AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT	1. CONTRACT ID CODE	PAGE OF PAGES
	DACA41-02-R-0011	1 of 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO *(If applicable)*
2	8/8/2002		

6. ISSUED BY CODE

US Army Corps of Engineers, Kansas City District
760 Federal Building, 601 East 12th Street
Kansas City, Missouri 64106-2896

7. ADMINISTERED BY *(If other than item 6)* CODE

8. NAME AND ADDRESS OF CONTRACTOR *(No.,street, county, State and ZIP Code)*

CODE FACILITY CODE

(x)	9a. AMENDMENT OF SOLICITATION NO.
X	DACA41-02-R-0011
	9B. DATED *(SEE ITEM 11)* 7/19/2002
	10A. MODIFICATION OF CONTRACT/ORDER NO.
	10B. DATED *(SEE ITEM 13)*

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[x] The above number solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers [X] is extended, [ ] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitaiton or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning___ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegraph which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFEI If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBER CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF:

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER ***(Specify type of modification and authority)***

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and retu copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

Wastewater Treatment Plant
Fort Riley, Kansas

The solicitation is amended in accordance with the attached pages.
The new proposal due date is 28 August 2002.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changes, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNEI *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
15B. CONTRACTOR/OFFEROR _____ *(Signature of person authorized to sign)*	15C. DATE SIGNE	16B. UNITED STATES OF AMERICA BY _____ *(Signature of Contracting Officer)*	16C. DATE SIGNED

SOLICITATION DACA41-02-R-0011 is amended as follows:

1. SPECIFICATIONS.

a. **Supplemental Attachments**. The supplemental attachments for the following specifications sections are included in this amendment. Copies of the attachments are enclosed.

03600 (3 pages)	03740 (2 pages)	05090 (1 page)	10400 (1 page)	11288 (1 page)
11310 (9 pages)	11312 (5 pages)	11320 (3 pages)	11350 (1 page)	11354 (3 pages)
11355 (3 pages)	11376 (2 pages)	11378 (2 pages)	11388 (1 page)	13205 (6 pages)
13280 (20 pages)	13405 (242 pages)	14558 (1 page)	15200 (5 pages)	16263 (1 page)
16405 (4 pages)				

b. **Narrative Changes**.

1. 1442. Paragraph 13. A. The new proposal due date is 28 August 2002.

2. Section 01010, PERFORMANCE START-UP, BIOLOGICAL START-UP (BSU), AND OPERATING;

a. Page 7, Article 1.7.9.3, third paragraph: Change "(e to 9 hours)" to "(8 to 9 hours)."

b. Page 13, ADD the following pargraph as 3.2.3:

"Fort Riley plant operators and maintenance personnel shall be allowed access to the immediate plant and pump station areas to observe the 45-day startup procedures. These Government employees will not be part of the operating or construction staff during the startup. The Contractor is encouraged to conduct the specified training of operating staff during the startup period. This training will allow the Fort Riley employees to take over the normal plant operations with minimal disruptions."

3. Section 02220a, DEMOLITION, Page 1, Article 1.2: DELETE the last sentence which reads "In the interest of conservation, salvage shall be pursued to the maximum extent possible (in accordance with Section 01572 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT); salvaged items and materials shall be disposed of as specified".

4. Section 02300a, EARTHWORK:

a. Page 1, Paragraph 1.2.1: MODIFY second sentence from "…less than 8 inches, except for fill material for pavements and railroads which shall be comprised of stones less than 3 inches in any dimension" to "…less than 3 inches, in any dimension".

b. Page 3, Article 1.7: MODIFY sixth sentence from "Coarse rock from…" to "Coarse rock (greater than 3-inch) from…".

c. Page 4, Article 3.1: MODIFY second sentence from "…spread on areas" to "…spread to a depth of 3 inches on areas".

5. Section 02531, GRAVITY SANITARY SEWER PIPE AND APPURTENANCES:

a. Page 3, Paragraph 2.2. Item 4: CHANGE "AWWA C110" to "AWWA C110 and C151".

b. Page 9, Paragraph 3.3.3: CHANGE third sentence of paragraph from "…adjust the manhole top as shown on the Drawings." to "…adjust the manhole top (for less than 6 inches of grade only) as shown on the Drawings."

5. Section 05120, STRUCTURAL STEEL, Page 4, Article 2.8: DELETE article in its entirety.

6. Section 11350A, SECONDARY CLARIFIER MECHANISMS, Page 19, Article 3.2: DELETE the last paragraph which starts as “See Section 01640...”.

7. Section 11354, GRAVITY BELT THICKENERS, Page 4, Article 1.5, Paragraph A: DELETE paragraph in its entirety.

8. Section 11590, AUTOMATIC, REFRIGERATED SAMPLERS, Page 4, Article 3.3: DELETE the last paragraph which starts as “See Section 01640...”.

9. Section 12345, SECTION LABORATORY CASEWORK AND FURNISHINGS.

a. Add “NIC” designation to the following articles: 2.13.6, Flask Washer; 2.13.8, Lab Fire Extinguisher; 2.13.9, Lab Water System, Central Deionized Service Exchange; 2.13.10, Lab Water System, Point of Use Ultra-Low Organic Deionized Water (Pretreated Feed) (also change article number from “22.13.10” to “2.13.10”; 2.13.13, Safety Eyewear Holder; 2.13.14, Spill Kit; 2.13.15, Under Counter Incubator; 2.13.16, Under Counter Refrigerator/Freezer; 2.13.17, Wall Clock; 2.13.18, Waste Receptacle.

b. Delete “NIC” designation from article 2.13.19, Writing Board.

2. PLANS.

a. **Revised Sheets**. The following sheets have been revised and are reissued as part of this amendment.

2-C-5 4-S-2 40-E-8

b. **New Sheets**. The following are new sheets added to the solicitation.

18-S-3A 40-E-10A 40-E-25A 40-E-28A 40-E-29A

c. **New Standard Details.** Insert new Standard Details 5069, 5072, and 5316.

d. **Narrative Changes**. Narrative changes are outlined below.

1. Drawing 2-C-25.

a. Post Aeration Structure Plan Q: ADD new note as follows:

“1. CREATE A THIRD RETENTION POOL BY ADDING A 1 FOOT HIGH CONCRETE CURB 8 FEET DOWNSTREAM OF LOWEST WEIR. BOTTOM ELEVATION 1220.00. TOP ELEVATION 1221.00.”

b. Slotted Weir Plate Detail: ADD new note as follows:

“NOTE 1. WEIR PLATE IS 3/8 INCH MIN. THICKNESS, 304 SST.”

2. Drawing 2-C-34, Septage Receiving Inlet:

a. Section: CHANGE “SET SUPPORT FRAME” detail reference “2050” to “5566”.

b. Note: CHANGE “…NOMINAL SIZE 46”X46”X16”…” to “…NOMINAL SIZE 34”X34”X16”…”.

3. Drawing 4-AS-1, Screening Room:

a. CHANGE aluminum beam size in channel from “AL I 5 x 4.23” to “AL I 5 x 3.70”.

b. ADD General Details 5069, 5072 and 5316.

c. Column 5, Row B: CHANGE “COVERED GRATING” to “1/4 INCH MIN. SKID RESISTANT FRP PLATE OVER FRP GRATING”.

d. Column 5, Rows C and D: ADD reference to “THREE RAIL, TOP MOUNT AL GUARDRAIL 5521, TYP” around Grit Tank.

4. Drawing 4-S-4, Section B: CHANGE detail reference “5616 sim” to “5069”.

5. Drawing 4-B-1:

a. Column 3, Row B: REPLACE “1/2” W2 FOR CONTINUATION SEE DWG. 4-M-1” with “1/2” W2 FOR CONTINUATION SEE DWG. 4-M-2”.

b. Column 5, Row B: REPLACE “1/2” W2 FOR CONTINUATION SEE DWG. 4-M-2” with “1/2” W2 FOR CONTINUATION SEE DWG. 4-M-1”.

c. Lower Plan: ADD new note as follows:

“NOTE 1. PROVIDE FLOOR DRAIN IN CHEMICAL INJECTOR VAULT (SEE 4-S-2).”

6. Drawing 8-SM-1:

a. Column 2, Row C: DELETE reference to “6” SCUM TO SCUM PUMP STATION”. REFER to Specification Section 11350A, SECONDARY CLARIFIER MECHANISMS, for scum collection details.

b. Column 3, Row C: DELETE reference to “ROTATING SCUM WEIR, TYP”. A rotating scum weir is **NOT** used for scum collection—REFER to Specification Section 11350A, SECONDARY CLARIFIER MECHANISMS, for scum collection details.

7. Drawing 8-SM-2:

a. DELETE reference to “ROTATING SCUM WEIR” and “SUPPORT SCUM WEIR FROM ACCESS BRIDGE”. A rotating scum weir is **NOT** used for scum collection - REFER to Specification Section 11350A, SECONDARY CLARIFIER MECHANISMS, for scum collection details.

b. DELETE “6” SCUM TO SCUM PUMP STATION” and REPLACE with “8” SCUM TO SCUM PUMP STATION”.

8. Drawing 10-AS-1: DELETE Note 1.

9. Drawing 10-B-1: DELETE the text in Note 1 and REPLACE with the following:

“PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A.”

10. Drawing 12-AS-1: DELETE Note 1.

11. Drawing 12-AS-3:

a. Section A: CHANGE detail reference number at door stoop from “5501” to “3337”.

12. Drawing 12-AS-4, Details A and B: CENTER reinforcing cage inside pilaster.

13. Drawing 12-B-2: DELETE the text in Note 1 and REPLACE with the following:

"PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A."

14. Drawing 12-M-2, Section A: REPLACE "6" WAS TO AEROBIC DIGESTERS, INV EL 8-SM-1 FOR CONT SEE 8-SM-1" with " 6"WAS TO AEROBIC DIGESTERS, INV EL 1233.50 FOR CONT SEE 8-SM-1".

15. Drawing 14-SM-1, Plan: DELETE "6" SSM FOR CONT SEE DWG 8-SM-1" and REPLACE with "8" SSM FOR CONT SEE DWG 8-SM-1".

16. Drawing 18-A-1:

a. ADD new note as follows:

"4. EF-18-5 NOT SHOWN ON EAST ELEVATION. MOUNT AS HIGH AS POSSIBLE, SEE DRAWING 18-B-1 FOR PLAN LOCATION."

b. DELETE Note 3.

17. Drawing 18-A-2: ADD new note as follows:

"NOTE 1. EF-18-4 NOT SHOWN ON WEST ELEVATION. MOUNT AS HIGH AS POSSIBLE, SEE DRAWING 18-B-1 FOR PLAN LOCATION."

18. Drawing 18-B-1:

a. ADD new notes as follows:

"7. PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A."

8. MOUNT FAN AS HIGH AS POSSIBLE."

b. ADD reference to EF-18-4 and EF-18-5 as follows: "SEE NOTE 8."

19. Drawing 20-AS-1: DELETE Note 1.

20. Drawing 20-B-1:

a. Chemical Storage Building Plan and Section A: DELETE text in Note 1 and REPLACE with the following:

"PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A."

b. Column 1, Row D: DELETE reference to EF-20-01 on roof. Fan was moved to west wall and shows correctly on building elevations (Drawing 20-AS-1).

21. Drawing 24-AS-1: DELETE Note 3.

22. Drawing 24-AS-2: DELETE Note 3.

23. Drawing 24-B-2: ADD new note as follows:

"3. PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A."

24. Drawing 28-B-2: DELETE text in Note 1 and REPLACE with the following:

"PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A."

25. Drawing 28-B-3: DELETE text in Note 1 and REPLACE with the following:

"PROVIDE EXTERNAL DUCT INSULATION AND WEATHER JACKET ON EXPOSED DUCTWORK AS SPECIFIED IN SECTION 15080A."

26. Drawing 40-E-16, Riser Diagrams, WWTP Telephone System Riser Diagram:

a. DELETE all callouts referencing "CAT-5 CABLE" and REPLACE with "CAT-5E CABLE."

b. ADD the following Note:

"4. Install a nylon pull cord in all empty conduits."

27. Drawing 40-E-19, Panelboard Schedules:

a. Lighting Panel LP-A1, Circuit 9: CHANGE the VA from "540.0" to "720.0".

b. Power Panel PP-A, Circuit 26: REMOVE the word "SPARE" and INSERT "BC-18-01".

c. ADD "900.0" to column A circuit 26, "900.0" to column B circuit 28, and "900.0" to column C circuit 30."

28. Drawing 40-E-23, Upper Level Plan: DELETE the callout "TX-1" and REPLACE with "TX-U1."

29. Drawing 40-E-53, Big Bertha Pump Station Site Plan:

a. DELETE Proposed Day Care Center and associated conduit from existing communication manhole.

b. ADD the following notes:

"1. The manhole labeled "EXST COMMUNICATION MANHOLE" is a new 4' wide x 5' wide x 4' deep handhole being installed under a separate design-build contract constructing a new child development center adjacent to the Youth Activity Center east on Thomas Avenue (contract awarded in June 2002). Location shown is approximate. CDC contractor is installing 15 meters of 1-24 strand single mode fiber cable in the new handhole for use by the pump station.

2. Contractor shall coordinate with the government on final location of the new handhole."

30. Drawing 44-C-1, Column 2, Row C: "HISTORIC DISTRICT 6" FORCE MAIN" leader incorrectly identifies gravity portion of conveyance pipeline. CHANGE leader to indicate force main portion of conveyance pipeline (see Drawing 44-P-2 plan to identify Force Main portion of line).

31. Drawing 48-D-38, Detail 15424 Gas-fired Unit Heater: ADD the following note:

"NOTE: MODIFY AS REQUIRED FOR CONCENTRIC COMBINATION FLUE/COMBUSTION AIR BOX."

32. Drawing 50-X-3, Legend: REVISE crosshatch description from "OPTIONAL DEMOLITION" to "MINIMUM DEMOLITION".

33. Drawing 52-X-1, Note 3: DELETE the following sentence “Reuse and recycling of materials shall be maximized in accordance with specification Section 01572, Construction and Demolition Waste Management.”

3. Bidders are required to acknowledge receipt of this amendment on the Bid Form, in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause rejection of the bid.

4. Proposals will be received until 2:00 p.m., local time, 22 Aug 2002, in Room 760, Federal Building, 601 East 12th Street, Kansas City, Missouri 64106-2896.

Encls
1. Spec pgs as listed
2. Drawings as listed

SUPPLEMENT 1

_____
(Test Lab Name)

_____
(Address)

_____
(Phone No.)

24-HOUR EVALUATION OF NONSHRINK GROUT TEST FORM

OBJECTIVE: Define standard set of test procedures for an independent testing laboratory to perform and complete within a 24-hour period.

SCOPE: Utilize test procedures providing 24-hour results to duplicate field grouting demands. Intent of evaluation is establish grout manufacturer's qualifications.

PRIOR TO TEST: Obtain five bags of each type of grout.

1. From intended grout supplier for Project.
2. Five bags of grout shall be of same lot number.

ANSWER THE FOLLOWING QUESTIONS FOR GROUT BEING TESTED FROM LITERATURE, DATA, AND PRINTING ON BAG:

A. Product data and warranty information contained in company literature and data? Yes_____ No_____

B. Literature and bag information meet specified requirements? Yes_____ No_____

C. Manufacturer guarantees grout as specified in Article GUARANTEE? Yes_____ No_____

D. Guarantee extends beyond grout replacement value and allows participation with CONTRACTOR in replacing and repairing defective areas? Yes_____ No_____

E. Water demands and limits printed on bag? Yes_____ No_____

F. Mixing information printed on the bag? Yes_____ No_____

G. Temperature restrictions printed on bag? Yes_____ No_____

*Rejection of a grout will occur if one or more answers are noted NO.

GROUT TESTING PROCEDURES

A. Bagged Material:

1. List lot numbers. _____

2. List expiration date. _____

3. Weigh bags and record weight. _____

ENGINEER will disqualify grout if bag weights have misstated measure plus or minus 2 pounds by more than one out of five bags. (Accuracy of weights is required to regulate amount of water used in mixing since this will affect properties.)

B. Mixing and Consistency Determination:

1. Mix full bag of grout in 10 gallon pail.

2. Use electric drill with a paddle device to mix grout (jiffy or jiffler type paddle).

3. Use maximum water allowed per water requirements listed in bag instructions.

4. Mix grout to maximum time listed on bag instructions.

5. In accordance with COE CRD-C611 (flow cone) determine time of mixed grout through the flow cone. _____ seconds

6. Add water to attain 20 to 30 second flow in accordance with COE CRD-C611.

7. Record time of grout through cone at new water demand. _____ seconds

8. Record total water needed to attain 20 to 30 second flow. _____ pounds

9. Record percent of water. _____ percent

C. When fluid grout is specified and additional water is required beyond grout manufacturer's listed maximum water, COE CRD-C621 will be run at new water per grout ratio to determine whether grout passes using actual water requirements to be fluid. Use new water per grout ratio on remaining tests.

D. Bleed Test:

1. Fill two gallon cans half full of freshly mixed grout at ambient temperatures for each category and at required consistency for each.

2. Place one can of grout in tub of ice water and leave one can at ambient temperature.

3. Cover top of both cans with glass or plastic plate preventing evaporation.

4. Maintain 38 to 42 degrees F temperature with grout placed in ice and maintain ambient temperature for second container for 1 hour.

5. Visually check for bleeding of water at 15-minute intervals for 2 hours.

6. Perform final observation at 24 hours.

If grout bleeds a small amount at temperatures specified, grout will be rejected.

E. Extended Flow Time and Segregation Test (for Category II and III):

1. Divide the remaining grout into two 3 gallon cans. Place the cans into the 40-degree F and 100-degree F containers and leave for 20, 40, and 60 minutes. Every 20 minutes remove and check for segregation or settlement of aggregate. Use a gloved hand to reach to the bottom of the can, if more than 1/4-inch of aggregate has settled to the bottom or aggregate has segregated into clumps reject the grout.

2. Right after the settlement test mix the grout with the drill mixer for 10 seconds. Take a COE CRD-C611 flow cone test of grout and record flow time. Maintain this process for 1 hour at ambient temperatures of 40 and 100 degrees F.

   a. 20 min _____, sec. @ 40 degrees F.

   b. 40 min _____, sec. @ 40 degrees F.

   c. 60 min _____, sec. @ 40 degrees F.

   d. 20 min _____, sec. @ 100 degrees F.

   e. 40 min _____, sec. @ 100 degrees F.

   f. 60 min _____, sec. @ 100 degrees F.

All Category II and III grout that will not go through the flow cone with continuous flow after 60 minutes will be disqualified.

_____ _____

Qualified Disqualified

F. 24-hour Strength Test:

1. Using grout left in mixing cans in accordance with COE CRD-C621 for mixing and consistency determination test and for extended time flow test, make minimum of nine cube samples.

2. Store cubes at 70 degrees F for 24 hours.

3. Record average compressive strength of nine cubes at 24 hours.

Grout will be disqualified if 24-hour compressive strengths are under 2,500 psi for grouts claiming fluid placement capabilities.

Grouts that have not been disqualified after these tests are qualified for use on the Project for the application indicated in Nonshrink Grout Schedule.

_____ _____

Signature of Independent Testing Laboratory Date Test Conducted

EPOXY ADHESIVE

Component A Properties: Blend of modified epoxy resins as follows:

	Test Method	Large Cracks	Small Cracks*
Color	**Visual**	**Clear Amber Liquid**	**Light Amber Liquid**
Viscosity @ 40, plus or minus 3 deg F	Brookfield RVT Spindle No. 4 @ 200 rpm	8,000 cps, max.	850 cps, max.
Viscosity @ 77, plus or minus 3 deg F	Brookfield RVT Spindle No. 2 @ 20 rpm	700 cps, max.	375 cps max. @ 50 rpm
*Small crack epoxy blend shall meet requirements for Large Cracks except as shown.			

Component B Properties: Modified amine curing agent as follows:

	Test Method	Large Cracks	Small Cracks*
Color	**Visual**	**Black Liquid**	**Black Liquid**
Viscosity @ 40, plus or minus 3 deg F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	1,400 cps, max.	550 cps, max.
Viscosity @ 77, plus or minus 3 deg F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	240 cps, max.	150 cps max. Using Spindle No. 1 @ 50 rpm
*Small crack epoxy blend shall meet requirements for Large Cracks except as shown.			

Uncured Adhesive Properties: When mixed in ratio specified on adhesive container label:

	Test Method	Large Cracks	Small Cracks
Pot Life (60-gram mass) @ plus or minus 4 deg F	As specified in Article SOURCE QUALITY CONTROL	13 to 25 minutes	15 to 30 minutes
Pot Life (60-gram mass) @ 100, plus or minus 3 deg F	As specified in Article SOURCE QUALITY CONTROL	3 to 10 minutes	10 to 20 minutes
Viscosity @ 40, plus or minus 3 deg F	Brookfield RVT Spindle No. 4 @ 20 rpm	4,400 cps	600 cps
Viscosity @ 75 to 77 deg F	Brookfield RVT Spindle No. 2 @ 20 rpm	375 to 350 cps	175 to 140 cps

Adhesive Properties: When cured for 7 days at 77, plus or minus 3 degrees F and conditioned at test temperature 12 hours prior to test, unless otherwise specified.

	Test Method	Large Cracks	Small Cracks
Ultimate Tensile Strength, psi	ASTM D638	8,000 min.	5,000 min.
Tensile Elongation @ Break, percent	ASTM D638	4.2 max.	3.0 max.
Flexural Strength, psi	ASTM D790	10,000 min.	10,000 min.
Flexural Modulus, psi	ASTM D790	$5.5x10^5$ min.	$4.5x10^5$ min.
Compressive Yield Strength, psi	ASTM D695*	15,000 min.	12,000 min.
Compressive Modulus, psi	ASTM D695*	$4.0x10^5$ min.	$4.0x10^5$ min.
Heat Deflection Temperature	ASTM D648*	130 deg F min.	140 deg F min.
Slant Shear Strength: (5,000 psi Compressive Strength Conc.)	AASHTO T 237**		
Cured 3 days @ 40 deg F-Wet Concrete			3,500 psi min.
Cured 1 day @ 77 deg F-Dry Concrete			5,000 psi min.
Cured 3 days @ 77 deg plus or minus 3 deg F			5,000 psi min.
*Cure test specimens so that peak exothermic temperature of adhesive does not exceed 100 degrees F			
**See referenced specifications for preparation method of test specimens			

WELDING AND NONDESTRUCTIVE TESTING						
Specification Section	**Governing Welding Codes or Standards**	**Submit WPS**	**Submit WPQ**	**Onsite CWI Req'd**	**Submit Written NDT Procedure Specifications**	**NDT Requirements**
05120 STRUCTURAL STEEL	AWS D1.1, Structural Welding Code–Steel	Yes	Yes	Yes	Yes	10% UT or RT of all groove-and-butt joint welds; 10% MT of all fillet welds; see Section 05120
05500 METAL FABRICATIONS AND CASTINGS	AWS D1.1, Structural Welding Code–Steel or AWS D1.2, Structural Welding Code–Aluminum	No	Yes	Yes	No	100% VT; see Section 05500
05520 HANDRAILS	AWS D1.2, Structural Welding Code–Aluminum	No	Yes	Yes	No	100% VT; see Section 05520
05530 METAL GRATING	AWS D1.1, Structural Welding Code–Steel or AWS D1.2, Structural Welding Code–Aluminum	No	No	No	No	100% VT; see Section 05530
11312 WELDED STEEL TANK	ASME BPV Code, Section IX or AWS D1.1, Structural Welding Code–Steel	Yes	Yes	Yes	Yes	100% VT and AWWA D100; see Section 13208
15200 DS-WELDED STEEL PIPE AND FITTINGS	ASME BPV Code, Section IX or AWS D1.1, Structural Welding Code–Steel	Yes	Yes	Yes	Yes	100% VT; see Section 15200 -04

SIGN SCHEDULE											
Type	Size			Mounting			Lettering				
	Width	Height	Color	Location	Method	Height to Top	Height	Style	Color	Message	Comment
Exterior Building Sign	14″	7″	As selected	As shown on Drawings	As specified		4″	Block	As selected	*	*By Owner
Interior Plaque Sign											
Control/Admin/Lab Building Room: 18-105	As required	2″	Brown	Door	Adhesive	5′-6″	1″	Helvetica Medium	White	LATRINE	
Control/Admin/Lab Building Room: 18-106	As required	2″	Brown	Door	Adhesive	5′-6″	1″	Helvetica Medium	White	LOCKER ROOM	
Control/Admin/Lab Building Room: 18-107	As required	2″	Brown	Door	Adhesive	5′-6″	1″	Helvetica Medium	White	LATRINE	
Control/Admin/Lab Building Room: 18-105	As required	2″	Brown	Door	Adhesive	5′-6″	1″	Helvetica Medium	White	RESTROOM	
Hazardous Material Signs											
Building: Main Post Ferrous Building, Chloride Facility No. 30	10″	10″	Per NFPA	Door	Adhesive	5′-6″	4	Block	Black	*	*As specified for ferrous chloride
Building: Camp Forsyth Ferrous Chloride Building, Facility No. 28	10″	10″	Per NFPA	Door	Adhesive	5′-6″	4″	Block	Black	*	*As specified for ferrous chloride
Building: Chemical Building, Facility No. 20	10″	10″	Per NFPA	Door	Adhesive	5′-6″	4″	Block	Black	*	*As specified for sodium hydroxide

SLIDE GATE AND SLIDE PLATE SCHEDULE						
Gate Identification No. and Location	**Assembly Style**	**Wall Opening (width/height inches) Note 2**	**Gate Height (inches)**	**Material**	**Design Operating Head (feet) Seating/Unseating Condition**	**Operator Type/Control Style**
G-0103-01 in Screen Channel	Style B	36 x 36	42	Aluminum	3, unseating	Type 1
G-0103-02 in Screen Channel	Style B	36 x 36	42	Aluminum	3, unseating	Type 1
G-0103-03 in Screen Channel	Style B	36 x 36	42	Aluminum	3, unseating	Type 1
G-0106-01 in Screen Channel	Style B	36 x 36	42	Aluminum	3, unseating	Type 1
G-0106-02 in Screen Channel	Style B	36 x 36	42	Aluminum	3, unseating	Type 1
G-0106-03 in Screen Channel	Style B	36 x 36	42	Aluminum	3, unseating	Type 1
G-0107 in Parshall Flume Channel	Style A Note 1	42 x 42	48	Aluminum	5, unseating	Type 1
G-0901-01 Digester 1	Style A	18 x 24	36	Aluminum	2, unseating	Type 2
G-0901-02 Digester 1	Style A	18 x 24	36	Aluminum	2, unseating	Type 2
G-0902-03 Digester 2	Style A	18 x 24	36	Aluminum	2, unseating	Type 2
G-0903-04 Digester 3	Style C	18 x 24	36	Aluminum	2, unseating	Type 2
G-0901-05 Digester 1	Style C	18 x 24	36	Aluminum	2, unseating	Type 2
G-0401-01 in Clarifier Splitter Vault	Style C	72 x 36	60	Aluminum	3, seating	Type 2
G-0401-02 in Clarifier Splitter Vault	Style C	72 x 36	60	Aluminum	3, seating	Type 2
G-0201-01 Grit Channel	Slide Plate	16 x 60	60	Aluminum	3, unseating	N/A
G-0201-02 Grit Channel	Slide Plate	24 x 54	54	Aluminum	3, unseating	N/A
G-0201-03 Grit Channel	Slide Plate	48 x 54	54	Aluminum	3, unseating	N/A

Notes:

1. Surface mount sides and top, embed bottom in channel floor.
2. Wall opening for channel-mounted gates and plates, except G-0107, refer to channel dimensions.
3. See Drawings for configuration and invert elevations.

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Plant Drain Pump Station Pumps

Equipment Tag Number(s): P-1601 and un-installed spare

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 7.5

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: Submersible-Explosion Proof

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Scum Pump Station Pumps

Equipment Tag Number(s): P-0404 and un-installed spare

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 10

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: Submersible-Explosion Proof

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Submersible Sump Pump in BFP Pump Room

Equipment Tag Number(s): M-1003

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 3

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☒ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Submersible Pump in WAS Holding Tank

Equipment Tag Number(s): P-0702-01 and P-0702-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 15

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Submersible Sump Pump in the Headworks

Equipment Tag Number(s): M-0208

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 2.2

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☒ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: TWAS Pump

Equipment Tag Number(s): P-0808

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 7

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☒ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: 20 to 100% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: BFP Feed Pumps

Equipment Tag Number(s): P-1002-01; P-1002-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 10

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: RAS Pump Station Pumps

Equipment Tag Number(s): P-0601-01; P-0601-02; P-0601-03

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 7.5

Voltage: 480

Phase: Three

Frequency: 60

Synchronous Speed: 580 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: WAS Pump Station Pumps

Equipment Tag Number(s): P-0602-01; P-0602-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 7.5

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Camp Forsyth Pump Station Pumps

Equipment Tag Number(s): P-2002-01; P-2002-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 150

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: 80 to 100% of Rated Speed

☒ Inverter Duty

☐ Thermal Protection: Y

☐ Space Heater: 110 volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Big Bertha Pump Station Pumps

Equipment Tag Number(s): P-2102-01

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 100

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☒ Thermal Protection: Y

☒ Space Heater: 110 volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Main Post Pump Station Pumps

Equipment Tag Number(s): P-2208-01; P-2208-02, P-2208-03

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 125

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: ODP

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☒ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☒ Thermal Protection: Y

☒ Space Heater: 110 volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Main Post Intermediate Pump Station Pump

Equipment Tag Number(s): P-2302-01; P-2302-02; P-2302-03

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 125

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: ODP

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☒ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☒ Thermal Protection: Y

☒ Space Heater: 110 volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Historic District Pump Station Pumps

Equipment Tag Number(s): P-2402-01; P-2402-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 20

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: ODP

Mounting Type: ☒ Horizontal ☒ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☒ Thermal Protection: y

☒ Space Heater: 110 volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S.Army COE

Equipment Name: Vortex Grit Chamber

Equipment Tag Number(s): M-0203

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 1

Voltage: 460

Phase: 3

Frequency: 60 Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency at Full Load: _____ percent

Guaranteed Minimum Power Factor at Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC-CISD

Mounting Type: ☐ Horizontal ☒ Vertical

☒ Vertical Shaft: ☒ Solid ☐ Hollow

☒ Vertical Thrust Capacity (lb): As required

☐ Controlled by Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☒ Oversize main terminal (conduit) box for motors

☒ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S.Army COE

Equipment Name: Grit Classifier

Equipment Tag Number(s): M-0207

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 1/2

Voltage: 460

Phase: 3

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency at Full Load: _____ percent

Guaranteed Minimum Power Factor at Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC-CISD

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): As required.

☐ Controlled by Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☒ Oversize main terminal (conduit) box for motors

☒ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Grit Pump

Equipment Tag Number(s): P-0205

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 10

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,760 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Secondary Clarifier Mechanisms

Equipment Tag Number(s): M-0402-01, M-0402-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: _____

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☐ Horizontal ☒ Vertical

☒ Vertical Shaft: ☒ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☒ Oversize main terminal (conduit) box for motors

☒ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Gravity Belt Thickener

Equipment Tag Number(s): M-0802

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 3.0

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: 50 to 150% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Washwater Booster Pump

Equipment Tag Number(s): P-1401-01

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: _____

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Air Compressor No. 1

Equipment Tag Number(s): M-1502

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: _____

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: _____

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Belt Filter Press

Equipment Tag Number(s): M-1107

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 3.0

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,200 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: 50 to 150% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Washwater Booster Pumps

Equipment Tag Number(s): P-1401-02 and P-1401-03

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: _____

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,200 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: 50 to 150% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Air Compressor No. 2

Equipment Tag Number(s): M-1501

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: _____

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,200 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS.

Operating Speed Range: 50 to 150% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Positive Displacement Blowers

Equipment Tag Number(s): M-1301-01, M-1301-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: _____

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Positive Displacement Blowers

Equipment Tag Number(s): M-1301-03, M-1301-04, M-1301-05

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 125

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

Adjustable speed drive is applicable only to M-1301-05.

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Positive Displacement Blowers

Equipment Tag Number(s): M-1301-01 and M-1301-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 250

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS.

Operating Speed Range: 15 to 100% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Positive Displacement Blowers

Equipment Tag Number(s): M-1301-03, M-1301-04, and M-1301-05

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 125

Voltage: 460

Phase: Three

Frequency: 60-Hz

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☒ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☒ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS.

Operating Speed Range: 15 to 100% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

Adjustable speed drive is applicable only to M-1301-05.

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: In-Line Sludge Grinders

Equipment Tag Number(s): M-1001-01, M-1001-02

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: 3

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: 1,800 rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☒ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☐ Horizontal ☒ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

TANK DATA SHEET — FORT RILEY WASTERWATER TREATMENT PLANT

Specification Section 13205

EQUIPMENT NO. AND TITLE T-1701 NA Bulk Tank

CONTENTS 50% Sodium Hydroxide

CAPACITY 7800 Gallons

DESIGN PRESSURE Atmospheric

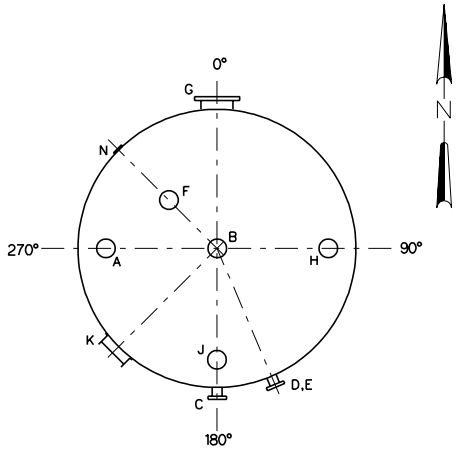
DESIGN TEMPERATURE 100° F

MATERIAL FRP

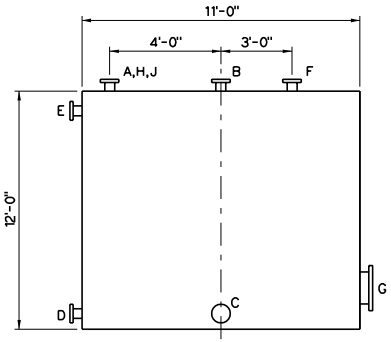
NOZZLE	SIZE/TYPE	℄ ELEV.	DESCRIPTION	ANGLE
A	2" FLANGED	T.O. TANK	Fill (Note 5)	270
B	3" FLANGED	T.O. TANK	Vent	N/A
C	1 1/2" FLANGED	0'-6"	Outlet	180
D	2" FLANGED	0'-4"	Drain	157
E	2" FLANGED	11'-9"	Overflow	157
F	3" FLANGED	T.O. TANK	Level Element	315
G	24" FLANGED	3'-6"	Manway	0
H	2" FLANGED	T.O. TANK	Spare (Note 6)	90
J	1 1/2" FLANGED	T.O. TANK	Day Tank Overflow	180
K			Ladder (Note 7)	225
L		T.O. TANK	Non-skid Surface (Note 8)	
N			Translucent Level Strip	315

Notes:

1. Tank location is indoors.
2. Elevations are from tank bottom.
3. All nozzles shall have a 6" projection from exterior of tank wall to flange face.
4. T.O. - Mounted on Top Of tank.
5. Provide interior drop pipe and supports. Terminate 12" above tank bottom.
6. Furnish with blind flange.
7. Provide ladder as specified.
8. Provide non-skid surface 4'-0" wide.



PLAN



ELEVATION

Nozzles rotated for clarity
Ladder not shown in elevation

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TANK DATA SHEET FORT RILEY WASTERWATER TREATMENT PLANT

Specification Section 13205

EQUIPMENT NO. AND TITLE T-1706 NA Day Tank

CONTENTS 50% Sodium Hydroxide

CAPACITY 250 Gallons

DESIGN PRESSURE 5 PSI

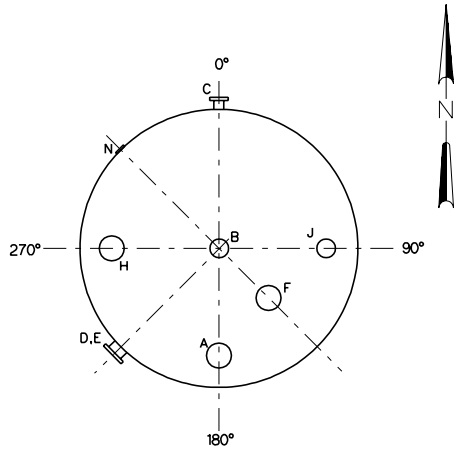
DESIGN TEMPERATURE 100° F

MATERIAL FRP

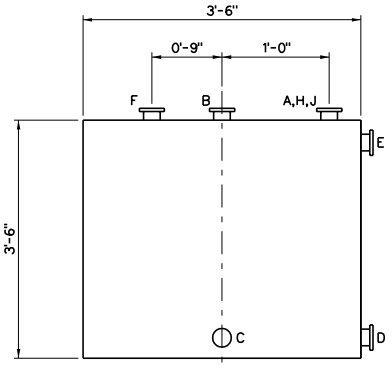
NOZZLE	SIZE/TYPE	℄ ELEV.	DESCRIPTION	ANGLE
A	1 1/2" FLANGED	T.O. TANK	Fill (Note 5)	180
B	2" FLANGED	T.O. TANK	Vent	N/A
C	3/4" FLANGED	0'-4"	Outlet	0
D	1 1/2" FLANGED	0'-3"	Drain	225
E	1 1/2" FLANGED	3'-3"	Overflow	225
F	3" FLANGED	T.O. TANK	Level Element	135
G			Not Used	
H	2" FLANGED	T.O. TANK	Spare (Note 6)	270
J	1/2" FLANGED	T.O. TANK	Recycle	90
K			Not Used	
L			Not Used	
N			Translucent Level Strip	315

Notes:

1. Tank location is indoors.
2. Elevations are from tank bottom.
3. All nozzles shall have a 3" projection from exterior of tank wall to flange face.
4. T.O. - Mounted on Top Of tank.
5. Provide interior drop pipe and supports. Terminate 6" above tank bottom.
6. Furnish with blind flange.



PLAN



ELEVATION

Nozzles rotated for clarity
Ladder not shown in elevation

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TANK DATA SHEET — FORT RILEY WASTERWATER TREATMENT PLANT

Specification Section 13205

EQUIPMENT NO. AND TITLE T-2001 FC Bulk Tank (Camp Forsyth)

CONTENTS 30% Ferrous Chloride

CAPACITY 1700 Gallons

DESIGN PRESSURE Atmospheric

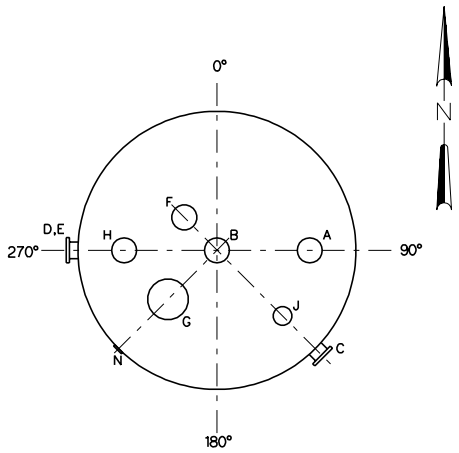
DESIGN TEMPERATURE 100° F

MATERIAL FRP

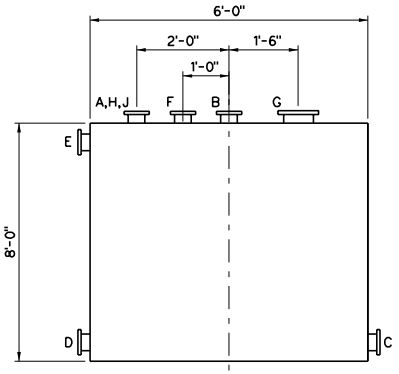
NOZZLE	SIZE/TYPE	℄ ELEV.	DESCRIPTION	ANGLE
A	2" FLANGED	T.O. TANK	Fill (Note 5)	90
B	2" FLANGED	T.O. TANK	Vent	N/A
C	1 1/2" FLANGED	0'-4"	Outlet	135
D	2" FLANGED	0'-3"	Drain	270
E	2" FLANGED	7'-9"	Overflow	270
F	3" FLANGED	T.O. TANK	Level Element	315
G	18" FLANGED	T.O. TANK	Hatch (Note 6)	225
H	2" FLANGED	T.O. TANK	Spare (Note 6)	270
J	1" FLANGED	T.O. TANK	Day Tank Overflow	135
K			Not Used	
L			Not Used	
N			Translucent Level Strip	225

Notes:

1. Tank location is indoors.
2. Elevations are from tank bottom.
3. All nozzles shall have a 3" projection from exterior of tank wall to flange face.
4. T.O. - Mounted on Top Of tank.
5. Provide interior drop pipe and supports. Terminate 12" above tank bottom.
6. Furnish with blind flange.



PLAN



ELEVATION

Nozzles rotated for clarity
Ladder not shown in elevation

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TANK DATA SHEET — FORT RILEY WASTERWATER TREATMENT PLANT

Specification Section 13205

EQUIPMENT NO. AND TITLE T-2004 FC Day Tank (Camp Forsyth)

CONTENTS 30% Ferrous Chloride

CAPACITY 100 Gallons

DESIGN PRESSURE 5 PSI

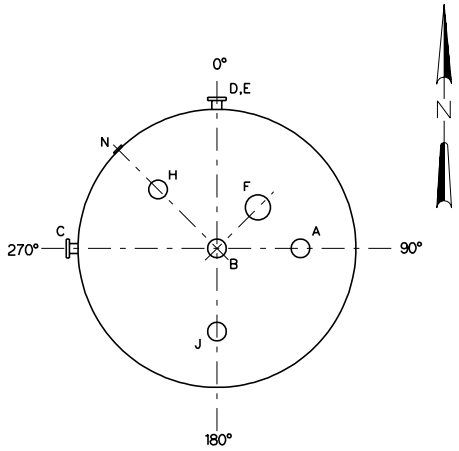
DESIGN TEMPERATURE 100° F

MATERIAL FRP

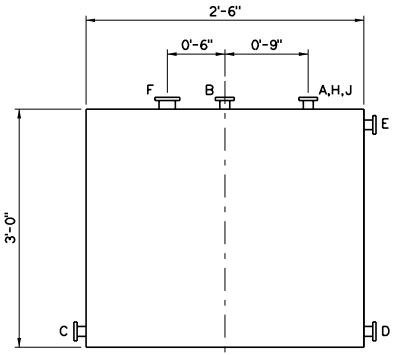
NOZZLE	SIZE/TYPE	℄ ELEV.	DESCRIPTION	ANGLE
A	3/4" FLANGED	T.O. TANK	Fill (Note 5)	90
B	1" FLANGED	T.O. TANK	Vent	N/A
C	1/2" FLANGED	0'-3"	Outlet	270
D	1" FLANGED	0'-3"	Drain	0
E	1" FLANGED	2'-9"	Overflow	0
F	3" FLANGED	T.O. TANK	Level Element	45
G			Not Used	
H	1" FLANGED	T.O. TANK	Spare (Note 6)	315
J	1/2" FLANGED	T.O. TANK	Recycle	180
K			Not Used	
L			Not Used	
N			Translucent Level Strip	315

Notes:

1. Tank location is indoors.
2. Elevations are from tank bottom.
3. All nozzles shall have a 1" projection from exterior of tank wall to flange face.
4. T.O. - Mounted on Top Of tank.
5. Provide interior drop pipe and supports. Terminate 6" above tank bottom.
6. Furnish with blind flange.



PLAN



ELEVATION

Nozzles rotated for clarity
Ladder not shown in elevation

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TANK DATA SHEET — FORT RILEY WASTERWATER TREATMENT PLANT

Specification Section 13205

EQUIPMENT NO. AND TITLE T-2201 FC Bulk Tank (Main Post)

CONTENTS 30% Ferrous Chloride

CAPACITY 1250 Gallons

DESIGN PRESSURE Atmospheric

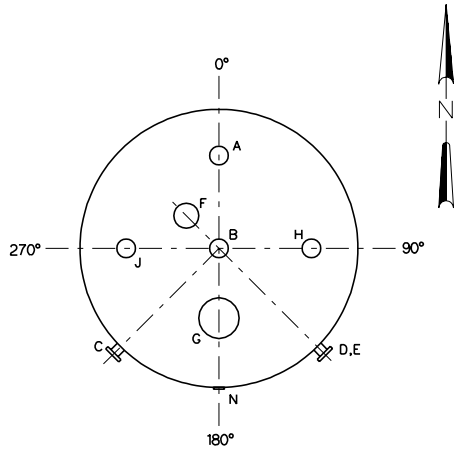
DESIGN TEMPERATURE 100° F

MATERIAL FRP

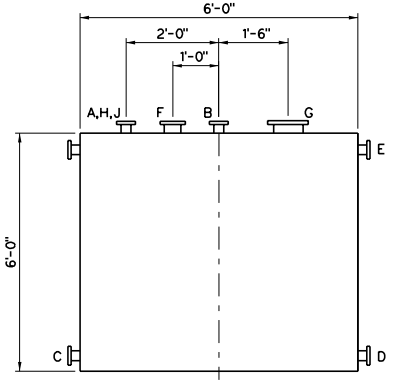
NOZZLE	SIZE/TYPE	℄ ELEV.	DESCRIPTION	ANGLE
A	2" FLANGED	T.O. TANK	Fill (Note 5)	0
B	2" FLANGED	T.O. TANK	Vent	N/A
C	1" FLANGED	0'-4"	Outlet	225
D	2" FLANGED	0'-3"	Drain	135
E	2" FLANGED	5'-9"	Overflow	135
F	3" FLANGED	T.O. TANK	Level Element	315
G	18" FLANGED	T.O. TANK	Hatch (Note 6)	180
H	2" FLANGED	T.O. TANK	Spare (Note 6)	90
J	1" FLANGED	T.O. TANK	Day Tank Overflow	270
K			Not Used	
L			Not Used	
N			Translucent Level Strip	180

Notes:

1. Tank location is indoors.
2. Elevations are from tank bottom.
3. All nozzles shall have a 3" projection from exterior of tank wall to flange face.
4. T.O. - Mounted on Top Of tank.
5. Provide interior drop pipe and supports. Terminate 12" above tank bottom.
6. Furnish with blind flange.



PLAN



ELEVATION

Nozzles rotated for clarity
Ladder not shown in elevation

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TANK DATA SHEET — FORT RILEY WASTERWATER TREATMENT PLANT

Specification Section 13205

EQUIPMENT NO. AND TITLE T-2204 FC Day Tank (Main Post)

CONTENTS 30% Ferrous Chloride

CAPACITY 100 Gallons

DESIGN PRESSURE 5 PSI

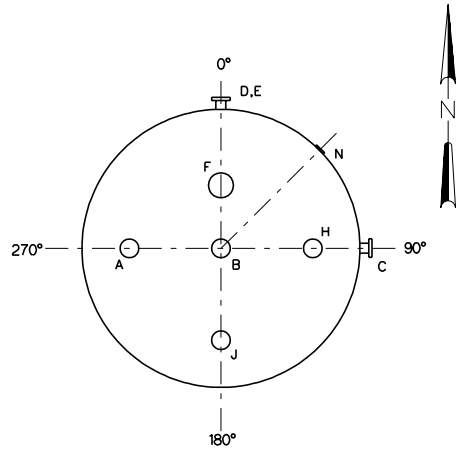
DESIGN TEMPERATURE 100° F

MATERIAL FRP

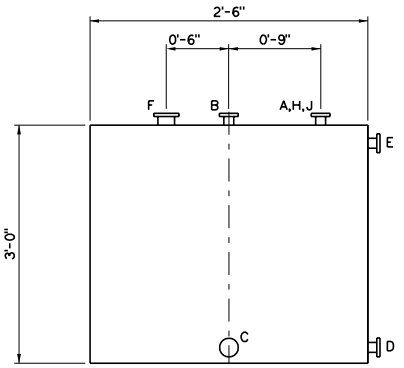
NOZZLE	SIZE/TYPE	℄ ELEV.	DESCRIPTION	ANGLE
A	3/4" FLANGED	T.O. TANK	Fill (Note 5)	270
B	1" FLANGED	T.O. TANK	Vent	N/A
C	1/2" FLANGED	0'-3"	Outlet	90
D	1" FLANGED	0'-3"	Drain	0
E	1" FLANGED	2'-9"	Overflow	0
F	3" FLANGED	T.O. TANK	Level Element	0
G			Not Used	
H	1" FLANGED	T.O. TANK	Spare (Note 6)	90
J	1/2" FLANGED	T.O. TANK	Recycle	180
K			Not Used	
L			Not Used	
N			Translucent Level Strip	45

Notes:

1. Tank location is indoors.
2. Elevations are from tank bottom.
3. All nozzles shall have a 1" projection from exterior of tank wall to flange face.
4. T.O. - Mounted on Top Of tank.
5. Provide interior drop pipe and supports. Terminate 6" above tank bottom.
6. Furnish with blind flange.



PLAN



ELEVATION

Nozzles rotated for clarity
Ladder not shown in elevation

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SUMMARY OF IDENTIFIED, PRESUMED OR SUSPECTED ASBESTOS-CONTAINING MATERIAL

Below is a quick summary/verification of identified, presumed or suspected asbestos-containing material that may be encountered in buildings 390, 391, 392, 393, 2591, 2592, 8129, 8130, 8131, 8132, 8133, 8134, 8135 and 8136. Special Note: Additional cementitious/transite piping may remain in areas, which were not accessible during the asbestos surveys. The cementitious/transite piping may be buried in/or around the water treatment facilities area.

MAIN POST

Building 390
- Transite Shingles on Roof (approx 1,352 square feet)
- Misc. pipe adhesives and/or gaskets.

Building 391
- Roofing Tar/Felt/Flashing (approx 510 square feet)
- Misc. pipe adhesives and/or gaskets.

Building 392
- Roofing Tar/Felt/Flashing (approx 300 square feet).

CAMP FORSYTH

Building 2591
- Roofing Paper/Felt/Flashing (approx 550 square feet)
- Misc. pipe adhesives and/or gaskets.

Building 2592
- Asbestos Cloth (approx 4 linear feet)
- Floor tile/mastic (approx 100 square feet)
- Roofing Paper/Felt/Flashing (approx 1,100 square feet)
- Misc. pipe adhesives and/or gaskets.

CUSTER HILL

Building 8129
- Mudded-Joint Packing (MJP) - Approx 2 areas.
- Pipe adhesive used on pump generator exhaust threads.

Building 8130
- Mastic under 1'x1' gold floor tile (approx 410 square feet).
- Magnesia Pipe Cover (approx 200 linear feet).
- MJP on pipe fitting (Estimate up to 50 may remain in tunnel, from 1" to 8" diameter).
- Roofing Tar/Felt/Flashing (approx 650 square feet).
- Misc. pipe adhesives and/or gaskets.
- Cementitious/transite piping (approx 400 in linear feet in tunnel, equipment room and
- various inaccessible locations).

Building 8131
- Roofing Paper/Felt/Flashing (approx 330 square feet)
- Misc. pipe adhesives and/or gaskets.

Building 8132
- No asbestos-containing material was identified during last survey.

Building 8133
- Transite pipe (approx 10 linear feet, 5" diameter).

Building 8134
- Roofing Paper/Felt/Flashing (approx 1,150 square feet).
- Misc. pipe adhesives and/or gaskets.

Building 8135
- Roofing Paper/Felt/Flashing (approx 560 square feet)
- Misc. pipe adhesives and/or gaskets.

Building 8136
- No asbestos-containing material was identified during last survey.

If you have any question's or require addition support, please call Robert Lynn at 239-6642.

Bob Lynn,
Asbestos Technician
DES, Safety Division
Dynamac Corporation
239-6642

Sample Analysis Report

02-Nov-00

BUILDING: 390

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	wallboard														
		836300													
			Office		PR	**0**	0	0	0	0	30	0	0	20	50
		836301													
			Office		PR	**0**	0	0	0	0	50	0	0	20	30
		836302													
			Office		PR	**0**	0	0	0	0	40	0	0	30	30
2	transite shingles														
		845495													
			Roof		PR	**70**	70	0	0	0	0	0	0	28	2
3	roofing felt														
		845496													
			Roof		PR	**0**	0	0	0	0	50	0	0	44	6

Caution: Additional asbestos-containing materials may be present behind walls, above ceilings, or in areas that were not accessed during the survey. No individuals should disturb any building material that may contain asbestos, unless they have been properly trained in methods to handle asbestos-containing materials. Questions regarding asbestos in buildings at Fort Riley may be directed to the Directorate of Environment and Safety at 239-6642.

Legend:
CHRY = Chrysotile
AMOS = Amosite
CROC = Crocidolite
GLASS WOOL = Mineral/Glass Wool, Glass Fibers/Minerals
CELL MATLS = Wood/Paper Fibers, Cellulose
AMOR = Vermiculite, Anthophylite, Actinolite, Tremolite
PER MATLS = Perlite/Pumice
BINDER MATL = Nonfibrous Binder, Amorphous Material
OTHER MATL = Other 1, Synthetic Fiber/Hair
Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 391

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	roof deck														
		845497	Roof		PR	**20**	20	0	0	5	15	0	0	54	6
		845498	Roof		PR	**15**	15	0	0	10	2	0	0	70	3
		845499	Roof		PR	**20**	20	0	0	10	0	0	0	61	9

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OTHER MATL = Other 1, Synthetic Fiber/Hair
Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 392

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	wallboard														
		900392													
			Refer to building 390		PR	**0**	0	0	0	0	50	0	0	20	30
2	Slate Shingles														
		892605													
			Roof		PR	**4**	4	0	0	0	0	0	0	96	0
		892617													
			Roof		PR	**4**	4	0	0	0	0	0	0	96	0
		895699													
			Roof		PR	**4**	4	0	0	0	0	0	0	96	0
3	Roof tar Flashing														
		884399													
			Roof		PR	**4**	4	0	0	0	0	0	0	96	0
		885999													
			Roof		PR	**4**	4	0	0	0	0	0	0	96	0
		888396													
			Roof		PR	**4**	4	0	0	0	0	0	0	96	0

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Other 2, Other 3

Sample Analysis Report

BUILDING: 393

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS	**TOTAL % ASB** #/Layer	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL

Acquired approximately 1991, No Survey Record

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AMOR = Vermiculite, Anthophylite, Actinolite, Tremolite
PER MATLS = Perlite/Pumice
BINDER MATL = Nonfibrous Binder, Amorphous Material
OTHER MATL = Other 1, Synthetic Fiber/Hair
Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 2591

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	roof deck														
		865375	Built-up roof		PR	**20**	20	0	0	0	35	0	0	42	3
		865376	Built-up roof		PR	**0**	0	0	0	0	50	0	0	48	2
		865377	Built-up roof		PR	**10**	10	0	0	0	45	0	0	39	6

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PER MATLS = Perlite/Pumice
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OTHER MATL = Other 1, Synthetic Fiber/Hair
Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 2592

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	9"x9" gray floor tile														
		843887	1st floor-latrine		PR	**2**	2	0	0	0	0	0	0	51	47
		843888	1st floor-latrine		PR	**2**	2	0	0	0	0	0	0	51	47
			1st floor-latrine	tile	S1	**2**	2	0	0	0	0	0	0	51	47
			1st floor-latrine	adh	S2	**0**	0	0	0	1	2	0	0	87	10
		843889	1st floor-office		PR	**2**	2	0	0	0	0	0	0	50	48
2	asbestos cloth														
		843890	1st floor-pump area-gas supply		PR	**65**	65	0	0	0	0	0	0	2	33
		843891	1st floor-pump area-gas supply		PR	**70**	70	0	0	0	0	0	0	3	27
		843892	1st floor-pump area-gas supply		PR	**45**	45	0	0	0	0	0	0	2	53
3	roof deck														
		865369	Roof		PR	**0**	0	0	0	10	0	0	0	85	5
		865370	Roof		PR	**0**	0	0	0	10	0	0	0	87	3
		865371	Roof		PR	**0**	0	0	0	10	0	0	0	87	3
4	flashing tar														
		865372	Roof		PR	**2**	2	0	0	2	0	0	0	90	6
			Roof	flash	S1	**7**	7	0	0	0	0	0	0	77	16
			Roof	roof	S2	**0**	0	0	0	3	0	0	0	94	3

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Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 2592

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
		865373													
			Roof		PR	**0**	0	0	0	10	0	0	0	85	5
			Roof	flash	S1	**5**	5	0	0	0	0	0	0	84	11
			Roof	roof	S2	**0**	0	0	0	10	0	0	0	86	4
		865374													
			Roof		PR	**0**	0	0	0	10	0	0	0	87	3
			Roof	flash	S1	**3**	3	0	0	0	0	0	0	89	8
			Roof	roof	S2	**0**	0	0	0	10	0	0	0	87	3

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PER MATLS = Perlite/Pumice
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Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 8129

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	roofing tar														
		859183	Roof		PR	**0**	0	0	0	0	25	0	0	71	4
		859184	Roof		PR	**0**	0	0	0	0	25	0	0	70	5
		859185	Roof		PR	**0**	0	0	0	0	25	0	0	71	4
2	Insulation material (black)														
		2949	On gasket	Insulation	PR	**0**	0	0	0	0	20	0	0	80	0
3	MJP														
		2974	Attached to pump generator (Ford Type) motor exhaust pipe ins.	MJP	PR	**5**	5	0	0	0	0	0	0	95	0
4	Adhisive														
		2975	On treads of pump generator exhaust pipe connection above ins.	Adhesive	PR	**5**	5	0	0	0	0	0	0	95	0

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Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 8130

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	9"x9" off-white floor tile														
		859266													
			Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	51	49
			Ground floor-lab area	tile	S1	**0**	0	0	0	0	0	0	0	49	51
			Ground floor-lab area	adh	S2	**0**	0	0	0	0	4	0	0	88	8
		859267													
			Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	50	50
			Ground floor-lab area	tile	S1	**0**	0	0	0	0	0	0	0	49	51
			Ground floor-lab area	adh	S2	**0**	0	0	0	0	1	0	0	92	7
		859268													
			Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	49	51
			Ground floor-lab area	tile	S1	**0**	0	0	0	0	0	0	0	48	52
			Ground floor-lab area	adh	S2	**0**	0	0	0	0	1	0	0	94	5
2	1'x1' gold floor tile														
		859269													
			Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	48	52
			Ground floor-lab area	tile	S1	**0**	0	0	0	0	0	0	0	45	55
			Ground floor-lab area	adh	S2	**2**	2	0	0	0	0	0	0	95	3
		859270													
			Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	48	52
			Ground floor-lab area	tile	S1	**0**	0	0	0	0	0	0	0	45	55
			Ground floor-lab area	adh	S2	**5**	5	0	0	0	1	0	0	91	3
		859271													
			Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	47	53
			Ground floor-lab area	tile	S1	**0**	0	0	0	0	0	0	0	45	55
			Ground floor-lab area	adh	S2	**2**	2	0	0	0	0	0	0	95	3

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AMOR = Vermiculite, Anthophylite, Actinolite, Tremolite
PER MATLS = Perlite/Pumice
BINDER MATL = Nonfibrous Binder, Amorphous Material
OTHER MATL = Other 1, Synthetic Fiber/Hair
Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 8130

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
3	2'x4' ceiling panels														
		859272	Ground floor-lab area		PR	**0**	0	0	0	50	20	0	15	13	2
		859273	Ground floor-lab area		PR	**0**	0	0	0	55	15	0	15	12	3
		859274	Ground floor-lab area		PR	**0**	0	0	0	60	15	0	10	12	3
4	baseboard mastic														
		859275	Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	93	7
		859276	Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	80	20
		859277	Ground floor-lab area		PR	**0**	0	0	0	0	0	0	0	78	22
5	magnesia pipe cover														
		859278	Pipe tunnel-sludge line		PR	**37**	7	30	0	0	0	0	0	53	10
6	roofing tar														
		859279	Roof		PR	**7**	7	0	0	0	20	0	0	69	4
		859280	Roof		PR	**0**	0	0	0	0	0	0	0	89	11
		859281	Roof		PR	**0**	0	0	0	5	0	0	0	87	8
7	flashing tar														
		859297	Roof		PR	**5**	5	0	0	0	0	0	0	79	16
		859298	Roof		PR	**7**	7	0	0	0	0	0	0	76	17

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Sample Analysis Report

02-Nov-00

BUILDING: 8130

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
		859299													
			Roof		PR	**7**	7	0	0	0	0	0	0	77	16
8	cementitious piping														
		908130													
			Refer to building 2153		PR	**15**	10	0	5	0	0	0	0	85	0
		918130													
			Refer to building 2153		PR	**15**	9	0	6	0	0	0	0	85	0
		928130													
			Refer to building 2153		PR	**15**	9	0	6	0	0	0	0	85	0

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Sample Analysis Report

02-Nov-00

BUILDING: 8131

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1	roofing tar														
		859288													
			Roof		PR	**14**	14	0	0	5	15	0	0	64	2
		859289													
			Roof		PR	**20**	20	0	0	5	20	0	0	50	5
		859290													
			Roof		PR	**0**	0	0	0	0	0	0	0	99	1

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Sample Analysis Report

02-Nov-00

BUILDING: 8132

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1	roofing tar														
		859291	Roof		PR	**0**	0	0	0	0	50	0	0	44	6
		859292	Roof		PR	**0**	0	0	0	0	40	0	0	50	10
		859293	Roof		PR	**0**	0	0	0	0	20	0	0	57	23

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Sample Analysis Report

02-Nov-00

BUILDING: 8133

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	roofing tar														
		859282													
			Roof		PR	**0**	0	0	0	0	30	0	0	68	2
		859283													
			Roof		PR	**0**	0	0	0	0	20	0	0	79	1
		859284													
			Roof		PR	**0**	0	0	0	0	20	0	0	79	1
2	cementitious piping														
		859342													
			Roof		PR	**15**	15	0	0	0	0	0	0	65	20

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OTHER MATL = Other 1, Synthetic Fiber/Hair
Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 8134

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	roofing tar														
		859294	Roof		PR	**0**	0	0	0	0	0	0	0	99	1
		859295	Roof		PR	**0**	0	0	0	0	0	0	0	99	1
		859296	Roof		PR	**2**	2	0	0	0	0	0	0	88	10

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Other 2, Other 3

Sample Analysis Report

02-Nov-00

BUILDING: 8135

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
1	roof deck														
		859285	Roof		PR	**2**	2	0	0	0	1	0	0	75	22
		859286	Roof		PR	**2**	2	0	0	0	0	0	0	81	17
		859287	Roof		PR	**2**	2	0	0	0	0	0	0	80	18

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Sample Analysis Report

BUILDING: 8136

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL
					#/Layer										

Acquired approximately 1987, No Survey Record

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Sample Analysis Report

BUILDING: 8140

HA #	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE LOCATION	ANALY TYPE	Substrate/ ANALYSIS #/Layer	**TOTAL % ASB**	CHRY	AMOS	CROC	GLASS WOOL	CELL MATLS	AMOR	PER MATLS	BINDER MATL	OTHER MATL

Acquired approximately 1993, No Survey Record

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FUNCTIONAL LOOP SPECIFICATIONS

UNIT PROCESS 01, PLANT INFLUENT AND SCREENING

LOOP 0101, PLANT INFLUENT LEVEL HIGH

IPS Functions:

Field Devices and Connections:

- Provide float switch to monitor level.
- Provide digital signal for alarm to PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide alarm to the HMI.
- Provide alarm to Common Alarm.
- Provide alarm to PLC AB.

Software Interlocks:

- LOOP 0211, HEADWORKS AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display alarm with high priority.
- Historically archive alarm.

Metasys:

- Display alarm.

LOOP 0102, PLANT INFLUENT FLOW

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure Parshall Flume level and derive flow from Parshall Flume curve.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide flow to the HMI.
- Provide flow to Influent Automatic Sampler.
- Provide flow to RAS Pumps.
- Provide flow to Sodium Hydroxide Feed Pumps.
- Provide flow to PLC AB.
- Totalize flow.
- Provide flow totalizer to the HMI.

Software Interlocks:

- LOOP 0107, INFLUENT AUTOMATIC SAMPLER.
- LOOP 0601, RAS PUMPS.
- LOOP 1707, SODIUM HYDROXIDE FEED PUMPS.

PLC AB Application Software:

Monitor and Control:

- Provide flow to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.

Metasys:

- Display flow.

LOOP 0104, FINE SCREEN DIFFERENTIAL LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic devices upstream and downstream of the Bar Screen to measure differential level.
- Indicate differential level locally using required engineering units.
- Provide analog signal proportional to differential level range to Fine Screen CP-0105.
- Provide analog signal proportional to differential level range to PLC HW.

Hard-Wired Interlocks:

- LOOP 0105, FINE SCREEN.

PLC HW Application Software:

Monitor and Control:

- Provide differential level to the HMI.
- Provide differential level to PLC AB.
- Receive differential level alarm high setpoint from the HMI.
- Compare differential level with differential level alarm high setpoint to generate differential level alarm high.
- Provide differential level alarm high to the HMI.
- Provide differential level alarm high to Common Alarm.

Software Interlocks:

- LOOP 0211, HEADWORKS AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide differential level to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display differential level.
- Historically archive differential level.
- Trend differential level.
- Provide the differential level alarm high setpoint to the PLC.
- Display differential level alarm high setpoint.
- Historically archive differential level alarm high setpoint.

- Display differential level alarm with medium priority.
- Historically archive differential level alarm.

Metasys:

- Display differential level.

LOOP 0105, FINE SCREEN

IPS Functions:

Field Devices and Connections:

- Receive analog signal proportional to Fine Screen Differential Level.
- Provide digital signal for on status to PLC HW.
- Provide digital signal for fail alarm to PLC HW.

Hard-Wired Interlocks:

- LOOP 0104, FINE SCREEN DIFFERENTIAL LEVEL.

PLC HW Application Software:

Monitor and Control:

- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide differential level alarm high to Common Alarm.
- Control mode:
  - None.

Software Interlocks:

- LOOP 0211, HEADWORKS AREA COMMON ALARM.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.

Metasys:

- None.

LOOP 0107, INFLUENT AUTOMATIC SAMPLER

IPS Functions:

Field Devices and Connections:

- Receive analog control signal proportional to Plant Influent Flow from PLC HW.
- Provide digital signal for fail alarm to PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide analog control signal proportional to Plant Influent Flow.
- Provide fail alarm to the HMI.

Software Interlocks:

- LOOP 0102, PLANT INFLUENT FLOW.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display fail alarm with low priority.
- Historically archive fail alarm.

Metasys:

- None.

LOOP 0108, PLANT INFLUENT AND SCREENING AIR MONITORING

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure combustible gases.
- Indicate combustible gas locally in % LEL.
- Provide analog signal proportional to 0-100% LEL to PLC HW.
- Provide digital signal for combustible gases present alarm (at or above 20% LEL) to the LCP.
- Provide instrument to measure H_2S.
- Indicate H_2S gas locally in PPM.
- Provide analog signal proportional to 0-100 PPM to PLC HW.
- Provide digital signal for H_2S present alarm (at or above 20 PPM) to the LCP.
- Provide digital signal for supply air flow alarm low to the LCP.
- Provide digital signal for exhaust air flow alarm low to the LCP.
- Receive digital signal for combustible gases present alarm from Grit Removal Air Monitoring to the LCP.
- Receive digital signal for H_2S present alarm from Grit Removal Air Monitoring to the LCP.
- Receive digital signal for supply air flow alarm low from Grit Removal Air Monitoring to the LCP.
- Receive digital signal for exhaust air flow alarm low from Grit Removal Air Monitoring to the LCP.
- Provide digital signals to energize the beacons from the LCP upon any alarm.
- Provide digital signals to energize the horns from the LCP upon any alarm.
- Provide test push button to energize the beacons and horns at the LCP.
- Provide silence push button to silence the horns at the LCP.
- Provide digital signal for air flow OK status to PLC HW.

Hard-Wired Interlocks:

- LOOP 209, GRIT REMOVAL AIR MONITORING.

PLC HW Application Software:

Monitor and Control:

- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to PLC AB.
- Hard-code combustible gas imminent alarm setpoint at 10% LEL.
- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the HMI.
- Hard-code combustible gas present alarm setpoint at 20% LEL.

- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to PLC AB.
- Provide H_2S gas PPM to the HMI.
- Provide H_2S gas PPM to PLC AB.
- Hard-code H_2S gas imminent alarm setpoint at 10 PPM.
- Compare H_2S gas PPM with H_2S gas imminent alarm setpoint to generate H_2S gas imminent alarm.
- Provide H_2S gas imminent alarm to the HMI.
- Hard-code H_2S gas present alarm setpoint at 20 PPM.
- Compare H_2S gas PPM with H_2S gas present alarm setpoint to generate H_2S gas present alarm.
- Provide H_2S gas present alarm to the HMI.
- Provide H_2S gas present alarm to PLC AB.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide combustible gas % LEL to Metasys.
- Provide combustible gas present alarm to Metasys.
- Provide H_2S gas PPM to Metasys.
- Provide H_2S gas present alarm to Metasys.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display H_2S gas PPM.

- Historically archive H_2S gas PPM.
- Trend H_2S gas PPM.
- Display H_2S gas imminent alarm setpoint.
- Historically archive H_2S gas imminent alarm setpoint.
- Display H_2S gas imminent alarm with low priority.
- Historically archive H_2S gas imminent alarm.
- Display H_2S gas present alarm setpoint.
- Historically archive H_2S gas present alarm setpoint.
- Display H_2S gas present alarm with high priority.
- Historically archive H_2S gas present alarm.
- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display H_2S gas PPM.
- Display H_2S gas present alarm.
- Display air flow alarm low.

UNIT PROCESS 02, GRIT REMOVAL

LOOP 0202, GRIT CHAMBER ROTATOR

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC HW.
- Provide digital signal for on status to PLC HW.
- Provide digital signal for fail alarm to PLC HW.
- Receive digital signal for run control from PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Control mode:
  - Manual only.
- Provide manual status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.

- Receive stop command from the HMI.
- Provide logic to deenergize run control upon stop command.

- Auto control mode:
  - None.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - Display manual status.
- Manual control mode
  - Provide start command to PLC HW.
  - Provide stop command to PLC HW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 0203, GRIT PUMP SUCTION PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 0204, GRIT PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC HW.
- Provide digital signal for on status to PLC HW.
- Provide digital signal for fail alarm to PLC HW.
- Receive digital signal for run control from PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.

- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive off-time setpoint from the HMI.
  - Provide logic to activate off-timer if not on status.
  - Provide logic for group-start command to Grit Pump and Grit Classifier when off-timer has expired.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Receive on-time setpoint from the HMI.
  - Provide logic to activate on-timer if on status.
  - Provide logic for group-stop command to Grit Pump and Grit Classifier when on-timer has expired.
  - Provide logic to deenergize run control upon group-stop command.
  - Provide interlock logic to deenergizes run control if Grit Classifier is not on status after a five-second delay.
  - Provide interlock alarm to the HMI.
  - Provide off-time elapsed to the HMI.
  - Provide on-time elapsed to the HMI.

Software Interlocks:

- LOOP 0206, GRIT CLASSIFIER.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.

- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC HW.
  - Provide manual command to PLC HW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC HW.
  - Provide stop command to PLC HW.
- Auto control mode:
  - Provide on-time setpoint to PLC HW.
  - Provide off-time setpoint to PLC HW.
- Display off-time setpoint.
- Historically archive off-time setpoint.
- Display on-time setpoint.
- Historically archive on-time setpoint.
- Display interlock alarm with low priority.
- Display off-time elapsed.
- Display on-time elapsed.

Metasys:

- None.

LOOP 0205, GRIT PUMP DISCHARGE PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 0206, GRIT CLASSIFIER

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC HW.
- Provide digital signal for on status to PLC HW.
- Provide digital signal for fail alarm to PLC HW.
- Receive digital signal for run control from PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide on status to Grit Classifier Water Supply Valve.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.

- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive group-start command from Grit Pump logic.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Receive group-stop command from Grit Pump logic.
  - Provide logic to deenergize run control upon group-stop command.
  - Provide interlock logic to deenergizes run control if Grit Pump is not on status after a five-second delay.
  - Provide interlock alarm to the HMI.

Software Interlocks:

- LOOP 0204, GRIT PUMP.
- LOOP 0207, GRIT CLASSIFIER WATER SUPPLY VALVE.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC HW.
  - Provide manual command to PLC HW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC HW.
  - Provide stop command to PLC HW.

- Auto control mode:
  - None.
- Display interlock alarm with low priority.

Metasys:

- None.

LOOP 0207, GRIT CLASSIFIER WATER SUPPLY VALVE

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC HW.
- Receive digital signal for open control from PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide open control to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive open command from the HMI.
  - Provide logic to energize open control upon open command.
  - Receive close command from the HMI.
  - Provide logic to deenergize open control upon close command.
- Auto control mode:
  - Receive Grit Classifier on status.
  - Provide logic to energize open control if Grit Classifier is on status.
  - Provide logic to deenergize open control if Grit Classifier is not on status after a ten-second delay.

Software Interlocks:

- LOOP 0206, GRIT CLASSIFIER.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display open control.
- Historically archive open control.
- Control mode:
  - Provide auto command to PLC HW.
  - Provide manual command to PLC HW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide open command to PLC HW.
  - Provide close command to PLC HW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 0208, GRIT REMOVAL SUMP PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for level alarm high-high to PLC HW.
- Provide digital signal for fail alarm to PLC RW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide level alarm high-high to the HMI.
- Provide alarm to Common Alarm.
- Provide alarm to PLC AB.
- Provide fail alarm to the HMI.

Software Interlocks:

- LOOP 0211, HEADWORKS AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide level alarm high-high to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level alarm high-high with high priority.
- Historically archive level alarm high-high.
- Display fail alarm with low priority.
- Historically archive fail alarm.

Metasys:

- Display level alarm high-high.

LOOP 0209, GRIT REMOVAL AIR MONITORING

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure combustible gases.
- Indicate combustible gas locally in % LEL.
- Provide analog signal proportional to 0-100% LEL to PLC HW.
- Provide digital signal for combustible gases present alarm (at or above 20% LEL) to Plant Influent and Screening Air Monitoring.
- Provide instrument to measure H_2S.
- Indicate H_2S gas locally in PPM.
- Provide analog signal proportional to 0-100 PPM to PLC HW.
- Provide digital signal for H_2S present alarm (at or above 20 PPM) to Plant Influent and Screening Air Monitoring.
- Provide digital signal for supply air flow alarm low to Plant Influent and Screening Air Monitoring.
- Provide digital signal for exhaust air flow alarm low to Plant Influent and Screening Air Monitoring.

Hard-Wired Interlocks:

- LOOP 0108, PLANT INFLUENT AND SCREENING AIR MONITORING.

PLC HW Application Software:

Monitor and Control:

- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to PLC AB.
- Hard-code combustible gas imminent alarm setpoint at 10% LEL.

- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the HMI.
- Hard-code combustible gas present alarm setpoint at 20% LEL.
- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to PLC AB.
- Provide H_2S gas PPM to the HMI.
- Provide H_2S gas PPM to PLC AB.
- Hard-code H_2S gas imminent alarm setpoint at 10 PPM.
- Compare H_2S gas PPM with H_2S gas imminent alarm setpoint to generate H_2S gas imminent alarm.
- Provide H_2S gas imminent alarm to the HMI.
- Hard-code H_2S gas present alarm setpoint at 20 PPM.
- Compare H_2S gas PPM with H_2S gas present alarm setpoint to generate H_2S gas present alarm.
- Provide H_2S gas present alarm to the HMI.
- Provide H_2S gas present alarm to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide combustible gas % LEL to Metasys.
- Provide combustible gas present alarm to Metasys.
- Provide H_2S gas PPM to Metasys.
- Provide H_2S gas present alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display H_2S gas PPM.
- Historically archive H_2S gas PPM.

- Trend H_2S gas PPM.
- Display H_2S gas imminent alarm setpoint.
- Historically archive H_2S gas imminent alarm setpoint.
- Display H_2S gas imminent alarm with low priority.
- Historically archive H_2S gas imminent alarm.
- Display H_2S gas present alarm setpoint.
- Historically archive H_2S gas present alarm setpoint.
- Display H_2S gas present alarm with high priority.
- Historically archive H_2S gas present alarm.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display H_2S gas PPM.
- Display H_2S gas present alarm.

LOOP 0211, HEADWORKS AREA COMMON ALARM

IPS Functions:

Field Devices and Connections:

- Provide the beacons.
- Provide the horns.
- Receive digital signal to energize the beacons from PLC HW.
- Receive digital signal to energize the horns from PLC HW.

Hard-Wired Interlocks:

- None.

PLC HW Application Software:

Monitor and Control:

- Provide logic which energizes the beacons and horns if any of the following alarms become true:
  - Plant influent channel level alarm high.
  - Fine screen differential level alarm high.
  - Fine screen fail alarm.
  - Grit removal sump pump level alarm high-high.
  - Duress alarm.
  - Fire alarm.
- Provide logic to deenergize the horns upon silence command from the HMI.
- Provide logic to deenergize the beacons if none of the alarms are true and the horns have been silenced.

Software Interlocks:

- LOOP 0101, PLANT INFLUENT LEVEL HIGH.
- LOOP 0104, FINE SCREEN DIFFERENTIAL LEVEL.
- LOOP 0105, FINE SCREEN.

- LOOP 0208, GRIT REMOVAL SUMP PUMP.
- LOOP 1908, PERSONNEL DURESS.
- LOOP 1909, ADMINISTRATION BUILDING FIRE ALARM PANEL.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Provide silence command to PLC HW.

Metasys:

- None.

UNIT PROCESS 03, CONTINUOUS LOOP REACTOR

LOOP 0302, CONTINUOUS LOOP REACTOR MIXER

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC RW.
- Provide digital signal for on status to PLC RW.
- Provide digital signal for fail alarm to PLC RW.
- Provide digital signal for moisture alarm to PLC RW.
- Receive digital signal for run control from PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Provide moisture alarm to the HMI.
- Control mode:
  - Manual only.
- Provide manual status to the HMI.

- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - None.

Software Interlocks:

- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Display moisture alarm with low priority.
- Historically archive moisture alarm.
- Control mode:
  - Display manual status.
- Manual control mode
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 0303, CONTINUOUS LOOP REACTOR AERATOR

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC RW.
- Provide digital signal for on status to PLC RW.
- Provide digital signal for fail alarm to PLC RW.
- Receive digital signal for run control from PLC RW.
- Provide analog signal proportional to speed status to PLC RW.
- Receive analog signal proportional to speed control from PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Provide speed status to the HMI.
- Control mode:
  - Manual only.
- Provide manual status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.
- Receive digital signal for emergency power on alarm.
- Provide logic which allows only two aerators to run simultaneously while under emergency power.
- Provide logic to cycle the aerator pair to run for one hour before cycling to the next pair of aerators.
- Provide speed control to the HMI.
- Auto control mode:
  - None.

Software Interlocks:

- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.
- LOOP 1903, RAS/WAS EMERGENCY GENERATOR AND ATS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive the fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Display manual status.
- Manual control mode
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
  - Provide speed command to PLC RW.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.
- Auto control mode:
  - None.

Metasys:

- None.

UNIT PROCESS 04, SECONDARY CLARIFIERS

LOOP 0401, SPLITTER BOX pH

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure pH.
- Indicate pH locally using required engineering units.
- Provide analog signal proportional to pH range to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide pH to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pH.
- Historically archive pH.
- Trend pH.

Metasys:

- None.

LOOP 0402, SECONDARY CLARIFIERS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for torque alarm high to the LCP.
- Provide digital signal for torque alarm high-high to the LCP.
- Latch and provide indicating light for torque alarm high at the LCP.
- Latch and provide indicating light for torque alarm high-high at the LCP.
- Prevent the motor from running on a torque alarm high-high at the LCP.
- Provide On/Off/Remote (OOR) switch at the LCP.
- Provide reset push button to reset the alarms at the LCP.
- Provide digital signal for remote status to PLC RW.
- Provide digital signal for torque alarm high to PLC RW.
- Provide digital signal for torque alarm high-high to PLC RW.
- Provide digital signal for on status to PLC RW.

- Provide digital signal for fail alarm to PLC RW.
- Receive digital signal for run control from PLC RW.

Hard-Wired Interlocks:

- NSHH-0402.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide torque alarm high to the HMI.
- Provide torque alarm high-high to the HMI.
- Provide torque alarm high-high to Common Alarm.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Control mode:
  - Manual only.
- Provide manual status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - None.

Software Interlocks:

- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display torque alarm high with low priority.
- Historically archive torque alarm high.
- Display torque alarm high-high with medium priority.

- Historically archive torque alarm high-high.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Control mode:
  - Display manual status.
- Manual control mode
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 0404, SCUM PUMP

IPS Functions:

Field Devices and Connections:

- Provide float switch to monitor scum pit level low.
- Provide float switch to monitor scum pit level high.
- Provide float switch to monitor scum pit level high-high.
- Provide digital signal for scum pit level low status to the LCP.
- Provide digital signal for scum pit level high status to the LCP.
- Provide digital signal for scum pit level alarm high-high to the LCP.
- Provide indicating light for scum pit level low status at the LCP.
- Provide indicating light for scum pit level high status at the LCP.
- Provide indicating light for scum pit level alarm high-high at the LCP.
- Provide On/Off/Remote (OOR) switch at the LCP.
- Provide digital signal for remote status to PLC RW.
- Provide digital signal for scum pit level low status to PLC RW.
- Provide digital signal for scum pit level high status to PLC RW.
- Provide digital signal for scum pit level alarm high-high to PLC RW.
- Provide digital signal for moisture alarm to PLC RW.
- Provide digital signal for on status to PLC RW.
- Provide digital signal for fail alarm to PLC RW.
- Receive digital signal for run control from PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide scum pit level low status to the HMI.
- Provide scum pit level high status to the HMI.
- Provide scum pit level alarm high-high to the HMI.
- Provide scum pit level alarm high-high to Common Alarm.
- Provide moisture alarm to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Provide logic for start command if scum pit is level high status and Scum Recirculation Valve is auto status and closed status.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from Scum Recirculation Valve logic.
  - Provide logic to deenergize run control upon stop command.

Software Interlocks:

- LOOP 0405, SCUM RECIRCULATION VALVE.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display scum pit level low status.
- Historically archive scum pit level low status.
- Display scum pit level high status.
- Historically archive scum pit level high status.
- Display scum pit level alarm high-high with medium priority.
- Historically archive scum pit level alarm high-high.
- Display moisture alarm with low priority.
- Historically archive moisture alarm.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC RW.
  - Provide manual command to PLC RW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 0405, SCUM RECIRCULATION VALVE

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC RW.
- Provide digital signal for opened status to PLC RW.
- Provide digital signal for closed status to PLC RW.
- Receive digital signal for open control from PLC RW.
- Receive digital signal for close control from PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide opened status to the HMI.
- Provide travel status to the HMI.
- Provide closed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive open command from the HMI.
  - Provide logic to energize open control upon open command.
  - Provide logic to deenergize open control upon opened status.
  - Receive close command from the HMI.
  - Provide logic to energize close control upon close command.
  - Provide logic to deenergize close control upon closed status.
- Auto control mode:
  - Receive open delay time setpoint from the HMI.
  - Provide logic to activate open delay timer if Scum Pump in auto status and on status.
  - Provide logic for open command if Scum Pump in auto status and on status and open delay timer has expired.
  - Provide logic to energize open control upon open command.
  - Provide logic to deenergize open control upon opened status.
  - Provide logic for close command upon Scum Pump in auto status and on status and scum pit low level.
  - Provide logic to energize close control upon close command.
  - Provide logic to deenergize close control upon closed status.
  - Receive close delay time setpoint from the HMI.
  - Provide logic to activate close delay timer if Scum Pump in auto status and on status and valve is closed status.
  - Provide logic for Scum Pump stop command if Scum Pump in auto status and on status and close delay timer has expired.
  - Provide open delay time elapsed to the HMI.
  - Provide close delay time elapsed to the HMI.

Software Interlocks:

- LOOP 0404, SCUM PUMP.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display opened status.
- Historically archive opened status.
- Display travel status.
- Historically archive travel status.
- Display closed status.
- Historically archive closed status.
- Control mode:
  - Provide auto command to PLC RW.
  - Provide manual command to PLC RW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide open command to PLC RW.
  - Provide close command to PLC RW.
- Auto control mode:
  - Provide open delay time setpoint to PLC RW.
  - Provide close delay time setpoint to PLC RW.
- Display open delay time setpoint.
- Historically archive open delay time setpoint.
- Display close delay time setpoint.
- Historically archive close delay time setpoint.
- Display open delay time elapsed.
- Display close delay time elapsed.

Metasys:

- None.

UNIT PROCESS 05, UV DISINFECTION

LOOP 0501, TRANSMITTANCE

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure transmittance.
- Indicate transmittance locally using required engineering units.
- Provide analog signal proportional to transmittance range to PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide transmittance to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display transmittance.
- Historically archive transmittance.
- Trend transmittance.

Metasys:

- None.

LOOP 0503, UV REACTOR ISOLATION VALVE

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC UV.
- Provide digital signal for opened status to PLC UV.
- Provide digital signal for closed status to PLC UV.
- Receive digital signal for open control from PLC UV.
- Receive digital signal for close control from PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide opened status to the HMI.
- Provide travel status to the HMI.
- Provide closed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Lead lag mode:
  - Receive lead command from the HMI.
  - Provide logic which makes this valve lead.
  - Provide logic which makes the other valve lag.
- Provide lead status to the HMI.
- Provide lag status to the HMI.
- Manual control mode:
  - Receive open command from the HMI.
  - Provide logic to energize open control upon open command.
  - Provide logic to deenergize open control upon opened status.
  - Receive close command from the HMI.
  - Provide logic to energize close control upon close command.
  - Provide logic to deenergize close control upon closed status.
- Auto control mode:
  - Provide logic for open command for the lead valve.
  - Provide logic to energize lead valve open control upon lead valve open command.
  - Provide logic to deenergize lead valve open control upon lead valve opened status.
  - Provide logic for close command for the lead valve if UV Disinfection Sump Pump is level alarm high.
  - Provide logic to energize lead valve close control upon lead valve close command.
  - Provide logic to deenergize lead valve close control upon lead valve closed status.
  - Receive final effluent flow high setpoint from the HMI.
  - Provide logic for open command for the lag valve if Final Effluent Flow is at or above final effluent flow high setpoint.
  - Provide logic to energize lag valve open control upon lag valve open command.
  - Provide logic to deenergize lag valve open control upon lag valve opened status.
  - Provide logic for close command for the lag valve if Final Effluent Flow is below final effluent flow high setpoint.
  - Provide logic for close command for the lag valve if UV Disinfection Sump Pump is level alarm high.

- Provide logic to energize lag valve close control upon lag valve close command.
- Provide logic to deenergize lag valve close control upon lag valve closed status.

Software Interlocks:

- LOOP 0504, UV REACTOR FLOW.
- LOOP 0506, UV DISINFECTION SUMP PUMP

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display opened status.
- Historically archive opened status.
- Display travel status.
- Historically archive travel status.
- Display closed status.
- Historically archive closed status.
- Control mode:
  - Provide auto command to PLC UV.
  - Provide manual command to PLC UV.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Lead lag mode:
  - Provide lead command to PLC UV.
- Display lead status.
- Historically archive lead status.
- Display lag status.
- Historically archive lag status.
- Manual control mode
  - Provide open command to PLC UV.
  - Provide close command to PLC UV.
- Auto control mode:
  - Provide final effluent flow high setpoint (3.7MGD) to PLC UV.
- Display final effluent flow high setpoint.
- Historically archive final effluent flow high setpoint.

Metasys:

- None.

LOOP 0504, UV REACTOR FLOW

IPS Functions:

Field Devices and Connections:

- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide flows to the HMI.
- Totalize flows.
- Provide flow totalizers to the HMI.
- Sum the flows for Final Effluent Flow.
- Provide Final Effluent Flow to the HMI.
- Provide Final Effluent Flow to UV Reactor Isolation Valves.
- Provide Final Effluent Flow to Effluent Automatic Sampler.
- Totalize final effluent flow.
- Provide final effluent flow totalizer to the HMI.

Software Interlocks:

- LOOP 0503, UV REACTOR ISOLATION VALVE.
- LOOP 0508, EFFLUENT AUTOMATIC SAMPLER.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flows.
- Historically archive flows.
- Trend flows.
- Display flow totalizers.
- Historically archive flow totalizers.

- Display Final Effluent Flow.
- Historically archive Final Effluent Flow.
- Trend Final Effluent Flow.
- Display final effluent flow totalizer.
- Historically archive final effluent flow totalizer.

Metasys:

- None.

LOOP 0505, UV REACTOR

IPS Functions:

Field Devices and Connections:

- Provide digital signal for temperature OK status to PLC UV.
- Provide digital signal for lamps OK status to PLC UV.
- Provide digital signal for wiper fault alarm to PLC UV.
- Provide digital signal for ground OK status to PLC UV.
- Receive digital signal for run level 1 control from PLC UV.
- Receive digital signal for run level 2 control from PLC UV.
- Receive digital signal for run level 3 control from PLC UV.
- Receive digital signal for immediate wipe control from PLC UV.
- Provide analog signal proportional to UV intensity range to PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide logic to generate temperature alarm high from temperature OK status.
- Provide temperature alarm high to the HMI.
- Provide temperature alarm high to Common Alarm.
- Provide logic to generate lamp alarm from lamps OK status.
- Provide lamp alarm to the HMI.
- Provide lamp alarm to Common Alarm.
- Provide wiper fault alarm to the HMI.
- Provide logic to generate ground fault alarm from ground OK status.
- Provide ground fault alarm to the HMI.
- Provide ground fault alarm to Common Alarm.
- Provide run level 1 control to the HMI.
- Provide run level 2 control to the HMI.
- Provide run level 3 control to the HMI.
- Provide immediate wipe control to the HMI.
- Provide UV intensity to the HMI.
- Provide UV intensity to PLC AB.
- Receive UV intensity alarm low setpoint from the HMI.

- Compare UV intensity with UV intensity alarm low setpoint to generate UV intensity alarm low.
- Provide UV intensity alarm low to the HMI.
- Provide UV intensity alarm low to Common Alarm.
- Receive UV intensity alarm low-low setpoint from the HMI.
- Compare UV intensity with UV intensity alarm low-low setpoint to generate UV intensity alarm low-low.
- Provide UV intensity alarm low-low to the HMI.
- Provide UV intensity alarm low-low to Common Alarm.
- Provide UV intensity alarm low-low to PLC AB.
- Control mode:
  - Manual only.
- Provide manual status to the HMI.
- Manual control mode:
  - Receive run level 1 command from the HMI.
  - Provide logic to energize run level 1 control, deenergize run level 2 control and deenergize run level 3 control upon run level 1 command.
  - Receive run level 2 command from the HMI.
  - Provide logic to energize run level 1 control, energize run level 2 control and deenergize run level 3 control upon run level 2 command.
  - Receive run level 3 command from the HMI.
  - Provide logic to energize run level 1 control, energize run level 2 control and energize run level 3 control upon run level 3 command.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run level 1 control, deenergize run level 2 control and deenergize run level 3 control upon stop command.
  - Receive immediate wipe command from the HMI.
  - Provide logic to energize immediate wipe control upon immediate wipe command and then deenergize immediate wipe control after two seconds.
- Auto control mode:
  - None.
- Provide logic which derives on status from run level 1 control.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.

Software Interlocks:

- LOOP 0507, UV AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide UV intensity to Metasys.
- Provide UV intensity alarm low-low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display temperature alarm high with medium priority.
- Historically archive temperature alarm high.
- Display lamp alarm with medium priority.
- Historically archive lamp alarm.
- Display wiper fault alarm with low priority.
- Historically archive wiper fault alarm.
- Display ground fault alarm with medium priority.
- Historically archive ground fault alarm.
- Display run level 1 control.
- Historically archive run level 1 control.
- Display run level 2 control.
- Historically archive run level 2 control.
- Display run level 3 control.
- Historically archive run level 3 control.
- Display immediate wipe control.
- Display UV intensity.
- Historically archive UV intensity.
- Trend UV intensity.
- Provide UV intensity alarm low setpoint to PLC UV.
- Display UV intensity alarm low setpoint.
- Historically archive UV intensity alarm low setpoint.
- Display UV intensity alarm low with medium priority.
- Historically archive UV intensity alarm low.
- Provide UV intensity alarm low-low setpoint to PLC UV.
- Display UV intensity alarm low-low setpoint.
- Historically archive UV intensity alarm low-low setpoint.
- Display UV intensity alarm low-low with high priority.
- Historically archive UV intensity alarm low-low.
- Manual control mode
  - Provide run level 1 command to PLC UV.
  - Provide run level 2 command to PLC UV.
  - Provide run level 3 command to PLC UV.
  - Provide stop command to PLC UV.
  - Provide immediate wipe command to PLC UV.
- Auto control mode:
  - None.
- Display on status.
- Historically archive on status.
- Display run-time.

Metasys:

- Display UV intensity.
- Display UV intensity alarm low-low.

LOOP 0506, UV DISINFECTION SUMP PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for level alarm high to PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide level alarm high to the HMI.
- Provide level alarm high to Common Alarm.
- Provide level alarm high to PLC AB.
- Provide level alarm high to UV Reactor Isolation Valves.

Software Interlocks:

- LOOP 0503, UV REACTOR ISOLATION VALVE.
- LOOP 0507, UV AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide level alarm high to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level alarm high with high priority.
- Historically archive level alarm high.

Metasys:

- Display level alarm high.

LOOP 0507, UV AREA COMMON ALARM

IPS Functions:

Field Devices and Connections:

- Provide the beacons.
- Provide the horns.
- Receive digital signal to energize the beacons from PLC UV.

- Receive digital signal to energize the horns from PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide logic which energizes the beacons and horns if any of the following alarms become true:
  - UV Reactor temperature alarm high.
  - UV Reactor lamp alarm.
  - UV Reactor ground fault alarm.
  - UV Reactor intensity alarm low.
  - UV Reactor intensity alarm low-low.
  - UV Disinfection Sump Pump level alarm high.
  - Duress alarm.
  - Fire alarm.
- Provide logic to deenergize the horns upon silence command from the HMI.
- Provide logic to deenergize the beacons if none of the alarms are true and the horns have been silenced.

Software Interlocks:

- LOOP 0505, UV REACTOR.
- LOOP 0506, UV DISINFECTION SUMP PUMP.
- LOOP 1908, PERSONNEL DURESS.
- LOOP 1909, ADMINISTRATION BUILDING FIRE ALARM PANEL.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Provide silence command to PLC UV.

Metasys:

- None.

LOOP 0508, EFFLUENT AUTOMATIC SAMPLER

IPS Functions:

Field Devices and Connections:

- Receive analog control signal proportional to Final Effluent Flow from PLC UV.
- Provide digital signal for fail alarm to PLC UV.

Hard-Wired Interlocks:

- None.

PLC UV Application Software:

Monitor and Control:

- Provide analog control signal proportional to Final Effluent Flow.
- Provide fail alarm to the HMI.

Software Interlocks:

- LOOP 0504, UV REACTOR FLOW.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display fail alarm with low priority.
- Historically archive fail alarm.

Metasys:

- None.

UNIT PROCESS 06, RAS/WAS PUMP STATION

LOOP 0601, RAS PUMPS AND RAS FLOW

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC RW.
- Provide digital signal for on status to PLC RW.
- Provide digital signal for fail alarm to PLC RW.
- Receive digital signal for run control from PLC RW.

- Provide analog signal proportional to speed status to PLC RW.
- Receive analog signal proportional to speed control from PLC RW.
- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC RW.
- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide on status to WAS Pumps.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Provide fail alarm to PLC AB.
- Provide speed status to the HMI.
- Provide pressure to the HMI.
- Provide pressure to PLC AB.
- Provide flow to the HMI.
- Provide flow to PLC AB.
- Sum the flows for Total RAS Flow.
- Provide Total RAS Flow to the HMI.
- Totalize Total RAS Flow.
- Provide Total RAS Flow totalizer to the HMI.
- Receive flow alarm low setpoint from the HMI.
- Compare flow with flow alarm low setpoint to generate flow alarm low.
- Provide flow alarm low to the HMI.
- Provide flow alarm low to Common Alarm.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.

- Receive speed command from the HMI.
- Provide logic to route speed command to speed control if on status.
- Receive stop command from the HMI.
- Provide logic to deenergize run control upon stop command.
- Provide logic for 0% speed control if not on status.

- Auto control mode:
  - Receive RAS/WAS Sump Pump level alarm high.
  - Deenergize control logic upon RAS/WAS Sump Pump level alarm high.
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive RAS flow pacing setpoint (50%-100%) from the HMI.
  - Receive Plant Influent Flow.
  - Calculate total RAS flow setpoint as: Plant Influent Flow * RAS flow pacing setpoint.
  - Calculate RAS flow setpoint as: Total RAS Flow setpoint / Number of RAS pumps running.
  - Provide PID logic to modulate speed control to maintain RAS flow at setpoint if on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.
- Provide speed control to the HMI.
- Provide total RAS flow setpoint to the HMI.
- Provide RAS flow setpoint to the HMI.

Software Interlocks:

- LOOP 0102, PLANT INFLUENT FLOW.
- LOOP 0602, WAS PUMPS.
- LOOP 0604, RAS/WAS SUMP PUMP.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide fail alarm to Metasys.
- Provide pressure to Metasys.
- Provide flow to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.

- Historically archive on status.
- Display run-time.
- Display fail alarm with high priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Display pressure.
- Historically archive pressure.
- Trend pressure.
- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.
- Display Total RAS Flow.
- Historically archive Total RAS Flow.
- Trend Total RAS Flow.
- Display Total RAS Flow totalizer.
- Historically archive Total RAS Flow totalizer.
- Provide RAS flow alarm low setpoint to PLC RW.
- Display RAS flow alarm low setpoint.
- Historically archive RAS flow alarm low setpoint.
- Display flow alarm low with medium priority.
- Historically archive flow alarm low.
- Control mode:
  - Provide auto command to PLC RW.
  - Provide manual command to PLC RW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
  - Provide speed command to PLC RW.
- Auto control mode:
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
  - Provide RAS flow pacing setpoint to PLC RW.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.
- Display RAS flow pacing setpoint.
- Historically archive RAS flow pacing setpoint.
- Trend RAS flow pacing setpoint.
- Display total RAS flow setpoint.
- Historically archive total RAS flow setpoint.

- Trend total RAS flow setpoint.
- Display RAS flow setpoint.
- Historically archive RAS flow setpoint.
- Trend RAS flow setpoint.

Metasys:

- Display fail alarm.
- Display pressure.
- Display flow.

LOOP 0602, WAS PUMPS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC RW.
- Provide digital signal for on status to PLC RW.
- Provide digital signal for fail alarm to PLC RW.
- Receive digital signal for run control from PLC RW.
- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Provide pressure to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.

    - Receive stop command from the HMI.
    - Provide logic to deenergize run control upon stop command.
  - Auto control mode:
    - Receive RAS/WAS Sump Pump level alarm high.
    - Deenergize control logic upon RAS/WAS Sump Pump level alarm high.
    - Receive on status from RAS Pumps.
    - Deenergize control logic if no RAS Pumps are on status.
    - Receive WAS Holding Tank level alarm high.
    - Deenergize control logic upon WAS Holding Tank level alarm high.
    - Receive start command from the HMI.
    - Provide logic to energize run control upon start command.
    - Provide logic to seal-in run control with on status.
    - Receive WAS to be pumped setpoint from the HMI.
    - Receive WAS Flow.
    - Provide logic to totalize WAS pumped.
    - Provide logic for stop command when WAS pumped is at or greater than WAS to be pumped setpoint.
    - Receive stop command from the HMI.
    - Provide logic to deenergize run control upon stop command.
  - Provide WAS pumped to the HMI.

  Software Interlocks:

  - LOOP 0601, RAS PUMPS AND RAS FLOW.
  - LOOP 0603, WAS FLOW.
  - LOOP 0604, RAS/WAS SUMP PUMP
  - LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.
  - LOOP 0701, WAS HOLDING TANK LEVEL.

PLC AB Application Software:

  Monitor and Control:

  - None.

  Software Interlocks:

  - None.

HMI Application Software:

  HMI:

  - Display remote status.
  - Historically archive remote status.
  - Display on status.
  - Historically archive on status.
  - Display run-time.
  - Display fail alarm with medium priority.
  - Historically archive fail alarm.

- Control mode:
  - Provide auto command to PLC RW.
  - Provide manual command to PLC RW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC RW.
  - Provide stop command to PLC RW.
- Auto control mode:
  - Provide start command to PLC RW.
  - Provide WAS to be pumped setpoint to PLC RW.
  - Provide stop command to PLC RW.
- Display WAS to be pumped setpoint.
- Historically archive WAS to be pumped setpoint.
- Receive WAS pumped from the PLC.
- Display WAS pumped.
- Historically archive WAS pumped.
- Trend WAS pumped.

Metasys:

- None.

LOOP 0603, WAS FLOW

IPS Functions:

Field Devices and Connections:

- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide flow to the WAS Pumps.
- Provide flow to the HMI.
- Totalize flow.
- Provide flow totalizer to the HMI.
- Receive flow alarm low setpoint from the HMI.
- Compare flow with flow alarm low setpoint to generate flow alarm low.
- Provide flow alarm low to the HMI.
- Provide flow alarm low to Common Alarm.

Software Interlocks:

- LOOP 0602, WAS PUMPS.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.
- Provide flow alarm low setpoint to PLC RW
- Display flow alarm low setpoint.
- Historically archive flow alarm low setpoint.
- Display flow alarm low with medium priority.
- Historically archive flow alarm low.

Metasys:

- None.

LOOP 0604, RAS/WAS SUMP PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for level alarm high to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide level alarm high to the HMI.
- Provide level alarm high to Common Alarm.
- Provide level alarm high to PLC AB.
- Provide level alarm high to RAS Pumps.
- Provide level alarm high to WAS Pumps.

Software Interlocks:

- LOOP 0601, RAS PUMPS AND RAS FLOW.
- LOOP 0602, WAS PUMPS.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- Provide level alarm high to Metasys..

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level alarm high with high priority.
- Historically archive level alarm high.

Metasys:

- Display level alarm high.

LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM

IPS Functions:

Field Devices and Connections:

- Provide the beacons.
- Provide the horns.
- Receive digital signal to energize the beacons from PLC RW.
- Receive digital signal to energize the horns from PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide logic which energizes the beacons and horns if any of the following alarms become true:
  - Continuous Loop Reactor Mixer fail alarm.
  - Continuous Loop Reactor Aerator fail alarm.
  - Secondary Clarifier torque alarm high-high.
  - Secondary Clarifier fail alarm.
  - Scum Pit level alarm high-high.
  - Scum Pump fail alarm.
  - RAS Pump fail alarm.
  - RAS flow alarm low.

- WAS Pump fail alarm.
- WAS flow alarm low.
- RAS/WAS Sump Pump level alarm high.
- RAS/WAS emergency Generator fail alarm.
- RAS/WAS emergency power on alarm.
- Duress alarm.
- Fire alarm.

- Provide logic to deenergize the horns upon silence command from the HMI.
- Provide logic to deenergize the beacons if none of the alarms are true and the horns have been silenced.

Software Interlocks:

- LOOP 0302, CONTINUOUS LOOP REACTOR MIXER.
- LOOP 0303, CONTINUOUS LOOP REACTOR AERATOR.
- LOOP 0402, SECONDARY CLARIFIERS.
- LOOP 0404, SCUM PUMP.
- LOOP 0601, RAS PUMPS AND RAS FLOW.
- LOOP 0602, WAS PUMPS.
- LOOP 0603, WAS FLOW.
- LOOP 0604, RAS/WAS SUMP PUMP.
- LOOP 1903, RAS/WAS EMERGENCY GENERATOR AND ATS.
- LOOP 1908, PERSONNEL DURESS.
- LOOP 1909, ADMINISTRATION BUILDING FIRE ALARM PANEL.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Provide silence command to PLC RW.

Metasys:

- None.

LOOP 0606, RAS/WAS PUMP STATION AIR MONITORING

IPS Functions:

Field Devices and Connections:

- Provide digital signal for supply air flow alarm low to the LCP.
- Provide digital signal for exhaust air flow alarm low to the LCP.

- Provide digital signals to energize the beacons from the LCP upon either alarm.
- Provide digital signals to energize the horns from the LCP upon either alarm.
- Provide test push button to energize the beacons and horns at the LCP.
- Provide silence push button to silence the horns at the LCP.
- Provide digital signal for air flow OK status to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display air flow alarm low.

UNIT PROCESS 07, WAS HOLDING TANK

LOOP 0701, WAS HOLDING TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level to the HMI.
- Receive WAS Holding Tank level alarm high setpoint.
- Compare level with WAS Holding Tank level alarm high setpoint to generate WAS Holding Tank level alarm high.
- Provide WAS Holding Tank level alarm high to WAS Pumps.
- Provide WAS Holding Tank level alarm high to the HMI.
- Provide WAS Holding Tank level alarm high to Common Alarm.
- Receive WAS Holding Tank level alarm low setpoint.
- Compare level with WAS Holding Tank level alarm low setpoint to generate WAS Holding Tank level alarm low.
- Provide WAS Holding Tank level alarm low to GBT Feed Pumps.
- Provide WAS Holding Tank level alarm low to the HMI.
- Provide WAS Holding Tank level alarm low to Common Alarm.

Software Interlocks:

- LOOP 0602, WAS PUMPS.
- LOOP 0702, GBT FEED PUMPS.
- LOOP 1203, DEWATERING AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Provide WAS Holding Tank level alarm high setpoint to PLC DW.
- Display WAS Holding Tank level alarm high setpoint.
- Historically archive WAS Holding Tank level alarm high setpoint.
- Display WAS Holding Tank level alarm high with medium priority.
- Historically archive WAS Holding Tank level alarm high.
- Provide WAS Holding Tank level alarm low setpoint to PLC DW.
- Display WAS Holding Tank level alarm low setpoint.
- Historically archive WAS Holding Tank level alarm low setpoint.
- Display WAS Holding Tank level alarm low with medium priority.
- Historically archive WAS Holding Tank level alarm low.

Metasys:

- None.

LOOP 0702, GBT FEED PUMPS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.

    - Provide logic to deactivate auto mode and activate manual mode upon manual command.
  - Provide manual status to the HMI.
  - Provide auto status to the HMI.
  - Manual control mode:
    - Receive start command from the HMI.
    - Provide logic to energize run control upon start command.
    - Provide logic to seal-in run control with on status.
    - Receive speed command from the HMI.
    - Provide logic to route speed command to speed control if on status.
    - Receive stop command from the HMI.
    - Provide logic to deenergize run control upon stop command.
    - Provide logic for 0% speed control if not on status.
  - Auto control mode:
    - Receive WAS Holding Tank level alarm low.
    - Deenergize control logic upon WAS Holding Tank level alarm low.
    - Receive Gravity Belt Thickener on status.
    - Deenergize control logic if Gravity Belt Thickener is not on status.
    - Receive group-start command from Gravity Belt Thickener logic.
    - Provide logic to energize run control upon group-start command.
    - Provide logic to seal-in run control with on status.
    - Receive GBT feed flow setpoint from the HMI.
    - Receive GBT Feed Flow.
    - Provide PID logic to modulate speed control to maintain GBT Feed flow at setpoint if on status.
    - Receive group-stop command from Gravity Belt Thickener logic.
    - Provide logic to deenergize run control upon group-stop command.
    - Provide logic for 0% speed control if not on status.
  - Provide speed control to the HMI.

  Software Interlocks:

  - LOOP 0701, WAS HOLDING TANK LEVEL.
  - LOOP 0802, GBT FEED FLOW.
  - LOOP 0807, GRAVITY BELT THICKENER.

PLC AB Application Software:

  Monitor and Control:

  - None.

  Software Interlocks:

  - None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide speed command to PLC DW.
  - Provide stop command to PLC DW.
- Display speed command.
- Historically archive speed command.
- Auto control mode:
  - Provide GBT Feed flow setpoint to PLC DW.
- Display GBT Feed flow setpoint.
- Historically archive GBT Feed flow setpoint.
- Display speed control.
- Historically archive speed control.
- Trend speed control.

Metasys:

- None.

UNIT PROCESS 08, GRAVITY BELT THICKENER

LOOP 0801, GBT POLYMER FLOW

IPS Functions:

Field Devices and Connections:

- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide flow to the HMI.
- Totalize flow.
- Provide flow totalizer to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.

Metasys:

- None.

LOOP 0802, GBT FEED FLOW

IPS Functions:

Field Devices and Connections:

- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide flow to the HMI.
- Provide flow to GBT Feed Pumps.

- Provide flow to Polymer Blending Units.
- Totalize flow.
- Provide flow totalizer to the HMI.

Software Interlocks:

- LOOP 0702, GBT FEED PUMPS.
- LOOP 1801, POLYMER BLENDING UNITS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.

Metasys:

- None.

LOOP 0803, GBT INLINE MIXER INLET PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 0805, GBT INLINE MIXER OUTLET PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 0806, GBT WASHWATER SUPPLY VALVE

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Receive digital signal for open control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide open control to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive open command from the HMI.
  - Provide logic to energize open control upon open command.
  - Receive close command from the HMI.
  - Provide logic to deenergize open control upon close command.
- Auto control mode:
  - Receive Gravity Belt Thickener on status.
  - Provide logic to energize open control if Gravity Belt Thickener is on status.
  - Provide logic to deenergize open control if Gravity Belt Thickener is not on status after a ten-second delay.

Software Interlocks:

- LOOP 0807, GRAVITY BELT THICKENER.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display open control.
- Historically archive open control.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide open command to PLC DW.
  - Provide close command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 0807, GRAVITY BELT THICKENER

IPS Functions:

Field Devices and Connections:

- Provide digital signal for water pressure OK status to PLC DW.
- Provide digital signal for air pressure OK status to PLC DW.
- Provide digital signal for tracking OK status to PLC DW.
- Provide digital signal for E-stop OK status to PLC DW.
- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide logic to generate water pressure alarm low from water pressure OK status.
- Provide water pressure alarm low to the HMI.
- Provide logic to generate air pressure alarm low from water pressure OK status.
- Provide air pressure alarm low to the HMI.
- Provide logic to generate tracking alarm from tracking OK status.
- Provide tracking alarm to the HMI.
- Provide logic to generate E-stop alarm from E-stop OK status.
- Provide E-stop alarm to the HMI.
- Provide remote status to the HMI.
- Provide on status to GBT Feed Pumps.
- Provide on status to GBT Washwater Supply Valve.
- Provide on status to Washwater Booster Pumps.
- Provide on status to Polymer Blending Units.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.
- Auto control mode:
  - Receive TWAS Hopper level alarm high-high.
  - Deenergize control logic upon TWAS Hopper level alarm high-high.
  - Receive group-start command from the HMI.
  - Provide logic which generates a group-start command to Gravity Belt Thickener, GBT Feed Pumps, Polymer Blending Units and Washwater Booster Pumps upon group-start command from the HMI.
  - Provide logic to energize run control upon group-start command.

- Provide logic to seal-in run control with on status.
- Receive Percent Speed at 100% GBT Feed Flow setpoint (50%-150%) from the HMI.
- Receive GBT Feed Flow.
- Provide logic to calculate speed setpoint: (GBT Feed Flow * Percent Speed at 100% GBT Feed Flow setpoint)/(100% GBT Feed Flow).
- Provide PID logic to modulate speed control to maintain speed status at setpoint if on status.
- Receive group-stop command from the HMI.
- Provide logic which generates a group-stop command to Gravity Belt Thickener, GBT Feed Pumps, Polymer Blending Units and Washwater Booster Pumps upon group-stop command from the HMI.
- Provide logic to deenergize run control upon group-stop command.
- Provide logic for 0% speed control if not on status.

- Provide speed control to the HMI.

Software Interlocks:

- LOOP 0702, GBT FEED PUMPS.
- LOOP 0802, GBT FEED FLOW.
- LOOP 0806, GBT WASHWATER SUPPLY VALVE.
- LOOP 0808, TWAS PUMP AND HOPPER LEVEL.
- LOOP 1401, WASHWATER BOOSTER PUMPS.
- LOOP 1801, POLYMER BLENDING UNITS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display water pressure alarm low with low priority.
- Historically archive water pressure alarm low.
- Display air pressure alarm low with low priority.
- Historically archive air pressure alarm low.
- Display tracking alarm with low priority.
- Historically archive tracking alarm.
- Display E-stop alarm with low priority.
- Historically archive E-stop alarm.
- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.

- Display fail alarm with low priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide speed command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide group-start command to PLC DW.
  - Provide Percent Speed at 100% GBT Feed Flow setpoint to PLC DW.
  - Provide group-stop command to PLC DW.
- Display Percent Speed at 100% GBT Feed Flow setpoint.
- Historically archive Percent Speed at 100% GBT Feed Flow setpoint.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.

Metasys:

- None.

LOOP 0808, TWAS PUMP AND HOPPER LEVEL

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.
- Provide ultrasonic instrument to measure hopper level.
- Indicate hopper level locally using required engineering units.
- Provide analog signal proportional to hopper level range to PLC DW.
- Provide digital signal for flow alarm low to PLC DW.
- Provide annular seal and instrument to measure pump discharge pressure.
- Indicate pump discharge pressure locally.

- Provide pressure switch for pump discharge pressure alarm high.
- Provide digital signal for pump discharge pressure alarm high to PLC DW.

Hard-Wired Interlocks:

- FSL-0808.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Deenergize control logic upon flow alarm low.
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.
- Auto control mode:
  - Deenergize control logic upon flow alarm low.
  - Receive hopper level high setpoint from the HMI.
  - Provide logic for start command if TWAS Hopper level meets or exceeds hopper level high setpoint.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive hopper level low setpoint from the HMI.
  - Provide logic to modulate speed control proportionally to hopper level, 100% speed at hopper level high setpoint, 50% speed at hopper level low setpoint.
  - Provide logic for stop command if hopper level meets or goes below hopper level low setpoint.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.

- Provide speed control to the HMI.
- Provide hopper level to the HMI.
- Receive hopper level alarm high-high setpoint from the HMI.
- Compare hopper level with hopper level alarm high-high setpoint to generate hopper level alarm high-high.
- Provide hopper level alarm high-high to Gravity Belt Thickener.
- Provide hopper level alarm high-high to the HMI.
- Provide flow alarm low to the HMI.
- Provide pump discharge pressure alarm high to the HMI.

Software Interlocks:

- LOOP 0807, GRAVITY BELT THICKENER.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
  - Provide speed command to PLC DW.
- Auto control mode:
  - Provide hopper level high setpoint to PLC DW.
  - Provide hopper level low setpoint to PLC DW.
- Provide hopper level alarm high-high setpoint to PLC DW.

- Display hopper level alarm high-high setpoint.
- Historically archive hopper level alarm high-high setpoint.
- Display hopper level alarm high-high with low priority.
- Historically archive hopper level alarm high-high.
- Display hopper level high setpoint.
- Historically archive hopper level high setpoint.
- Display hopper level low setpoint.
- Historically archive hopper level low setpoint.
- Display hopper level.
- Historically archive hopper level.
- Trend hopper level.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.
- Display flow alarm low with low priority.
- Historically archive flow alarm low.
- Display pump discharge pressure alarm high with low priority.
- Historically archive pump discharge pressure alarm high.

Metasys:

- None.

LOOP 0809, TWAS PUMP DISCHARGE PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 0810, TWAS DENSITY

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure density.
- Indicate density locally using required engineering units.
- Provide analog signal proportional to density range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide density to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display density.
- Historically archive density.
- Trend density.

Metasys:

- None.

UNIT PROCESS 09, AEROBIC DIGESTERS

LOOP 0901, AEROBIC DIGESTER NO. 1 DO, pH AND TEMPERATURE

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure dissolved oxygen.
- Indicate dissolved oxygen locally using required engineering units.
- Provide analog signal proportional to dissolved oxygen range to PLC DW.
- Provide instrument to measure pH.
- Indicate pH locally using required engineering units.
- Provide analog signal proportional to pH range to PLC DW.
- Provide instrument to measure temperature.
- Indicate temperature locally using required engineering units.
- Provide analog signal proportional to temperature range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide dissolved oxygen to the HMI.
- Provide pH to the HMI.
- Provide temperature to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display dissolved oxygen.
- Historically archive dissolved oxygen.
- Trend dissolved oxygen.

- Display pH.
- Historically archive pH.
- Trend pH.
- Display temperature.
- Historically archive temperature.
- Trend temperature.

Metasys:

- None.

LOOP 0902, AEROBIC DIGESTER NO. 2 DO, pH AND TEMPERATURE

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure dissolved oxygen.
- Indicate dissolved oxygen locally using required engineering units.
- Provide analog signal proportional to dissolved oxygen range to PLC DW.
- Provide instrument to measure pH.
- Indicate pH locally using required engineering units.
- Provide analog signal proportional to pH range to PLC DW.
- Provide instrument to measure temperature.
- Indicate temperature locally using required engineering units.
- Provide analog signal proportional to temperature range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide dissolved oxygen to the HMI.
- Provide pH to the HMI.
- Provide temperature to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display dissolved oxygen.
- Historically archive dissolved oxygen.
- Trend dissolved oxygen.
- Display pH.
- Historically archive pH.
- Trend pH.
- Display temperature.
- Historically archive temperature.
- Trend temperature.

Metasys:

- None.

LOOP 0903, AEROBIC DIGESTER NO. 3 DO, pH AND TEMPERATURE

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure dissolved oxygen.
- Indicate dissolved oxygen locally using required engineering units.
- Provide analog signal proportional to dissolved oxygen range to PLC DW.
- Provide instrument to measure pH.
- Indicate pH locally using required engineering units.
- Provide analog signal proportional to pH range to PLC DW.
- Provide instrument to measure temperature.
- Indicate temperature locally using required engineering units.
- Provide analog signal proportional to temperature range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide dissolved oxygen to the HMI.
- Provide pH to the HMI.
- Provide temperature to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display dissolved oxygen.
- Historically archive dissolved oxygen.
- Trend dissolved oxygen.
- Display pH.
- Historically archive pH.
- Trend pH.
- Display temperature.
- Historically archive temperature.
- Trend temperature.

Metasys:

- None.

LOOP 0904, DIGESTED SOLIDS HOLDING TANK LEVEL AND AERATORS

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC DW.
- Provide digital signal for aerator remote status to PLC DW.
- Provide digital signal for aerator on status to PLC DW.
- Provide digital signal for aerator fail alarm to PLC DW.
- Receive digital signal for aerator run control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide aerator remote status to the HMI.
- Provide aerator on status to the HMI.
- Accumulate aerator run-time.
- Provide aerator run-time to the HMI.

- Provide aerator fail alarm to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide aerator manual status to the HMI.
- Provide aerator auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive tank level high 1 setpoint from the HMI.
  - Provide logic for DST Aerator No. 1 start command if tank level meets or exceeds tank level high 1 setpoint.
  - Provide logic to energize DST Aerator No. 1 run control upon DST Aerator No. 1 start command.
  - Provide logic to seal-in DST Aerator No. 1 run control with DST Aerator No. 1 on status.
  - Receive tank level low 1 setpoint from the HMI.
  - Provide logic for DST Aerator No. 1 stop command if tank level meets or goes below tank level low 1 setpoint.
  - Provide logic to deenergize DST Aerator No. 1 run control upon DST Aerator No. 1 stop command.
  - Receive tank level high 2 setpoint from the HMI.
  - Provide logic for DST Aerator No. 2 start command if tank level meets or exceeds tank level high 2 setpoint.
  - Provide logic to energize DST Aerator No. 2 run control upon DST Aerator No. 2 start command.
  - Provide logic to seal-in DST Aerator No. 2 run control with DST Aerator No. 2 on status.
  - Receive tank level low 2 setpoint from the HMI.
  - Provide logic for DST Aerator No. 2 stop command if tank level meets or goes below tank level low 2 setpoint.
  - Provide logic to deenergize DST Aerator No. 2 run control upon DST Aerator No. 2 stop command.
- Receive tank level alarm high-high setpoint from the HMI.
- Compare tank level with tank level alarm high-high setpoint to generate tank level alarm high-high.
- Provide tank level alarm high-high to the HMI.
- Provide tank level alarm high-high to Common Alarm.
- Receive tank level alarm low-low setpoint from the HMI.
- Compare tank level with tank level alarm low-low setpoint to generate tank level alarm low-low.
- Provide tank level alarm low-low to BFP Feed Pumps.
- Provide tank level alarm low-low to the HMI.
- Provide tank level alarm low-low to Common Alarm.

Software Interlocks:

- LOOP 1002, BFP FEED PUMPS.
- LOOP 1203, DEWATERING AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display aerator remote status.
- Historically archive aerator remote status.
- Display aerator on status.
- Historically archive aerator on status.
- Display aerator run-time.
- Display aerator fail alarm with low priority.
- Historically archive aerator fail alarm.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide tank level high 1 setpoint to PLC DW.
  - Provide tank level low 1 setpoint to PLC DW.
  - Provide tank level high 2 setpoint to PLC DW.
  - Provide tank level low 2 setpoint to PLC DW.
- Display tank level high 1 setpoint.
- Historically archive tank level high 1 setpoint.
- Display tank level low 1 setpoint.
- Historically archive tank level low 1 setpoint.
- Display tank level high 2 setpoint.
- Historically archive tank level high 2 setpoint.
- Display tank level low 2 setpoint.
- Historically archive tank level low 2 setpoint.
- Provide tank level alarm high-high setpoint to PLC DW.

- Display tank level alarm high-high setpoint.
- Historically archive tank level alarm high-high setpoint.
- Display tank level alarm high-high with medium priority.
- Historically archive tank level alarm high-high.
- Provide tank level alarm low-low setpoint to PLC DW.
- Display tank level alarm low-low setpoint.
- Historically archive tank level alarm low-low setpoint.
- Display tank level alarm low-low with medium priority.
- Historically archive tank level alarm low-low.

Metasys:

- None.

UNIT PROCESS 10, BFP FEED PUMPS

LOOP 1001, SLUDGE GRINDERS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.

- Receive stop command from the HMI.
- Provide logic to deenergize run control upon stop command.

- Auto control mode:
  - Receive BFP Feed Pump on status.
  - Deenergize control logic if BFP Feed Pump is not on status.
  - Receive group-start command from Belt Filter Press logic.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Receive group-stop command from Belt Filter Press logic.
  - Provide logic to deenergize run control upon group-stop command.

Software Interlocks:

- LOOP 1002, BFP FEED PUMPS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 1002, BFP FEED PUMPS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.
- Provide digital signal for flow alarm low to PLC DW.
- Provide annular seal and instrument to measure pump discharge pressure.
- Indicate pump discharge pressure locally.
- Provide digital signal for pump discharge pressure alarm high to PLC DW.

Hard-Wired Interlocks:

- FSL-1002.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide on status to Sludge Grinders.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Deenergize control logic upon flow alarm low.
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.

- Provide speed control to the HMI.
- Auto control mode:
  - Deenergize control logic upon flow alarm low.
  - Receive Digested Solid Holding Tank level alarm low-low.
  - Deenergize control logic upon Digested Solid Holding Tank level alarm low-low.
  - Receive BFP Feed Pump Sump Pump level alarm high.
  - Deenergize control logic upon BFP Feed Pump Sump Pump level alarm high.
  - Receive Belt Filter Press on status.
  - Deenergize control logic if Belt Filter Press is not on status.
  - Receive group-start command from Belt Filter Press logic.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Receive BFP feed flow setpoint from the HMI.
  - Receive BFP Feed Flow.
  - Provide PID logic to modulate speed control to maintain BFP Feed flow at setpoint if on status.
  - Receive group-stop command from Belt Filter Press logic.
  - Provide logic to deenergize run control upon group-stop command.
  - Provide logic for 0% speed control if not on status.
- Provide speed control to the HMI.
- Provide flow alarm low to the HMI.
- Provide pump discharge pressure alarm high to the HMI.

Software Interlocks:

- LOOP 0904, DIGESTED SOLIDS HOLDING TANK LEVEL AND AERATORS.
- LOOP 1001, SLUDGE GRINDERS.
- LOOP 1003, BFP FEED PUMP SUMP PUMP.
- LOOP 1102, BFP FEED FLOW.
- LOOP 1107, BELT FILTER PRESS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.

- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide speed command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide BFP Feed flow setpoint to PLC DW.
- Display BFP Feed flow setpoint.
- Historically archive BFP Feed flow setpoint.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.
- Display flow alarm low with low priority.
- Historically archive flow alarm low.
- Display pump discharge pressure alarm high with low priority.
- Historically archive pump discharge pressure alarm high.

Metasys:

- None.

LOOP 1003, BFP FEED PUMP SUMP PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for level alarm high to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level alarm high to the HMI.
- Provide level alarm high to BFP Feed Pumps.

Software Interlocks:

- LOOP 1002, BFP FEED PUMPS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level alarm high with low priority.
- Historically archive level alarm high.

Metasys:

- None.

LOOP 1004, BFP FEED PUMP AIR MONITORING

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure combustible gases.
- Indicate combustible gas locally in % LEL.
- Provide analog signal proportional to 0-100% LEL to PLC DW.
- Provide digital signal for combustible gases present alarm (at or above 20% LEL) to the LCP.
- Provide digital signal for supply air flow alarm low to the LCP.
- Provide digital signal for exhaust air flow alarm low to the LCP.
- Provide digital signals to energize the beacons from the LCP upon any alarm.
- Provide digital signals to energize the horns from the LCP upon any alarm.
- Provide test push button to energize the beacons and horns at the LCP.
- Provide silence push button to silence the horns at the LCP.
- Provide digital signal for air flow OK status to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to PLC AB.

- Hard-code combustible gas imminent alarm setpoint at 10% LEL.
- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the HMI.
- Hard-code combustible gas present alarm setpoint at 20% LEL.
- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to PLC AB.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide combustible gas % LEL to Metasys.
- Provide combustible gas present alarm to Metasys.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display air flow alarm low.

UNIT PROCESS 11, BELT FILTER PRESS

LOOP 1101, BFP POLYMER FLOW

IPS Functions:

Field Devices and Connections:

- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide flow to the HMI.
- Totalize flow.
- Provide flow totalizer to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.

Metasys:

- None.

LOOP 1102, BFP FEED FLOW

IPS Functions:

Field Devices and Connections:

- Provide magnetic flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide flow to the HMI.
- Provide flow to BFP Feed Pumps.
- Provide flow to Polymer Blending Units.
- Totalize flow.
- Provide flow totalizer to the HMI.

Software Interlocks:

- LOOP 1002, BFP FEED PUMPS.
- LOOP 1801, POLYMER BLENDING UNITS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow.
- Historically archive flow.
- Trend flow.
- Display flow totalizer.
- Historically archive flow totalizer.

Metasys:

- None.

LOOP 1103, BFP INLINE MIXER INLET PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 1105, BFP INLINE MIXER OUTLET PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide annular seal and instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

LOOP 1106, BFP WASHWATER SUPPLY VALVE

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Receive digital signal for open control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide open control to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.

- Receive manual command from the HMI.
- Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive open command from the HMI.
  - Provide logic to energize open control upon open command.
  - Receive close command from the HMI.
  - Provide logic to deenergize open control upon close command.
- Auto control mode:
  - Receive Belt Filter Press on status.
  - Provide logic to energize open control if Belt Filter Press is on status.
  - Provide logic to deenergize open control if Belt Filter Press is not on status after a ten-second delay.

Software Interlocks:

- LOOP 1107, BELT FILTER PRESS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display open control.
- Historically archive open control.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide open command to PLC DW.
  - Provide close command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 1107, BELT FILTER PRESS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for water pressure OK status to PLC DW.
- Provide digital signal for air pressure OK status to PLC DW.
- Provide digital signal for tracking OK status to PLC DW.
- Provide digital signal for E-stop OK status to PLC DW.
- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide logic to generate water pressure alarm low from water pressure OK status.
- Provide water pressure alarm low to the HMI.
- Provide logic to generate air pressure alarm low from water pressure OK status.
- Provide air pressure alarm low to the HMI.
- Provide logic to generate tracking alarm from tracking OK status.
- Provide tracking alarm to the HMI.
- Provide logic to generate E-stop alarm from E-stop OK status.
- Provide E-stop alarm to the HMI.
- Provide remote status to the HMI.
- Provide on status to BFP Feed Pumps.
- Provide on status to BFP Washwater Supply Valve.
- Provide on status to Washwater Booster Pumps.
- Provide on status to Polymer Blending Units.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.

    - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
    - Receive start command from the HMI.
    - Provide logic to energize run control upon start command.
    - Provide logic to seal-in run control with on status.
    - Receive speed command from the HMI.
    - Provide logic to route speed command to speed control if on status.
    - Receive stop command from the HMI.
    - Provide logic to deenergize run control upon stop command.
    - Provide logic for 0% speed control if not on status.
- Auto control mode:
    - Receive Cake Screw Conveyor No. 1 on status.
    - Deenergize control logic upon Cake Screw Conveyor No. 1 not on status.
    - Receive group-start command from the HMI.
    - Provide logic which generates a group-start command to Cake Screw Conveyor No. 2, Cake Screw Conveyor No. 1, Belt Filter Press, BFP Feed Pumps, Sludge Grinders, Polymer Blending Units and Washwater Booster Pumps upon group-start command from the HMI.
    - Provide logic to energize run control upon group-start command.
    - Provide logic to seal-in run control with on status.
    - Receive Percent Speed at 100% BFP Feed Flow setpoint (50%-150%) from the HMI.
    - Receive BFP Feed Flow.
    - Provide logic to calculate speed setpoint: (BFP Feed Flow * Percent Speed at 100% BFP Feed Flow setpoint)/(100% BFP Feed Flow).
    - Provide PID logic to modulate speed control to maintain speed status at setpoint if on status.
    - Receive group-stop command from the HMI.
    - Provide logic which generates a group-stop command to Cake Screw Conveyor No. 2, Cake Screw Conveyor No. 1, Belt Filter Press, BFP Feed Pumps, Sludge Grinders, Polymer Blending Units and Washwater Booster Pumps upon group-stop command from the HMI.
    - Provide logic to deenergize run control upon group-stop command.
    - Provide logic for 0% speed control if not on status.
- Provide speed control to the HMI.

Software Interlocks:

- LOOP 1001, SLUDGE GRINDERS.
- LOOP 1002, BFP FEED PUMPS.
- LOOP 1102, BFP FEED FLOW.
- LOOP 1106, BFP WASHWATER SUPPLY VALVE.
- LOOP 1201, CAKE SCREW CONVEYOR NO. 1.

- LOOP 1202, CAKE SCREW CONVEYOR NO. 2.
- LOOP 1401, WASHWATER BOOSTER PUMPS.
- LOOP 1801, POLYMER BLENDING UNITS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display water pressure alarm low with low priority.
- Historically archive water pressure alarm low.
- Display air pressure alarm low with low priority.
- Historically archive air pressure alarm low.
- Display tracking alarm with low priority.
- Historically archive tracking alarm.
- Display E-stop alarm with low priority.
- Historically archive E-stop alarm.
- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide speed command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide group-start command to PLC DW.
  - Provide Percent Speed at 100% BFP Feed Flow setpoint to PLC DW.
  - Provide group-stop command to PLC DW.
- Display Percent Speed at 100% BFP Feed Flow setpoint.
- Historically archive Percent Speed at 100% BFP Feed Flow setpoint.

- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.

Metasys:

- None.

UNIT PROCESS 12, CAKE CONVEYING

LOOP 1201, CAKE SCREW CONVEYOR NO. 1

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Provide digital signal for speed OK status to PLC DW.
- Provide digital signal for E-stop OK status to PLC DW.
- Receive digital signal for run control from PLC DW.

Hard-Wired Interlocks:

- HS-1201.
- SS-1201.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to Belt Filter Press.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide logic to generate speed alarm low from speed OK status.
- Provide speed alarm low to the HMI.
- Provide logic to generate E-stop alarm from E-stop OK status.
- Provide E-stop alarm to the HMI.
- Provide E-stop alarm to Common Alarm.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.

- Manual control mode:
  - Deenergize control logic upon E-stop alarm.
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Provide logic to deenergize run control upon speed alarm low after a five second delay.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Deenergize control logic upon E-stop alarm.
  - Receive Cake Screw Conveyor No. 2 on status.
  - Deenergize control logic if Cake Screw Conveyor No. 2 is not on status.
  - Receive group-start command from Belt Filter Press logic.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Provide logic to deenergize run control upon speed alarm low after a five second delay.
  - Receive group-stop command from Belt Filter Press logic.
  - Provide logic to deenergize run control upon group-stop command.

Software Interlocks:

- LOOP 1107, BELT FILTER PRESS.
- LOOP 1202, CAKE SCREW CONVEYOR NO. 2.
- LOOP 1203, DEWATERING AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Display speed alarm low with low priority.
- Historically archive speed alarm low.
- Display E-stop alarm with medium priority.
- Historically archive E-stop alarm.

- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 1202, CAKE SCREW CONVEYOR NO. 2

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Provide digital signal for speed OK status to PLC DW.
- Provide digital signal for E-stop OK status to PLC DW.
- Receive digital signal for run control from PLC DW.

Hard-Wired Interlocks:

- HS-1202.
- SS-1202.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to Cake Screw Conveyor No. 1.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide logic to generate speed alarm low from speed OK status.
- Provide speed alarm low to the HMI.
- Provide logic to generate E-stop alarm from E-stop OK status.
- Provide E-stop alarm to the HMI.
- Provide E-stop alarm to Common Alarm.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.

        - Receive manual command from the HMI.
        - Provide logic to deactivate auto mode and activate manual mode upon manual command.
    - Provide manual status to the HMI.
    - Provide auto status to the HMI.
    - Manual control mode:
        - Deenergize control logic upon E-stop alarm.
        - Receive start command from the HMI.
        - Provide logic to energize run control upon start command.
        - Provide logic to seal-in run control with on status.
        - Provide logic to deenergize run control upon speed alarm low after a five second delay.
        - Receive stop command from the HMI.
        - Provide logic to deenergize run control upon stop command.
    - Auto control mode:
        - Deenergize control logic upon E-stop alarm.
        - Receive group-start command from Belt Filter Press logic.
        - Provide logic to energize run control upon group-start command.
        - Provide logic to seal-in run control with on status.
        - Provide logic to deenergize run control upon speed alarm low after a five second delay.
        - Receive group-stop command from Belt Filter Press logic.
        - Provide logic to deenergize run control upon group-stop command.

    Software Interlocks:

    - LOOP 1201, CAKE SCREW CONVEYOR NO. 1.
    - LOOP 1203, DEWATERING AREA COMMON ALARM.

PLC AB Application Software:

    Monitor and Control:

    - None.

    Software Interlocks:

    - None.

HMI Application Software:

    HMI:

    - Display remote status.
    - Historically archive remote status.
    - Display on status.
    - Historically archive on status.
    - Display run-time.
    - Display fail alarm with low priority.
    - Historically archive fail alarm.
    - Display speed alarm low with low priority.
    - Historically archive speed alarm low.
    - Display E-stop alarm with medium priority.

- Historically archive E-stop alarm.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 1203, DEWATERING AREA COMMON ALARM

IPS Functions:

Field Devices and Connections:

- Provide the beacons.
- Provide the horns.
- Receive digital signal to energize the beacons from PLC DW.
- Receive digital signal to energize the horns from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide logic which energizes the beacons and horns if any of the following alarms become true:
  - WAS Holding Tank level alarm high.
  - WAS Holding Tank level alarm low.
  - Digested Solids Holding Tank level alarm high-high.
  - Digested Solids Holding Tank level alarm low-low.
  - Cake Screw Conveyor No. 1 E-stop alarm.
  - Cake Screw Conveyor No. 2 E-stop alarm.
  - Aeration Blower fail alarm.
  - Plant Drain level alarm high-high.
  - Plant Drain Pump fail alarm.
  - Sodium Hydroxide Storage Tank level alarm low-low.
  - Sodium Hydroxide Storage Tank level alarm high-high.
  - Sodium Hydroxide Day Tank level alarm low-low.
  - Sodium Hydroxide Day Tank level alarm high-high.
  - Sodium Hydroxide Feed Pump fail alarm.
  - Sodium Hydroxide Feed Pump pressure alarm high.

- Dewatering emergency generator fail alarm.
- Dewatering emergency power on alarm.
- Duress alarm.
- Fire alarm.

- Provide logic to deenergize the horns upon silence command from the HMI.
- Provide logic to deenergize the beacons if none of the alarms are true and the horns have been silenced.

Software Interlocks:

- LOOP 0701, WAS HOLDING TANK LEVEL.
- LOOP 0904, DIGESTED SOLIDS HOLDING TANK LEVEL AND AERATORS.
- LOOP 1201, CAKE SCREW CONVEYOR NO. 1.
- LOOP 1202, CAKE SCREW CONVEYOR NO. 2.
- LOOP 1301, AERATION BLOWERS TEMPERATURE, PRESSURE AND FLOW.
- LOOP 1601, PLANT DRAIN LEVEL AND PUMP.
- LOOP 1701, SODIUM HYDROXIDE STORAGE TANK LEVEL.
- LOOP 1706, SODIUM HYDROXIDE DAY TANK LEVEL.
- LOOP 1707, SODIUM HYDROXIDE FEED PUMPS.
- LOOP 1906, DEWATERING EMERGENCY GENERATOR AND ATS.
- LOOP 1908, PERSONNEL DURESS.
- LOOP 1909, ADMINISTRATION BUILDING FIRE ALARM PANEL.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Provide silence command to PLC DW.

Metasys:

- None.

UNIT PROCESS 13, AERATION BLOWERS

LOOP 1301, AERATION BLOWERS TEMPERATURE, PRESSURE AND FLOW

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.

- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.
- Provide instrument to measure temperature.
- Indicate temperature locally using required engineering units.
- Provide analog signal proportional to temperature range to PLC DW.
- Provide instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.
- Provide flowmeter to measure flow.
- Indicate flow locally using required engineering units.
- Provide analog signal proportional to flow range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Provide fail alarm to PLC AB.
- Provide speed status to the HMI.
- Provide temperature to the HMI.
- Provide pressure to the HMI.
- Provide flow to the HMI.
- Provide flow to PLC AB.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI (variable speed only).
  - Provide logic to route speed command to speed control if on status (variable speed only).
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.

- Provide logic for 0% speed control if not on status (variable speed only).
- Auto control mode:
  - Receive temperature alarm high setpoint from HMI.
  - Compare temperature with temperature alarm high setpoint for temperature alarm high.
  - Deenergize control logic if temperature alarm high is sustained for thirty seconds.
  - Receive pressure alarm high setpoint from HMI.
  - Compare pressure with pressure alarm high setpoint for pressure alarm high.
  - Deenergize control logic if pressure alarm high is sustained for thirty seconds
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI (variable speed only).
  - Provide logic to route speed command to speed control if on status (variable speed only).
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status (variable speed only).
- Provide temperature alarm high to the HMI.
- Provide pressure alarm high to the HMI.
- Provide speed control to the HMI.
- Receive digital signal for emergency power on alarm.
- Provide logic which allows only one large and one small aeration blower to run simultaneously while under emergency power.
- Provide logic to cycle the aeration blowers to run for one hour before cycling to the next pair of aeration blowers.

Software Interlocks:

- LOOP 1203, DEWATERING AREA COMMON ALARM.
- LOOP 1906, DEWATERING EMERGENCY GENERATOR AND ATS.

PLC AB Application Software:

Monitor and Control:

- Provide fail alarm to Metasys.
- Provide flow to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.

- Historically archive on status.
- Display run-time.
- Display fail alarm with high priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Display temperature.
- Historically archive temperature.
- Trend temperature.
- Display pressure.
- Historically archive pressure.
- Trend pressure.
- Display flow.
- Historically archive flow.
- Trend flow.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide speed command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide temperature alarm high setpoint to PLC DW.
  - Provide pressure alarm high setpoint to PLC DW.
  - Provide start command to PLC DW.
  - Provide speed setpoint to PLC DW.
  - Provide stop command to PLC DW.
  - Temperature and pressure setpoints.
- Display temperature alarm high setpoint.
- Historically archive temperature alarm high setpoint.
- Display temperature high alarm.
- Historically archive temperature high alarm.
- Display pressure alarm high setpoint.
- Historically archive pressure alarm high setpoint.
- Display pressure alarm high.
- Historically archive pressure alarm high.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.

Metasys:

- Display fail alarm.
- Display flow.

LOOP 1302, AERATION BLOWER INLET FILTER DIFFERENTIAL PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide digital signal for media out alarm to PLC DW.
- Provide instrument to measure differential pressure.
- Indicate differential pressure locally using required engineering units.
- Provide analog signal proportional to differential pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide media out alarm to the HMI.
- Provide differential pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display media out alarm with low priority.
- Historically archive media out alarm.
- Display differential pressure.
- Historically archive differential pressure.

Metasys:

- None.

UNIT PROCESS 14, WASHWATER BOOSTER PUMPS

LOOP 1401, WASHWATER BOOSTER PUMPS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode (Washwater Booster Pump No. 1 or 2):
  - Receive Gravity Belt Thickener on status.
  - Deenergize control logic if Gravity Belt Thickener is not on status.
  - Receive group-start command from Gravity Belt Thickener logic.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Receive group-stop command from Gravity Belt Thickener logic.
  - Provide logic to deenergize run control upon group-stop command.
- Auto control mode (Washwater Booster Pump No. 2 or 3):
  - Receive Belt Filter Press on status.

- Deenergize control logic if Belt Filter Press is not on status.
- Receive group-start command from Belt Filter Press logic.
- Provide logic to energize run control upon group-start command.
- Provide logic to seal-in run control with on status.
- Receive group-stop command from Belt Filter Press logic.
- Provide logic to deenergize run control upon group-stop command.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 1402, WASHWATER PRESSURES

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.

Metasys:

- None.

UNIT PROCESS 15, COMPRESSED AIR

LOOP 1501, AIR COMPRESSORS

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure pressure.
- Indicate pressure locally using required engineering units.
- Provide analog signal proportional to pressure range to PLC DW.

- Provide instrument to monitor pressure.
- Provide digital signal for pressure alarm low to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide pressure to the HMI.
- Provide pressure alarm low to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Display pressure alarm low with low priority.
- Historically archive pressure alarm low.

Metasys:

- None.

UN IT PROCESS 16, PLANT DRAIN PUMP STATION

LOOP 1601, PLANT DRAIN LEVEL AND PUMP

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC DW.
- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for moisture alarm to PLC DW.

- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level to the HMI.
- Receive level alarm high-high setpoint from the HMI.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Common Alarm.
- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide moisture alarm to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive level high setpoint from the HMI.
  - Provide logic for start command if level meets or exceeds level high setpoint.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive level low setpoint from the HMI.
  - Provide logic for stop command if level meets or goes below level low setpoint.
  - Provide logic to deenergize run control upon stop command.

Software Interlocks:

- LOOP 1203, DEWATERING AREA COMMON ALARM.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Provide level alarm high-high setpoint to PLC DW.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.
- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display moisture alarm with low priority.
- Historically archive moisture alarm.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide level high setpoint to PLC DW.
  - Provide level low setpoint to PLC DW.
- Display level high setpoint.
- Historically archive level high setpoint.
- Display level low setpoint.
- Historically archive level low setpoint.

Metasys:

- None.

UNIT PROCESS 17, SODIUM HYDROXIDE STORAGE AND FEED

LOOP 1701, SODIUM HYDROXIDE STORAGE TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC DW.
- Receive analog signal proportional to level range at the LCP.
- Indicate level at the LCP using required engineering units.
- Receive digital signal for level alarm high at the LCP.
- Provide horn for level alarm high at the LCP.
- Provide silence pushbutton at the LCP.
- Provide digital signal for silence to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level to the HMI.
- Receive level alarm low-low setpoint from the HMI.
- Receive level alarm low setpoint from the HMI.
- Receive level alarm high setpoint from the HMI.
- Receive level alarm high-high setpoint from the HMI.
- Provide logic which compares level with level alarm low-low setpoint to generate level alarm low-low.
- Provide logic which compares level with level alarm low setpoint to generate level alarm low.
- Provide logic which compares level with level alarm high setpoint to generate level alarm high.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm low-low to Sodium Hydroxide Transfer Pumps.
- Provide level alarm low-low to the HMI.
- Provide level alarm low-low to Common Alarm.
- Provide level alarm low to the HMI.
- Provide level alarm high to the HMI.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Common Alarm.
- Receive silence from the LCP.
- Provide logic which energizes the horn at the LCP upon level alarm high and deenergizes the horn at the LCP upon silence.

Software Interlocks:

- LOOP 1203, DEWATERING AREA COMMON ALARM.
- LOOP 1702, SODIUM HYDROXIDE TRANSFER PUMPS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Provide level alarm low-low setpoint to PLC DW.
- Historically archive level alarm low-low setpoint.
- Provide level alarm low setpoint to PLC DW.
- Historically archive level alarm low setpoint.
- Provide level alarm high setpoint to PLC DW.
- Historically archive level alarm high setpoint.
- Provide level alarm high-high setpoint to PLC DW.
- Historically archive level alarm high-high setpoint.
- Display level alarm low-low with medium priority.
- Historically archive level alarm low-low.
- Display level alarm low with low priority.
- Historically archive level alarm low.
- Display level alarm high with low priority.
- Historically archive level alarm high.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.

Metasys:

- None.

LOOP 1702, SODIUM HYDROXIDE TRANSFER PUMPS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive level alarm low-low from Sodium Hydroxide Storage Tank.
  - Deenergize control logic upon Sodium Hydroxide Storage Tank level alarm low-low.
  - Receive level alarm low from Sodium Hydroxide Day Tank.
  - Provide logic for start command upon Sodium Hydroxide Day Tank level alarm low.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive level alarm high from Sodium Hydroxide Day Tank.
  - Provide logic for stop command upon Sodium Hydroxide Day Tank level alarm high.
  - Provide logic to deenergize run control upon stop command.

Software Interlocks:

- LOOP 1701, SODIUM HYDROXIDE STORAGE TANK LEVEL
- LOOP 1706, SODIUM HYDROXIDE DAY TANK LEVEL.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - None.

Metasys:

- None.

LOOP 1706, SODIUM HYDROXIDE DAY TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level to the HMI.
- Receive level alarm low-low setpoint from the HMI.
- Receive level alarm low setpoint from the HMI.
- Receive level alarm high setpoint from the HMI.
- Receive level alarm high-high setpoint from the HMI.
- Provide logic which compares level with level alarm low-low setpoint to generate level alarm low-low.

- Provide logic which compares level with level alarm low setpoint to generate level alarm low.
- Provide logic which compares level with level alarm high setpoint to generate level alarm high.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm low-low to Sodium Hydroxide Feed Pumps.
- Provide level alarm low-low to the HMI.
- Provide level alarm low-low to Common Alarm.
- Provide level alarm low to Sodium Hydroxide Transfer Pumps.
- Provide level alarm low to the HMI.
- Provide level alarm high to Sodium Hydroxide Transfer Pumps.
- Provide level alarm high to the HMI.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Common Alarm.

Software Interlocks:

- LOOP 1203, DEWATERING AREA COMMON ALARM.
- LOOP 1702, SODIUM HYDROXIDE TRANSFER PUMPS.
- LOOP 1707, SODIUM HYDROXIDE FEED PUMPS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Provide level alarm low-low setpoint to PLC DW.
- Historically archive level alarm low-low setpoint.
- Provide level alarm low setpoint to PLC DW.
- Historically archive level alarm low setpoint.
- Provide level alarm high setpoint to PLC DW.
- Historically archive level alarm high setpoint.
- Provide level alarm high-high setpoint to PLC DW.
- Historically archive level alarm high-high setpoint.
- Display level alarm low-low with medium priority.
- Historically archive level alarm low-low.
- Display level alarm low with low priority.
- Historically archive level alarm low.
- Display level alarm high with low priority.

- Historically archive level alarm high.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.

Metasys:

- None.

LOOP 1707, SODIUM HYDROXIDE FEED PUMPS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.
- Provide digital signal for pressure alarm high to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide fail alarm to Common Alarm.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the HMI.

    - Provide logic to deenergize run control upon stop command.
    - Provide logic for 0% speed control if not on status.
  - Auto control mode:
    - Receive level alarm low-low from Sodium Hydroxide Day Tank.
    - Deenergize control logic upon Sodium Hydroxide Day Tank level alarm low-low.
    - Receive Plant Influent Flow low setpoint from the HMI.
    - Receive Plant Influent Flow (MGD).
    - Provide logic for start command if Plant Influent Flow meets or exceeds Plant Influent Flow low setpoint for one minute.
    - Provide logic to energize run control upon start command.
    - Provide logic to seal-in run control with on status.
    - Receive chemical dosing setpoint (mg/L) from the HMI.
    - Provide logic to calculate feed rate: 0.55 * dosing setpoint * Plant Influent Flow (MGD).
    - Receive pump capacity at 100% speed setpoint (gal/hour) from the HMI.
    - Provide logic to calculate speed command: (feed rate * 100%) / (pump capacity at 100% speed setpoint).
    - Provide logic to route speed command to speed control if on status.
    - Provide logic for stop command if Plant Influent Flow meets or goes below Plant Influent Flow low setpoint for one minute.
    - Provide logic to deenergize run control upon stop command.
    - Provide logic for 0% speed control if not on status.
  - Provide calculated feed rate to the HMI.
  - Provide speed control to the HMI.
  - Provide pressure alarm high to the HMI.
  - Provide pressure alarm high to Common Alarm.

  Software Interlocks:

  - LOOP 0102, PLANT INFLUENT FLOW.
  - LOOP 1203, DEWATERING AREA COMMON ALARM.
  - LOOP 1706, SODIUM HYDROXIDE DAY TANK LEVEL.

PLC AB Application Software:

  Monitor and Control:

  - None.

  Software Interlocks:

  - None.

HMI Application Software:

  HMI:

  - Display remote status.
  - Historically archive remote status.
  - Display on status.
  - Historically archive on status.

- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to PLC DW.
  - Provide manual command to PLC DW.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to PLC DW.
  - Provide speed command to PLC DW.
  - Provide stop command to PLC DW.
- Auto control mode:
  - Provide Plant Influent Flow low setpoint to PLC DW.
  - Provide chemical dosing setpoint to PLC DW.
  - Provide pump capacity at 100% speed setpoint to PLC DW.
- Display Plant Influent Flow low setpoint.
- Historically archive Plant Influent Flow low setpoint.
- Display chemical dosing setpoint.
- Historically archive chemical dosing setpoint.
- Display pump capacity at 100% speed setpoint.
- Historically archive pump capacity at 100% speed setpoint.
- Display calculated feed rate.
- Historically archive calculated feed rate.
- Display speed command.
- Historically archive speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.
- Display pressure alarm high with medium priority.
- Historically archive pressure alarm high.

Metasys:

- None.

LOOP 1709, SODIUM HYDROXIDE CONTAINMENT LEVEL ALARM HIGH

IPS Functions:

Field Devices and Connections:

- Provide float switch to monitor level.
- Provide digital signal for level alarm high to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide level alarm high to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level alarm high with low priority
- Historically archive level alarm high.

Metasys:

- None.

UNIT PROCESS 18, POLYMER STORAGE AND FEED

LOOP 1801, POLYMER BLENDING UNITS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC DW.
- Provide digital signal for on status to PLC DW.
- Provide digital signal for fail alarm to PLC DW.
- Receive digital signal for run control from PLC DW.
- Provide analog signal proportional to speed status to PLC DW.
- Receive analog signal proportional to speed control from PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.

- Accumulate run-time.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Control mode:
  - Receive auto command from the HMI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the HMI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Manual control mode:
  - Receive start command from the HMI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the HMI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the HMI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.
- Auto control mode (Polymer Blending Unit No. 1 or 2):
  - Receive Gravity Belt Thickener on status.
  - Deenergize control logic if Gravity Belt Thickener is not on status.
  - Receive group-start command from Gravity Belt Thickener logic.
  - Provide logic to energize run control upon group-start command.
  - Provide logic to seal-in run control with on status.
  - Receive pump capacity at 100% speed setpoint (gal/hour) from the HMI.
  - Receive chemical concentration setpoint (%) from the HMI.
  - Receive chemical density setpoint (lbs/gal) from the HMI.
  - Receive chemical dosing setpoint (mg/L) from the HMI.
  - Receive GBT Feed Flow.
  - Provide logic to calculate feed rate: (8.34 * GBT Feed Flow (MGD) * dosing setpoint) / (concentration setpoint * density setpoint * 24).
  - Provide logic to calculate speed command: (feed rate * 100%) / (pump capacity at 100% speed setpoint).
  - Provide logic to route speed command to speed control if on status.
  - Receive group-stop command from Gravity Belt Thickener logic.
  - Provide logic to deenergize run control upon group-stop command.
  - Provide logic for 0% speed control if not on status.
- Auto control mode (Polymer Blending Unit No. 2 or 3):
  - Receive Belt Filter Press on status.
  - Deenergize control logic if Belt Filter Press is not on status.
  - Receive group-start command from Belt Filter Press logic.
  - Provide logic to energize run control upon group-start command.

- Provide logic to seal-in run control with on status.
- Receive pump capacity at 100% speed setpoint (gal/hour) from the HMI.
- Receive chemical concentration setpoint (%) from the HMI.
- Receive chemical density setpoint (lbs/gal) from the HMI.
- Receive chemical dosing setpoint (mg/L) from the HMI.
- Receive BFP Feed Flow.
- Provide logic to calculate feed rate: (8.34 * BFP Feed Flow (MGD) * dosing setpoint) / (concentration setpoint * density setpoint * 24).
- Provide logic to calculate speed command: (feed rate * 100%) / (pump capacity at 100% speed setpoint).
- Provide logic to route speed command to speed control if on status.
- Receive group-stop command from Belt Filter Press logic.
- Provide logic to deenergize run control upon group-stop command.
- Provide logic for 0% speed control if not on status.

- Provide speed control to the HMI.

Software Interlocks:

- LOOP 0802, GBT FEED FLOW.
- LOOP 0807, GRAVITY BELT THICKENER.
- LOOP 1102, BFP FEED FLOW.
- LOOP 1107, BELT FILTER PRESS.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive the fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Control mode:
  - Provide auto command to the PLC.
  - Provide manual command to the PLC.

- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Manual control mode
  - Provide start command to the PLC.
  - Provide speed command to the PLC.
  - Provide stop command to the PLC.
- Auto control mode:
  - Provide pump capacity at 100% speed setpoint to PLC DW.
  - Provide chemical concentration setpoint to PLC DW.
  - Provide chemical density setpoint to PLC DW.
  - Provide chemical dosing setpoint to PLC DW.
- Display pump capacity at 100% speed setpoint.
- Historically archive pump capacity at 100% speed setpoint.
- Display chemical concentration setpoint.
- Historically archive chemical concentration setpoint.
- Display chemical density setpoint.
- Historically archive chemical density setpoint.
- Display chemical dosing setpoint setpoint.
- Historically archive chemical dosing setpoint.
- Display calculated feed rate.
- Historically archive calculated feed rate.
- Display speed command.
- Historically archive speed command.
- Trend speed command.
- Display speed control.
- Historically archive speed control.
- Trend speed control.

Metasys:

- None.

LOOP 1803, NON-POTABLE WATER PRESSURE

IPS Functions:

Field Devices and Connections:

- Provide instrument to measure pressure.
- Indicate pressure locally.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- None.

Metasys:

- None.

UNIT PROCESS 19, MISCELLANEOUS PLANT SYSTEMS

LOOP 1903, RAS/WAS EMERGENCY GENERATOR AND ATS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for emergency generator fail alarm to PLC RW.
- Provide digital signal for emergency power on alarm to PLC RW.

Hard-Wired Interlocks:

- None.

PLC RW Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to the HMI.
- Provide emergency generator fail alarm to Common Alarm.
- Provide emergency generator fail alarm to PLC AB.
- Provide emergency power on alarm to the HMI.
- Provide emergency power on alarm to Common Alarm.
- Provide emergency power on alarm to PLC AB.
- Provide emergency power on alarm to Continuous Loop Reactor Aerators.
- Provide emergency power on alarm to Administration Building ECP.

Software Interlocks:

- LOOP 0303, CONTINUOUS LOOP REACTOR AERATOR.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.
- LOOP 1907, ADMINISTRATION BUILDING ECP.

PLC AB Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to Metasys.
- Provide emergency power on alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display emergency generator fail alarm with high priority.
- Historically archive emergency generator fail alarm.
- Display emergency power on alarm with high priority.
- Historically archive emergency power on alarm.

Metasys:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

LOOP 1904, DEWATERING BUILDING BLOWER ROOM AIR FLOW ALARM LOW

IPS Functions:

Field Devices and Connections:

- Provide digital signal for flow alarm low to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide flow alarm low to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow alarm low with low priority.
- Historically archive flow alarm low.

Metasys:

- None.

LOOP 1905, DEWATERING BUILDING ELECTRICAL ROOM AIR FLOW ALARM LOW

IPS Functions:

Field Devices and Connections:

- Provide digital signal for flow alarm low to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide flow alarm low to the HMI.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- None.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flow alarm low with low priority.
- Historically archive flow alarm low.

Metasys:

- None.

LOOP 1906, DEWATERING EMERGENCY GENERATOR AND ATS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for emergency generator fail alarm to PLC DW.
- Provide digital signal for emergency power on alarm to PLC DW.

Hard-Wired Interlocks:

- None.

PLC DW Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to the HMI.
- Provide emergency generator fail alarm to Common Alarm.
- Provide emergency generator fail alarm to PLC AB.
- Provide emergency power on alarm to the HMI.
- Provide emergency power on alarm to Common Alarm.
- Provide emergency power on alarm to PLC AB.
- Provide emergency power on to the Aeration Blowers.

Software Interlocks:

- LOOP 1203, DEWATERING AREA COMMON ALARM.
- LOOP 1301, AERATION BLOWERS TEMPERATURE, PRESSURE AND FLOW.

PLC AB Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to Metasys.
- Provide emergency power on alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display emergency generator fail alarm with high priority.
- Historically archive emergency generator fail alarm.
- Display emergency power on alarm with high priority.
- Historically archive emergency power on alarm.

Metasys:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

LOOP 1907, ADMINISTRATION BUILDING ECP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for flow OK to PLC AB.
- Receive digital signal for air conditioning shutdown from PLC AB.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide logic to generate flow alarm low from flow OK status.
- Provide flow alarm low to the HMI.
- Receive emergency power on alarm from PLC RW.
- Provide logic to energize shutdown control of air conditioning if RAS/WAS emergency power is on.

Software Interlocks:

- LOOP 1903, RAS/WAS EMERGENCY GENERATOR AND ATS.

HMI Application Software:

HMI:

- Display flow alarm low with medium priority.
- Historically archive flow alarm low.
- Display shutdown control of air conditioning.

Metasys:

- None.

LOOP 1908, PERSONNEL DURESS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for duress alarm to PLC AB.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide duress alarm to the HMI.
- Provide duress alarm to Metasys.
- Provide duress alarm to Headworks Area Common Alarm.
- Provide duress alarm to UV Area Common Alarm.
- Provide duress alarm to RAS/WAS Pump Area Common Alarm.
- Provide duress alarm to Dewatering Area Common Alarm.

Software Interlocks:

- LOOP 0211, HEADWORKS AREA COMMON ALARM.
- LOOP 0507, UV AREA COMMON ALARM.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.
- LOOP 1203, DEWATERING AREA COMMON ALARM.

HMI Application Software:

HMI:

- Display duress alarm with high priority.
- Historically archive duress alarm.

Metasys:

- Display duress alarm.

LOOP 1909, ADMINISTRATION BUILDING FIRE ALARM PANEL

IPS Functions:

Field Devices and Connections:

- Provide digital signal for fire alarm to PLC AB.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide fire alarm to the HMI.
- Provide fire alarm to Metasys.
- Provide fire alarm to Headworks Area Common Alarm.
- Provide fire alarm to UV Area Common Alarm.
- Provide fire alarm to RAS/WAS Pump Area Common Alarm.
- Provide fire alarm to Dewatering Area Common Alarm.

Software Interlocks:

- LOOP 0211, HEADWORKS AREA COMMON ALARM.
- LOOP 0507, UV AREA COMMON ALARM.
- LOOP 0605, RAS/WAS PUMP AREA COMMON ALARM.
- LOOP 1203, DEWATERING AREA COMMON ALARM.

HMI Application Software:

HMI:

- Display fire alarm with high priority.
- Historically archive fire alarm.

Metasys:

- Display fire alarm.

UNIT PROCESS 20, CAMP FORSYTH PUMP STATION

LOOP 2001, FERROUS CHLORIDE STORAGE TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC CF.
- Receive analog signal proportional to level range at the LCP from PLC CF.
- Indicate level at the LCP using required engineering units.
- Receive digital signal for level alarm high at the LCP from PLC CF.
- Provide horn for level alarm high at the LCP.
- Provide silence pushbutton at the LCP.
- Provide digital signal for silence to PLC CF.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Provide level to the OI.
- Provide level to PLC AB.
- Receive level alarm low-low setpoint from the OI.
- Provide level alarm low-low setpoint to PLC AB.
- Receive level alarm low setpoint from the OI.
- Provide level alarm low setpoint to PLC AB.
- Receive level alarm high setpoint from the OI.
- Provide level alarm high setpoint to PLC AB.
- Receive level alarm high-high setpoint from the OI.
- Provide level alarm high-high setpoint to PLC AB.
- Provide logic which compares level with level alarm low-low setpoint to generate level alarm low-low.
- Provide logic which compares level with level alarm low setpoint to generate level alarm low.
- Provide logic which compares level with level alarm high setpoint to generate level alarm high.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm low-low to Ferrous Chloride Transfer Pump.
- Provide level alarm low-low to the OI.
- Provide level alarm low-low to PLC AB.
- Provide level alarm low to the OI.
- Provide level alarm low to PLC AB.
- Provide level alarm high to the OI.
- Provide level alarm high to PLC AB.
- Provide level alarm high-high to the OI.
- Provide level alarm high-high to PLC AB.
- Receive silence from the LCP.
- Provide logic which energizes the horn at the LCP upon level alarm high and deenergizes the horn at the LCP upon silence.

Software Interlocks:

- LOOP 2002, FERROUS CHLORIDE TRANSFER PUMP.

PLC AB Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide level alarm low-low setpoint to the HMI.
- Provide level alarm low setpoint to the HMI.
- Provide level alarm high setpoint to the HMI.
- Provide level alarm high-high setpoint to the HMI.
- Provide level alarm low-low to the HMI.
- Provide level alarm low to the HMI.
- Provide level alarm high to the HMI.
- Provide level alarm high-high to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level alarm low-low setpoint.
- Historically archive level alarm low-low setpoint.
- Display level alarm low setpoint.
- Historically archive level alarm low setpoint.
- Display level alarm high setpoint.
- Historically archive level alarm high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm low-low with medium priority.
- Historically archive level alarm low-low.
- Display level alarm low with low priority.
- Historically archive level alarm low.
- Display level alarm high with low priority.
- Historically archive level alarm high.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- None.

OI:

- Display level.
- Provide level alarm low-low setpoint to PLC CF.
- Provide level alarm low setpoint to PLC CF.
- Provide level alarm high setpoint to PLC CF.
- Provide level alarm high-high setpoint to PLC CF.
- Display level alarm low-low.
- Display level alarm low.
- Display level alarm high.
- Display level alarm high-high.

LOOP 2002, FERROUS CHLORIDE TRANSFER PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC CF.
- Provide digital signal for on status to PLC CF.

- Provide digital signal for fail alarm to PLC CF.
- Receive digital signal for run control from PLC CF.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Provide remote status to the OI.
- Provide remote status to PLC AB.
- Provide on status to the OI.
- Provide on status to PLC AB.
- Accumulate run-time.
- Provide run-time to the OI.
- Provide run-time to PLC AB.
- Provide fail alarm to the OI.
- Provide fail alarm to PLC AB.
- Control mode:
  - Receive auto command from the OI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the OI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the OI.
- Provide manual status to PLC AB.
- Provide auto status to the OI.
- Provide auto status to PLC AB.
- Manual control mode:
  - Receive start command from the OI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the OI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive level alarm low-low from Ferrous Chloride Storage Tank.
  - Deenergize control logic upon Ferrous Chloride Storage Tank level alarm low-low.
  - Receive level alarm low from Ferrous Chloride Day Tank.
  - Provide logic for start command upon Ferrous Chloride Day Tank level alarm low.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive level alarm high from Ferrous Chloride Day Tank.
  - Provide logic for stop command upon Ferrous Chloride Day Tank level alarm high.
  - Provide logic to deenergize run control upon stop command.

Software Interlocks:

- LOOP 2001, FERROUS CHLORIDE STORAGE TANK LEVEL
- LOOP 2004, FERROUS CHLORIDE DAY TANK LEVEL.

PLC AB Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide manual status to the HMI.
- Provide auto status to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - None.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.

Metasys:

- None.

OI:

- Display remote status.
- Display on status.
- Display run-time.
- Display fail alarm.
- Control mode:
  - Provide auto command to PLC CF.
  - Provide manual command to PLC CF.
- Display auto status.
- Display manual status.
- Manual control mode

    - Provide start command to PLC CF.
    - Provide stop command to PLC CF.
  - Auto control mode:
    - None.

LOOP 2004, FERROUS CHLORIDE DAY TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC CF.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Provide level to the OI.
- Provide level to PLC AB.
- Receive level alarm low-low setpoint from the OI.
- Provide level alarm low-low setpoint to PLC AB.
- Receive level alarm low setpoint from the OI.
- Provide level alarm low setpoint to PLC AB.
- Receive level alarm high setpoint from the OI.
- Provide level alarm high setpoint to PLC AB.
- Receive level alarm high-high setpoint from the OI.
- Provide level alarm high-high setpoint to PLC AB.
- Provide logic which compares level with level alarm low-low setpoint to generate level alarm low-low.
- Provide logic which compares level with level alarm low setpoint to generate level alarm low.
- Provide logic which compares level with level alarm high setpoint to generate level alarm high.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm low-low to Ferrous Chloride Feed Pump.
- Provide level alarm low-low to the OI.
- Provide level alarm low-low to PLC AB.
- Provide level alarm low to Ferrous Chloride Transfer Pump.
- Provide level alarm low to the OI.
- Provide level alarm low to PLC AB.
- Provide level alarm high to Ferrous Chloride Transfer Pump.
- Provide level alarm high to the OI.
- Provide level alarm high to PLC AB.
- Provide level alarm high-high to the OI.
- Provide level alarm high-high to PLC AB.

Software Interlocks:

- LOOP 2002, FERROUS CHLORIDE TRANSFER PUMP.
- LOOP 2005, FERROUS CHLORIDE FEED PUMP.

PLC AB Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide level alarm low-low setpoint to the HMI.
- Provide level alarm low setpoint to the HMI.
- Provide level alarm high setpoint to the HMI.
- Provide level alarm high-high setpoint to the HMI.
- Provide level alarm low-low to the HMI.
- Provide level alarm low to the HMI.
- Provide level alarm high to the HMI.
- Provide level alarm high-high to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level alarm low-low setpoint.
- Historically archive level alarm low-low setpoint.
- Display level alarm low setpoint.
- Historically archive level alarm low setpoint.
- Display level alarm high setpoint.
- Historically archive level alarm high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm low-low with medium priority.
- Historically archive level alarm low-low.
- Display level alarm low with low priority.
- Historically archive level alarm low.
- Display level alarm high with low priority.
- Historically archive level alarm high.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- None.

OI:

- Display level.
- Provide level alarm low-low setpoint to PLC CF.
- Provide level alarm low setpoint to PLC CF.
- Provide level alarm high setpoint to PLC CF.
- Provide level alarm high-high setpoint to PLC CF.
- Display level alarm low-low.
- Display level alarm low.
- Display level alarm high.
- Display level alarm high-high.

LOOP 2005, FERROUS CHLORIDE FEED PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC CF.
- Provide digital signal for on status to PLC CF.
- Provide digital signal for fail alarm to PLC CF.
- Receive digital signal for run control from PLC CF.
- Provide analog signal proportional to speed status to PLC CF.
- Receive analog signal proportional to speed control from PLC CF.
- Provide digital signal for pressure alarm high to PLC CF.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Provide remote status to the OI.
- Provide remote status to PLC AB.
- Provide on status to the OI.
- Provide on status to PLC AB.
- Accumulate run-time.
- Provide run-time to the OI.
- Provide run-time to PLC AB.
- Provide fail alarm to the OI.
- Provide fail alarm to PLC AB.
- Provide speed status to the OI.
- Provide speed status to PLC AB.
- Control mode:
  - Receive auto command from the OI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the OI.

    - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the OI.
- Provide manual status to PLC AB.
- Provide auto status to the OI.
- Provide auto status to PLC AB.
- Manual control mode:
    - Receive start command from the OI.
    - Provide logic to energize run control upon start command.
    - Provide logic to seal-in run control with on status.
    - Receive speed command from the OI.
    - Provide logic to route speed command to speed control if on status.
    - Receive stop command from the OI.
    - Provide logic to deenergize run control upon stop command.
    - Provide logic for 0% speed control if not on status.
- Auto control mode:
    - Receive level alarm low-low from Ferrous Chloride Day Tank.
    - Deenergize control logic upon Ferrous Chloride Day Tank level alarm low-low.
    - Provide logic to seal-in run control with on status.
    - Receive pump station flow setpoints (MGD) from the OI, (up to eight setpoints for various times during the day).
    - Receive sulfide concentration setpoints (mg/L) from the OI, (up to eight setpoints for various times during the day).
    - Based upon time of the day, select the current setpoints.
    - Provide logic to calculate feed rate: 0.87 * Pump Station Flow setpoint * (sulfide concentration setpoint – 0.5).
    - Receive pump capacity at 100% speed setpoint (GPH) from the OI.
    - Provide logic to calculate speed command: (feed rate * 100%) / (pump capacity at 100% speed setpoint).
    - Provide logic to energize run control if calculated speed command is valid.
    - Provide logic to route speed command to speed control if on status.
    - Provide logic for 0% speed control if calculated speed command is invalid.
- Provide current pump station flow setpoint to the OI.
- Provide current pump station flow setpoint to PLC AB.
- Provide current sulfide concentration setpoint to the OI.
- Provide current sulfide concentration setpoint to PLC AB.
- Provide calculated feed rate to the OI.
- Provide calculated feed rate to PLC AB.
- Provide speed control to the OI.
- Provide speed control to PLC AB.
- Provide pressure high alarm to the OI.
- Provide pressure high alarm to PLC AB.

Software Interlocks:

- LOOP 2004, FERROUS CHLORIDE DAY TANK LEVEL.

PLC AB Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Provide speed control to the HMI.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Provide current pump station flow setpoint to the HMI.
- Provide current sulfide concentration setpoint to the HMI.
- Provide calculated feed rate to the HMI.
- Provide pressure high alarm to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive the fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Display current pump station flow setpoint.
- Historically archive current pump station flow setpoint.
- Display current sulfide concentration setpoint.
- Historically archive current sulfide concentration setpoint.
- Display calculated feed rate.
- Historically archive calculated feed rate.
- Trend calculated feed rate.
- Display speed control.
- Historically archive speed control.
- Trend speed control.

- Display pressure alarm high with medium priority.
- Historically archive pressure alarm high.

Metasys:

- None.

OI:

- Display remote status.
- Display on status.
- Display run-time.
- Display fail alarm.
- Display speed status.
- Control mode:
  - Provide auto command to PLC CF.
  - Provide manual command to PLC CF.
- Display manual status.
- Display auto status.
- Manual control mode:
  - Provide start command to PLC CF.
  - Provide speed command to PLC CF.
  - Provide stop command to PLC CF.
- Auto control mode:
  - Provide pump station flow setpoints (MGD) to PLC CF, (up to eight setpoints for various times during the day).
  - Provide sulfide concentration setpoints (mg/L) to PLC CF, (up to eight setpoints for various times during the day).
- Display calculated feed rate.
- Display speed control.
- Display pressure high alarm.

LOOP 2007, WET WELL LEVEL

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Receive level from CP-2008.
- Provide level to the OI.
- Provide level to PLC AB.
- Receive level low setpoint from CP-2008.
- Provide level low setpoint to the OI.
- Provide level low setpoint to PLC AB.

- Receive level mid setpoint from CP-2008.
- Provide level mid setpoint to the OI.
- Provide level mid setpoint to PLC AB.
- Receive level high setpoint from CP-2008.
- Provide level high setpoint to the OI.
- Provide level high setpoint to PLC AB.
- Receive level alarm high-high setpoint from CP-2008
- Provide level alarm high-high setpoint to the OI.
- Provide level alarm high-high setpoint to PLC AB.
- Receive level alarm high-high from CP-2008.
- Provide level alarm high-high to the OI.
- Provide level alarm high-high to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide level to Metasys.
- Provide level low setpoint to the HMI.
- Provide level mid setpoint to the HMI.
- Provide level high setpoint to the HMI.
- Provide level alarm high-high setpoint to the HMI.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level low setpoint.
- Historically archive level low setpoint.
- Display level mid setpoint.
- Historically archive level mid setpoint.
- Display level high setpoint.
- Historically archive level high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm high-high with high priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- Display level.
- Display level alarm high-high.

OI:

- Display level.
- Display level low setpoint.
- Display level mid setpoint.
- Display level high setpoint.
- Display level alarm high-high setpoint.
- Display level alarm high-high.

LOOP 2008, PUMPS

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Receive remote status from CP-2008.
- Provide remote status to the OI.
- Provide remote status to PLC AB.
- Receive on status from CP-2008.
- Provide on status to the OI.
- Provide on status to PLC AB.
- Accumulate run-time.
- Provide run-time to the OI.
- Provide run-time to PLC AB.
- Receive fail alarm from CP-2008.
- Provide fail alarm to the OI.
- Provide fail alarm to PLC AB.
- Receive speed status from CP-2008.
- Provide speed status to the OI.
- Provide speed status to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide speed status to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Display speed status.
- Historically archive speed status.

Metasys:

- None.

OI:

- Display remote status.
- Display on status.
- Display run-time.
- Display fail alarm.
- Display speed status.

LOOP 2009, STATION FLOOD ALARM

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Receive flood alarm from CP-2008.
- Provide flood alarm to the OI.
- Provide flood alarm to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide flood alarm to the HMI.
- Provide flood alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flood alarm with high priority.
- Historically archive flood alarm.

Metasys:

- Display flood alarm.

OI:

- Display flood alarm.

LOOP 2010, STATION AIR MONITORING

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Receive combustible gas % LEL from CP-2008.
- Provide combustible gas % LEL to the OI.
- Provide combustible gas % LEL to PLC AB.

- Hard-code combustible gas imminent alarm setpoint at 10% LEL.
- Provide combustible gas imminent alarm setpoint to the OI.
- Provide combustible gas imminent alarm setpoint to PLC AB.
- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the OI.
- Provide combustible gas imminent alarm to PLC AB.
- Hard-code combustible gas present alarm setpoint at 20% LEL.
- Provide combustible gas present alarm setpoint to the OI.
- Provide combustible gas present alarm setpoint to PLC AB.
- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the OI.
- Provide combustible gas present alarm to PLC AB.
- Receive air flow OK from CP-2008.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the OI.
- Provide air flow alarm low to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to Metasys.
- Provide combustible gas imminent alarm setpoint to the HMI.
- Provide combustible gas imminent alarm to the HMI.
- Provide combustible gas present alarm setpoint to the HMI.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to Metasys.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.

- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display air flow alarm low.

OI:

- Display combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Display combustible gas present alarm.
- Display air flow alarm low.

LOOP 2011, STATION EMERGENCY GENERATOR AND ATS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for emergency generator fail alarm to PLC CF.
- Provide digital signal for emergency power on alarm to PLC CF.

Hard-Wired Interlocks:

- None.

PLC CF Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to the OI.
- Provide emergency generator fail alarm to PLC AB.
- Provide emergency power on alarm to the OI.
- Provide emergency power on alarm to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to the HMI.
- Provide emergency generator fail alarm to Metasys.

- Provide emergency power on alarm to the HMI.
- Provide emergency power on alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display emergency generator fail alarm with high priority.
- Historically archive emergency generator fail alarm.
- Display emergency power on alarm with high priority.
- Historically archive emergency power on alarm.

Metasys:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

OI:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

UNIT PROCESS 21, BIG BERTHA PUMP STATION

LOOP 2101, WET WELL LEVEL

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive level from CP-2102.
- Provide level to the HMI.
- Provide level to Metasys.
- Receive level low setpoint from CP-2102.
- Provide level low setpoint to the HMI.
- Receive level mid1 setpoint from CP-2102.
- Provide level mid1 setpoint to the HMI.
- Receive level mid2 setpoint from CP-2102.
- Provide level mid2 setpoint to the HMI.
- Receive level high setpoint from CP-2102.
- Provide level high setpoint to the HMI.
- Receive level alarm high-high setpoint from CP-2102.

- Provide level alarm high-high setpoint to the HMI.
- Receive level alarm high-high from CP-2102.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Metasys.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level low setpoint.
- Historically archive level low setpoint.
- Display level mid1 setpoint.
- Historically archive level mid1 setpoint.
- Display level mid2 setpoint.
- Historically archive level mid2 setpoint.
- Display level high setpoint.
- Historically archive level high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm high-high with high priority.
- Historically archive level alarm high-high.

Metasys:

- Display level.
- Display level alarm high-high.

OI:

- None.

LOOP 2102, PUMPS

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive remote status from CP-2102.
- Provide remote status to the HMI.
- Receive on status from CP-2102.
- Provide on status to the HMI.
- Accumulate run-time.

- Provide run-time to the HMI.
- Receive fail alarm from CP-2102.
- Provide fail alarm to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.

Metasys:

- None.

OI:

- None.

LOOP 2103, STATION FLOOD ALARM

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive flood alarm from CP-2102.
- Provide flood alarm to the HMI.
- Provide flood alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flood alarm with high priority.
- Historically archive flood alarm.

Metasys:

- Display flood alarm.

OI:

- None.

LOOP 2104, STATION AIR MONITORING

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive combustible gas % LEL from CP-2102.
- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to Metasys.
- Hard-code combustible gas imminent alarm setpoint at 10% LEL.
- Provide combustible gas imminent alarm setpoint to the HMI.
- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the HMI.
- Hard-code combustible gas present alarm setpoint at 20% LEL.
- Provide combustible gas present alarm setpoint to the HMI.
- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to Metasys.
- Receive air flow OK status from CP-2102.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display air flow alarm low.

OI:

- None.

LOOP 2105, STATION EMERGENCY GENERATOR AND ATS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for emergency generator fail alarm to CP-2102.
- Provide digital signal for emergency power on alarm to CP-2102.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive emergency generator fail alarm from CP-2102.
- Provide emergency generator fail alarm to the HMI.
- Provide emergency generator fail alarm to Metasys.
- Receive emergency power on alarm from CP-2102.
- Provide emergency power on alarm to the HMI.
- Provide emergency power on alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display emergency generator fail alarm with high priority.
- Historically archive emergency generator fail alarm.
- Display emergency power on alarm with high priority.
- Historically archive emergency power on alarm.

Metasys:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

OI:

- None.

UNIT PROCESS 22, MAIN POST PUMP STATION

LOOP 2201, FERROUS CHLORIDE STORAGE TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC MP.
- Receive analog signal proportional to level range at the LCP from PLC MP.
- Indicate level at the LCP using required engineering units.
- Receive digital signal for level alarm high at the LCP from PLC MP.
- Provide horn for level alarm high at the LCP.
- Provide silence pushbutton at the LCP.
- Provide digital signal for silence to PLC MP.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Provide level to the OI.
- Provide level to PLC AB.
- Receive level alarm low-low setpoint from the OI.
- Provide level alarm low-low setpoint to PLC AB.
- Receive level alarm low setpoint from the OI.
- Provide level alarm low setpoint to PLC AB.

- Receive level alarm high setpoint from the OI.
- Provide level alarm high setpoint to PLC AB.
- Receive level alarm high-high setpoint from the OI.
- Provide level alarm high-high setpoint to PLC AB.
- Provide logic which compares level with level alarm low-low setpoint to generate level alarm low-low.
- Provide logic which compares level with level alarm low setpoint to generate level alarm low.
- Provide logic which compares level with level alarm high setpoint to generate level alarm high.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm low-low to Ferrous Chloride Transfer Pump.
- Provide level alarm low-low to the OI.
- Provide level alarm low-low to PLC AB.
- Provide level alarm low to the OI.
- Provide level alarm low to PLC AB.
- Provide level alarm high to the OI.
- Provide level alarm high to PLC AB.
- Provide level alarm high-high to the OI.
- Provide level alarm high-high to PLC AB.
- Receive silence from the LCP.
- Provide logic which energizes the horn at the LCP upon level alarm high and deenergizes the horn at the LCP upon silence.

Software Interlocks:

- LOOP 2202, FERROUS CHLORIDE TRANSFER PUMP.

PLC AB Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide level alarm low-low setpoint to the HMI.
- Provide level alarm low setpoint to the HMI.
- Provide level alarm high setpoint to the HMI.
- Provide level alarm high-high setpoint to the HMI.
- Provide level alarm low-low to the HMI.
- Provide level alarm low to the HMI.
- Provide level alarm high to the HMI.
- Provide level alarm high-high to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.

- Display level alarm low-low setpoint.
- Historically archive level alarm low-low setpoint.
- Display level alarm low setpoint.
- Historically archive level alarm low setpoint.
- Display level alarm high setpoint.
- Historically archive level alarm high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm low-low with medium priority.
- Historically archive level alarm low-low.
- Display level alarm low with low priority.
- Historically archive level alarm low.
- Display level alarm high with low priority.
- Historically archive level alarm high.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- None.

OI:

- Display level.
- Provide level alarm low-low setpoint to PLC MP.
- Provide level alarm low setpoint to PLC MP.
- Provide level alarm high setpoint to PLC MP.
- Provide level alarm high-high setpoint to PLC MP.
- Display level alarm low-low.
- Display level alarm low.
- Display level alarm high.
- Display level alarm high-high.

LOOP 2202, FERROUS CHLORIDE TRANSFER PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC MP.
- Provide digital signal for on status to PLC MP.
- Provide digital signal for fail alarm to PLC MP.
- Receive digital signal for run control from PLC MP.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Provide remote status to the OI.
- Provide remote status to PLC AB.
- Provide on status to the OI.
- Provide on status to PLC AB.
- Accumulate run-time.
- Provide run-time to the OI.
- Provide run-time to PLC AB.
- Provide fail alarm to the OI.
- Provide fail alarm to PLC AB.
- Control mode:
  - Receive auto command from the OI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the OI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the OI.
- Provide manual status to PLC AB.
- Provide auto status to the OI.
- Provide auto status to PLC AB.
- Manual control mode:
  - Receive start command from the OI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive stop command from the OI.
  - Provide logic to deenergize run control upon stop command.
- Auto control mode:
  - Receive level alarm low-low from Ferrous Chloride Storage Tank.
  - Deenergize control logic upon Ferrous Chloride Storage Tank level alarm low-low.
  - Receive level alarm low from Ferrous Chloride Day Tank.
  - Provide logic for start command upon Ferrous Chloride Day Tank level alarm low.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive level alarm high from Ferrous Chloride Day Tank.
  - Provide logic for stop command upon Ferrous Chloride Day Tank level alarm high.
  - Provide logic to deenergize run control upon stop command.

Software Interlocks:

- LOOP 2201, FERROUS CHLORIDE STORAGE TANK LEVEL
- LOOP 2204, FERROUS CHLORIDE DAY TANK LEVEL.

PLC AB Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide manual status to the HMI.
- Provide auto status to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with low priority.
- Historically archive fail alarm.
- Control mode:
  - None.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.

Metasys:

- None.

OI:

- Display remote status.
- Display on status.
- Display run-time.
- Display fail alarm.
- Control mode:
  - Provide auto command to PLC MP.
  - Provide manual command to PLC MP.
- Display auto status.
- Display manual status.
- Manual control mode
  - Provide start command to PLC MP.
  - Provide stop command to PLC MP.
- Auto control mode:
  - None.

LOOP 2204, FERROUS CHLORIDE DAY TANK LEVEL

IPS Functions:

Field Devices and Connections:

- Provide ultrasonic instrument to measure level.
- Indicate level locally using required engineering units.
- Provide analog signal proportional to level range to PLC MP.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Provide level to the OI.
- Provide level to PLC AB.
- Receive level alarm low-low setpoint from the OI.
- Provide level alarm low-low setpoint to PLC AB.
- Receive level alarm low setpoint from the OI.
- Provide level alarm low setpoint to PLC AB.
- Receive level alarm high setpoint from the OI.
- Provide level alarm high setpoint to PLC AB.
- Receive level alarm high-high setpoint from the OI.
- Provide level alarm high-high setpoint to PLC AB.
- Provide logic which compares level with level alarm low-low setpoint to generate level alarm low-low.
- Provide logic which compares level with level alarm low setpoint to generate level alarm low.
- Provide logic which compares level with level alarm high setpoint to generate level alarm high.
- Provide logic which compares level with level alarm high-high setpoint to generate level alarm high-high.
- Provide level alarm low-low to Ferrous Chloride Feed Pump.
- Provide level alarm low-low to the OI.
- Provide level alarm low-low to PLC AB.
- Provide level alarm low to Ferrous Chloride Transfer Pump.
- Provide level alarm low to the OI.
- Provide level alarm low to PLC AB.
- Provide level alarm high to Ferrous Chloride Transfer Pump.
- Provide level alarm high to the OI.
- Provide level alarm high to PLC AB.
- Provide level alarm high-high to the OI.
- Provide level alarm high-high to PLC AB.

Software Interlocks:

- LOOP 2202, FERROUS CHLORIDE TRANSFER PUMP.
- LOOP 2205, FERROUS CHLORIDE FEED PUMP.

PLC AB Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide level alarm low-low setpoint to the HMI.
- Provide level alarm low setpoint to the HMI.
- Provide level alarm high setpoint to the HMI.
- Provide level alarm high-high setpoint to the HMI.
- Provide level alarm low-low to the HMI.
- Provide level alarm low to the HMI.
- Provide level alarm high to the HMI.
- Provide level alarm high-high to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level alarm low-low setpoint.
- Historically archive level alarm low-low setpoint.
- Display level alarm low setpoint.
- Historically archive level alarm low setpoint.
- Display level alarm high setpoint.
- Historically archive level alarm high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm low-low with medium priority.
- Historically archive level alarm low-low.
- Display level alarm low with low priority.
- Historically archive level alarm low.
- Display level alarm high with low priority.
- Historically archive level alarm high.
- Display level alarm high-high with medium priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- None.

OI:

- Display level.
- Provide level alarm low-low setpoint to PLC MP.
- Provide level alarm low setpoint to PLC MP.

- Provide level alarm high setpoint to PLC MP.
- Provide level alarm high-high setpoint to PLC MP.
- Display level alarm low-low.
- Display level alarm low.
- Display level alarm high.
- Display level alarm high-high.

LOOP 2205, FERROUS CHLORIDE FEED PUMP

IPS Functions:

Field Devices and Connections:

- Provide digital signal for remote status to PLC MP.
- Provide digital signal for on status to PLC MP.
- Provide digital signal for fail alarm to PLC MP.
- Receive digital signal for run control from PLC MP.
- Provide analog signal proportional to speed status to PLC MP.
- Receive analog signal proportional to speed control from PLC MP.
- Provide digital signal for pressure alarm high to PLC MP.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Provide remote status to the OI.
- Provide remote status to PLC AB.
- Provide on status to the OI.
- Provide on status to PLC AB.
- Accumulate run-time.
- Provide run-time to the OI.
- Provide run-time to PLC AB.
- Provide fail alarm to the OI.
- Provide fail alarm to PLC AB.
- Provide speed status to the OI.
- Provide speed status to PLC AB.
- Control mode:
  - Receive auto command from the OI.
  - Provide logic to activate auto mode and deactivate manual mode upon auto command.
  - Receive manual command from the OI.
  - Provide logic to deactivate auto mode and activate manual mode upon manual command.
- Provide manual status to the OI.
- Provide manual status to PLC AB.
- Provide auto status to the OI.
- Provide auto status to PLC AB.

- Manual control mode:
  - Receive start command from the OI.
  - Provide logic to energize run control upon start command.
  - Provide logic to seal-in run control with on status.
  - Receive speed command from the OI.
  - Provide logic to route speed command to speed control if on status.
  - Receive stop command from the OI.
  - Provide logic to deenergize run control upon stop command.
  - Provide logic for 0% speed control if not on status.
- Auto control mode:
  - Receive level alarm low-low from Ferrous Chloride Day Tank.
  - Deenergize control logic upon Ferrous Chloride Day Tank level alarm low-low.
  - Provide logic to seal-in run control with on status.
  - Receive pump station flow setpoints (MGD) from the OI, (up to eight setpoints for various times during the day).
  - Receive sulfide concentration setpoints (mg/L) from the OI, (up to eight setpoints for various times during the day).
  - Based upon time of the day, select the current setpoints.
  - Provide logic to calculate feed rate: 0.87 * Pump Station Flow setpoint * (sulfide concentration setpoint – 0.5).
  - Receive pump capacity at 100% speed setpoint (GPH) from the OI.
  - Provide logic to calculate speed command: (feed rate * 100%) / (pump capacity at 100% speed setpoint).
  - Provide logic to energize run control if calculated speed command is valid.
  - Provide logic to route speed command to speed control if on status.
  - Provide logic for 0% speed control if calculated speed command is invalid.
- Provide current pump station flow setpoint to the OI.
- Provide current pump station flow setpoint to PLC AB.
- Provide current sulfide concentration setpoint to the OI.
- Provide current sulfide concentration setpoint to PLC AB.
- Provide calculated feed rate to the OI.
- Provide calculated feed rate to PLC AB.
- Provide speed control to the OI.
- Provide speed control to PLC AB.
- Provide pressure high alarm to the OI.
- Provide pressure high alarm to PLC AB.

Software Interlocks:

- LOOP 2204, FERROUS CHLORIDE DAY TANK LEVEL.

PLC AB Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.
- Provide run-time to the HMI.

- Provide fail alarm to the HMI.
- Provide speed status to the HMI.
- Provide speed control to the HMI.
- Provide manual status to the HMI.
- Provide auto status to the HMI.
- Provide current pump station flow setpoint to the HMI.
- Provide current sulfide concentration setpoint to the HMI.
- Provide calculated feed rate to the HMI.
- Provide pressure high alarm to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive the fail alarm.
- Display speed status.
- Historically archive speed status.
- Trend speed status.
- Display auto status.
- Historically archive auto status.
- Display manual status.
- Historically archive manual status.
- Display current pump station flow setpoint.
- Historically archive current pump station flow setpoint.
- Display current sulfide concentration setpoint.
- Historically archive current sulfide concentration setpoint.
- Display calculated feed rate.
- Historically archive calculated feed rate.
- Trend calculated feed rate.
- Display speed control.
- Historically archive speed control.
- Trend speed control.
- Display pressure alarm high with medium priority.
- Historically archive pressure alarm high.

Metasys:

- None.

OI:

- Display remote status.
- Display on status.

- Display run-time.
- Display fail alarm.
- Display speed status.
- Control mode:
  - Provide auto command to PLC MP.
  - Provide manual command to PLC MP.
- Display manual status.
- Display auto status.
- Manual control mode:
  - Provide start command to PLC MP.
  - Provide speed command to PLC MP.
  - Provide stop command to PLC MP.
- Auto control mode:
  - Provide pump station flow setpoints (MGD) to PLC MP, (up to eight setpoints for various times during the day).
  - Provide sulfide concentration setpoints (mg/L) to PLC MP, (up to eight setpoints for various times during the day).
- Display calculated feed rate.
- Display speed control.
- Display pressure high alarm.

LOOP 2207, WET WELL LEVEL

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Receive level from CP-2208.
- Provide level to the OI.
- Provide level to PLC AB.
- Receive level low setpoint from CP-2208.
- Provide level low setpoint to the OI.
- Provide level low setpoint to PLC AB.
- Receive level mid1 setpoint from CP-2208.
- Provide level mid1 setpoint to the OI.
- Provide level mid1 setpoint to PLC AB.
- Receive level mid2 setpoint from CP-2208.
- Provide level mid2 setpoint to the OI.
- Provide level mid2 setpoint to PLC AB.
- Receive level high setpoint from CP-2208.
- Provide level high setpoint to the OI.
- Provide level high setpoint to PLC AB.
- Receive level alarm high-high setpoint from CP-2208

- Provide level alarm high-high setpoint to the OI.
- Provide level alarm high-high setpoint to PLC AB.
- Receive level alarm high-high from CP-2208.
- Provide level alarm high-high to the OI.
- Provide level alarm high-high to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide level to the HMI.
- Provide level to Metasys.
- Provide level low setpoint to the HMI.
- Provide level mid1 setpoint to the HMI.
- Provide level mid2 setpoint to the HMI.
- Provide level high setpoint to the HMI.
- Provide level alarm high-high setpoint to the HMI.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level low setpoint.
- Historically archive level low setpoint.
- Display level mid1 setpoint.
- Historically archive level mid1 setpoint.
- Display level mid2 setpoint.
- Historically archive level mid2 setpoint.
- Display level high setpoint.
- Historically archive level high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm high-high with high priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- Display level.
- Display level alarm high-high.

OI:

- Display level.
- Display level low setpoint.
- Display level mid1 setpoint.
- Display level mid2 setpoint.
- Display level high setpoint.
- Display level alarm high-high setpoint.
- Display level alarm high-high.
- Control
  - None.

LOOP 2208, PUMPS AND STATION OUTLET PRESSURE

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Receive remote status from CP-2208.
- Provide remote status to the OI.
- Provide remote status to PLC AB.
- Receive on status from CP-2208.
- Provide on status to the OI.
- Provide on status to PLC AB.
- Accumulate run-time.
- Provide run-time to the OI.
- Provide run-time to PLC AB.
- Receive fail alarm from CP-2208.
- Provide fail alarm to the OI.
- Provide fail alarm to PLC AB.
- Receive pressure status from CP-2208.
- Provide pressure status to the OI.
- Provide pressure status to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide remote status to the HMI.
- Provide on status to the HMI.

- Provide run-time to the HMI.
- Provide fail alarm to the HMI.
- Provide pressure status to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.
- Display pressure status.
- Historically archive pressure status.

Metasys:

- None.

OI:

- Display remote status.
- Display on status.
- Display run-time.
- Display fail alarm.
- Display pressure status.

LOOP 2209, STATION FLOOD ALARM

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Receive flood alarm from CP-2208.
- Provide flood alarm to the OI.
- Provide flood alarm to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide flood alarm to the HMI.
- Provide flood alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flood alarm with high priority.
- Historically archive flood alarm.

Metasys:

- Display flood alarm.

OI:

- Display flood alarm.

LOOP 2210, STATION AIR MONITORING

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Receive combustible gas % LEL from CP-2208.
- Provide combustible gas % LEL to the OI.
- Provide combustible gas % LEL to PLC AB.
- Hard-code combustible gas imminent alarm setpoint at 10% LEL.
- Provide combustible gas imminent alarm setpoint to the OI.
- Provide combustible gas imminent alarm setpoint to PLC AB.
- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the OI.
- Provide combustible gas imminent alarm to PLC AB.
- Hard-code combustible gas present alarm setpoint at 20% LEL.

- Provide combustible gas present alarm setpoint to the OI.
- Provide combustible gas present alarm setpoint to PLC AB.
- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the OI.
- Provide combustible gas present alarm to PLC AB.
- Receive air flow OK from CP-2208.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the OI.
- Provide air flow alarm low to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to Metasys.
- Provide combustible gas imminent alarm setpoint to the HMI.
- Provide combustible gas imminent alarm to the HMI.
- Provide combustible gas present alarm setpoint to the HMI.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to Metasys.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display air flow alarm low.

OI:

- Display combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Display combustible gas present alarm.
- Display air flow alarm low.

LOOP 2211, STATION EMERGENCY GENERATOR AND ATS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for emergency generator fail alarm to PLC MP.
- Provide digital signal for emergency power on alarm to PLC MP.

Hard-Wired Interlocks:

- None.

PLC MP Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to the OI.
- Provide emergency generator fail alarm to PLC AB.
- Provide emergency power on alarm to the OI.
- Provide emergency power on alarm to PLC AB.

Software Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Provide emergency generator fail alarm to the HMI.
- Provide emergency generator fail alarm to Metasys.
- Provide emergency power on alarm to the HMI.
- Provide emergency power on alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display emergency generator fail alarm with high priority.
- Historically archive emergency generator fail alarm.
- Display emergency power on alarm with high priority.
- Historically archive emergency power on alarm.

Metasys:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

OI:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

UNIT PROCESS 23, MAIN POST INTERMEDIATE PUMP STATION

LOOP 2301, STATION INLET PRESSURE

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive pressure from CP-2302.
- Provide pressure to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display pressure.
- Historically archive pressure.
- Trend pressure.

Metasys:

- None.

OI:

- None.

LOOP 2302, PUMPS

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive remote status from CP-2302.
- Provide remote status to the HMI.
- Receive on status from CP-2302.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Receive fail alarm from CP-2302.
- Provide fail alarm to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.

Metasys:

- None.

OI:

- None.

LOOP 2303, STATION FLOOD ALARM

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive flood alarm from CP-2302.
- Provide flood alarm to the HMI.
- Provide flood alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flood alarm with high priority.
- Historically archive flood alarm.

Metasys:

- Display flood alarm.

OI:

- None.

LOOP 2304, STATION AIR MONITORING

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive air flow OK status from CP-2302.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display air flow alarm low.

OI:

- None.

LOOP 2305, STATION EMERGENCY GENERATOR AND ATS

IPS Functions:

Field Devices and Connections:

- Provide digital signal for emergency generator fail alarm to CP-2302.
- Provide digital signal for emergency power on alarm to CP-2302.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive emergency generator fail alarm from CP-2302.
- Provide emergency generator fail alarm to the HMI.
- Provide emergency generator fail alarm to Metasys.
- Receive emergency power on alarm from CP-2302.
- Provide emergency power on alarm to the HMI.
- Provide emergency power on alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display emergency generator fail alarm with high priority.
- Historically archive emergency generator fail alarm.
- Display emergency power on alarm with high priority.
- Historically archive emergency power on alarm.

Metasys:

- Display emergency generator fail alarm.
- Display emergency power on alarm.

OI:

- None.

UNIT PROCESS 24, HISTORIC DISTRICT PUMP STATION

LOOP 2401, WET WELL LEVEL

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive level from CP-2402.
- Provide level to the HMI.
- Provide level to Metasys.
- Receive level low setpoint from CP-2402.
- Provide level low setpoint to the HMI.
- Receive level mid setpoint from CP-2402.
- Provide level mid setpoint to the HMI.
- Receive level high setpoint from CP-2402.
- Provide level high setpoint to the HMI.
- Receive level alarm high-high setpoint from CP-2402.
- Provide level alarm high-high setpoint to the HMI.
- Receive level alarm high-high from CP-2402.
- Provide level alarm high-high to the HMI.
- Provide level alarm high-high to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display level.
- Historically archive level.
- Trend level.
- Display level low setpoint.
- Historically archive level low setpoint.
- Display level mid setpoint.
- Historically archive level mid setpoint.
- Display level high setpoint.
- Historically archive level high setpoint.
- Display level alarm high-high setpoint.
- Historically archive level alarm high-high setpoint.
- Display level alarm high-high with high priority.
- Historically archive level alarm high-high.
- Control
  - None.

Metasys:

- Display level.
- Display level alarm high-high.

OI:

- None.

LOOP 2402, PUMPS

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive remote status from CP-2402.
- Provide remote status to the HMI.
- Receive on status from CP-2402.
- Provide on status to the HMI.
- Accumulate run-time.
- Provide run-time to the HMI.
- Receive fail alarm from CP-2402.
- Provide fail alarm to the HMI.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display remote status.
- Historically archive remote status.
- Display on status.
- Historically archive on status.
- Display run-time.
- Display fail alarm with medium priority.
- Historically archive fail alarm.

Metasys:

- None.

OI:

- None.

LOOP 2403, STATION FLOOD ALARM

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive flood alarm from CP-2402.
- Provide flood alarm to the HMI.
- Provide flood alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display flood alarm with high priority.
- Historically archive flood alarm.

Metasys:

- Display flood alarm.

OI:

- None.

LOOP 2404, STATION AIR MONITORING

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive combustible gas % LEL from CP-2402.
- Provide combustible gas % LEL to the HMI.
- Provide combustible gas % LEL to Metasys.
- Hard-code combustible gas imminent alarm setpoint at 10% LEL.
- Provide combustible gas imminent alarm setpoint to the HMI.
- Compare combustible gas % LEL with combustible gas imminent alarm setpoint to generate combustible gas imminent alarm.
- Provide combustible gas imminent alarm to the HMI.
- Hard-code combustible gas present alarm setpoint at 20% LEL.
- Provide combustible gas present alarm setpoint to the HMI.
- Compare combustible gas % LEL with combustible gas present alarm setpoint to generate combustible gas present alarm.
- Provide combustible gas present alarm to the HMI.
- Provide combustible gas present alarm to Metasys.
- Receive air flow OK status from CP-2402.
- Provide logic to generate air flow alarm low from air flow OK status.
- Provide air flow alarm low to the HMI.
- Provide air flow alarm low to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display combustible gas % LEL.
- Historically archive combustible gas % LEL.
- Trend combustible gas % LEL.
- Display combustible gas imminent alarm setpoint.

- Historically archive combustible gas imminent alarm setpoint.
- Display combustible gas imminent alarm with low priority.
- Historically archive combustible gas imminent alarm.
- Display combustible gas present alarm setpoint.
- Historically archive combustible gas present alarm setpoint.
- Display combustible gas present alarm with high priority.
- Historically archive combustible gas present alarm.
- Display air flow alarm low with high priority.
- Historically archive air flow alarm low.

Metasys:

- Display combustible gas % LEL.
- Display combustible gas present alarm.
- Display air flow alarm low.

OI:

- None.

LOOP 2405, STATION POWER MONITORING

IPS Functions:

Field Devices and Connections:

- None.

Hard-Wired Interlocks:

- None.

PLC AB Application Software:

Monitor and Control:

- Receive power OK status from CP-2402.
- Provide logic to generate power fail alarm from power OK status.
- Provide power fail alarm to the HMI.
- Provide power fail alarm to Metasys.

Software Interlocks:

- None.

HMI Application Software:

HMI:

- Display power fail alarm with high priority.
- Historically archive power fail alarm.

Metasys:

- Display power fail alarm.

OI:

- None.

COMPONENT SPECIFICATIONS

A. A7 pH Element and Transmitter:

1. General:
   a. Function: Measure, indicate, and transmit pH of process fluid.
   b. Type: Electrometrically measure pH without requiring electrolyte flow.
   c. Parts: Element, transmitter, interconnecting cable, and expendables.
2. Performance:
   a. Range: 0.00 to 14.00 pH units.
   b. Accuracy: 0.05 percent of span.
   c. Sensitivity: 0.05 percent of span.
   d. Stability: 0.05 percent of span per 24 hours, noncumulative.
   e. Non-linearity: 0.05 percent of span.
   f. Repeatability: 0.1 percent of span.
   g. Temperature drift:
      1) Zero: less than 0.01 percent of span per degree C.
      2) Span: less than 0.01 per cent span per degree C.
   h. Maximum Flow Rate: 3 feet per second.
3. Features: Automatic compensation for process liquid temperatures minus 10 to 110 degrees C (14 to 230 degrees F).
4. Element:
   a. Type: 5-wire differential, unless otherwise noted.
   b. Process Electrode: Glass, unless otherwise noted.
   c. Ground Electrode: Titanium.
   d. Body Material: Liquid crystal polymer, unless otherwise noted.
   e. Liquid Junction (if applicable): Wood/Kynar, unless otherwise noted.
   f. Features: Integral preamplifier.
   g. Sensitivity: Less than 0.005 pH.
   h. Stability: 0.03 pH units for 24 hours, non-cumulative.
   i. Operating Conditions: Capable of withstanding up to 40 psig at 140 degrees F, unless otherwise noted.
   j. Mounting/Process Connection: As noted, from among the following:
      1) As shown on Drawings.
      2) Immersion:
         a) CPVC pipe (1-inch diameter by 4.5-feet long).
         b) Coupling.
         c) Sensor protector.
         d) PVC pipe-mount J-box.
         e) Interconnecting cable.
      3) Flow-Through Mounting:
         a) CPVC 1-1/2-inch tee and aluminum J-box.
         b) Rated for 100 psig at 150 degrees F.
         c) Interconnecting cable.
      4) Union mounting:
         a) CPVC 2-inch special tee and aluminum J-box.
         b) Rated for 100 psig at 140 degrees F.
         c) Interconnecting cable.

5. Transmitter:
   a. Features:
      1) Indicator: LCD with LED backlighting.
         a) Main Display: pH.
         b) Auxiliary Display: Temperature, sensor diagnostics, etc.
      2) Scale Range: 0.0 to 14.0 pH units, 00.00 to 14.00 pH units, field selectable.
   b. Signal Interface:
      1) Analog Output:
         a) Two isolated 4 to 20 mA dc for load impedance 0 to 900 ohms, unless otherwise noted.
         b) Output proportional to pH and process temperature, unless otherwise noted.
      2) Discrete Contacts:
         a) Two SPDT plus one SPST rated 5 amp continuous at 120V ac, unless otherwise noted.
         b) Each Contact Set Point: Fully adjustable for pH or temperature.
   c. Enclosure:
      1) Type: NEMA 4X.
      2) Mounting: Wall, unless otherwise noted.
   d. Power: 105-250V ac, 50/60-Hz.
6. Cable: 10 feet standard; Length as required to accommodate device location.
7. Expendables (for Each Unit Provided):
   a. Chemicals: 1 pint each of buffer solution for pH 4, pH 7, and pH 10.
   b. Salt Bridge: One double junction salt bridge, containing ceramic inner junction, binary fill solution, and O-ring.
   c. Standard Cell Replacement Solution: One container, 500 milliliters pH.
8. Manufacturers:
   a. GLI, International: Model P63 pH analyzer and model 60X8P0 differential pH sensor.
   b. Rosemount Analytical; Model 1054B pH transmitter and Model 381 pH element.
   c. Foxboro; Model 873 transmitter and Model 871 pH element.

B. A10 Combustible Gas Element and Transmitter:

1. General:
   a. Function: Continuously monitor ambient air for the lower explosive limit (LEL) of combustible hydrocarbon based gases.
   b. Type: Multi-channel transmitter with poison-resistant catalytic bead elements.
   c. Parts: Elements, transmitter, interconnecting cables, calibrator, and calibration check kit. Note that this is a multi-point instrument which may have several different types of sensors for each transmitter.
2. Performance:
   a. Range: 0 to 100 percent LEL.
   b. Resolution: 0.1 percent LEL.
   c. Repeatability: Plus or minus 1 percent of full scale.
   d. Analog Output Accuracy: Plus or minus 1 percent full scale.

e. Sensor Life: 1 year, minimum.
f. Temperature, Operating:
1) Element: Minus 40 to plus 200 degrees F.
2) Monitor: Plus 32 to 125 degrees F.
g. Humidity, Operating: 0 to 95 percent, noncondensing.

3. Element (Sensor):
a. Type: Combustible gas sensor, catalytic bead type.
b. Gas Monitored: As noted for each element.
c. Calibration: Wireless calibration receiver using a digital coded infrared light from remote calibrator.
d. Enclosure: Suitable for NEC, Class 1, Division 1, Groups C and D hazardous areas.
e. Mounting: Wall.
f. Signal Interface: Digital or frequency transmitted via interconnecting cable.
g. Power: 14V dc obtained from transmitters via interconnecting cable.

4. Transmitter (Monitor):
a. Input: Separate, independent input for each sensor.
b. Number of Channels: As noted.
c. Indicator: Three-digit LED readout to display the value measured by each sensor in units 0 to 100 percent LEL.
d. Alarm Indication: Separate alarm lights for caution, warning, and alarm for each sensor.
e. Alarm Set Points: Three separate alarm set points for each sensor independently adjustable for any value in range.
f. Audible Alarm: Horn, buzzer, or tone when alarm condition occurs.
g. Discrete Outputs:
1) Relay contact outputs for each set point noted.
2) One relay contact output to indicate system power loss, sensor signal loss, and 15 percent or greater under range.
h. Signal Interface:
1) Contacts: When noted or shown, Form C, SPDT rated 5A resistive at 120V ac, minimum.
2) Analog Output: 4 to 20 mA dc, for each channel representing measured gas concentration, for load impedance 0 to 250 ohms minimum for 24V dc supply without load adjustments.
i. Enclosure:
1) Type: NEMA 12, unless otherwise noted.
2) Mounting: Wall, unless otherwise noted.
j. Power: 115V ac, 60-Hz, unless otherwise noted.

5. Cables:
a. Type: As recommended or provided by the manufacturer.
b. Length: As required to accommodate the device locations.

6. Calibration System:
a. Zero and Span Adjustment: One remote control calibrator unit for calibration of all combustible gas sensors, without declassifying the area, and without opening the sensor enclosure.
b. Calibration Check Kit: With all accessories, including cylinder(s) of the gas(es) being monitored.

7. Manufacturers:
a. MSA Instrument; Series 5000.
b. Bacharach, Inc.

C. A19 Hydrogen Sulfide Element and Transmitter:

1. General:
   a. Function: Continuously monitor ambient air for hydrogen sulfide gas.
   b. Type: Multi-channel transmitter with electrochemical element(s) to sense hydrogen sulfide.
   c. Parts: Element(s), transmitters, interconnecting cables, calibrator, and calibration check kit.
2. Performance:
   a. Range: 0 to 50 ppm, unless otherwise noted.
   b. Resolution: 0.1 ppm.
   c. Repeatability: Plus or minus 1 percent of full scale.
   d. Analog Output Accuracy: Plus or minus 1 percent of full scale.
   e. Sensor Life: 1 year, minimum.
   f. Temperature, Operating:
      1) Element: Minus 10 to plus 120 degrees F.
      2) Transmitter: Plus 32 to 125 degrees F.
   g. Humidity, Operating: 0 to 95 percent noncondensing.
3. Element (Sensor):
   a. Quantity: As noted.
   b. Type: Electrochemical, for monitoring hydrogen sulfide gas.
   c. Calibration: Wireless calibration receiver using digital coded infrared light from remote calibrator.
   d. Enclosure: Suitable for NEC, Class 1, Division 1, Groups C and D hazardous areas.
   e. Mounting: Wall.
   f. Signal Interface: Digital or frequency transmitted via interconnecting cable.
   g. Power: 14V dc obtained from transmitters via interconnecting cable.
4. Transmitter (Monitor):
   a. Input: Separate, independent input for each sensor.
   b. Number of Channels: As noted.
   c. Indicator: Three-digit LED readout to display value measured by each sensor, in units of ppm.
   d. Alarm Indication: Separate alarm lights for caution, warning, and alarm for each sensor.
   e. Alarm Set Points: Three separate alarm set points for each sensor independently adjustable for any value in range.
   f. Audible Alarm: Horn, buzzer, or tone when alarm condition occurs.
   g. Discrete Outputs:
      1) Relay contact outputs for each set point noted.
      2) One relay contact output to indicate system power loss, sensor signal loss, and 15 percent or greater under range.
   h. Signal Interface:
      1) Contacts: When noted or shown, Form C, SPDT rated 5 amps resistive at 120V ac, minimum.
      2) Analog Outputs: 4 to 20 mA dc, for each channel representing measured gas concentration, for load impedance of 0 to 250 ohms minimum for 24V dc supply without load adjustments.
   i. Enclosure:
      1) Type: NEMA 12, unless otherwise noted.
      2) Mounting: Wall, unless otherwise noted.
   j. Power: 120V ac, 60 Hz, unless otherwise noted.

5. Cables:
   a. Type: As recommended or provided by manufacturer.
   b. Length: As required to accommodate device locations.
6. Calibration System:
   a. Zero and Span Adjustment: One remote control calibrator unit for calibration of each gas sensor without declassifying area and without opening sensor enclosure.
   b. Calibration Check Kit: With all accessories, including cylinders of 10 ppm and 40 ppm hydrogen sulfide calibration gas.
7. Manufacturers and Products:
   a. MSA Instrument; Series 5000.
   b. Bacharach, Inc.

D. A21 Dissolved Oxygen Element and Transmitter, Nonmembrane:

1. General:
   a. Function: Continuous measurement of dissolved oxygen (DO) concentration of process fluid in an open channel.
   b. Type:
      1) Nonmembrane sensor.
      2) Metal electrode concentric rings with rotating grindstone for polishing.
   c. Parts: Element (sensor), transmitter (analyzer), external power supply, interconnecting cable, mounting hardware, and ancillaries.
2. Performance:
   a. Range:
      1) 0-15 mg/L with iron electrode.
      2) 0-25 mg/L with zinc electrode.
   b. Sensor Accuracy:
      1) For Flow Rate Less than 1.5 fps:
         a) Plus or minus 0.2 mg/L for DO less than 5 mg/L.
         b) Plus or minus 0.3 mg/L for DO greater than 5 mg/L.
      2) Response Time: Less than 3 seconds to 90 percent of value upon step change.
   c. Analyzer:
      1) Accuracy: 0.05 percent of span.
      2) Stability: 0.05 percent of span per 24 hours, noncumulative.
      3) Repeatability: 0.10 percent of span or better.
      4) Temperature Drift:
         a) Zero: 0.01 percent of span per degree centigrade.
         b) Span: 0.01 percent of span per degree centigrade.
   d. Temperature Compensation: Automatic thermocompensator for process liquid temperatures 32 to 95 degrees F.
3. Element:
   a. Self-cleaning using rotating grindstone which continuously polishes spring-loaded concentric metal electrode rings.
   b. Nonmembrane.
   c. Iron and silver amalgam electrodes, unless otherwise noted.
   d. Process Temperature Range: 37 to 86 degrees F.
   e. Flow Rate: None required.

f. Submersion Depth: 20 inches minimum, 100 feet maximum.
g. Sensor Cable: Integral 16 feet of cable.

4. Transmitter:
   a. Display:
      1) Graphic dot matrix LCD with LED backlighting.
      2) 1/2-inch main display readout height.
      3) Menu screens include up to six lines of text.
      4) Main Display: 0 to 25 ppm DO or 0 to 200 percent saturation, user selectable.
      5) Auxiliary Readout:
         a) Temperature.
         b) DO in units not selected in main display.
         c) Diagnostic warnings.
         d) Error messages.
         e) Other information.
   b. Ambient Conditions:
      1) Temperature minus 22 to plus 140 degrees F.
      2) Humidity: 0 to 95 percent, relative, noncondensing.
   c. Temperature Compensation: Automatic, 0 to 40 degrees C.
   d. Calibration Methods: Supports calibration by portable DO meter, lab analyzed sample, or saturated air.
   e. Nonvolatile memory backup.
   f. Real-time clock, maintained by lithium battery when power is interrupted.
   g. Electromagnetic/Radio Frequency Interferences (EMI/RFI) Immunity:
      1) Unless otherwise noted, standard protection consisting of metal enclosure and line power filters.
   h. Signal Interface:
      1) Analog Output:
         a) Isolated 4 to 20 mA dc for load impedance up to 900 ohms for 24V dc power supply without load adjustment.
         b) Configurable for either DO or temperature.
      2) Relay Outputs:
         a) Unless otherwise noted, three electromechanical relays; two SPDT; one SPST; rated at 5 amps resistive for either 115V ac or 30V dc.
         b) Each relay assignable to either DO or temperature.
         c) Function:
            (1) Control: Settings for fail safe on/off, high/low phasing, set point, deadband, and on/off displays.
            (2) Alarm: Settings for fail safe on/off, high alarm point, high alarm point deadband, low alarm point, low alarm point deadband, and on/off relays.
      3) Discrete TTL Outputs: Three isolated auxiliary outputs suitable for NAMUR diagnostic signaling, as follows:
         a) Instrument “offline” for calibration or maintenance.
         b) Software/system alarms in “warn” state.
         c) Software/system alarms in “fail” state.

i. Enclosure:
1) NEMA 4X polycarbonate/aluminum.
2) Dimensions: 6H by 8W by 6D inches, nominal.
j. Mounting Hardware: Suitable to support panel, surface, horizontal pipe, and vertical pipe mounting.
k. Power Requirements: 120V ac, 50/60-Hz.
l. Stainless steel equipment tag.

5. External Power Supply:
a. Required to provide power to sensor motor.
b. Operating Temperature: Minus 22 to 140 degrees F.
c. Power Requirements: 120V ac, 50/60-Hz.
d. Enclosure:
1) NEMA 4X Norel (UV stabilized).
2) Dimensions: 12H by 8W by 5D inches, nominal.
e. Mounting Hardware: Suitable to support surface, horizontal pipe, and vertical pipe mounting.

6. Interconnecting Cable: Length as required to accommodate device locations, i.e.:
a. Sensor, external power supply, and analyzer.

7. Junction Box: Provide junction box and extension cable as required.

8. Accessories:
a. Unless otherwise noted, provide submersion mounting hardware and mounting bracket:
1) 37-inch long PVC pipe, 1-1/2-inch diameter.
2) PVC coupling for sensor.
3) PVC bushing with wire handle.
4) Mounting Bracket: 20-inch holder arm.
5) Protection Cylinder: If noted.
6) Bubble Deflector: If noted.

9. Expendables:
a. Grinding Stones: Two for each unit provided.
b. Electrodes: One of each type for each unit provided.

10. Manufacturer and Product:
a. GLI International; Model Z63/5040 “Züllig” Dissolved Oxygen System.

E. D2 Sludge Density Element and Transmitter:

1. General:
a. Function: Measure, indicate and transmit the sludge density of a process fluid.
b. Type: Infrared back-scatter.
c. Parts: Element, transmitter, interconnecting cable(s) and accessories.

2. Performance:
a. Range: 0 to 5 percent solids.
b. Accuracy: Plus or minus 5 percent full scale.
c. Repeatability: Plus or minus 1 percent full scale.
d. Linearity: Plus or minus 3 percent full scale.

3. Element:
a. Features: Mechanism for periodically drawing liquid into sampling chamber and cleaning its optical surfaces at each sample cycle.
b. Mounting: Pipe mounted.
c. Mounting Requirements:
1) Pipe Mounted: Provide standard pipe thread-o-let, 1-1/4-inch, and safety chain. Pipe size as noted.
d. Rated for 70 psig maximum operating pressure.

4. Transmitter:
   a. Indicator: Digital with membrane keypad..
   b. Scale Range: 0 to 5 percent solids.
   c. Enclosure:
      1) Type: NEMA 4X, unless otherwise noted.
      2) Mounting: Wall unless otherwise noted.
   d. Signal Interface:
      1) Output: Isolated 4 to 20 mA dc for load impedance 0 to 700 ohms minimum for 24V dc supply without load adjustments.
   e. Power: 120V ac, 60-Hz.
5. Cables:
   a. Field Mounted Transmitter: Cable length as required to accommodate the device location.
6. Accessories:
   a. Calibration Kit: One for each unit provided.
7. Manufacturer: Partech; Model 7200 with IL55 sensor.

F. F1 Flow Element and Switch, RF Type:

1. General:
   a. Function: Operate contact when pipe is filled with liquid.
   b. Type: RF electronic.
   c. Parts: Element, switch, and cable.
2. Service:
   a. Fluid: Water unless otherwise noted.
   b. Pressure: As noted.
   c. Temperature: As noted.
3. Element:
   a. Type: Thin cylindrical section that fits between flanges without obstructing liquid flow.
   b. Ring: Epoxy-coated Type 316 stainless steel.
   c. Insulation: PVC on adjacent pipe flanges.
   d. Process Connections:
      1) Line Size: As noted.
      2) Connection Type: 150-pound ANSI flanges.
4. Electronics:
   a. Features:
      1) Relay Action: De-energize in absence of liquid; fail-safe protection circuit.
      2) Time Delay: Adjustable up to 30 seconds for pump startup and shutdown.
      3) Enclosure Type: NEMA 4.
   b. Mounting: Wall.
   c. Signal Interface: Contact: DPDT rated 5A continuous at 120V ac.
   d. Power:
      1) 120V ac, 60 Hz, unless otherwise noted.
      2) Fail-safe protection circuit.
5. Cables:
   a. Type: As required.
   b. Length: As required.
6. Manufacturers and Products:
   a. Drexelbrook Engineering; Series 506-7000.
   b. Princo Instruments; Null-Kote, Model L2515 or L2545 with Type L630 series sensor flange.

G. F4 Flow Element and Transmitter, Electromagnetic:

1. General:
   a. Function: Measure, indicate, and transmit the flow of a process liquid in a full pipe.
   b. Type: Electromagnetic flowmeter, with operation based on Faraday's Law, utilizing the pulsed dc type coil excitation principle with high impedance electrodes.
   c. Parts: Flow element, transmitter, interconnecting cables, mounting hardware, and calibrator.
2. Service:
   a. Stream Fluid: As noted.
   b. Flow Stream Descriptions:
3. Performance:
   a. Flow Range: As noted.
   b. Accuracy: Plus or minus 1 percent of rate for all flows resulting from pipe velocities of 1 to 33 feet per second.
   c. Turndown Ratio: Minimum of 10 to 1 when flow velocity at minimum flow is at least 1 foot per second.
4. Features:
   a. Zero stability feature to eliminate the need to stop flow to check zero alignment.
   b. No obstructions to flow.
   c. Very low pressure loss.
5. Process Connection:
   a. Meter Size: As noted.
   b. Connection Type: 150-pound ANSI raised-face flanges or wafer style depending on meter size, unless otherwise noted.
   c. Flange Material: Carbon steel, unless otherwise noted.
6. Signal Interface:
   a. 4 to 20 mA dc for load impedance 0 to 800 ohms minimum for 24V dc supply.
7. Power: 120V ac, 60-Hz, unless otherwise noted.
8. Element:
   a. Meter Tube Material: 304 stainless steel, unless otherwise noted.
   b. Liner Material: Teflon, unless otherwise noted.
   c. Liner Protectors: Covers on each end to protect liner during shipment.
   d. Electrode Type: Flush or bullet nose as recommended by the manufacturer for the noted stream fluid.
   e. Electrode Material: Type 316 stainless steel, unless otherwise noted.
   f. Enclosure: NEMA 4, unless otherwise noted.
   g. Grounding Ring/Electrode Material: Type 316 stainless steel, unless otherwise noted.
9. Transmitter:
   a. Display: Blind or indicating and/or totalizing as noted.
   b. Mounting: Pipe stand, wall, panel, or integral as noted.
   c. Enclosure: NEMA 4X.
   d. Zero and Span: Field adjustable.
   e. Indicator: Digital 16-character display, with scale range as noted.
   f. Totalizer: Digital 16-character display, with totalizer unit digit value as noted.

10. Cables:
    a. Types: As recommended by manufacturer.
    b. Lengths: As required to accommodate device locations.
11. Calibration System:
    a. Features:
        1) Field programmable electronics.
        2) Self-diagnostics with troubleshooting codes.
        3) Ability to program electronics with full scale flow, engineering units, meter size, zero flow cutoff, desired signal damping, totalizer unit digit value, etc.
        4) Initial flow tube calibration and subsequent calibration checks.
    b. Equipment:
        1) Built-in electronics with each unit provided.
        2) Alternatively, one portable calibrator of each type required for the various electromagnetic flowmeters provided on the project.
12. Manufacturers:
    a. Sparling Instruments; Tigermags, Model FM625 or FM655, as applicable;
    b. Foxboro; Series 8000 or Series 2800 flow tube with Model 896 transmitter, as applicable;
    c. Fischer & Porter; miniMAG, COPA-X or MAG-X, as applicable;
    d. Rosemount; Model 8701 flow tube with Model 8712 transmitters.

H. F51 Flow Element and Transmitter, Thermal Mass Flow:

1. General:
    a. Function: Directly measure, indicate, and transmit the mass flow of the gas in the pipeline.
    b. Type: Insertion type, thermal dispersion detection probe using platinum resistance temperature detectors (RTD).
    c. Parts: Element and transmitter.
2. Performance:
    a. Process Gas: Air, nitrogen, flue gas; unless otherwise noted.
    b. Range:
        1) As noted, within the following:
            a) 0.25 to 1,600 standard fps.
            b) 0.25 to 200 actual fps.
    c. Flow Turndown: As noted, to 100:1.
    d. Accuracy:
        1) Flow: Plus or minus 1 percent of reading plus 0.5 percent full scale.
        2) Temperature: Plus or minus 2 degrees F.
    e. Repeatability:
        1) Flow: Plus or minus 0.5 percent of reading.
        2) Temperature: Plus or minus 1 degree F.
    f. Temperature, Operating:
        1) Flow Element: Minus 50 to plus 350 degrees F, unless otherwise noted.
        2) Transmitter Housing: 0 to plus 150 degrees F.
    g. Pressure, Operating, Flow Element: Up to 300 psig, unless otherwise noted.

3. Flow Element:
   a. Features:
      1) Insertion Length: As noted or as required by manufacturer's recommendation.
      2) Wetted Surfaces Materials: Type 316 stainless steel with nickel braze, unless otherwise noted.
   b. Process Connections:
      1) Line Size: As noted or shown.
      2) Connection Type: 1-inch MNPT, unless otherwise noted.
      3) Connection Material: Type 316 stainless steel, unless otherwise noted.
   c. Sensor Termination Enclosure:
      1) Type: Aluminum, NEMA 4X, rated for Classes 1 and 2, Divisions 1 and 2, Groups B, C, D, E, F, G, and Eexd IIC; unless otherwise noted.
   d. Process Orientation: Horizontal, unless otherwise noted.
4. Transmitter:
   a. Features: 4-line by 20-character LCD, keypad programmable.
   b. Nonvolatile memory.
   c. Signal Interface:
      1) Outputs:
         a) Analog: Two 4 to 20 mA dc for maximum 600 ohm load, unless otherwise noted.
         b) Discrete:
            (1) Two independently adjustable 10 amp at 115V ac or 12V dc
            (2) Configurable as high, low, or windowed flow; or high, low, or windowed process temperature.
      2) Communication: RS-232C serial port enables remote adjustment and reading of process values and set points.
   d. Power:
      1) Selectable: 115V ac, 230V ac, 24V dc.
   e. Electrical Connection: 1-inch FNPT.
   f. Transmitter Enclosure:
      1) Type: Fiberglass NEMA 4X, unless otherwise noted.
      2) Mounting: Remote from sensor.
5. Cables:
   a. Type: 8 conductor shielded.
   b. Length: 10 feet, unless otherwise noted.
   c. Cable Jacket: PVC (rated for 220 degrees F), unless otherwise noted.
6. Manufacturer:
   a. Fluid Components, Inc.; Model GF90.
   b. Kurz Instruments; Series 452/155.
   c. Sierra Instruments; Series 640S.

I. L5 Level Element and Transmitter, Ultrasonic:

1. General:
   a. Function: Continuous, noncontacting level measurement..
   b. Type: Ultrasonic.
   c. Parts: Element, transmitter, and interconnecting cable between element and transmitter.

2. Service:
   a. Vapor Space Pressure: Atmospheric, unless otherwise noted..
   b. Operating Temperature Range:
      1) Element: Minus 40 to plus 200 degrees F.
      2) Transmitter: Minus 5 to 140 degrees F.
3. Performance:
   a. Range: As noted.
   b. Zero Reference: As noted.
   c. Accuracy: Plus or minus 0.25 percent.
   d. Resolution: 2 mm or 0.1 percent of range, whichever is greater.
   e. Blanking Distance: As short as 1-foot.
4. Element:
   a. Waterproof/weatherproof.
   b. Housing and Face: Kynar, unless otherwise noted.
   c. Process Connection: 1-inch NPT, unless otherwise noted.
   d. Rating: Factory Mutual (FM) approval for use in the following hazardous environments without the use of intrinsically safe relays: Class I, Division I, Groups A, B, C, D, and Class II, Division I, Groups E, F, and G.
   e. Beam Angle: 12 degrees or less.
   f. Integral temperature compensation.
5. Transmitter:
   a. Microprocessor based with removable keyboard operator interface.
   b. Enclosure: NEMA 4 polycarbonate, unless otherwise noted.
   c. Power Supply: 115-volt, 50/60 Hz, unless otherwise noted.
   d. Isolated Analog Output:
      1) Milliamp current loop for load impedance of 0 to 750 ohms.
      2) Milliamp current loop programmable as 4-20, 0-20, 2-4, 0r 20-0 mA.
   e. Discrete Outputs: Five SPDT contacts, rated at 10 amps, continuous, at 115VAC.
   f. Display:
      1) Four digit LCD.
      2) High contrast 18 mm (0.7-inches).
      3) In standard engineering units (feet, inches, or centimeters); volumetric conversion.
      4) Alarm Messages: Loss of echo and cable circuit open or shorted.
   g. Filters, Electronic:
      1) For agitator blade echoes.
      2) To remove small variations from surface waves.
6. Interconnecting Cable: Weatherproof, length as required.
7. Manufacturers/Models:
   a. Milltronics, Multiranger Plus.
   b. Endress & Hauser, FMU-860.
   c. Milltronics, Hydroranger I.

J. L8 Level Switch, Float:

1. General:
   a. Function: Actuate contact at preset liquid level.
   b. Type: Direct-acting float with an enclosed mercury switch and integral cable.

2. Service: Liquid; water, wastewater, unless otherwise noted.
3. Performance:
   a. Set Point: As noted.
   b. Differential: 1-inch maximum.
   c. Temperature: 0 to 180 degrees F.
4. Features:
   a. Entire Assembly: Watertight and impact-resistant.
   b. Float Material and Size: Polyethylene/foam filled; 4.5-inch diameter tear drop.
   c. Cable:
      1) Combination support and signal.
      2) Length as noted or as necessary per mounting requirements.
      3) Type SO nitrile PVC jacket, AWG No. 18/2 or No. 18/4.
   d. Mounting:
      1) Pipe:
         a) Cable-to-pipe clamp, corrosion-proof cable for 1-inch pipe.
         b) Pipe-to-wall bracket for 1-inch pipe.
      2) Suspended Type: As noted.
5. Signal Interface:
   a. Switch Type: Mercury tilt.
   b. Switch Contacts:
      1) Isolated, rated 4.5A continuous at 120V ac.
      2) As required (for example 1NO, 1NO+1NC) to meet functional requirements, or as shown.
6. Manufacturers and Products:
   a. Consolidated Electric Co.; Model LS.
   b. Anchor Scientific; Roto-Float, Type P/Type S.

K. L11 Level Element and Transmitter, Guided Level Radar:

1. General:
   a. Function: Measure and transmit product level in vessel.
   b. Type: Guided level radar using low power radio frequency source:
      1) Two-wire transmitter.
      2) “Smart” electronics.
   c. Parts: Probe, transmitter with electronics and local readout.
2. Service:
   a. Process Fluid: Sump fluid.
   b. Vessel Material: Concrete.
3. Performance:
   a. Range: 0 to 26 feet.
   b. Linearity: Plus or minus 3 mm.
   c. Ambient Temperature: Minus 40 to plus 176 degrees F.
   d. Process Pressure and Temperature Limits: Minus 22 degrees F to plus 302 degrees F and vacuum to 586 psig.
   e. Vessel Agitation: 4 horsepower maximum.
4. Element:
   a. Type: 304 stainless steel cable with end weight.
   b. Connection Type: 3/4-inch NPT.
   c. Insertion Length: As required to accommodate specified range and vessel dimensions.
   d. Process Wetted Parts: Type 304 stainless steel cable.
   e. 4 mm diameter, nominal.

5. Transmitter:
   a. Integral.
   b. Enclosure: NEMA 4X.
   c. Signal Interface: 4 to 20 mA dc output with Hart protocol for load impedance 0 to 660 ohms minimum for a nominal 24V dc supply without load adjustment.
   d. Minimum Response Time: 1 second.
   e. Indicator: Digital LCD.
6. Accessories:
   a. Calibration Device: Hart hand-held communicator.
   b. Calibration Software Package:
      1) Windows 2000 based.
      2) CD ROM or floppy disk.
      3) Model FXA 191 Commubox.
      4) Model ToF Tool software.
7. Manufacturer: Endress and Hauser; Model FMP40-AAC2CNJB21CA.

L. M9 Three Position Selector Switch

1. General:
   a. Function: Select discrete control functions.
   b. Type: Heavy-duty, corrosion-resistant, industrial.
2. General Features:
   a. Mounting: 30.5 mm single round hole. Panel thickness 1/16 inch to ¼ inch.
   b. Legend Plate: Standard size square style laminate with white field and black markings, unless otherwise noted. Markings as shown.
   c. Configuration: Three Position maintained.
3. Switch Features:
   a. Guard: Full guard with flush button, unless otherwise noted.
   b. Operator: Black pushbutton, black non illuminated knob on switch, unless otherwise noted.
   c. Boot: None, unless otherwise noted.
4. Signal Interface:
   a. Contact Block:
      1) Type: Silver-coated butting, unless otherwise noted.
      2) Rating: 10 amps continuous at 120V ac or as noted.
      3) Sequence: Break-before-make, unless otherwise shown.
      4) Arrangement: Normally open or normally closed as shown, or to perform the functions noted.
      5) Terminals: Screw with strap clamp, unless otherwise noted.
5. NEMA Rating: NEMA 4, watertight, dusttight, and NEMA 4X, corrosion-resistant.
6. Manufacturers:
   a. Allen-Bradley; Bulletin 800H.
   b. Eaton Corp.; Cutler-Hammer, Type E34.
   c. Square D Co.; Class 9001, Type SK.

M. M26 Pushbutton Switch, Corrosion, Round

1. General:
   a. Function: Select, initiate, discrete control functions.

b. Type: Heavy-duty, corrosion-resistant, industrial.

2. General Features:
   a. Mounting: 30.5 mm single round hole. Panel thickness 1/16 inch to ¼ inch.
   b. Legend Plate: Standard size square style laminate with white field and black markings, unless otherwise noted. Markings as shown.
   c. Configuration: pushbutton.
3. Pushbutton and Switch Features:
   a. Guard: Full guard with flush button, unless otherwise noted.
   b. Operator: Black pushbutton, unless otherwise noted.
   c. Boot: None, unless otherwise noted.
4. Signal Interface:
   a. Contact Block:
      1) Type: Silver-coated butting, unless otherwise noted.
      2) Rating: 10 amps continuous at 120V ac or as noted.
      3) Sequence: Break-before-make, unless otherwise shown.
      4) Arrangement: Normally open or normally closed as shown, or to perform the functions noted.
      5) Terminals: Screw with strap clamp, unless otherwise noted.
5. NEMA Rating: NEMA 4, watertight, dusttight, and NEMA 4X, corrosion-resistant.
6. Manufacturers:
   a. Allen-Bradley; Bulletin 800H.
   b. Eaton Corp.; Cutler-Hammer, Type E34.
   c. Square D Co.; Class 9001, Type SK.

N. M27 Indicator Light, Corrosion, Round

1. General:
   a. Function: Display discrete functions.
   b. Type: Heavy-duty, corrosion-resistant, industrial.
2. General Features:
   a. Mounting: 30.5 mm single round hole. Panel thickness 1/16 inch to ¼ inch.
   b. Legend Plate: Standard size square style laminated with white field and black markings, unless otherwise noted. Markings as shown.
   c. Configuration: Light, pushbutton, or switch as noted or shown.
3. Light Features:
   a. Lights: LED lamps and integral transformer for operation for operation from 120V ac, unless otherwise noted.
   b. Lens Color: Color as specified under PANEL, STANDARD LIGHT COLOR AND INSCRIPTIONS, or as noted.
   c. Guard: Full guard.
4. Signal Interface:
   a. Terminals: Screw with strap clamp, unless otherwise noted.
5. NEMA Rating: NEMA 4, watertight, dusttight, and NEMA 4X, corrosion-resistant.
6. Manufacturers:
   a. Allen-Bradley; Bulletin 800H.
   b. Eaton Corp.; Cutler-Hammer, Type E34.
   c. Square D Co.; Class 901, Type SK.

O. M30 Horn, Indoor/Outdoor:

1. General:
   a. Function: Audible alarm.
2. Performance:
   a. Temperature, Operating: Minus 65 to 150 degrees F.
   b. Sound Output Level: 100 dB nominal at 10 feet.
3. Features:
   a. Dimensions: 4-3/8 inches in height and width, and 2.5 inches in depth, for horn and enclosure.
   b. Diaphragm: Stainless steel.
   c. Projector: None, unless otherwise noted.
   d. Listings: UL listed, FM, CSA approved.
4. Enclosure:
   a. Type: Cast aluminum neoprene-gasketed weatherproof housing.
   b. Mounting: Surface mount.
5. Power: 120V ac, 50/60-Hz, unless otherwise noted.
6. Manufacturer: Federal Signal Corp.; Model 350WB.

P. M31 Warning Light, Indoor/Outdoor:

1. General:
   a. Function: Visual alarm.
   b. Type: Rotating reflector or flashing bulb.
   c. Parts: Light and spare bulbs.
2. Performance:
   a. Temperature, Operating: Minus 35 to 190 degrees F.
   b. Flash Rate: Nominally 90 per minute.
3. Features:
   a. Dome Color: Amber, unless otherwise noted.
   b. Lamp Life: 200 hours.
   c. Lamp: Incandescent/25 watts.
4. Enclosure:
   a. Type: Water-resistant closed cell neoprene gasket.
   b. Mounting: Wall bracket, unless otherwise noted.
   c. UL Listing: Indoor/outdoor use.
5. Power: 120V ac, 50/60-Hz.
6. Spare Bulbs: Two for each light.
7. Manufacturers:
   a. Federal Signal; Model 225.
   b. Benjamin Electric Manufacturing; Series KL-4000.

Q. P3 Pressure Differential Transmitter, Electronic:

1. General:
   a. Function: Measure differential pressure and transmit signal proportional to differential pressure, flow, or level.
   b. Type: Electronic variable capacitance; two-wire transmitter; “smart electronics.”
   c. Parts: Transmitter; three-valve manifold, and communicator.
2. Performance:
   a. Range: As noted.
   b. Maximum Adjustable Range: Noted range shall be between 40 percent and 80 percent of the maximum adjustable range.
   c. Accuracy: Plus or minus 0.075 percent of span, unless otherwise noted.

d. Temperature: Operating range minus 20 degrees F to plus 150 degrees F, minimum.

3. Features:
   a. Square Root Extraction: When noted.
   b. Damping: Fluid or electronic type with adjustment.
   c. Indicator: Four-digit LCD indicating the noted range.
   d. Suppressed or Elevated Zero: When noted.
   e. Materials: Wetted parts including process flanges and drain/vent valves, 316 stainless steel, unless otherwise noted.
   f. Wetted O-Rings: Glass Filled TFE, Graphite Filled PTFE or Viton, unless otherwise noted.
   g. Fill Fluid: Silicone, unless otherwise noted.
4. Signal Interface:
   a. 4 to 20 mA dc output for load impedance of 0 to 500 ohms minimum without load adjustment with 24V dc supply.
   b. Digital process variable signal superimposed on 4-20 mA signal; support HART® protocol type device.
5. Enclosure:
   a. Type: NEMA 4X, unless otherwise noted.
   b. Mounting: Pipe or wall as noted. Provide stainless steel brackets with stainless steel bolts.
   c. Housing: Modular with separate compartments for electronics and field connections. Epoxy coated aluminum, unless otherwise noted
6. Three-Valve Manifold:
   a. Provide, unless otherwise noted.
   b. Materials: Type 316 stainless steel.
7. Communicator:
   a. Quantity: One per lot of Component P3 devices provided under Contract, unless otherwise noted.
   b. Features:
      1) Program Memory: 8.0 MB, unless otherwise noted.
      2) Transmitter Data: 2 KB, unless otherwise noted.
      3) Battery Pack: Disposable AA 1.5V batteries, unless otherwise noted.
      4) Factory Mutual (FM) Intrinsic Safety Approval: Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D.
   c. Manufacturer and Product: HART® Communicator.
8. Manufacturers:
   a. Rosemount; Model 3051CD.
   b. SMAR: LD301 Series.
   c. Foxboro; Series IDP10.

R. P4 Pressure Gauge:

1. General:
   a. Function: Pressure indication.
   b. Type: Bourdon tube.
2. Performance:
   a. Scale Range: As noted.
   b. Accuracy: Plus or minus 0.50 percent of full scale.
3. Features:
   a. Liquid Filled: Required unless otherwise noted.
      1) Glycerin fill, unless otherwise noted.
   b. Dial: 4-1/2-inch diameter, unless otherwise noted.
   c. Case Material: Black phenolic plastic, unless otherwise noted.

d. Element Material: Phosphor-bronze, unless otherwise noted.
e. Throttling Devices.
1) Pulsation Dampener required, unless otherwise noted.
2) Brass, unless otherwise noted.
f. Pointer: Micrometer-adjustable.
g. Movement: Stainless steel, teflon coated bearings, rotary geared.
h. Window: Glass, unless otherwise noted.
i. Socket Materials: brass, unless otherwise noted.
j. Threaded reinforced polypropylene front ring for easy zero adjustment.
k. Case Type: Solid front with solid wall between window and element. Rear of case, gasketed pressure relief.

4. Process Connection:
a. Mounting: Lower stem, unless otherwise noted.
b. Size: 1/2-inch, unless otherwise noted.
c. Connection Type: Threaded (NPT).

5. Manufacturers and Products:
a. Ashcroft; Duragauge Model 1279/1379.
b. Weksler; Royal Process Gauge Model AAXX.
c. Ametek U.S. Gauge; Solfrunt Model 19XX.

S. P6 Pressure Seal, Diaphragm:

1. General:
a. Function: Isolate sensing element from process fluid.
b. Type: Fluid filled, corrosion resistant.

2. Service:
a. Pressure: Same as associated sensor.
b. Temperature: As noted.

3. Features:
a. Materials:
1) Lower Housing: 316 stainless steel, unless otherwise noted.
2) Diaphragm Material: 316 stainless steel, unless otherwise noted.
b. Bleed screw in upper housing.
c. Fill Fluid: As noted. Factory filled and assembled when possible.

4. Process Connections:
a. Instrument: 1/2-inch female NPT, unless otherwise noted.
b. Process: 1/2-inch female NPT, unless otherwise noted.
c. Connection Material: As noted.

5. Manufacturers:
a. Ametek, Mansfield and Green Division; Type SG.
b. Ashcroft; Type 101.

T. P7 Pressure Switch, Adjustable Dead Band:

1. General:
a. Function: Monitor pressure, activate switch at set point, and deactivate switch at reset point.
b. Type: Piston actuated; set point, and dead band adjustable.

2. Performance:
a. Set Point:
1) Adjustable over the full range.

2) Set as noted.
b. Reset Point: As noted.
c. Dead Band: Adjustable up to 60 percent of range.
d. Set Point Repeatability: Plus or minus 1.0 percent of range span.
e. Range: The noted set point shall fall between 20 and 80 percent of the range.
f. Maximum Pressure: Minimum 400 percent over range.

3. Features:
a. Materials:
1) Pressure Connection: Stainless steel standard for psi ranges; i.e., 15 psi and above, unless otherwise noted. Carbon steel standard for inches WC ranges; i.e., 150 inches WC and below.
2) Actuator Seal (Diaphragm): Buna-N, unless otherwise noted.

4. Process Connections: 0.25-inch NPT female connection, unless otherwise noted.
5. Signal Interface:
a. Contact Type: SPDT, rated for 10 amps at 120V ac.
b. Hermetically sealed switch, if noted.
6. Enclosure: NEMA 4X, unless otherwise noted.
7. Manufacturers and Products:
a. Ashcroft; P Series.
b. United Electric; 400 Series.

U. P9 Pressure Transmitter, Electronic:

1. General:
a. Function: Measure pressure and transmit signal proportional to pressure or level.
b. Type: Electronic variable capacitance; two-wire transmitter; “smart electronics”.
c. Parts: Transmitter and communicator.
2. Performance:
a. Range: As noted.
b. Maximum Adjustable Range: Noted range shall lie between 40 percent and 80 percent of maximum adjustable range.
c. Accuracy: Plus or minus 0.075 percent of span, unless otherwise noted.
d. Temperature: Operating range minus 20 degrees F to plus 250 degrees F, minimum.
e. Humidity: 0 to 100 percent relative humidity.
3. Features:
a. Type: Gauge pressure, unless otherwise noted.
b. Damping: Fluid or electronic type with adjustment.
c. Indicator: Four-digit LCD indicating noted range.
d. Suppressed or Elevated Zero: When noted.
e. Materials: Wetted parts including process flanges and drain/vent valves, 316 stainless steel, unless otherwise noted.
f. Wetted O-Rings: Glass filled TFE, graphite filled PTFE, or Viton, unless otherwise noted.
g. Fill Fluid: Silicone, unless otherwise noted.
4. Process Connections:
a. Line Size: 1/2 inch or 1/4 inch, selectable.
b. Connection Type: FNPT.
5. Signal Interface:

a. 4 to 20 mA dc output for load impedance of 0 to 500 ohms minimum, without load adjustment with 24V dc supply.
b. Digital process variable signal superimposed on 4-20 mA signal; support HART® protocol type device.

6. Enclosure:
   a. Type: NEMA 4X, unless otherwise noted.
   b. Mounting: Pipe or wall as noted. Provide stainless steel brackets with stainless steel bolts.
   c. Housing: Modular with separate compartments for electronics and field connections. Epoxy coated aluminum, unless otherwise noted.
7. Communicator:
   a. Quantity: One per lot of Component P9 devices provided under Contract, unless otherwise noted.
   b. Features:
      1) Keypad and LCD display.
      2) Program Memory: 8.0 MB, unless otherwise noted.
      3) Transmitter Data: 2 KB, unless otherwise noted.
      4) Battery Pack: Disposable AA 1.5V batteries, unless otherwise noted.
      5) Factory Mutual (FM) Intrinsic Safety Approval: Intrinsically safe for Class I, Division 1, Groups A, B, C and D.
      6) Manufacturer: HART® Communicator.
8. Manufacturers and Products:
   a. Gauge Pressure Units:
      1) Rosemount; Model 3051 TG.
      2) SMAR; LD301M Series.
      3) Foxboro; Model IGP10.
   b. Absolute Pressure Units:
      1) Rosemount; Model 3051 TA.
      2) SMAR; LD301A Series.
      3) Foxboro; Model IAP10.

V. P15 Pressure Seal, Annular:

1. General:
   a. Function: Sense pressure in a process line and transfer to a pressure monitoring device(s), such as a pressure gauge or switch.
   b. Type: Annular fluid-filled device that measures pressure around the full inside circumference of the pipeline.
2. Performance:
   a. Operating Conditions: Suitable for line pressures up to pipe flange rating.
3. Features:
   a. Materials:
      1) Body: Carbon steel, unless otherwise noted.
      2) Flanges: Carbon steel, unless otherwise noted.
      3) Flexible Liner: Buna-N, unless otherwise noted.
      4) Sensing Fluid: 50 percent ethylene dycol and water, unless otherwise noted.
   b. Factory Filled System: Locked-in and sealed sensing fluid which is factory filled and assembled to the pressure device(s).
4. Process Connections:
   a. ANSI 125-pound flanges, unless otherwise noted.
   b. Pipe Size: As noted.

5. Manufacturers:
   a. Red Valve Company; Series 40, Series 42.
   b. Ronningen-Petter; Iso-Spool or Iso-Ring.

W. S27 Indicator, Digital Panel:

1. General:
   a. Function: Display analog signal.
   b. Type: 7-segment digital, horizontal edgewise.
2. Performance:
   a. Range: As noted, engineering units as noted.
   b. Accuracy: Plus or minus 0.1 percent full scale.
   c. Temperature, Operating: 32 to 120 degrees F.
3. Features:
   a. Digits: 3-1/2; 0.43-inch high minimum; 7-segment LED, gas plasma, or vacuum fluorescent.
   b. Decimal Point: Field selectable.
   c. Input Impedance: 100 ohms maximum.
   d. Service Legend: Permanent, display of engineering units.
   e. Response Time: 1 second maximum to 0.1 percent accuracy.
4. Signal Interface: 4 to 20 mA dc.
5. Enclosure:
   a. Type: NEMA 1.
   b. Mounting: Panel; approximately 2-inch high, 4-inch wide, 5-inch deep.
6. Power: 120V ac, 50/60-Hz unless otherwise noted.
7. Manufacturers:
   a. Action Instruments; Model V508.
   b. Analogic; Measurometer Series, Model PI-2455 or PI-4455.
   c. Moore Industries; Model DSM.

X. T3 Temperature Element and Transmitter, Resistance:

1. General:
   a. Function: Measure the temperature of a process fluid, and transmit analog signal proportional to temperature.
   b. Type: RTD.
   c. Parts: Element, thermowell, and transmitter.
2. Service:
   a. Process Fluid: As noted.
   b. Process Temperature Range: As noted.
3. Element:
   a. Type:
      1) Single-element, unless otherwise noted
      2) Three-wire, RTD.
      3) Platinum, 100 ohm nominal at 0 degrees C.
   b. Performance:
      1) Accuracy: Greater of plus or minus 4 degrees F or plus or minus 0.75 percent of reading.
   c. Features:
      1) Dimensions: 1/4-inch diameter.
      2) Length to accommodate thermowell insertion and extension lengths.
      3) Spring-loaded element when well is used.

4) Sheath
a) Type 316 Stainless Steel, unless otherwise noted.
b) Process Operating Temperature Range: minus 320 to 900 degrees F, unless otherwise noted.
5) Terminal Connection Head:
a) General purpose, NEMA 4 weatherproof, unless otherwise noted.
b) Maximum Temperature: 220 degrees F, unless otherwise noted.
6) Thermowell Connection: Union Coupler, unless otherwise noted.
7) Sensitive Length: 1.6 inch minimum, measured from closed end.

4. Thermowell:
a. Features:
1) Inside Diameter: Sized to match thermocouple.
2) Material: Type 304 stainless steel, unless otherwise noted.
3) Insertion Length: As noted.
4) Extension Length: 3 inches, unless otherwise noted.
b. Process Connection: 1-inch NPT connection, unless otherwise noted.
c. Well Type: Plain, threaded solid, unless otherwise noted.

5. Transmitter:
a. Ambient Operation Conditions.
1) Temperature: minus 20 to 158 degrees F, with display.
2) Relative Humidity: 0 to 100 percent, noncondensing.
b. Type: Two-wire, powered by a remote power supply.
c. Performance:
1) Accuracy: Greater of plus or minus 0.7 degree F or plus or minus 0.06 percent of span.
2) Response Time: 1.2 second 90 percent response time for 80 percent input step, with minimum damping.
d. Electrical Safety: Standard unless otherwise noted.
e. Features:
1) Indicator: Three line LCD, unless otherwise noted.
2) Automatic reference junction compensation.
3) Failsafe Mode:
a) User configurable ON, unless otherwise noted.
b) Downscale, unless otherwise noted.
4) Electric damping: 1.2 seconds.
f. Signal Interface: 4 to 20 mA dc
g. Power: 24V dc external power supply.
h. Digital Communication: HART.
1) One HART communicator to be supplied for all HART capable transmitters, if not already supplied under another specification section.
i. Enclosure:
1) Materials: Epoxy coated, low-copper aluminum, unless otherwise noted.
2) Type: NEMA 4X.

3) Mounting: Wall, pipe stand, or integral to thermowell, as noted.
a) For wall or pipe stand, provide stainless steel mounting set, unless otherwise noted.
b) For integral thermowell mount, provide zinc-plated steel union coupling, unless otherwise noted.

6. Manufacturers and Products:
a. Foxboro; RTT20 Series Transmitter with PR Series RTD and Thermowell.
b. Rosemount; Series LTS Thermowell, 78 Series Platinum RTD and Model 644H Transmitter.

Y. Y401D Communications Network Architecture:

1. General:
a. Function: Communications links that allow the Personal Computers (PC's), Programmable Logic Controllers (PLC’s), Operator Interfaces (OI’s) and Johnson Controls Metasys systems to interact and provide a capable process control system.
b. Type: Ethernet Local Area Network (LAN) and Wide Area Network (WAN), dedicated industrial high speed LANs, and serial communications using Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP), coaxial cable, single mode fiber optic and multi-mode fiber optic cabling and RS-232 cabling.
c. Components: Communications links used in the project:
1) TCP/IP ethernet LAN.
2) Dedicated industrial PC and PLC peer-to-peer communications LAN.
3) N1 ethernet WAN.
4) N2 Bus and RS-232 serial communications.
5) Dedicated industrial OI and PLC peer-to-peer communications LAN.
6) Spare components.
7) End of project spare components.
8) Additional components.
d. Architecture: Reference the AWTP Control System Block Diagram and the Pump Station Control System Block Diagram.

2. TCP/IP ethernet LAN. This network is a local network connecting the Server, Client and Engineering PC's at the AWTP. It allows the HMI Server, Client and Engineering PC's to communicate so the operators can monitor and control the AWTP. This network will be stand-alone, physically isolated from any other AWTP LAN or WAN. The network consists of:
a. Server PC TCP/IP ethernet port, 10/100BaseT fast ethernet, Cat 5 UTP connector and cable.
b. Client PC's TCP/IP ethernet ports, 10/100BaseT fast ethernet, Cat 5 UTP connectors and cables.
c. Engineering PC TCP/IP ethernet port, 10/100BaseT fast ethernet, Cat 5 UTP connector and cable.
d. Hub, 10/100 BaseT fast ethernet ports, Cat 5 UTP connectors.
e. Fiber optic to Cat 5 UTP modems/transceivers, 10/100BaseFL fast ethernet.
f. Fiber optic cabling and connectors approved for use by the fiber optic to Cat 5 UTP modems/transceivers.

3. Dedicated industrial PC and PLC peer-to-peer communications LAN. This communication network allows the HMI Server and Engineering PC to read status from and write operator commands to the AWTP PLC's. It also allows the PLC's to share interlocks and other data amongst themselves for control of the AWTP. The network consists of:
   a. Server PC peer-to-peer communications adapter.
   b. Engineering PC peer-to-peer communications adapter.
   c. Headworks PLC HW peer-to-peer communications port or module.
   d. RAS/WAS PLC RW peer-to-peer communications port or module.
   e. Ultraviolet PLC UV peer-to-peer communications port or module.
   f. Dewatering PLC DW peer-to-peer communications port or module.
   g. Administration Building PLC AB peer-to-peer communications port or module.
   h. Associated coaxial or shielded twisted pair (STP) cabling and connectors.
   i. Peer-to-peer fiber optic modems.
   j. Fiber optic cabling and connectors.
   k. All peer-to-peer communications adapters, ports or modules, modems and copper or fiber optic cable and connectors must be certified and approved for use by:
      1) Rockwell Automation for ControlNet fiber optic communications.
      2) Schneider Automation for Modicon Modbus Plus fiber optic communications.
4. N1 ethernet WAN. This network is the wide area network managed by Ft. Riley's Directorate of Information Management (DOIM). This communications network will allow the AWTP to monitor the Pump Stations and allows the Pump Stations to communicate with each other, where required. This network will allow critical alarms and process status to be monitored and displayed by Ft. Riley's Utility Monitoring and Control System (UMCS) and/or Water Distribution and Management Control System (WDMCS). The UMCS and WDMCS are Johnson Controls Metasys systems, and Metasys interfaces with the DOIM WAN will be used for AWTP and Pump Station communications. The AWTP LAN and DOIM WAN will be physically isolated. The network consists of:
   a. Metasys PC N1 ethernet port and Cat 5 UTP cable at the AWTP.
   b. Johnson Controls Network Control Module (NCM) and Cat 5 UTP cable at the AWTP.
   c. Foundry FastIron Workgroups 24 port switch at the AWTP, which is Not In Contract.
   d. Fiber optic cabling and associated interconnections from the AWTP to the existing WAN.
   e. Fiber optic cabling and associated interconnections from the existing WAN to each of the Pump Stations.
   f. Fiber optic transceiver at each of the Pump Stations.
   g. Johnson Controls NCM and Cat 5 UTP cable at each of the Pump Stations.
5. N2 Bus and RS-232 serial communications. This communication network allows the Johnson Controls NCM to communicate with the PLC's RS-232 port at the AWTP and at the Pump Stations. A Centaurus integration device (CIG) is required to convert the NCM's N2 Bus to either Modbus or

DF1 protocol for the PLC's RS-232 serial ports. The network consists of:
a. N2 Bus connection from the NCM to the CIG at the AWTP.
b. A CIG and RS-232 cable to PLC AB at the AWTP.
c. N2 Bus connection from the NCM to the CIG at each of the Pump Stations.
d. A CIG and RS-232 cable to the PLC at each of the Pump Stations.

6. Dedicated industrial OI to PLC peer-to-peer communications LAN. This communication network allows the Pump Station OI’s to read status from and write operator commands to the Pump Station PLC's. It also allows the Pump Station PLC's to share interlocks and other data amongst themselves for control of the Pump Stations. The networks consists of:
a. OI peer-to-peer communications adapter at each of the Pump Stations.
b. PLC peer-to-peer communications port or module at each of the Pump Stations.
c. Associated coaxial or shielded twisted pair (STP) cabling and connectors.
d. Rockwell Automation Data Highway Plus or Schneider Automation Modbus Plus

7. Spare components:
a. Hub, 10/100 BaseT fast ethernet.
b. Fiber optic to Cat 5 UTP modems/transceivers, 10/100BaseT fast ethernet: 1.
c. Peer-to-peer fiber optic modems: 2.
d. Foundry FastIron Workgroups 24 port switch, which is Not In Contract: 1.
e. NCM: 2.
f. CIG: 2.
g. Fiber optic transceiver: 2.
h. Spare copper communications cable of each type: 2.
i. Spare fiber optic patch cables of each type: 4.

8. End of project spare components:
a. Any spare components consumed during startup are to be replaced prior to project closeout.

9. Additional components:
a. Provide any additional components required for a complete and fully functional system.

Z. Y402D Process Control Computer System (PC’s):

1. General:
a. Function: Personal Computers (PC's) that the operators use to interact with the process control system at the AWTP.
b. Type: General top-of-the-line, off-the-shelf PC's, Windows based with high performance Intel processors, large amounts of memory and configured for business use.
c. Components: All of the PC's will be configured identically by the OEM and then customized with communications adapters and software for a specific purpose. The CS system consists of:
1) Generic OEM supplied PC (configured to function as one of the following PC's).
2) Server PC.
3) Client PC's.

4) Engineering PC.
5) Metasys PC.
6) Dot matrix alarm printer.
7) Color inkjet graphics printer.
8) Spare components.
9) End of project spare components.
10) Additional components.
11) Human-Machine Interface (HMI) software.

d. Architecture: Reference the AWTP Control System Block Diagram.

2. Generic OEM supplied PC. All PC's will be identical in hardware configuration so they are interchangeable. The PC's will be the same model, from the same manufacturer, ordered at the same time so they are as identical to each other as possible with serial numbers as close to each other as possible. Requirements include but are not limited to:
   a. Tower or mini tower chassis and heavy duty power supply.
   b. Intel Pentium IV, 800MHz, minimum.
   c. RAM, 512 Mbyte, minimum.
   d. Hard drive, 40 Gbyte, minimum.
   e. Color LCD 17" monitor, 1280 x 1024 resolution, minimum. Cathode ray tube monitors are not acceptable.
   f. AGP video adapter.
   g. QWERTY keyboard and PS/2 mouse.
   h. Two parallel printer ports.
   i. RS-232 serial port.
   j. Internal modem, 57Kbaud, minimum.
   k. Audio on motherboard with internal speaker.
   l. Multimedia capability with external stereo speakers.
   m. TCP/IP ethernet port, 10/100BaseT fast ethernet, Cat 5 UTP connector.
   n. Floppy disk drive, 3-1/2", 1.44 MByte.
   o. CD Read/Write drive.
   p. PCI slot for PC and PLC peer-to-peer communications adapter.
   q. Operating system (OS) and other software:
      1) PC OEM installed OS, including all original OEM installation and recovery CD's and diskettes.
      2) Microsoft Windows NT, 2000 or XP OS, whichever meets all requirements, purchased from Microsoft, including all original Microsoft installation and recovery CD's and diskettes.
      3) All PC OEM supplied drivers and software, original install CD's and diskettes.
      4) All updated software and drivers, with the latest set on one CD.
      5) Microsoft Office, including Word, Excel and Access, original install CD.
      6) Microsoft Winzip, original install CD.
   r. Manufacturer and model:
      1) Dell.
      2) Compaq.
      3) Micron.

3. Server PC. Add the following hardware and software to the generic PC specified above:
   a. PCI communications adapter, software and drivers for PC and PLC peer-to-peer communications.

b. Full-function run-time version of the HMI software, 2048 I/O tags minimum.
c. HMI server capability for three HMI clients minimum.
d. Any other hardware or software components required for a complete and totally operational system.

4. Client PC. Add the following hardware and software to the generic PC specified above:
   a. Full-function client version of the HMI software.
   b. Any other hardware or software components required for a complete and totally operational system.
5. Engineering PC. Add the following hardware and software to the generic PC specified above:
   a. PCI communications adapter, software and drivers for PC and PLC peer-to-peer communications.
   b. Full-function development version of the HMI software, 2048 I/O tags minimum.
   c. HMI server capability for three HMI clients minimum.
   d. Full-function client version of the HMI software.
   e. Any other hardware or software components required for a complete and totally operational system.
6. Metasys PC. Add the following hardware and software to the generic PC specified above:
   a. Metasys M5 software.
   b. Any other hardware or software components required for a complete and totally operational system.
7. Dot matrix alarm printer:
   a. Epson.
8. Color inkjet graphics printer:
   a. Hewlett Packard.
9. Spare components:
   a. PCI communications adapter, software and drivers for PC and PLC peer-to-peer communications. 1.
10. End of project spare components:
    a. Any spare components consumed during startup are to be replaced prior to project closeout.
11. Additional components:
    a. Provide any additional components required for a complete and fully functional system.
12. HMI software:
    a. Microsoft Windows NT, 2000 or XP based, whichever meets all requirements.
    b. Server and client architecture.
    c. Dynamic color graphics.
    d. Alarm handling, with a minimum of four alarm levels and priorities.
    e. Historical archiving.
    f. Real-time and historical trending.
    g. Log all operator actions to file.
    h. System security with a minimum of four access levels, with associated rights and passwords.
    i. Communications drivers for required PC to PLC peer-to-peer communications.
    j. Minimum of 2048 I/O tags. Upon project completion, the HMI application must not consume more than 75% of the HMI’s available I/O tags. If the HMI does not have adequate spare I/O tags, it must be upgraded prior to project closeout.
    k. Manufacturer and model:
       1) Rockwell Automation RSView.
       2) Intellution iFIX.
       3) Wonderware InTouch.

13. Software ownership:
    a. All PC related software, original media and documentation is to be turned over to the Government prior to project closeout.
        1) PC OEM installed OS, including all original OEM installation and recovery CD's and diskettes.
        2) Microsoft Windows NT, 2000 or XP OS, whichever meets all requirements, purchased from Microsoft, including all original Microsoft installation and recovery CD's and diskettes.
        3) All PC OEM supplied drivers and software, original install CD's and diskettes.
        4) All PCI communications adapter software and drivers.
        5) All updated software and drivers, with the latest set on one CD.
        6) Microsoft Office, including Word, Excel and Access, original install CD.
        7) Microsoft Winzip, original install CD.

AA. Y403D Programmable Logic Controller (PLC) System:

1. General:
    a. Function: Process controller consisting of the PLC system itself, Operator Interfaces (OI's) and a notebook Personal Computer (PC) with communications interfaces.
    b. Type: Industrially hardened, microprocessor based PLC, industrially hardened flat panel touchscreen OI and commercially available notebook PC with software and communications.
    c. Components: The system consists of:
        1) PLC system, modular in design with racks populated with intelligent modules.
            a) Racks.
            b) Power Supply (PS) modules.
            c) Central Processing Unit (CPU) modules.
            d) High speed peer-to-peer communications.
            e) Remote I/O (RIO) interface modules.
            f) Digital input (DI), digital output (DO), analog input (AI) and analog output (AO) modules.
            g) Programming software.
            h) Manufacturer and products.
        2) Flat-panel OI.
            a) Touchscreen.
            b) Communications.
            c) Configuration software.
            d) Manufacturer and products.
        3) Notebook PC.
            a) Communications interfaces.
            b) Programming and up/download cables.
            c) Manufacturer and products.
        4) Functional spare PLC and OI for software development.
        5) Spare components.
        6) End of project spare components.
        7) Additional components.
    d. Architecture: Reference the AWTP Control System Block Diagram and the Pump Station Control System Block Diagram.

2. PLC system, process controller using hardware and software which emulate relays, timers, counters, calculation modules, signal conditioners, PID controllers and drum sequencers. PLC programmed with Function Block Diagram (FBD), Structured Text (ST) and/or Relay Ladder Logic (RLL) programming languages. PLC consists of:
   a. Racks, at least one required at each PLC location:
      1) Size the racks to provide adequate slots for input and output (I/O) modules.
      2) Group the I/O modules in the racks per type, DI, DO, AI then AO.
      3) Provide at least one empty slot after each group for a future module of the same type.
      4) If more spare slots are available, allocate them proportionally to the I/O.
   b. Power supply (PS) module, at least one required for each rack:
      1) Supply voltage 120VAC, 60Hz.
      2) Size the PS to support required as well as future modules (a full rack).
   c. Central processing unit (CPU) module:
      1) Latest available microprocessor with fastest logic solve time and adequate memory such that the application program and documentation consume no more than 75% of the CPU’s available memory.
      2) RS-232 port to program and up/download from a notebook PC's standard RS-232 port and/or to communicate with Johnson Controls Metasys system.
   d. High speed peer-to-peer communications port or module:
      1) Communicate with other PLC ports or modules, peer-to-peer.
      2) Communicate with Human-Machine-Interface (HMI) PC’s peer-to-peer adapters.
      3) Communicate with Operator Interface (OI) peer-to-peer adapters.
      4) Program and up/download from notebook PC's PCMCIA peer-to-peer adapter.
   e. Remote I/O (RIO) modules (optional):
      1) Remote I/O module for local I/O rack.
      2) Remote I/O module for remote I/O rack.
   f. Input and output (I/O) modules, quantity of each at each PLC location determined by the I/O List:
      1) AWTP I/O modules:
         a) Digital Input (DI) module, 120VAC, 60Hz, 16 point, each individually isolated.
         b) Digital Output (DO) module, normally open relay, 16 point, 2A, each individually isolated.
         c) Analog Input (AI) module, 4-20ma, 12 bit resolution, 8 channel, each individually isolated.
         d) Analog Output (AO) module, 4-20ma, 12 bit resolution, 4 channel, each individually isolated.
      2) Pump Station I/O modules:
         a) Digital Input (DI) module, 120VAC, 8 point, each individually isolated.

b) Digital Output (DO) module, normally open relay, 8 point, each individually isolated.
c) Analog Input (AI) module, 4-20ma, 4 channel, each individually isolated.
d) Analog Output (AO) module, 4-20ma, 2 channel, each individually isolated.

3) Provide 20% additional spare points and channels for each I/O type, rounded up, with a minimum of two. Example: the I/O list has 16 DI, 7 DO, 5 AI and 0 AO for a PLC. Provide, at a minimum, 20 DI and 9 DO (20% rounded up), 7 AI and 2 AO (minimum of two) for that particular PLC.

g. Programming software:
1) Capabilities:
a) Create and edit the PLC program, variables and documentation off-line while not connected to the PLC.
b) Edit the PLC program on-line while connected to the PLC.
c) Up/download the PLC program, variables and documentation while connected to the PLC.
d) Start and stop the PLC.
e) Monitor the PLC I/O and internal variables.
f) Force digital signals and inject analog variables.
g) PID loop tuning.
2) Languages supported:
a) Function Block Diagram (FBD).
b) Structured Text (ST).
c) Relay Ladder Logic (RLL).
3) Protocols supported:
a) Program and up/download from programmer notebook PC's standard RS-232 port.
b) Program and up/download from programmer notebook PC's peer-to-peer PCMCIA communications adapter.

h. Manufacturer and Products:
1) AWTP PLC’s:
a) Rockwell Automation ControlLogix PLC with DF1, ControlNet and RSLogix5000.
b) Schneider Automation/Modicon Quantum PLC with Modbus, Modbus Plus and Concept.
2) Pump Station PLC’s:
a) Rockwell Automation SLC PLC with DF1, Data Highway Plus and RSLogix500.
b) Schneider Automation /Modicon Compact PLC with Modbus, Modbus Plus and Concept.

3. Flat-panel OI, operator interface using hardware and software which emulate pushbuttons, indicating lights, potentiometers, ASCII message displays, loop controllers and alarm annunciators. Flat-panel OI’s consists of:
a. Color graphics display and touchscreen:
1) 640 x 480 VGA minimum.
2) 8.4” diagonal TFT display, minimum.
3) 256 colors, minimum.
4) High speed peer-to-peer communications.
5) Configuration software with communications drivers and manuals.
b. Manufacturer and products:
1) Rockwell Automation PanelView 900, with Data Highway Plus, configuration software and cable.

2) Cutler-Hammer PanelMate Power Pro 1700, with Modbus Plus, configuration software and cable.

4. Notebook PC consists of:
   a. Windows compatible portable notebook personal computer (PC):
      1) Processor: Intel Pentium III, 400 Mhz, minimum.
      2) RAM: 256 Mbyte, minimum.
      3) Hard drive: 4 Gbyte, minimum.
      4) Floppy drive: 3-1/2 inch, 1.44Mbyte diskette drive, external if necessary.
      5) CD Read/Write drive: 33X, minimum.
      6) Flat-screen display: Color, 1024 X 786, minimum.
      7) External PS/2 mouse and mouse pad.
      8) RS-232 serial communications port.
      9) PCMCIA socket for high speed peer-to-peer communications adapter.
      10) Parallel printer port.
      11) Power supply/charger and battery.
      12) Carrying case with shoulder strap, storage pockets and space for notebook PC, power supply/charger, power cords, PCMCIA adapter and communications cables.
   b. Notebook PC Manufacturer:
      1) Dell.
      2) Micron.
      3) Compaq.
   c. Operating System (OS) and Other Software:
      1) Notebook PC OEM installed OS, including all original OEM installation and recovery CD's and diskettes.
      2) Microsoft Windows NT, 2000 or XP OS, whichever meets all requirements, purchased from Microsoft, including all original Microsoft installation and recovery CD's and diskettes. If one OS does not meet all requirements for software and communications, then provide multiple OS's with dual boot capabilities.
      3) All notebook PC OEM supplied drivers and software, original install CD's and diskettes.
      4) All updated software and drivers, with the latest set on one CD.
      5) Microsoft Winzip, original install CD.
   d. Communications:
      1) Serial cable to program and up/download the PLC’s from the notebook PC's standard RS-232 port.
      2) Serial cable to up/download the OI’s from the notebook PC's standard RS-232 port.
      3) PCMCIA peer-to-peer communications adapter and all necessary drivers required to program and up/download the PLC’s using high speed peer-to-peer communications.
         a) Rockwell Automation ControlNet PCMCIA Adapter and configuration software and drivers.
         b) Rockwell Automation Data Highway Plus PCMCIA Adapter and configuration software and drivers.
         c) Schneider Automation/Modicon Modbus Plus PCMCIA Adapter and configuration software and drivers.

4) Three node cable for software development while using the notebook PC's peer-to-peer PCMCIA communications adapter, the PLC’s peer-to-peer communications adapter and the OI’s peer-to-peer communications adapter. This cable must be fabricated from trunk cable, taps and drop cables.

e. Other:
1) Box of 10 R/W CD’s.
2) Box of 10 3-1/2 inch, 1.44Mbyte floppies.

5. Functional spare PLC’s and OI for software development:
a. Software development spare PLC (one for the AWTP and one for the Pump Stations):
1) Rack: 1.
2) Power Supply (PS) module: 1.
3) Central Processing Unit (CPU) module: 1.
4) Remote I/O module for local I/O rack: 1 (if used on the project).
5) I/O modules: 1 of each type used for this project.
b. Software development spare OI and communications interface:
1) Spare OI: 1.
2) Spare high speed peer-to-peer communications interface: 1.

6. Spare components:
a. Spare PLC:
1) Rack: 1 of every type used for the project.
2) Power Supply (PS) module: 1 of every type used for the project.
3) Central Processing Unit (CPU) module: 1 of every type used for the project.
4) Remote I/O module for local I/O rack: 1 of every type used for the project (if used on the project).
5) Remote I/O module for remote I/O rack: 1 of every type used for the project (if used on the project).
6) I/O modules: 1 of each type used for the project.
b. Spare OI and communications interface:
1) Spare OI: 1.
2) Spare high speed peer-to-peer communications interface: 1.
c. Other spares:
1) Serial cables to program and up/download the PLC’s from the notebook PC's standard RS-232 port.
2) Serial cable to up/download the OI from the notebook PC's standard RS-232 port.

7. End of project spare components:
a. Any spare components consumed during startup are to be replaced prior to project closeout.

8. Additional components:
a. Provide any additional components required for a complete and fully functional system.

BB. Y404D Applications Software:

1. General:
   a. Function: Custom software that meets the unique and specific requirements for AWTP and Pump Station monitoring and control.
   b. Functionality:
      1) Human-Machine-Interface (HMI):
         a) Operator interaction with the PLC’s at the AWTP.
         b) Read status, alarms, setpoints, commands and control from the PLC's at the AWTP.
         c) Display and archive status, alarms, setpoints, commands and control from the PLC's at the AWTP.
         d) Write commands and setpoints to the PLC's at the AWTP.
      2) Programmable Logic Controller (PLC):
         a) Performs all process control.
         b) Monitors process status.
         c) Generates alarms.
         d) Receives setpoints and commands.
         e) Solves the PLC application program.
         f) Generates commands based upon process status, setpoints and the program.
         g) Issues control signals to field devices.
         h) Provides status, alarms, setpoints, commands and control for the HMI.
      3) Johnson Controls Metasys:
         a) Displays critical status and critical alarms.
         b) Coordinate communications between the AWTP and the Pump Stations over the DOIM network.
      4) Operator Interface (OI):
         a) Operator interaction with the PLC's at the Pump Stations.
         b) Read status, alarms, setpoints, commands and control from the PLC's at the Pump Stations.
         c) Display status, alarms, setpoints, commands and control from the PLC's at the Pump Stations.
         d) Write commands and setpoints to the PLC's at the Pump Stations.
   c. Components: Application software required for the project:
      1) HMI application software.
         a) Server HMI:
            (1) Run-time version of the HMI package.
            (2) HMI application software is loaded on this machine.
            (3) Read, display and archive status, alarms, setpoints, commands and control from PLC HW, PLC RW, PLC UV, PLC DW and PLC AB.
            (4) Write commands and setpoints to PLC HW, PLC RW, PLC UV, PLC DW and PLC AB.
            (5) This HMI is intended to run all the time.

b) Client HMI's:
(1) Client version of the HMI package.
(2) HMI application software is not loaded on this machine, it is a client to the server.
(3) Communicates with the server HMI to display status and issue operator commands.
(4) This HMI is intended to run all the time.

c) Engineering HMI:
(1) Development version of the HMI package.
(2) HMI application software is loaded on this machine.
(3) Capable of all of the functionality of the server HMI, except is used to edit and maintain the application software while providing a backup to the server HMI should it fail.
(4) Client version of the HMI package.
(5) Capable of functioning as another client HMI if needed.
(6) This HMI is intended to run only when the server is down or when testing HMI software.

2) PLC application software.

a) Headworks PLC HW:
(1) Monitors equipment in the headworks area of the AWTP.
(2) Generates alarms for equipment in the headworks area of the AWTP.
(3) Receives commands and setpoints from the server HMI.
(4) Generates commands from the application program.
(5) Issues control signals to the equipment in the headworks area of the AWTP.
(6) Provides status, alarms, setpoints, commands and control for the HMI.

b) RAS/WAS PLC RW:
(1) Monitors equipment in the RAS/WAS area of the AWTP.
(2) Generates alarms for equipment in the RAS/WAS area of the AWTP.
(3) Receives commands and setpoints from the server HMI.
(4) Generates commands from the application program.
(5) Issues control signals to the equipment in the RAS/WAS area of the AWTP.
(6) Provides status, alarms, setpoints, commands and control for the HMI.

c) Ultraviolet PLC UV:
(1) Monitors equipment in the Ultraviolet area of the AWTP.
(2) Generates alarms for equipment in the Ultraviolet area of the AWTP.
(3) Receives commands and setpoints from the server HMI.
(4) Generates commands from the application program.

(5) Issues control signals to the equipment in the Ultraviolet area of the AWTP.
(6) Provides status, alarms, setpoints, commands and control for the HMI.

d) Dewatering PLC DW:
(1) Monitors equipment in the Dewatering area of the AWTP.
(2) Generates alarms for equipment in the Dewatering area of the AWTP.
(3) Receives commands and setpoints from the server HMI.
(4) Generates commands from the application program.
(5) Issues control signals to the equipment in the Dewatering area of the AWTP.
(6) Provides status, alarms, setpoints, commands and control for the HMI.

e) Administration Building PLC AB:
(1) Monitors equipment in the Administration Building.
(2) Generates alarms for equipment in the Administration Building.
(3) Receives status and alarms from all of the Pump Stations via the Metasys system.
(4) Provides Administration Building and Pump Stations status and alarms to the server HMI.
(5) Receives DOIM communication alarms from the Metasys system.
(6) Provides DOIM communication alarms to the server HMI.
(7) Receives high priority alarms from PLC HW, PLC RW, PLC UV and PLC DW.
(8) Provides high priority alarms from PLC HW, PLC RW, PLC UV, PLC DW and from all of the Pump Stations to the Metasys system.
(9) Generates commands from the application program.
(10) Issues control signals to the equipment in the Administration Building.

f) Camp Forsyth Pump Station PLC CF:
(1) Monitors chemical handling equipment at the Camp Forsyth Pump Station.
(2) Generates alarms for chemical handling equipment at the Camp Forsyth Pump Station.
(3) Receives status and alarms from the Camp Forsyth Pump Station.
(4) Provides status and alarms for the chemical handling equipment and the Camp Forsyth Pump Station to the Administration Building PLC AB via the Metasys system.
(5) Receives commands and setpoints from the chemical handling OI.
(6) Generates commands from the application program.

(7) Issues control signals to the chemical handling equipment at the Camp Forsyth Pump Station.

g) Big Bertha Pump Station:

(1) Provides status and alarms for the Big Bertha Pump Station to the Administration Building PLC AB via the Metasys system.

h) Main Post Pump Station PLC MP:

(1) Monitors chemical handling equipment at the Main Post Pump Station.

(2) Generates alarms for chemical handling equipment at the Main Post Pump Station.

(3) Receives status and alarms from the Main Post Pump Station.

(4) Provides status and alarms for the chemical handling equipment and the Main Post Pump Station to the Administration Building PLC AB via the Metasys system.

(5) Provide status and alarms for the Main Post Pump Station to the Main Post Intermediate Pump Station via the Metasys system.

(6) Receive status and alarms from the Main Post Intermediate Pump Station via the Metasys system.

(7) Provide status and alarms from the Main Post Intermediate Pump Station to the Main Post Pump Station.

(8) Receives commands and setpoints from the chemical handling OI.

(9) Generates commands from the application program.

(10) Issues control signals to the chemical handling equipment at the Main Post Pump Station.

i) Main Post Intermediate Pump Station:

(1) Provides status and alarms for the Main Post Intermediate Pump Station to the Administration Building PLC AB via the Metasys system.

(2) Provide status and alarms for the Main Post Intermediate Pump Station to the Main Post Pump Station via the Metasys system.

(3) Receive status and alarms for the Main Post Pump Station via the Metasys system.

j) Historic District Pump Station:

(1) Provides status and alarms for the Historic District Pump Station to the Administration Building PLC AB via the Metasys system.

3) Metasys application software.

a) Critical status and alarms:

(1) Read critical status and alarms from PLC AB.

(2) Display critical status and alarms.

b) Coordinate AWTP and Pump Station communications over the DOIM network.
(1) Provide all status and alarms from Camp Forsyth Pump Station PLC CF to AWTP PLC AB.
(2) Provide all status and alarms from Big Bertha Pump Station to AWTP PLC AB.
(3) Provide all status and alarms from Main Post Pump Station PLC MP to AWTP PLC AB.
(4) Provide all status and alarms from Main Post Intermediate Pump Station to AWTP PLC AB.
(5) Provide all status and alarms from Historic District Pump Station to AWTP PLC AB.
(6) Provide all pump station (not chemical handling) status and alarms from Main Post Pump Station PLC MP to Main Post Intermediate Pump Station.
(7) Provide all status and alarms from Main Post Intermediate Pump Station to Main Post Pump Station PLC MP.
(8) Monitor these DOIM communications and provide communications failure alarms to PLC AB.

4) OI application software.
a) Camp Forsyth Pump Station:
(1) Read and display status, alarms, setpoints, commands and control from PLC CF.
(2) Write commands and setpoints to PLC CF.
b) Main Post Pump Station:
(1) Read and display status, alarms, setpoints, commands and control from PLC MP.
(2) Write commands and setpoints to PLC MP.

d. Software development coordination and testing.
e. Software ownership.
f. e. Architecture: Reference the AWTP Control System Block Diagram and the Pump Station Control System Block Diagram.

2. HMI application software:
a. Graphics:
1) Startup graphic:
a) Graphic appears upon HMI startup.
b) Display project name as it appears on the contract documents with plant address.
c) Consultant: CH2MHill's address, project manager and project number.
d) Contractor: Name, address and project manager.
e) System Integrator (application software responsible): Name, address and project manager.
f) After five seconds or upon mouse click anywhere, graphic is replaced by main menu graphic.

2) Menu graphic:
   a) Emulates Process Interface Diagram if possible, if not provide menu access to unit processes.
   b) Allows access to any unit process with one mouse click.
   c) Indicate if there is an active alarm or unacknowledged alarm for each unit process.
3) Unit process graphics:
   a) Emulates P&ID's, one graphic per unit process if possible.
   b) Same look and feel for all, background color, device colors, borders, etc.
   c) Unit process title, same as on the P&ID, logged in user with PC's date and time at the top.
   d) Alarm banner displaying latest, highest priority alarm near the bottom.
   e) Navigation buttons at the bottom, same on all unit process graphics if possible.
   f) One mouse click to the main menu, upstream graphic, downstream graphic and alarm graphic.
   g) Displays all relevant unit process status, for example:
      (1) Displays lead or lag status.
      (2) Displays local or remote status
      (3) Displays auto or manual status
      (4) Displays on or opened, off or closed, in alarm, unacknowledged alarm or in travel status.
      (5) Displays motor speed status.
      (6) Displays valve position status.
      (7) Displays setpoint status.
      (8) Displays process variable status.
   h) Green is on or opened, red is off or closed, yellow is in alarm, blinking yellow is unacknowledged alarm and cyan is valve in travel and analog data.
   i) No control capability, all operator actions for process control are via pop-up graphics..
   j) Mouse click on a controllable device or button brings up the appropriate pop-up graphic.
   k) Controllable devices will have a tool-tip identifying it as a control point.
   l) Devices without control will have a tool-tip indicating no control.
4) Pop-Up graphics:
   a) Appears when a controllable device or button is clicked on the unit process graphic.
   b) All operator actions for process control are via pop-ups, never from any other graphic.
   c) Pop-up includes all functionality relevant to that device, for example:
      (1) Operator issues lead or lag commands.
      (2) Operator issues auto or manual commands.

(3) Operator issues start or stop commands.
(4) Operator issues open or close commands.
(5) Operator issues motor speed commands.
(6) Operator issues valve position commands.
(7) Operator issues setpoints.
(8) Displays lead or lag status.
(9) Displays local or remote status.
(10) Displays auto or manual status.
(11) Displays on or opened, off or closed, in alarm, unacknowledged alarm or in travel status.
(12) Displays motor speed status.
(13) Displays valve position status.
(14) Displays setpoint status.
(15) Displays process variable status.

d) Pop-ups close by mouse click on button or by selecting another graphic.

5) Alarm graphic:
a) Display alarms in chronological or priority sort.
b) Four alarm priorities, high priority, medium priority and low priority process alarms and system alarms.
c) High priority alarms are red, medium priority alarms are yellow, low priority alarms are cyan, system alarms are white. Acknowledged alarms are solid, unacknowledged alarms blink.
d) Upon alarm, activate the speaker, display alarm description, alarm time and date with blinking priority color and text.
e) Upon alarm acknowledge, silence the speaker, display alarm description, acknowledge time and date with priority color and text, no blinking.
f) Alarm acknowledgement at any HMI acknowledges all the other HMI's.

6) Trend Graphics:
a) Trend all process variables every minute.
b) Group trend data for relevance, i.e. Plant Influent Flow, Sodium Hydroxide Feed Rate, RAS Flow.
c) Maximum of eight pens (process variables, setpoints and status) per trend.
d) Pan forward, pan back, zoom out and zoom in.
e) Display actual value of the pens on the trend at the time selected by mouse click.
f) Dedicated trends with pre-selected pens.
g) User-selectable trends where operator can pick pens.
h) Engineering units displayed as well as the variable.

7) Equipment run-time graphic:
a) Display the run-time for each relevant piece of equipment in table format.

8) System graphics: Functionality includes:
a) Control System Block Diagram graphic, displaying the following:

(1) PLC diagnostics failure alarms.
(2) Communications failure alarms.
(3) Emergency power status.
(4) Emergency generator failure alarms.

b) Pumping Station Block Diagram graphic, displaying the following:
(1) PLC diagnostics failure alarms.
(2) Communications failure alarms.
(3) Emergency power status.
(4) Emergency generator failure alarms.

b. Historically archive:
1) All process variables, setpoints, commands, control, status and alarms every minute.
2) All operator actions for process control as they occur, time and date stamped.
3) All alarms as they occur and when acknowledged, time and date stamped.

c. Communications:
1) All data to be read from the PLC's will be optimized into packets with consecutive addresses.
2) Read optimized floating point data packets every second.
3) Read optimized integer data packets every second
4) Read optimized digital data packets every second.
5) Writes of floating point setpoints and commands are immediate, with readback for display.
6) Writes of integer setpoints and commands are immediate, with readback for display.
7) Writes of digital commands are immediate, with readback for display.
8) All digital commands are momentary on, i.e. mouse click writes a 1, mouse release writes a 0.
9) Implement watchdog timers or apply inherent diagnostics to alarm communications failures.

d. Security:
1) Provide four levels of HMI PC access rights complete with password protection:
a) Administrator: Overall PC maintenance.
(1) Windows operating system administrator rights and privileges.
(2) HMI maintenance, can shut down, edit and restart the HMI.
(3) HMI operation, can access pop-up graphics.
(4) HMI observing.
b) Supervisor: HMI maintenance.
(1) HMI maintenance, can shut down, edit and restart the HMI.
(2) HMI operation, can access pop-up graphics.
(3) HMI observing.
c) Operator: Operate the plant.
(1) HMI operation, can access pop-up graphics.
(2) HMI observing.
d) Observer: View the plant.
(1) HMI observing, cannot access pop-up graphics.

e. Reports:
   1) Provide all historically archived data in a manner and format usable by Windows Excel or Access.
   2) All report creation and generation is by the client, and is Not In Contract.

f. Standards:
   1) All discrete logic and tag names will be positive logic, where on is a 1, off is a 0. Tag names must reflect the status or function of a digital when on.
   2) Tag names for data read from or written to the PLC will match the PLC tag name as closely as possible.
   3) All analogs to be displayed in required engineering units.
   4) All speed commands, speed status and speed control are 0-100%.
   5) All valve position commands, valve position status and valve position control are 0-100%.

3. PLC application software:

a. Languages:
   1) Process control functions will be implemented in the language most appropriate for the function.
   2) Relay Ladder Logic for motor and valve discrete interlocking and control.
   3) Function Block Diagram for regulatory control of analog systems and PID control.
   4) Structured Text for mathematical equations, table lookup, etc.

b. Standards:
   1) All plant and process control is done by the PLC.
   2) All devices and functions have their own dedicated logic, no multiplexing of data and logic.
   3) All calculations have their own dedicated registers, no multiplexing of calculations and data.
   4) All similar devices with similar functionality will be programmed using similar techniques.
   5) Safety related setpoints shall be hard-coded, such as H2S alarm setpoints.
   6) Communications addresses and control parameters shall be hard-coded for reliability.
   7) All discrete logic is positive logic, on is a 1, off is a 0. If a contact closes when a pump is on, then the tag name is ON. If a contact is wired fail-safe, such as a flow switch where the contact opens on low flow, then the tag name is FLOW OK. Tag names must reflect the status or function of a digital when it is on.
   8) All I/O and internal variables used in the program shall have tag names and descriptions.

c. PLC I/O:
   1) Digitals.
      a) All digital I/O is 120VAC.
      b) All digital I/O is positive logic, i.e. on is a 1, off is a 0.

2) Analogs.
a) All analog inputs are 4-20ma, with 12 bit decode minimum.
b) All analog inputs will be scaled into required engineering units.
c) All analog outputs are 4-20ma, with 12 bit decode minimum.
d) All analog outputs will be scaled into required engineering units.

d. Alarms and setpoints:
1) All alarms will be generated by the PLC.
2) All digital alarms, except motor or AFD fail alarms, will have adjustable on-delay and off-delay timers, tuned during startup, to prevent alarm chatter.
3) All analog alarm and control setpoints will have 5% hysteresis of analog range to prevent alarm chatter and excessive control. Example: Assume a level ranges from 0 to 10 feet, with the high-high alarm setpoint at 8 feet and the high setpoint (to start the pump) at 6 feet. The alarm will activate at 8 feet and clear at 7.5 feet, and the pump start command will go active at 6 feet and will maintain until 5.5 feet..

e. Communications:
1) Floating point status, setpoints, commands and control will be packed for optimized read by the HMI.
2) Integer status, setpoints, commands and control will be packed for optimized read by the HMI.
3) Digital status, alarms, commands and control will be packed for optimized read by the HMI.
4) Digital commands from the HMI will be momentary on, but the PLC logic will also clear the command after a two-second delay.
5) Implement watchdog timers or apply inherent diagnostics to alarm PLC to PLC communications failures.

f. Diagnostics:
1) PLC will monitor itself and generate alarms.
a) PLC fault.
b) Logic error.
c) I/O module fail.
d) Battery low, etc.

g. Other:
1) All motor runtimes will be accumulated by the PLC in tenths of hours.
2) All flows totalized by the PLC.

4. Metasys application software:
a. Standards:
1) Status and alarms.
a) Displays critical status and critical alarms in a manner consistent with the existing Metasys system.
2) Communications.
a) Coordinate communications between the AWTP and the Pump Stations over the DOIM network.

5. OI application software:
    a. Graphics:
        1) Unit process graphics:
            a) Emulates P&ID if possible.
            b) Display all relevant unit process status, for example:
                (1) Display auto or manual status.
                (2) Display on or opened, off or closed or in travel.
                (3) Display in alarm, unacknowledged alarm.
                (4) Displays motor speed status.
                (5) Displays valve position status.
                (6) Displays setpoint status.
                (7) Displays process variable status.
            c) Green is on or opened, red is off or closed, yellow is in alarm, blinking yellow is unacknowledged alarm and cyan is valve in travel and analog data.
        2) Control:
            a) Touch screen pop-up or membrane keypad.
                (1) Operator issues auto or manual commands.
                (2) Operator issues start or stop commands.
                (3) Operator issues open or close commands.
                (4) Operator issues motor speed commands.
                (5) Operator issues valve position commands.
                (6) Operator issues setpoints.
        3) Alarms:
            a) Display alarms with a dedicated alarm page.
            b) Upon alarm, display alarm description, alarm time and date with blinking priority color and text.
            c) Upon alarm acknowledge, display alarm description, acknowledge time and date with priority color and text, no blinking.
        4) Equipment run-time graphic:
            a) Display the run-time for each relevant piece of equipment in table format.
    b. Communications:
        1) All data to be read from the PLC's will be optimized into packets with consecutive addresses.
        2) Read optimized floating point data packets every second.
        3) Read optimized integer data packets every second
        4) Read optimized digital data packets every second.
        5) Writes of floating point setpoints and commands are immediate, with readback for display.
        6) Writes of integer setpoints and commands are immediate, with readback for display.
        7) Writes of digital commands are immediate, with readback for display.
        8) All digital commands are momentary on, i.e. button push writes a 1, button release writes a 0.
    c. Standards:
        1) All discrete logic and tag names will be positive logic, where on is a 1, off is a 0. Tag

names must reflect the status or function of a digital when on.
2) Tag names for data read from or written to the PLC will match the PLC tag name as closely as possible.
3) All analogs to be displayed in required engineering units.
4) All speed commands, speed status and speed control are 0-100%.
5) All valve position commands, valve position status and valve position control are 0-100%.
6)

6. Software development and testing:
   a. Three software development meetings are to be held to coordinate development of standards. Attendees to include the Contractor, Engineer and the Govennment.
   b. Software development kickoff meeting to discuss the HMI, PLC, OI and Metasys standards, and strategies for the next two software development meetings.
   c. Two software development meetings to develop, implement and test:
      1) Communications standards between HMI's and PLC's, between OI's and PLC's, between Metasys PC's and PLC's and between PLC's, etc. One example of every type of control function is to be addressed.
      2) Graphics standards for HMI, OI and Metasys graphics screens and navigation, pop-up graphics, color implementation, alarm presentations and trend displays, etc. One example of every type of control function is to be addressed.
      3) Programming standards for PLC programming, discrete control, analog control , scaling and alarming, etc. One example of every type of control function is to be addressed.
         a) Coordinate between Contractor, Engineer and the Government for completion of a Software Development Test (SDT), where one example of every type of control functionality is tested, between HMI, OI and Metasys and the PLC's as well as between PLC's. Once this test has passed, software development can proceed to completion.
7. Application software ownership:
   a. All application software is to be turned over to the Government prior to project closeout.
   b. All application software is to be fully documented to the extent that the software naturally allows.
   c. Provide three CD-ROM copies of all application software for turnover prior to project closeout:
      1) Human-Machine-Interface (HMI) application software.
      2) Programmable Logic Controller (PLC) application software.
      3) Johnson Controls Metasys application software.
      4) Operator Interface (OI) application software.
      5) Any other application software relevant to the project.

END OF COMPONENT SPECIFICATIONS

Instrument List

Tag Number	Component	Description	Pipe Size	Process	Scale	Setpoint	P&ID Dwg	Notes
Unit Process:	**01**	**PLANT INFLUENT AND SCREENING UNIT PROCESS 1**						
AIT-0108-01	A010	COMBUSTIBLE GAS ELEMENT AND TRANSMITTER			0-100 LEL		38-I-04	
AIT-0108-02	A019	HYDROGEN SULFIDE ELEMENT AND TRANSMITTER			0-25 ppm		38-I-04	
FIT-0102	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-3.5 ft.		38-I-04	
HS-0108-01A	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-05	
HS-0108-01A	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-04	
HS-0108-01B	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-05	
LIT-0104-01	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-3.5 ft.		38-I-04	
LIT-0104-02	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-3.5 ft.		38-I-04	
LSH-0101	L008	LEVEL SWITCH, FLOAT			0-3.5 ft.	3.0	38-I-04	*
YA-0108-01A	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-04	
YA-0108-01B	M030	HORN, INDOOR/OUTDOOR			-		38-I-04	
YA-0108-01B	M030	HORN, INDOOR/OUTDOOR			-		38-I-04	
YA-0108-01C	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-04	
YA-0108-01D	M030	HORN, INDOOR/OUTDOOR			-		38-I-05	
YA-0108-01E	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-05	
YA-0108-01F	M030	HORN, INDOOR/OUTDOOR			-		38-I-05	
Unit Process:	**02**	**GRIT REMOVAL UNIT PROCESS 2**						
AE-0209-01	A010	COMBUSTIBLE GAS ELEMENT AND TRANSMITTER			0-100 percent LEL		38-I-05	
AE-0209-02	A010	COMBUSTIBLE GAS ELEMENT AND TRANSMITTER			0-100 percent LEL		38-I-05	
AIT-0209-01	A010	COMBUSTIBLE GAS ELEMENT AND TRANSMITTER			0-100 percent LEL		38-I-05	
AIT-0209-02	A019	HYDROGEN SULFIDE ELEMENT AND TRANSMITTER			0-25 ppm		38-I-05	
HS-0204 OOR	M009	THREE POSITION SELECTOR SWITCH			-		38-I-05	
HS-0207	M009	THREE POSITION SELECTOR SWITCH			-		38-I-05	
PE-0203	P015	PRESSURE SEAL, ANNULAR			0-50 psig		38-I-05	
PE-0205	P015	PRESSURE SEAL, ANNULAR			0-50 psig		38-I-05	
PIT-0203	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-50 psig		38-I-05	
PIT-0205	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-50 psig		38-I-05	
YA-0211-01A	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-05	
YA-0211-01B	M030	HORN, INDOOR/OUTDOOR			-		38-I-05	
YA-0211-01C	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-05	
YA-0211-01D	M030	HORN, INDOOR/OUTDOOR			-		38-I-05	
Unit Process:	**04**	**SECONDARY CLARIFIERS UNIT PROCESS 4**						
AIT-0401 pH	A007	pH ELEMENT AND TRANSMITTER			2-14 pH		38-I-07	

Tag Number	Component	Description	Pipe Size	Process	Scale	Setpoint	P&ID Dwg	Notes
HS-0402-01A OOR	M009	THREE POSITION SELECTOR SWITCH			-		38-I-07	
HS-0402-01B RESET	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-07	
HS-0402-02A OOR	M009	THREE POSITION SELECTOR SWITCH			-		38-I-07	
HS-0402-02B RESET	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-07	
HS-0404 OOR	M009	THREE POSITION SELECTOR SWITCH			-		38-I-07	
LSH-0404	L008	LEVEL SWITCH, FLOAT			0-10 ft.	7.5	38-I-07	*
LSHH-0404	L008	LEVEL SWITCH, FLOAT			0-15 ft.	12.5	38-I-07	*
LSL-0404	L008	LEVEL SWITCH, FLOAT			0-10 ft.	7.0	38-I-07	*
YL-0402-01A HIGH	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
YL-0402-01B HIGH H	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
YL-0402-02A HIGH	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
YL-0402-02B HIGH H	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
YL-0404 HIGH	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
YL-0404 HIGH HIGH	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
YL-0404 LOW	M027	INDICATOR LIGHT, CORROSION, ROUND			-		38-I-07	
Unit Process:	**05**	**UV DISINFECTION UNIT PROCESS 5**						
FIT-0504-01	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	14 in.		300-2700 gpm		38-I-08	
FIT-0504-02	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	14 in.		300-2700 gpm		38-I-08	
YA-0507-01A	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-08	
YA-0507-01B	M030	HORN, INDOOR/OUTDOOR			-		38-I-08	
YA-0507-01C	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-08	
YA-0507-01D	M030	HORN, INDOOR/OUTDOOR			-		38-I-08	
Unit Process:	**06**	**RAS/WAS PUMP STATION UNIT PROCESS 6**						
FIT-0601-01	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	8 in.		0-1500 gpm		38-I-09	
FIT-0601-02	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	8 in.		0-1500 gpm		38-I-09	
FIT-0601-03	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	8 in.		0-1500 gpm		38-I-09	
FIT-0603	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	6 in.		0-450 gpm		38-I-09	
HS-0606-01A TEST	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-09	
HS-0606-01B SILENC	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-09	
PE-0601-01	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-09	
PE-0601-02	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-09	
PE-0601-03	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-09	
PE-0602-01	P015	PRESSURE SEAL, ANNULAR			0-60 psig		38-I-09	
PE-0602-02	P015	PRESSURE SEAL, ANNULAR			0-60 psig		38-I-09	
PIT-0601-01	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-09	
PIT-0601-02	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-09	
PIT-0601-03	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-09	

Tag Number	Component	Description	Pipe Size	Process	Scale	Setpoint	P&ID Dwg	Notes
PIT-0602-01	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-60 psig		38-I-09	
PIT-0602-02	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-60 psig		38-I-09	
YA-0605-01A	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-09	
YA-0605-01B	M030	HORN, INDOOR/OUTDOOR			-		38-I-09	
YA-0605-01C	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-09	
YA-0605-01D	M030	HORN, INDOOR/OUTDOOR			-		38-I-09	
YA-0606-01A BEAC	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-09	
YA-0606-01B HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-09	
YA-0606-01C BEACO	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-09	
YA-0606-01D HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-09	
Unit Process:	**07**	**WAS HOLDING TANK UNIT PROCESS 7**						
LIT-0701	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-25 ft.		38-I-10	
Unit Process:	**08**	**GRAVITY BELT THICKENER UNIT PROCESS 8**						
DIT-0810	D002	DENSITY ELEMENT AND TRANSMITTER, OPTICAL			0-10 percent		38-I-11	
FIT-0801	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	1.5 in.		0-10 gph		38-I-11	
FIT-0802	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	6 in.		0-1000 gpm		38-I-11	
HS-0806 OOR	M009	THREE POSITION SELECTOR SWITCH			-		38-I-11	
LIT-0808	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-10 ft.		38-I-11	
PE-0803	P015	PRESSURE SEAL, ANNULAR			0-50 psig		38-I-11	
PE-0805	P015	PRESSURE SEAL, ANNULAR			0-50 psig		38-I-11	
PE-0808	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-11	
PE-0809	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-11	
PI-0808	P004	PRESSURE GAUGE			0-30 psig		38-I-11	
PIT-0803	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-50 psig		38-I-11	
PIT-0805	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-50 psig		38-I-11	
PIT-0809	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-11	
PSH-0808	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-30 psig	25	38-I-11	
Unit Process:	**09**	**AEROBIC DIGESTERS UNIT PROCESS 9**						
AIT-0901-01 DO	A021	DISSOLVED OXYGEN ELEMENT AND TRANSMITTER, SUBMERSIBLE			0-15 mg/l		38-I-12	
AIT-0901-02 pH	A007	pH ELEMENT AND TRANSMITTER			2-14 pH		38-I-12	
AIT-0902-01 DO	A021	DISSOLVED OXYGEN ELEMENT AND TRANSMITTER, SUBMERSIBLE			0-15 mg/l		38-I-12	
AIT-0902-02 pH	A007	pH ELEMENT AND TRANSMITTER			2-14 pH		38-I-12	
AIT-0903-01 DO	A021	DISSOLVED OXYGEN ELEMENT AND TRANSMITTER, SUBMERSIBLE			0-15 mg/l		38-I-12	
AIT-0903-02 pH	A007	pH ELEMENT AND TRANSMITTER			2-14 pH		38-I-12	
LIT-0904	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-20 ft.		38-I-12	
TIT-0901	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-100 deg F		38-I-12	

Tag Number	Component	Description	Pipe Size	Process	Scale	Setpoint	P&ID Dwg	Notes
TIT-0902	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-100 deg F		38-I-12	
TIT-0903	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-100 deg F		38-I-12	
Unit Process:	**10**	**BFP FEED PUMPS UNIT PROCESS 10**						
AIT-1004	A010	COMBUSTIBLE GAS ELEMENT AND TRANSMITTER			0-100 percent LEL		38-I-13	
HS-1004-01A TEST	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-13	
HS-1004-01B SILENC	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-13	
PE-1002-01	P015	PRESSURE SEAL, ANNULAR			0-60 psig		38-I-13	
PE-1002-02	P015	PRESSURE SEAL, ANNULAR			0-60 psig		38-I-13	
PI-1002-01	P004	PRESSURE GAUGE			0-60 psig		38-I-13	-
PI-1002-02	P004	PRESSURE GAUGE			0-60 psig		38-I-13	-
PSH-1002-01	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-50 psig	40	38-I-13	
PSH-1002-02	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-50 psig	40	38-I-13	
YA-1004-01A BEAC	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-13	
YA-1004-01B HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-13	
YA-1004-01C BEACO	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-13	
YA-1004-01D HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-13	
Unit Process:	**11**	**BELT FILTER PRESS UNIT PROCESS 11**						
FIT-1101	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	1.5 in.		0-10 gph		38-I-14	
FIT-1102	F004	FLOW ELEMENT AND TRANSMITTER, ELECTROMAGNETIC	6 in.		0-500 gpm		38-I-14	
HS-1106 OOR	M009	THREE POSITION SELECTOR SWITCH			-		38-I-14	
PE-1103	P015	PRESSURE SEAL, ANNULAR			0-50 psig		38-I-14	
PE-1105	P015	PRESSURE SEAL, ANNULAR			0-50 psig		38-I-14	
PIT-1103	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-50 psig		38-I-14	
PIT-1105	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-50 psig		38-I-14	
Unit Process:	**12**	**CAKE CONVEYING UNIT PROCESS 12**						
YA-1203-01A	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-15	
YA-1203-01B	M030	HORN, INDOOR/OUTDOOR			-		38-I-15	
YA-1203-01C	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-15	
YA-1203-01D	M030	HORN, INDOOR/OUTDOOR			-		38-I-15	
Unit Process:	**13**	**AERATION BLOWERS UNIT PROCESS 13**						
FIT-1301-01	F051	FLOW ELEMENT AND TRANSMITTER, THERMAL MASS FLOW			0-5000 cfm		38-I-16	
FIT-1301-02	F051	FLOW ELEMENT AND TRANSMITTER, THERMAL MASS FLOW			0-5000 cfm		38-I-16	
FIT-1301-03	F051	FLOW ELEMENT AND TRANSMITTER, THERMAL MASS FLOW			0-5000 cfm		38-I-16	
FIT-1301-04	F051	FLOW ELEMENT AND TRANSMITTER, THERMAL MASS FLOW			0-5000 cfm		38-I-16	
PDIT-1302	P003	PRESSURE DIFFERENTIAL TRANSMITTER, ELECTRONIC			0-minus 10 inch W.		38-I-16	
PIT-1301-01	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-16	

Tag Number	Component	Description	Pipe Size	Process	Scale	Setpoint	P&ID Dwg	Notes
PIT-1301-02	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-16	
PIT-1301-03	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-16	
PIT-1301-04	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-16	
PIT-1301-05	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-30 psig		38-I-16	
TIT-1301-01	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-200 deg F		38-I-16	
TIT-1301-02	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-200 deg F		38-I-16	
TIT-1301-03	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-200 deg F		38-I-16	
TIT-1301-04	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-200 deg F		38-I-16	
TIT-1301-05	T003	TEMPERATURE ELEMENT AND TRANSMITTER, RESISTANCE			0-200 deg F		38-I-16	
Unit Process:	**14**	**WASHWATER BOOSTER PUMPS UNIT PROCESS 14**						
PIT-1402-01	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-150 psig		38-I-17	
PIT-1402-02	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-150 psig		38-I-17	
Unit Process:	**15**	**COMPRESSED AIR UNIT PROCESS 15**						
PI-1501-01	P004	PRESSURE GAUGE			0-160 psig		38-I-18	-
PI-1501-02	P004	PRESSURE GAUGE			0-160 psig		38-I-18	-
PIT-1501-01	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-160 psig		38-I-18	
PIT-1501-02	P009	PRESSURE TRANSMITTER, ELECTRONIC			0-160 psig		38-I-18	
PSL-1501-01	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-160 psig	125	38-I-18	
PSL-1501-02	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-160 psig	125	38-I-18	
Unit Process:	**16**	**PLANT DRAIN PUMP STATION UNIT PROCESS 16**						
LIT-1601	L011	LEVEL ELEMENT AND TRANSMITTER, [redacted] GUIDED LEVEL RADAR			0-25.5 ft.		38-I-19	
Unit Process:	**17**	**SODIUM HYDROXIDE STORAGE AND FEED UNIT PROCESS 17**						
HS-1701 SILENCE	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-20	
LAH-1701	M030	HORN, INDOOR/OUTDOOR			-		38-I-20	
LI-1701	S027	INDICATOR, DIGITAL PANEL			0-12 ft.		38-I-20	
LIT-1701	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-12 ft.		38-I-20	
LIT-1706	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-3.5 ft.		38-I-20	
LSH-1709	L008	LEVEL SWITCH, FLOAT			0-1.0 in. A.F.F.	0.5	38-I-20	*
PE-1707-01	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-20	
PE-1707-02	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-20	
PI-1707-01	P004	PRESSURE GAUGE			0-30 psig		38-I-20	-
PI-1707-02	P004	PRESSURE GAUGE			0-30 psig		38-I-20	-
PSH-1707-01	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-30 psig	25	38-I-20	
PSH-1707-02	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-30 psig	25	38-I-20	
Unit Process:	**18**	**POLYMER STORAGE AND FEED UNIT PROCESS 18**						

Tag Number	Component	Description	Pipe Size	Process	Scale	Setpoint	P&ID Dwg	Notes
PI-1803	P004	PRESSURE GAUGE			0-100 psig		38-I-21	-
Unit Process:	**19**	**MASCELLANEOUS PLANT SYSTEMS UNIT PROCESS 19**						
YA-1901-01A BEAC	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-01B BEACO	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-01C BEACO	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-01D BEAC	M031	WARNING LIGHT, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-02A HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-02B HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-02C HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-22	
YA-1901-02D HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-22	
Unit Process:	**20**	**CAMP FORSYTH PUMP STATION UNIT PROCESS 20**						
HS-2001 SILENCE	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-24	
LAH-2001 HORN	M030	HORN, INDOOR/OUTDOOR			-		38-I-24	
LI-2001	S027	INDICATOR, DIGITAL PANEL			0-8 ft.		38-I-24	
LIT-2001	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-8 ft.		38-I-24	
LIT-2004	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-3 ft.		38-I-24	
LSH-2003	L008	LEVEL SWITCH, FLOAT			0-1.0 in. A.F.F.	0.5	38-I-24	*
PE-2005	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-24	
PI-2005	P004	PRESSURE GAUGE			0-30 psig		38-I-24	-
PSH-2005	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-30 psig	25	38-I-24	
Unit Process:	**22**	**MAIN POST STATION UNIT PROCESS 22**						
HS-2201 SILENCE	M026	PUSHBUTTON SWITCH, CORROSION, ROUND			-		38-I-26	
LAH-2201	M030	HORN, INDOOR/OUTDOOR			-		38-I-26	
LI-2201	S027	INDICATOR, DIGITAL PANEL			0-6 ft.		38-I-26	
LIT-2201	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-6 ft.		38-I-26	
LIT-2204	L005	LEVEL ELEMENT AND TRANSMITTER, ULTRASONIC			0-3 ft.		38-I-26	
LSH-2203	L008	LEVEL SWITCH, FLOAT			0-1.0 in. A.F.F.	0.5	38-I-26	*
PE-2205	P015	PRESSURE SEAL, ANNULAR			0-30 psig		38-I-26	
PI-2205	P004	PRESSURE GAUGE			0-30 psig		38-I-26	-
PSH-2205	P007	PRESSURE SWITCH, ADJUSTABLE DEAD BAND			0-30 psig	25	38-I-26	

Control System I/O List

PLC Number:

I/O Type: AI

Total I/O count for PLC: 464

I/O Type count: 99

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
FI-0102		Indication		PLANT INFLUENT FLOW	38-I-04
LI-0104-01		Indication		FINE SCREEN DIFFERENTIAL LEVEL NO. 1	38-I-04
LI-0104-02		Indication		FINE SCREEN DIFFERENTIAL LEVEL NO. 2	38-I-04
AI-0108-01	COMB GAS	Indication		PLANT INFLUENT AND SCREENING AIR MONITORING	38-I-04
AI-0108-02	H2S	Indication		PLANT INFLUENT AND SCREENING AIR MONITORING	38-I-04
PI-0203		Indication		GRIT PUMP SUCTION PRESSURE	38-I-05
PI-0205		Indication		GRIT PUMP DISCHARGE PRESSURE	38-I-05
AI-0209-01	COMB GAS	Indication		GRIT REMOVAL AIR MONITORING	38-I-05
AI-0209-01	H2S	Indication		GRIT REMOVAL AIR MONITORING	38-I-05
SI-0303-01	SPEED	Indication		CONTINUOUS LOOP REACTOR AERATOR NO. 1	38-I-06
SI-0303-02	SPEED	Indication		CONTINUOUS LOOP REACTOR AERATOR NO. 2	38-I-06
SI-0303-03	SPEED	Indication		CONTINUOUS LOOP REACTOR AERATOR NO. 3	38-I-06
SI-0303-04	SPEED	Indication		CONTINUOUS LOOP REACTOR AERATOR NO. 4	38-I-06
SI-0303-05	SPEED	Indication		CONTINUOUS LOOP REACTOR AERATOR NO. 5	38-I-06
SI-0303-06	SPEED	Indication		CONTINUOUS LOOP REACTOR AERATOR NO. 6	38-I-06
AI-0401	pH	Indication		SPLITTER BOX pH	38-I-07
AI-0501	TRANSMITT	Indication		TRANSMITTANCE	38-I-08
FI-0504-01	FLOW	Indication		UV REACTOR FLOW	38-I-08
FI-0504-02	FLOW	Indication		UV REACTOR FLOW	38-I-08
CP-0505-01	UV LEVEL	Indication		UV REACTOR	38-I-08
CP-0505-02	UV LEVEL	Indication		UV REACTOR	38-I-08
SI-0601-01		Indication		RAS PUMPS AND RAS FLOW NO. 1	38-I-09
PI-0601-01		Indication		RAS PUMPS AND RAS FLOW NO. 1	38-I-09
FI-0601-01		Indication		RAS PUMPS AND RAS FLOW NO. 1	38-I-09

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
FI-0601-02		Indication		RAS PUMPS AND RAS FLOW NO. 2	38-I-09
PI-0601-02		Indication		RAS PUMPS AND RAS FLOW NO. 2	38-I-09
SI-0601-02		Indication		RAS PUMPS AND RAS FLOW NO. 2	38-I-09
SI-0601-03		Indication		RAS PUMPS AND RAS FLOW NO. 3	38-I-09
FI-0601-03		Indication		RAS PUMPS AND RAS FLOW NO. 3	38-I-09
PI-0601-03		Indication		RAS PUMPS AND RAS FLOW NO. 3	38-I-09
PI-0602-01		Indication		WAS PUMPS NO. 1	38-I-09
PI-0602-02		Indication		WAS PUMPS NO. 2	38-I-09
FI-0603		Indication		WAS FLOW	38-I-09
LI-0701		Indication		WAS HOLDING TANK LEVEL	38-I-10
SI-0702-01		Indication		GBT FEED PUMPS NO. 1	38-I-10
SI-0702-02		Indication		GBT FEED PUMPS NO. 2	38-I-10
FI-0801		Indication		GBT POLYMER FLOW	38-I-11
FI-0802		Indication		GBT FEED FLOW	38-I-11
PI-0803		Indication		GBT INLINE MIXER INLET PRESSURE	38-I-11
PI-0805		Indication		GBT INLINE MIXER OUTLET PRESSURE	38-I-11
SI-0807		Indication		GRAVITY BELT THICKENER	38-I-11
SI-0808		Indication		TWAS PUMP AND GRAVITY THICKENER	38-I-11
LI-0808		Indication		TWAS PUMP AND GRAVITY THICKENER	38-I-11
PI-0809		Indication		TWAS PUMP DISCHARGE PRESSURE	38-I-11
DI-0810		Indication		TWAS DENSITY	38-I-11
TI-0901		Indication		AEROBIC DIGESTER NO. 1 DO, pH AND TEMPERATURE	38-I-12
AI-0901-01	DO	Indication		AEROBIC DIGESTER NO. 1 DO, pH AND TEMPERATURE	38-I-12
AI-0901-02	pH	Indication		AEROBIC DIGESTER NO. 1 DO, pH AND TEMPERATURE	38-I-12
TI-0902		Indication		AEROBIC DIGESTER NO. 2 DO, pH AND TEMPERATURE	38-I-12
AI-0902-01	DO	Indication		AEROBIC DIGESTER NO. 2 DO, pH AND TEMPERATURE	38-I-12
AI-0902-02	pH	Indication		AEROBIC DIGESTER NO. 2 DO, pH AND TEMPERATURE	38-I-12
TI-0903		Indication		AEROBIC DIGESTER NO. 3 DO, pH AND TEMPERATURE	38-I-12
AI-0903-01	DO	Indication		AEROBIC DIGESTER NO. 3 DO, pH AND TEMPERATURE	38-I-12

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
AI-0903-02	pH	Indication		AEROBIC DIGESTER NO. 3 DO, pH AND TEMPERATURE	38-I-12
LI-0904		Indication		DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
SI-1002-01		Indication		BFP FEED PUMPS NO. 1	38-I-13
SI-1002-02		Indication		BFP FEED PUMPS NO. 2	38-I-13
AI-1004	COMB. GAS	Indication		BFP FEED PUMP AIR MONITORING	38-I-13
FI-1101		Indication		BFP POLYMER FLOW	38-I-14
FI-1102		Indication		BFP FEED FLOW	38-I-14
PI-1103		Indication		BFP INLINE MIXER INLET PRESSURE	38-I-14
PI-1105		Indication		BFP INLINE MIXER OUTLET PRESSURE	38-I-14
SI-1107		Indication		BELT FILTER PRESS	38-I-14
SI-1301-01		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
TI-1301-01		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
PI-1301-01		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
FI-1301-01		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
SI-1301-02		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
TI-1301-02		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
PI-1301-02		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
FI-1301-02		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
FI-1301-03		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
TI-1301-03		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
PI-1301-03		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
TI-1301-04		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
FI-1301-04		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
PI-1301-04		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
SI-1301-05		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
PI-1301-05		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
TI-1301-05		Indication		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
PID-1302		Indication		AERATION BLOWER INLET FILTER DIFFERENTIAL PRE	38-I-16
PI-1402-01		Indication		WASHWATER PRESSURES	38-I-17

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
PI-1402-02		Indication		WASHWATER PRESSURES	38-I-17
PI-1501-01		Indication		AIR COMPRESSORS	38-I-18
PI-1501-02		Indication		AIR COMPRESSORS	38-I-18
LI-1601		Indication		PLANT DRAIN LEVEL AND PUMP	38-I-19
LI-1701		Indication		SODIUM HYDROXIDE STORAGE TANK LEVEL	38-I-20
LI-1706		Indication		SODIUM HYDROXIDE DAY TANK LEVEL	38-I-20
SI-1707-01		Indication		SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20
SI-1707-02		Indication		SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
SI-1801-01		Indication		POLYMER BLENDING UNITS NO. 1	38-I-21
SI-1801-02		Indication		POLYMER BLENDING UNITS NO. 2	38-I-21
SI-1801-03		Indication		POLYMER BLENDING UNITS NO. 3	38-I-21
LI-2001		Indication		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-24
LI-2004		Indication		FERROUS CHLORIDE DAY TANK LEVEL	38-I-24
SI-2005		Indication		FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
LI-2201		Indication		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-26
LI-2204		Indication		FERROUS CHLORIDE DAY TANK LEVEL	38-I-26
SI-2205				FERROUS CHLORIDE FEED PUMP	38-I-26
I/O Type:	AO				**I/O Type count:** 31
M-0107	FLOW	Control		INFLUENT AUTOMATIC SAMPLER	38-I-04
SC-0303-01	SPEED	Control		CONTINUOUS LOOP REACTOR AERATOR NO. 1	38-I-06
SC-0303-02	SPEED	Control		CONTINUOUS LOOP REACTOR AERATOR NO. 2	38-I-06
SC-0303-03	SPEED	Control		CONTINUOUS LOOP REACTOR AERATOR NO. 3	38-I-06
SC-0303-04	SPEED	Control		CONTINUOUS LOOP REACTOR AERATOR NO. 4	38-I-06
SC-0303-05	SPEED	Control		CONTINUOUS LOOP REACTOR AERATOR NO. 5	38-I-06
SC-0303-06	SPEED	Control		CONTINUOUS LOOP REACTOR AERATOR NO. 6	38-I-06
M-0508	FLOW	Control		EFFLUENT AUTOMATIC SAMPLER	38-I-08
SC-0601-01		Control		RAS PUMPS AND RAS FLOW NO. 1	38-I-09
SC-0601-02		Control		RAS PUMPS AND RAS FLOW NO. 2	38-I-09
SC-0601-03		Control		RAS PUMPS AND RAS FLOW NO. 3	38-I-09

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
SC-0702-01		Control		GBT FEED PUMPS NO. 1	38-I-10
SC-0702-02		Control		GBT FEED PUMPS NO. 2	38-I-10
SC-0807		Control		GRAVITY BELT THICKENER	38-I-11
SC-0808		Control		TWAS PUMP AND GRAVITY THICKENER	38-I-11
SC-1002-01		Control		BFP FEED PUMPS NO. 1	38-I-13
SC-1002-02		Control		BFP FEED PUMPS NO. 2	38-I-13
SC-1107		Control		BELT FILTER PRESS	38-I-14
SC-1301-01		Control		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
SC-1301-02		Control		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
SC-1301-05		Control		AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
LI-1701	OUT	Control		SODIUM HYDROXIDE STORAGE TANK LEVEL	38-I-20
SC-1707-01		Control		SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20
SC-1707-02		Control		SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
SC-1801-01		Control		POLYMER BLENDING UNITS NO. 1	38-I-21
SC-1801-02		Control		POLYMER BLENDING UNITS NO. 2	38-I-21
SC-1801-03		Control		POLYMER BLENDING UNITS NO. 3	38-I-21
LI-2001	OUT	Indication		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-24
SC-2005		Control		FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
LI-2201	OUT	Indication		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-26
SC-2205				FERROUS CHLORIDE FEED PUMP	38-I-26
I/O Type: DI				**I/O Type count:**	244
LAH-0101		Alarm	HIGH	PLANT INFLUENT LEVEL HIGH	38-I-04
CP-0105-01	ON	Status		FINE SCREEN	38-I-04
CP-0105-01	FAIL	Alarm		FINE SCREEN	38-I-04
CP-0105-02	ON	Status		FINE SCREEN	38-I-04
CP-0105-02	FAIL	Alarm		FINE SCREEN	38-I-04
M-0107	FAIL	Alarm		INFLUENT AUTOMATIC SAMPLER	38-I-04
QL-0602-02		Status	ON	PLANT INFLUENT AND SCREENING AIR MONITORING	38-I-04
QA-0602-02		Alarm	FAIL	PLANT INFLUENT AND SCREENING AIR MONITORING	38-I-04

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QL-0202	RMT	Status	REMOTE	GRIT CHAMBER ROTATOR	38-I-05
QL-0202		Status	ON	GRIT CHAMBER ROTATOR	38-I-05
QA-0202		Alarm	FAIL	GRIT CHAMBER ROTATOR	38-I-05
QL-0204	RMT	Status	REMOTE	GRIT PUMP	38-I-05
QL-0204		Status	ON	GRIT PUMP	38-I-05
QA-0204		Alarm	FAIL	GRIT PUMP	38-I-05
QL-0206	RMT	Status	REMOTE	GRIT CLASSIFER	38-I-05
QA-0206		Alarm	FAIL	GRIT CLASSIFER	38-I-05
QL-0206	RMT	Status	REMOTE	GRIT CLASSIFER	38-I-05
QL-0206		Status	ON	GRIT CLASSIFER	38-I-05
LAHH-0208		Alarm	HI-HI	GRIT REMOVAL SUMP PUMP	38-I-05
QA-0208		Alarm	FAIL	GRIT REMOVAL SUMP PUMP	38-I-05
QA-0302-01		Alarm	FAIL	CONTINUOUS LOOP REACTOR MIXER NO. 1	38-I-06
QL-0302-01		Status	ON	CONTINUOUS LOOP REACTOR MIXER NO. 1	38-I-06
QA-0302-01	MOISTURE	Alarm	TROUBLE	CONTINUOUS LOOP REACTOR MIXER NO. 1	38-I-06
QL-0302-01	RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR MIXER NO. 1	38-I-06
QA-0302-02	MOISTURE	Alarm	TROUBLE	CONTINUOUS LOOP REACTOR MIXER NO. 2	38-I-06
QL-0302-02		Status	ON	CONTINUOUS LOOP REACTOR MIXER NO. 2	38-I-06
QL-0302-02	RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR MIXER NO. 2	38-I-06
QA-0302-02		Alarm	FAIL	CONTINUOUS LOOP REACTOR MIXER NO. 2	38-I-06
QA-0302-03	MOISTURE	Alarm	TROUBLE	CONTINUOUS LOOP REACTOR MIXER NO. 3	38-I-06
QA-0302-03		Alarm	FAIL	CONTINUOUS LOOP REACTOR MIXER NO. 3	38-I-06
QL-0302-03		Status	ON	CONTINUOUS LOOP REACTOR MIXER NO. 3	38-I-06
QL-0302-03	RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR MIXER NO. 3	38-I-06
QL-0302-04		Status	ON	CONTINUOUS LOOP REACTOR MIXER NO. 4	38-I-06
QA-0302-04		Alarm	FAIL	CONTINUOUS LOOP REACTOR MIXER NO. 4	38-I-06
QL-0302-04	RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR MIXER NO. 4	38-I-06
QA-0302-04	MOISTURE	Alarm	TROUBLE	CONTINUOUS LOOP REACTOR MIXER NO. 4	38-I-06
QA-0303-01		Alarm	FAIL	CONTINUOUS LOOP REACTOR AERATOR NO. 1	38-I-06

Tag Number	I/O Function	Logical State	I/O Description	PID Drawing
QL-0303-01	Status	ON	CONTINUOUS LOOP REACTOR AERATOR NO. 1	38-I-06
QL-0303-01 RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR AERATOR NO. 1	38-I-06
QA-0303-02	Alarm	FAIL	CONTINUOUS LOOP REACTOR AERATOR NO. 2	38-I-06
QL-0303-02	Status	ON	CONTINUOUS LOOP REACTOR AERATOR NO. 2	38-I-06
QL-0303-02 RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR AERATOR NO. 2	38-I-06
QA-0303-03	Alarm	FAIL	CONTINUOUS LOOP REACTOR AERATOR NO. 3	38-I-06
QL-0303-03	Status	ON	CONTINUOUS LOOP REACTOR AERATOR NO. 3	38-I-06
QL-0303-03 RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR AERATOR NO. 3	38-I-06
QL-0303-04	Status	ON	CONTINUOUS LOOP REACTOR AERATOR NO. 4	38-I-06
QL-0303-04 RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR AERATOR NO. 4	38-I-06
QA-0303-04	Alarm	FAIL	CONTINUOUS LOOP REACTOR AERATOR NO. 4	38-I-06
QL-0303-05 RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR AERATOR NO. 5	38-I-06
QA-0303-05	Alarm	FAIL	CONTINUOUS LOOP REACTOR AERATOR NO. 5	38-I-06
QL-0303-05	Status	ON	CONTINUOUS LOOP REACTOR AERATOR NO. 5	38-I-06
QL-0303-06 RMT	Status	REMOTE	CONTINUOUS LOOP REACTOR AERATOR NO. 6	38-I-06
QL-0303-06	Status	ON	CONTINUOUS LOOP REACTOR AERATOR NO. 6	38-I-06
QA-0303-06	Alarm	FAIL	CONTINUOUS LOOP REACTOR AERATOR NO. 6	38-I-06
QL-0402-01 RMT	Status	REMOTE	SECONDARY CLARIFIERS NO. 1	38-I-07
NAHH-0402-	Alarm	HI-HI	SECONDARY CLARIFIERS NO. 1	38-I-07
NAH-0402-0	Alarm	HIGH	SECONDARY CLARIFIERS NO. 1	38-I-07
QL-0402-01	Status	ON	SECONDARY CLARIFIERS NO. 1	38-I-07
QA-0402-01	Alarm	FAIL	SECONDARY CLARIFIERS NO. 1	38-I-07
QL-0402-02 RMT	Status	REMOTE	SECONDARY CLARIFIERS NO. 1	38-I-07
NAH-0402-0	Alarm	HIGH	SECONDARY CLARIFIERS NO. 2	38-I-07
NAHH-0402-	Alarm	HI-HI	SECONDARY CLARIFIERS NO. 2	38-I-07
QL-0402-02	Status	ON	SECONDARY CLARIFIERS NO. 2	38-I-07
QA-0402-02	Alarm	FAIL	SECONDARY CLARIFIERS NO. 2	38-I-07
LAH-0404	Alarm	HIGH	SCUM PUMP	38-I-07
LAL-0404	Alarm	LOW	SCUM PUMP	38-I-07

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QL-0404		Status	ON	SCUM PUMP	38-I-07
QA-0404	MOISTURE	Alarm	TROUBLE	SCUM PUMP	38-I-07
QA-0404		Alarm	FAIL	SCUM PUMP	38-I-07
QL-0404	RMT	Status	REMOTE	SCUM PUMP	38-I-07
LAHH-0404		Alarm	HI-HI	SCUM PUMP	38-I-07
ZL-0405	OPENED	Status	OPEN	SCUM RECIRCULATION VALVE	38-I-07
ZL-0405	CLOSED	Status	CLOSED	SCUM RECIRCULATION VALVE	38-I-07
QL-0405	RMT	Status	REMOTE	SCUM RECIRCULATION VALVE	38-I-07
FV-0503-01	REMOTE	Status		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-01	OPENED	Status		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-01	CLOSED	Status		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-02	REMOTE	Status		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-02	OPENED	Status		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-02	CLOSED	Status		UV REACTOR ISOLATION VALVE	38-I-08
CP-0505-01	LAMPS	Alarm		UV REACTOR	38-I-08
CP-0505-01	GROUND	Alarm		UV REACTOR	38-I-08
CP-0505-01	WIPER	Alarm		UV REACTOR	38-I-08
CP-0505-01	TEMP	Alarm		UV REACTOR	38-I-08
CP-0505-02	GROUND	Alarm		UV REACTOR	38-I-08
CP-0505-02	FAULT	Alarm		UV REACTOR	38-I-08
CP-0505-02	LAMPS	Alarm		UV REACTOR	38-I-08
CP-0505-02	TEMP	Alarm		UV REACTOR	38-I-08
CP-0506	HIGH	Alarm		UV DISENFECTION SUMP PUMP	38-I-08
M-0508	FAIL	Alarm		EFFLUENT AUTOMATIC SAMPLER	38-I-08
QL-0601-01	RMT	Status	REMOTE	RAS PUMPS AND RAS FLOW NO. 1	38-I-09
QL-0601-01		Status	ON	RAS PUMPS AND RAS FLOW NO. 1	38-I-09
QA-0601-01		Alarm	FAIL	RAS PUMPS AND RAS FLOW NO. 1	38-I-09
QL-0601-02	RMT	Status	REMOTE	RAS PUMPS AND RAS FLOW NO. 2	38-I-09
QL-0601-02		Status	ON	RAS PUMPS AND RAS FLOW NO. 2	38-I-09

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QA-0601-02		Alarm	FAIL	RAS PUMPS AND RAS FLOW NO. 2	38-I-09
QL-0601-03	RMT	Status	REMOTE	RAS PUMPS AND RAS FLOW NO. 3	38-I-09
QL-0601-03		Status	ON	RAS PUMPS AND RAS FLOW NO. 3	38-I-09
QA-0601-03		Alarm	FAIL	RAS PUMPS AND RAS FLOW NO. 3	38-I-09
QL-0602-01	RMT	Status	REMOTE	WAS PUMPS NO. 1	38-I-09
P-0602-01	FAIL	Alarm		WAS PUMPS	38-I-09
P-0602-01	ON	Status		WAS PUMPS	38-I-09
QL-0602-02	RMT	Status	REMOTE	WAS PUMPS NO. 2	38-I-09
P-0602-02	FAIL	Alarm		WAS PUMPS	38-I-09
P-0602-02	ON	Status		WAS PUMPS	38-I-09
LAHH-0604		Alarm	HI-HI	RAS/WAS SUMP PUMP	38-I-09
FAL-0606		Alarm		RAS/WAS PUMP STATION AIR MONITORING	38-I-09
QL-0702-01	RMT	Status	REMOTE	GBT FEED PUMPS NO. 1	38-I-10
QL-0702-01		Status	ON	GBT FEED PUMPS NO. 1	38-I-10
QA-0702-01		Alarm	FAIL	GBT FEED PUMPS NO. 1	38-I-10
QA-0702-02		Alarm	FAIL	GBT FEED PUMPS NO. 2	38-I-10
QL-0702-02	RMT	Status	REMOTE	GBT FEED PUMPS NO. 2	38-I-10
QL-0702-02		Status	ON	GBT FEED PUMPS NO. 2	38-I-10
QL-0806	RMT	Status	REMOTE	GBT WASHWATER SUPPLY VALVE	38-I-11
PAL-0808		Alarm	LOW	GBT WASHWATER SUPPLY VALVE	38-I-11
QL-0807	ESTOP	Status		GRAVITY BELT THICKENER	38-I-11
QA-0807	AIR	Alarm	TROUBLE	GRAVITY BELT THICKENER	38-I-11
QL-0807		Status	ON	GRAVITY BELT THICKENER	38-I-11
QA-0807		Alarm	FAIL	GRAVITY BELT THICKENER	38-I-11
QA-0807	WATER	Alarm	TROUBLE	GRAVITY BELT THICKENER	38-I-11
QL-0807	TRACKING	Status		GRAVITY BELT THICKENER	38-I-11
QL-0807	RMT	Status	REMOTE	GRAVITY BELT THICKENER	38-I-11
FAL-0808	LOW	Alarm		TWAS PUMP AND GRAVITY THICKENER	38-I-11
QL-0808	RMT	Status	REMOTE	TWAS PUMP AND GRAVITY THICKENER	38-I-11

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QL-0808		Status	ON	TWAS PUMP AND GRAVITY THICKENER	38-I-11
QA-0808		Alarm	FAIL	TWAS PUMP AND GRAVITY THICKENER	38-I-11
PAH-0808		Alarm	HIGH	TWAS PUMP AND GRAVITY THICKENER	38-I-11
QL-0904-01	RMT	Status	REMOTE	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
QL-0904-01		Status	ON	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
QA-0904-01		Alarm	FAIL	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
QL-0904-02		Status	ON	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
QA-0904-02		Alarm	FAIL	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
QL-0904-02	RMT	Status	REMOTE	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
QL-1001-01	RMT	Status	REMOTE	SLUDGE GRINDERS NO. 1	38-I-13
QL-1001-01		Status	ON	SLUDGE GRINDERS NO. 1	38-I-13
QA-1001-01		Alarm	FAIL	SLUDGE GRINDERS NO. 1	38-I-13
QL-1001-02	RMT	Status	REMOTE	SLUDGE GRINDERS NO. 2	38-I-13
QL-1001-02		Status	ON	SLUDGE GRINDERS NO. 2	38-I-13
QA-1001-02		Alarm	FAIL	SLUDGE GRINDERS NO. 2	38-I-13
FAL-1002-01	LOW	Alarm		BFP FEED PUMPS	38-I-13
PAH-1002-0		Alarm	HIGH	BFP FEED PUMPS NO. 1	38-I-13
QL-1002-01	RMT	Status	REMOTE	BFP FEED PUMPS NO. 1	38-I-13
QL-1002-01		Status	ON	BFP FEED PUMPS NO. 1	38-I-13
QA-1002-01		Alarm	FAIL	BFP FEED PUMPS NO. 1	38-I-13
PAH-1002-0		Alarm	HIGH	BFP FEED PUMPS NO. 2	38-I-13
QL-1002-02	RMT	Status	REMOTE	BFP FEED PUMPS NO. 2	38-I-13
QL-1002-02		Status	ON	BFP FEED PUMPS NO. 2	38-I-13
QA-1002-02		Alarm	FAIL	BFP FEED PUMPS NO. 2	38-I-13
FAL-1002-02	LOW	Alarm		BFP FEED PUMPS	38-I-16
LAHH-1003		Alarm	HI-HI	BFP FEED PUMP SUMP PUMP	38-I-13
FAL-1004		Alarm		BFP FEED PUMP AIR MONITORING	38-I-13
QL-1106	RMT	Status	REMOTE	BFP WASWATER SUPPLY VALVE	38-I-14
QA-1107	AIR	Alarm	TROUBLE	BELT FILTER PRESS	38-I-14

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QL-1107	TRACKING	Status		BELT FILTER PRESS	38-I-14
QA-1107		Alarm	FAIL	BELT FILTER PRESS	38-I-14
QL-1107	ESTOP	Status		BELT FILTER PRESS	38-I-14
QA-1107	WATER	Alarm	TROUBLE	BELT FILTER PRESS	38-I-14
QL-1107	RMT	Status	REMOTE	BELT FILTER PRESS	38-I-14
QL-1107		Status	ON	BELT FILTER PRESS	38-I-14
QA-1201		Alarm	FAIL	CAKE SCREW CONVEYOR NO. 1	38-I-15
QL-1201	RMT	Status	REMOTE	CAKE SCREW CONVEYOR NO. 1	38-I-15
SS-1201	OK	Status		CAKE SCREW CONVEYOR NO. 1	38-I-15
QA-1201	ESTOP	Alarm	STOP	CAKE SCREW CONVEYOR NO. 1	38-I-15
QL-1201		Status	ON	CAKE SCREW CONVEYOR NO. 1	38-I-15
QA-1202	ESTOP	Alarm	STOP	CAKE SCREW CONVEYOR NO. 2	38-I-15
QL-1202		Status	ON	CAKE SCREW CONVEYOR NO. 2	38-I-15
SS-1202	OK	Status		CAKE SCREW CONVEYOR NO. 2	38-I-15
QL-1202	RMT	Status	REMOTE	CAKE SCREW CONVEYOR NO. 2	38-I-15
QA-1202		Alarm	FAIL	CAKE SCREW CONVEYOR NO. 2	38-I-15
QA-1301-01		Alarm	FAIL	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-01	RMT	Status	REMOTE	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-01		Status	ON	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-02	RMT	Status	REMOTE	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-02		Status	ON	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QA-1301-02		Alarm	FAIL	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QA-1301-03		Alarm	FAIL	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-03		Status	ON	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-03	RMT	Status	REMOTE	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-04	RMT	Status	REMOTE	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QA-1301-04		Alarm	FAIL	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-04		Status	ON	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-05		Status	ON	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QA-1301-05		Alarm	FAIL	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
QL-1301-05	RMT	Status	REMOTE	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
CP-1302	MEDIA OUT	Status		AERATION BLOWER INLET FILTER DIFFERENTIAL PRE	38-I-16
QA-1401-01		Alarm	FAIL	WASHWATER BOOSTER PUMPS NO. 1	38-I-17
QL-1401-01		Status	ON	WASHWATER BOOSTER PUMPS NO. 1	38-I-17
QL-1401-01	RMT	Status	REMOTE	WASHWATER BOOSTER PUMPS NO. 1	38-I-17
QL-1401-02		Status	ON	WASHWATER BOOSTER PUMPS NO. 2	38-I-17
QA-1401-02		Alarm	FAIL	WASHWATER BOOSTER PUMPS NO. 2	38-I-17
QL-1401-02	RMT	Status	REMOTE	WASHWATER BOOSTER PUMPS NO. 2	38-I-17
QL-1401-03		Status	ON	WASHWATER BOOSTER PUMPS NO. 3	38-I-17
QA-1401-03		Alarm	FAIL	WASHWATER BOOSTER PUMPS NO. 3	38-I-17
QL-1401-03	RMT	Status	REMOTE	WASHWATER BOOSTER PUMPS NO. 3	38-I-17
PAL-1501-01		Alarm	LOW	AIR COMPRESSORS	38-I-18
PAL-1501-02		Alarm	LOW	AIR COMPRESSORS	38-I-18
QL-1602	RMT	Status	REMOTE	PLANT DRAIN LEVEL AND PUMP	38-I-19
QL-1601		Status	ON	PLANT DRAIN LEVEL AND PUMP	38-I-19
QA-1601		Alarm	FAIL	PLANT DRAIN LEVEL AND PUMP	38-I-19
QA-1601	MOISTURE	Alarm	TROUBLE	PLANT DRAIN LEVEL AND PUMP	38-I-19
HS-1701	SILENCE	Status	SILENCE	SODIUM HYDROXIDE STORAGE TANK LEVEL	38-I-20
QL-1702-01		Status	ON	SODIUM HYDROXIDE TRANSFER PUMPS NO. 1	38-I-20
QL-1702-01	RMT	Status	REMOTE	SODIUM HYDROXIDE TRANSFER PUMPS NO. 1	38-I-20
QA-1702-01		Alarm	FAIL	SODIUM HYDROXIDE TRANSFER PUMPS NO. 1	38-I-20
QL-1702-02	RMT	Status	REMOTE	SODIUM HYDROXIDE TRANSFER PUMPS NO. 2	38-I-20
QL-1702-02		Status	ON	SODIUM HYDROXIDE TRANSFER PUMPS NO. 2	38-I-20
QA-1702-02		Alarm	FAIL	SODIUM HYDROXIDE TRANSFER PUMPS NO. 2	38-I-20
PAH-1707-0		Alarm	HIGH	SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20
QA-1707-01		Alarm	FAIL	SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20
QL-1707-01		Status	ON	SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20
QL-1707-01	RMT	Status	REMOTE	SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QL-1707-02		Status	ON	SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
QA-1707-02		Alarm	FAIL	SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
PAH-1707-0		Alarm	HIGH	SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
QL-1707-02	RMT	Status	REMOTE	SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
LAH-1709		Alarm	HIGH	SODIUM HYDROXIDE CONTAINMENT LEVEL ALARM H	38-I-20
QA-1801-01		Alarm	FAIL	POLYMER BLENDING UNITS NO. 1	38-I-21
QL-1801-01		Status	ON	POLYMER BLENDING UNITS NO. 1	38-I-21
QL-1801-01	RMT	Status	REMOTE	POLYMER BLENDING UNITS NO. 1	38-I-21
QA-1801-02		Alarm	FAIL	POLYMER BLENDING UNITS NO. 2	38-I-21
QL-1801-02	RMT	Status	REMOTE	POLYMER BLENDING UNITS NO. 2	38-I-21
QL-1801-02		Status	ON	POLYMER BLENDING UNITS NO. 2	38-I-21
QL-1801-03		Status	ON	POLYMER BLENDING UNITS NO. 3	38-I-21
QA-1801-03		Alarm	FAIL	POLYMER BLENDING UNITS NO. 3	38-I-21
QL-1801-03	RMT	Status	REMOTE	POLYMER BLENDING UNITS NO. 3	38-I-21
HS-2001	SILENCE	Control		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-24
QL-2002	RMT	Status	REMOTE	FERROUS CHLORIDE TRANSFER PUMP NO. 1	38-I-24
QL-2002		Status	ON	FERROUS CHLORIDE TRANSFER PUMP NO. 1	38-I-24
QA-2002		Alarm	FAIL	FERROUS CHLORIDE TRANSFER PUMP NO. 1	38-I-24
PAH-2005		Alarm	HIGH	FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
QL-2005	RMT	Status	REMOTE	FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
QA-2005		Alarm	FAIL	FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
QL-2005		Status	ON	FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
YAL-2011-0	FAIL	Alarm		STATION EMERGENCY GENERATOR AND ATS	38-I-24
YAL-2011-0	ON	Status		STATION EMERGENCY GENERATOR AND ATS	38-I-24
HS-2201	SILENCE	Control		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-26
YL-2202	FAIL	Alarm		FERROUS CHLORIDE TRANSFER PUMP	38-I-26
HS-2202	OOR	Status		FERROUS CHLORIDE TRANSFER PUMP	38-I-26
YL-2202	ON	Status		FERROUS CHLORIDE TRANSFER PUMP	38-I-26
QL-2205	REMOTE			FERROUS CHLORIDE FEED PUMP	38-I-26

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
QA-2205	FAIL			FERROUS CHLORIDE FEED PUMP	38-I-26
QL-2205	ON			FERROUS CHLORIDE FEED PUMP	38-I-26
YL-2211-01	ON	Status		STATION EMERGENCY GENERATOR AND ATS	38-I-26
YL-2211-01	FAIL	Alarm		STATION EMERGENCY GENERATOR AND ATS	38-I-26
I/O Type:	DO			**I/O Type count:**	90
HS-0202	RUN	Control	RUN	GRIT CHAMBER ROTATOR	38-I-05
HS-0204	RUN	Control	RUN	GRIT PUMP	38-I-05
HS-0206	RUN	Control	RUN	GRIT CLASSIFER	38-I-05
HS-0206	OPEN	Control	OPEN	GRIT CLASSIFER	38-I-05
YA-0211-01	HORN	Alarm		HEADWORKS AREA COMMON ALARM	38-I-05
YA-0211-01	BEACON	Alarm		HEADWORKS AREA COMMON ALARM	38-I-05
YA-0211-01	HORN	Alarm		HEADWORKS AREA COMMON ALARM	38-I-05
YA-0211-01	BEACON	Indication		HEADWORKS AREA COMMON ALARM	38-I-05
HS-0302-01	RUN	Control	RUN	CONTINUOUS LOOP REACTOR MIXER NO. 1	38-I-06
HS-0302-02	RUN	Control	RUN	CONTINUOUS LOOP REACTOR MIXER NO. 2	38-I-06
HS-0302-03	RUN	Control	RUN	CONTINUOUS LOOP REACTOR MIXER NO. 3	38-I-06
HS-0302-04	RUN	Control	RUN	CONTINUOUS LOOP REACTOR MIXER NO. 4	38-I-06
HS-0303-01		Control	RUN	CONTINUOUS LOOP REACTOR AERATOR NO. 1	38-I-06
HS-0303-02		Control	RUN	CONTINUOUS LOOP REACTOR AERATOR NO. 2	38-I-06
HS-0303-03		Control	RUN	CONTINUOUS LOOP REACTOR AERATOR NO. 3	38-I-06
HS-0303-04		Control	RUN	CONTINUOUS LOOP REACTOR AERATOR NO. 4	38-I-06
HS-0303-05		Control	RUN	CONTINUOUS LOOP REACTOR AERATOR NO. 5	38-I-06
HS-0303-06		Control	RUN	CONTINUOUS LOOP REACTOR AERATOR NO. 6	38-I-06
HS-0402-01		Control	RUN	SECONDARY CLARIFIERS NO. 1	38-I-07
HS-0402-02		Control	RUN	SECONDARY CLARIFIERS NO. 1	38-I-07
HS-0404		Control	RUN	SCUM PUMP	38-I-07
HS-0405	CLOSE	Control	CLOSE	SCUM RECIRCULATION VALVE	38-I-07
HS-0405	OPEN	Control	OPEN	SCUM RECIRCULATION VALVE	38-I-07
FV-0503-01	OPEN	Control		UV REACTOR ISOLATION VALVE	38-I-08

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
FV-0503-01	CLOSE	Control		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-02	OPEN	Control		UV REACTOR ISOLATION VALVE	38-I-08
FV-0503-02	CLOSE	Control		UV REACTOR ISOLATION VALVE	38-I-08
CP-0505-01	IMM WIPE	Control		UV REACTOR	38-I-08
CP-0505-01	RUN LVL 2	Control		UV REACTOR	38-I-08
CP-0505-01	RUN LVL 3	Control		UV REACTOR	38-I-08
CP-0505-01	RUN LVL 1	Control		UV REACTOR	38-I-08
CP-0505-02	IMM WIPE	Control		UV REACTOR	38-I-08
CP-0505-02	RUN LVL 3	Control		UV REACTOR	38-I-08
CP-0505-02	RUN LVL 2	Control		UV REACTOR	38-I-08
CP-0505-02	RUN LVL 1	Control		UV REACTOR	38-I-08
YA-0507-01	HORN	Alarm		UV AREA COMMON ALARM	38-I-08
YA-0507-01	BEACON	Alarm		UV AREA COMMON ALARM	38-I-08
YA-0507-01	HORN	Alarm		UV AREA COMMON ALARM	38-I-08
YA-0507-01	BEACON	Alarm		UV AREA COMMON ALARM	38-I-08
HS-0601-01		Control	RUN	RAS PUMPS AND RAS FLOW NO. 1	38-I-09
HS-0601-02		Control	RUN	RAS PUMPS AND RAS FLOW NO. 2	38-I-09
HS-0601-03		Control	RUN	RAS PUMPS AND RAS FLOW NO. 3	38-I-09
HS-0602-01		Control	RUN	WAS PUMPS NO. 1	38-I-09
HS-0602-02		Control	RUN	WAS PUMPS NO. 2	38-I-09
YA-0605-01	HORN	Alarm		RAS/WAS PUMP AREA COMMON ALARM	38-I-09
YA-0605-01	BEACON	Alarm		RAS/WAS PUMP AREA COMMON ALARM	38-I-09
YA-0605-01	BEACON	Alarm		RAS/WAS PUMP AREA COMMON ALARM	38-I-09
YA-0605-01	HORN	Alarm		RAS/WAS PUMP AREA COMMON ALARM	38-I-09
HS-0702-01		Control	RUN	GBT FEED PUMPS NO. 1	38-I-10
HS-0702-02		Control	RUN	GBT FEED PUMPS NO. 2	38-I-10
HS-0806		Control	OPEN	GBT WASHWATER SUPPLY VALVE	38-I-11
HS-0807		Control	RUN	GRAVITY BELT THICKENER	38-I-11
HS-0808		Control	RUN	TWAS PUMP AND GRAVITY THICKENER	38-I-11

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
HS-0904-01		Control	RUN	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
HS-0904-02		Control	RUN	DIGESTED SOLIDS HOLDING TANK LEVEL AND AERAT	38-I-12
HS-1001-01		Control	RUN	SLUDGE GRINDERS NO. 1	38-I-13
HS-1001-02		Control	RUN	SLUDGE GRINDERS NO. 2	38-I-13
HS-1002-01		Control	RUN	BFP FEED PUMPS NO. 1	38-I-13
HS-1002-02		Control	RUN	BFP FEED PUMPS NO. 2	38-I-13
HS-1106		Control	OPEN	BFP WASWATER SUPPLY VALVE	38-I-14
HS-1107		Control	RUN	BELT FILTER PRESS	38-I-14
HS-1201		Control	RUN	CAKE SCREW CONVEYOR NO. 1	38-I-15
HS-1202		Control	RUN	CAKE SCREW CONVEYOR NO. 2	38-I-15
YA-1203-01	HORN	Alarm		DEWATERING AREA COMMON ALARM	38-I-15
YA-1203-01	BEACON	Alarm		DEWATERING AREA COMMON ALARM	38-I-15
YA-1203-01	BEACON	Alarm		DEWATERING AREA COMMON ALARM	38-I-15
YA-1203-01	HORN	Alarm		DEWATERING AREA COMMON ALARM	38-I-15
HS-1301-01		Control	RUN	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
HS-1301-02		Control	RUN	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
HS-1301-03		Control	RUN	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
HS-1301-04		Control	RUN	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
HS-1301-05		Control	RUN	AERATION BLOWERS TEMPERATURE, PRESSURE AND	38-I-16
HS-1401-01		Control	RUN	WASHWATER BOOSTER PUMPS NO. 1	38-I-17
HS-1401-02		Control	RUN	WASHWATER BOOSTER PUMPS NO. 2	38-I-17
HS-1401-03		Control	RUN	WASHWATER BOOSTER PUMPS NO. 3	38-I-17
HS-1602		Control	RUN	PLANT DRAIN LEVEL AND PUMP	38-I-19
LAH-1701	HORN OUT	Control	HIGH	SODIUM HYDROXIDE STORAGE TANK LEVEL	38-I-20
HS-1702-01		Control	RUN	SODIUM HYDROXIDE TRANSFER PUMPS NO. 1	38-I-20
HS-1702-02		Control	RUN	SODIUM HYDROXIDE TRANSFER PUMPS NO. 2	38-I-20
HS-1707-01		Control	RUN	SODIUM HYDROXIDE FEED PUMPS NO. 1	38-I-20
HS-1707-02		Control	RUN	SODIUM HYDROXIDE FEED PUMPS NO. 2	38-I-20
HS-1801-01		Control	RUN	POLYMER BLENDING UNITS NO. 1	38-I-21

Tag Number		I/O Function	Logical State	I/O Description	PID Drawing
HS-1801-02		Control	RUN	POLYMER BLENDING UNITS NO. 2	38-I-21
HS-1801-03		Control	RUN	POLYMER BLENDING UNITS NO. 3	38-I-21
LAH-2001	HORN	Alarm		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-24
HS-2002		Control	RUN	FERROUS CHLORIDE TRANSFER PUMP NO. 1	38-I-24
HS-2005		Control	RUN	FERROUS CHLORIDE FEED PUMP NO. 1	38-I-24
LAH-2201	OUT	Alarm		FERROUS CHLORIDE STORAGE TANK LEVEL	38-I-26
HS-2202	OOR	Control		FERROUS CHLORIDE TRANSFER PUMP	38-I-26
HS-2205	RUN			FERROUS CHLORIDE FEED PUMP	38-I-26

CONTROL PANEL SCHEDULE

Panel No.	Location	Mounting	NEMA	Dimensions			FDT	Space Heater	Service Light, Receptacle	Environment	SS
				H	W	D					
LCP-0108	Influent and Screening	WALL	4X	16	16	8	YES	NO	NO	OUTSIDE	YES
LCP-0402-01	Secondary Clarifiers	WALL	4X	12	12	8	YES	NO	NO	OUTSIDE	YES
LCP-0402-02	Secondary Clarifiers	WALL	4X	12	12	8	YES	NO	NO	OUTSIDE	YES
LCP-0404	Scum Pump Station	WALL	4X	12	12	8	YES	NO	NO	OUTSIDE	YES
LCP-0606	RAS/WAS Pump Station	WALL	4X	16	16	8	YES	NO	NO	OUTSIDE	YES
LCP-1004	BFP Feed Pumps	WALL	4X	16	16	8	YES	NO	NO	OUTSIDE	YES
LCP-1701	Sodium Hydroxide Feed	WALL	4X	16	16	8	YES	NO	NO	OUTSIDE	YES
LCP-2001	Ferrous Chloride	WALL	4X	16	16	8	YES	NO	NO	INSIDE	
LCP-2201	Ferrous Chloride	WALL	4X	16	16	8	YES	NO	NO	INSIDE	
LCP-HW	Headworks	WALL	12	48	30	10	YES	NO	YES	INSIDE	
LCP-RW	RAS/WAS	WALL	12	48	30	10	YES	NO	YES	INSIDE	
LCP-UV	Ultraviolet	WALL	12	48	30	10	YES	NO	YES	INSIDE	
LCP-DW	De-water	WALL	12	48	30	10	YES	NO	YES	INSIDE	
LCP-AB	Administration	WALL	12	48	30	10	YES	NO	YES	INSIDE	
LCP-CF	Camp Forsyth	WALL	12	48	30	10	YES	NO	YES	INSIDE	
LCP-MP	Main Post	WALL	12	48	30	10	YES	NO	YES	INSIDE	

Column Descriptions:

FDT: Factory Demonstration test required
Dimensions: Minimum panel size. Contractor responsible for final sizing
SS: Stainless Steel

CH2M HILL **LOOP STATUS REPORT** ***Rev.06.05.92***

Project Name:	Project No.

FUNCTIONAL REQUIREMENTS:

COMPONENT STATUS (Check & initial each item when complete)

Tag Number	Delivered	Tag ID Checked	Installation	Termination Wiring	Termination Tubing	Calibration	

REMARKS:

Loop Ready for Operation	By:	Date:	Loop No.:

CH2M HILL **LOOP STATUS REPORT** Rev.06.05.92
EXAMPLE FORMAT

Project Name: *Newport News WTP*	Project No. *WDC23456.C1*

FUNCTIONAL REQUIREMENTS:

1. Measure, locally indicate, and transmit RAS flow to LP-10.	
2. At LP-10 indicate flow and provide flow control by modulation of FCV-10-2.	
3. Provide high RAS flow alarm on LP-10.	

COMPONENT STATUS (Check & initial each item when complete)

Tag Number	Delivered	Tag ID Checked	Installation	Termination Wiring	Termination Tubing	Calibration	
FE/FIT-10-2	*Jan-12-90 DWM*	*Jan-12-90 DWM*	*Feb-7-90 DWM*	*Mar-5-90 DWM*	*N.A.*	*May-6-90 VDA*	
FIC-10-2	*Jan-12-90 DWM*	*Jan-12-90 DWM*	*Mar-5-90 DWM*	*Apr-4-90 DWM*		*May-4-90 VDA*	
FSH-10-2	*Jan-12-90 DWM*	*Jan-12-90 DWM*	*Mar-5-90 DWM*	*Apr-4-90 DWM*		*May-7-90 VDA*	
FAH-10-2	*Jan-12-90 DWM*	*Jan-12-90 DWM*	*Mar-5-90 DWM*	*Apr-4-90 DWM*		*May-7-90 VDA*	
FCV-10-2	*Mar-2-90 DWM*	*Mar-2-90 DWM*	*Apr-20-90 DWM*	*Apr-30-90 DWM*		*May-16-90 VDA*	

REMARKS: None.

Loop Ready for Operation	By: *D.W. Munzer*	Date: *May-18-90*	Loop No.: *10-2*

CH2M HILL **INSTRUMENT CALIBRATION SHEET** Rev.06.05.92

COMPONENT	**MANUFACTURER**	**PROJECT**
Code:	Name:	Number:
Name:	Model:	Name:
	Serial #:	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? Y / N	CONTROL? Y / N Action? direct / reverse Modes? P / I / D
Indicate? Y/N Record? Y/N	Chart:			Describe:	
	Scale:				SWITCH? Y / N Unit Range: Differential: fixed/adjustable Reset? automatic / manual
Transmit/ Convert? Y/N	Input:				
	Output:				

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
Input	Indicated	Output	Increasing Input		Decreasing Input	
			Indicated	Output	Indicated	Output
CONTROL MODE SETTINGS:			P:	I:	D:	

DISCRETE CALIBRATIONS

	REQUIRED		AS CALIBRATED		Note. No
Number	Trip Point	Reset Pt.	Trip Point	Reset Pt.	
	(note rising or falling)		(note rising or falling)		
1.					
2.					
3.					
4.					
5.					
6.					
7.					

#	**NOTES:**

Component Calibrated and Ready for Start-up

By:

Date:

Tag No.:

CH2M HILL **INSTRUMENT CALIBRATION SHEET** Rev.06.05.92
EXAMPLE - ANALYZER/TRANSMITTER

COMPONENT	**MANUFACTURER**	**PROJECT**
Code: *A7*	Name: *Leeds & Northrup*	Number: *WDC30715.B2*
Name: *pH Element & Analyzer/Transmitter*	Model: *12429-3-2-1-7*	Name: *UOSA AWT PHASE 3*
	Serial #: *11553322*	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? N	CONTROL? N Action? direct / reverse Modes? P / I / D
Indicate? Y Record? N	Chart:			Describe:	
	Scale:	*1-14*	*pH units*		SWITCH? N Unit Range: Differential: fixed/adjustable Reset? automatic / manual
Transmit/	Input:	*1-14*	*pH units*		
Convert? Y	Output:	*4-20*	*mA dc*		

ANALOG CALIBRATIONS							**DISCRETE CALIBRATIONS**					**Note No.**
REQUIRED			**AS CALIBRATED**				**REQUIRED**			**AS CALIBRATED**		
Input	Indicated	Output	Increasing Input		Decreasing Input		Number	Trip Point	Reset Pt.	Trip Point	Reset Pt.	
			Indicated	Output	Indicated	Output		(note rising or falling)		(note rising or falling)		
1.0	*1.0*	*4.0*	*1.0*	*4.0*	*1.0*	*3.9*	*1.*	*N.A.*		*N.A.*		
2.3	*2.3*	*5.6*	*2.2*	*5.5*	*2.3*	*5.6*	2.					*1.*
7.5	*7.5*	*12.0*	*7.5*	*11.9*	*7.5*	*12.0*	3.					
12.7	*12.7*	*18.4*	*12.7*	*18.3*	*12.6*	*18.3*	4.					
14.0	*14.0*	*20.0*	*14.0*	*20.0*	*14.0*	*20.0*	5.					
							6.					
CONTROL MODE SETTINGS:			P: *N.A.*	I:	D:		7.					

#	**NOTES:**	**Component Calibrated and Ready for Start-up**
	1. Need to recheck low pH calibration solutions.	By: *J.D. Sewell*
		Date: *Jun-6-92*
		Tag No.: *AIT-12-6*[pH]

INDUCTION MOTOR DATA SHEET

Project: Fort Riley Wastewater Treatment Plant

Owner: U.S. Army COE

Equipment Name: Shaftless Screw Conveyors

Equipment Tag Number(s): M-1201; M-1202

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark

Motor Horsepower: Three

Voltage: 460

Phase: Three

Frequency: 60

Synchronous Speed: _____ rpm

☐ Multispeed, Two-Speed:

_____ / _____ rpm

☐ Constant Horsepower

☐ Variable Torque

☐ Constant Torque

Winding: ☐ One ☐ Two

Guaranteed Minimum Efficiency @ Full Load: _____ percent

Guaranteed Minimum Power Factor @ Full Load: _____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up _____ Down

☐ Adjustable Speed Drive: See Section 16261, VARIABLE FREQUENCY DRIVE SYSTEMS.

Operating Speed Range: _____ to _____% of Rated Speed

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single phase

☐ Oversize main terminal (conduit) box for motors

☐ Terminal for connection of equipment grounding wire in each terminal box

Additional Motor Requirements: ☒ See Section 16405, AC INDUCTION MOTORS

Special Features:

Table 1
ELECTRICALLY OPERATED VALVES (OPEN/CLOSE TYPE)

Valve Number	P&ID Number	Valve Type	Size (Inches)	Flow stream Designation	Delta press. Max Shutoff (psig)	Actuator Type	Actuator Voltage (Volts)	Travel Time (Seconds)	Control Features	Notes
FV-0503-01	38-I-8	V406	14	SE	20	O/C	480	60	A,B,D,E	
FV-0503-02	38-I-8	V406	14	SE	20	O/C	480	60	A,B,D,E	
FV-0405	38-I-7	V410	6	SSM	30	O/C	480	30	A,B,D,E	

Control Features for Electrically Operated Valves:

A = Nonmodulating Service. LOCAL-OFF-REMOTE selector switch for OPEN-CLOSE valves with integral OPEN-STOP-CLOSE pushbutton control in LOCAL mode and provisions for remote OPEN-CLOSE control via remote contact closures in REMOTE mode (4-wire circuit, no seal-in required).

B = A pair of OPEN and CLOSED unit switches for remote STATUS indication.

C = Modulating service valve modulates in response to a remote 4 to 20 mA signal when switch is in REMOTE position. In local position OPEN/CLOSE pushbuttons allow valve control.

D = Auxiliary contact which closes when the LOCAL-OFF-REMOTE switch is in the REMOTE position.

E = Actuator shall remain in last position upon loss of signal.

F = Provision of a pendant type REMOTE/OPEN/CLOSE control station.

H = Motor and control enclosure(s) NEMA 250, Type 7 (explosion-proof).

I = Provide limit switch for manual valves.

Table 2
AIR/PRESSURE RELIEF VALVES

Valve Number	PID Number	Valve Type	Maximum Operating Pressure (psig)	Inlet Size (inches)	Orifice Size (inches)	Maximum Flow (gpm)	Features
ARV-1303	38-I-19	752	20	2	5/16	450	A

REQUIRED FEATURES FOR AIR VACUUM VALVES
A = valves fitted with resilient seats and soft seat and seals.

NOTES
X = 1 TO 7
Y = 1 to 3

Table 3
SOLENOID VALVES

Valve Number	P&ID Number	Valve Type	Size (Inches)	Flow Stream Designation	Delta Press. Max Shutoff (psig)	Control Features	Notes
FV-0105-01	38-I-4	V940	3/4	W2	80	Fail Close	
FV-0105-02	38-I-4	V940	3/4	W2	80	Fail Close	
FV-0207	38-I-5	V940	1/2	W2	80	Fail Close	
FV-1106	38-I-14	V904	2	W2	120	Fail Close	
FV-0806	38-I-11	V904	2	W2	120	Fail Close	

Table 4
PRESSURE CONTROL VALVES

Valve Number	PID Number	Valve Type	Size (inches)	Maximum Operating Pressure (psi)	Set Pressure (psi)	Notes
PCV-1402-01	38-I-17	710	2			Maximum operating pressure and set pressure as recommended by GBT and BFP manufacturer
PCV-1402-02	38-I-17	710				Maximum operating pressure and set pressure as recommended by GBT and BFP manufacturer
PCV-1703	38-I-20					As specified in Section 11242A, CHEMICAL FEED SYSTEMS
PCV-1708	38-I-20					As specified in Section 11242A, CHEMICAL FEED SYSTEMS
PCV-1801-01	38-I-21					As specified in Section 11345, POLYMER FEED SYSTEM, LIQUID
PCV-1801-02	38-I-21					As specified in Section 11345, POLYMER FEED SYSTEM, LIQUID
PCV-1801-03	38-I-21					As specified in Section 11345, POLYMER FEED SYSTEM, LIQUID
PCV-1803	38-I-21	710	1-1/2	80	As recommended by polymer feed system supplier	
PCV-2006	38-I-24					As specified in Section 11242A, CHEMICAL FEED SYSTEMS
PCV-2206	38-I-26					As specified in Section 11242A, CHEMICAL FEED SYSTEMS

Pipe Schedule

Service	Legend	Size(s) (In.)	Exposure	Piping Material	Operating Pressure (psig) Note 9	Test Presssure and Type	Notes
Air, High Pressure	AHP	All	All	STL	120	180	
Air, Low Pressure	ALP	All	Exposed	304 SST	9.5	15, H	Note 27
Air, Low Pressure	ALP	All	Buried	CLDI	9.5	15, H	Note 17
Air, Low Pressure	ALP	All	Submerged	304 SST	9.5	15, H	By aerator supplier
Chemical Resistant Drain	CRD	All	All	CPVC	gravity	N/A	Note 6
Acid Resistant Drain	ARD	All	All	CPVC	gravity	N/A	
Belt Filter Press Feed	BFPF	All	All	CLDI	90	135	
Drain, Sanitary	D	All	All	CISP	gravity	N/A	Note 6
Domestic Hot Water	DHW	All	All	CU	80	120, H	
Dewatered Solids Cake	DSC	NA					
Digested Solids	DSD	All	All	CLDI	90	135, H	
Sludge, Digested	DSD	All	All	CLDI	90	135, H	
Ferrous Chloride	FC	All	All	PVC	60	90,H	
Filtrate	FILL	All	All	CLDI	gravity	N/A	Note 26
Finished Effluent	FE	14 "	Exposed	CLDI	gravity	N/A	
	FE	30"	Burried	PVC SDR 25	gravity	N/A	
Gravity Belt Thickener Feed	GBTF	All	All	CLDI	80	120, H	
Natural Gas/High Pressure	NG-HP	All	Exposed	CST-G	60	100	Note 18
	NG-HP	All	Buried	PE	60	100	See Notes 12 and 18
Natural Gas/Low Pressure	NG-LP	All	Exposed	CST-G	10-May	20	Note 18
	NG-LP	All	Buried	PE	10-May	20	See Notes 12 and 18
Grit	GR	All	All	CLDI	Atm	N/A	
Grit Slurry	GRS	All	All	CLDI	20	30, H	
Mixed Liqour	ML	All	Buried	CLDI	10	15,H	
Sodium Hydroxide	NA	All	All	CPVC	60	90, H	Notes 1, 2, 13, 25
Process Overflow	OF	All	Exposed	process pipe	Atm	N/A	
Overflow Roof Drain	OF	All	All	CISP	Atm	N/A	Note 19
Process Drain	PD	All	All	process pipe	gravity	N/A	
	PD	All	Buried	PVC SDR 25	gravity	N/A	See Notes 21 and 24
Plant Drain Discharge	PDD	All	All	CLDI	40	60, H	
Polymer	PO		Exposed	PVC	Atm	N/A	
Polymer Solution	POS		Exposed	PVC	100	150, H	
Sludge, Return Activated	RAS	All	All	CLDI	30	45, H	
Roof Drain	RD	All	Exposed	CISP	Atm	N/A	Note 19
Raw Sewage	RS	>=4	Exposed	CLDI	<100	150, H	
Raw Sewage	RS	<4	Exposed	PVC	<100	150, H	Note 13
Raw Sewage	RS	>=4	Buried	PVC SDR 21	<100	150, H	Note 21
Raw Sewage	RS	<4	Buried	PVC	<100	150, H	Note 13
Sample	SA	<=2 1/2 inch	All	PVC	60	90, H	
Secondary Effluent	SE	All	All	CLDI	20	30, H	
Sodium Hypochlorite	SH	All	All	CPVC	60	90, H	Notes 1, 2, 13, 25
Secondary Influent	SI	All	All	CLDI	20	30, H	
Sump Pump Discharge	SPD	All	All	PVC	40	60, H	
Sanitary Sewer (Temporary)	SS	All	Buried	PVC SDR 35	gravity	N/A	only. See Notes 21 and 22
Sanitary Sewer (Permanent)	SS		Buried	PVC SDR 25	gravity	N/A	For permanent connection. See Note 21
Scum, Secondary	SSM	>4	All	CLDI	40	60, H	
		<=4	All	PVC	40	60, H	
Storm Drain	SD	All	Buried	RCP	gravity	N/A	Note 15
Thickened Waste Activated Sl	TWAS	All	All	CLDI	80	120, H	
Vent	V	All	All	CISP	Atm	N/A	Note 19
Process Vent	V	All	All	same as process	Atm	N/A	
Vent Thru Roof	VTR	All	Exposed	CISP	Atm	N/A	Note 19
Water, Potable	W1	>3"	Exposed	CLDI	80	120, H	
Water, Potable	W1	All	Buried	PVC	80	120, H	
Water, Potable	W1	<=3"	Exposed	CU	80	120, H	
Water, Potable	W1	<=3"	Buried	PVC	80	120, H	
Water, Nonpotable	W2	>3"	All	PVC	80	120, H	
Water, Nonpotable	W3	<=3"	Exposed	PVC	80	120, H	Note 19
Sludge, Waste Activated	WAS	All	All	CLDI	20	30, H	
Wash Water	WW	All	All	PVC	120	180	Note 13

ENGINE-GENERATOR PARAMETER SCHEDULE

Power Rating	Emergency Standby
Service Load	[_____] kVA (maximum) [_____] kVA (continuous
Motor Starting kVA (Max.)	[_____] kVA
Power Factor	0.8 lagging
Engine-Generator Applications	stand-alone
Maximum Speed	1800 rpm
Heat Exchanger Type	fin-tube (radiator)
Governor Type	Droop
Frequency Regulation No Load to Full Load)	3% (maximum)
Frequency Bandwidth steady state)	0.25%
Voltage Regulation (No Load to Full Load) (Stand alone applications)	Plus or minus 2% (maximum
Voltage Bandwidth (steady state)	Plus or minus 2%
Frequency	60 Hz
Voltage	480Y/277 volts
Phases	3 Phase, Wye
Minimum Generator Subtransient Reactance	[_____] %
Nonlinear Loads	[_____] kVA
Max Step Load Increase	[25] [50] [75] [100] % of Service Load at [_____] PF
Transient Recovery Time with Step Load Increase (Voltage)	[_____] seconds
Transient Recovery Time with Step Load Increase (Frequency)	[_____] seconds
Maximum Voltage Deviation with Step Load Increase	[5] [10] [30] [_____] % of rated voltage
Maximum Frequency Deviation with Step Load Increase	[2.5] [5] [_____] % of rated frequency
Max Step Load Decrease (without shutdown)	100 % of Service Load at [_____] PF
Max Time to Start and be Ready to Assume Load	[10] [_____] seconds
Max Summer Indoor Temp (Prior to Genset Operation)	[_____] degrees
Min Winter Indoor Temp (Prior to Genset Operation)	[_____] degrees
Max Allowable Heat Transferred To Engine Generator Space at Rated Output Capacity	[_____] MBTU/hr
Max Summer Outdoor Temp Ambient)	[_____] degrees
Min Winter Outdoor Temp (Ambient)	[_____] degrees
Installation Elevation	[_____] above sea level

TABLE 1
MOTOR PERFORMANCE REQUIREMENTS

		% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
hp	Nom.Speed rpm	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC
1	1,800	82.5	82.5			Mfr.'s Std.	Mfr.'s Std.		
	1,200	80.0	80.0			Mfr.'s Std.	Mfr.'s Std.		
1.5	3,600	82.5	82.5			Mfr.'s Std.	Mfr.'s Std.		
	1,800	84.0	84.0			Mfr.'s Std.	Mfr.'s Std.		
	1,200	84.0	85.5		82.0	Mfr.'s Std.	Mfr.'s Std.		Mfr.'s Std.
2	3,600	84.0	84.0			Mfr.'s Std.	Mfr.'s Std.		
	1,800	84.0	84.0			Mfr.'s Std.	Mfr.'s Std.		
	1,200	85.5	86.5	83.7	83.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	82.9	82.5	82.9	81.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
3	3,600	84.0	85.5	82.0	82.0	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	86.5	87.5	84.8	84.8	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	86.5	87.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	84.1	83.0	84.1	82.9	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
5	3,600	85.5	87.5	84.8	84.8	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	87.5	87.5	84.8	84.8	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	87.5	87.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	87.5	85.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
7.5	3,600	87.5	88.5	84.8	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	88.5	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	88.5	89.5	88.4	87.5	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	87.5	85.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.

TABLE 1
MOTOR PERFORMANCE REQUIREMENTS

		% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
hp	Nom.Speed rpm	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC
10	3,600	88.5	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	89.5	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	90.2	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	89.3	88.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
15	3,600	89.5	90.2	88.4	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	91.0	91.0	90.9	90.2	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	90.2	90.2	90.2	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	89.3	88.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
20	3,600	90.2	90.2	90.9	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	91.0	91.0	91.7	90.9	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	91.0	90.2	90.2	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	90.2	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
25	3,600	91.0	91.0	91.7	90.2	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	91.7	92.4	92.4	91.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	91.7	91.7	90.9	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	90.2	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
30	3,600	91.0	91.0	89.5	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	92.4	92.4	92.4	91.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	92.4	91.7	91.7	90.2	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	91.7	91.0	90.9	90.9	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.

TABLE 1
MOTOR PERFORMANCE REQUIREMENTS

		% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
hp	Nom.Speed rpm	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC
40	3,600	91.7	91.7	90.2	89.3	86.6	86.1	87.0	89.0
	1,800	93.0	93.0	92.8	91.7	78.2	78.2	83.0	84.5
	1,200	93.0	93.0	91.7	90.9	81.5	81.5	81.5	81.5
	900	91.7	91.0	90.9	90.2	70.0	70.5	70.0	70.5
50	3,600	92.4	92.4	90.2	89.3	85.1	86.7	89.0	89.0
	1,800	93.0	93.0	92.8	91.7	79.5	79.4	82.5	82.5
	1,200	93.0	93.0	91.7	90.9	81.5	81.5	81.5	81.5
	900	91.7	91.7	90.9	90.9	78.5	72.9	78.5	80.0
60	3,600	93.0	93.0	91.7	90.9	85.8	88.3	87.5	89.0
	1,800	93.6	93.6	93.5	92.8	80.5	79.9	80.5	80.5
	1,200	93.6	93.6	92.8	91.7	81.5	81.5	81.5	81.5
	900	92.4	91.7	91.7	90.9	79.5	73.2	79.5	79.5
75	3,600	93.0	93.0	91.7	91.7	87.1	88.5	88.5	88.5
	1,800	94.1	94.1	93.5	93.5	81.0	81.5	81.0	81.5
	1,200	93.6	93.6	93.5	92.8	82.0	82.0	82.0	82.0
	900	92.8	92.4	92.8	91.7	80.5	74.5	80.5	81.0
100	3,600	93.0	93.6	91.7	91.7	87.0	88.2	87.0	88.5
	1,800	94.1	94.5	94.0	93.5	81.0	81.0	81.0	81.0
	1,200	94.1	94.1	92.8	92.8	82.1	81.7	85.5	85.5
	900	93.5	92.4	92.8	91.7	77.0	77.3	77.0	80.0

TABLE 1
MOTOR PERFORMANCE REQUIREMENTS

		% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
hp	Nom.Speed rpm	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC	Drip-proof ODP	TEFC
125	3,600	93.6	94.5	91.7	91.7	86.4	89.1	87.0	90.5
	1,800	94.5	94.5	93.5	92.8	85.4	85.5	87.5	86.0
	1,200	94.1	94.1	93.5	92.8	82.7	82.3	85.5	85.5
	900	93.5	93.0	92.8	92.4	78.5	78.5	78.5	78.5
150	3,600	93.6	94.5	92.4	91.7	86.5	90.0	86.5	90.5
	1,800	95.0	95.0	94.5	94.0	82.5	85.0	84.5	85.0
	1,200	94.5	95.0	93.5	94.0	81.5	81.5	81.5	81.5
	900	93.5	93.0	92.8	92.4	78.0	78.5	78.0	78.5
200	3,600	94.5	95.0	92.4	93.0	87.8	89.4	91.0	91.0
	1,800	95.0	95.0	94.0	94.0	85.2	86.5	87.0	87.0
	1,200	94.5	95.0	93.5	93.5	79.0	82.5	79.0	82.5
250	3,600	95.0	95.0	91.7	92.4	85.0	86.5	85.0	86.5
	1,800	96.0	96.0	94.5	94.5	79.0	79.0	79.0	79.0
	1,200	95.0	95.0	94.5	93.5	82.0	82.0	82.0	82.0
300	3,600	95.0	95.0			89.8	89.9		
	1,800	95.4	95.2	94.5	94.0	80.0	80.0	80.0	80.0
	1,200	95.0	95.0			84.5	90.1		