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SECTION 01012

SITE WORK/CIVIL/UTILITIES

PART 1 GENERAL

1.1 REFERENCES

DEPARTMENT OF THE ARMY/Air Force

- TM 5-803-5 (Mar 81) Installation Design [Ref: AFM 88-43]
- TM 5-820-4 (Oct 83) Drainage Areas Other Than Airfields [Ref: AFM 88-5, Chap. 4]
- TM 5-822-5 (June 92) Pavement Design for Roads, Streets Walks, and Open Storage Areas [Ref: AFM 88-7, Chap. 1]
- TM 5-813-5 (3 Nov 86) Water Supply, Water Distribution [Ref: AFM 88-10, Vol 5]
- TM 5-813-7 (2 Sep 86) Water Supply for Special Project [Ref: AFM 88-10, Vol 7}]
- TM 5-814-1 (4 Mar 85) Sanitary and Industrial Wastewater Collection - Gravity Sewers and Appurtenances [Ref: AFM 88-11, Vol 1]
- TM 5-814-2 (15 Mar 85) Sanitary and Industrial Wastewater Collection-- Pumping Stations and Force Mains [Ref: AFM 88-11, Vol 2]
- (15 Mar 85) Sanitary and Industrial Wastewater Collection-- Pumping Stations and Force Mains [Ref: AFM 88-11, Vol 2]

KANSAS DEPARTMENT OF TRANSPORTATION

- KDOT STANDARD SPECIFICATIONS FOR STATE ROAD AND BRIDGE CONSTRUCTION

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA C651 (1992)Disinfecting Water Mains
- AWWA M 17 (1989) Installation, Field Testing, and Maintenance of Fire Hydrants

FEDERAL STANDARDS (FED STD)

- UFAS (April 1988) Uniform Federal Accessibility Standards

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

- NWS HYDRO-35 (June 1977) Five to 60-Minute
Precipitation Frequency For The Eastern
and Central United States
- NOAA ATLAS 2 (1973) Precipitation-Frequency Atlas of
the Western United States

HANDICAPPED STANDARDS (HS)

- ADAAG (January 1998) Americans with Disabilities
Act Accessibility Guidelines for Buildings
and Facilities; Play Areas

AMERICAN ASSOCIATION OF STATE HIGHWAY & TRANSPORTATION OFFICIALS
(AASHTO)

- AASHTO A Policy on Geometric Design of Highways
and Streets

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- D6.1-2000 Manual on Uniform Traffic Control Devices
for Streets & Highways

MILITARY HANDBOOKS (MH)

- MIL-HDBK-1008C (10 Jun 1997) Fire Protection for
Facilities Engineering, Design, and
Construction

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 24 Standard for the Installation of Private
Fire Service Mains and Their
Appurtenances, 1995 Edition NFPA 24, Ch
8-1.1;

National Institute of Standards and Technology (NIST)

- NIST 44 (Current Edition) Weights and Measures
Handbook 44
- UFC 4-010-01 DoD Minimum Antiterrorism Standards for
Buildings

1.2 NOT USED

1.3 SURVEY

1.3.1 Field Survey.

The engineering survey to be used in the development of the design

submittal is available to the Contractor on CD-ROM furnished with this solicitation. The information is in a 3-d Bentley Microstation drawing file. The survey data information was gathered by a topographical survey performed in December 2002 to April 2003. Contours were gathered at 1 foot intervals. The survey drawings shall be used by the Contractor to prepare for development of design drawings. Any additional survey information required by the Contractor for preparation of his proposal or for development of design drawings shall be obtained by the Contractor at his own expense.

1.4 STAGING AND CONTRACTORS ACCESS

1.4.1 Staging Area

The location of the Contractor staging area shall be within the project limits as shown on the drawings. Contractor private vehicles shall not be allowed inside of the project limits but must park outside. Contractor vehicles shall be marked with the company name. Staging area shall be returned to its original condition or improved condition if indicated in the contract upon completion of construction.

1.4.2 Contractors Access Route

The Contractor's Access Route shall be through the west gate.

1.5 DEMOLITION

The buildings noted on the Demolition Plan and Bid Schedule to be demolished are included in the project. Floor plans and wall sections drawings have been provided if available. Soil removal/remediation is required as indicated on the plans. The Contractor shall remove all pavements, utilities and other appurtenances necessary to construct the new facility. Disposal shall be off base at contractor expense. The Contractor shall notify the Contracting Officer if any material to be disposed of is found to contain hazardous, toxic, biological or radiological substances. Rubbish and debris shall be removed from the site on a daily basis to avoid accumulation at the project site. Demolition shall conform to Unified Facilities Guide Specification (UFGS) Section 02220 DEMOLITION. Burining is not allowed. Foundations shall be removed to a depth of at least 42 inches. Fence posts and fence mow strips to be removed shall be removed entirely. The Air Force reserves salvage rights to all materials until building or structure is turned over to the contractor. Special scheduling is required as some facilities must be completed by the contractor before demolition may begin. The POL facility is an example. Demolition of an Oil Water Seperator is required. Refer to Specification 02000 OUTLINE SPECIFICATIONS for requirements. Note the requirements under fencing to salvage, protect, crate, and deliver for the Air Force gates, controls, and motors.

OIL Water Seperator requirement:

1.6 NEW CONSTRUCTION

The location and construction shall be as indicated on the attached drawings and in the specifications.

New utility service lines shall consist of sanitary sewers, waterlines, gas

lines, electrical power and communications lines. All utility lines installed shall have a plastic marker tape minimum 6 inches(15 centimeters) wide by 0.4 inch (.01 centimeter) thick installed 8 to 10 inches below grade. The plastic marker tape shall include a metallic wire for detection purposes and shall bear a continuous printed inscription describing the type of utility line buried below. Metal pipes, (including ductile iron) and valves shall be cathodically protected and include test stations.

The exact limits are part of the design effort and depend on the existing pavements, design traffic and proposed construction.

1.6.1 Building

Location and construction of structures, roads, parking, utilities and landscaping shall be as indicated on the attached drawings and as specified herein. The new buildings shall be handicap accessible. Minor changes to the overall layout may be accepted by the Government if it is beneficial to the overall design of the project.

1.6.2 Walks

Exterior concrete walks 4 inches thick shall be placed to connect POV parking and buildings as needed. Walks shall have a medium broom finish. Adjustments to the walk layout may be made to facilitate the final Site Plan. Walks along the parking lots shall be a minimum of 10 foot wide. Walks leading to the main entrance shall be a minimum of eight feet wide and match the width of the front facade of the building. Walks leading to all other entrances shall be a minimum of 5 feet wide. Walks 10 foot wide shall have a five foot square joint pattern.

1.6.3 Parking Areas

As a minimum, curbs or wheel stops shall be used to maintain the AT/FP setback from vehicles to buildings. Parking areas are indicated on the Site Plan and shall be located a minimum of 25 meters (82 feet) from the building main entrance. Provide, as a minimum, the number of parking spaces as indicated on the Site Plan. Two Handicap van-accessible universal stalls in accordance with January 1998 Accessibility Guidelines for Buildings and Facilities, Appendix (with striping, signage, and ramps) shall be provided for the POL building. Adjustments to the parking lots as shown may be made but must be approved by the Government. The number of parking stalls shall be as shown on the drawings. Regular parking stalls shall be a minimum of 9.5 feet wide and 20 feet long. Driving lanes shall be a minimum of 2-12 feet wide. Parking stalls shall be delineated with 4 inch white stripes. Pavement design shall be the responsibility of the contractor according to the geotechnical report. Provide integral curb, double purpose walk, or concrete curb and gutter. Contractor shall use installation design standard designs, for example, use the 24 inch wide curb and gutter that is standard for MAFB.

See Section 01700: ELECTRICAL for exterior lighting requirements.

1.6.4 Screen Walls/Dumpster Enclosure

Construct screen walls to block the view of exterior mechanical equipment from vehicular and pedestrian traffic. Top of screen wall shall be no less than 12 inches higher than the top of any portion of the mechanical equipment unless noted otherwise. Also, construct concrete dumpster pad(s)

with a three-sided screen wall enclosure with wood gate. Screen walls shall be constructed in accordance with the installation standard design guide.. The dumpster enclosure shall be constructed in accordance with the installation standard design guide. Concrete walks to the dumpster pad and a concrete approach pad (if approach if not directly from a concrete pavement)a minimum of 15 feet wide (center of bollard to center of bollard) by 12 feet deep by 8 feet high. Approach slab shall be portland cement concrete not less than 15 feet by 15 feet unless otherwise noted. Comply with the AT/FP requirements for walls, enclosures and stand off distance.

1.6.5 Seeding

1.6.12.1 Soil Preparation

Prior to seeding, all surface soils shall be loosened to a minimum depth of four inches and broken up to a fine, workable texture suitable for seeding.

1.6.12.2 Seeding and/or Sodding

Turfed areas shall be seeded according to the installation guide. All newly turfed areas shall be fertilized with fertilizer at the rate and composition recommended by a soil test (submit FIO the test results to the COR. Seed shall be according to 01140 installation design guide at the rate and species indicated therein or 5 pounds per 1000 SF. (also called base standards).

Seeding shall be specified in accordance with Section 02000 of this RFP document and UFGS Section 02921A SEEDING.

Sodding shall be specified in accordance with UFGS Section 02922A SODDING.

1.6.6 Fence and Gates

a. Fences shall be 7 foot high fabric with top and bottom tension wire.

Outriggers shall be constructed with barbed wire or ribbon wire atop the fence to match the adjacent fence. Post shape shall match the existing shape. Chain Link fencing shall be specified in UFGS Section 02821 FENCING.

New fencing shall be constructed before removal of fencing to be demolished so the security of the base may be maintained.

b. Cantilever gates for vehicle access shall be a minimum width of back of curb to back of curb or edge of pavement to edge of pavement wide unless otherwise noted on the drawings. Single swing personnel gates shall be a minimum of 4 feet wide. The height of the gates shall match the fence. Sliding, cantilever gates, motorized shall be required unless swing gates are indicated on the drawings. NEW gates and fences are required. Existing gates, motor and controls) (from this project shall be protected from damage and turned over and to the Base Civil Engineer. Controls, motors, drive assemblies shall be crated for turnover. Refer to the drawings. New cantilever, motorized gates shall have two conduits each from the controls to two pedestal mounted, waterproof switch boxes. Switch/control boxes face shall be located 12 inches behind the back of curb where curbs exist and 6 inches away from the road edge of pavement where there is no curb. . Gates shall be specified in UFGS Section 02821 FENCING.

c. All chain link fences constructed (permanent) shall have a concrete mow strip installed no more than one inch (25 mm below the bottom) tension wire.

The mow strip shall be 6 inches deep by 12 inches wide with two No. 4 bars running parallel to the fence line. The top 6 inches of the fence post base shall be 12 inches by 12 inches square to accommodate the placement of 12.7 mm preformed expansion joints on each side of the fence post foundation.

d. Fence fabric for fences and gates shall have a PVC coating as specified in UFGS Section 02821, color shall be black .

1.6.7 CONSTRUCTION AREA FENCING

The Contractor shall maintain a 6' high chain link fence around the construction areas. Chain Link fencing shall be as specified in UFGS Section 02821 FENCING. Orange safety fence may be used around the parking lots and utility construction. Upon completion of construction, all fence materials shall be disposed of outside the limits of Government-controlled lands. A free zone fence shall be constructed to prevent construction worker from accidentally walking outside the construction limit toward the flight line. This fence may be an orange snow fence or the chain link, temporary construction fence. This fence shall be the first work in each area to preclude workers from wandering into and being challenged by Air Force security forces.

1.7 Exterior Gas Distribution

A new service line shall be provided and connected by tapping into the existing gas line. Service lines to buildings shall run parallel and/or perpendicular to the building lines, shall be buried at least 18 inches below the ground surface, shall not be laid in the same trench with other utilities, and shall be above other utilities whenever they cross. Gas lines shall not be laid under paved streets, parking lots, roads or in other locations subject to heavy traffic whenever practicably avoidable. Whenever it is necessary to locate gas lines in such locations, the lines shall be protected by suitable encasement or by burying to a depth to provide at least 4 feet of cover over the top of the pipe except that gas lines shall be provided with encasement (minimum 12 x 12 inches) when laid under new or existing paved streets, and parking lots. The tap into the existing line shall be a "hot tap" and the Installation's Fire Department shall be given 30 days advance notification of the date of the tap. The point of connection shall be provided with a shutoff plug valve, conveniently located outside of any traffic area and protected with a valve box. Service lines shall not be installed under or routed thru the facility. Except for piping located at the new gas meter/service regulator assemblies, no aboveground gas piping shall be exposed to view. The service line shall enter the building in an accessible location outside the mechanical room. The gas meter/service regulator assemblies shall be hidden from view to the greatest extent possible. Gas Distribution System shall include anodless risers at buildings and meters at each building. PE piping is required. Steel components shall be cathodically protected and include test stations.

1.8 Exterior Water Distribution

Water service line shall tap into the existing water lines. Minimum cover for water mains and fire lines shall be according to the base standards. All valves shall be protected with bituminous coating. Mains and piping shall be disinfected in accordance with AWWA manual C-651. Fire hydrants shall be UL listed dry barrel type with break away flange and shall match in appearance and threading those presently in use on the installation.

Hydrant laterals shall be 6-inch(152 mm) minimum size, and shall have an underground shutoff valve with an adjustable valve box in each lateral within 10 feet(3 meters) of the hydrant. Hydrants shall be set to provide 24 inches(610 mm) from finished ground to top nut of hydrant and 460 mm (18 inches) to center of pumper connection. Metal pipes, (including ductile iron) and valves shall be cathodically protected and include test stations. All plugs, caps, tees, bends, and hydrants on water mains and hydrant laterals shall be provided with reaction backing or movement prevented by attaching metal tie rods or clamps. Water line valves shall be provided for all water service lines. Valve boxes shall be provided for all valves and shall extend to finished grade. The facility shall be provided with an interior service main cutoff valve. Material shall be as required by the Base Standard. Seperate fire (with PIV) and domestic water lines shall be as required by the Base Standard.

1.9 Exterior Sanitary Sewer

Sanitary sewer connection shall be to the existing system. Manholes are required in changes in direction, slope and where required to keep the maximum length between manholes or building exit to 300 feet. An exterior cleanout or manhole is required for each building within 5 feet of the building exit. Cleanouts shall have a minimum collar of 18x18x6 inches. Plug shall be recessed type. Material shall be as required by the Base Standard..

1.10 Exterior Electric and Communications Distribution

Location of power and communications shall be as shown on the drawings. See SECTION 01017 ELECTRICAL REQUIREMENTS for additional information and requirements.

1.11 PAVEMENTS

1.11.1 Pavement Subgrade Preparation

Pavement subgrades shall be prepared, as a minimum, in accordance with the Corrosion Control Facility, Phase 1 Geotechnical Report recommendations.

1.11.2 Pavement Design

The Contractor shall use the pavement cross section in the Corrosion Control Facility Phase 1 Geotechnical Report as the minimum design pavement cross section.

1.11.3.1 Asphalt Concrete Pavement

The Contractor shall use the pavement cross section in the Corrosion Control Facility Phase 1 Geotechnical Report as the minimum design pavement cross section.

1.11.3.2 Portland cement concrete pavements: This project requires limited surface areas to be paved with Portland cement concrete, and construction of small concrete slabs on grade.

The Contractor shall use the pavement cross section in the Corrosion Control Facility Phase 1 Geotechnical Report as the minimum design pavement cross section. In addition the following requirements pertain:

The maximum water/cement (cementitious) ratio shall not exceed 0.42 by weight. Aggregate shall conform to ASTM C 33 Class 5S, except that the coarse aggregate shall not show more than 40 percent loss after 500 revolutions when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The maximum allowable limit on Coal and Lignite shall be 0.25 percent. The aggregate shall meet or exceed the State Specifications requirement for Durability Class I. Portland cement concrete shall contain at least 564 pounds of Portland cement per cubic yard. Portland cement shall conform to ASTM C 150 Type I or II, and conform to the low alkali requirement. All Portland cement for use in the work shall be obtained from the same source. Class F Fly Ash may be used up to a maximum limit of 20 percent of the cementitious content. Fly Ash shall conform to ASTM C 618, meeting the optional physical and chemical requirements and the limit on available alkalis, Tables 1, 2,3, and 4. Slump shall be measured at the location of placement at the form. Concrete placed using pumping methods, slump shall be measured at the discharge end of the pump line at the location of placement.

1.11.3 [Enter Appropriate Subpart Title Here] 1.11.4 Rigid Pavement Joint Layout

A typical joint layout for plain concrete road intersections is shown in Figure 13-1 of TM 5-822-5. A typical joint layout for plain concrete roads and parking areas is shown in Chapter 15 of TM 5-822-5. Odd-shaped slabs should be reinforced in two directions normal to each other using a minimum of 0.10 percent of steel in both directions. The entire area of the slab should be reinforced. An odd-shaped slab is considered to be one in which the longer dimension exceeds the shorter dimension by more than 25 percent or a slab which essentially is neither square nor rectangular. Odd-shaped slabs will generally be reinforced with steel welded wire fabric. Slabs in which a structure is placed shall also be reinforced with welded wire fabric. Each slab to be reinforced with welded wire fabric will be marked with an "R" on the joint layout plan. Details showing typical layout of joints at intersection as indicated in Figure 13-1 of TM 5-822-5 will be provided when applicable. All joints in concrete pavement shall be cleaned and sealed with a joint sealant. All concrete shall be proportioned using a maximum water/cement ratio of less than 0.42 by weight.

1.11.4 [Enter Appropriate Subpart Title Here] Sidewalks

P.C. concrete sidewalks shall be a minimum of 150 mm thick. Transverse contraction joint spacing shall be as follows; 4 feet(1.2 m) for walks 4 and 8 feet(1.2 m and 2.4 m) wide, five feet(1.5 m) for walks five and 15 feet(1.5 m and 3.0 m) wide, six feet(1.8 m)for walks 6 and 12 feet (1.8 m and 3.6 m)wide. Longitudinal contraction joints shall be constructed in sidewalk widths 8 feet(2.4 m) and greater. Expansion joint spacing shall not exceed 40 feet(12.2 m). An expansion joint shall be provided at sidewalk intersections, between sidewalks and back of curbs, between sidewalks and vertical surfaces of structures, and between sidewalks and entrances to structures.

1.11.5 Bituminous Prime Coat

A bituminous prime coat shall be used at the option of the Contractor. Bituminous prime coat will be used when it is anticipated that the constructed base course may be damaged by rain, wind, or traffic prior to placement of the bituminous concrete pavement.

1.11.6 Bituminous Tack Coat

Contact surfaces of previously constructed pavement, curbs, manholes, and other structures shall be sprayed with a thin coat of bituminous material. Tack Coat shall conform to KDOT specifications.

1.11.7 Joint Sealing

Joints in P.C. concrete pavements may be sealed with field molded sealants and specified in accordance with The Kansas Department of Transportation, "STANDARD SPECIFICATIONS FOR STATE ROAD AND BRIDGE CONSTRUCTION".

1.11.8 Concrete Sidewalks, and Curbs and Gutters

Concrete sidewalks and curbs and gutters shall be specified in accordance with The Kansas Department of Transportation, "STANDARD SPECIFICATIONS FOR STATE ROAD AND BRIDGE CONSTRUCTION".

1.12 GRADING

1.12.1 General

Positive drainage shall be provided for all areas and existing drainage ways shall be utilized to the extent possible. It is mandatory to direct drainage away from buildings to curb and gutter. Parking areas shall be graded such that storm water is directed off to the sides and not down the center of the parking area. Drainage along new entrance drives shall be controlled by the use of curb and gutter and drainage structures.

1.12.2 Borrow and Waste

Borrow material shall be obtained from locations off base. Excess waste material shall be disposed of by the Contractor off base.

1.12.3 Sidewalks

Concrete walks shall have a transverse grade of 2 percent. A desirable maximum longitudinal walk grade will be 4 percent with an absolute maximum of 8 percent. Handicapped accessible walks with a longitudinal slope greater than 5 percent shall be considered a ramp. See FED STD 795 Uniform Federal Accessibility Standards for ramp requirements. Special attention shall be given to sidewalks that are on the north (shaded) side of buildings. 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. 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.

1.12.4 Transverse Parking Area Grades

a. Desirable minimum of 2 percent.

b. Absolute minimum of 1.5 percent for flexible pavement and 1 percent for rigid pavement.

1.12.5 Longitudinal Parking Area Grades

Maximum of 4 percent.

1.12.6 Ramp Grades

- a. Desirable maximum of 6 percent.
- b. Absolute maximum of 8 percent for short distances only.

1.12.7 Gutter Grades

- a. Desirable minimum of 0.8 percent.
- b. Absolute minimum of 0.5 percent.

1.12.8 Building Floor Elevation

Building finished floor elevation shall be set to 6 inches higher than the surrounding grade, except for entrance ramps. A 6 inch step up at doors is acceptable for NON-HANDICAPED entrances.

1.12.9 Grades Away From Building

a. Minimum of 5 percent for 10 feet. Grades between buildings can be less than the minimum due to the close proximity of the structures. Care shall be taken in the design to ensure that this area drains properly. Contractor consideration shall be given to the use of area inlets, trench drains, etc. to provide adequate drainage. Exception is for paved areas adjacent to buildings.

- b. Maximum of 10 percent for 10 feet.

1.12.10 Overlot Grades

Provide positive drainage for all areas.

- a. Minimum 1 percent for cohesionless sandy soils.
- b. Minimum 2 percent for cohesive soils or turfed areas.
- c. Sideslopes for ditches, roads, and other turfed areas shall be no steeper than 1V on 3H.

1.12.11 Adjustment of Existing Structures

All manholes, valve boxes, handholes or inlets of any nature within the project that do not conform to the new finish grade in either surfaced or unsurfaced areas shall be adjusted to the new finish grade. Where inlets, manholes, valve boxes, or handholes fall within a surfaced or unpaved roadway or parking, the existing frames and cover shall be removed and

replaced with a heavy-duty frame and cover. The structure shall be adjusted as needed to fit the new conditions.

1.13 STORM DRAINAGE

1.13.1 Determination of Storm Runoff

The computation of runoff may be accomplished by the Rational Method. Sizing of storm drainage systems shall be based on rainfall of 10-year frequency.

1.13.1.1 Design Storm Return Period

Storm drains and culverts shall be sized for a design storm with a return period of 10 years. Provisions shall be made to protect all buildings and critical structures from a major storm with a return period of 100 years.

1.13.1.2 Rainfall Depth-Duration-Frequency Data

Rainfall data for states in the western United States shall be obtained from NOAA ATLAS 2. Rainfall intensity-duration data developed by cities or regions may be used if available.

1.13.2 Storm Drainage System Layout

The Contractor shall be responsible for the complete design of the storm drainage system. The new storm drainage system shall be coordinated with surrounding properties to ensure runoff does not cause damage to the other properties. Erosion control shall be provided for all storm drain structures. The Contractor shall provide details for all drainage structures. Under no circumstance shall storm drain lines be located beneath buildings.

1.13.2.1 Manholes

Diameter of manholes shall be large enough to accommodate pipes entering and exiting the manhole. No ladders or steps are to be provided.

1.13.2.2 Headwalls and Flared End Sections

Unless otherwise approved, headwalls or flared end sections shall be provided at the entrance and ends of culverts and at storm drain outfalls. Outlets and endwalls shall be protected from undermining, scour, lateral erosion.

1.13.2.3 Culverts

Culvert pipes shall have a minimum diameter of 18 inches wherever possible.

1.13.2.4 Roof Drain Outfall Lines

Downspouts and/or roof drains shall be connected to an underground roof drain system. 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 (downspout). Downspouts shall connect to a transition boot (cast

iron, color to match). Boot shall have a brass cleanout plug. Boot shall extend a minimum 6 inches below ground level and a minimum 24 inches above ground level. 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.

1.13.3 Storm Drain and Culvert Pipe

The Contractor shall select the appropriate storm drain and culvert pipe materials from the options specified in UFGS Section 02630 STORM DRAINAGE SYSTEM. RCP is preferred. Pipe, bedding, and backfill shall be of adequate strength (or stiffness) to support the earth, live, and construction loads imposed on the pipe. Only pipe materials which have a minimum design service life of 25 years shall be allowed for permanent installations. As a minimum, all pipe joints shall be soiltight. The Contractor shall specify watertight joints when the water table is at or above the pipeline.

1.13.3.1 Concrete Pipe

Reinforced concrete pipe shall be a minimum Class III. Type I cement may be used only when sulfates in the soil are 0.1 percent or less and dissolved sulfates in the effluent are 150 ppm or less. Type II cement may be used only when sulfates in the soil are 0.2 percent or less and dissolved sulfates in the effluent are 1,500 ppm or less. Only Type V cement may be used if sulfates in the soil exceed 0.2 percent or dissolved sulfates in the effluent exceed 1,500 ppm. Concrete culverts and storm drains shall be protected by a minimum of 1.0 m of cover during construction to prevent damage before permitting heavy construction equipment to pass over them during construction.

1.13.3.2 Corrugated Metal Pipe

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. The time to first perforation for corrugated steel pipe shall be determined using the California Chart (California Division of Highways Test Method 643-B). Corrugated metal pipe shall not be allowed in areas where previous satisfactory service has not been achieved. Zinc-coated corrugated steel pipe shall not be allowed if the soil and water pH is less than 6 or greater than 8 or the minimum soil resistivity for the site is less than 2,500 ohm-cm. Aluminum-coated corrugated steel pipe shall not be allowed if the soil and water pH is less than 6 or greater than 9 or the minimum soil resistivity for the site is less than 1,500 ohm-cm. Stiffness of the corrugated metal pipe and soil envelope shall be such that the predicted long-term deflection shall not exceed 5.0 percent. Corrugated metal culverts and storm drains shall be protected by a minimum cover as recommended in Section 26 of AASHTO HB-16 during construction to prevent damage before permitting heavy construction equipment to pass over them during construction. In general, Coated 14 gage CMP is the minimum that will meet the duration requirements.***

1.13.3.3 Plastic Pipe

Stiffness of the plastic pipe and soil envelope shall be such that the predicted long-term deflection shall not exceed 7.5 percent. Plastic culverts and storm drains shall be protected by a minimum of 1.0 m of cover during construction to prevent damage before permitting heavy construction

equipment to pass over them during construction. Split couplers shall not be allowed for corrugated high-density polyethylene pipe.

1.14 TRAFFIC SIGNAGE AND STRIPING

Traffic signage and striping shall be provided for all new roads and parking areas. Signage and striping shall be designed in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways.

1.15 EROSION AND SEDIMENT CONTROL

The Contractor shall be responsible for selecting and implementing Best Management Practices (BMPs) to minimize pollutants in storm water discharges associated with construction activity at the construction site. All erosion and sediment measures and other protective measures shall be maintained by the Contractor in effective operating condition. All temporary structural practices shall be removed once the corresponding disturbed drainage area has been permanently stabilized. **NPDES permit shall be required in accordance with the Kansas Department Of Health & Environment. Permit is required as area disturbed is over 1 acres. Permit can be obtained from industrial programs, stormwater program at (785) 296-5547. The internet website address is <http://www.kdhe.state.ks.us/stormwater/index.html>.**

1.15.1 Temporary Construction Entrance

Tracking of mud from the construction site onto adjacent roads and streets shall be kept to a minimum. A temporary stabilized stone pad shall be constructed at points where vehicular traffic will be leaving the construction site and moving directly onto a paved road or street. It shall extend the full width of the vehicular ingress and egress area and have a minimum length of 70 feet. The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto adjacent roads or streets. If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the stone, then the tires of the vehicles shall be washed before entering the road or street. Any mud which is tracked onto roads or streets shall be removed at least once daily.

1.16 COMPOSITE UTILITIES

The Contractor shall not run utilities underneath buildings. The Contractor shall avoid running utilities underneath streets and parking lots where practicable. In cases where it is necessary for the utilities to cross existing streets, the Contractor shall install the lines by trenchless excavation methods. No open trenching will be allowed through existing streets, unless written permission is obtained and approved by the installation.

1.16.1 Service Line Tracer Wire

For new underground non-ferrous service lines are installed, the service lines shall be identified by a tracer wire to permit locating with a metal detector. Tracer wires shall be 12 gauge AWWG copper wire. The tracer wire shall be installed 150 mm above the pipe.

1.16.2 Service Line Warning

New below grade lines shall be identified by placing a continuous plastic warning ribbon in the trench such that any excavation shall uncover the

ribbon prior to reaching the line.

1.16.3 CATHODIC PROTECTION

Corrosion protection shall be provided for all buried gray or ductile-iron piping, fittings, valves, and other water line appurtenances, regardless of pipe material. Corrosion protection shall consist of an anode type cathodic protection system. See SECTION 01017 ELECTRICAL REQUIREMENTS.

1.16.4 WATERLINES

a. Waterlines shall be designed and constructed in accordance with the combination of the State of Kansas Department of Public Health and Environment's "*Design Criteria for Potable Water Systems (Revised March 31, 1997)*" and the Corps of Engineers Guide Specifications, Technical Manuals (TM), Engineering Manuals (EM), Military Handbooks (MH), and the industry standards listed herein. In the event of conflict, the Contractor shall follow the Local or State requirements/criteria (whichever are more stringent) which govern the waterlines. In addition to the State of Kansas criteria listed above, water distribution systems and service lines shall be designed and constructed in accordance with TM 5-813-5, TM 5-813-7, and UFGS Section 02510 WATER DISTRIBUTION SYSTEM. The Contractor shall be responsible for protection of existing waterlines. If any potable waterlines are damaged during construction, the Contractor must immediately notify the Contracting Officer. The Contractor shall disinfect all new water lines and any remaining lines which do not remain fully pressurized during construction or connection. The Contractor shall notify the Contracting Officer 7 days prior to disinfection of the water lines. The disinfection shall be in accordance with the American Water Works Association Standard AWWA C651, and shall not be considered complete until two consecutive days of bacteriological samples show no contamination. All bacteriological, lead and copper tests shall be performed by Environmental Protection Agency (EPA) certified laboratories. Copies of results of the analyses shall be forwarded to the Contracting Officer upon receipt.

b. The Contractor shall design and provide all facilities required to deliver water to the project. Service connections or extensions to the existing water distribution system shall be made without interruption to service. Sizing of the domestic water service lines for the new facility served shall be determined in accordance with the National Standard Plumbing Code Fixture Count Method. For design of the waterlines, use maximum Hazen-Williams "C" value of 130 for plastic pipe and 120 for other pipe materials.

1.16.4.1 Water Distribution and Service Lines

a. Flow Requirements

Water shall be supplied by service lines of appropriate capacity to provide the flows determined to be necessary to meet all requirements of the new facility. The requirements for sizing the water lines include all domestic use, and interior and exterior fire protection water, as required.

b. Service Connections

A maximum velocity of 10 feet per second (3.048 meters per second) shall be used for metallic piping and five feet (1.5 meters) per second shall be used for nonmetallic piping. Service connections shall be made via corporation stops, appropriate gooseneck connections, or tapping sleeves and valves. The number and maximum size of corporation stops shall be as specified in the UFGS Section 02510 WATER DISTRIBUTION SYSTEM.

c. Dewatering, Hydrostatic Testing, and Flushing of Lines

The Contractor shall be responsible for implementing the terms and requirements of SECTION 01355 ENVIRONMENT PROTECTION for dewatering, hydrostatic testing, and flushing of lines after disinfection.

d. Domestic Service Stop Valve

Building shall be provided with separate service and stop valves in areas readily accessible to maintenance and emergency personnel.

1.16.4.2 Dedicated Fire Water Service Lines

a. Fire Flow Data

Hydrant flow data shall be conducted by the contractor. Data to be recorded with the flow tests are static pressures, residual pressures, flowrates, pump status, date and time tests were conducted, and name of personnel conducting the fire hydrant flow tests. The static pressures, residual pressures, flowrates, test hydrant and flow hydrants shall be shown on the appropriate contract drawings. Fire hydrant flow tests required for fire protection design shall be made in accordance with the procedures specified in AWWA M17, (Installation, Field Testing, and Maintenance of Fire Hydrants). The Contractor shall coordinate with the McConnell Air Force Base Fire Department and BCE prior to conducting such tests. The Contractor shall submit verification of fire hydrant flow test data provided with the design calculations.

b. Fire Hydrants

The Contractor shall be required to install fire hydrants for the new facilities. One fire hydrant shall be located within a minimum of 150 feet (45 m) of the building fire department connection. All other hydrants shall be located in accordance with Military Handbook MH 1008C. Fire hydrant styles shall meet the installation requirements.

c. Dedicated Fire Line

The Contractor shall be required to provide a separate fire water service line to the building for interior fire sprinkler protection in accordance with NFPA 24, and Military Handbook (MH) 1008C. The fire water service line to the building shall be equipped with a Post Indicator Valve (PIV) that can be readily located by the fire department. The PIV shall not be placed closer than 40 feet (12 m) to the building it is serving and shall be provided with a tamper switch connected to the building fire control panel. The PIV shall be protected by base standard pipe bollards, filled with concrete, painted and spaced in accordance with installation requirements.

1.16.5 WASTEWATER

Wastewater lines shall be designed and constructed in accordance with the

combination of the State of Kansas, Dept. of Health and Environment, "Design Criteria Considered in Review of Wastewater Treatment Facilities, Policy 96-1" and the Corps of Engineers Guide Specifications, Technical Manuals (TM), Engineering Manuals (EM), Military Handbooks (MH), and the industry standards listed herein. In the event of conflict, the Contractor shall follow the Local or State requirements/criteria (whichever are more stringent) which govern the wastewater lines.

1.16.5.1 Design Criteria

In addition to the State and Local criteria listed above, the sewage system shall be designed in accordance with TM 5-814-1, TM 5-814-2, and UFGS Guide Specification Section 02531 SANITARY SEWERS. The Contractor shall field verify the location of the existing sanitary sewer system, the sanitary sewer system capacity and invert elevations to ensure that it is adequate for the flows generated by the new facilities. No interruption of service shall be allowed on the existing sanitary sewer line. The Contractor shall coordinate the sequencing of construction as it affects the existing sanitary sewer line with the Contracting Officer. Exterior building sanitary sewer service lines shall be 6 inch minimum diameter. All design slopes will be calculated using the Manning formula. The Contractor shall provide all calculations.

1.16.5.2 Manholes

Manholes are required at all changes of direction, slope, and size. Manholes shall be spaced not more than 300 feet apart. Avoid placing manholes where the tops will be submerged or subject to surface water inflow. Where the invert of the inlet pipe would be more than 18 inches above the manhole floor, a drop connection will be provided. The Contractor shall provide all calculations.

1.16.6 Sewer Mains

The peak diurnal and extreme peak flowrates shall be calculated according to TM 5-814-1. Curved sewers are prohibited. Pipes shall be designed to provide a minimum velocity of two feet per second at the average hourly flowrate, and a minimum velocity of 2.5 to 3.3 feet per second at the peak diurnal flowrate. Maximum velocity shall be 10 feet per second.

1.16.7 Exterior Gas Distribution

This Section contains instructions and engineering requirements relating to the design of the new exterior natural gas distribution system where required, including the building gas service lines and gas service regulator and meter assemblies. The line to the building shall be sized by the Contractor (see minimum service line sizing paragraph Service Line Sizing). The gas distribution systems shall be designed in accordance with NFPA-54, and shall meet the requirements of UFGS Section 02556A GAS DISTRIBUTION. See SECTION 01016, MECHANICAL REQUIREMENTS for additional information and requirements.

1.16.7.1 Service Line Pressure

Natural gas shall be distributed to the building at about 0.4 psi. The designer shall verify the actual gas pressure in the existing gas main.

1.16.7.2 Manholes or Valve Boxes

All manholes, or valve boxes of any nature within the project that do not conform to the new finish grade in either surfaced or unsurfaced areas shall be adjusted to the new finish grade. Where manholes, or valve boxes fall within a surfaced or unpaved roadway or parking, the existing frames and cover shall be removed and replaced with a heavy-duty frame and cover. The structure shall be adjusted as needed to fit the new conditions. All structures shall be of a type suitable for the intended use and shall conform to the requirements of the applicable section of these specifications.

1.16.7.3 Service Line Sizing

The size of the service lines shall be sufficient to supply the demand without excessive pressure drop and shall not be less than one inch in size.

1.16.7.4 Service Line Materials

All new service lines shall be underground and shall be polyethylene. All aboveground lines at the meter set assembly shall be steel as specified in UFGS Section 15190A, GAS PIPING SYSTEMS and Section 01016, MECHANICAL REQUIREMENTS.

1.16.7.5 Cathodic Protection

Cathodic protection shall be provided for all underground metallic piping and fittings except cast iron. Design of cathodic protection system shall in accordance with Section 01017 ELECTRICAL REQUIREMENTS, paragraph entitled "Cathodic Protection".

1.16.7.6 Gas Meters

A new gas meter shall be provided as part of the new service regulator assemblies. Meters shall be provided with a direct non-resettable, digital readout. Meters shall have a pulse switch initiator capable pulse output of operating up to speeds of 500 pulses per minute with no false pulses and shall require no field adjustments or 4-20 mA output. Initiators shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. It shall provide not less than one pulse per 100 cubic feet (2.8 cubic meter) of gas. Meters shall be connected to the EMCS.

1.17 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

1.17.1 Trenches

A trenchless excavation method shall be required when an underground utility line crosses any roadway. Sewer and water lines, mains or laterals, shall be placed in separate trenches. The separate trenches shall maintain a minimum horizontal separation of 10 feet and the bottom of the water line shall be at least 18 inches above the top of the sewer. Sewers crossing above potable water lines shall maintain a vertical separation of 18 inches and must be constructed of suitable pressure pipe or fully encased in concrete for a distance of 3 m on each side of the crossing.

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Bedding and initial backfill material shall be in accordance with the manufacturers recommendations. Where no manufacturer's installation manual is available, trench walls shall be excavated to a

stable angle of repose as required to properly complete the work. Trench excavations shall adhere to requirements prescribed in EM 385-1-1, September 1996, Safety and Health Requirements Manual. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. Excavation, trenching, and backfilling shall be performed in accordance with the UFGS Section 02316A EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS.

1.18 Oil Water Separators

Existing Oil Water Separators (OWS) are at capacity. New OWS must be provided by the contractor for work covered in this contract. OWS are required for the military fuel station and for the Refueler Maintenance Facility. Effluent quality shall meet the KDHE standard. Design, size, location are contractor responsibilities. OWS shall have an alarm sounding when the oil volume reaches the alarm quantity. Trench drains connected to OWS and thence to Sanitary Sewers are required at the Refueler Maintenance Facility and Military Fuel Station. Size, configuration, maintenance methods are the responsibility of the contractor. Ventilation of gasoline fumes and ease of cleaning are required features.

1.19 Termite Treatment

Termite Treatment shall be required for all buildings without chloropyrifos as an active ingredient (shall be equal to Demon TC).

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

SECTION 01013

ARCHITECTURAL BUILDING REQUIREMENTS
[04/03]

PART 1 GENERAL

1.1 REFERENCES

The codes and referenced design publications listed below shall be used as sources of criteria for the architectural design. The most current edition of the code or standard shall be used as criteria for the design unless supplied with a date as listed here. The criteria from these sources may be supplemented but not supplanted, by applicable criteria contained in nationally recognized codes and standards.

DEPARTMENT OF THE ARMY

TI-800-1	Design Criteria
TI-800-2	Design Build Criteria
TM 5-803-5	(Mar 81) Installation Design Guide (Ref: AFM 88-43)
Design Guide	Architectural Compatibility Guide, McConnell AFB, Wichita, Kansas, 1994

BRICK INSTITUTE OF AMERICA

Tech Note 28B	Brick Veneer / Steel Stud Walls Nov. 1999
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DEPARTMENT OF DEFENSE

UFC 3-600-01	(April 2003) Fire Protection Engineering for Facilities
DoD-Standard	(Jan 2002) Department of Defense Antiterrorism Standards for buildings

Federal Standards (FED STD)

FED STD 795	(April 1988) Uniform Federal Accessibility Standards, Available at www.access-board.gov
ADAAG	(January 1998) ADA Accessibility Guidelines for Buildings and Facilities, Available at www.access-board.gov
OSHA	Occupational Safety and Health Standards

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS

UBC-1997	International Building Code, 2000
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NATIONAL FIRE PROTECTION ASSOCIATION

NFPA-101

Life Safety Code, 2000

1.2 GENERAL

The architectural portion of the base bid will provide a new Refueler Maintenance Facility (RMF), POL Operations Center (POLOPS), and Military Fuel Station. Architectural bid options include construction of a canopy for the Military Fuel Station and construction of an inspection bay for the Refueler Maintenance Facility.

The following spaces will be provided within the POL Operation Center: Vestibules, Interior Circulation, Classroom, Laboratory, Lab Office, Ready Room, Control Room, Mechanical/Electrical Room, Communications Room, Janitor's Closet, Break Room, Men's and Women's Toilets (including Locker areas), and Offices.

The following spaces will be provided within the Refueler Maintenance Facility: Vestibule, Offices, Interior Circulation, Mechanical/ Electrical Room, Communications Room, Storage (Bid Alternate only), Men's and Women's Toilets, Men's and Women's Clean Rooms, Tool Room, Wash Bay Equipment (Bid Alternate only), Work Bays and an Inspection Bay (Bid Alternate only).

The canopy for the proposed Military Fuel Pumps will measure 44'-0" x 52'-0" minimum. Clearance height from pavement to the underside of the canopy will be 16'-0".

The attached floor plans and elevations are conceptual and require refinement. However, adjustments by the contractor's design agent to accommodate building equipment, structural components, etc., must be approved by the Contracting Officer.

The attached floor plan for the POL Operations Center contains 4,300 GSF. The Refueler Maintenance Facility floorplan contains 5,601 GSF (base bid), or 6,861 GSF with the optional Wash Bay. These gross square footages may be increased, but not reduced.

Columns will not be allowed within any of the room spaces as laid out on the enclosed floor plans, unless otherwise shown on the drawings. Pilasters and in-wall columns which protrude into the room spaces and interfere with activities and or furniture placement are not acceptable.

1.3 DESIRED IMAGE AND ARCHITECTURAL COMPATIBILITY

The contractor will verify all existing conditions and dimensions during design and prior to construction.

The building will fit the site and be compatible with the surrounding environment and be in full compliance with the base Architectural Compatibility Guide. Building elevations will be similar in appearance to the attached drawings.

The POL Operations Center and Refueler Maintenance Facility are single story buildings with hipped roof structures. Entrance canopies will also be hipped roof structures as indicated in the attached building elevations. Additionally, the Military Fuel Pump canopy will be a hipped roof structure.

Interior materials and finishes will comply with the requirements specified in Interior Finish Schedules on the attached plans and Section 01014 Interior Design Requirements.

1.4 DESIGN CRITERIA

The technical sections provided will serve as the minimum design standards established for this project. Design publications listed in each section shall be used as sources of criteria for design. The criteria from these sources may be supplemented, but not supplanted, by applicable criteria contained in nationally recognized codes, standards, and specifications. The basic US Army Corps of Engineers design guidance is contained in TI-800-1, Design Criteria, TM 5-803-5, Installation Design, and the Design Guide, Installation Design Guide, McConnell AFB.

1.4.1 Fire Safety

The initial basis for determination of building structure type and building area is the UFC 3-600-01. This will direct the designer to the appropriate area of the UBC-1997 and NFPA-101. Fire separation walls and egress from the facilities will meet or exceed the requirements of NFPA-101. Also see Section 01018 FIRE PROTECTION REQUIREMENTS of this document. The POL Operations Center and Refueler Maintenance Facility will be completely fire sprinklered as part of the requirement.

1.4.2 Occupational Safety and Health

Building design will comply with OSHA, Occupational Safety and Health Standards criteria for all items which must be included in the design to ensure safety compliance.

1.4.3 Handicapped Accessibility

The POL Operations Center and Refueler Maintenance Facility will be in compliance with the requirements of the Uniform Federal Accessibility Standards (UFAS), FED STD 795 and Americans with Disabilities Act, ADAAG. In situations where conflicts exist between UFAS and ADA requirements, the more stringent requirement will govern.

1.5 TECHNICAL SPECIFICATIONS

The government provided technical specifications, Unified Facilities Guide Specifications (UFGS) are available at the website identified in Section 01331, SUBMITTALS DURING DESIGN. These specifications will be completely edited by the contractor's design agent and fully coordinated with the drawings to accurately and clearly identify the products used in construction and their installation requirements.

The provided specifications define the minimum requirements and level of quality for items of equipment, materials, installation, and testing that will be provided for the facility. Where items of equipment, materials, installation, or testing requirements are not covered in the provided specifications, the contractor's design agent will prepare new specification sections addressing the requirements, or further elaborate such requirements within existing guide specification sections.

1.6 TYPE AND METHOD OF CONSTRUCTION

1.6.1 Facility Construction

This facility will be designed as permanent construction. The definition of permanent construction per MIL HDBK 1190; "Buildings and facilities designed and constructed to serve a life expectancy of more than 25 years, should be energy efficient, and must have finishes, materials, and systems selected for low maintenance and low life-cycle cost".

1.6.2 Exterior Walls and Finish Materials

Exterior walls and finish materials will be selected on the basis of architectural compatibility and appearance in accordance with the design provided. The outside face of the exterior walls will be composed of face brick and exterior insulation and finish system (EFIS). Exterior walls will have a minimum insulation of R19 based on aged insulation values for the opaque portion of the exterior wall construction. If steel stud backup is used in the exterior wall construction, the insulating value of the insulation material between studs must be de-rated in accordance with ASRAE 90.1 table 8C-2. Exterior foundation walls shall have 2" of Polyurethane Type II perimeter insulation from the top of the footing to the underside of the floor slab. In addition, brick veneer and steel stud back up shall be designed in accordance with the Brick Institute's Tech Note 28B.

All interior cavity thru-wall flashing shall be a metal type.

1.6.3 Interior Wall Construction

All interior walls will be permanent noncombustible construction. Steel studs when used will be sized according to the wall heights. Framing shall be spaced at a maximum of 16" on center. The contractor will design the partition framing and furring system to be capable of carrying a transverse load of 5 PSF without exceeding either the allowable stress or a deflection of L/240.

Interior walls requiring fire ratings will be designed and constructed in accordance with an UL tested system. Fire rated walls will be continuous from the floor to the structural roof deck above. These walls will allow for structural deflection of the roof structure.

1.6.4 Floors

The Refueler Maintenance Facility will have a minimum 10 inch thick reinforced concrete floor slab with hardened non-slip surface in the work and inspection bay areas, placed on granular base and engineered fill materials recommended by the Offeror's geotechnical engineer. Other areas of the Refueler Maintenance Facility, and the POL Operations Facility, will have concrete slabs, granular base and engineered fill materials placed in accordance with the geotechnical engineer's recommendations. All interior slabs will be consistent in thickness in any one room. Floors containing floor drains will be constructed to slope to the drains.

Interior stairs providing access to/from the Refueler Maintenance Facility work/inspection bays and administrative area will have steel nosings and safety strips.

The floor slab in the POL Operations Center Laboratory will be depressed 6" as indicated in the attached plans. Steps to/from the depressed will be provided as indicated.

Finish floor materials will be provided in accordance with the Material Finish

Schedules and Section 01014, Interior Design Requirements.

1.7 EQUIPMENT AND FURNISHINGS

1.7.1 Contractor Furnished and Installed Equipment

Contractor Furnished and Contractor Installed equipment within these facilities will include, but not be limited to the following:

POL Operations Center:

- Toilet Accessories and Partitions
- Built-in benches
- Fire extinguisher cabinets (2) & extinguishers (1)
- Plastic laminate surfaced casework
- Metal laboratory casework
- Two compartment sink w/high rise faucet
- Exhaust hood
- Vacuum Pump
- Emergency shower and eye wash station
- Utility sink
- Garbage disposal
- Double bowl SS sink w/faucet & spray attachment (Break Room)
- Large single bowl SS sink w/ high rise faucet (Laboratory)
- Shelving and mop rack in Janitor's Closets
- Drinking fountains, including (1) ADA compliant
- Slide-in electric range
- Range hood w/fire suppression system
- Double tier metal lockers w/canted tops
- Wall or ceiling mounted T.V. monitor brackets
- Key storage cabinet

Refueler Maintenance Facility:

- Toilet Accessories and Partitions
- Built-in benches
- Fire extinguisher cabinets & extinguishers
- Emergency shower and eye wash stations
- Utility/shop sink w/spray attachment
- Waste oil collection system
- Fully recessed 75,000 lb. hydraulic lift and related equipment
- Overhead crane rail rated for 2 ton capacity
- Electric overhead door openers
- Drinking fountains, including (1) ADA compliant
- Air Compressor and related equipment
- Vehicle wash system
- Double tier metal lockers with canted tops
- Key storage cabinet

Military Fuel Pumps and Canopy (Bid Alternate):

- Dual nozzle fuel pumps
- Automatic pump control system
- Fire extinguisher cabinet & extinguisher

1.7.2 Government-Furnished, Contractor Removed/Reinstalled Equipment

The government will provide equipment indicated below. The contractor

shall remove, transport and install this equipment in the POL Operations Center:

- Full-size refrigerator
- Dishwasher
- Water filtration system for dishwasher
- Fire extinguisher and fire blanket
- Laboratory warning signage

1.8 SOUND AND VIBRATION CONTROL

1.8.1 Wall Construction

Construction methods, materials, and finish materials shall be selected to impede transmission of the human voice and equipment vibrations. Noise generating equipment and activity centers will be isolated through conventional methods where possible. Utilization of equipment isolators, construction of full height walls, stud staggering, and offsetting of receptacles and other wall penetrations will be used to limit sound transmission. All interior walls will extend up to the underside of structural deck. Walls surrounding an office, classroom, control room, break area, etc will be full height with sound attenuation insulation batts, with a minimum sound transmission class (STC) of 50.

1.8.2 Sound Absorption

Installation of sound absorption materials and other techniques will be used throughout the facility to reduce noise reverberation.

1.9 PHYSICAL SECURITY

Conventional security measures, such as: door locking hardware, will be incorporated into the facility design and development. See specific paragraphs in this section for additional security criteria.

1.10 ECONOMY AND VALUE OF BUILDING CONSTRUCTION

1.10.1 Economy

All materials will be readily available within the local area, as shall sufficient trades to construct the building. Special or unique forms of construction should avoided, where skilled workers within the local area are not readily available.

1.10.2 Operations and Maintenance

Material selections will be based upon reducing operation and maintenance costs. All materials will be easy to clean and resist soiling. No material on the exterior of the building shall require field painting, except hollow metal doors and frames.

1.10.3 Life Cycle Cost

Material selection shall be based upon overall Life Cycle Cost to the Government.

1.11 TECHNICAL REQUIREMENTS

1.11.1 Exterior walls

The primary finish material for the exterior walls shall be face brick and Exterior Insulation and Finish System (EFIS).

1.11.2 Miscellaneous Metals

1.11.2.1 Access Doors and Panels

Access doors and panels shall be flush type. Frames for access doors will be fabricated of not lighter than 16 gauge steel with welded joints and finished with anchorage for securing into construction. Access doors will be a minimum of 14" by 20" and of not lighter than 14 gauge steel, with stiffened edges, complete with attachments. Access doors will be hinged to frame and provided with a flush face and a keyed operated latch. Exposed metal surfaces will have a shop applied prime coat. Finished paint coat will match surrounding surfaces. Panel will be installed in uninhabitable rooms (i.e., closets) and/or non-conspicuous locations.

1.11.2.2 Louvers

Location and sizing of louvers in the exterior walls will be consistent with the attached building elevations. Louvers shall be aluminum with dark bronze anodized finish. Force protection issues require that all intake air for the HVAC system be brought into the building 10'-0" above grade. See mechanical requirements Section 01016. Recommended louver locations are indicated on the attached building elevations.

1.11.3 Roof Design

1.11.3.1 Structural Standing Seam Metal Roofing

All proposed structures will have a 13" or 19" Structural Standing Seam Metal roof, polyvinylidene fluoride (Kynar 500). Color will be federal specification 595b, No. X3617. The standing seam roofing will meet the requirements of specification section 07416, Structural Standing Seam Metal Roofing. The roof will also meet the load, deflection and uplift requirements of the criteria listed in section 01015.

1.11.3.2 Military Fuel Pump Canopy (Bid Alternate)

A hipped roof canopy measuring approximately 44'-0" by 52'-0" (minimum) will be located as indicated on the attached site plan. This canopy will be steel framed with structural standing seam metal roofing. The canopy will meet the load, deflection and uplift requirements of the criteria listed in section 01015. The canopy columns will have brick veneer and EFIS enclosures as indicated on the attached elevations. The underside of the canopy will be covered with a factory finished aluminum or steel soffit to prevent birds from nesting in steel framework. Lighting will be provided in the soffit of the canopy.

1.11.3.3 Roof Insulation

Roofing insulation will be a polyisocyanurate type. A minimum aged "R" value of the roofing insulation will be R30, based upon a maximum R-5.56 per 1" of thickness. Therefore, the total roofing insulation thickness will be a minimum 6".

A single ply vapor barrier will be installed between the roofing deck and the bottom of the roofing insulation. The thickness of the vapor barrier will be in accordance with the roofing system standard thickness.

1.11.4 Sheet Metalwork, General

Contractor will include a quality assurance plan which includes a checklist of points to be observed, prior to start of roofing work.

Fascia shall have "V" crimps and a stable substrate as required to prevent "oil-canning" effect. Finish will be dark bronze anodized.

1.11.5 Windows

1.11.5.1 Exterior Windows

Exterior windows will have aluminum thermal break frames and insulated glazing as specified in UFGS Section 08810 GLASS & GLAZING. Windows will be deep set with a dark bronze anodized finish. Glazing will be medium bronze tint. Exposed trim will be dark bronze anodized aluminum. Window installation must meet the following DoD-Standard Antiterrorism force protection requirements: To ensure that the full strength of the laminated glazing is engaged, frames, mullions, and window hardware will be designed to resist a static load of 1 lb per square in applied to the surface of the glazing. Frame and mullion deformations will not exceed 1/160 of the unsupported member lengths. The glazing will have a minimum frame bite of 3/8" for structural glazed window systems and 1" for window systems that are not structurally glazed. Frame connections to surrounding walls will be designed to resist a combined loading consisting of a tension force of 200 lbs/in and a shear force of 75 lbs/in. Alternatively, use frames that provide an equivalent level of performance.

1.11.5.2 Interior Windows

Windows located in the interior walls of the POL Operations Center and Refueler Maintenance Facility will be hollow metal frames. These windows will have tempered, laminated glazing as specified in UFGS Section 08810 GLASS & GLAZING. Window frames will be painted to match the door frames. Pass-through window units in the POL Operations Center Laboratory and Control Center will be a two lite slider type and measure approximately 3'-6" x 4'-0". Window units in the Refueler Maintenance Facility Offices will be fixed type measuring approximately 4'-0" x 6'-0". The top of the interior windows will match the top of the interior door frames.

1.11.6 Doors

1.11.6.1 Exterior Doors

Exterior personnel doors will be insulated, heavy duty level 3, flush hollow metal doors in accordance with specification section 08110, Steel Doors and Frames, except the main entrance doors, Laboratory exterior door, Break room exterior door, Work Bay exterior doors (2), and Inspection Bay exterior door. These doors will be aluminum storefront in accordance with Specification 08120, Aluminum Doors and Frames. Exterior doors and glazing will meet the same force protection requirements as exterior windows. Exterior H.M. doors and frames and frames will be painted to match the dark bronze anodized finish specified for aluminum windows. Exterior aluminum doors will be dark bronze anodized finish.

1.11.6.2 Interior Doors

Interior doors for the POL Operations Center will be solid core wood in accordance with specification section 08210, Wood Doors. Frames for wood doors will be hollow metal. Interior doors for the Refueler Maintenance Facility will be flush solid core metal in accordance with section 08110, Steel Doors and Frames.

1.11.7 Hardware; Builder's (General Purpose)

1.11.7.1 Locks and Latchsets

All doors will be lockable, except toilets, locker areas and interior vestibule doors. All keyed locks will have removable lock cylinders. All doors shall have lever handles.

1.11.7.2 Lock Cylinders

Provide Corbin cylinders, 7 pin, Kaba Peak keyway to match the existing McConnell AFB grandmaster. Each lock will be provided with 4 change keys

1.11.7.3 Lock Trim

The doors of these facilities will have lever handles. All exterior doors will have panic type hardware, except doors from mechanical/ electrical and communications rooms.

1.11.8 Keying

Locks and special key hardware will be keyed to the McConnell AFB master key system. The contractor will provide construction cores. The Contractor will meet with the Contracting Officer's Representative and the Base Locksmith prior to developing the keying schedule. A grand master keying system will be provided for each building. All of the keys will be keyed in one series, except the mechanical/electrical and communication equipment rooms. Locks for all mechanical/electrical, and communications equipment rooms will be keyed to the existing Base utility keying system.

1.11.9 Auxiliary Hardware

All exterior doors will have aluminum housed type weather seals. All fire rated doors will have compression type seal gasketing.

1.11.10 Finishes

Door hardware finish will match satin stainless steel Type 630.

1.11.11 Door Hardware

1.11.11.1 Hardware Requirements

Door hardware in fire-rated walls will comply with NFPA and other applicable criteria.

1.11.11.2 Hardware Sets

The following hardware sets listed are the minimum functional hardware requirements for each door types. The contractor's design agent will review these requirements and determine if additional hardware is necessary prior to construction.

a. Exterior Steel Doors

(1) All single exterior personnel doors except communications rooms will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Exit Device
- Lockset
- Overhead closer
- Wall or floor Stops
- Weatherstripping
- Rain drips
- Threshold
- Kickplate
- Silencers

(2) All double exterior doors except mechanical/electrical rooms will have the following hardware features:

- 3 Pr Grade 1 hinges
- Surface vertical rod exit devices
- Lockset
- Overhead closer (Both leafs)
- Wall or Floor stops
- Kick plate
- Weatherstripping
- Rain drips
- Threshold
- Silencers

(3) All Communications room doors will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Lockset
- Overhead holder (grade 1)
- Kickplate
- Weatherstripping
- Rain drips
- Threshold
- Silencers

(4) All double exterior mechanical room/electrical room doors will have the following hardware features:

- 3 Pr Grade 1 hinges
- Lockset (active leaf)
- Overhead holder both leaves (grade 1)
- 2 Lever extension flush bolts(grade 1) (inactive leaf)
- Kickplate
- Weatherstripping
- Astragal
- Rain drips
- Threshold
- Silencers

b. Interior Doors

(1) All single doors, except where specified otherwise, will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Lockset
- Overhead closer
- Wall or floor stops
- Silencers

(2) POL Operation Center Control Room door will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Cypher lock (Simplex Unican Series 1000, model 1021C or equal)
- Overhead closer
- Wall stop
- Silencers

(3) Restroom and locker/clean room doors (excluding fire rated partitions) will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Push Plate
- Pull with Plate
- Overhead closer
- Wall or floor stops
- Kick plate
- Silencers

(4) Restroom doors in fire rated partitions will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Latchset (hositality, push/pull)
- Overhead closer
- Wall or floor stops
- Kick plate
- Silencers

(5) Doors separating the Refueler Maintenance Facility work bay and inspection bay areas from the administrative areas will have the following hardware features:

- 1-1/2 Pr Grade 1 hinges
- Exit Device
- Lockset
- Overhead closer
- Wall stops
- Weatherstripping
- Threshold
- Kickplate

(5) Double interior personnel doors at the Refueler Maintenance Tool Room room will have the following hardware:

- Grade 1 hinges
- Push Plate
- Pull with Plate
- Overhead holder both leaves (grade 1)

Weatherstripping
 Overhead closer (both leafs)
 Kick plates

(6) Double or single interior personnel doors to vestibules will have the following hardware:

Grade 1 hinges
 Push Pull bars on both sides
 Overhead closer(s) (Both leafs if double door)
 Wall or Floor stops
 Kick plates

1.11.12 Key Storage System

A recessed wall mounted key cabinet will be provided in Office 113 (POL Operations Center) and Office 108 (Refueler Maintenance Facility). The key cabinet will contain all additional keys for all areas of the applicable building. Cabinet will have the capacity to store a minimum of two keys for each room on an individual key hook. Key hooks will be mounted on panels with sufficient distance between hooks that will allow easy identification and removal. Cabinet key panels will be readily removable and capable to insert additional panels for expansion needs. Key cabinet will have key locking capabilities. Cabinet door will be a full height piano hinge.

1.11.13 Gypsum Wallboard

Predecorated gypsum board is not considered acceptable.
 Exterior gypsum soffit board is not considered acceptable.

1.11.14 Exterior Signage

1.11.14.1 Unit Identification Signage

Exterior unit identification signage will be provided in accordance with details contained in the plans, and shall be mounted on an exterior wall surface at a location determined by Contracting Officer. Exterior signage shall be of the size and type as shown on the drawings and/or as detailed and described herein. Signage shall be complete with lettering, reflective backing material, fasteners, brackets, and associated components for a complete installation. Materials and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of facility signage. Letters shall be installed flush against the wall surface without use of extender sleeves.

Individual letters shall be fabricated from solid acrylic and shall be 12-inches in height. Text shall be all upper case (all capitals) Helvetica Medium, except for use of lower-case for the small "nd" in 22d with the bottom of all letters flush along baseline. Individual letters shall have a depth of 1-inch. The messages shall read as follows:

Sign One:
 22nd LRS POL

Sign Two:
 22nd LRS REFUELING MAINTENANCE

Note: The contractor must verify this information with the Base Civil Engineer prior to fabrication

Threaded studs, of number and size as recommended by manufacturer, shall be secured in quick-setting mortar or sealant for concealed anchorage. Letters shall be mounted with mounting studs and be flush with building surface. Templates for mounting shall be supplied.

1.12.2 Real Property Building Number Signs

The POL Operations Center, Refueler Maintenance Facility and Military Fuel Station will receive a Real Property Facility Number Sign (AFP 32-1097 Type B5 Building Number Sign). These signs shall consist of white reflective numbers on brown reflective sheeting adhered to aluminum blanks (8-inches in height, 16-inches in width) utilizing 4-inch high Helvetica Medium numbers and fastened directly to wall surface with exposed fasteners (fastener heads painted after installation). Sleeves shall be utilized on Exterior Finish and Insulation System (EIFS) with fasteners embedded into solid substrate. The sign(s) shall be installed at locations as directed by the Contracting Officer. The numbers for the new facilities are as follows:

POL Operations Center -	955
Refueler Maintenance Facility -	952
Military Fuel Station -	953

1.11.15 Fire Extinguisher Cabinets

Fire extinguisher cabinets will be fully recessed type with a flat metal door. Clear plastic bubble type door fronts are not acceptable. Fire extinguisher cabinets will be located in accordance with NFPA Life Safety Code #101. Color of the cabinets will match that of the wall.

1.13.1 Fire Extinguishers

Fire extinguishers will be provided in all fire extinguisher cabinets. Extinguishers will be 10lb, ABC type in all locations except mechanical rooms. Mechanical rooms will receive 10 lb, BC type. The contractor's design agent will verify this information with the base fire department prior to design.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION 01016

MECHANICAL REQUIREMENTS

02/02

PART 1 TECHNICAL REQUIREMENTS

This Section contains instructions and engineering requirements relating to the design of the new mechanical systems for the Refueler Maintenance Facility (RMF), POL Operations Center (POLOPS), and Military Fuel Pumps. The design of all systems shall comply with the standards listed below in the Reference section. Delineation of the mechanical work between the building and the site utilities construction shall generally, with the exception of the natural gas system, be a point 5 feet outside of the building. The design and installation of all mechanical systems, including manufacturer's products, shall meet the instructions and requirements contained herein and the requirements of the provided technical guide specifications. Where conflicts between these instructions and the guide specifications or criteria exist, these instructions shall take precedence.

Any installation requirements within these instructions, but not contained in the specifications, shall be added to the specifications or shown on the drawings. The HVAC system type for the Refueler Maintenance Facility (RMF) and POL Operations Center (POLOPS) has been selected by the government on the basis of lowest Life Cycle Cost as required by Federal Law 10CFR436 to approach the Energy Use Budget (EUB) as required by Federal Law 10CFR435. Individual mechanical equipment selection by the designer shall also consider life cycle operability based on 25 years, maintenance and repair of the facility and real property installed equipment components and systems. The mechanical systems of the Refueler Maintenance Facility (RMF) shall consist of gas distribution, plumbing, all water hydronic heating with overhead unit heaters for the maintenance bays, gas fired unitary heating and split system DX cooling equipment for non-work bay areas including administration, air supply, distribution, ventilation, exhaust systems, and direct digital control systems with the following components as specified herein. The mechanical systems of the POL Operations Center (POLOPS) shall consist of gas distribution, plumbing, all hydronic hot water heating, split system direct expansion cooling, two-deck multizone air handler for administration, air supply, distribution, ventilation, exhaust systems, and direct digital control systems with the following components as specified below. The mechanical systems of the Military Fuel Pumps shall consist of new tank truck bulk off-loading, tank truck bulk loading, and ground vehicle dispensing pumps and dispenser for the two existing above ground tanks 3 and 4, and ground vehicle dispensing pumps and dispenser for the two existing underground tanks 7 and 8 as specified below.

- a. Interior Gas Piping Systems.
- b. Thermal Insulation of Mechanical Systems.
- c. Plumbing Systems.
- e. Hydronic Heating Systems.
- f. Pulse boilers.
- g. Refrigeration/Chilled Water Systems.
- j. Hot and chilled water pumps.
- k. Horizontal, ceiling hung, DX-type computer room or fan coil unit one per communication room.
- l. multi-zone air handler.
- o. Exhaust fans

- p. Propeller Unit Heaters (Located in the mechanical rooms.)
- q. Appropriate DDC controls for all systems.

All equipment installed shall be capable of maintaining the design conditions for all spaces throughout the life of the facility. Ease of access to components and systems in accordance with industry standards and safe working practices is a design requirement. Maintenance clearances shall be as minimum as recommended by the equipment manufacturer. All like equipment and accessories shall be from a single manufacturer.

1.1 REFERENCES

The design shall comply with good engineering practice. Mechanical systems shall be designed to comply with the documents listed below, whether or not referenced otherwise in this specification. The publications are referred to in the text by basic designation only. The latest edition of the following standards and codes in effect and amended as of date of supplier's proposal, and any subsections thereof as applicable, shall govern design and selection of equipment and material supplied:

Air Conditioning and Refrigeration Institute (ARI) Standard

American Conference of Governmental Industrial Hygienists (ACGIH) - Industrial Ventilation, A Manual of Recommended Practice, 24th Edition.

American Society for Testing and Materials (ASTM) publications - A53, D1248, F876, F877.

American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):

Guides; Terminology of HVAC&R, 2nd Edition etc.
Guideline 1, The HVAC Commissioning Process.

Handbooks; 1999 HVAC Applications, 2002 Refrigeration, 2001 Fundamentals, 2000 HVAC Systems & Equipment, etc. SI editions

Standards; 15-1994, 54-1992, 62-1999, 90.1-1989 & Addendum 90.1-1989, 52.1-1992, 111-88 etc..

American National Standards Institute (ANSI) publications - Z83.6.

American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. box 2900, Fairfield, N.J. 07007-2900.

Army Technical Instructions, TI 800-01, Design Criteria, dated Jul 1998.

Army Technical Instructions, TI 809-04, Seismic Design for Buildings, dated Dec 1998.

Army Technical Instructions, TI 810-10, Mechanical Design, Heating Ventilating and Air Conditioning, dated Feb 1999.

Army Technical Instructions, TI 810-11, Heating, Ventilating and Air Conditioning Control Systems, dated Nov 1998.

Army Technical Instructions, TI 810-32, Heating and Cooling Distribution Systems, dated Jan 2002.

Army Technical Manual, TM 5-805-4, Noise Control for Mechanical Equipment, dated May 1995.

Army Technical Manual, TM 5-810-5, Plumbing, dated Aug 1993.

Instrument Society of America Standard (ISA S75.01), Current edition.

Manufacturers Standardization Society of the Valve and Fitting Industry, Inc. (MSS) Standards

UFC 3-600-01, Fire Protection for Facilities

MIL-HDBK-1022A, Petroleum Fuel Facilities

National Fire Codes (NFPA), with most current updates, including NFPA 70 National Electrical Code (NEC).

International Plumbing Code (IPC).

Sheet Metal and air-conditioning Contractors National Association (SMACNA) Standards

Underwriters Laboratories (UL 142),(UL 441) Current edition.

International Building Code, latest edition

Military Criteria is available on the internet at www.usace.army.mil/inet/usace-docs/ and/or www.hnd.usace.army.mil/techinfo/instruct.htm.

Engineering Weather Data, TM 5-785, dated Jul 1978.

1.2 General Mechanical Requirements

As applicable, the following shall be provided for all new mechanical systems:

1.2.1 Design Submittals

Drawings, specifications, design analysis and calculations shall be provided in accordance with SECTION 01019 - DESIGN AFTER AWARD-35 PERCENT, SECTION 01020 - DESIGN AFTER AWARD-60 PERCENT and SECTION 01021 - DESIGN AFTER AWARD-100 PERCENT.

1.2.2 National Electrical Code NFPA 70 (NEC), Class 1 Requirements.

The NEC requirements apply to all facilities, and shall be exceeded as follows; All equipment installed above the floor, including near the roof, in the Work Bays and Inspection Bay of the Refueler Maintenance Facility (RMF) shall meet Class 1 Division 1 requirements. Other requirements, including Class 1 Division 1 area, per NEC shall apply.

1.2.3 Technical Specifications

For minimum technical specification requirements see SECTION 15000 - MECHANICAL SYSTEMS - OUTLINE SPECIFICATIONS.

1.2.4 Equipment Efficiency

Mechanical equipment shall be energy efficient per Executive Order 12902, 13123 and ASHRAE/90.1. Where products are not yet rated as energy efficient products by ENERGY STAR (Registered Trademark) the Contractor should strive to provide products that meet the above criteria and be in the upper 25 percent of energy efficiency as designated by FEMP.

1.2.5 Mechanical/Electrical Equipment Coordination

Arrangement of all mechanical equipment and piping shall be coordinated with electrical work to prevent interference with electrical components. Special care shall be taken with conduits and other components that may run through the mechanical room and to insure adequate space in shared chases. Mechanical equipment (pipes, ducts, etc. unless items solely serve the area) shall not be installed OVER OR WITHIN SPACE which is dedicated to transformers, panelboards, or other electrical equipment unless items solely serve the area. When electrical equipment is located in a mechanical equipment room, the dedicated electrical space shall be indicated by a dashed line and noted "Electrical Equipment Space".

1.2.6 Finished Spaces.

All piping and equipment located in finished areas of the building shall be concealed or furred-in; exposed piping and equipment is only allowed in utility, equipment, storage and other rooms of this nature.

1.2.7 Mechanical Spaces.

There is some flexibility in the size of some of the mechanical spaces. All mechanical rooms and yards shall have sufficient size as required to house all mechanical equipment and provide adequate clearance as specified below. All clearances required by the equipment manufacture for operation, routine maintenance, and replacement of minor and major components shall be provided for all mechanical equipment. Piping and supports shall not interfere with equipment maintenance access or pull space. In addition a minimum of 2 feet clear shall be provided around all mechanical equipment. Ample space shall be provided around equipment to allow unobstructed access for entry, servicing, and routine maintenance to include pull space for service and/or replacement of filters, coils, motors, boilers and other equipment items. Pull space provided in rooms for service and/or replacement of mechanical equipment items shall be indicated with broken (dashed) lines on the drawings. Provisions for installation, removal, and future replacement of equipment shall be coordinated with the architectural design. The arrangement, selection, and sizing of all mechanical equipment shall be such that it can be broken down and removed from the building without dismantling any adjacent systems or structures. All required clearances shall be provided for government acceptance to verify mechanical space layout. Servicing and maintenance areas interior and exterior to building shall be sized according to manufacturer's recommendations for equipment. All pipe insulation shall be jacketed within 6 feet above the finished floor.

1.2.7.1 Mechanical Room.

The mechanical room shall house the boilers, air handling units, domestic hot water heating system, all pumps, and miscellaneous equipment. The gas service, domestic service and fire service entrances shall also be located in the mechanical room. The mechanical equipment room layouts shall be

provided with ample floor space to accommodate routine maintenance of equipment and have head-room to accommodate required equipment as specified above.

1.2.7.2 Mechanical Equipment Yard.

The mechanical equipment yard shall house the air cooled condensing unit(s). The equipment yard shall be as specified in Section 01012, SITE WORK/CIVIL/UTILITIES. In addition, ample space shall be provided around all cooling equipment to allow adequate air flow for heat rejection with consideration to the type of screening provided. At a minimum, all clearances shall be per the manufacture's recommendations.

1.2.8 Roof Mounted Equipment

Except for plumbing vents and boiler vents, no other mechanical equipment shall be located on the roof of the facility.

1.2.9 Safety, Noise and Security.

Equipment shall be selected to meet the following safety, noise, and security criteria:

1.2.9.1 Rotating Guards.

All mechanical equipment selected shall have proper guards for rotating parts.

1.2.9.2 Noise.

All equipment selected shall not produce objectionable noise or vibration in occupied areas. All air supply devices shall be selected to have a noise criteria rating of NC30 or less.

1.2.9.3 Vibration Isolation/Equipment Pads

Provide vibration isolation devices on all new floor mounted or suspended mechanical equipment. All new floor mounted mechanical equipment shall be provided with housekeeping pads. Housekeeping pads shall be as specified in Section 01015, Structural Requirements.

1.2.9.4 Mechanical Rooms.

All mechanical rooms shall be secured and shall have access by only authorized personnel.

1.2.9.5 Fire Rated Walls

Fire-rated of walls shall be as required in Section 01013 ARCHITECTURAL BUILDING REQUIREMENTS.

1.3 General Facility Descriptions and Requirements

1.3.1 Refueler Maintenance Facility (RMF)

The purpose of the facility is for repair of refueler vehicles, which are are completely full in most cases, and can weigh 68,000 lbs, with the fuel weight at 40,000 lbs. Thus an empty truck weighs 28,000 lbs. The R-11 refueler truck is 22 ½ feet long and the R-12 refueler truck is 14 feet

long. All work shall conform to MIL-HDBK-1022A, Petroleum Fuel Facilities, UFC 3-600-01, Fire Protection Engineering for Facilities, Industrial Ventilation by ACGIH, and other references listed in this section.

1.3.2 POL Operations Center (POLOPS)

The purpose of the facility is to control fuel dispensing at the installation. All work shall conform to MIL-HDBK-1022A, Petroleum Fuel Facilities, UFC 3-600-01, Fire Protection Engineering for Facilities, Industrial Ventilation by ACGIH, and other references listed in this section.

1.4 HVAC Load Calculations.

This Section contains instructions and engineering requirements relating to the design of the new HVAC supply and distribution systems. The design of all systems shall comply with the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Handbooks, Terminology of HVAC&R guide and to the requirements of NFPA Standards Nos. 90A. Load calculation procedures shall be based on ASHRAE. Calculations shall be provided for all mechanical equipment such as boilers, heating & cooling coils, condensing units, unit heaters, piping, pumps, expansion tanks, fans, ducts, louvers, gas services and piping, plumbing, water heaters, and etc. Deleted sentence.

1.4.1 Safety Factors

A 20% safety factor shall be applied to the total room-heating load. A 10% safety factor shall be applied to the total room-cooling load.

1.4.2 Infiltration Rates.

All outdoor air shall be introduced into the occupied portions of the buildings through the air handling unit or the blower coil unit. Therefore, all occupied spaces shall be positively pressurized. However, for the purposes of sizing equipment, an infiltration rate of 0.5 air changes per hour (ACH) shall be included for all rooms with an exterior exposure. A rate of 4 ACH shall be allowed for the vestibules. Deleted sentence.

1.4.3 Building Thermal Properties.

Building thermal properties shall be as follows;

Coefficient of Heat Transmission ("U" Value)	
Roofs	0.030 Btu/square ft - degree F
Walls	0.058 Btu/square ft - degree F
Windows	0.31/0.32 Btu/square ft - degree F (winter / summer)
<u>Exterior doors shall be hollow metal with rigid insulation cores.</u>	

These values represent the minimum acceptable level of building insulation. The mechanical designer shall verify the actual building materials meet or exceed these values. If the building envelop fails to meet these levels, the mechanical designer shall inform the Contractor, the Architectural designer and the Contracting Officer's representative of the condition and recommended corrective action. A copy of all calculations shall be included in the design submittal.

1.4.4 Computer Programs.

Capacity of heating and cooling systems shall be based on load calculations for individual spaces as well as block loads. Heat loss and heat gain calculation shall use actual design U-values. All calculations shall be based on ASHRAE methods as computed by a commercially recognized computer HVAC loads program i.e., Elite Software Inc., Trane Trace Load 700, Carrier E20-II Hourly Analysis Program (HAP) version 3.04 . A copy of all load calculations, both input and output, shall be included in the design submittal.

1.4.4.1 Delete Paragraph

1.4.4.2 Delete Paragraph

1.4.5 Internal Heat Gains for Cooling Calculations

All installed electrical equipment shall be assumed to impose 100% resistive heating load on the space except as indicated below for return air plenums.

1.4.5.1 Lighting Loads

The heat gain from space lighting loads shall be coordinated with Electrical Design Engineer (see Section 01017 ELECTRICAL REQUIREMENTS). Where the space above the ceiling is a return air plenum, than a minimum of 70% of the heat gain from the lights shall be assumed to place a direct load on the space. A maximum of 30% of the heat gain from the lights shall be assumed to place a direct load on the return air plenum.

1.4.5.2 Communication Equipment Loads

The heat gain from the communication equipment installed in the communication equipment rooms shall be coordinated with Electrical Design Engineer (see Section 01017 ELECTRICAL REQUIREMENTS).

1.4.5.3 PC/monitor/printer Loads

The heat gain from each PC/monitor/printer combination shall be 240 watts total per station.

1.4.5.4 People Loads

The heat gain from people shall be 75 Watts/person sensible and 70 Watts/person latent for walking and standing per ASHRAE Handbook of Fundamentals.

1.4.5.5 Solar, Transmission, conduction, slab loads etc Loads

The heat gain from solar sources shall be as shown in ASHRAE Handbook of Fundamentals.

1.4.6 Deleted Paragraph

1.4.7 Deleted Paragraph

1.5 HVAC Load Calculations.

1.5.1 Heating & Cooling Equipment.

1.5.1.1 Outdoor Design Temperatures.

Outdoor design conditions shall be in accordance with TM 5-785 Engineering Weather Data.

1.5.1.2 Indoor Design Temperatures.

Mechanical designs shall give maximum consideration to the comfort of the occupants. The HVAC systems shall, at all times, maintain all occupied spaces, except for the restrooms, laundry and utility spaces, within the ASHRAE comfort zone as defined in Standard 55-1992, Thermal Environmental Conditions for Human Occupancy. The restrooms and laundry shall be maintained with in this same comfort zone when exterior temperatures and humidities are below the comfort zone. Actual indoor design conditions and setpoints, in degrees F, shall be as follows:

Occupied Areas	Heat/Cool	68/78, 50%RH
Storage/Rest rooms	Heat/(Vent)	68/84
Mechanical/utility	Heat/(Vent)	55/84
unoccupied/Setback	Heat only	55

1.5.1.3 Heating

All areas of the buildings shall be heated. Vestibules, etc, shall be heated for freeze protection of sprinklers only (or Mechanical design shall be coordinated with the Fire Sprinkler Installation for freeze protection).

1.5.1.4 Cooling

All areas of the buildings shall be provided with mechanical cooling (via refrigeration) except for the RMF work bays, restrooms, vestibules, storage areas, mechanical rooms, and electrical rooms. The storage areas, mechanical rooms, and electrical rooms shall receive additional ventilation as specified below for summer cooling. Note, all communication room shall be provided with mechanical cooling and positively pressurized.

1.5.1.5 Humidity

Humidity shall not be directly controlled in any space during the cooling season. Humidity control shall be limited to 50% relative humidity through good selection of the cooling coil. Deleted Sentence.

1.6 Ventilation.

1.5.2 Mechanical Ventilation.

The design shall insure that indoor air quality shall be maintained for all occupants during the occupied periods. Mechanical ventilation shall be provided to the buildings in strict accordance with ASHRAE Ventilation Standard 62. The maximum ventilation rate per system shall be calculated using the Ventilation Rate Procedure. The outside air rates for each system shall be corrected for multiple spaces as required by ASHRAE Ventilation Standard 62. A complete room by room ventilation analysis for

each AHU shall be included in the design submittal.

1.5.3 Combustion Air

The mechanical equipment rooms containing gas burning equipment that is not directly vented to the outdoors for both combustion air and combustion by-productst shall be provided with combustion air louver sized and located in accordance with NFPA 54. Care shall be taken in design in order to minimize the potential for piping freeze-up in the mechanical room due to combustion air intake.

1.5.4 Building Exhaust.

A undercut door and/or transfer duct shall be required to allow for replacement air when required make-up air is specified to be transfered from adjoining spaces.

1.5.4.1 Toilet Exhaust.

The toilets shall be supplied with 50 cfm of exhaust per water closet or urinal as required by ASHRAE Ventilation Standard 62 or a minimum of 10 air changes per hour, which ever is greater. The required make-up air for the exhaust system shall be transfered from adjoining spaces. Finned tube radiators, cabinet unit heaters, etc. can be used to supply heat.

1.5.4.2 Janitors Closets

Janitors closets shall be exhausted at the rate of 50 cfm. The required make-up air for the exhaust system shall be transfered from adjoining spaces.

1.5.4.3 Refueler Maintenance Facility Work Bay, Inspection Bay Emergency Exhaust

An emergency exhaust system shall be installed in the Work Bay and Inspection Bay of the Refueler Maintenance Facility providing 10 air changes per hour and activated by a push button located in the bay. For the Work Bay this is about 10,400 cfm. Spark proof exhaust fan()s per AMCA, with aluminum wheels and housing, and explosion proof electric or air driven motors shall be provided. Louvers shown on Architectural Elevation Sheets above Work Bay and Inspection Bay garage doors shall be used, with intake on one side and exhaust on the other side of building. All equipment located in the Work Bay and Inspection Bay, including controls, shall meet requirements for NEC class 1 division 1 construction.

1.5.4.4 Refueler Maintenance Facility Exhaust in Areas Adjacent to Work Bay, Inspection Bay

Install exhaust in areas adjacent to, and communicating with, the Work Bay or Inspection Bay in accordance with the National Electrical Code to prevent these areas from requiring hazardous construction.

1.5.4.5 Summer Ventilation.

Ventilation shall be supplied in all parts of the building that do not receive summer cooling via mechanical cooling (i.e. the mechanical, electrical, and storage rooms). The space shall be ventilated and cooled

with outside air by thermostatically controlled fans. The fans shall be set to operate when the respective space temperature exceeds 86 degrees F. The volume of air supplied shall be calculated using an assumed delta temperature of 10 degrees F or a minimum of 10 air changes per hour. A copy of all calculations shall be included in the design submittal.

1.5.5 Building Pressurization

Entire building shall be pressurized to reduce infiltration. A building air balance calculation shall be included with the complete room by room ventilation analysis for each AHU specified above. A relative positive or negative pressurization shall be as specified below:

1.5.5.1 Restrooms and Janitor's Closet

The restrooms and janitor's closet shall be maintained at a negative pressure relative to the rest of the facility. Supply air to these rooms shall be limited to the smaller volume of volume required to meet the heating load or 90 percent of the exhaust air volume. Remaining exhaust air shall be transferred from adjacent spaces.

1.5.5.2 Control Rooms for POL Operations Center.

The Control Rooms shall receive filtered conditioned relief air transferred from the main ceiling plenum into the communication rooms to maintain the space under positive pressure.

1.5.6 Building Envelop Penetrations.

All building envelop penetrations for ventilation, supply, exhaust and relief, shall be provided with low leak motorized control dampers to maintain a tight building envelop anytime the ventilation is not required.

1.5.6.1 Building Outside Air Intakes.

Air intakes to heating, ventilation, and air conditioning (HVAC) systems shall be located at least 10 feet above the ground. Building envelop penetrations for outside air intake shall be located in the roof and/or clear story walls. A minimum of 40 feet shall be maintained between outside air intakes and any boiler exhaust vents, plumbing vents, the exhaust air or relief air penetrations. If feasible, locate intakes and exhausts on different building faces.

1.5.6.2 Building Relief Air.

All building relief air shall not be returned to the air handling units prior to being relieved or exhausted from the building. Building relief penetrations shall include a gravity backdraft damper in series with the motorized control damper required above.

1.6 Force Protection

In addition to the requirements listed below, the mechanical design shall include the following measures for force protection:

1.6.1 Emergency Shutoff or Kill Switch

Provide an emergency shutoff switch in the HVAC control system that can immediately shut down air distribution throughout the building. The switch

(or switches) must be located to be easily accessible by building occupants. The actual location shall be determined during design. If the occupant so directs, than the switch shall be located the greatest distance possible from the equipment location.

1.6.2 Utility Service Entrance

For all new inhabited buildings, route critical or fragile utilities so that they are not on exterior walls. Secure exterior access to gas mains, and water supplies with manual shut-off valves.

1.6.3 Building Outside Air Intakes.

Air intakes to heating, ventilation, and air conditioning (HVAC) systems shall be located at least 10 feet above the ground.

1.6.4 Equipment Bracing

Mount all overhead utilities and other fixtures to minimize the likelihood that they will fall and injure building occupants. Design all equipment mountings to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction. This standard does not preclude the need to design equipment mountings for forces required by other criteria such as seismic standards.

1.7 Seismic Protection

The facility is to be considered seismic use Group I, and site classifications indicated in Section 01015 STRUCTURAL REQUIRMENTS.

1.7.1 Fire Protection Systems

Seismic protection for sprinkler systems for fire protection systems shall be as required by the current issue of the National Fire Protection Association NFPA 13.

1.7.2 All Other Mechanical Systems and Equipment

All other mechanical equipment, piping and ductwork shall be provided with seismic protection as required by TI 809-04, Seismic Design for Buildings and FEMA 302.

1.7.3 Materials and Installation

When seismic protection is required, the seismic restraints shall be designed in accordance with UFGS Section 13080A, SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and shall meet the requirements of Section 15070A, SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT.

1.8 Mechanical Insulation Systems

Insulation requirements of new mechanical systems, including insulation of plumbing systems and equipment, hot water piping systems, chilled water piping systems and equipment, and the insulation of the duct systems shall meet the requirements of Section 15080ATHERMAL INSULATION FOR MECHANICAL SYSTEMS. All hot and chilled water piping shall be insulated. Hot water piping shall be required to follow tabulated thicknesses. Domestic hot and cold water piping shall be insulated. All ducts shall be insulated in the mechanical rooms. All supply and outside air ducts shall be insulated

regardless of location. Cold piping and ductwork shall have a vapor barrier. High abuse areas shall have aluminum jackets such as janitor closets and mechanical rooms, within 6 feet above the finished floor.

1.9 Natural Gas Piping System.

The facility shall be provided with natural gas. This Section contains instructions and engineering requirements relating to the design of new interior natural gas piping systems. Interior gas piping systems shall extend from the outlet of the gas service regulator/meter assembly to the point of connection of each gas utilization device. Natural gas shall be provide to the boilers and domestic hot water heater. The aboveground gas piping system shall be designed, sized and installed in accordance with NFPA 54.

1.9.1 Gas Service Entrance

The gas service shall not be located on the front elevation of any building. The gas service shall be located as far from the front elevation of any building as practical, and the vent for the gas meter and gas regulators shall be at least 30 feet from outside air intake louvers. An anodeless riser shall be provided where PVC is connected to a metal riser prior to entering the building. An emergency gas connection shall be provided, with a sign stating "EMERGENCY GAS CONNECTION" located on the adjacent wall.

1.9.2 Gas Piping

Piping shall be sized in accordance with NFPA 54 to supply the demand without excessive pressure drop between the point of delivery and the gas utilization equipment. The pressure at the outlet of the meter set at the building's service entrance to the inlet of the individual appliance pressure regulators shall be 2 psig. Deleted sentence. Design for all piping for all systems, valves, regulators, etc. shall be per applicable industry criteria and standards and as referenced in above. All materials used for piping, valves and miscellaneous equipment shall meet or exceed the calculated design pressures, loads and stresses for each system. During design of the piping systems, consideration shall be given to future operations and maintenance activities. All systems shall be capable of being maintained with a minimal amount of disassembly of all assemblies and sub-assemblies. Interior piping shall be black steel as specified in Section 15190A, GAS PIPING SYSTEMS. Minimum interior gas pipe size shall be 3/4 inch. Gas piping shall be shown on the mechanical HVAC Drawings. The following items shall be provided as part of the building's natural gas system in the order listed below;

1.9.3 Automatic Shut-off Natural Gas Safety Device

A separate automatic shut off device shall be located up stream of regulators at the service entrance to the building. The safety device shall be a mechanical, pilot operated device which does not require electrical power to operate. The pressure sensing element of the pilot operated device shall be located down stream of first regulators to cut off gas flow if the supply pressure to the building exceeds the safe inlet pressure to all down stream regulators.

1.9.4 Building Regulator

Coordinate with base on natural gas distribution pressure prior to design.

The designer shall verify the actual gas pressure in the existing gas main.

Natural gas shall be distributed within the building at about 2 psig with an inline regulator near appliance reducing pressure as required. The building regulator shall have a maximum turn down ratio of 20 to 1. This may result in two building natural gas regulators in series if supply pressure is greater than 40 psig. The contractor shall submit shop drawing showing natural gas regulator(s) inlet and outlet pressure recommended orifice diameter, and orifice diameter installed, to insure its within the manufacturer's recommendation for the gas system pressure design. Install a pressure relief valve immediately downstream of the building service pressure regulator (prior to the meter), even if the regulator is equipped with an integral pressure relief valve.

1.9.5 Gas Meter

A gas meter shall be provided for each building (POL and Refueler Maintenance facilities). The gas meter shall contain visual readout and pulse initiator connected to the base wide EMCS system. Readout shall index in cubic feet.

1.9.6 Appliance Regulator

Each piece, except as noted below, of equipment which is fired by natural gas shall be provided with a separate gas pressure appliance regulator to reduce the gas pressure to the value as recommended by the manufacture of the gas burning appliance. When multiple pieces of the identical gas burning equipment, such as boilers, are to be installed in the same room a single appliance regulator shall be provided for the group of identical equipment. Other equipment with in the same room maybe combined onto a common appliance regulator if all equipment served by the common appliance regulator require the same inlet gas pressure.

1.9.7 Equipment Connections

The final connection to gas equipment shall be made with rigid metallic pipe and fittings. Accessible gas shutoff valve and coupling are required for each piece of gas equipment.

1.10 Plumbing System.

This Section contains instructions and engineering requirements relating to the design of the new plumbing systems as required. A plumbing system consists of the Drain Waste and Vent system (DWV) system; the domestic hot and cold water supply distribution system to the various plumbing fixtures; and the Domestic Hot Water Heating System; make-up water piping to the various hydronic type environmental control systems; and shall extend from connections within the structure to a point 5 feet outside the structure. The design of all plumbing systems shall, unless otherwise stated herein, comply with the most current TM 5-810-5 and International Plumbing Code (IPC) and shall meet the requirements of Section 15400A PLUMBING, GENERAL PURPOSE. The quantity of plumbing fixtures shall be as shown on the contract Architectural drawings. The designer shall submit for review all plumbing calculations demonstrating his pipe sizing methods and assumptions.

1.10.1 Piping Runs

Piping runs in buildings shall be arranged to not interfere with movement of personnel and equipment. Neither water nor drainage piping shall be

located over electrical equipment or panels. Domestic water piping located outside of mechanical equipment areas shall be routed in the ceiling space above the corridors. Water and waste piping shall not be located in exterior walls or other spaces where there is possibility of freezing. Where piping is to be concealed in wall spaces or pipe chases, such spaces shall be checked to insure that clearances are adequate to properly accommodate the piping.

1.10.2 Soil, Waste and Vent Piping System.

Horizontal soil and waste piping shall be installed at a uniform pitch in accordance with the International Plumbing Code (IPC) in the buildings. Soil, waste and vent stacks shall be located to serve each fixture or group of fixtures depending on fixture proximity to stack. Material type shall be as specified in Section 15400A, Plumbing, General Purpose.

1.10.2.1 Piping Invert Elevations

All building underslab piping elevations should be shown on the drawings. Verify that the pipe elevations do not conflict with building structural footings and foundations walls.

1.10.2.2 Floor Drains

Floor drains shall be provided as shown in section 01018, Space Data Sheets. The mechanical equipment rooms shall be provided with sufficient floor drains to accommodate routine maintenance and drain down of equipment and piping within the room without running drain pipes over the floor. In addition, a floor drain shall be provided in the mechanical room and janitors closet. To prevent traps from drying out, deep seal traps shall be provided on all floor drains.

1.10.2.3 Cleanouts

On straight runs of pipe, cleanouts shall be provided at not more than 50 feet apart. Cleanouts shall be provided at each change of direction of pipe and shall be provided at the base of all storm, soil, waste, and vent stacks.

1.10.2.4 Oil Water Separator for Refueler Maintenance Facility

An oil water separator shall be provided for the Refueler Maintenance Facility to serve trench drains in the Work Bays and Inspection Bay.

1.10.2.5 Plumbing Vents

Where feasible, combine circuit vents in a concealed space to a main vent through the roof in lieu of an excessive number of individual vents through the roof. All vent lines through roof shall be 4 inches and terminate with a minimum of 6 inches above finished roof. Where vents connect to horizontal soil or waste lines, the vent shall be taken off so that the invert of the vent pipe is at or above the centerline of the horizontal soil or waste pipe.

1.10.3 Domestic Potable Water System.

Domestic potable water pipe sizing criteria shall be based on a system supply pressure, residual pressure, and flow rate to provide a minimum of 25 psig at the most hydraulically remote fixture. The system supply

pressure, residual pressure, and flow rate as specified in Section 01018, FIRE PROTECTION REQUIREMENTS. Water service entrance shall be sized for the maximum probable demand. Water piping shall be designed not to exceed a velocity of 8 feet per second at full flow. All domestic potable water piping shall be nonferrous as specified in Section 15400A, Plumbing, General Purpose. All materials used for piping, valves and miscellaneous equipment shall meet or exceed the calculated design pressures, loads and stresses for each system. During design of the piping systems, consideration shall be given to future operations and maintenance activities. All systems shall be capable of being maintained with a minimal amount of disassembly of all assemblies and sub-assemblies.

1.10.3.1 Water Service Entrances

New water service entrances shall be provided with a water meter and isolation valves located inside the building. Meters shall be provided with a direct non-resettable, digital readout. Meters shall have a pulse switch initiator capable pulse output of operating up to speeds of 500 pulses per minute with no false pulses and shall require no field adjustments or 4-20 mA output. Initiators shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. Meters shall be connected to the EMCS system.

1.10.3.2 Protection of Water Supplies

Cross connections between water supply piping and waste, drain, vent, or sewer piping are prohibited. Exterior water fountains shall be connected to the domestic water to the building and be provided with a reduced pressure principle type backflow preventor. Reduced pressure type backflow preventers shall be provided on all make-up water systems. All backflow preventers shall be installed for accessibility per International Plumbing Code (IPC) and shall comply with the requirements of the State of Kansas regulations. State licensed plumbers shall install and/or test backflow preventors and cross connections devices. For Fire Protection backflow preventor requirements see Section 01018 FIRE PROTECTION REQUIREMENTS.

1.10.3.3 Water Hammer Arresters

Commercially available water hammer arresters shall be provided at all new quick closing valves such as flush valves and solenoid valves and shall be installed according to manufacturers recommendations. Vertical capped pipe columns in lieu of water hammer arresters are not permitted.

1.10.3.4 Deleted Paragraph

1.10.3.5 Freeze-Proof Wall Hydrants and Hose Bibbs.

Exterior freeze-proof wall hydrants with vacuum-breaker-backflow-preventer shall be provided on the exterior of the buildings to accommodate a maximum hose length of 100 feet. Wall hydrant drops shall be installed within interior partitions to eliminate freeze potential. A wall hydrant shall be provided near all Mechanical Room's exterior doors. Exterior wall hydrants shall be mounted 2 feet above finished grade.

The Refueler Maintenance Facility (RMF) shall contain interior hose bibbs, one at each end of the Work Bay, and one in Wash Bay. An interior hose bibb shall be provided in all mechanical rooms. All hose bibbs shall be

mounted 3 feet above the finished floor.

1.10.3.6 Deleted Paragraph

1.10.3.7 Service Stop Isolation Valves

For normal maintenance or replacement, servicing stop isolation valves shall be installed in water connections to all installed new equipment and new fixtures. In addition, stop valves shall be provided to isolate portions of systems so as to not require shutdown of entire systems. Stop isolation valves for piping and equipment shall be shown on the drawings. Service stop isolation valves to faucets shall meet ANSI/NSF 61, section 9 lead leaching requirements.

1.10.4 Domestic Hot Water Heating System.

Domestic water heating system shall be located in the mechanical equipment rooms. Heater(s) shall be natural gas fired with a combined or separate water storage tank(s). The capacity of the water heater(s) shall be adequate to meet the peak hot water requirements of the facility and shall be designed in accordance with Chapter 48, Service Water Heating, of the 1999 ASHRAE HVAC Applications Manual. The domestic hot water heater(s) and/or storage tank(s) shall be selected to provide the combination of recovery capacity and usable storage capacity to the building as required by ASHRAE. Only 75 percent of the installed storage capacity shall be considered usable in calculating the required recovery rate.

1.10.4.1 Equipment Size Limitations.

Size limit of individual storage tanks or domestic hot water heaters shall be limited to a size that can be removed and replaced through the mechanical room door on a dolly without dismantling the building, the door, the domestic hot water heater, the storage tank or any other installed mechanical equipment, piping or ductwork.

1.10.4.2 Domestic Cold Water Inlet Temperatures.

An inlet water temperature of 50 degrees F. shall be used for sizing the water heaters.

1.10.4.3 Domestic Hot Water Supply Temperatures.

Domestic hot water shall be supplied to the building for general use at a temperature of 140 degrees F.

1.10.4.4 Domestic Hot Water Storage Temperatures.

Water storage temperature shall be 140 degrees F. as a minimum to prevent bacterial growth within the tank.

1.10.4.5 Deleted paragraph

1.10.5 Domestic Water Pumps.

Domestic hot water pumps shall be all bronze centrifugal pumps. Pumps and motors shall be properly sized for the application required. Pump

capacity, efficiency, motor size, speed and impeller types shall be optimized for the application. Pump motor shall have the required capacity to prevent overloading with pump operating at any point on its characteristic curve. Pumps and motors shall operate at 1800 RPM (maximum).

1.10.5.1 Domestic Water Circulation Pumps.

When separate heater and storage tanks are provided, one or more individual domestic hot water pumps shall be provided to circulate hot water between the hot water storage tanks and the heater separate from the domestic hot water recirculation pump.

1.10.5.2 Domestic Water Recirculation Pumps.

Each domestic hot water system shall have a domestic hot water recirculation pump to recirculate 5 gpm of domestic hot water from within a minimum of 50 feet of every plumbing fixture that utilizes hot water within the building and back to the heating system. The system shall continually circulate domestic hot water in order to insure that domestic hot water is available at each fixture without delay. In buildings operated on a nominal 40-hour week or on a nominal two-shift basis (either a 5- or a 7-day week) a clock or other automatic control shall be installed on domestic hot water circulation pumps to permit operation only during periods of occupancy plus 30 minutes prior.

1.10.5.3 (Re)Circulation Pipe Sizing Criteria.

The piping systems shall be sized to limit pressure loss and noise. Pipes 2 1/2 inch and larger shall be sized for a maximum pressure loss of 4 feet per 100 feet. Pipes 2 inches and smaller shall be sized for a maximum velocity of 4 feet per second.

1.10.5.4 Computer Program or Spreadsheet.

The pressure loss, velocity and volume of each piping segment shall be calculated by a computer program/spreadsheet, based on the actual pipe material installed for each piping segment. The computer program/spreadsheet shall calculate the pressure loss through each and every individual flow path of each system to determine the maximum pressure lost of the system. The computer program/spreadsheet shall also calculate the total system volume. A copy of all calculations, both input and output, shall be included in the design submittal.

1.10.6 Plumbing Fixtures.

Plumbing fixtures shall conform to ASME standards and Executive Order 12902 with lead-free faucets. End-point devices shall meet lead leaching requirements of ANSI/NSF 61, section 9, lavatory faucets, kitchen and bar faucets, supply stops and endpoint control valves. All plumbing fixtures shall be the water conservation types as specified in Section 15400A, Plumbing, General Purpose.

1.10.6.1 Handicapped Water Cooler Drinking Fountains

Handicapped water cooler drinking fountains shall be Elkay model EBFSA8 or equal. Front and side push bars, stainless steel finish, ADA compliant, no lead design. For non-handicapped water cooler drinking fountains, use Elkay model LWAE8 or LWCE8, or equal. Drinking fountains shall meet the requirements of NSF 61, Section 9. Water cooler drinking fountains shall:

be self contained, conform to ARI 1010, use one of the fluorocarbon gases conforming to ARI 700 and ASHRAE 34 which has an Ozone Depletion Potential of less than or equal to 0.05.

1.10.6.2 Shower Receptors

Shower Receptors; Florestone Terrazzo Shower Receptor model 200 or equal, tan color, marble chips cast in white Portland cement to produce a compressive strength of over 3000psi and reinforced with 16 gauge galvanized wire. Removeable type strainers are supplied. 1 1/4 inch tiling flange on 3 sides. Center drain.

1.10.6.3 Laboratory Sink for POL Operations Center

Stainless steel, single bowl, self rim with holes for faucet and spout, single compartment 28 x 18 x 10 inches deep, seamless 20 guage 302 stainless steel with full undercoat.

Faucet, Handles, and Spout - Single lever control with gooseneck faucet. Faucets shall meet the requirements of NSF 61, Section 9. Spout body, base, dome, and handles are chrome-plated brass. Faucet is protected from back siphonage by combination of two check valves and a vacuum breaker. Flow shall be limited to 0.16 liters per second (2.5gpm) at a flowing water pressure of 549kPa (80psig).

1.10.6.4 Break Room Sink and Refrigerator Ice Maker for POL Operations Center

Self rim with holes for faucet and spout, double bowl, left compartment 14 x 15 3/4 x 10 inches deep, right compartment 14 x 15 3/4 x 7 inches deep with waste disposer drain opening, seamless 20 guage 302 stainless steel with full undercoat, right compartment equipped with food waste disposer. The food waste disposer shall contain a 3/4 horsepower motor with 2700rpm grinding action and delux sound insulation.

Faucet, Handles, and Spout - Single lever control with pullout retractable spray, Elkay model LK4330FCR or equal. Faucets shall meet the requirements of NSF 61, Section 9. Spout body, base, dome, and handles are chrome-plated brass. Faucet is protected from back siphonage by combination of two check valves and a vacuum breaker. Flow shall be limited to 0.16 liters per second (2.5gpm) at a flowing water pressure of 549kPa (80psig). Valves shall be thermostatic mixing type with pressure compensation.

Drain Assembly - Plug, cup strainer, crossbars, jam nuts, washers, couplings, stopper, etc., shall be copper alloy or stainless steel.

The refrigerator shall contain an icemaker domestic water hook-up

1.10.6.5 Lavatory Sinks

Handles - Two lever type handles required, one for hot, and one for cold.

1.10.6.6 Janitor Closet Sinks

A enameled cast iron floor mounted type service sink shall be provided in all janitor closets. Overall sink dimensions shall be approximately 28 inches x 28 inches. The depth of the floor sink bowl shall be approximately 10 inches.

1.10.7 Storm Drainage

Where required storm drainage system shall include roof drains, overflow drains, leaders, and conductors within the building to a point 1.5 m outside the building. Where required by the architectural drawings, roof drains, with auxiliary overflow drains, shall be provided at the low points of the roof. Storm water shall be routed through interior downspouts and piped directly to the facility storm drainage system. Roof drains shall be designed for a maximum rainfall rate of 111 mm per hour and shall be sized in accordance with the International Plumbing Code (IPC). All elbows for the storm drainage and overflow drainage piping 10 inches and smaller shall be 90 degree short sweep elbows.

1.10.8 Cathodic Protection

Cathodic protection shall be provided for any new underground ferrous piping, fittings, and valves except cast iron. Design of cathodic protection system shall in accordance with Section 01017 ELECTRICAL REQUIREMENTS, paragraph entitled "Cathodic Protection".

1.11 General Hydronic Systems.

System, equipment and calculation requirements listed below shall be required for the heating hydronic systems. The building distribution piping shall be direct return with automatic flow control valves. The material and installation requirements for items common to both systems shall be as specified in UFGS Section 15569A WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH.

1.11.1 Flow Medium.

The hot water system designs shall include safeguards to protect against freezing damage. The flow medium for the hot water systems shall be a mixture 40% propylene-glycol.

1.11.2 Computer Program or Spreadsheet.

The pressure loss, velocity and volume of each piping segment shall be calculated by a computer program/spreadsheet, based on the actual pipe, fitting, and valve material installed for each piping segment. The pressure loss calculations shall include the actual pressure loss through each valve such as control valves, triple duty valves, shut off valves, etc, based on the valve Cv. The designer shall show the valve Cv used in the hydronic calculations on the construction drawings. The computer program/spreadsheet shall calculate the pressure loss through each and every individual flow path of each system to determine the maximum pressure lost of the system. The computer program/spreadsheet shall also calculate the total system volume. A copy of all hydronic calculations, both input and output, shall be included in the design submittal.

1.11.3 Piping

The hot and chilled water piping shall be as specified in UFGS Section 15569A WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH.

1.11.3.1 Pipe Sizing Criteria.

The hydronic piping systems shall be sized to limit pressure loss and noise. Pipes 2 1/2 inches and larger shall be sized for a maximum pressure loss of 4 feet per 100 feet. Pipes 2 inches and smaller shall be sized for a maximum velocity of 4 feet per second.

1.11.3.2 Piping Material.

All materials used for piping, valves and miscellaneous equipment shall meet or exceed the calculated design pressures, loads and stresses for each system. During design of the piping systems, consideration shall be given to future operations and maintenance activities. All systems shall be capable of being maintained with a minimal amount of disassembly of all assemblies and sub-assemblies. The technical specifications contain more than one possible material type. If the material type or valve Cv for any one piping segment is changed after the hydronic calculations for a given system have been calculated. The entire system shall be recalculated, as specified above, based on the actual materials installed and the pump shall be reselected.

1.11.3.3 Piping Slope

All piping shall be pitched up in the direction of flow, shall be designed without pockets which would permit accumulation of air, and shall be provided with vents at high points and drains at low points. Piping located outside of mechanical equipment areas shall be routed in the attic or in the pipe chases. Slope of piping shall be as indicated in technical specifications.

1.11.3.4 Pipe Expansion

In runs of pipe 50 feet and longer, or in shorter runs where designer deems it is required, indicate size on project drawings the location of all anchors, bends, loops, and pipe guides to adequately limit and provide for pipe expansion. Do not use expansion joints in piping unless absolutely necessary and justified. Anchors and guides shall be indicated on the project drawings and detailed for installation in the building structure provided. STRUCTURAL DESIGN ENGINEER shall be thoroughly informed of all forces generated.

1.11.4 Coils and Terminal Equipment

Provide isolation valves, balancing valve, flow measuring device, and pressure/temperature test taps at all heating and/or cooling units, pumps, and hot water unit heaters. Pipe taps, suitable for use with temperature or pressure probe, shall be located at each pressure gauge. All coils shall be provided with valved drain and air vent connections. A thermometer shall be installed on the supply and return piping to/from each coil. All thermometers shall be legible to service mechanics standing at ground level. Temperature/pressure taps shall be provided on the supply and return piping of each coil. All three-way type control valves shall be provide with a balancing globe valve or cock in the bypass piping.

1.11.5 Pumps.

Pumps and motors for hot water systems shall be properly sized for the application required. Pump capacity, efficiency, motor size, speed and impeller types shall be optimized for the application. Pump motor shall have the required capacity to prevent overloading with pump operating at any point on its characteristic curve. Pumps and motors shall operate at 1800 RPM (maximum).

1.11.6 Expansion Tanks

A diaphragm type expansion tank shall be provided in the hot water piping systems. The expansion tank's precharge pressure and acceptance volume shall be selected based on the design of the piping systems. The STRUCTURAL DESIGN ENGINEER shall be thoroughly consulted before hanging any thing from the building structure.

1.11.7 Air Separation Tanks

The hot and chilled water piping systems shall be provided with an air separation tank. The air separators shall include an automatic air vent and make-up water system, consisting of a pressure reducing valve, strainer, reduced pressure type backflow preventer and isolation valves.

1.11.8 Water Treatment Systems

Provide a mixture of 40% propylene glycol and 60% water into the hot water piping systems. Provide a shot feeder (chemical feeder) at the hot water circulating pumps to allow introduction of chemicals into the system. Provide the chemical treatment necessary to protect the system equipment from damage due to corrosion.

1.11.8.1 Chemical Treatment

The water shall be treated to maintain the conditions recommended by the boiler manufacturer. Chemicals shall meet required federal, state, and local environmental regulations for the treatment of boilers and discharge to the sanitary sewer. The services of a company regularly engaged in the treatment of boilers shall be used to determine the correct chemicals and concentrations required for water treatment. The company shall maintain the chemical treatment and provide all chemicals required for a period of 1 year from the date of occupancy. Filming amines and proprietary chemicals shall not be used. The water treatment chemicals shall remain stable throughout the operating temperature range of the system and shall be compatible with pump seals and other elements of the system.

1.11.8.2 Make Up Water

The makeup water conditions reported per ASTM D 596 shall be as specified in Section 15569A WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH. Water softener and water analysis shall be as specified herein for makeup water. A water treatment plan shall also be provided as specified in accordance with Section 15569A WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH

1.12 Hydronic Heating System for POL Operations Center and Refueler Maintenance Facility.

Gas fired radiant heat shall not be used in the Work Bays or Inspection Bay of the Refueler Maintenance Facility. Heating system for the Refueler Maintenance Facility (RMF) shall be hot water system with unit heaters in

Work Bays and Inspection Bay, fan-coil units in heated only center areas. Heating system for the POL Operations Center shall be a forced-air/hot water system consisting of a natural gas fired boilers, water distribution system, circulating pumps, and associated space heating equipment. The hydronic heating system shall provide 100% of the buildings heating requirements for both space and ventilation loads. The use of electric resistance heating is not permitted. The heating system designs shall meet the requirements of UFGS Section 15569 WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH and, unless otherwise stated, shall comply with the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Handbooks and Terminology of HVAC&R guide. The hydronic heating system shall be heated by gas fired modular pulse condensing hot water boilers. The boilers shall be located in the mechanical room. The hot water heating system shall be circulated in a primary/secondary arrangement.

1.12.1 Gas Fired Modular Pulse Condensing Hot Water Boilers.

Gas Fired Modular Pulse Condensing Hot Water Boilers shall be provided for the POL Operations Center and the Refuler Maintenance Facility as specified in Section 15569A, WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH. All boiler modules which serve the same building shall be of the same size. The boilers shall have a minimum rated efficiency of 90 percent with a return water temperature of 120 degrees F.

1.12.2 Pulse Boilers Venting.

The boilers shall have a flue gas temperature low enough to permit side wall venting. Boiler vents shall be located through the side wall at approximately 28 inches above the finished grade. Maximum separation, as recommended by the boiler manufacture, shall be provided. The boilers shall be individually vented, both intake and exhaust, directly to the outside. Boiler vent exhaust fans shall not be provided. Boiler vents shall not be located on the front elevation of any building. Boiler vents shall be located as far from the front elevation of any building as practical.

1.12.3 Hot Water Supply Temperature.

The system shall be controlled to reset the supply water temperature based on outside air temperature without the use of three-way valves at the boilers. The hot water system shall be designed for a maximum supply temperature of 150 degrees F, a maximum return temperature of 120 degrees F and a minimum return temperature of 80 degrees F. Since the boiler efficiency is an inverse function of the return water temperature, the hot water return temperature of 120 degrees F was selected by the Government to allow for maximum system efficiency. Deleted sentence. Sufficient coil capacity shall be provided.

1.12.4 Hot Water Pumps.

Hot water centrifugal pump shall be as specified in Section 15569A, WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH. In addition to the boiler pumps required above, the building shall be provided with a hot water based-mounted centrifugal pump and standby pump for the hot water heating system. The pumps shall distribute hot water through the building distribution piping to the coils located in air handling units, blower coil units and unit heaters.

1.12.5 Propeller Unit Heaters.

The mechanical and electrical equipment rooms shall be provided with a thermostatically controlled, hot-water, horizontal throw unit heaters to maintain a space temperature of 45 degrees F. minimum. Unit heaters shall be cycled from a space thermostat to maintain the space setpoint. Propeller unit heaters, as specified in Section 15569A, WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH, shall be provide to heat the mechanical rooms.

1.13 POL Operations Center Control Room.

Communication rooms shall be provided with individual horizontal, ceiling hung, direct expansion type computer room or fan coil units for filtration, mechanical cooling, heating and pressurization. The unit shall transfer filtered relief air from the main ceiling plenum into the communication room to maintain the space under positive pressure. The unit shall be as specified in Section 15700A, UNITARY HEATING AND COOLING EQUIPMENT.

1.14 Air Supply and Distribution Equipment.

This Section contains instructions and engineering requirements relating to the design of the new HVAC supply and distribution systems. The air supply and distribution system shall inculde all air handling equipment, fans, ductwork, hoods, etc. The design of all systems shall comply with the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Handbooks, Terminology of HVAC&R guide and to the requirements of NFPA Standards Nos. 90A. All HVAC systems shall be designed in accordance with NFPA for fire dampers, smoke dampers and fan shutdown. The designer shall show on the construction drawings all fire or smoke dampers required by NFPA. The materials and installation of the air supply and distribution system shall be as specified in Section 15895A, AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

1.14.1 Two-deck Multizone Air Handling Unit for POL Operations Center (POLOPS).

A portion of the POL Operations Center shall be heated & cooled by a two-deck (cold and hot) multizone air handling unit. All air handling unit components shall be located within the air handling unit. Coils shall be selected with no more than 500 feet per minute coil face velocity. To maintain outside air percentage less than 25% of the multi-zone supply, only a portion of the ventilation air required by ASHRAE standard 62 shall be supplied by the multizone AHU, with balance supplied by a blower coil.

1.14.1.1 Two Deck Multizone Module for POL.

Part or all of the AHU shall be manufacture's standard modular design or a custom design as required to provide a cold deck with cooling coil, and a hot deck with heating coil.

1.14.1.2 Two Deck Multizone Zone Control Dampers for POL.

There shall be one damper actuator per zone. Control dampers shall be as specified in Section 15951, DIRECT DIGITAL HVAC CONTROL SYSTEMS.

1.14.1.3 Filter Mixing Box.

A filter mixing box with 2 inch pleated filter shall be provided.

1.14.1.4 Return Air Plenum

A return air plenum shall be provided for the POL Operations Center with no air being returned from the Laboratory, Laboratory Office, or Toilet Rooms.

1.14.1.5 Access Sections.

The designer shall show access sections in the AHU where required to provide access for inspection, maintenance and/or control sensor installation.

1.14.1.6 Mandatory Space Zoning Requirements for POL

At least six multi-zone air handling unit zones shall be provided for the POL, and these are Office 116 (corner office), Office 115 plus Office 114, Classroom, Laboratory plus Lab Office, Break Room, and Ready Room plus Vestibule.

1.14.2 Exhaust Systems.

Except for wall mounted propeller units, all fans shall be centrifugal type and connected directly to weather-proof louvers using ductwork. Low leakage motorized dampers shall be provided. In-line fans located outside the main mechanical and electrical areas shall be the provided with a manufacturers standard acoustical enclosure to inhibit noise transmission to the adjoining occupied spaces. Some value of fans measured 5 feet from fan inlet shall be less than 30 sones outside the mechanical equipment room. Sound transmission data shall be submitted for approval by the designer and acceptance at the governments option and design shall indicate noise criteria on schedules.

1.14.2.1 Mechanical Electrical Rooms.

Exhaust or intake fan(s) shall be provided in the mechanical and electrical rooms for summer ventilation as specified above. Intake fans shall be provided when the mechanical room contains gas burning equipment that is not directly vented to the outdoors for both combustion air and combustion by-products. Sidewall mounted fans with exterior louvers shall be provided. The fans shall be controlled by a space mounted thermostat to cycle the fans on when the space temperature rises above 85 degrees F.

1.14.2.2 Toilets.

The restroom exhaust shall be provided through inline exhaust fans, duct systems, and louvers directly to the exterior. Each set (male and female) of restrooms shall be provided with an individual inline centrifugal fan. Exhaust fans shall be provided with a single speed motor.

1.14.3 Duct Systems Calculations.

The velocity and total pressure loss, both velocity and static, of each duct segment shall be calculated by a computer program/spreadsheet, based on the equal friction method or by T-method Optimization as described by ASHRAE. The computer program/spreadsheet shall calculate the pressure loss through each duct segment for each and every individual flow path and determine the maximum pressure loss of the system. The computer program/spreadsheet shall perform calculations based on the actual material installed. A copy of all duct calculations, both input and output, shall

be included in the design submittal.

1.14.3.1 Duct Pressure Classification

The designer shall indicate the duct pressure classification for each duct segment on the construction drawings. All ductwork shall be sealed to seal class A.

1.14.3.2 Diffusers, Registers and Grilles.

Supply diffusers and registers shall be sized for a maximum total pressure (velocity and static) loss of 0.15 inches w.g. and a maximum noise criteria (NC) of 30. Return, exhaust and relief registers and grilles shall be sized for a maximum total pressure (velocity and static) loss of 0.1 inches w.g. and a maximum noise criteria (NC) of 20. Diffusers, registers, and grilles in humid areas shall be aluminum or stainless steel for corrosion resistance.

1.14.3.3 Supply Duct Systems Maximum Friction Rate.

Supply duct friction rate for the equal friction method shall not exceed 0.08 inches w.g. per 100 feet.

1.14.3.4 Return and Exhaust Duct Systems Maximum Friction Rate.

Exhaust duct friction rate for the equal friction method shall not exceed 0.08 inches w.g. per 100 feet.

1.14.3.5 Positive Pressure Duct Velocity.

Except for relief duct and openings, the maximum velocity for ductwork under positive pressure shall be limited as specified below. Building relief duct and openings shall be sized for a maximum velocity of 300 feet per minute.

a. Areas with Exposed Ductwork. For areas with exposed ductwork or dustwork above an open grid type ceiling, the maximum main air duct velocity shall be 1200 feet per minute for rectangular duct and 2200 feet per minute for round duct. Branch air ducts maximum velocity shall be 80 percent of the velocity values specified above for main air ducts. The maximum velocity for runouts to outlets shall be 50 percent of the velocity values specified above for main air ducts.

b. Areas with Gypsum Ceilings. For ductwork located within the ceiling space above a gypsum ceilings, the maximum main air duct velocity shall be 2000 feet per second for rectangular duct and 2500 feet per second for round duct. Branch air ducts maximum velocity shall be 80 percent of the velocity values specified above for main air ducts. The maximum velocity for runouts to outlets shall be 50 percent of the velocity values specified above for main air ducts.

c. Areas with Acoustical Ceilings. For ductwork located within the ceiling space above a acoustical ceilings, the maximum main air duct velocity shall be 1500 feet per minute for rectangular duct and 2500 feet per minute for round duct. Branch air ducts maximum velocity shall be 80 percent of the velocity values specified above for main air ducts. The maximum velocity for

runouts to outlets shall be 50 percent of the velocity values specified above for main air ducts.

1.14.3.6 Negative Pressure Duct Velocity.

For ductwork under negative pressure the maximum velocity shall be limited to 80 percent of the value specified above for positive pressure ductwork except that transfer air openings and return air openings from return air plenums shall be sized for a maximum velocity of 300 feet per minute. Return air openings from return air plenums shall be with bell-mouth type entrances into the return duct system.

1.14.3.7 Duct Fitting Pressure Loss Coefficients.

Pressure loss through ductwork fittings shall be determined utilizing both methods and coefficients as presented in the ASHRAE Duct Fitting Database. Fitting types that are not part of the ASHRAE Duct Fitting Database shall not be designed provided or installed. The designer shall show, on the drawings, the fitting type used in the system calculations.

1.14.4 Ductwork Componets.

1.14.4.1 Acoustical Duct Liner.

Acoustical Duct Liner shall not be provided. To the maximum extent possible, objectionable sound shall be attenuated through the design and layout of the duct system. If required to control objectionable noise, sound attenuators shall be provided as specified in Section 15895A, AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

1.14.4.2 Moist Exhaust Ducts.

Exhaust ductwork serving high moisture areas, such as shower areas, shall not be routed through unconditioned spaces and shall be sealed water tight and constructed of stainless steel or welded aluminum.

1.14.4.3 Duct Drainage

Outside air intake louvers, louvered penthouses and moist exhaust ducts specified above shall be ducted and shall have provisions to dispose of melted snow, wind-blown rain and condensate which enters through the louvers or condenses in the duct. The duct seams shall be sealed watertight by soldering, brazing or welding and a drain provided at the duct low point. The drain shall be routed to a floor drain in a non-finished area such as the mechanical room. Duct access doors shall be provided near the louvers and drains.

1.14.4.4 Fire Dampers.

Fire dampers shall be provided as required by NFPA 90A and 90B. The designer shall show, on the construction drawings, all fire dampers as required by NFPA 90A and 90B. The pressure loss resulting from a full open fire damper shall be included in the system calculations specified above.

1.14.4.5 Manual Balancing Dampers.

Manual balancing dampers shall be provided at all branch take-offs in duct systems to permit adequate opportunity for balancing the system. Balancing dampers shall be located within 12 inches of the main duct. Splitter type

dampers or air deflectors which project out of the branch and into the main duct shall not be provided. The designer shall show, on the construction drawings, all balancing dampers. The pressure loss resulting from a full open balancing damper shall be included in the system calculations specified above.

1.14.4.6 Manual Zone Balancing Dampers.

Manual zone balancing dampers shall be provided on each zone's main duct at the multizone AHU. These dampers shall be located within the mechanical room and within 3 feet vertically from the discharge of the AHU. The designer shall show, on the construction drawings, all balancing dampers. The pressure loss resulting from a full open balancing damper shall be included in the system calculations specified above.

1.14.4.7 Louvers.

Fixed blade louvers shall be located where exhaust fans and relief dampers discharge from the building and where outside air is brought into the building. Motorized dampers shall be provided at all duct penetrations of the building envelope to prevent loss of energy. Relief louvers and dampers (both a motorized and a backdraft per louver) shall be provided as specified above.

1.14.4.8 Cold Air Diffusers.

When the leaving air temperature for the cooling coil is below the dew point temperature of the space, diffusers designed for diffusion of cold air below 50 degrees F shall be provided. The designer shall clearly indicate on the construction drawings which diffusers are required to be cold air diffusers.

1.15 HVAC Controls.

Design of the Direct Digital Controls (DDC) for the various HVAC systems shall be included as part of the system design. Direct Digital Controls shall be as specified in Section 15951, DIRECT DIGITAL HVAC CONTROL SYSTEMS. The designer shall use the same basic format (symbols, nomenclature and identifiers) as shown in TI 810-11 for Single Loop Digital Controls.

1.15.1 Permanent Maintenance Instrumentation

Provide sufficient instrumentation to aid maintenance personnel in balancing and/or troubleshooting mechanical systems. Instrumentation shall be provided in the media at each change in temperature and at all mixing points in air handling systems, at all discharges of air handlers, and at all return mains. Pressure gauges, thermometers, flow indicators, sight glasses, etc., shall be installed to be easily read from the adjacent floor. Separate pressure gauges shall be installed on both the suction end and discharge end of pumps. Provide an isolation valve on all pressure gauges. Thermometers shall have separable socket thermo-wells. Allow for the removal, repair, or cleaning of flow measuring devices without having to shut down the system. Provide a portable meter, with appropriate range, for each type of flow measuring device installed.

1.15.2 EMCS Connection .

The contractor shall provide programming to construct new graphical

interfaces at central operators console located in the building specified by the Contracting Officer's Representative. The contract shall provide software all hardware as required to connect the facility to the existing McConnell AFB Barber Coleman basewide centralized Energy Monitoring and Control System (EMCS).

1.15.2.1 Power Outage Start-Up

Upon an electrical power outage, all air handling units, pumps, and other major mechanical equipment shall shut down and shall be restarted in a logical and efficient manner. Timing between starts and sequence of equipment starting upon restoration of electrical power shall be provided and programmed into the HVAC temperature control system, with programming capable of being changed by the operating personnel.

1.15.2.2 Local Space Temperature Control

Control of local space temperature setpoints shall be under control of the EMCS.

1.15.2.3 Freeze Protection

Standard type freeze stats shall not be provided. The equipment is protected from freezing by the glycol mixture of the heating and cooling fluids. The control systems shall send an alarm through the EMCS and shut down the equipment when an averaging type sensor reports the delivery of air at a freezing temperature from any system within the facility. The equipment shall be restartable at both the local control panel and by the EMCS. Low temperature averaging safety sensors shall be as specified for other averaging type sensors in the air stream and may or may not be required to preform another control function.

1.15.3 Construction Control Drawings.

As a minimum, the designer's construction control drawings shall include a system schematic (following the format and symbology contained in TI 810-11), the sequence of operation, a table of all digital and analog inputs and outputs (points), all control valve Cv's, and wiring diagrams for all motor starters. The above information shall be provided for each and every distinct mechanical system.

1.15.3.1 System Schematic.

The system schematic shall identify all system sensors, indicators, actuators, pressure switches, gages, etc, and all major mechanical components such as fans, filter banks, dampers, coils, and control valves. An indicator shall be shown and installed everywhere a sensor is shown and installed for troubleshooting purposes. Separate stem type thermometers shall be required at the inlet and outlet of all hot water coils, all chilled water coils, and all dry cooler coils.

1.15.3.2 Sequence of Operations.

The sequence of operation shall be completed by the designer and shall be as specified in Section 15951, DIRECT DIGITAL HVAC CONTROL SYSTEMS. The designer shall modify all setpoints in the sequence of operation as required to match the final design of the system.

1.15.3.3 Input and Output Table.

The table of all digital and analog inputs and outputs shall, at a minimum, include function, setpoint and any appropriate remarks.

1.15.3.4 Control Valve Cv Table.

The table of all control valve Cv's shall, at a minimum, include each control valve's unique identifier, function, type, range and minimum required Cv. The control valve Cv shown here shall be the Cv used in the hydronic pressure loss calculations specified above.

1.15.3.5 Wiring Diagrams.

The wiring diagrams shall, at a minimum, show the source of power; control transformers (as necessary) including primary and secondary voltages; grounding; overcurrent protection; overload protection; safety devices; and all control contacts and switches. The diagrams shall be coordinated with the requirements of Section 16415A, Electrical Work Interior. All control voltages shall not be more than 120 volts to ground. All three-phase motors over 1 horsepower shall be wired with phase failure relay in the motor starter.

1.15.4 Control Panels.

The DDC HVAC panel shall be located in the mechanical room.

1.15.5 Package Equipment.

Package equipment, such as boilers and chillers, shall be provided with standard manufacture's DDC controls for each individual piece of equipment.

1.15.5.1 Boilers.

Each boiler shall accept a start/stop signal from the HVAC control system and shall provide a unit failure signal to the HVAC control system.

1.16 MILITARY FUEL PUMPS GENERAL INFORMATION

All work shall conform to MIL-HDBK-1022A, Petroleum Fuel Facilities, UFC 3-600-01, Fire Protection Engineering for Facilities, Industrial Ventilation by ACGIH, and other references listed in this section. Four fuels will be dispensed which are ethanol, bio grade diesel fuel B-20, normal diesel fuel, and MOGAS (unleaded regular gasoline). Existing above ground storage tanks will contain the two diesel fuels, and the existing underground tanks will contain the ethanol and MOGAS. Installation must comply with federal, state, and local government regulations that are in effect at a particular facility. This contract may be more stringent than the previously mentioned standards because all pipe must be double wall type with leak detection devices monitored at the POL Operations facility constructed under this contract. However, where this contract is less stringent than MIL-HDBK-1022A, UFC 3-600-01, ACGIH, or federal, state, and local government regulations, these standards and regulations shall take precedence over this contract. See civil sheet CG2.6 and mechanical demolitions sheets contain photographs of existing facilities.

This contract includes installation of two ground vehicle fuel dispensing units located as shown on the architectural plans, each dispensing unit containing two nozzles (four total nozzles), with fuel pumps located remotely at the existing storage tanks. Each of the four fuels being

dispensed (ethanol, MOGAS, and two grades of diesel), from four existing remote fuel storage tanks, will be dedicated to one nozzle. These remote tanks, which are shown on the civil drawings, are two aboveground Tanks 3 and 4, and two underground tanks 7 and 8.

Also, four 25gpm pumps, each dedicated to one of the four fuels, will be required near the aboveground tank, or submerged in the underground tank, and serving the remote ground vehicle fuel dispensing units. Two of these pumps will be submersible installed in the existing underground tanks, one in underground tank number 7, and one in underground tank number 8, located approximately as shown on the civil and mechanical sheets. Assume that no provisions have been made in these existing underground tanks for insertion of these two submersible pumps. The remaining two pumps will be mounted outside on the ground near the above ground tanks, one serving tank 3, and the other tank 4.

In addition, one 300 gpm bulk loading, and one 300gpm bulk unloading, aboveground pumps shall be added at the tank farm. At the tank farm (location of subject tanks 3, 4, 7, and 8), are bulk loading and unloading equipment for tank trucks. For the aboveground tanks 3 and 4, there are two existing pumps, one for loading, and the other for unloading tank trucks, with existing pipe and valves controlling connections to either tank 3 or tank 4. Two additional 300gpm pumps must be installed, one for loading, and one for unloading, tank trucks. Each tank will be re-piped with a dedicated loading and unloading pumps, and independent piping, for each of tank 3 and tank 4.

All piping serving the ground vehicle dispensing units from the four existing storage tanks, and the bulk loading and unloading header stations serving the four existing storage tanks, shall be new with leak detection monitoring, with existing underground pipe abandoned or removed, and existing aboveground pipe removed, as required by applicable codes or regulations. For bulk loading, unloading , and ground vehicle dispensing units, the piping system shall be changed so that each of the four fuels have independent dedicated piping without possibility of contamination of one fuel by the other. Thus four separate pipes are required, routed mostly underground, double wall monitored from the tanks to the new ground vehicle dispensing units, one dedicated fuel pipe run per nozzle. New aboveground pipe is required carrying fuel over the dikes serving aboveground tanks from bulk tank truck unloading station, through pump, and to tank 3. Re-use existing pump, related components, and unloading station. Also, for tank 4 new aboveground pipe is required similar to tank 3, but new pump, unloading station, and all related components area required, similar to existing. New tank truck loading pipes are required, double walled monitor type for underground pipes, and aboveground pipe shall be over existing dikes and monitored, is required from tanks 3 and tank 4, through pumps, to truck loading stations. For tank 3, existing pump and truck loading header station can be re-used, but will be dedicated to tank 3. For tank 4, a new pump with related components as stated, and the existing second truck loading header station can be used but must be re-pipe so that it is dedicated to tank 4 without contamination from tank 3 fuel. The existing submersible bulk truck load pumps for each of tanks 7 and 8 will not be part of this contract.

All four fuel storage tanks shall be cleaned after installation is complete. Modify these aboveground and underground tanks to meet standards listed in this specification section.

1.17 MILITARY FUEL PUMPS

1.17.1 PUMPS, LOADING, OFF LOADING EQUIPMENT AND HEADER STATIONS FOR EXISTING ABOVEGROUND TANKS 3 AND 4

Provide one 300 gpm centrifugal bulk tank truck unloading pump and related equipment configured for automatic air elimination to serve aboveground Tank 4, and existing pump will serve only Tank 3. Locate pump in underground covered vault with proper depth to meet net positive suction head requirements. Install fuel system pump components required by MIL-HDBK-1022A, including that specified in paragraph 3.3.2.3, and shown on Facility Plate No. 003, including flexible pipe joints at pump connections, isolation valves, strainer, flow switch, gauge, and surge check valve, and equal to existing installation to serve tank 3. The new pump shall be equal to the existing pump which is Gorman Pump, Mansfield OH, RD3A31-BAR, 7 5/8 inch impeller, 1154579N, US Electric Motor 40 HP, 3ph, 60hz, except it must conform to MIL-HDBK-1022A and provide 300gpm.

Provide one 300gpm truck loading pump to serve aboveground Tank 4, and existing pump to serve only Tank 3. Install fuel system pump components required by MIL-HDBK-1022A, including flexible joints, isolation valves, fuel meter, and surge check valve. The new pump shall be equal to the existing pump which is Byron Jackson Pumps, BW/IP Internation Inc., serial number 97ER1740, model TP-4, 300gpm, 112feet head, 3600rpm, 1000psi test pressure, 667mwp, 15hp, 460volts ac, except it must conform to MIL-HDBK-1022A.

Provide two 25 gpm pumps serving remote ground vehicle dispensing units, one dedicated to tank3, and the other dedicated to tank 4, each to be activated by dispenser nozzle removal, each with fuel system pump components required by MIL-HDBK-1022A, including flexible joints, isolation valves, fuel meter, and surge check valve. Pumps shall conform to API Std 610, Appendix A, except as modified herein. Mechanical seals within the pump shall be Buna-N or Viton. Pump casing, bearing housing, and impellor shall be stainless steel ASTM A 743/A 743M GR CF8M or GR CA6NM or aluminum ASTM A 356/A 356M GR T6. Pump shaft shall be stainless steel ASTM A 276 Type 410 or 416. Pump baseplate shall be of cast iron construction. Internal pump components in direct contact with the fuel to be handled shall be of compatible construction. Pump assembly shall be statically and dynamically balanced for all flow rates from no flow to 120 percent of design flow. Pump bearings shall be selected to give a minimum L-10 rating life of 25,000 hours in continuous operation. Pump shall be driven by an explosion-proof motor for Class I, Division 1, Group D hazardous locations as defined in NFPA 70. Pump shall be accessible for servicing without disturbing connecting piping. Pump control panel shall include on and off indication lights for each pump. The panel shall contain an adjustable control logic for pump operation in accordance with the indicated operation. The panel shall also have a manual override switch for each pump to allow for the activation or deactivation of each pump. Panel, except as modified herein, shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Pump shall be the in-line, split-case, double suction, single stage, self-priming, centrifugal type. Pump motor shall be mounted horizontal to the pump housing and be provided with flanged end connections.

1.17.2 SUBMERSIBLE PUMPS FOR EXISTING UNDERGROUND TANKS 7 AND 8

Provide two submersible dispensing pump, one for each underground tank to serve the new ground vehicle dispensing units, to be activated by dispenser nozzle removal. The submersible pumps to be located in the existing product storage tanks. Pump and motor combination shall operate efficiently totally submerged in product of storage tank. When pump only is submerged, pump shall be driven by explosion-proof motor for Class I, Division 1, Group D hazardous locations as defined in NFPA 70. Each pump shall have delivery capacity of 25 liter per second at a total discharge head to be determined by the designer. Install on discharge side of each pump, an approved leak detection device which will provide indication when piping between tank-mounted pump and dispensers are not liquid-tight. Pump inlet shall be horizontal. Provide clearance of not less than 127 mm nor more than 178 mm between bottom of tank and end of pump. Pump shall be a single-stage vertical pump and extend inside the tank to within 150 mm of the striker/impact plate. Pump and motor combination shall operate totally submerged in the product of the storage tank. Pump fuel inlets shall be horizontal. Pump, motor, and column pipe assemble shall mount through a NPT pipe penetration in a tank's manway cover. Pump mounting shall completely support both the weight and vibration of the pump. The unit shall be provided with a steel lifting lug capable of supporting the weight of the entire pump and motor assembly. Pump shall include a vertical solid shaft motor, base mounting flange, horizontal pump discharge, low net positive suction head (NPSH) first stage impellers, dynamic and thrust balancing of impellers, and a stainless steel one piece pump shaft. Pump shall be provided with flanged end piping connections.

1.18 CLEANING OF EXISTING FUEL STORAGE TANKS

The two existing above ground tanks number 3 and 4, 70,000 gallons each, and the two underground tanks, 10,000gallons each, shall be cleaned after all work is complete in accordance with MIL-STD-1022A and American Petroleum Institute API 2015. Existing Tank 7 contains de-icing solution.

1.19 MILITARY FUEL PUMPS PIPING

1.19.1 Piping General

Route four underground pipes from each pump serving the four fuel storage tanks to the new ground vehicle dispensing unit. Use double wall fiberglass re-inforced pipe with leak detection system monitored by the POL Operations Center. Piping routinely carrying fuel shall be fiberglass reinforced plastic (FRP) or stainless steel as defined herein.

1.19.2 Secondary Containment Piping for Outside Tank 3 and 4 Containment Area

All piping installed shall be secondarily contained, unless otherwise indicated. Piping system shall be of double-wall construction with the internal pipe being the product pipe and the exterior pipe being an fiberglass reinforced plastic containment pipe as defined herein. Piping system shall be a factory manufactured piping system designed in accordance with ASME B31.3 and NFPA 30. The containment piping shall allow for complete inspection of the product piping before the containment piping is sealed. Containment piping shall be chemically compatible with the type of fuel to be handled. Containment piping shall be non-corrosive, dielectric, non-biodegradable, and resistant to attack from microbial growth. Containment piping shall be capable of withstanding a minimum 35 kPa air

pressure. Containment piping shall be evenly separated from the primary pipe using pipe supports which are designed based on pipe size, pipe and fuel weight, and operating conditions. The supports shall be constructed of the same material as the primary pipe and shall be designed so that no point loading occurs on the primary or exterior pipe. Supports shall be permanently attached to the product pipe either by tack welding or by an adhesive. The exterior piping and supports shall allow for normal draining as well as the installation of any necessary leak detection equipment or cables. Supports shall be designed and installed to allow for pipe movement of both the product piping and the exterior piping without causing damage to either. Containment piping shall be capable of withstanding H-20 highway loading as defined by AASHTO HB-16.

1.19.3 Fiberglass Reinforced Plastic (FRP) Pipe

1.19.3.1 Pipe

Pipe shall be compatible with the fuel to be handled and be in accordance with ASTM D 5677. Pipe shall be compatible with the fluid being transported. Use of FRP piping is limited to buried service only and at pressures not exceeding that marked on the pipe.

1.19.3.2 Fittings

Fittings and joining materials shall be in accordance with ASTM D 5677. Threaded fittings shall not be used for product piping in inaccessible locations. Fittings for secondary exterior pipe of double-wall piping system shall accommodate the primary inner pipe and any additional equipment required, such as leak detection cables. Fittings and joining materials shall be compatible with the fuel to be handled.

1.19.4 Stainless Steel Pipe

Stainless steel pipe 150 mm or smaller shall be in accordance with ASTM A 312/A 312M Schedule 40, Type TP304L, seamless only. Longitudinally welded 150 mm pipe also can be provided if made in accordance with the procedures in ASTM A 358/A 358M with wall thickness of 6.4 mm. Stainless steel pipe larger than 150 mm shall be in accordance with ASTM A 312/A 312M Schedule 10S, Grade 304L, seamless only or ASTM A 358/A 358M Grade 304L, Class 1 or 3, welded with wall thickness no less than 6 mm for pipe 300 mm and smaller, and 8 mm for pipe larger than 300 mm.

1.19.4.1 Connections

Connections for pipe smaller than 65 mm shall be forged, socket weld type, Type 304 or 304L, 2000 W.O.G. conforming to ASTM A 182/A 182M and ASME B16.11. Connections for pipe 65 mm and larger shall be butt weld type conforming to ASTM A 403/A 403M, Class WP, Type 304L, seamless or welded, and ASME B16.9 of the same wall thickness as the adjoining pipe. Piping in inaccessible locations, such as product piping inside of containment piping, shall be welded.

1.19.4.2 Welding Process and Electrodes

The welding process for stainless steel piping shall be a gas tungsten arc or gas metal arc process in accordance with ASME B31.3. Welding electrodes shall be E308L conforming to AWS A5.4.

1.19.5 Valves

Portions of a valve coming in contact with fuel shall be compatible with the fuel to be handled. Valves shall have bodies, bonnets, and covers constructed of stainless steel conforming to ASTM A 743/A 743M, Type 304 or 316; or aluminum alloy conforming to ASTM B 26/B 26M, Type 3003, 6061-T6, or 356-T6. Each valve shall have stainless steel stem and trim. Valves shall be suitable for a working pressure of 1900 kPa (275 psig) at 38 degrees C with a weatherproof housing and be provided with flanged end connections unless indicated otherwise. Seats, body seals, and stem seals shall be Viton or Buna-N.

1.19.6 Piping

Piping shall be inspected, tested, and approved before burying, covering, or concealing. Piping shall be installed straight and true to bear evenly on supports. Piping shall be free of traps, shall not be embedded in concrete pavement, and shall drain toward the corresponding storage tank. Any pipe, fittings, or appurtenances found defective after installation shall be replaced. Piping connections to equipment shall be as indicated or as required by the equipment manufacturer. Pipe and accessories shall be handled carefully to assure a sound, undamaged condition. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during installation. The pipe shall not be laid in water or stored outside unprotected when weather conditions are unsuitable. When work is not in progress, open ends of pipe and fittings shall be securely closed so that water, earth, or other substances cannot enter the pipe or fittings. Cutting pipe, when necessary, shall be done without damage to the pipe. Pipe shall be reamed to true internal diameter after cutting to remove burrs. Changes in pipe sizes shall be made through tapered reducing pipe fittings. Stainless steel pipe shall in no case be welded directly to carbon steel pipe. Cutting of FRP pipe shall be performed with a hacksaw or circular saw. Fuel supply piping from a storage tank shall extend to within 150 mm of the tank's bottom.

1.19.6.1 Aboveground Piping

Pipe sections shall be installed as indicated and be complete prior to performing any piping tests. FRP shall not be used aboveground.

1.19.6.2 Belowground Piping

Nonmetallic pipe shall be installed in accordance with pipe manufacturer's instructions. Belowground piping shall be laid with a minimum pitch of 25 mm per 6 m. Horizontal sections of pipe shall be installed with a minimum of 450 mm of backfill between the top of the pipe and the ground surface. The full length of each section of belowground pipe shall rest solidly on the pipe bed. Joints in secondary piping shall not be made until inner pipe is successfully pressure tested.

1.19.6.3 Pipe Hangers and Supports

Seismic requirements shall be in accordance with Sections 13080, SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and 15070A SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT. Additional hangers and supports shall be installed for concentrated loads in piping between hangers and supports, such as for valves. Miscellaneous steel shapes as required shall be installed in accordance with ASTM A 36/A 36M. Pipe supports shall be installed in accordance with MSS SP-58 and MSS SP-69. Pipe spacing shall be as follows:

Nominal Pipe Size (mm)	25 and Under	40	50	80	100	150	200	250	300
Maximum Hanger Spacing (m)	2.1	2.7	3	3.7	4.3	5.2	5.8	6.7	7.0

1.19.6.4 Pipe Sleeve

Piping passing through concrete or masonry construction shall be fitted with sleeves. Sleeve shall be of sufficient length to pass through the entire thickness of the associated structural member and be large enough to provide a minimum clear distance of 13 mm between the pipe and sleeve. Sleeves through concrete shall be 0.91 mm steel, fiberglass, or other material as approved by the Contracting Officer. Sleeves shall be accurately located on center with the piping and securely fastened in place. The space between a sleeve and a pipe shall be caulked and sealed as specified in Section 07900A JOINT SEALING. In fire walls and fire floors, both ends of a pipe sleeve shall be caulked with UL listed fill, void, or cavity material.

1.19.6.5 Pipe Anchor

Where steel piping is to be anchored, the pipe shall be welded to the structural steel member of the anchor and the abraded area shall be patched with protective coating or covering as specified.

1.20 MILITARY FUEL PUMPS PIPING LEAK DETECTION MONITORING SYSTEM

Where conflicts exist between this section and the electrical section, the electrical section shall govern. Provide continuous surveillance leak detection system suitable for operation in an NFPA 70, Class 1, Division 1, Group D environment and located in the leak containment space between interior and exterior walls of double-wall piping. System shall detect leakage into containment space by monitoring interstitial pressure, vacuum variations, or sense hydrocarbon vapors electronically. Sensor output and transmission shall be electronic. Sensors shall be compatible with and detect leakage of materials stored in pipe at a rate of 0.105 milliliter per second with 95 percent probability of detecting this size leak and five percent probability of declaring pipe leaking at this rate when, in fact, it may be leaking less as well as ground water which may leak through secondary containment. Panel shall be in a NEMA enclosure suitable for the environment and have an audible and visual alarm for each zone and include acknowledgement switch and rechargeable battery backup capable of operating the system continuously for a minimum of 48 hours. Panel shall incorporate self-test system which permits operator verification of proper operation of leak detection equipment. Mount panel in POL facility as indicated. Enclose underground cable in PVC coated conduit. Provide instructions and equipment required for calibration of leak detection system and manufacturer's recommend calibration maintenance schedule.

1.21 FUEL DISPENSING UNITS FOR GROUND VEHICLES

For ground vehicles, two dispensing units are required each with two hose

outlets, and shall be located on island shown on civil and architectural drawings. When fuel pump nozzle removed, card key entered at pedestal, and subsequent approval is obtained, then respective remote tank fuel pump will start. Each nozzle will be dispense only one type of fuel and will be piped separately from the remote fuel storage tank and pump. These four nozzles will be located on two dispensing unit enclosures on an island as shown, allowing four vehicles to fuel simultaneously.

Each dispensing unit shall be computer controlled, lighted, double sided, remote type, with two hose outlets each suitable for single product delivery flow rate of 0.76 liter per second from each nozzle. Steel frame shall be capable of resisting normal vertical and lateral loads and secured to dispensing island with at least two 15 mm anchor bolts. Exterior panels shall be either stainless steel or steel with baked enamel finish, or combination of the two. Provide manufacturer's standard microprocessor which has the following functions:

- a. Totalizer: Eight-digit (999,999.99) electronic totalization with identification for each product volume in liters.
- b. Filters: Replaceable filter element on each product line with a nominal filtration efficiency of 0.025 mm with a flow rating equal to the rate of the dispensing unit.
- c. Backup: Battery backup with automatic charging circuits to hold data for a minimum of three months without recharging.
- d. Accessories: Equip each assembly with accessories such as built-in air eliminators, line check valves, and emergency shut-off valve. Install centering ring or stabilizer bar to ensure proper shearing action for emergency shut-off valve if the dispensing unit is knocked from it's supports.
- e. Interlocks: Units shall include nozzle supports interlocked to pump motor control switch to start and stop the pump by nozzle removal and replacement. Provide each unit with interlock switch and valve arrangement that prevents flow of product until meter is reset after dispensing nozzle is returned to holder.
- f. Hose: Provide dispensing hose conforming to UL 330, gasoline and oil resistant, statically grounded, flexible in sub-zero temperatures. Provide a minimum of 3.70 meters of hose for each product line on the dispenser. Provide each hose with spring loaded cable to return device attached near mid-length of hose.
- g. Nozzles: Dispensing nozzles shall be automatic shutoff type, without latch-open device, aluminum body, and full hand insulator to prevent splash-back.
- h. Breakaway device: Provide each product hose with UL listed emergency breakaway device designed to retain liquid on both sides of breakaway point. Breakaway device shall have pressure balancing chamber to override line pressure to prevent nuisance breaks caused by a restriction in delivery hose diameter.

1.22 MILITARY FUEL PUMPS BULK FUELING LOADING AND UNLOADING HEADER STATIONS

1.22.1 Loading and Unloading Header Stations, General

To serve aboveground existing tank 4, install new tank truck bulk loading and unloading (off loading) equipment in accordance with MIL-STD-1022A, including requirements in paragraphs 3.4.2 and 3.3.2.3 and Facility Plate 003, similar to existing loading and unloading stations to be re-piped and dedicated to tank 3, with two each off loading fueling hoses (four total hoses, two serving each tank unloading station). The new station shall contain a check valve and strainer for each hose. Replace deicing truck loading header station by providing new hose for existing underground tank 7 and associated piping for arrangement similar to tank 8, and in accordance with MIL-HDBK-1022A.

1.22.2 Fueling Hose

Hose shall be in accordance with API Std 1529, Grade 3, Type A or C, semi-hardwall. Hose shall be compatible with the specified fuel and withstand a working pressure of 2070 kPa (300 psig) . Hose shall be constructed of braided synthetic cord surrounded by an interior rubber tube and an exterior rubber cover. Each fueling hose shall be provided with a stainless steel hose tray. The hose tray shall provide support for the entire length of the fueling hose, allow for draining of rainwater, support the fueling hose at the height indicated, protect the hose from the sun's ultraviolet rays, and allow for easy insertion and removal of the fueling hose.

1.23 Miscellaneous Requirements.

1.23.1 Hydraulic Lift for Refueler Maintenance Facility (RMF)

A 75,000 lbs hydraulic lift is required in one Work Bay of the Refueler Maintenance Facility with hydraulic pump and reservoir located outside. See architectural floor plan for details.

1.23.2 Wash Bay Equipment for Inspection Bay of Refueler Maintenance Facility (RMF)

Provide wash bay equipment as required. See architectural plan for location.

1.23.3 Air Compressor and drops for Refueler Maintenance Facility (RMF)

Provide are compressor designed for outside installation, 125psig with 80 gallon receiver, and compressor capacity equivalent to Ingersoll Rand model 2545 located in the existing facility. See architectural plan for location. Provide compressed air drops in Tool Room, Inspection bay, and two per stall in Work Bay (between each door).

1.23.4 Vacuum Pump and Hood for POL Operations Center Laboratory

Provide hood equivalent to Iroquois Hoods except meeting 29 CFR 1910.1450 and MIL-HDB-1022A, 2100 Burton Street, 40inches x 32inches high x26inches

deep, 816-726-5971. Provide vacuum pump capable of 25inches of mercury in the laboratory for the POL facility hood, ¼ hp motor, equivalent to Vacuum System Inc. model IPC-2, serial number 5112.

1.23.5 Ventilation of the POL Operations Center Laboratory and Lab Office

The Laboratory, and Lab Office, shall exhausted to maintain a negative room pressure between each of these rooms and adjacent areas (Laboratory and Lab Office may be neutral to each other). Room air from the Laboratory and Lab Office shall not be re-circulated to other building areas. Ventilation shall conform to the ACGIH manual, MIL-HDBK-1022A, and other relevant standards.

PART 2 NOT USED.

PART 3 NOT USED

-- End of Section --

SECTION 01018
Space Data Sheets

-- End of Section --

Space Data Sheet

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Work Bays (3 ea.) (Entire bay area from floor (including pits/depressions) to roof structure and wall to wall is classified as Class 1 Division 1)

Room Number: 100

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: (3)

Function:

- Refueler vehicle maintenance and repair

Power/Data/Communications Requirements:

- (8) reel-type 120V drop cords with twist lock connectors
- (4) RJ-45S combination phone/data outlets, each under (1) cover plate.
- (6) NEMA 5-20R GFCI duplex receptacles
- Grounding points: Inside each work bay located adjacent to the roll up door and outside each work bay in vehicle parking located adjacent to the roll up door.

Environmental Requirements:

- Negative room pressure relative to adjacent spaces
- Provide means to mechanically ventilate (purge) entire work bay area per NEC
- Provide air exhaust fans and louvers as required
- All electrical & mechanical equipment must be explosion proof, classification class1, Division 1
- Ambient Room Temperature: Year round ventilation, 55 degrees F (winter) +/- 1 degree F
- Relative Humidity: N/A
- Minimum Lighting: 50 FC @ 36" A.F.F.
- Light Source: HID & Industrial fluorescent strip
- Exhaust extractor system; hoses capable of reaching a refueler vehicle's exhaust pipe
- Ventilated trench drains in locations indicated on the plans
- Ventilated floor recess for hydraulic lift
- Oil and water separator with alarm
- Waste oil collection point w/storage tank
- Egress and emergency lighting required

Plumbing requirements:

- Safety station w/eye wash and emergency shower (2 ea.)
- (1) electric water cooler
- (8) Compressed air drops
- Utility sink (pedestal type) and high rise faucet w/spray attachment

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- Class I, Division I type construction
- Insulated garage doors w/glazed panels and electric openers
- Recessed (flush w/floor) 75,000 lb hydraulic lift & crane rail rated at 2 ton capacity
- Surface mounted FEC

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Mechanical/Electrical Room

Room Number: 101

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Function:

- Provide space for mechanical and electrical equipment

Power/Data/Communications Requirements:

- (2) NEMA 5-20R duplex receptacles at 48" A.F.F.
- (1) RJ-11 wall mounted at 48" A.F.F.
- Electrical service entrance

Environmental Requirements:

- Ambient Room Temperature: Year round ventilation, 55 degrees F (winter) +/- 1 degree F
- Minimum Lighting: 50 FC @ 36" A.F.F.
- Light Source: Industrial fluorescent strip
- Emergency lighting required

Plumbing requirements:

- Floor drain
- Hose bib
- Domestic water service entrance
- Fire riser location
- Compressed air equipment

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- Size and configuration to be modified as necessary based on mechanical/electrical equipment selected
- Exterior doors (pair)

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Communications Room

Room Number: 102

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Provides space for communications equipment

Power/Data/Communications Requirements:

- (2) 120 VAC 60 Hz quadraplex receptacles @ 54" A.F.F.
- Isolated ground for backboard
- (2) RJ-45S combination phone/data outlets under (1) coverplate
- Fire alarm control panel and radio transceiver

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 50 FC @ 36" A.F.F.
- Light Source: Industrial fluorescent strip

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- Exterior door
- Terminal board, 4' x 8' x 3/4" A/C plywood, shellacked

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Tool Room

Room Number: 103

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Provides space for communications equipment

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC.

Environmental Requirements:

- Ambient Room Temperature: Year round ventilation, 55 degrees F (winter) +/- 1 degree F
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Industrial fluorescent strip

Plumbing requirements:

- One (1) compressed air drop

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- Pair of doors to work bay area

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Inspection Bay Equipment

Room Number: 104

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Provides space for communications equipment

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC.

Environmental Requirements:

- Ambient Room Temperature: Year round ventilation, 55 degrees F (winter) +/- 1 degree F
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Industrial fluorescent strip

Plumbing requirements:

- Vehicle wash bay system including pump, transformer, timer, regulator, valves, chemical tank w/auto mixer, pressure regulator, hose boom and high pressure hose, trigger wand and holder, etc.
- Floor drain
- One hose bibb
- One (1) Compressed air drop

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- Door to wash bay area
- Size and configuration to be modified as necessary based on mechanical/electrical equipment selected
- CMU Wall separating the tool room and wash bay equipment room and the door to the wash bay will be eliminated if the optional wash bay is not funded, i.e. the tool room would be expanded to include the wash room equipment space

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Clean Room (Men's)

Room Number: 105

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Shower and lockers for employees

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Provide air intake louvers as required
- Provide air exhaust fans and louvers as required

Plumbing requirements:

- (1) Shower
- floor drain

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- Provide 6" high seamless resinous coved wall base integral with flooring.
- Provide metal double tier lockers in quantities and in locations as shown on the Government drawings and edited technical specification section 10500, LOCKERS
- Construct and install a wall-mounted shower bench in locations and to dimensions in accordance with the Government drawings.
- Provide and install solid polymer shower wall panels and soap dish in accordance with the Government drawings and outline specification Section 06000, DIVISION 6: WOOD AND PLASTICS (paragraph Section 06650, SOLID POLYMER FABRICATIONS)
- Provide shower/toilet accessories in locations and quantities as shown on the Government drawings and outline specification Section 10000, DIVISION 10: SPECIALTIES (paragraph 1.8, SECTION 10800A, TOILET ACCESSORIES).

Remarks:

- None

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Men's Restroom

Room Number: 106

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Restroom facilities for employees and visitors

Power/Data/Communications Requirements:

- (1) NEMA 5-20R GFCI duplex receptacles above lavatory counter

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Provide air intake louvers as required
- Provide air exhaust fans and louvers as required

Plumbing requirements:

- (1) Wall mounted toilet
- (1) Lavatory with high rise faucet

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- Provide 6" high seamless resinous coved wall base integral with flooring.
- Provide shower/toilet accessories in locations and quantities as shown on the Government drawings and outline specification Section 10000, DIVISION 10: SPECIALTIES (paragraph 1.8, SECTION 10800A, TOILET ACCESSORIES). Meet all ADA requirements for mounting heights, dimensions, and clearances where applicable.
- Construct vanity and solid polymer material vanity top in accordance with Government drawings and outline specification Section 06000, DIVISION 6: WOOD & PLASTICS (paragraph 1.5, SECTION 06650, SOLID POLYMER FABRICATIONS).
- Provide solid phenolic toilet partitions in accordance with Government drawings and outline specification Section 10000, DIVISION 10: SPECIALTIES (paragraph 1.8, SECTION 10160A, TOILET PARTITIONS). Meet all ADA requirements for mounting heights, dimensions, and clearances where applicable.

Remarks:

- Door access from Corridor 107

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Vestibule (Men's Restroom)

Room Number: 107

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Eliminates direct sightlines into restroom/clean room facilities

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Provide air intake louvers as required
- Provide air exhaust fans and louvers as required

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- None

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Clean Room (Women's)

Room Number: 108

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Showers and lockers for employees

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Provide air intake louvers as required
- Provide air exhaust fans and louvers as required

Plumbing requirements:

- (1) Shower
- floor drain

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- Provide 6" high seamless resinous coved wall base integral with flooring.
- Provide metal double tier lockers in quantities and in locations as shown on the Government drawings and edited technical specification section 10500, LOCKERS
- Construct and install a wall-mounted shower bench in locations and to dimensions in accordance with the Government drawings.
- Provide and install solid polymer shower wall panels and soap dish in accordance with the Government drawings and outline specification Section 06000, DIVISION 6: WOOD AND PLASTICS (paragraph Section 06650, SOLID POLYMER FABRICATIONS)
- Provide shower/toilet accessories in locations and quantities as shown on the Government drawings and outline specification Section 10000, DIVISION 10: SPECIALTIES (paragraph 1.8, SECTION 10800A, TOILET ACCESSORIES).

Remarks:

- None

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Women's Restroom

Room Number: 109

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Restroom facilities for employees and visitors

Power/Data/Communications Requirements:

- Minimum requirements per NEC
- (1) NEMA 5-20R GFCI duplex receptacles above lavatory counter

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Provide air intake louvers as required
- Provide air exhaust fans and louvers as required

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- Provide 6" high seamless resinous coved wall base integral with flooring.
- Provide shower/toilet accessories in locations and quantities as shown on the Government drawings and outline specification Section 10000, DIVISION 10: SPECIALTIES (paragraph 1.8, SECTION 10800A, TOILET ACCESSORIES). Meet all ADA requirements for mounting heights, dimensions, and clearances where applicable.
- Construct vanity and solid polymer material vanity top in accordance with Government drawings and outline specification Section 06000, DIVISION 6: WOOD & PLASTICS (paragraph 1.5, SECTION 06650, SOLID POLYMER FABRICATIONS).
- Provide solid phenolic toilet partitions in accordance with Government drawings and outline specification Section 10000, DIVISION 10: SPECIALTIES (paragraph 1.8, SECTION 10160A, TOILET PARTITIONS). Meet all ADA requirements for mounting heights, dimensions, and clearances where applicable.

Plumbing requirements:

- (1) Wall mounted toilet
- (1) Lavatory with high rise faucet

Remarks:

- Door access from Corridor 107

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Vestibule (Women's Restroom)

Room Number: 110

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Eliminates direct sightlines into restroom/clean room facilities

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Provide air intake louvers as required
- Provide air exhaust fans and louvers as required

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- None

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Corridor

Room Number: 111

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Internal circulation

Power/Data/Communications Requirements:

- No additional requirements beyond those contained in the NEC

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 20 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.

Remarks:

- Interior access to restroom/lockers, offices, work bays and wash bay

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Office

Room Number: 112

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: (4)

Functions:

- Administrative support for refueler maintenance operations
- Break area

Power/Data/Communications Requirements:

- (1) NEMA 5-20R duplex receptacle per wall
- (1) Combination phone/data outlets per wall, each combination outlet under (1) coverplate.
- (1) duplex receptacle at 84" A.F.F. for wall clock

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 50 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- ~~Provide panel based systems furniture configuration for one person to include a corner computer station, overhead flipper door storage, task lighting, undercounter mobile pedestal and lateral file. Systems furniture configuration and performance requirements shall be in accordance with the Government drawings and fully edited technical specification SECTION 12705, FURNITURE SYSTEMS.~~
- Wood framed dry erase markerboard 4' wide by 3' high.
- Room will accommodate one full size refrigerator (N.I.C.)

Remarks:

- Door access from Corridor 107
- Visual access to outdoors and work bays

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Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Vestibule

Room Number: 113

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: N/A

Functions:

- Air lock for Corridor 107

Power/Data/Communications Requirements:

- Minimum requirements per NEC

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 15 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer
- Emergency and exit lighting required

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- A surface mounted entrance mat shall be provided. Floor mat shall extend wall-to wall and door-to-door to include custom fit cutouts as necessary to achieve full floor coverage. Floor mat shall be a ball-and-socket, roll-up, type. Floor mat system shall include an acrylic-vinyl square profile perimeter frame. Reference government edited specification Section 12690, ENTRANCE MAT.
-

Remarks:

- Door access from Corridor 107
- Visual access to outdoors
- Fire alarm annunciator panel located to allow direct sightline from building exterior
- Provide half-saddle thresholds at both vestibule doors to accommodate and transition floor mat.

Space Data Sheet

DACA41-03-R-0008-0001

Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Office

Room Number: 114

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: (4)

Functions:

- Administrative support for vehicle washing and inspection operations
- Break Area

Power/Data/Communications Requirements:

- (1) NEMA 5-20R duplex receptacle per wall
- (1) Combination phone/data outlets per wall, each combination outlet under (1) coverplate.
- (1) duplex receptacle at 84" A.F.F. for wall clock

Environmental Requirements:

- Ambient Room Temperature: 75 degrees F (summer) +/- 1 degree F, 72 degrees F (winter) +/- 1 degree F
- Relative Humidity: 50% relative humidity in cooling mode
- Minimum Lighting: 50 FC @ 36" A.F.F.
- Light Source: Fluorescent troffer

Plumbing requirements:

- None

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes.
- ~~Provide panel based systems furniture configuration for one person to include a corner computer station, overhead flipper door storage, task lighting, undercounter mobile pedestal and lateral file. Systems furniture configuration and performance requirements shall be in accordance with the Government drawings and fully edited technical specification SECTION 12705, FURNITURE SYSTEMS.~~
- Wood framed dry erase markerboard 4' wide by 3' high.
- Room shall accommodate one full size refrigerator.

Remarks:

- Door access from Corridor 107
- Visual access to outdoors and wash bay

Space Data Sheet

DACA41-03-R-0008-0001

Corrosion Control Facilities
McConnell Air Force Base
Building: **Refueler Maintenance Facility**

Room Name: Inspection Bay. (Entire bay area from floor (including pits/depressions) to roof structure and wall to wall is classified as Class 1 Division 1)

Room Number: 115

Adjacencies/Area Allocation: Required adjacencies and minimum room size are indicated on the Government approved plan included in the set of drawings.

Occupancy: (1-2)

Function:

- Refueler vehicle inspection

Power/Data/Communications Requirements:

- All equipment rated for wet or damp locations

Environmental Requirements:

- Provide means to mechanically ventilate (purge) entire inspection bay area
- Provide air exhaust fans and louvers as required
- All electrical & mechanical equipment must be explosion proof
- Ambient Room Temperature: Year round ventilation, 55 degrees F (winter) +/- 1 degree F
- Relative Humidity: N/A
- Minimum Lighting: 50 FC @ 36" A.F.F.
- Light Source: Industrial fluorescent strip rated for wet or damp locations
- Exhaust extractor system; hoses capable of reaching a refueler vehicle's exhaust pipe
- Ventilated trench drains in locations indicated on the plans
- Oil and water separator with alarm (annunciates in both offices)
- Egress and emergency lighting required

Plumbing requirements:

- (1) electric water cooler
- Wash equipment
- (1) compressed air drop

FF&E:

- Interior Finishes: Reference the Room Finish Schedule on Government drawing sheet B_IN601 and applicable Government outline and/or fully edited technical specifications for the required finishes

Remarks:

- Class I, Division I type construction
- Insulated garage doors w/glazed panels and electric openers

SECTION 01020

60 PERCENT DESIGN REQUIREMENTS

PART 1 60 PERCENT DESIGN SUBMITTALS

Attachments: Code Analysis
ADA Architectural Design Checklist

For general submittal requirements, See Section 01331 SUBMITTALS FOR DESIGN.

1.1 SITE PLANNING

1.1.1 Drawings

1.1.1.1 Location Plan and Vicinity Map

The Location Plan and Vicinity Map provided in the Request For Proposal (RFP) shall be updated as necessary and included in the drawings. The Location Plan shall include the Contractor's Access Route, Staging Area, and the Project Site.

1.1.1.2 **Construction Phasing**

The construction phasing plan will show how the Contractor will maintain access to the site (6:00 A.M. to 6:00 P.M. Monday thru Friday) for the duration of the contract. At all times access to parking for AF personnel & equipment shall be provided. Phasing plan shall include any signage, temporary access drives, or temporary parking needed.

1.1.1.3 Removal Plan

The removal plan will show the existing physical features and condition of the site before construction. Each physical feature to be removed shall be hatched as indicated on the standard legend sheet, a legend on the removal plan, and properly noted: to be removed, to remain, or to be relocated. The Removal Plan shall be prepared at the same drawing scale and use the sheet boundaries as the Site Plan.

1.1.1.4 Site Plan

The Site Plan shall show all the site layout information necessary to field locate the building, parking lots, roads, sidewalks, and all other appurtenances to be constructed as part of the project. All major site work to be constructed will be dimensioned for size and location. The Site Plan will identify all site-related items such as: curbs, pavements, walks, bollards, trash enclosures, chiller units, electrical transformers locations, etc. in accordance with a standard legend sheet or with additional legends or notes. Drawing scales of between one inch to 20 feet, 30 feet, or 40 feet (for plans with sparse information) are acceptable scales for the Site Plan.

The contractor shall consider the project's construction area, drawing legibility, number of sheets required in choosing the drawing scale. The Site Plan, prior to adding the dimensions and notes, should serve as the base sheet to other Plans, such as: Utilities Plan, Grading and Drainage Plans and Landscape Plan. Existing and proposed contours or utility lines shall not be shown on Site Plan. Physical features that will remain after the proposed construction has been completed shall be shown. This plan, or the Location Plan, will also show any free zones, construction limits, etc. Whenever the Site Plan occupies more than one sheet of drawings, a Key Plan shall be included. Additional plans showing specific areas of the site in smaller scales can be included if more detail is necessary.

1.1.1.5 Site Details

The Contractor shall provide designs and details as necessary for site furnishings, accessories, accessible parkings stalls and ramps, bollards, signage, striping, and any other site structure or item requiring a detail for clarity and construction accuracy.

1.1.1.6 Landscape Plans

A detailed Landscape Plan showing trees, shrubs, ground covers, seeded and sodded areas, shall be prepared by the Contractor.

1.1.1 Specifications

Provide marked up of all Technical Specifications proposed for use in the final site design. Line through deletions and enbolden additions.

1.1.2 Design Analysis Narrative

Design analysis shall include the following:

1.1.3.1 Design References

Design references used in preparing the site design.

1.1.3.2 Basis, Specific Goals, Objectives and Priorities For Site Design

The Design Analysis should give the basis, specific goals, objectives and priorities for site design of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Document pollution prevention measures and other environmental considerations made during design. The 60 percent Design Analysis must be approved and accepted before Final Design.

1.1.2.1 Sustainable Design Objectives

The Design Analysis shall include the proposed sustainable design objectives with reference to site planning and civil design work which will be attained as part of this project. The SpiRiT will be completed and included.

1.2 CIVIL

In addition to the following requirements the 60% submittal shall include incorporation of all comments from earlier design submittals and conferences.

1.2.1 Drawings

1.2.1.1 Grading and Drainage Plan

A preliminary grading and drainage plan showing the proposed layout of all new culverts and roof drains shall be provided at the same scale as the site plan. Existing grading contours shall be indicated at 1 foot contour intervals. New grading contours shall be shown. Indicate finished floor elevation of new buildings. Plans shall show the layout of the new and existing storm drain and roof drain system. Also include layout of subdrains. Storm drain system shall be labeled. The rim elevations of all manholes, curb inlets, and area inlets shall be indicated. Label sizes and materials.

1.2.1.2 Typical Pavement Sections

Provide typical pavement and road sections and details showing interface between new and existing pavements and new pavements of different sections.

1.2.2 Specifications

Provide a listing by title and number of all Technical Specifications proposed for use in the final civil design.

1.2.3 Design Analysis Narrative

Design analysis shall include the following:

1.2.3.1 References

Design references used in preparing the civil design.

1.2.3.2 Grading

A narrative of the grading design and criteria used.

1.2.3.3 Pavements

A narrative of the pavement design and criteria used plus design calculations used to obtain the pavement design. Include copies of programs and manuals used to develop the pavement design sections.

1.2.3.4 Drainage

A narrative of the drainage design and criteria used. Include information on the culvert pipe materials anticipated to be used.

1.2.3.5 Basis, Specific Goals, Objectives and Priorities For Civil Design

The Design Analysis should give the basis for the civil design and should establish specific goals, objectives and priorities for civil design of the project. Identify, explain and document use of design criteria and how the design meets goals, objectives and priorities. Identify the preferred site development concept. Document pollution prevention measures and other

environmental considerations made during design. The 60 percent Design Analysis must be accepted before Final Design.

1.3 GEOTECHNICAL

See Civil and Structural Design Requirements.

1.4 WATER SUPPLY AND WASTEWATER

1.4.1 Drawings

1.4.1.1 Water Distribution and Sewage Collection Systems Plan (including building services)

Provide all existing utilities and above ground features which may pose as an obstacle (i.e., water, sewer, gas, electrical, etc.) on the utility plan that references in the site plan. Exclude siting notes and dimensions from the plan. Provide all proposed new water and sewer lines with preliminary sizes. This shall include all new service lines up to the 5 foot building line. Show the proposed locations of all new manholes, fire hydrants, valves (including PIV's), and connection points.

1.4.1.2 Water Distribution and Sewage Collection Systems Profiles

Profiles of all gravity sewers and waterlines shall be provided. Profiles may be omitted for short waterlines, unless necessary to assure adequate cover or avoid interference with other underground facilities. Indicate existing pipe material and sizes where new lines connect. Indicate type of connection and elevation. Include all interference elevations of crossing utilities and structures.

1.4.1.3 Water Distribution and Sewage Collection Systems Details

Appropriate water and sewer details shall be provided. The standard detail sheets will be furnished if required. For roadway pavement crossings, indicate installation method (boring, jacking, trenchless excavation, etc.). Include standard casing details.

1.4.2 Specifications

Specifications shall be coordinated with the plans and include all items. Provide a listing of specifications to be provided. Provide a complete copy of special sections to cover those subjects for which no UFGS guide specifications are used or available. Deletions from the guide specs should be indicated by striking through and additions by bold or underscore.

1.4.3 Design Analysis Narrative

Design analysis shall include the following:

1.4.3.1 References

Provide design references used in preparing the water and wastewater design.

1.4.3.2 Water Supply and Distribution Systems

A narrative of the water supply and distribution systems design and applicable criteria used shall be provided. Include the peak and average domestic demands, the fire flow required and the available flow and

residual pressures. A description of the water distribution system, a listing of allowable piping materials, hydrant flow test data and preliminary calculations necessary to support equipment, piping sizes, fire and domestic demands, etc., shall be provided.

1.4.3.3 Wastewater and Sewers

Based on existing information the sanitary sewer system in the vicinity of the proposed facility is assumed to be adequate to carry the flows expected to be generated by the new facility. A narrative of the wastewater supply design and applicable criteria used shall be provided. Include the preliminary calculations used to design the average and peak contributing flows. Field verify the available capacity and full flow capacity of the existing system to ensure that it will be adequate for the flows generated by the new facility. Include the available capacity and full flow capacity in the design analysis. Preliminary calculations necessary to support equipment and piping sizes and a listing of allowable piping materials shall be provided.

1.5 Exterior Gas Distribution System

1.5.1 Design Narrative

The 60 Percent Design Analysis Narrative shall include the information presented in the 35 percent submittal. The information shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the 60 percent design.

1.5.2 Pipe Sizing Calculations

The 60 percent calculations shall include all the information presented in the 35 percent submittal, shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the 60 percent design. In addition, new calculations shall be as specified in Section 01019, 35 PERCENT DESIGN REQUIREMENTS and the narrative sections (01012 and 01016) referenced there.

1.5.3 Exterior Utility Drawings

The 60 percent drawings shall include all the information presented in the 35 percent submittal, shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the 60 percent design. In addition, any new drawings shall be as specified in Section 01019, 35 PERCENT DESIGN REQUIREMENTS.

1.5.4 SPECIFICATIONS

The submitted 35 percent technical guide specifications shall be updated, completely edited, and fully coordinated with the drawings to accurately and clearly identify the 60 percent product and installation requirements for the facility. Technical specifications shall be Unified Facilities Guide Specifications (UFGS), which shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the product and installation requirements for the facility as specified in Section 02000, DIVISION 2: SITE WORK - OUTLINE SPECIFICATIONS. In addition, new specifications shall be as specified in Section 01019, 35 PERCENT DESIGN REQUIREMENTS and the narrative sections (01012 and 01016) referenced there. Deletions from the guide specs should be indicated by striking through and additions by bold or underscore.

1.5.4.1 Items to be Fast Tracked

All items to be fast tracked shall be as specified in Section 01019, 35 PERCENT DESIGN REQUIREMENTS.

1.6 ARCHITECTURAL

1.6.1 Drawings

The Sixty percent architectural drawing submittal shall be a complete set of architectural drawings without large scale details. All other drawings shall be complete except referencing of the large scale details.

1.6.1.1 Floor Plans

Provide a double line Floor Plan, drawn at the largest scale practicable to include the entire building on a single sheet. See paragraph on Drawing Scales for plan scale requirements. Floor plans shall essentially be complete with the exception of large scale detail referencing. Floor plans shall be scaled double-line drawings showing the functional arrangement, pocheing, location of all openings and plumbing fixtures, all section cuts, wall types, all notes and leaders, all general notes, and all dimensions shall be completed. The plans shall indicate door swings, door numbers and window type; door and window schedules are required. A north arrow shall be shown on each floor plan. Enlarged toilet and stair plans shall also be included. The first composite plan sheet shall include a gross area tabulation comparing the actual square meters with the authorized square meters of the facility. Architect-Engineer suggestions for plan improvement shall be fully shown and justified. Include the following:

- Overall, control, and door/ window opening dimensioning.
- 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 and door numbers.
- Window types.
- Area in square meters.
- General notes.
- All Floor & Wall Patterns/Borders.

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. Major elements of mechanical and electrical equipment affecting room size or shape, shall be shown on the architectural plans to a practicable extent and coordinated with other respective disciplines. When applicable, Government-furnished, Contractor-installed, or Government-furnished and Government-installed items shall be shown as a dashed line.

1.6.1.2 Reflected Ceiling Plans

Reflected ceiling plans shall be complete including all electrical lights, mechanical supply & diffusers, notes, complete legends and pocheing of all materials to be used. See paragraph on Drawing Scales for reflected ceiling plan scale requirements.

1.6.1.3 Roof Plan

Roof plans shall be complete including all notes, legends, slope indications, gutter and downspout locations, and roof overflow drains. All elements located on the roof shall be coordinated with all disciplines. See paragraph on Drawing Scales for roof plan scale requirements. Roof mounted equipment should be limited to exhaust fans, vents, and intakes, no large pieces of equipment shall be allowed to be mounted on the roof.

1.6.1.4 Building Elevations

Provide all building elevations complete showing the appearance and architectural treatment. Elevations shall be dimensioned to show total height, and relation to grade. Critical elevations such as top of finish floor, top of steel, etc. shall be indicated. All notes for materials shall be included. See paragraph on Drawing Scales for Exterior Building Elevation scale requirements.

1.6.1.5 Building Sections

Building cross section and longitudinal sections shall be included to show general interior volumes, construction methods, and height of ceilings and partitions. Identify materials used and necessary dimensions. See paragraph on Drawing Scales for Building Section scale requirements.

1.6.1.6 Wall Sections

Drawings shall include all wall sections and stair section conditions including corridors, showing vertical control elevations and dimensions, with all materials labeled. The sections should normally be cut through doors, windows, and other critical wall section locations. Wall sections shall not be broken. 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. See paragraph on Drawing Scales for Wall Section scale requirements.

1.6.1.7 Door, Window, and Louver Schedules

Door schedule shall be complete in accordance with Corps of Engineers (COE) standard format. Schedule shall include door and frame types, except referencing to door details and hardware sets. Window and louver schedules shall be complete including window and louver types except referencing to details.

1.6.1.8 Fire Ratings

Wall ratings, and fire hazards shall be clearly indicated as required by Fire Protection criteria. Wall fire ratings shall be graphically shown by a continuous symbol or pocheing within the wall on a Fire Protection /Life Safety Plan. 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, floor plan which makes an accurate presentation of these various features and functions.

1.6.1.9 Drawing Scales

Architectural work shall be drawn at the scales listed below. Other scales

may be used only by written authorization through the Technical Manager, Omaha District. Units of measurements shown on the drawings shall be done in millimeters. All disciplines should use the same scale for plan sheets. The following is a comparison guide to establish equivalent scaling of drawings:

	<u>METRIC</u>
Composite Plans (Note 1)	Varies
Floor Plans	1:100
Reflected Ceiling Plans	1:100
Detail Plans (Note 2)	1:20
Roof Plans	1:100
Exterior Elevations	Same scale as plan
Interior Elevations	1:20
Interior Toilet Elevations	1:20
Building Cross Sections	1:100 or 1:50
Wall Sections (Note 3)	1:10
Stair Sections	1:20
Details (Note 2)	1:5
Wall Types	1:10
Fire Protection Plans (Note 1)	Varies

Notes:

1. Scale of composite plan shall be as required so that the entire facility is drawn on one sheet without break lines.
2. The goal of this requirement is that the details be large enough to show all fixtures, accessories, equipment, materials, manner of construction, clearances required for proper maintenance, and complete dimensions. Toilet rooms and Equipment rooms are examples of the kind of spaces which shall be drawn as a Detail Plan.

1.6.1.10 Legends

Standard architectural material symbols used on the drawings shall be provided as a separate architectural legend drawing located just in front of the architectural drawings in the set. Additional material symbols should be added to the Legend Sheet as needed for the project.

1.6.1.11 North Arrows and Graph Scales

North arrows shall be oriented the same direction on all plan sheets and by all disciplines; including site and civil drawings. Plan north shall be "up" or the left on the drawings. Indicate true north on composite plan drawings. North arrows shall be located approximately at the same location on all sheets. Graphic scale shall be placed on each drawing.

1.6.1.12 Modular Design

Modular Design practices shall be followed in the design of all masonry buildings or components of buildings. Dimensions shall be figured to whole or half-unit lengths of standard units in order to reduce on-site cutting of masonry.

1.6.1.13 Symbols

The Room and Door Numbering system shall be consistent. The standard

symbols for Amendments (a triangular box) or Modifications (a type of circular box, see the chapter on Drafting Criteria) 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.

1.6.1.14 Schedules

Schedules for room finish, doors, windows, louvers, 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. Other scheduling methods as standard with the A-E may be used if approved by written authorization from the Project Architect, Omaha District.

1.6.1.15 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. Notes that pertain to each drawing however, should be placed on each drawing.

1.5.1.18 Dimensions

Dimensions must be complete, accurate and fully coordinated. 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 one or both nominal faces of masonry and to jambs of openings.

1.6.1.16 Access to Utilities

All utilities within the building, such as piping, ductwork, electrical work, etc., shall be concealed in finished areas. Provide plumbing chases in toilet 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 systems must be adequate but should not be excessive.

1.6.1.17 Reflected Ceiling Plans

Reflected Ceiling Plans shall be provided for all spaces in the building. Reflected ceiling plans shall show the ceiling tile layout and location of gypsum wallboard and other ceiling types where applicable. All light fixtures, air diffusers, grilles, registers, PA speakers, sprinkler head layout, smoke and heat detectors - if ceiling mounted, and other ceiling mounted items will also be shown on the reflected ceiling plans. 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. All ceiling mounted items shown shall be fully coordinated with all other

disciplines.

1.6.1.18 Sketches

All sketches presented during the design phase shall be reduced to 8-1/2" by 11" and included in this design analysis to document the design options and decisions evaluated during the design process.

1.6.2 Technical Specifications

1.6.2.1 Use of Technical Guide Specifications

Technical Unified Federal Guide Specifications (UFGS) shall be used to achieve the maximum uniformity in contract requirements. The technical 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 provisions of the technical guide specifications should not be changed without justification. The 60% submittal shall include a draft edited specifications of all the applicable sections. Items added or deleted in these specification sections shall be evident. Complete descriptions including specific size, gauge, and configuration are included in the technical Guide Specifications for a wide variety of items. The designer must be familiar with the technical Guide Specification requirements in order to provide details fully coordinated with the technical specification descriptions. Terminology used on the drawings shall be the same as used in the Technical Guide Specifications. Where it is desirable to detail a variance with the standard provisions of the Technical Guide Specifications, the specifications must be revised to coordinate with the details. In addition to the guidance in specification Section 01332, SUBMITTAL PROCEDURES FOR CONSTRUCTION on editing technical specifications, data and sample submittals for all interior and exterior finishes shall be "G" submittals.

a. New Guide Specifications

New guide specifications shall be limited to those specialty type items not covered in the regular sections of Technical Guide Specifications or provided as a requirement listed in the various CSI divisions within this document.

1.6.3 Design Analysis Narrative

The Design Analysis shall be essentially complete with emphasis on the following:

1.6.3.1 Basic Criteria Statement

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..

1.6.3.2 Description of Materials

A description of materials for all major building components and of all interior and exterior finishes ascertaining their matching of existing. The description of materials must include type of exterior wall construction, room finish schedule, window types, panel materials, etc.

The description of materials should follow the continuity of the Military Handbook 1190. The description of finishes may be presented in schedule form.

1.6.3.3 General Parameters

The design analysis shall follow the format described herein.

- a.** The purposes, overall functions, and total capacities of the facility.
- b.** The design theme 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.
- c.** The number of personnel to use facility.
- d.** The type of activities and equipment involved.
- e.** The anticipated life of the functions to be accommodated.
- f.** The category of construction; permanent

1.6.3.4 Functional and Technical Requirements

- a.** Functional areas, occupant capacities, and allocation, including a functional relationship matrix.
- b.** All items of equipment, required.
- c.** Occupational safety and health.
- e.** Energy conservation energy budget goals.
- f.** Sound and vibration control.
- g.** Interior service areas.
- h.** Physical security; lock and keying, intrusion-detection, alarms, restricted access areas, interior guard support, and ties to local authorities.
- i.** Justification for selection of exterior and interior finishes and materials.
- j.** Moisture Vapor Control.
- k.** Lessons learned incorporated into the design.

1.6.3.5 Design Objectives and Provisions

- a.** Adaptation of the building to the size, shape, and orientation of the site.
- b.** Building layout to establish convenient circulation flows during normal operation and emergency evacuation activities, for materials, equipment, services, and people.

- c.** Grouping spaces into sound-compatible zones and protective construction zones, e.g., for fire and storm.
- d.** Space layout compatible with modular (structural and environmental) support systems.
- e.** Type of construction materials, architectural systems, and finishes.
- f.** Building expandability/changeability.
- g.** Physical security.
- i.** Energy conservation. (insulation, orientation)
- j.** Acoustical design.
- k.** Moisture vapor condensation design.
- l.** Composition of masses and spaces architectural compatibility and architectural details to reflect the design theme and desired image, and the scale and nature of the activities involved.
- m.** Perception of the building details and volumes. (Specific provisions made, e.g., an identifiable sequence of viewing positions for experiencing the interior and exterior architectural design.)
- n.** Enhancement of materials and systems maintenance and operation.
- o.** Economy of building construction, operation, and maintenance: life-cycle cost effectiveness.

1.6.3.6 Coordination with Installation or Outside Agencies

- a.** Physical security support.
- b.** Occupational safety and health, as required.
- c.** Government furnished equipment.
- d.** Operations and maintenance support.

1.6.3.7 Checklists

Fire Protection Code Analysis shall be included in the Design Analysis. See Attachments Code Analysis and ADA Architectural Design Checklist at the end of this section.

1.6.4 Design Analysis Calculations

- a.** 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".)

- b.** U-values for each wall, window, door, or roof type studied or selected.

c. Acoustics.

d. Rainfall intensity relative to roof area and roof drain size and number calculations.

e. Sustainable Design. The Design Analysis shall include the proposed sustainable design objectives with reference to building design and construction work which will be attained as part of this project.

1.7 INTERIORS

The interior design portion of the submittal shall address both building-related and furniture-related portions of the comprehensive interior design.

1.7.1 Design Analysis/Narrative

A section for interior design shall be included in the design analysis. This section shall include:

A. A detailed narrative statement of design objective with an explanation of the desired image or visual appearance of the interior of the facility and the design intent.

B. Description and rationale for finish materials used, their performance characteristics, durability, maintenance requirements, and other pertinent data.

C. Sustainable Design. The Design Analysis shall include the proposed sustainable design objectives with reference to interior finishes and furnishings design which will be attained as part of this project.

1.7.2 Technical Specifications

Provide a complete listing of all interior finish, equipment, and furnishings related specification sections which will be provided in this project.

1.7.3 Color Boards

Preliminary architectural (AE) design color boards shall be supplied in the format described in government specification Section 09920, CONTRACTOR COLOR BOARDS, paragraphs 2.1 and 3.1. The color boards shall show actual color samples of all proposed exterior and interior building finishes, and, on separate color boards, the proposed coordinating furniture finishes. Samples shall be identified by a universal symbol that is used to describe the material on the color boards and drawings for cross reference purposes.

A copy of the Interior Finish Schedule and Interior Finish Materials Legend shall accompany the color boards to aid in clearly identifying all finishes. Clarification of finish placement shall be required when more than one color of a single finish is proposed. A minimum of two sets shall be supplied to the government.

1.7.4 Drawings

Sixty percent architectural drawing submittal shall be a complete set of

architectural drawings meeting the requirements regarding dimensioning, scales, and formatting as described in paragraph 1.5.1 of this specification. For interior design purposes the drawings shall include:

1.7.4.1 Floor Plans

The overall and expanded floor plans shall locate and show the following scaled items:

- A. Plumbing fixtures.
- B. Kitchen equipment.
- C. Cabinets, counters, and casegoods.
- D. Furniture Plan showing location of all proposed furniture.

1.7.4.2 Interior Elevations

Fully dimensioned interior elevations shall be provided of all walls or partial wall areas required to visually and dimensionally locate interior architectural materials, finishes, cabinetry, or equipment. Interior elevations shall include symbology for required detail cross sections.

1.7.4.3 Schedules and Legends

Provide a fully edited interior room finish schedule in the COE format provided. Provide a 60 percent complete Interior Finish Materials Legend in the COE format provided.

1.7.4.4 Furniture-Related Design

Provide a three ring binder preliminary presentation to include illustrations, specifications, and procurement information on proposed furniture and accessory selections. All items should be coded and cross-referenced to the furniture floor plan.

1.8 STRUCTURAL

1.8.1 DRAWINGS

Drawings shall include roof framing plans, floor slab plans and foundation plans for buildings. Roof framing plans shall show sufficient details to clearly indicate the type of framing system used, size and spacing of members and their elevations. The location of all columns or pilasters shall be shown, and all building structural members shall be at least outlined. The sizes, locations and elevations of footings shall be shown. Slab plans shall be coordinated with the Architectural sheets and shall indicate the locations of structural walls and masonry partitions, recessed slabs and contraction or construction joints. Concrete slab-on-grade thicknesses and sections shall be shown. Proposed treatment of unique or complex features and details shall be shown on the drawings. Elevation views, sections and details necessary to illustrate the design at a 60% level of completion shall be provided. Drawings shall also include overall building plan dimensions, north arrows, and design notes. Drawings shall be done at a scale appropriate for the design, in no case however, shall plan type drawings be done at a scale smaller than 1:100 or detail type drawings at a scale smaller than 1:20.

1.8.2 SPECIFICATIONS

For this 60% design submittal the Contractor shall provide a listing by title and number of all Technical Specifications proposed for use in the final structural design.

1.8.3 DESIGN ANALYSIS NARRATIVE

The design analysis shall include all items included in the 35% submittal expanded as necessary to reflect the current stage of the project and any revisions necessitated by comments on the Concept submittal. Design analysis shall follow the format described in Section 01331 SUBMITTALS DURING DESIGN, Paragraph 3.3, "Design Analyses" and the specific content shall be essentially as outlined below.

1.8.3.1 Design Criteria and References

A list of design criteria references, such as Department of the Air Force Manuals, Army Corps of Engineers Technical Instructions, ACI Standards, AISC Specifications, etc., and any other references which were used in the design of the project shall be included in the narrative.

1.8.3.2 Design Loads and Conditions

A list of structural design loads and conditions shall be provided, including:

- Snow load parameters;
- Wind load parameters
- Seismic design parameters;
- Roof live loads;
- Floor live loads, identifying each loading with usage and the room or space where used;
- 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 Final Foundation Analysis report (See Attachment No. 2 included as an appendix to this solicitation), a copy of which shall be included as an Appendix to the design analysis.

1.8.3.3 Structural Materials

A list of structural materials shall be provided, together with the stress grades and/or ASTM designations, as applicable, for structural steel, concrete, and reinforcing steel; the series for steel joists; and identification of the proposed use of each material in the structure.

1.8.3.4 Availability of Precast Concrete Units

Where precast concrete units of particular cross section(s) and concrete strength are 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 Contractor 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 Contractor's staff member who obtained the verification.

1.8.3.5 Description of the Structural System

A concise description of the proposed structural systems selected for the building, together with the reasons for its selection, shall be provided. All principal elements of the structural system selected shall be described. Typically, these shall include:

- Primary supporting members for the roof;
- Masonry walls, type of material, and whether load bearing or non-load bearing, with location of load-bearing walls defined, and measures taken to compensate for expansion/contraction and crack control in masonry walls;
- The proposed system for resisting lateral forces (wind and earthquake) and transferring them to the ground, whether diaphragms, chord bracing, shear walls, braced or moment resisting frame, etc;
- Foundations, description of special designs to accommodate existing site conditions;
- Concrete slab-on-grade floors, description of floor surface finish treatment, accommodation of live loads, and the use, location and types of crack control joints;
- The proposed treatment of any unusual structural loadings, features or unique solutions to structural problems.
- Identification of any major vibrating elements and measures taken to isolate them.

1.8.4 DESIGN ANALYSIS CALCULATIONS

The extent of the structural calculations shall be indicative of a design which has reached a 60% level of completion. Computations shall include the determination of snow, wind, seismic, dead and live loads. Computations shall show sizing and spacing of structural members for roof framing, sidewalls and foundation sizes, as appropriate to the systems to be used for these elements.

1.9 MECHANICAL

Compliance with the design requirements for the building mechanical systems will be determined by a review of the submitted 60 percent design analysis, design calculations, drawings and specifications. The 60 percent design submittal shall include all the information presented in the 35 percent submittal, updated to 60 percent design status, corrected to reflect any changes made in response to review comments, and shall include the additional requirements specified hereinafter. Any conflicts in the design requirements or lack of thorough understanding of the nature and scope of work shall be identified and resolved prior to submittal of the 60 percent design.

1.9.1 DESIGN ANALYSIS NARRATIVE

The 60 Percent Design Analysis Narrative shall include the information presented in the 35 percent submittal and as specified in Section 01019, 35 PERCENT DESIGN REQUIREMENTS. The information shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the 60 percent design.

1.9.2 CALCULATIONS

The 60 percent calculations shall include all the information presented in the 35 percent submittal and as specified in Section 01019, 35 PERCENT DESIGN REQUIREMENTS, shall be corrected to reflect changes in content made in response to review comments, and shall be expanded to reflect the 60 percent design. The design analysis calculations shall include the heating, cooling, and ventilation load calculations to determine the selection of the type and size of mechanical equipment to be used. Design calculations shall be provided in sufficient detail to enable the reviewer to get a clear understanding of all work to allow approval. Backup data shall be furnished to support basic design decisions related to sizing of major equipment and materials, performance of specific systems or equipment. Manufacturer's catalog data sheets shall be provided for each item of equipment selected. Calculations shall be performed by computerized procedures as specified in Section 01016, MECHANICAL REQUIREMENTS. Use of standardized charts, curves, tables, graphs shall not be acceptable for portions of required calculations in lieu of specific calculation procedures, except when the charts, curves, tables, and/or graphs are part of the manufactures' proprietary published selection procedure/data to determine the output capacity, pressure drops, etc of the equipment being selected. Design calculations and computations shall be provided for all systems and shall include, but not limited to, the following:

1.9.2.1 Block Air-Conditioning Loads

Preliminary block load calculations as specified in Section 01016, MECHANICAL REQUIREMENTS for boiler selection. A copy of all input and output printouts for all three design conditions shall be provided.

1.9.2.2 Deleted Paragraph

1.9.2.3 Deleted Paragraph

1.9.2.4 Boiler Selection

Include boiler capacity adjustments for altitude, inefficiency, and net rating. Provide catalog data indicating input capacity, net output capacity, number of modules, dimensions, and water and intake and exhaust size connections.

1.9.2.5 Combustion-Air Requirements

Include combustion air quantity and free area calculations for all indirectly vented gas burning appliances, louver selection, combustion air heating requirements, and selection of heating equipment.

1.9.2.6 Air Handling Units

Air handling unit selection including selection of all filters, mixing boxes, access sections, fan section, coils and coil sections in accordance with the manufacturer's published selection procedures and/or the manufacturer's selection software. Provide catalog data indicating flow rate volumes, coil capacity and water flow rates, number of modules, dimensions and connection sizes. All selections shall be relatively final except for the fan sizing.

1.9.2.7 Blower Coil Units

Blower coil unit selection including selection of all filters, access sections, fan section, coils and coil sections in accordance with the manufacturer's published selection procedures and/or the manufacturer's selection software. Provide catalog data indicating flow rate volumes, coil capacity and water flow rates, dimensions and connection sizes. All selections shall be relatively final except for the fan sizing.

1.9.2.8 Computer or Fan Coil Unit

Selection of the unit for the communication rooms including selection of all filters, access sections, fan section, heating coil and DX coil in accordance with the manufacturer's published selection procedures and/or the manufacturer's selection software. Provide catalog data indicating flow rates, coil capacity, dimensions and connection sizes. All selections shall be relatively final except for the fan sizing.

1.9.2.9 Make Up Air Unit

Make up air unit selection including selection of all filters, access sections, fan section, coils and coil sections in accordance with the manufacturer's published selection procedures and/or the manufacturer's selection software. Provide catalog data indicating flow rate volumes, coil capacity and water flow rates, dimensions and connection sizes. All selections shall be relatively final except for the fan sizing.

1.9.2.10 Unit Heater Selections

For each area requiring a unit heater, provide data on capacity, flow rates, pressure drops, weight, and horsepower.

1.9.2.11 Waste and Vent Pipe Sizes

Provide preliminary riser diagrams with fixture type, fixture units and resultant pipe sizes.

1.9.2.12 Domestic Water Demand

Calculations for determining the size of the domestic cold water supply line to the building shall be provided.

1.9.2.13 Domestic Pipe Sizes

Provide preliminary riser diagrams with fixture type, fixture units and resultant pipe sizes. In addition to the pipe sizes provide a summary of the pressure drops and available pressure from the service entrance to the most hydraulically remote fixture that demonstrates the pressure required by the fixture is met.

1.9.2.14 Domestic Hot Water Demand

The design guidance provided for service water heating in ASHRAE Handbook HVAC Systems and Applications shall be followed to determine the domestic hot water demand for the facility as specified in Section 01016, MECHANICAL REQUIREMENT. Provide calculations and catalog data for the domestic water heaters and storage tanks.

1.9.2.15 Pipe Sizes for Internal Roof Drains

If any internal roof drains are provided, then provide preliminary riser

diagrams with drain type, estimated flow and resultant pipe sizes as specified in Section 01016, MECHANICAL REQUIREMENT.

1.9.2.16 Natural Gas Pipe Sizes

Provide preliminary riser diagrams with appliance type, input rating and resultant pipe sizes as specified in NFPA 54 and section 01016, MECHANICAL REQUIREMENT.

1.9.2.17 Hydraulic Calculations for Fire Protection

Hydraulic calculations for the wet pipe sprinkler system, including a drawing showing hydraulic reference points and pipe segments.

1.9.2.18 Load Calculations for Sizing Sway Bracing

For wet pipe sprinkler systems that are required to be protected against damage from earthquakes, load calculations shall be provided for sizing of sway bracing.

1.9.2.19 Estimated Preliminary Calculations

Segment by segment calculations of pressure drop for piping and ductwork need not be submitted at the stage except for items to be Fast Tracked. Any additional preliminary calculations shall be provided to estimate pressure drop in pump and fan selections, pipe and duct sizes and expansion tank sizing shall be submitted for review.

1.9.2.20 Electrical Load Summary

A summary of all mechanical equipment and the associated electrical load requirements shall be provided.

1.9.2.21 Mechanical Items to be Fast Tracked

All final calculations as specified above, in section 01020, 60 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS shall be submitted, reviewed and approved to accurately and clearly identify the final requirements for every piece of mechanical, HVAC and/or plumbing equipment to be installed before the full facility design is complete and approved prior to the installation of the subject item.

1.9.2.22 Site, Architectural and Structural Items to be Fast Tracked

Prior to the installation of any structural foundations the size of the mechanical room shall be verified and all piping to be installed below the slab on grade floor shall be fully designed and approved as specified above, in section 01020, 60 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS. All final calculations as specified above, in section 01020, 60 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS shall be submitted, reviewed and approved to accurately and clearly identify the final requirements, including all maintenance clearances, for every piece of mechanical, HVAC and/or plumbing equipment to be installed within the foot print of the mechanical room and all piping to be installed below the slab on grade floor. When grading or building surface is to be fast tracked, then all final calculations as specified above, in section 01020,

60 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS shall be submitted, reviewed and approved to accurately and clearly identify the final requirements for every mechanical, HVAC and/or plumbing distribution system that penetrates the installed grading or surface prior to the installation of the subject grading or surface.

1.9.3 CONSTRUCTION DRAWINGS

The drawings shall be fully coordinated with the design analysis and specifications. Provide sufficient plans, piping diagrams and isometrics, sections, air and water flow diagrams, details, schedules, and control diagrams/sequences of operation etc. shall be provided as necessary to define the required design intent and requirements. The designer shall show on the construction drawings all items which are referred to with phrases such as "as shown", "as indicated", "as detailed", etc within the UFGS Specifications. The construction drawings shall show, to scale, the actual equipment to be installed and all required clearances required for operation, routine maintenance, and replacement of minor and major components. The drawings shall not show any piping, ductwork or other mechanical equipment to be exposed in finished spaces except where approved by the government. All exposed items shall be called out to the government for approval before proceeding. Access panels required for concealed items shall be shown on the construction drawings. The design and installation shall be fully coordinated with all other trades involved in the design and construction of the facility. Special care shall be given to National Electric Code requirements for clearance in front of and above electrical equipment. The construction drawing shall be produced to incorporate the requirements below into all drawings. Furthermore, the requirements below shall be repeated in the form of general notes on every mechanical (both HVAC and plumbing) construction drawing that shows a plan view. General notes shall include any mechanical general installation notes that may be required to clarify the construction intent that may not be readily apparent in the specifications or on the drawings. General notes may be provided on a separate sheet if space does not exist on the plan sheets. Sheet reference number sequencing shall be in accordance with the A/E/C CADD Standards Manual, ERDC/ITL TR-01-6. Submittal drawings shall include, but not limited to, the following:

1.9.3.1 Drawing Clarity

All drawings specified below, when reproduced at half scale, shall be clear and easily readable as determined by the Contracting Officer's Representative (COR).

1.9.3.2 Drawing Coordination

Show on all mechanical drawings specified below, all items of mechanical equipment and systems, to determine proper space allocation within the limits of the architectural, structural and electrical layout requirements. Plans, elevations, and sections shall be developed sufficiently to insure that major equipment items, piping, and ductwork cause no interference with architectural members, structural members, electrical equipment, etc.

1.9.3.3 Index Sheet

An index sheet identifying all mechanical drawings shall be provided, including those drawings anticipated to be provided in the 100 percent design submittal. Index shall include drawing design file numbers, drawing

numbers, sheet numbers, and drawing descriptions.

1.9.3.4 Legend Sheet

This sheet shall include all mechanical abbreviations and symbols that will be used on the drawings. Symbols shall be grouped into sections; as a minimum, provide sections for Plumbing, Heating, Miscellaneous Piping, Valves and Fittings, and ventilation.

1.9.3.5 Plumbing Plan Sheets

Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at 1:50 scale and shall show all room names and numbers. Coordinate with architectural design for provisions of access panels for all concealed valves, traps, fire dampers and air vents etc.. Coordinate with architectural design so that louvers shown on architectural drawings match damper sizes for the respective openings as shown on Mechanical drawings. An exception to this are mechanical room plans shall be 1:20 scale.

Plumbing plans showing the design and tentative layout of the domestic hot and cold water distribution systems; make-up water piping; soil, waste and vent piping; and storm water drainage system shall be provided. Plans shall show all anticipated routing of piping systems from the connections within the structure to a point 5 feet outside the structure. The grade of all drain lines shall be calculated and invert elevations established. All electrical panels/equipment and pertinent HVAC equipment (expansion tanks, boilers, AHU's, pumps, etc.) shall be outlined in half-tone on the plumbing plans. Plumbing fixtures and drains shown on the drawings shall be designated by the same identification system used in the Technical Specification and Plumbing Fixture Schedule.

1.9.3.6 Enlarged Mechanical Room Plumbing Plan

An enlarged mechanical room plumbing plan drawn at a minimum 1:20 scale shall be provided. Plan shall show layout of all plumbing equipment and piping within the rooms. Mechanical room piping, ductwork and equipment shall be installed to provide a minimum headroom of 2 m below all overhead mechanical room piping, ductwork and equipment. Aluminum jackets shall be provided over all insulation installed within 1500 mm of the mechanical room floor. In addition to all the plumbing systems required, the plan shall show half-toned outlines of all HVAC equipment located in the room, gas service, the fire protection entrance and risers, and the outline of any electrical panels or equipment located in the room.

1.9.3.7 Enlarged Kitchen Plumbing Plan

An enlarged Kitchen plan drawn at a minimum of 1:20 scale shall be provided. Plan shall show layout of all plumbing equipment and piping within the rooms. In addition to all the plumbing required, the plan shall show half-toned outlines of all HVAC equipment located in the room, gas service the fire protection and the outline of any electrical panels or equipment located in the rooms.

1.9.3.8 Plumbing Detail Sheets

Installation details showing all specification requirements such as isolation and balancing valves, thermometers, pressure gauges, equipment

pads, strainers, vents, hangers, vibration isolation, etc. shall be provided for each item of plumbing equipment. Details shall be provided in the construction drawings for each piece of equipment such as pumps, water heaters, water service entrance, and other similar items. Details shall clearly show all requirements specified in this section and the Technical Specifications.

1.9.3.9 Plumbing Schedule Sheet

Schedules, with preliminary capacities, shall be provided for each item of plumbing equipment. At a minimum, a plumbing fixture schedule and a water heater schedule shall be provided.

1.9.3.10 Plumbing Riser Sheet

Plumbing Riser Diagrams showing all fixtures, water, waste, and vent piping shall be provided for the mechanical equipment room, kitchen, laundry and each toilet area including janitor's closet.

1.9.3.11 Enlarged Mechanical Equipment Yard Plan

An enlarged mechanical equipment yard plan drawn at a minimum of 1:20 scale shall be provided. Plan shall show layout of all mechanical equipment and piping within the space. In addition to all the mechanical required, the plan shall show half-toned outlines of all electrical panels or equipment located in the space.

1.9.3.12 HVAC Plan Sheets

Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at 1:50 scale and shall show all room names and numbers. Coordinate with architectural design for provisions of access panels for all concealed valves, traps, fire dampers and air vents etc.. Coordinate with architectural design so that louvers shown on architectural drawings match damper sizes for the respective openings as shown on Mechanical drawings. An exception to this are mechanical room plans shall be 1:20 scale.

Mechanical HVAC plans showing the design and tentative layout of the hot water piping distribution system and equipment, the chilled water piping distribution system and equipment, the air supply and distribution systems and equipment, and the ventilation and exhaust systems and equipment shall be provided. Air supply and distribution systems shall show all ductwork, including supply and return ductwork, ductwork to diffusers, and all diffusers. Use of flexible ductwork shall be limited to a maximum length of 2 m. Where ductwork must be offset to cross another duct, the duct with the lowest velocity shall be offset. Ductwork offsets shall not be greater than 30 degrees unless the designer has shown the offset and included it in the duct systems calculations. The designer shall indicate the duct pressure classification for each duct segment on the construction drawings.

All ductwork shall be sealed to seal class A. For the 60 percent submittal, all ductwork may be shown as single-lined. The final design submittal shall show all ductwork as double-lined. All electrical panels/equipment and pertinent plumbing equipment shall be outlined in half-tone on the HVAC plans.

1.9.3.13 Mechanical Sections

For each air handling unit and for congested areas where the proximity of mechanical, HVAC, plumbing and electrical items, equipment and/or distribution system require vertical spatial definition, a mechanical section view shall be provided showing, but not limited to, all AHU or other equipment components, ductwork and piping connections/routing, and relationship to adjacent architectural, structural and electrical features.

1.9.3.14 Enlarged Mechanical Room HVAC Plan

An enlarged mechanical room HVAC plan drawn at a minimum 1:20 scale shall be provided. Plan shall show layout of all mechanical systems, HVAC equipment, piping, and ducts within the rooms. Equipment shall include (but not limited to) air handling units with associated outside air intakes, relief air, and supply/return ducts; exhaust/supply fans, mechanical room ventilation intake/relief openings, gas service entrance, combustion air opening (if required), unit heaters, HW pumps, CW pumps, boilers, air separators, expansion tanks, water treatment and temperature control panels. Openings for relief air and outside air shall be coordinated with size of architectural louver. Plans shall show dedicated access space for items requiring maintenance. Mechanical room piping, ductwork and equipment shall be installed to provide a minimum headroom of 2 m below all overhead mechanical room piping, ductwork and equipment. Aluminum jackets shall be provided over all insulation installed within 1500 mm of the mechanical room floor. In addition to all the HVAC systems required, the plan shall show half-toned outlines of all plumbing equipment located in the room, gas service, the fire protection entrance and risers, the water service entrance, and the outline of any electrical panels or equipment located in the room.

1.9.3.15 Enlarged Kitchen HVAC Plan

Enlarged Kitchen plans showing all mechanical systems and drawn at a minimum 1:20 scale shall be provided. Plans shall show layout of all equipment, piping, and ducts located within the rooms. Equipment shall include (but not be limited to) air handling units with associated outside air intakes, relief air, and supply/return ducts; exhaust/supply fans, condensate hoods and grease hoods. Plans shall show dedicated access space for items requiring maintenance. In addition to all the mechanical HVAC systems required, the plan shall show half-toned outlines of all major plumbing equipment, and any electrical equipment or panels located in the room.

1.9.3.16 Mechanical Detail Sheets

Installation details showing all specification requirements such as isolation and balancing valves, thermometers, pressure gauges, equipment pads, strainers, vents, hangers, vibration isolation, etc. shall be provided in the construction drawings for each piece of equipment such as pumps, air handling units, heating or cooling coils, in-line fans, propeller fans, exhaust hoods, relief hoods or penetrations, unit heaters, expansion tanks, chemical shot feeders, boilers, chillers, fluid coolers, and other similar items. Pressure gauges shall be installed on each side of each piece of equipment such as pumps, heating or cooling coils, boilers, chillers, fluid coolers, and other similar items. Pressure gauges located on the return side of coils shall be located between the coil and the control valve. Thermometers shall be installed on each side of each piece of equipment such as heating or cooling coils, boilers, chillers, fluid coolers, and other similar items. Thermometers in horizontal lines shall be installed with stems horizontal or above. Thermometers located on

the return side of coils shall be located between the coil and the control valve. Details shall clearly shown all requirements specified in either in this section or the Technical Specifications.

1.9.3.17 Mechanical Schedule Sheets

Schedules, with equipment type, sizes, dimensions, capacities (both input and output), all velocities, all pressure drops, all input and output temperatures, all volume flow rates, rotational speed, efficiencies, noise criteria and electrical data as a minimum shall be provided for each item of mechanical equipment. Preliminary schedules shall be revised and completed as necessary to suit the project requirements.

1.9.3.18 Combined Enlarged Mechanical Plan

Where separate plans have been specified above for the plumbing, HVAC and other mechanical requirements with the other disciplines specified to be shown half-toned, a single combined plan maybe provided if all other requirements specified above are meet including drawing clarity. The plan shall show half-toned outlines of all major architectural, structural and electrical items and clearances located in the room.

1.9.3.19 Wet Pipe Sprinkler System Drawings

The Sprinkler System Shop Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance.

a. Floor plans drawn to a scale not less than 1:100 which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.

b. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

c. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

d. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

1.9.3.20 Mechanical Items to be Fast Tracked

All final drawings including fully edited and coordinated control drawings as specified above, in section 01019, 35 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in TI 810-11 shall be submitted, reviewed and approved to accurately and clearly identify the

final requirements for every piece of mechanical, HVAC and/or plumbing system, equipment and the final control requirements for every piece of HVAC equipment to be installed before the full facility design is complete and approved prior to the installation of the subject item.

1.9.3.21 Site, Architectural and Structural Items to be Fast Tracked

Prior to the installation of any structural foundations the size of the mechanical room shall be verified and all piping to be installed below the slab on grade floor shall be fully designed and approved as specified above, in section 01019, 35 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS. All final drawings as specified above, in section 01019, 35 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS shall be submitted, reviewed and approved to accurately and clearly identify the final requirements, including all maintenance clearances, for every piece of mechanical, HVAC and/or plumbing equipment to be installed within the foot print of the mechanical room and below the slab on grade floor. When grading or building surface is to be fast tracked, than all final drawings as specified above, in section 01019, 35 PERCENT DESIGN REQUIREMENTS, in section 01021, 100 PERCENT DESIGN REQUIREMENTS and in section 01016, MECHANICAL REQUIREMENTS shall be submitted, reviewed and approved to accurately and clearly identify the final requirements for every mechanical, HVAC and/or plumbing distribution system that penetrates the installed grading or surface prior to the installation of the subject grading or surface.

1.9.4 SPECIFICATIONS

The submitted 35 percent technical guide specifications shall be updated, completely edited, and fully coordinated with the drawings to accurately and clearly identify the 60 percent product and installation requirements for the facility. Technical specifications shall be Unified Facilities Guide Specifications (UFGS), which shall be completely edited and fully coordinated with the drawings to accurately and clearly identify the product and installation requirements for the facility as specified in Section 15000, DIVISION 15: MECHANICAL - OUTLINE SPECIFICATIONS. The UFGS specifications define the minimum requirements for items of equipment, materials, installation, training, operating and maintenance instructions, O&M manuals and testing that shall be provided for the facility. All UFGS specification indexes shall be completely edited to reflect the paragraphs retained in the body of the technical specification. All references that have not been used in the body of the technical specification shall be edited from the UFGS specification. Technical specifications shall be coordinated with the plans and include all items contained within the project. Provide special sections to cover those subjects for which no UFGS guide specification is available. Specific items of equipment identified in the UFGS specifications but not required for the facility shall be edited out. All edited UFGS guide specifications, to be provided, shall be in edited form showing all text to be deleted and added. Government conformance review is required for any specification addition or deletion.

1.9.4.1 Items to be Fast Tracked

Fully edited and coordinated technical guide specifications as specified above and in Section 15000, DIVISION 15: MECHANICAL - OUTLINE

SPECIFICATIONS shall be submitted, reviewed and approved to accurately and clearly identify the final product and installation requirements for every item to be installed before the design is complete and approved prior to the installation of the subject item.

1.10 ELECTRICAL

1.10.1 Drawings

Drawing scale shall match architectural drawing requirements. Drawings shall show the following:

1.10.1.1 Lighting Layout and List of Fixtures

Complete lighting layout of all areas shall be provided. The type of fixture shall be indicated on the drawing. Complete list of fixtures proposed with type of lamp and wattage.

1.10.1.2 Receptacle Layout

Complete receptacle layout should be provided for all areas to indicate project requirements.

1.10.1.3 Power Equipment and Layout

Power equipment and layout such as switchgear, panelboards, large motor driven items, etc.

1.10.1.4 Power One Line Diagram

Power one line diagram shall be shown to indicate arrangement of the system.

1.10.1.5 Communications

Communications (telephone, public address) shall be shown sufficiently to indicate the designers understanding of the Section 01007 ELECTRICAL REQUIREMENTS.

1.10.1.6 Fire Detection

Fire Detection drawings shall be provided and inserted in the Fire Protection/Fire Suppression F-Series of drawings.

1.10.1.7 Miscellaneous Details of Special Equipment

Miscellaneous details of special equipment to indicate understanding of 01007 ELECTRICAL REQUIREMENTS.

1.10.2 Specifications

Submit prescriptive specification sections to specify the quality, characteristics, installation procedures and testing requirements for all items of the proposed electrical design.

Specifications shall be provided (to approximately 60 percent completion).

See Section 01332 SUBMITTALS DURING DESIGN, paragraph 3.2, SPECIFICATIONS for additional requirements.

1.10.3 Design Analysis Narrative

The design analysis shall contain a description and analysis of the electrical portions of the design. Special features, unusual requirements, etc., should be noted. Narrative must address all technical requirements identified in Section 01007 ELECTRICAL REQUIREMENTS.

1.10.4 Design Analysis Calculations

Backup data shall be furnished to support basic design decisions related to sizing of major equipment and materials. As a minimum the following shall be submitted.

1.10.4.1 Service

Sizing of building services EMD (Estimated Maximum Demand) for all the building loads.

1.10.4.2 Transformers

Sizing of general purpose dry type transformers.

1.10.4.3 Feeders

Sizing of main feeders.

1.10.4.4 Panelboards

Sizing of panelboards and distribution equipment.

1.10.4.5 Illumination Calculations

Data should identify target and calculated illumination levels for all typical rooms. Calculations should be adjusted to compensate for special applications such as irregularly shaped rooms, open sides, ceiling obstructions (beams, ductwork), corridors, etc. If the lumen method is used for corridor calculations, the calculations should be performed using a module in which the length doesn't exceed 3 times the width (2:1 ratio preferred).

1.10.4.6 Short Circuit Evaluation

The maximum possible fault current at the building service should be calculated.

1.10.4.7 Sustainable Design

The Design Analysis shall include the proposed sustainable design objectives with reference to electrical systems, equipment, lighting, and design work which will be attained as part of this project.

1.11 FIRE PROTECTION

1.11.1 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. Fire detection and sprinkler systems shall be laid out and detailed sufficiently to indicate the designers understanding of the Section 01008 FIRE PROTECTION REQUIREMENTS. When other functions

co-exist 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. As part of the submittal, provide a set of plans that shows emergency egress for the facility.

1.11.2 DESIGN ANALYSIS

The 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.

- a. Location and rating of fire walls and fire partitions.
- b. Column, floor, and roof protection.
- c. Path of travel for emergency egress and operation of panic exits.
- d. Access to building for fire fighting.
- e. Design and placement of fire and smoke stop doors.
- f. Labeled windows, where required.
- g. Venting of smoke.
- h. Placement of hand fire extinguisher cabinets.
- i. Type and adequacy of sprinkler system.
- j. Building exterior fire protection facilities and building clearances.
- k. Type of occupancy.
- l. Zoning of fixed fire protection systems.
- m. Type and adequacy of fire alarm and detection systems.
- n. Zoning of fire alarm and detection systems.
- o. Number of zones of alarm and detection systems that are separately transmitted to the base or installation fire department.
- p. Type of Construction.
- q. Height and area limitation.
- r. Flame-spread and smoke-developed ratings.
- s. Water supplies for fire protection.

1.11.3 TECHNICAL GUIDE SPECIFICATIONS

None of the UFGS guide specifications are required to be submitted at this design stage. However; any Contractor generated specifications required to meet the project specifics, or individual specification items added to the provided guide specifications shall be submitted for review. Note that guide specifications 13930, WET PIPE SPRINKLER SYSTEMS, FIRE PROTECTION and

13851, FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE are required for this contract. As such they may be edited only for those portions that do not apply to this project. Note that this applies only to equipment items. Testing, qualifications, submittal requirements, etc., may not be modified or deleted. For the equipment items that do apply, no changes may be made.

1.12 ENVIRONMENTAL PROTECTION, COMPLIANCE, AND PERMITS

Specification Section 01410, ENVIRONMENTAL PROTECTION, COMPLIANCE, AND PERMITS furnished with Division 1 of this RFP, contains requirements presently known to be required for environmental protection, compliance, and permits. It is the Contractor's responsibility to provide any additional requirements to ensure that the project is in full environmental compliance with Federal, State, Regional and local laws and regulations. All new environmental requirements shall be submitted with the 60% Design Review Submittal.

1.12.1 Design Analysis Chapter

The Contractor shall prepare a chapter in the Design Analysis entitled: "ENVIRONMENTAL PROTECTION, COMPLIANCE, AND PERMITS". This chapter shall include a summary of environmental coordination, compliance, approvals, permits, and etc. required for the project. The Contractor shall include documentation of the coordinations, discussions, phone conversation records, and/or letters required to assure that the project is in full compliance with all Federal, State, Regional, and local environmental laws and regulations. A list of environmental permits, approvals, notifications, etc. that are required for the project shall be included.

1.12.2 Draft Environmental Protection Plan

The Contractor shall prepare and submit a Draft Environmental Protection Plan in accordance with the requirements of Section 01410 ENVIRONMENTAL PROTECTION, COMPLIANCE, AND PERMITS. If additional environmental compliance plans are identified, during the design, the Contractor shall submit the additional environmental plans and/or attachments.

1.12.3 Submittal of Environmental Permits, Notices, Reviews and/or Permit Applications and Associated Documents

As an Appendix to the Draft Environmental Protection Plan, the Contractor shall submit copies of all environmental permits, notices, reviews, and/or approvals that are required for the project. Copies of the applications and associated documents required by the the environmental permits, notices, reviews, and/or approvals shall be included in the Environmental Protection Plan Appendix.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

SECTION 01022

FIRE PROTECTION REQUIREMENTS

PART 1 FIRE PROTECTION REQUIREMENTS

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.

DEPARTMENT OF DEFENSE

UFC 3-600-01 (April 2003) Fire Protection Engineering for Facilities

(Aug 2001) Department of Defense Antiterrorism Construction Standards

INTERNATIONAL CODE COUNCIL

IBC (2000) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (1999) Installation of Sprinkler Systems

NFPA 72 (1999) National Fire Alarm Code

NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems

NFPA 101 (2000) Code for Safety to Life from Fire in buildings and Structures

NFPA 1963 (1998) Fire Hose Connections

1.2 GENERAL PARAMETERS

All military construction must comply with the requirements of UFC 3-600-01. This states that the type of construction and building area requirements are to be determined from the International Building Code (IBC). All other requirements for separation, exiting, fire suppression, detection and alarms are to be determined from NFPA codes.

Fire protection shall be based on sound fire protection engineering principles that gives safeguards against loss of life and property by fire, consistent with the mission, risk involved, and economical utilization.

All applicable requirements of the aforementioned codes shall be incorporated into the design. Life Safety Code, NFPA 101 relative to this design shall give special attention to the application of fire codes as they relate to Life Safety. Features of fire protection based on the

following shall be included in the design: automatic operating devices; exiting for inhabitants and the protection of egress components; personnel safety in hazardous areas; appropriate ratings of partitions, doors and windows; travel distances; common paths of travel; occupancy types; hazard of occupancies and their contents; isolation from the remainder of the facility; etc.

1.2.1 Types of Occupancies and List of Hazardous Areas/Essential Equipment

1.2.1.1 Occupancy Classification

1. Refueler maintenance.

The Refueler maintenance building is an Industrial Occupancy in accordance with NFPA 101. According to the International Building Code (IBC), the building shall be classified as a "Group H-3" occupancy per paragraph 307.5, Group H-3 structures.

2. POL Operations Center.

The POL building is a Business Occupancy in accordance with NFPA 101. According to the International Building Code (IBC), the building shall be classified as a "Group B" occupancy per paragraph 304.1, Business Group B.

1.2.1.2 Classification of Hazard of Contents

The classification of hazard of contents shall be determined by each portion of the building.

1.2.2 Separation of Structure

1.2.2.1 Exposure Classification

The building construction shall be a one-story structure. The types of non-combustible roof construction options available for each facility shall be determined by the Proposer, in accordance with the requirements contained within the RFP.

1.2.3 Fire Fighting Support

The main fire suppression for the Refueler Maintenance Facility and POL Operations Center shall be supplied by an automatic wet pipe sprinkler system. This fire protection and suppression system shall be tied into the building's fire detection and alarm system. The building shall be provided with fire extinguisher cabinets. The fire extinguisher cabinets shall be of the fully recessed type in all finished areas.

A fire alarm system in accordance with NFPA-72 shall be provided that covers the various parts of the building, monitoring of the sprinkler system, air handling units, etc..

See subsequent paragraphs of this Fire Protection section for additional information regarding fire suppression, detection, and other aspects of fire fighting support. Fire extinguishers are to be Contractor furnished/Contractor installed.

1.3 FUNCTIONAL AND TECHNICAL REQUIREMENTS

1.3.1 Construction for Fire Resistances of the Building Including Roofs, Walls, and Doors.

1.3.1.1 Building Construction Type

The building structures shall be a minimum Type II-B in accordance with the IBC. However, the offeror's design agent is responsible for verifying the appropriate construction type for each facility, or portion thereof.

1.3.1.2 Exterior Walls

Exterior walls of the facilities shall not be rated as long as minimum distances from other buildings are maintained.

1.3.1.3 Roof

The building roof covering shall be Factory Mutual Approved or classified by Underwriter's Laboratory as Class A, roof system.

1.3.1.4 Interior Walls

Fire separation of various occupancies shall be provided per NFPA 101. All penetrations in fire rated walls (conduits, pipes, cable trays...etc.) shall be firestopped according to their respective wall/floor/ceiling rating at each penetration.

1.3.2 Type of Occupancies, Occupant Loads, Exits, and Travel Distances to Exits

1.3.2.1 Occupant Load

For purposes of determining required exits, the occupant load shall be based upon the actual maximum number of persons intended to occupy the space but not less than that required by NFPA 101.

1.3.2.2 Means of Egress

Not less than two exits shall be accessible from every part of the facility.

1.3.2.3 Travel Distance to Exits

Allowable travel distance limits to exits shall be per NFPA 101, Chapter 30.

1.3.3 Resistance to Interior Finishes and Materials to Flame Spread and Smoke Development

1.3.3.1 Interior Finishes

Interior finish materials on walls, ceilings, and partitions in all exits shall be Class A as defined in the International building Code (IBC) and UFC 3-600-01. All other areas shall have Class A or B interior finish materials for walls, ceilings, and furnishings. Smoke Developed Ratings shall not exceed 50 for Class A materials and 100 for Class B materials when tested in accordance with ASTM E-84.

1.3.3.2 Cellular Plastics

Cellular Plastics shall not be used as interior wall and ceiling materials per UFC 3-600-01.

1.3.3.3 Floor Finishes

Floor finishes shall be Class I or Class II. Carpet and other floor finishes shall have passed the acceptable criteria of American Society for Testing and Materials (ASTM) standard 84 or equivalent.

1.3.4 Fire Extinguisher Cabinets

Fire extinguisher cabinets shall be provided per NFPA 10 with a travel distance between fire extinguisher cabinets not to exceed 75 feet. Fire extinguisher cabinets shall be fully-recessed in finished areas, such as administrative, corridors, etc. Ten pound ABC rated Fire extinguishers shall be supplied as part of this contract.

1.3.5 Not Used

1.3.6 Sprinkler Systems

Wet pipe sprinkler system shall be provided in all areas of the Refueler Maintenance Facility and POL Operations Center buildings. The sprinkler system shall provide fire sprinkler protection for the entire building. The wet pipe sprinkler system shall be provided for 100% coverage. Except as modified herein, the system shall be designed and installed in accordance with NFPA 13 and UFC 3-600-01. Where any conflicts exist between UFC 3-600-01 and other criteria, the requirement in UFC 3-600-01 shall be met. Pipe sizes shall be shown on drawings and shall be determined by hydraulic calculation. The design of the sprinkler system shall be based on hydraulic calculations, and the other provisions specified herein. The Fire Protection Engineer shall fully investigate the water supply, including all modifications made to the distribution system as part of this contract to determine the requirements for fire protection system as required by UFC 3-600-01.

1.3.7 Fire Protection Engineer.

The sprinkler and fire alarm system shall be designed by a qualified fire protection engineer as defined in UFC 3-600-01. All work shall be performed under the supervision of and certified by the Fire Protection Specialist. The Fire Protection Specialist shall be an individual who is a registered professional engineer and a Full Member of the Society of Fire Protection Engineers. The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.3.8 Hazard Classifications.

The area hazard classifications shall be as classified in accordance with NFPA 13.

1.3.9 Not Used

1.3.10 Hydraulic Calculations.

Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13 except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping,

150 for copper tubing, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall be based on the water supply data verified by the designer. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. The minimum pipe size for branch lines in gridded systems shall be 32 mm . Water velocity in the piping shall not exceed 6 m/s . A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

1.3.11 Hose Demand

An allowance for exterior hose streams of 1892 L/min shall be added to the sprinkler system demand at the point of connection to the existing system. An allowance for interior hose stations of 1892 L/min shall also be added to the sprinkler system demand.

1.3.12 Fire Flows Data.

The fire protection engineer shall perform fire flow test to determine the actual static pressure, residual pressure and flow at the finished site. The actual system installed shall be based on these final results for the finished site. Fire flows data for the CDC site is as follows:

1.3.12.1 Sprinkler Spacing

Sprinklers shall be uniformly spaced on branch lines. Maximum spacing per sprinkler shall not exceed limits specified in NFPA 13 for each individual hazard occupancy.

1.3.13 Fire Department Connections and Fire Hydrants

Fire Department connections for the sprinkler system(s) shall be provided with suitable all weather access for pumper apparatus within 150 feet, reference UFC 3-600-01. A minimum of one fire hydrant shall be located within 150 feet of the fire department connections, reference UFC 3-600-01.

1.3.14 HVAC System.

All HVAC systems shall be designed in accordance with NFPA 90A for fire dampers, smoke dampers and fan shutdown. The designer shall show on the construction drawings all fire or smoke dampers required by NFPA.

1.3.15 Fire Alarm and Detection System

The system shall be designed in accordance with UFC 3-600-01, NFPA 72 and NFPA 101. Supervisory initiating devices shall be provided and designed in accordance with NFPA 13 and 72. Placement of audio/visual devices shall comply with the Americans with Disabilities Act (ADA) and NFPA 72. Use the most stringent requirements from ADA or NFPA 72 where conflicts occur. Outside electric bell for sprinkler system(s) shall also be provided with a visual strobe. The facility shall be provided with a main control panel. A local annunciator is required in the vestibule of the POL Operations Center. Fire alarm system shall be addressable to each device. The system shall use Style 6, SLC and Style Z NAC. Alarms shall be transmitted back to the Post Fire Station via a Mononco D-700 Transciever.

1.3.15.1 Main Control Panel

The Main Fire Alarm control panel shall be located in each building electric room or mech room if no dedicated electric room provided. Devices installed in the service station shall be an extension of POL fire alarm system. Devices at the service station shall be on a seperate zone. The panel shall shut down the entire HVAC system upon activiaton. Fire alarm system alarms, supervisory signals and trouble conditions shall be as follows:

- a. Alarms
 - 1. Manual Pull Station
 - 2. Duct Smoke Detector
 - 3. Waterflow Indicator
 - 4. Smoke Detector

- b. Supervisory Signals
 - 1. Valve Supervisory Switches
 - 2. Control Components
 - 3. Transceiver Door Tamper Switch

- c. Trouble Conditions
 - 1. Low Battery Voltage
 - 2. Circuit Fault
 - 3. Supervised Component Failure
 - 4. Power Failure

1.3.15.2 Annunciator Panel

A flush mounted annunciator panel shall be located in the vestibule of the POL building only (Refueler maintenance has no annunicator requirement). The panel shall provide an appropriately sized floor plan of the building with names and room numbers indicated. The building will be seperated into zones. Each zone shall have two red alarm lights. One light will be labeled initiating device and the other labeled water flow. A yellow trouble and blue supervisory light shall be included for each zone.

1.3.15.3 Monaco Transceiver

A Monaco D-700 transceiver shall be provided each for POL and Refueler maintenance to transmit information to the base fire department. The transmitter shall be sized for the following zones:

- a. Alarm by initiating device

- b. Supervisory Alarm

- c. Trouble Alarm
- d. Sprinkler Water Flow
- e. Alarm Panel and Transceiver Door Tamper Switches
- f. Four Spare Zones

1.3.15.4 NFPA 13 and NFPA 72 Requirements

Provide control modules, smoke detectors, OS&Y tamper switches and water flow switches as required by NFPA 13 and NFPA 72. The requirements for smoke and heat detectors shall be as required by NFPA 101. All signaling line circuits shall be Style 6.

1.3.15.5 Other Requirements

- A. Provide duct detectors, manual pull stations, flow switches, tamper switches, notifications appliances, etc. The notification appliances shall be with flashing strobe.
- B. Provide programable device and required cables for connecting to the system.
- C. Provide all software and a backup copy of all programming code for the system.

1.3.15.6 Alarm Verification

The system shall be provided with alarm verification features. The alarm verification features shall reduce false alarms due to transient conditions. The alarm/activation delay shall be adjustable from 0 to 60 seconds.

1.3.15.7 Indicating Devices

Evacuation indicating signalling devices shall be provided and designed in accordance with NFPA 101. Indicating devices shall be Style Z as defined by NFPA 72. Evacuation alarms shall be activated by any action described above under the alarm heading. Indicating devices shall be chimes with strobe lights.

1.3.15.8 System Design

The contractor shall edit and provide UFGS guide specifications for SECTION 13851, FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE. The fire detection system shall be designed in accordance with the criteria specified in paragraph SYSTEM DESIGN of SECTION 13851. All requirements contained in SECTION 01017 ELECTRICAL REQUIREMENTS & Space Data Sheets of the RFP document must be incorporated into the edited specifications.

1.4 DESIGN OBJECTIVES AND PROVISIONS

1.4.1 Zoning and Treatment of Each Potential Hazard

1.4.1.1 Fire Alarms and Extinguishing Systems

The facilities shall be provided with a fire suppression system and a detection system as indicated previously.

1.4.1.2 Egress Locations

Egress locations shall be marked with exit signs per Section 01017. (LSC).

1.4.2 Required Fire Exits

Required fire exits from the building shall lead to a public way or to a clear safe area at a minimum distance of 75 feet from the building.

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --