CHASE WALL

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
P.T. LUMBER	2" X 6" X 8'	EACH	1	
SYP. LUMBER	2" X 6" X 8'	EACH	10	

NOTE: ALL QUANTITIES SHOWN ARE BASED ON AN 8'X8'X8' SHELTER.

MATERIALS LISTS

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SHELTER: INSULATING CONCRETE FORMS ON SLAB - ON -GRADE

INSULATING CONCRETE FORMS - FLAT WALL ALTERNATIVE

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
FORMS		SQUARE FEET	256	
CONCRETE 4" FLAT WALL		CUBIC YARDS	3	
CONCRETE 6" FLAT WALL		CUBIC YARDS	5	
REINFORCING BARS 4" FLAT WALL	#4	LINEAR FEET	672	
REINFORCING BARS 6" FLAT WALL	#4	LINEAR FEET	528	

INSULATING CONCRETE FORMS-WAFFLE GRID WALL ALTERNATIVE

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
FORMS		SQUARE FEET	256	
CONCRETE 6" WAFFLE GRID WALL		CUBIC YARDS	3.5	
CONCRETE 8" WAFFLE GRID WALL		CUBIC YARDS	5	
REINFORCING BARS	#4 #5	LINEAR FEET LINEAR FEET	416 256	

SLAB-ON-GRADE FOUNDATION

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
CONCRETE		CUBIC YARDS	2	
REINFORCING BARS	#4	LINEAR FEET	192	

INSULATING CONCRETE FORM ROOF ALTERNATIVE

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
FORMS		SQUARE FEET	64	
CONCRETE		CUBIC YARDS	1	
REINFORCING BARS	#4 #5	LINEAR FEET LINEAR FEET	128 32	

FLAT CONCRETE ROOF ALTERNATIVE

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
CONCRETE		CUBIC YARDS	1	
REINFORCING BARS	#4	LINEAR FEET	128	

HARDWARE

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
DEADBOLTS		EACH	3	SEE ITEM 3 ON SHEET 14
DOORFRAME		EACH	1	SEE DETAIL 1 ON SHEET 6
DOOR		EACH	1	SEE ITEMS 3 AND 4 ON SHEET 14

SHELTER: WOOD-FRAME WITH CMU INFILL WALL ON SLAB-ON-GRADE

WALLS

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 4" X 8'	EACH	38	
P.T. LUMBER	2" X 4" X 8'	EACH	4	
SYP. LUMBER	2" X 6" X 8'	EACH	1	
PLYWOOD	3/4"	4' X 8' SHEET	24	
SOLID BLOCK	4" X 8" X 16"	EACH	128	DRY - STACK
SYP. LUMBER	2" X 8" X 10"	EACH	2	
SYP. LUMBER	1" X 4" X 8'	EACH	19	

CEILING

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 6" X 8'	EACH	10	
PLYWOOD	3/4"	4" X 8" SHEET	4	
STEEL SHEATHING	14 GA.	4' X 8' SHEET	2	

HARDWARE

MATERIAL	DIAMETER	LENGTH	MEASURE	QUANTITY	REMARKS
DOOR FRAME			EACH	1	SEE DETAILS 5 AND 6 ON SHEET 9
DOOR			EACH	1	SEE ITEMS 3 AND 4 ON SHEET 14
ANCHOR BOLTS	1/2"	MIN. 2-1/6" EMBED.	EACH	25	
TYPE "E" CONNECTORS			EACH	2	SEE ITEM 2 ON SHEET 14
TYPE "F" CONNECTORS			EACH	14	SEE ITEM 2 ON SHEET 14
TYPE "G" CONNECTORS			EACH	14	SEE ITEM 2 ON SHEET 14
DEADBOLTS			EACH	3	SEE ITEM 3 ON SHEET 14
16D NAILS			LB	20	

CHASE WALL

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
P.T. LUMBER	2" X 6" X 8'	EACH	1	
SYP. LUMBER	2" X 6" X 8'	EACH	10	

SHELTER: WOOD-FRAME WITH PLYWOOD AND STEEL SHEATHING WALL ON SLAB-ON-GRADE

WALLS

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 4" X 8'	EACH	58	
P.T. LUMBER	2" X 4" X 8'	EACH	4	
PLYWOOD	3/4"	4' X 8' SHEET	16	
STEEL SHEATHING	14 GA.	4' X 8' SHEET	8	
SYP. LUMBER	2" X 10" X 8'	EACH	2	
SYP. LUMBER	2" X 6" X 8'	EACH	1	

CEILING

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
SYP. LUMBER	2" X 6" X 8'	EACH	10	
PLYWOOD	3/4"	4' X 8' SHEET	4	
STEEL SHEATHING	14 GA.	4' X 8' SHEET	2	

HARDWARE

MATERIAL	DIAMETER	LENGTH	MEASURE	QUANTITY	REMARKS
DOOR FRAME			EACH	1	SEE DETAILS 5 AND 6 ON SHEET 9
DOOR			EACH	1	SEE ITEMS 3 AND 4 ON SHEET 14
ANCHOR BOLTS	1/2"	MIN. 2-1/8" EMBED.	EACH	25	
TYPE "E" CONNECTORS			EACH	2	SEE ITEM 2 ON SHEET 14
TYPE "F" CONNECTORS			EACH	14	SEE ITEM 2 ON SHEET 14
TYPE "G" CONNECTORS			EACH	14	SEE ITEM 2 ON SHEET 14
DEADBOLTS			EACH	3	SEE ITEM 3 ON SHEET 14
16D NAILS			LB.	20	

CHASE WALL

MATERIAL	SIZE	MEASURE	QUANTITY	REMARKS
P.T. LUMBER	2" X 6" X 8'	EACH	1	
SYP. LUMBER	2" X 6" X 8'	EACH	10	

NOTE: ALL QUANTITIES SHOWN ARE BASED ON AN 8'X8'X8' SHELTER.

MATERIALS LISTS

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