AUGUST 3, 2022

CONTRACT NO. 1760 G, E, H, P

CSO BYPASS AND DISINFECTION

ADDENDUM NO. 2

All bidders bidding Contract No. **1760 G, E, H, P** shall read and take note of this Addendum No. 2. The Contract Documents for **Contract No. 1760 G, E, H, P – CSO Bypass and Disinfection** are hereby revised and/or clarified as stated below.

Acknowledgement of Contract No. 1760 G, E, H, P ; Addendum No. 2
The Acknowledgement attached to Addendum No. 2 is to be signed and returned immediately via **email** to **Kathleen P. Uniatowski** at contract.clerks@alcosan.org and acknowledged with Bidder's Proposal.

Kimberly Kennedy, P.E.
Director – Engineering and Construction

ACKNOWLEDGEMENT OF

CONTRACT NO. 1760 G, E, H, P – CSO BYPASS AND DISINFECTION

ADDENDUM NUMBER 2

FIRM NAME: _____

SIGNATURE: _____

TITLE: _____

DATE: _____

AUGUST 3, 2022

CONTRACT NO. 1760 G, E, H, P

CSO BYPASS AND DISINFECTION

ADDENDUM NO. 2

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CSO BYPASS AND DISINFECTION

ADDENDUM NO. 2

A. Contract Documents – Volume 1

1. *(No Items)*

B. Contract Specifications – Volume 2

1. Replace the existing Summary of Work (Section 01 11 00) in its entirety with the revised version (attached). {Note - Changes were made to the following: In Section 1.2 B – items 24, 32, 34, 36 and 41. In Section 1.2 C – items 10 and 17. In Section 1.2 D – item 6. In Section 1.2 E – items 1, 3 and 10.}

2. Maintenance of Plant Operations (Section 01 52 00)

    a) At the end of paragraph 1.23.A.3.a, ADD "…shall not occur until on or after 3/1/2023. If at any time (prior to December 31, 2024) the existing defoamer system cannot remain in its present location (within existing building 850), then the general contractor shall move the existing system to a location closer to the existing outfall & furnish and install a suitable temporary shelter to protect it."

    b) At the end of Paragraph 1.23.A.3.b, ADD "…shall not occur until on or after 3/2/2023."

C. Contract Specifications – Volume 3

1. Pipe and Pipe Fittings – Basic Requirements (Section 40 05 00). Add the following to the Pipe System Schedule, Paragraph 3.12:

Abbreviation	Piping Service	System Number
DRT	Storm drain piping	2

2. Stop Logs and Frames (Section 40 05 60)
    a) Section 2.3 I 1 b: Replace “Type 304” with “Type 316 L.”
    b) Section 2.3 I 1 d: Replace “Type 304” with “Type 316 L”

3. Replace the existing Heat Tracing Cable (Section 40 41 13) in its entirety with the revised version (attached).

4. Replace the existing Pipe, Duct and Equipment Insulation (Section 40 42 00) in its entirety with the revised version (attached).

5. Replace the existing Process Control Systems – General Requirements (Section 40 61 13) in its entirety with the revised version (attached).

D. <u>Contract Drawings</u>

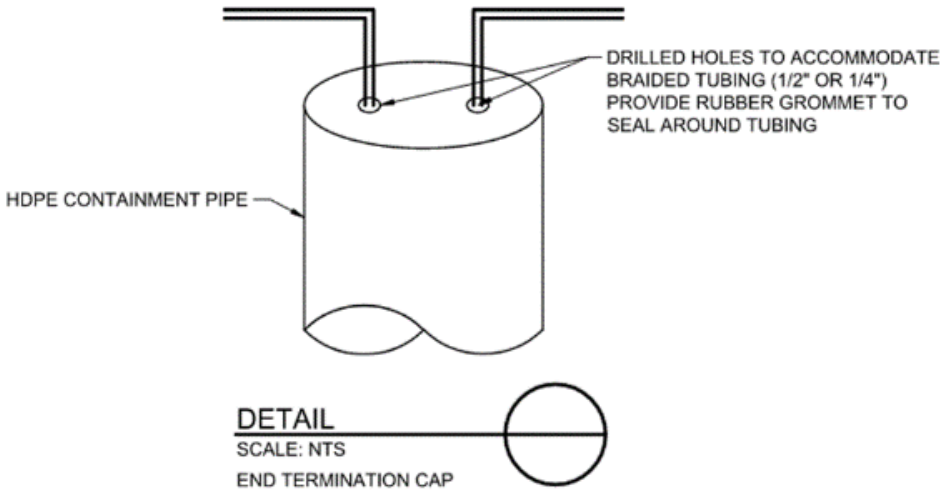
1. On drawing 750-M-01:
    a. Change “SSP-72”-PEF-MJ” to “SSP-72”-PEF-WJ” in both locations.
    b. Sump drain lines: Replace “CVP-2”DRA-SW” with “CVP-3”DRA-SW.”

2. On drawing 750-M-41, Detail 1. Modify the chart as follows:
    a. Change the number of Type II diffusers required from “20” to “3.”
    b. Change the number of Type III diffusers required from “124” to “27.”

3. On drawing 822-M-40 (regarding the “Flow Regulator Chamber Plan” in the upper left-hand quadrant of this drawing), change callout “Connect to New Pipe in Structure” to read “Provide DIP 90-Degree Downward Facing Bend and Route Drain Piping into Sump and Terminate Pipe at El. 711.00”

4. On drawings 840-M-10, 840-M-11, (and any other drawing bearing the “PAC” nomenclature): all references to “PAC” should be changed to read “PAL.”

5. On drawing 900-M-42, Add the detail shown below:



E. Questions

Response to Question #10, parts C and D (from addendum #1):

Question: Please verify that the 1760-G Contract is responsible for the following:

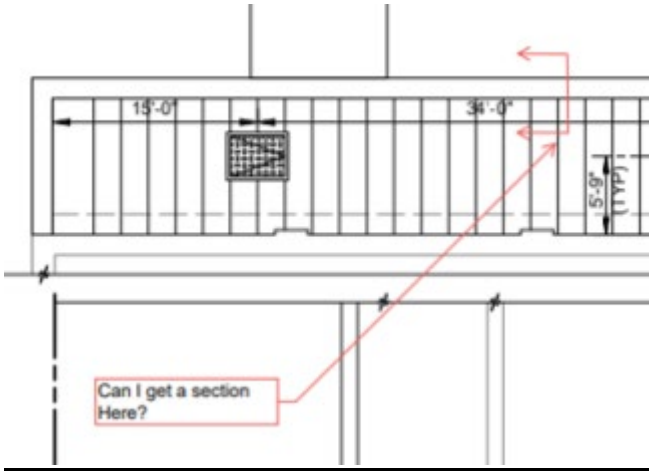
a) Development of Loop Drawings for all Instrumentation on the Project
b) All start-up testing and commissioning of all Systems and Subsystems on the Project

Answer:

a) See revised spec section 40 61 13.
b) See revised spec section 40 61 13.

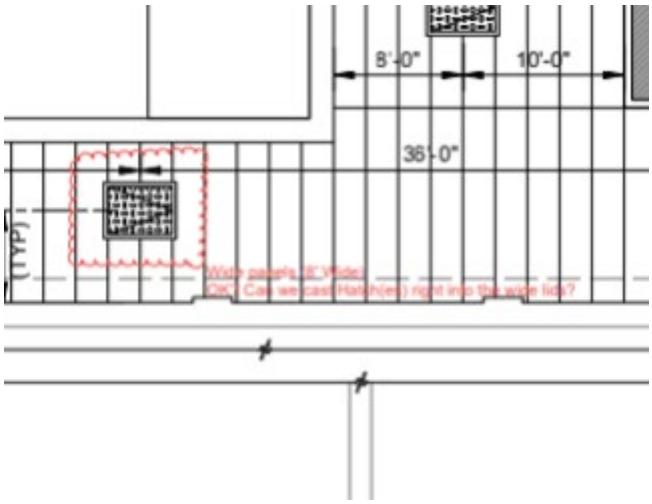
13. {Regarding drawing 750-S-16 }:

A.) ***Question:*** Can I get a section here?



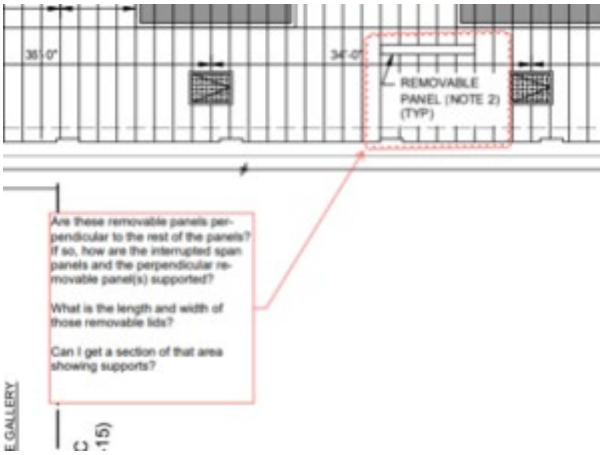
Answer: Panels are expected to bear on top of the existing wall which will have fill concrete installed similar to that being placed on the existing corbel as shown in section(s) B, C and D on drawing 750-S-41.

B.) ***Question:*** Wide panels (8' Wide) OK? can we cast hatch(es) right into the wide lids?



Answer: It is preferred that panels are 2' wide for future removal. If the manufacturer recommends 8' wide panels as the hatch locations, that is acceptable.

C.) ***Question***: Are these removable panels perpendicular to the rest of the panels? If so, how are the interrupted span panels and the perpendicular removable panel(s) supported? What is the length and width of those removable lids? Can I get a section of that area showing supports?



Answer: Intention is that removable panel is fabricated from tread plate or similar by others and will cover the area at the location of the stop plates. Panels should be supported by typical precast hangers that span the (5) adjacent panels.

14. ***Question:*** Clarification of System Integrator.

Answer: See revised spec section 40 61 13 (Process Control Systems General Requirements).

15. ***Question:*** Section A on plan sheet 000-CUT-42 shows a profile for PVC-8"-SBD-PJ. This line is noted on plan sheet 000-CUT-11 as PVC-8"-SBD-RJ. I don't find SBD listed in the PIPE SYSTEM SCHEDULE listed in 3.12 of specification 40 05 00. Please advise which pipe specification system number should be utilized and whether it needs to be push joint or restrained joint -Section B on plan sheet 000-CUT-42 shows a pipe profile for DIP-18"-DRT-PJ. I don't find DRT listed in the PIPE SYSTEM SCHEDULE listed in 3.12 of specification 40 05 00. Please advise which pipe specification system number should be utilized.

Answer: SBD "Scrubber Blown Down" pipe was not included in the schedule in specification. SBD pipe shall be SDR-26 PVC with push on joints per section 33 31 11. (See revision to Spec 40 05 00)

16. ***Question:*** There is a note for detail D/000-CUT-40 that states "CONNECT TO FLOW REGULATOR CHAMBER." On plan sheet 822-M-40 in the FLOW REGULATOR CHAMBER PLAN (TYP FOR WA-3, WA-2, WA-1, EA-1, EA-2, AND EA-3) there is a note that states "CONNECT TO NEW PIPE IN STRUCTURE". I don't find any new piping in the drawings for what this connection entails. Please advise.

Answer: Please refer to revision to drawing 822-M-40.

17. ***Question:*** There is keynote #3 on plan sheet 000-CUT-10 where the 8" DIP-EWH branches from the 18" DIP-EWH. The note states "CONNECT TO NEW PIPE IN STRUCTURE". I don't find any new piping in the drawings for what this connection entails. Please advise.

Answer: Please refer to Section C on drawing 750-M-40 for additional detail.

18. ***Question:*** CDI-6"-PCW-RJ, DIP-6"-EWL-RJ, and DIP-18-EWH-RJ piping all pass through the New Flow Regulator Chambers. Please confirm piping within these structures is considered "exposed," and therefore should be flanged or grooved per the pipe schedule in 40 05 00.

Answer: Confirmed, piping within structures is exposed.

19. ***Question:*** Reference specification section 40 05 60 where paragraph 2.3 B 1 indicates 316SS Logs & Frames, while the schedule in paragraph 2.3 I 1 b & d call for 304SS logs & frames. Please clarify the material required for Stop Logs, Frames, & Lifters.

Answer: See revisions to section 40 05 60.

20. Regarding spec sections 40 41 13 and 40 42 00:

A.) ***Question:*** 40 41 13 includes pages 5 & 6 of a Heat Trace Schedule. It appears like pages 1 – 4 of the schedule are missing. Please advise.

Answer: Entire 40 41 13 section has been reissued.

B.) ***Question:*** 40 41 13 has a Heat Trace Schedule, also see specification 40 42 00 that has a Schedule noted as 40 41 13 within. Are these lists independent from the other, or are some of the line items in both lists? Please advise.

Answer: Entire 40 41 13 section has been reissued. Entire section 40 42 00 has been reissued with Piping Insulation Schedule provided.

C.) ***Question:*** 40 41 13 has a Heat Trace Schedule (but makes no mention of insulation), while 40 42 00 also has a Schedule noted as 40 41 13 in it that is labeled "Process Piping Heat Tracing Cable With Insulation". Does all heat traced process piping require insulation, regardless of location? Or is insulation of heat traced pipe location dependent? Please clarify.

Answer: Entire 40 41 13 section has been reissued.

D.) ***Question:*** 40 42 00 has a Process Pipe Insulation Schedule that notes "Leave blank for now". Is this schedule going to be published? Please advise.

Answer: Entire section 40 42 00 has been reissued with Piping Insulation Schedule provided.

21. ***Question:*** Reference specification section 40 05 07 that generally calls for carbon steel supports with galvanized finish such as 2.2 A 1 a & b or 2.2 F 1 a & b, whereas a majority of the pipe support standard details on MD-61 through MD-65 indicate SS pipe supports. Please clarify which pipe systems, pipe materials, or plant locations*** require the use of SS supports. Where SS supports are required, please confirm that 304SS support material & connecting hardware is acceptable.

*** As an example area that requires clarification: Reference DWG 840-M-11 (180), the 10" SS PAC line exposed on top of tank calls for DET 21/MD-62 (TYP.), which is a SS pipe stand detail, while 20" SS PAC line on inside of tank wall notes DET 46/MD-65 which is a CS GALV wall bracket detail. Clarification is requested on the location/application of SS supports for SS pipe lines, on all lines in tanks (submerged or nearly submerged), on all lines in exterior exposed locations, etc.

Answer: Will be addressed in a subsequent addendum.

22. ***Question:*** Reference specification section 40 05 07 under F Trapeze Hangers 2 a calls for FRP, 2 b calls for Unistrut.

a) Please clarify if only chemical containing pipes in Chemical Storage & Feed Areas require FRP Trapeze Hangers, or if all piping in these areas require FRP Trapeze Hangers.
b) Please confirm FRP Trapeze Hangers (Unistrut) are acceptable to use in exterior exposed locations. The specification only requires FRP supports under F 2 Trapeze Hangers (in Chemical Storage & Feed Areas).
c) Please clarify if all hangers types used for chemical containing pipes must be FRP, or only if Trapeze style Hangers must be FRP.
d) Please clarify if all piping in Chemical Storage & Feed Areas require all hangers types to be FRP, or only if Trapeze style Hangers used on all piping in these areas must be FRP.

Answer: Will be addressed in a subsequent addendum.

23. ***Question:*** Reference DWG 840-M-11 (180) that calls for 10" & 20" SS Pipe PAC lines, but PAC isn't in the Process Fluid Identification Codes shown on Sheet 5, or in the Piping System Schedule in specification 40 05 00. Please clarify if these should be noted as PAL lines.

Answer: See revisions to drawing 840-M-11.

24. ***Question:*** Reference DWG 750-M-01 (141) that shows 2 locations with SSP-72"-PEF-MJ Mechanical Joint (In the Flow Regulating Chambers). Please confirm these lines should be SSP-72"-PEF-WJ Welded Joint.

Answer: See revision to drawing 750-M-01.

25. ***Question:*** Reference DWG 900-M-42 (197) that calls for containment end termination per Detail 17/MD-61, but Detail 17/MD-61 appears to be a pipe support detail. Please clarify where this end termination detail is located in the drawings.

Answer: Detail has been provided. (See revision to drawing 900-M-42)

26. ***Question:*** Reference DWG 900-M-41 & -42 (196 & 197) that call for drip pan & drip pan supports. Specification 40 05 00 3.2 H 3 a indicates drip pans are to be 16ga. 316SS. Please confirm that these are the only (2) locations where these drip pans are required. Please clarify if the drip pan supports need to be 316SS like the pans.

Answer: Will be addressed in a subsequent addendum.

27. ***Question:*** Reference DWG 700-MDM-40 that calls for, "DEMOLISH EXISTING DRAIN TRAPS IF REQUIRED AFTER FIELD CONFIRMATION OF NEW TOP OF FLIGHT ELEVATION (TYP)." Please clarify if the removal is limited to the 4" PVC drain traps as called out, or if the entire drain bodies need to be removed as indicated by the hash marks on the drawing.

Answer: Drain demolition should be limited to PVC pipe under the roof slab.

28. ***Question:*** Reference DWG 700-M-40 (161) that has this note, "IF DRAIN TRAPS ARE TO BE REMOVED AFTER FIELD VERIFICATIONS AS NOTED ON DEMOLITION DRAWINGS, PROVIDE NEW 90° ELBOW WITH TIDEFLEX CHECK VALVE MOUNTED TO CEILING DRAIN". Please confirm only the 4" PVC drain traps need to be replaced, not the drain bodies that are embedded in the slab. There is no info on TIDEFLEX Check Valves in the Check Valve specification 40 05 66. Please provide TIDEFLEX check valve info & size required.

Answer: See above comment response (# 27). Drain bodies embedded in slab do not need to be replaced. Tideflex check valve shall be model CheckMate UltraFlex as recommended by manufacturer to eliminate conflict with raised flight elevation.

29. ***Question:*** Reference DWG 750-M-40 that notes to insulate all Process Air Piping. Please confirm the pipe insulation is to terminate at the top of the BFVs on the vertical drops, and no insulation is required below theses BVFs (reference Section A/750-M-40).

Answer: Process Air piping: insulation shall be placed on all pipe located above grade.

30. ***Question:*** Reference DWG 822-M-40 that appears to show grooved couplings in SSP-72"-PEF-FE lines. Please confirm Victaulic W77B grooved couplings with standard DI housings, standard Orange Enamel finish & CS hardware are acceptable for use in these 8 locations.

Answer: Per Specification 40 05 24- Victaulic W77B Grooved Couplings are acceptable.

31. ***Question:*** Reference specification section 40 05 23 titled Pipe - Stainless Steel Pipe for Process Air. Please confirm this same SS pipe specification applies to SSP-72"-PEF-FE piping as well. Also, is immersion pickling w/passivation of SSP-72"-PEF-FE lines per 40 05 23 2.3 A 5 required?

Answer: 40 05 23 does not apply to the Primary Effluent piping SSP-72"-PEF-FE. Reference 40 05 24 Pipe- Steel and 40 05 00 Pipe and Fitting - Basic Requirements for Primary Effluent (PEF) Pipe requirements.

32. ***Question:*** Reference DWGS 822-M-10 & 832-M-10 that both appear to show some type of special joint in the middle of the SSP-72"-PEF-FE pipes. Please clarify if these special joints are grooved couplings. If yes, please confirm Victaulic W77B grooved couplings with standard DI housings, standard Orange Enamel finish & CS hardware are acceptable for use in these 2 locations.

Answer: Couplings shown on 822-M-10 & 832-M-10 in the middle of the SSP-72"-PEF-FE are grooved couplings as shown on 822-M-40. Per Specification 40 05 24- Victaulic W77B Grooved Couplings are acceptable.

33. ***Question:*** Reference DWG 750-M-40, Section C which is noted to be on DWG 750-M-12, but it appears Section C is not on 750-M-11, please verify. Where this section ties into existing 8" EWH, please confirm 2 - 4" DIP ends on the channel floor don't require nozzles of any kind.

Answer: Section C on 750-M-40 is on 750-M-11, not 750-M-12. Nozzles are not required.

34. ***Question:*** Reference DWG 750-M-01 that calls for 2" CPVC sump pump drains, while DWG 822-M-40 indicates that the ball & check valves in these sump drain lines are 3". Please clarify the size of these sump drain lines.

Answer: Sump drain lines are: 3". See revisions to drawing 750-M-01.

35. ***Question:*** Reference DWG 750-M-41 Detail 1 / Primary Effluent Channel Diffuser. Please confirm / Clarify:

a) Total Number of Type II diffusers = 20
b) Total Number of Type III diffusers = 124
c) Total Number of Type IV diffusers = 2.
d) Are there Type II, Type III & Type IV diffusers shown on other dwgs, or just those shown on 750-M-41?
e) Are diffusers from other DWGS included in the total diffuser count provided in Detail 1 / 750-M-41?

Answer:

a) Total Number of Type II diffusers = See revisions to drawing 750-M-41.
b) Total Number of Type III diffusers = See revisions to drawing 750-M-41.
c) Total Number of Type IV diffusers = 2
d) Just those shown on 750-M-41.
e) No.

36. ***Question:*** Reference DWG 825-M-10 Section A notes to connect new CDI-6"-PCW line to existing via Victaulic coupling. Please confirm a Victaulic coupling is also required where the DIP-10"-EWH ties into an existing line that's shown on DWG 825-M-10 Section A as well.

Answer: Victaulic coupling may be required; however, Contractor is responsible to determine means and methods for connection to existing pipe in both instances.

37. ***Question:*** Reference the specification's Table of Contents. Section 40 41 13 - Heat Tracing Cable is shown to have 7 pages. Please confirm how many pages are supposed to be included in this section.

Answer: Section 40 41 13 has been reissued in its entirety. There are only 6 pages in this specification. *Note for clarification*: the numbers in the far-right column of the table of contents do not indicate the responsible contractor – rather, they indicate the design professional responsible for the spec section.

38. ***Question:*** Reference specification section 01 11 00, Page 4, Item 1.2.C.4. It is our understanding that the Electrical Contractor is responsible for providing and installing all Heat Trace "wiring and controllers, panels, circuits, wiring and conduit". Is the Electrical Contractor to supply and install the Heat Trace Cabling – Section 40 41 13? Please clarify.

Answer: Yes, Electrical Contractor is to provide the Heat Tracing Systems.

39. ***Question:*** Reference specification section 01 11 00, Page 3, Item 1.2.B.30 and Page 4, Item 1.2.C.2. It is our understanding that the General Contractor is to furnish and install the field mounted instruments and cabling that is supplied by the manufacturer with the instruments. These instruments are shown in the Instrument List in Section 40 61 97. Per Section 01 11 00, Page 4, Item 1.2.C.2, it is our understanding that the Electrical Contractor is responsible to supply and install all conduit and wiring from the instrument to the control panels in their scope of supply. Please confirm.

Answer: Confirmed.

40. ***Question:*** Reference specification section 40 61 13, Page 1, Item 1.1.F. This item states that the "Contractor is responsible for the copper and fiber cable installation and termination of the DCS communications networks". Please confirm that this supply and installation is by the Electrical Contractor Contact and not the General Contract.

Answer: See revised spec section 40 61 13.

41. ***Question:*** Please confirm that the Section 40 66 33 – Fiber Optic Communications Systems are to be supplied and installed by the Electrical Contractor.

Answer: Confirmed.

42. ***Question:*** Reference specification section 40 61 13, Page 1, Item 1.1.E - Please confirm that "The Electrical Contractor/System Integrator Contractor is responsible for the hardware installation of the DCS hardware which includes providing housekeeping pads, installing cabinets, wiring, wiring terminations, patch panels and cable management system, I/O checks, loop checks, and assisting with functional testing and startup." The General Contractor is to supply and install the instruments that are shown in the Instrument List in Section 40 61 97 and the Electrical Contractor/System integrator Contractor (which is part of the Electrical Contractor's scope) is to include all of the tasks listed above in Item 1.1.E.

Answer: See revised spec section 40 61 13.

43. ***Question:*** Reference specification section 40 61 98, Page 1, Item 1.1.D. regarding the installation of the Emerson DCS Equipment. "The Contractor shall be responsible for the installation of the Emerson DCS equipment, as described in the contract specifications and/or indicated on the Contract drawings." Please confirm this installation is to be included in the Electrical Contract and not the General Contract.

Answer: Confirmed.

44. ***Question:*** Reference specification section 40 63 43, Page 1, Item 1.1.A.2 in regards to the Distributed Control System. "The Owner will be procuring the equipment and manufacturer's services associated with this specification section. The Contractor shall include in its Bid the costs for installing, testing, starting-up, demonstrating, coordinating, and other incidentals required to place this into service." Please confirm these tasks are to be included in the Electrical Contract and not the General Contract.

Answer: Confirmed.

45. ***Question:*** Please confirm that the following specification sections are to be supplied by the Owner/Owner's Consultant and installed/wired/terminated by the Electrical Contractor - Contract "E":

a) 40 61 13 – Process Control Systems General Requirements
b) 40 61 93 – DCS Input-Output Database
c) 40 61 98 – Functional Control Descriptions
d) 40 63 43 – Distributed Control System (DCS)

Answer: See previous comment responses.

46. ***Question:*** Please confirm that the following sections are to be supplied and installed by the General Contractor – Contract "G" and Conduit/Wire/Terminations by the Electrical Contractor - Contract "E":

a) 40 61 97 – Process Control System Instrument List
b) 40 71 00 – Flow Instrumentation (As listed in Section 40 61 97)
c) 40 72 00 – Level Instrumentation (As listed in Section 40 61 97)
d) 40 73 00 – Pressure Instrumentation (As listed in Section 40 61 97)
e) 40 75 00 – Process Liquid Analytical Measurement (As listed in Section 40 61 97)
f) 40 91 10 – Miscellaneous Meters and Transmitters (As listed in Section 40 61 97)

Answer: See previous comment responses.

47. ***Question:*** Reference specification section 01 11 00, Page 5, Item 1.2.E.6. Please confirm that the Plumbing Contractor is responsible for supplying Section 28 31 11 – Addressable Fire Alarm System.

Answer: Confirmed.

48. ***Question:*** Please confirm that the "G" Contractor is to supply and install Section 28 21 13 - Power Over Ethernet IP Video Cameras and that the "E" Contractor is to supply and install the wiring and conduit for Section 28 21 13 - Power Over Ethernet IP Video Camera.

Answer: The Electrical Contractor will supply and install all cameras, wiring and conduit. Refer to reissued 01 11 00.

49. ***Question:*** Section 011100 Summary of Work, 1.7 Owner Furnished Products A. Table states that (2) existing sodium hypochlorite tanks, to be Tagged THS001-865 and THS002-865, are to be relocated from the temporary sodium hypochlorite area to the new Disinfection Chemical Building. Section 434145 Fiberglass Reinforced Plastic Tanks states that there are (1) 21,000 gallon sodium hypochlorite storage tank (Tagged THS002-865) and (2) 8,000 gallon sodium hypochlorite storage tanks (Tagged THS001-900 and THS002-900). Questions as follows:

a) Please advise which of the existing sodium hypochlorite storage tanks are to be relocated with Tagging ID.
b) Section 434145 Article 2.3 Accessories calls for various items to be provided for all new and/or relocated sodium hypochlorite storage tanks. Please advise which of the Accessories are to be provided as new for the relocated tanks.

Answer:

a) Tag existing tanks which are relocated per positions indicated on 865-M drawings.
b) Contractor shall furnish all new ladders and platforms for relocated tanks as well as any required hardware for anchoring tank and connections to new piping.

50. ***Question:*** Table of Contents Page 5 Division 40, Section 406198 Functional Control Descriptions lists the responsibility for that Section as Number 1 which is the General Contractor. Isn't it correct that the only responsibility that Contract 1760-G would have relative to Section 406198 would be to furnish and install all valves, miscellaneous valves, cast iron sluice gates, stainless steel slide gates, flushing gates and stop logs and frames as required by that Section? Please advise

Answer: Confirmed. Note for clarification, the numbers in the far-right column of the table of contents do not indicate the responsible contractor – rather, they indicate the design professional responsible for the spec section.)

51. ***Question:*** Section 011100 Summary of Work 1.2 B. 30. states that the General Contractor is to furnish all field mounted instruments including associated cable and wiring. Summary of Work 1.2 C. 2. states that the Electrical Contractor is to wire all field mounted instruments. Which Contractor is responsible to provide wiring for all of the field mounted instruments? Please advise.

Answer: The GC provides all manufacturer's cables that integral to the instruments and are factory-installed. The electrical contractor is responsible for all other wiring required to connect instrumentation.

52. ***Question:*** Section 011100 Summary of Work 1.2 B. 22. and 23. states that the General Contractor is to provide "heat trace cable" for hypochlorite, sodium bisulfite and/or sampling piping. Summary of Work 1.2 C. 4. states that the Electrical Contractor is to provide "heat trace wiring and controllers, panels, circuits, wiring, and conduit. Please advise if the General Contractor is responsible to furnish and install the heat tracing cable only and the Electrical Contractor is to furnish and install the power to the heat trace cable along with all required controllers, panels, circuits, etc.

Answer: The intent of the contract drawings and specifications is that the Electrical Contractor provide the Heat Tracing Systems. Refer to the reissued 01 11 00.

53. ***Question:*** Section 011100 Summary of Work 1.2 B. 33. states that the General Contractor is to furnish and install hydrants and yard hydrants and is also to provide potable water and drain piping to within 5 feet of the Bypass Disinfection Chemical Building. Summary of Work 1.2 1. states that the Plumbing Contractor is to provide potable water main to Bypass Disinfection Chemical Building (within 5 feet). Please advise which Contractor is to provide the potable water to within 5 feet of the Bypass Disinfection Chemical Building and which Contractor is to provide hydrants and yard hydrants on the site

Answer: See revised spec section 01 11 00. Please see Keynote 14 on drawing 000-CUT-11. GC is responsible for hydrants.

54. ***Question:*** Section 406197 Process Control Systems Instrument List, at the end of this Section there are (2) pages, back-to-back, which indicate the CSO Instrument List for this Section. Please issue these (2) pages in much larger font in order that we can read the very small print presently.

Answer: These pages will not be reissued.

55. ***Question:*** Drawing 750-G-10 Area Classification – Note 1 States “Classification is within the entire Primary Effluent Channel and CSO Bypass Channel”. Drawing 750-ELP-10 and 750-ELP-10 – The light fixtures scheduled to be installed in the CSO Bypass Channel are Type ‘HZ’.

The Type ‘HZ’ light fixture is specified as a Lithonia WL4 Series or Equal. This fixture is not a Class 1, Division 1 rated light fixture. Can you verify that the lighting needs to be Class 1, Division 1 in the CSO Bypass Channel? If so please specify a light fixture that meets these requirements.

Answer: Yes, the lighting fixtures in the CSO by-pass channel shall be Class 1, Division 1 rated. Light fixture HZ is indeed specified as a hazardous light fixture. The fixture referenced in the RFI (Lithonia WL4) is actually the spec for fixture “LB”. The lighting specifications are shown above the fixture names on sheet 000-E-60, not below.

Attachments:

Specifications:

a. Summary of Work (Section 01 11 00)
b. Heat Tracing Cable (Section 40 41 13)
c. Pipe, Duct and Equipment Insulation (Section 40 42 00)
d. Process Control Systems – General Requirements (Section 40 61 13)

Drawings:

N/A

Other:

N/A

*** * * * END OF ADDENDUM NO. 2* * * ***

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 GENERAL

A. General:
   1. It is the intent of the Contract Documents to describe a functionally complete project.
   2. The work included in this project is at the Allegheny County Sanitary Authority (Owner) Woods Run Wastewater Treatment Plant in Pittsburgh, PA and is described in detail in the rest of this section.
   3. Furnish all labor, materials, tools, equipment and services as indicated in accordance with provisions of Contract Documents.
   4. Furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and functional installation of the work.
   5. In addition to this individual project, there may be construction activities underway at the plant site during part or all of the construction period for this project.
   6. Work areas shall be confined to areas specifically designated for the CSO Bypass and Disinfection Project on the Site Utilization Plan.

B. Contract No. 1760 will be executed by four Prime Contractors according to the requirements of the Contract Documents. The following parties may be present at the job site and have the responsibilities described generally in Article 3, Contract Provisions:
   1. ALCOSAN (Owner)
   2. Construction Manager (CM) (Michael Baker International, Inc.)
   3. Consulting Engineer (GHD Inc.)
   4. Prime Contractor(s)
   5. Fabricators and supplier(s)
   6. Testing agencies
   7. Commissioning firms
   8. Other project stakeholders

C. Owner:
   1. The Owner may be identified as the responsible entity for certain actions in the sections of Divisions 2 through 46. The Owner may elect to delegate certain of these respective duties and responsibilities to the aforementioned parties.
   2. All contact between the Contractor(s) and the remaining aforementioned parties shall be through the Construction Manager.

D. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this contract. Coordinate the work of this contract with work performed under separate contracts.

1.2 WORK COVERED BY CONTRACT

A. The work includes, but is not necessarily limited to, the following. However, this description is in no way meant to limit or restrict the work required under the contract. Refer to the Contract Drawings and the remainder of the specifications for additional detail on the Scope of the Work. All Contractors are responsible to review the entire set of Contract Documents and Contract Drawings to familiarize themselves with the entire project.
   1. General Construction, Contract G.
   2. Electrical Construction, Contract E.
   3. HVAC Construction, Contract H.
   4. Plumbing Construction, Contract P.

B. Tasks to be completed by the General Contractor will include, but will not be limited to:
   1. Any and all excavation required for all work included in the Contract Documents, including test pits, with the exception of excavation for electrical duct banks.
   2. Provide excavation support and dewatering systems.
   3. Provide temporary bulkheads and weirs as required for equipment and structure installation.
   4. Site grading, landscaping, concrete, asphalt and gravel paving, bollards, curbing, erosion and sediment control provisions, and stormwater collection systems.
   5. Demolition of existing Maintenance Storage Building (850), Carpenter Shop (880), Chlorine Sampling Building (841), portions of BCCT (existing chlorine contact tank 840) including sampling structure overtop the CCT, select equipment within the primary sedimentation basins, and flow regulator chambers.
   6. Demolish one existing Area 900 sodium hypochlorite tank and relocate two existing Area 900 sodium hypochlorite storage tanks.
   7. Demolition and replacement of select existing aeration basin sluice gates.
   8. Demolition and removal of existing duct banks after power has been terminated and feeders and conductors removed by Electrical Contractor.
   9. Demolition of existing foundations for sight light poles.
   10. Provide all equipment and housekeeping pads for equipment supplied by all Prime Contractors. General Contractor shall coordinate locations, sizes, and orientation with the installing contractor for the equipment to be supported on the respective pads.
   11. Provide king piles, steel sheet piles, auger-cast piles, concrete encased piles and steel casings, tie rods, rock sockets, and rock anchors.
   12. Demolition, handling, and disposal of hazardous materials identified in the Reference Information.
   13. Removal and replacement of riprap as required. Limits of removal as indicated on Contract Drawings.
   14. Construction of concrete CSO Bypass Channel, BCCT Inlet Chamber, BCCT Effluent Chamber, BCCT outfall, BCCT Dewatering Pump Station, new Outfall 002, flow regulator chambers, Bypass Disinfection Chemical Building foundation, Defoamer Building foundation, truck unloading pad, and equipment pads.

15. Provide Bypass Disinfection Chemical Building concrete masonry walls, doors, windows, roof and wall panels, overhead doors, stairs, handrails, and other architectural appurtenances. Provide metal fabricated stairs and walkways in BCCT area.
16. Provide pre-engineered FRP Sampling Building and Defoamer Building.
17. Excavation, bedding, backfilling, and thrust blocking for installation of yard piping.
18. Provide stainless steel slide gates, cast iron sluice gates, hydraulic flushing gates, and operators.
19. Provide security fencing.
20. Provide existing Primary Effluent Channel aeration equipment and piping replacement.
21. Provide new flow regulator chambers and 72-inch diameter venturi-type flow meter apparatuses including 54-inch butterfly control valves and differential pressure meters.
22. Modifications to the existing primary treatment tanks, including new chain-and-flight mechanisms, scum troughs, and weir modifications.
23. Provide two new sodium hypochlorite tanks in Area 900 and one new sodium hypochlorite tank in Area 865.
24. Provide new sodium hypochlorite and sodium bisulfite pumps, valves, panels, piping, insulation and defoamer pumps, valves, piping, and insulation.
25. Provide Sampling Building, sample pumps, sample sink, auto samplers, sampling piping, piping insulation and, and chlorine analyzers.
26. Provide Defoamer Building defoamer storage and feed system including pumps, piping, valves, and fittings.
27. Provide low-pressure air piping and insulation, diffusers, and induction mixers.
28. Provide BCCT access platforms, grating, stairs, and railings.
29. Provide BCCT effluent weirs.
30. Provide CM field office. Contractor to transfer ownership to Owner at completion of project.
31. Furnish OEM control panels and VFDs for designated equipment, consistent with the functional control descriptions listed in the specifications.
32. Furnish all and install all field-mounted instruments including associated manufacturer's cable and wiring required to install and put instruments into service, consistent with the functional control descriptions listed in the specifications. All cable/wire installation shall be performed by Electrical Contractor.
33. Provide calibration for all field mounted instruments.
34. Furnish and install concrete bases, poles and mounts for video cameras where applicable.
35. Modifications to and rehabilitation of existing wastewater treatment plant facilities and systems including existing pipe gallery.
36. Furnishing and installing subsurface and exposed pipelines, utilities and associated appurtenances, including hydrants and yard hydrants. Provide potable water and drain piping located greater than five (5) feet from the Bypass Disinfection Chemical

Building exterior and coordinate with Plumbing Contractor for continuation into building.

37. Provide any additional electrical energy required by General Contractor's means and methods for the execution of the work.
38. Provide and maintain construction entrance on Tracy Street.
39. Provide weekly street sweeping of areas indicated on drawings.
40. Provide regular snow plowing as necessary of all roads, walkways, and parking lots interior to the plant.
41. Other items as indicated on the Contract Documents and generally as shown on the following Drawings:
    a. "General" drawings, designated as:
        1) XXX-G-XX
    b. "Civil" drawings, designated as:
        1) XXX-C-XX
        2) XXX-CDM-XX
        3) XXX-CSP-XX
        4) XXX-CUT-XX
        5) XXX-CGR-XX
        6) XXX-CD-XX
    c. "Structural" drawings, designated as:
        1) XXX-S-XX
        2) XXX-SD-XX
        3) XXX-SDM-XX
        4) XXX-B-XX
    d. "Mechanical" drawings, designated as:
        1) XXX-M-XX
        2) XXX-MS-XX
        3) XXX-MDM-XX
        4) XXX-MD-XX
    e. "Architectural" drawings, designated as:
        1) XXX-A-XX
        2) XXX-AD-XX
    f. "Piping and Instrumentation Diagrams" and associated details, designated as:
        1) XXX-I-XX
        2) XXX-ID-XX

C. Tasks to be completed by the Electrical Contractor will include, but will not be limited to:
    1. Provide yard lighting and building lighting.
    2. Wiring of all field-mounted instruments.
    3. Provide Bypass Disinfection Chemical Building MCC, VFDs, Data Processing Unit, transformer, panels, circuits, wiring, and conduit.
    4. Install electrical equipment provided by the General Contractor as defined elsewhere.
    5. Provide heat trace systems including cable, wiring and controllers, panels, circuits,

wiring, and conduit.

6. Provide 5 kV and 15 kV duct banks (including excavation, bedding, concrete encasement, and backfill), electrical manholes, feeders, conductors, and associated conduit.
7. Provide new lighting, including new poles and concrete foundations where applicable.
8. Provide electrical control panels, disconnects, switches, starters, and other electrical devices in the Contract Documents. Equipment shall be consistent with the functional control descriptions listed in the Specifications.
9. Where scheduled, terminate power and remove existing feeders and conductors prior to duct bank demolition by General Contractor.
10. Furnish and install video cameras and camera equipment, and associated wiring and conduit.
11. Provide grounding grids and yard cable.
12. Provide central pipe gallery cable tray.
13. Provide electrical wiring for all contract equipment.
14. Provide power to all field office trailers.
15. Provide any additional electrical energy required by Electrical Contractor's means and methods for the execution of the work.
16. Wiring of Power Over Ethernet for video cameras and installation of network switches and enclosures.
17. Other items as indicated on the Contract Documents and generally as shown on the following Drawings:
    a. "General" drawings, designated as:
        1) XXX-G-XX
    b. "Electrical" drawings, designated as:
        1) XXX-E-XX
        2) XXX-ED-XX
        3) XXX-EDM-XX
        4) XXX-ESP-XX
        5) XXX-FS-XX
        6) XXX-ESL-XX
        7) XXX-ET-XX
        8) XXX-EZ-XX
        9) XXX-ELP-XX
        10) XXX-EM-XX
        11) XXX-EP-XX
        12) Block Diagram DCS Network Communications, 000-I-02

D. Tasks to be completed by the HVAC Contractor will include, but will not be limited to:
    1. Provide fans, air handlers, heat pumps, make-up air units, unit heaters, fan coil units, positive pressurized units, and HVAC units.
    2. Provide louvers, diffusers, registers, grilles, and ductwork.
    3. Provide piping between and from HVAC equipment.

4. Demolish HVAC equipment within building area 842 including fans, make up air unit, ductwork, louvers, and grilles.
5. Provide any additional electrical energy required by HVAC Contractor's means and methods for the execution of the work.
6. Other items as indicated on the Contract Documents and generally as shown on the following Drawings:
    a. "General" drawings, designated as:
        1) XXX-G-XX
    b. "HVAC" drawings, designated as:
        1) XXX-H-XX
        2) XXX-HS-XX
        3) XXX-HDM-XX

E. Tasks to be completed by the Plumbing Contractor will include, but will not be limited to:
1. Provide potable water main to Bypass Disinfection Chemical Building (located less than five (5) feet from the building exterior) and coordinate with General Contractor for continuation of piping within the yard.
2. Provide Bypass Disinfection Chemical Building plumbing supply piping, valves and supports, backflow preventers, water heaters, hose bibbs, wall hydrants, and emergency eyewash/showers.
3. Provide floor drains, cleanouts, vents, and sanitary sewer piping to the connection point with other contracts (located less than five (5) feet from the building exterior).
4. Provide Defoamer Building plumbing supply piping and emergency eyewash/shower.
5. Provide Bypass Disinfection Chemical Building sprinkler system piping, valves, and supports.
6. Furnish and install fire alarm equipment ready for wiring by Electrical Contractor.
7. Provide insulation and jacket for potable water pipes, fittings, valves, and equipment.
8. Provide any additional electrical energy required by Plumbing Contractor's means and methods for the execution of the work
9. Provide water and sanitary sewer connections to all field office trailers, including other Primes and CM.
10. Other items as indicated on the Contract Documents and generally as shown on the following Drawings:
    a. "General" drawings, designated as:
        1) XXX-G-XX
    b. "Plumbing" drawings, designated as:
        1) XXX-P-XX
    c. "Fire Protection" and "Fire Alarm" drawings, designated as:
        1) XXX-F-XX
        2) XXX-FP-XX
        3) XXX-FA-XX
        4) XXX-FD-XX

1.3 WORK SEQUENCE

A. Organize and plan the construction activities to assure the safety and reliability of and to minimize the interruption to the plant operations and performance.

B. The proposed work sequence shall be submitted to the CM in accordance with Section 01 32 16, Construction Progress Schedule.

1.4 WORK BY OWNER

A. Owner's Responsibilities:
   1. Operation of all valves and gates as needed to complete work.
   2. Draining, to Owner standards, of primary sedimentation tanks needed to complete chain-and-flight, weir modification, and associated work.
   3. Draining, to Owner standards, of aeration tanks needed to complete slide gate replacement and associated work.
   4. Draining, to Owner standards, process piping by gravity to facilitate Contractor dewatering needed to complete work.

1.5 OWNER OCCUPANCY

A. Owner will occupy the premises during the entire period of construction for the conduct of his normal operations. Coordinate with Owner in all construction operations to minimize conflicts and to facilitate Owner usage.

B. Execute Certificate of Substantial Completion for each area all systems installed and commissioned as described in Article 1.2.
   1. After Owner occupancy, allow:
      a. Access for Owner's personnel.
      b. Access for the public.
      c. Operation of area process, HVAC, plumbing and electrical systems.
   2. After occupancy, Owner will provide:
      a. Contractor access to finish punch list items.
      b. Access to area process, HVAC, plumbing, and electrical systems for Contractors to perform warranty work.

1.6 OUTAGES

A. Organize and plan the construction activities so that the number and length of any required outages shall be minimized.

B. An outage to any customer shall require specific approval of the Owner. The Owner reserves the right to reject any request for an outage.

C. In some cases, it may be necessary, at Contractor's expense, to either install temporary facilities for service or schedule the work during a period when the outage would have minimal impact on the Owner.

D. Provide the Owner at least 14 days' notice in advance of any requested outage so that the Owner may advise and coordinate the outage with the customers.

1.7 OWNER-FURNISHED PRODUCTS

A. Products furnished and paid for by Owner shall be as follows:

Product	Comment	Section
Two existing temporary sodium hypochlorite tanks	Contractor shall relocate from the existing temporary sodium hypochlorite area and install in the new Bypass Disinfection Chemical Building as Tanks THS001-865 and THS002-865	Section 43 41 45, Fiberglass Reinforced Plastic Tanks
DCS Equipment	Contractor shall install equipment as shown on the Drawings	Section 40 63 43, Distributed Control System (DCS)

1.8 CONTRACTOR-FURNISHED PRODUCTS

A. Furnish all products other than Owner-furnished products designated above.

B. Components required to be supplied in quantity within a specification section shall all be the same and shall be interchangeable.

C. Unless otherwise indicated in the Contract Documents, provide materials and equipment that:
   1. Are produced by reputable manufacturers having adequate experience in the manufacture of these items;
   2. Are designed for the service intended;
   3. Have not been previously incorporated into another project or facility;
   4. Have not changed ownership since their initial production or fabrication and shipment from the manufacturer's factory or facility;
   5. If stored since their manufacture or fabrication, have, while in storage, been properly maintained and serviced in accordance with the manufacturer's recommendations for long-term storage. Submit documentation under the relevant technical section that such maintenance and service has been performed.
   6. Have not been subject to degradation or deterioration since manufacture.
   7. Are the current model(s) or type(s) furnished by the supplier and only modified as necessary to comply with the design.

1.9 UNDERGROUND UTILITIES

A. Notify Call Before You Dig at 811 or 800-242-1776 before excavation.

B. Consult Steve Miller of ALCOSAN Engineering Department for access to underground utility record drawings.

C. Utilities known to the Engineer who have underground facilities in the vicinity of the work may be contacted as follows:
   1. Windstream 855-849-5248
   2. CenturyLink 610-572-4887

1.10 PERMITS AND LICENSES

A. The Owner has applied for and obtained, at Owner's expense, the following permits and approvals for the work:

1. U.S. Department of the Army Permit No. LRP-2017-1183 for work on the river wall along the Ohio River.

B. Obtain all other permits and licenses necessary for the construction of the work in accordance with Article 3.11 of the General Conditions.

1.11 ACCESS BY GOVERNMENT OFFICIALS

A. Authorized representatives of governmental agencies shall at all times have access to the work.

1.12 FENCES

A. All fences affected by the work shall be maintained by the Contractor until completion of the work. Fences disturbed by the construction shall be restored immediately by the Contractor to their original or better condition and to their original location unless otherwise indicated or directed.

1.13 LEAD- AND ASBESTOS-CONTAINING MATERIALS (ACM)

A. Lead containing paint may be present at the site and are within the scope of the work for which Contractor shall be responsible. Lead containing paint removal must be performed within compliance with EPA regulations. Should lead-based paint be discovered, stop work in the area of possible contamination and notify Owner.

B. Materials containing less than or equal to 1 percent asbestos may be present in the work area. Handling/removal of this material must be performed within compliance with any applicable EPA or OSHA regulations. ACM is not expected in the work area. Should ACM be discovered, stop work in the area of possible contamination and notify Owner.

1.14 CONFINED SPACES

A. All work involving confined space entry will be in accordance with 29 CFR 1910.146. The Owner has adopted a Permit Required Confined Space Entry Program for its employees in accordance with OSHA requirements found at 29 CFR 1910.146. This permit Required Confined Space Entry Program must be adopted by the Contractor if its employees will be working in confined spaces. No Contractor employee shall be permitted to enter a "Permit Required Confined Space" as defined in 29 CFR 1910.146 without having complied with all of the requirements of said regulations, including the sign-off on the "Owner On-Site Confined Space Entry Permit" adopted by the Contractor. The Contractor shall have gas detection equipment, which is capable of detecting combustibles, oxygen, hydrogen sulfide, and carbon monoxide.

B. The following work areas within the contract are defined as Confined Space:
   1. Primary sedimentation tanks.
   2. Flow regulator chambers.
   3. Dewatering Pump Station
   4. Bypass Chlorine Contact Tank

C. The Contractor shall comply with the requirements of the applicable Permit Required Confined Space Entry Program whenever the potential exists that work in such spaces

could be hazardous. Any work involving confined space entry will be in accordance with OSHA requirements as presented in 29 CFR 1910.146. Contractor's personnel must not enter any areas identified by Owner as confined spaces without first receiving written approval from the responsible Owner Shift Superintendent and without first having complied with all the requirements of said regulations. This includes the sign-off on the "Owner On-Site Confined Space Entry Permit" or equivalent permit adopted by the Contractor.

D. If confined space entry is required, the Contractor shall supply personal protective equipment (PPE) and gas detection equipment, which is capable of detecting combustibles, oxygen, hydrogen sulfide and carbon monoxide.

E. The Contractor shall identify to the Construction Manager any new confined or enclosed space that is created as a result of the performance of the contract work. The Contractor shall comply with the requirements of the applicable permit-required confined space entry program whenever the potential exists that work in such spaces could be hazardous

1.15 DESCRIPTION OF PROJECT PERSONNEL AND THEIR RESPONSIBILITIES

A. Contractor's Personnel: As described in these Contract Documents and as follows:
   1. Project Manager and Site Superintendent must be on site at all times when work in individual contract area is proceeding. The Owner reserves the right to approve the Contractor's proposed Project Manager and Site Superintendent. If at any time during the execution of the Contract the Owner determines that the Contractor's Project Manager or Site Superintendent is not executing the work in conformance with the Contract Documents, the Owner may request in writing that he/she be replaced. Contractor will not replace the Project Manager or Site Superintendent without written notice to Construction Manager except under extraordinary circumstances. The Project Manager or Site Superintendent will be Contractor's representative at the site and shall have the authority to act on behalf of Contractor. All communications to the Project Manager or Site Superintendent shall be as binding as if given to Contractor. If at any time during the Project the Project Manager or Site Superintendent must leave the project site while work is in progress, the Construction Manager shall be notified and provided with the name of the Contractor's representative having responsible charge.
   2. Quality Control Representative will be responsible for Contractor's quality control program while work is in progress. Notify the Construction Manager of any change in quality control assignment.
   3. Safety and Protection Representative:
      a. Contractor shall designate a qualified and experienced Safety Representative at the site whose duties and responsibilities shall be to prevent accidents and to maintain and supervise the implementation of the Contractor's Safety Plan. The Safety Representative shall be trained in First Aid and CPR. The Safety Representative's qualifications shall be submitted to the Construction Manager prior to beginning work on site.
      b. Initiate, maintain, and supervise the safety plan in connection with the work. Take all necessary precautions for safety and provide for the necessary

protection to prevent damage, injury, or loss to:

1) All persons on the work site or who may be affected by the work;
2) All the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
3) Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction.

c. Comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss.
d. Before any work at the site is started, the Contractor shall prepare a written project-site specific Safety Plan and submit to the Construction Manager for record. The Site-specific Safety Plan must follow the template attached to this specification. If it does not, the Owner reserves the right to return it for revisions.
e. The Safety Representative shall revise the Safety Plan at appropriate times to reflect changes in construction conditions, the work, Contractor's means, methods, techniques, sequences and procedures of construction. The Safety Representative will submit the revised Safety Plan to the Construction Manager for record.
f. Contractor's personnel are obligated to act, without direction or authorization from Owner or Construction Manager, to prevent any potential injury or property loss when confronted with any emergency situation affecting the safety or protection of persons or the work or property at the site or adjacent thereto.
g. Contractor shall give Construction Manager prompt written notice if Contractor believes that any significant changes in the work or variations from the Contract Documents have been caused by any unforeseen emergency situation. If Construction Manager determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, Construction Manager will proceed in accordance with Article 3, Contract Provisions.
h. In emergencies affecting the safety or protection of persons or the work or property at the site or adjacent thereto, each Contractor, without special instruction or authorization from Owner or Construction Manager, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give Construction Manager prompt written notice if Contractor believes that any significant changes in the work or variations from the Contract Documents have been caused thereby. If Construction Manager determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, Construction Manager will proceed in accordance with Article 3, General Contract Conditions.
i. Contractor shall take precautions to prevent any materials related to the work from falling into active process tanks such as the aeration basins, secondary

clarifiers, primary sedimentation basins, etc. It will be the Contractor's responsibility to retrieve any such debris at his own expense with assistance from ALCOSAN. Contractor may be back-charged ALCOSAN's costs for assistance in retrieving Contractor debris from process tanks.

B. Owner: As described in these Contract Documents and as follows:
   1. Can enter into legal contract with Contractor for completion of the work.
   2. Can approve contract amendments, progress payments, and make final acceptance of the work.
   3. Can participate in coordination of site construction activities.
   4. Can participate in training, testing and startup activities.

C. Construction Manager (CM): As described in these Contract Documents and as follows:
   1. Inspect and monitor Contractor progress and quality of work during all structural, mechanical and electrical construction work.
   2. Contractor shall provide all required assistance for the CM's inspection of the work.
   3. Make available for the use of Contractor, copies of all existing information in the possession of the Construction Manager, which may be pertinent to the performance of Contractor services under the Scope of work
   4. Assist Contractor in obtaining access to all work sites through within the plant.
   5. Provide on-site representative and construction inspection services
   6. Coordinate training, testing and startup activities.

D. Engineer: As described in these Contract Documents and as follows:
   1. Performs weekly site inspections.
   2. Provides engineering support services including RFI responses.
   3. Reviews technical submittals and shop drawings.
   4. Prepares drawing revisions and cost estimates.
   5. Provides drawing and submittal control.
   6. Provides technical supervision of startup activities
   7. Assists in training, testing and startup activities.

E. Supplier (Material and Equipment): As described in these Contract Documents and as follows:
   1. Will provide submittals and operation and maintenance manuals for equipment and material as specified.
   2. Will perform on-site training
   3. Will provide commissioning and start up services
   4. Will provide engineering support services during commissioning

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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SITE SPECIFIC SAFETY PLAN (SSSP) TEMPLATE

Cover Page

- Company Name
- Address or coordinates
- Site Specific Safety Plan
- Project Name/Number
- Date

Table of Contents

1. **Purpose**

2. **Scope of Work**
    a. Identify steps of the work
    b. Hours of Operation Project

3. **Site Specific Safety Plan**
    a. Spill Leak Prevention and Response
        i. Identify location of Chemical Inventory (SDSs) – ex: Tool Trailer, Job Office, Foreman Truck
    b. Hazard Recognition and Mitigation (Define ***all project*** hazards and steps to mitigate)
        i. *Examples*:
            a) Hot Work
            b) Confined Space Entry
            c) Fall Hazard Control and Protection
            d) Arc Flash Protection (70E) using correct PPE
    c. Minimum Required PPE
    d. Fire Control
    e. Dust Control
    f. Housekeeping Program
    g. Evacuation Plan
    h. Rescue Plan (if applicable)
    i. Traffic Control – School Bus Curfews, Speed Limits, etc.
    j. Utility Locate Verification (if applicable)
    k. COVID-19 Plan (consistent with ALCOSAN protocols)

4. **Contact information – Names / Contact Info.**
    a. Contractor
        i. Operations Manager
        ii. Project Supervisor
        iii. Safety Manager
        iv. Foreman

SITE SPECIFIC SAFETY PLAN (SSSP) TEMPLATE

b. Subcontractor(s)
    i. List Company Name and Contact Person
c. Alcosan
    i. Engineers
    ii. Construction Manager
    iii. Loss Control Manager
    iv. Safety Specialist
    v. Security

5. Injury and Incident Response Plan

a. Owner Emergency Procedures/Notification
    i. All cases
    ii. First aid cases
    iii. Severed of life-threatening injuries
b. Important information
    i. GPS Coordinates
    ii. Emergency Contact Information
        a) Hospital(s) Contact Information
            a. Map – Route to Hospital

6. Training – What types of work should include specific regulatory training

a. *Examples*:
    i. Hot work
    ii. Confined Space
    iii. Fall Protection
    iv. Hazard Communication
    v. LOTO
    vi. Housekeeping
    vii. Equipment

7. Acknowledgment Form

a. "I acknowledge the SSSP for _____ has been reviewed and explained to me"

Note: Plan to be reviewed with General Contractor and Subcontractors
    i. Print name
    ii. Signatures
    iii. Date

8. Attachments

a. Training Documents for specific work listed
b. Safety Data Sheets (SDS) for all chemicals brought onto site
c. Proof of CCO certification for all crane operators

SITE SPECIFIC SAFETY PLAN (SSSP) TEMPLATE

d. Required blank (contractor owned) forms to be completed
    i. *Examples*:
        a) Hot Work
        b) Tailgate Safety Meeting (TSM) / Job Safety Analysis (JSA)
        c) Confined Space Entry
        d) Excavation Daily Inspection
        e) LOTO

9. Additional Comments/Notes

SECTION 40 41 13

HEAT TRACING CABLE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Heat tracing cable and related appurtenances as required for heat tracing of pipes and valves as indicated on the Drawings.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - General Contract Conditions
   2. Division 01 - General Requirements
   3. Section 26 05 00 - Electrical Work
   4. Section 40 42 00 - Pipe, Duct and Equipment Insulation

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. Institute of Electrical Engineers, Inc. (IEEE): 515, Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications.
   3. Underwriters Laboratories, Inc. (UL).

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00, Submittals, for requirements for the mechanics and administration of the submittal process.
   2. Product Technical Data:
      a. Power requirements for each circuit based upon actual length of heat trace and maintained temperature.
      b. Circuit breaker rating based upon inrush current at minimum expected start-up temperature.
      c. Length of heat tape for each pipe size and run.
      d. Coordinate and verify length and watts/foot of heat tape required based upon pipe size and insulation thickness.
         1) Include the calculations to support the heat tape output.
      e. See Section 26 05 00, Electrical Work, for additional requirements.
      f. Plastic Pipe Installations: output adjustment factors for heating tape for the services indicated.
   3. Fabrication and/or Layout Drawings:
      a. Wiring diagrams showing physical locations of thermostats and heat trace power supply.

B. Contract Closeout Information:
   1. Operation and Maintenance Data:
      a. See Section 01 33 04, Operation and Maintenance Manuals, for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

C. Informational Submittals:
   1. See Section 01 33 00, Submittals, for requirements for the mechanics and administration of the submittal process.
   2. Test Reports: Megger test results.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Shall be stored such that they are not exposed to sunlight or other UV rays.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Thermon.
   2. Chemelex Division; Raychem Corp.
   3. Chromalox.

B. Submit request for substitution in accordance with Section 01 25 13, Product Substitutions.

2.2 HEAT TRACING

A. Design Parameters:
   1. Pipe Diameter, Length and Material:
      a. See Heat Trace Schedule (found at the end of this section), Drawings, and relevant piping specifications.
   2. Flange, Valve, Pipe Support Size:
      a. See Drawings and relevant piping specifications.
   3. Pipe Insulation Type and Thickness:
      a. See Heat Trace Schedule and relevant piping specifications.
   4. Temperature Requirements:
      a. See Heat Trace Schedule and below.
         1) Low Ambient Temperature for the Specific Location: -9 degrees F.
         2) Wind Factor for the Specific Location: 10 MPH.
   5. Controller:
      a. Intellitrace controller, two circuits MODBUS RTU/RS 485 NEMA 4X FRP ; one each for SHC, SBS, CHF, SPL, and DR; or approved equal. See Heat Trace Schedule for list of controllers.
   6. RTD: HT/Pipe Sensor; Fiberglass; Sheath Length:
      a. 3-inch Hot, 4-inch Cold; aluminum or approved equal.
   7. Other appurtenances as required and recommended by the manufacturer.

8. Electrical Requirements:
    a. See Heat Trace Schedule for controller electrical requirements.
9. Safety Factor:
    a. 10 percent.

B. Self-regulating or power-limiting parallel circuit construction consisting of an inner core of conductive material between parallel copper bus wires, with inverse temperature - conductivity characteristics with metal overbraid. Provide tinned copper braid for PVC and stainless steel pipe applications.

C. Thermostats adjustable between 35 and 200 degrees F minimum with maximum differential range of 9 degrees F, furnished complete with NEMA 4X enclosures in all areas, stainless steel temperature bulb and capillary.

D. All necessary or required components and accessories, such as power connection boxes, end seals, straps, tape, junction fittings and fitting brackets.

E. See Heat Trace Schedule for piping and insulation material.

F. Protection and Control Requirements:
1. Protection by a GFEPCI Circuit Breaker:
    a. Breaker amperage rating shall be coordinated with Contractor when different than the Contract Drawings.
2. Provide two line sensing thermostats, one for power and one for alarm.
3. The alarm thermostat shall be placed on the opposite end of the circuit from the power thermostat or power connection to allow for annunciation of partial failure of a circuit or the loss of power from a tripped GFEPCI circuit breaker.
4. Provide a monitoring module that monitors the voltage (circuit breaker status) to each circuit.
5. The alarm from the alarm thermostat and monitor module shall be annunciated on the indicated control system. Alarm output relay shall be 120V-1.8A rated dry contacts.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping has been tested and approved.

3.2 INSTALLATION

A. Insulate and heat trace wet pipe systems as indicated on Drawings and Heat Trace Schedule.

B. Install materials in accordance with manufacturer's instructions.
1. Each circuit shall not exceed the manufacturer's recommended maximum length.
2. Where the proposed heating load exceeds heating tape capacity, install with multiple passes. Spiral wound heat trace is not permissible.

C. For Metallic Piping:
1. Heat tracing shall be installed completely wired.

2. Cut heat trace to lengths as required and secure to pipe with glass or polyester fiber tape.

D. For Nonmetallic Piping:
   1. Allow for extra heat trace output because nonmetallic pipe has a lower heat transfer.
      a. Heat tracing shall be installed completely wired.
   2. Cut heat trace to lengths as required and secure to pipe with aluminum tape throughout the length of the trace.

3.2 TESTING

A. Megger the cables at the manufacturer's recommended voltage level three times.
   1. Before installation.
   2. After attachment to pipe but before insulation is installed.
   3. After pipe insulation is installed but before energization.

(continued)

HEAT TRACE SCHEDULE

Process Flow Diagram Sheet	Description	Process Fluid Code	Concen-tration (%)	Pipe Diameter (in)	Pipe Material Code	Length (ft)	Number of Runs	Controller ID	Controller Voltage	Insulation Material	Insulation Thickness (In)	Jacket Material	Heat Trace Purpose	Fluid Freeze Point (F)	Pipe Maintenance Temp (F)
900-M-01	THS001-900 and THS002-900 fill lines	SHC	15	3"	CVP	120	2	900-HTC-1	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
900-M-01	PHT001-900 and PHT002-900 discharge line to THS001-900 and THS002-900	SHC	15	2"	CVP	255	1	900-HTC-2	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
900-M-01	THS001-900 and THS002-900 discharge lines to 900 Bldg	SHC	15	2"	CVP	220	1	900-HTC-2	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
900-M-01 and 902-M-01	PCW line from 900 Bldg to Defoamer Bldg	PCW	NA	1.25"	CVP	85	1	902-HTC-1	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
900-M-02	CHF feed line from Defoamer Bldg to BCCT	CHF	NA	1.5"	CVP	180	1	902-HTC-1	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
840-M-1, 902-M01, and 840-M02	840 Sampling Building drain line	DRE	NA	2"	CVP	15	1	840-HTC-01	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
	840 Sampling Building drain line	DRE	NA	4" to 6"	CVP	80	1	840-HTC-01	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
	840 Sampling Building drain line	DRE	NA	1.5"	CVP	15	1	840-HTC-01	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
	840 Sampling Building drain line	DRE	NA	4"	CVP	40	1	840-HTC-01	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
	EWH line to Sampling Building and BCCT Effluent Chamber	EWH	NA	8"	DIP	75	1	840-HTC-02	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45

Process Flow Diagram Sheet	Description	Process Fluid Code	Concen-tration (%)	Pipe Diameter (in)	Pipe Material Code	Length (ft)	Number of Runs	Controller ID	Controller Voltage	Insulation Material	Insulation Thickness (In)	Jacket Material	Heat Trace Purpose	Fluid Freeze Point (F)	Pipe Maintenance Temp (F)
840-M-1, 902-M01, and 840-M02 (cont.)	EWH lines to BCCT hose racks	EWH	NA	1.5"	CUP	50	1	840-HTC-02	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
840-M-01 and 865-M-01	SHC feed lines to BCCT (East)	SHC	15	1"	CVP	520	2	865-HTC-01	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
	SHC feed lines to BCCT (West)	SHC	15	1"	CVP	520	2	865-HTC-02	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
	SHC secondary feed line to BCCT	SHC	15	1"	CVP	130	1	865-HTC-03	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
	EFH line to 865 Disinfection Chemical Bldg.	EWH	NA	1.5"	CUP	20	1	865-HTC-03	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
865-M-01	865 Disinfection Chemical Bldg. exterior emergency shower	PCW	NA	1.25"	CUP	10	1	865-HTC-04	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	32	45
865-M-01	THS001-865, THS002-865, and THS003-865 fill lines	SHC	15	3"	CVP	10	1	865-HTC-04	208V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	-5	45
865-M-01	SBS feed lines to BCCT (East)	SBS	38-42	2"	CVP	600	1	842-HTC-01	277V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	45	55
840-M-01 and 842-M-01	SBS feed lines to BCCT (West)	SBS	38-42	2"	CVP	600	1	842-HTC-01	277V / 1 phase	Cellular glass	1.5"	PVC	Freeze protection	45	55

END OF SECTION

SECTION 40 42 00

PIPE, DUCT AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Insulation:
      a. Piping insulation.
      b. Duct insulation.
   2. Adhesives, mastics, sealants, and finishes.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements
   2. Division 01 - General Requirements
   3. Section 40 05 07 - Pipe Support Systems
   4. Section 40 41 13 - Heat Tracing Cable

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. ASTM International (ASTM):
      a. C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
      b. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
      c. E96, Standard Test Methods for Water Vapor Transmission of Materials.
      d. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
      e. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
      f. ASTM C177 Standard Test method for Steady-State Heat Flux measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
      g. ASTM C203 Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
      h. ASTM C240 Standard Test Methods of Testing Cellular Glass Insulation Block
      i. ASTM C335 Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation.
      j. ASTM C552 Standard Specification for Cellular Glass Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
      k. ASTM C552 Standard Specification for Cellular Glass Thermal Insulation
      l. ASTM C623 Standard Test Method for Young's Modulus, Shear Modulus, and Poisson's Ratio for Glass and Glass-Ceramic by Resonance.

m. ASTM C1639 Standard Specification for Fabrication of Cellular Glass Pipe and Tubing Insulation.
2. ISO 6944-1985, Method of Determining Fire Resistance of Ventilation Ducts.
3. National Fire Protection Association (NFPA):
   a. 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.
4. Underwriters Laboratories, Inc. (UL):
   a. 723, Standard for Test for Surface Burning Characteristics of Building Materials.
5. National Commercial and Industrial Insulation Standards (2013 seventh edition).
   a. Published by Midwest Insulation Contractors Association (MICA).
   b. Endorsed by National Insulation Association (NIA).
   c. MICA plate numbers listed in this specification reference this document.

1.3 SUBMITTALS

A. Shop Drawings:
1. See Section 01 33 00, Submittals, for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
   a. Acknowledgement that products submitted meet requirements of standards referenced.
   b. Manufacturer's installation instructions.
   c. Submit complete specification of insulation materials, adhesives, cement, together with manufacturer's recommended methods of application and coverage for coatings and adhesives.
3. Submit itemized schedule by building of proposed insulation systems showing density, thermal conductivity, thickness, adhesive, jackets, and vapor barriers.
4. Certifications:
   a. Products will meet the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Cellular Glass Insulation:
   a. Owens Coming
2. Fiberglass Insulation:
   a. CertainTeed Corporation.
   b. Johns Manville.
   c. Owens Corning.
   d. Knauf.
3. PVC Jacket:
   a. Ceel-Co.
   b. PIC Plastics.

4. Ductwork Insulation:
    a. CertainTeed.
    b. Johns Manville.
    c. Owens Corning.
5. High Density Perlite:
    a. Johns Manville.
    b. Industrial Insulation Group (LIC).
6. High Density Calcium Silicate:
    a. Industrial Insulation Group (LIC).
7. Adhesives, Mastics, Sealants, and Finishes:
    a. Foster Products.
    b. Childers.
    c. Dow Corning.
    d. Johns Manville.
    e. Knauf.

B. Submit request for substitution in accordance with Section 01 25 13, Product Substitutions.

2.2 PIPING INSULATION – CELLULAR GLASS

A. General:
1. Insulation fire and smoke hazard ratings for composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation), as tested by procedure ASTM E84, NFPA 255 and UL 723, not exceeding:
    a. Flame Spread: 0.
    b. Smoke Developed: 0.
2. Accessories (Adhesives, Mastics, Cements, and Tapes):
    a. Same component ratings as listed above.
3. Indicate on Product Labels or Their Shipping Cartons:
    a. Flame and smoke ratings do not exceed above requirements.
4. Permanent treatment of jackets or facings to impart flame and smoke safety is required.
    a. Water-soluble treatments are prohibited.
5. Insulated shields at pipe support points.

B. Pipe, Fitting, and Valve Insulation:
1. Cellular Glass Pipe Insulation:
    a. Average thermal conductivity not to exceed 0.29 (BTU-IN)/(HR-FT^2-degrees F) at mean temperature of 75 degrees F, temperature range -450 to 900 degrees F; 0 permeability-inch; water absorption 0.2 percent by ASTM C240.
2. Provide minimum insulation thickness conforming to schedules or as shown on Drawings.

2.3 PIPING INSULATION - FIBERGLASS

A. Pipe and Fitting Insulation:
   1. Preformed Fiberglass Pipe Insulation:
      a. Density: 4 lbs/CuFt.
      b. Temperature Rated: 650 degrees F.
      c. Average thermal conductivity not to exceed 0.23 (BTU-IN)/(HR-FT^2-degrees F) at mean temperature of 75 degrees F.
      d. Fire Hazard Rating:
         1) UL 723, ASTM E84, NFPA 255.
         2) Flame spread not exceeding 25 and smoke developed not exceeding 50.
   2. Moisture Adsorption:
      a. ASTM C553.
      b. Not greater than 5 percent moisture by volume when exposed to moisture laden air at 120 degrees F and 96 percent RH.
   3. Fungi and Bacteria Resistance:
      a. ASTM C665.
      b. Does not breed or promote growth.
      c. Flame attenuated glass fibers bonded with thermosetting resin.
   4. Piping Jackets (General Applications):
      a. Aluminum: 16 mil embossed aluminum.
      b. PVC: Preformed 0.028-inch thick PVC jackets fabricated from B.F. Goodrich PVC sheeting V-66 with proven resistance to ultraviolet degradation when temperatures do not exceed the limits of PVC.
      c. Piping jacket not required on concealed piping.
   5. Provide minimum insulation thickness conforming to schedules or as shown on Drawings.

2.4 PIPE INSULATION INSERTS AT PIPE SUPPORTS

A. High Density Perlite:
   1. Pre-formed.
   2. Fire Hazard Rating:
      a. UL 723, ASTM E84, NFPA 255.
      b. Flame spread: Zero.
      c. Smoke developed: Zero.
   3. Average Density: 13 lbs/CuFt.
   4. Compressive Strength: 80 psi to produce 5 percent compression.
   5. Maximum Surface Temperature: 1,200 degrees F.

B. High Density Calcium Silicate:
   1. Pre-formed.
   2. Fire Hazard Rating:
      a. UL 723, ASTM E84, NFPA 255.
      b. Flame Spread: Zero.
      c. Smoke Developed: Zero.
   3. Average Density: 14 lbs/CuFt.
   4. Compressive Strength: 100 psi to produce 5 percent compression.

5. Maximum Surface Temperature: 1,200 degrees F.

2.5 DUCTWORK INSULATION: FIBERGLASS

A. Flexible Insulation:
   1. Material: Commercial-grade fiberglass thermal insulation, formaldehyde free.
   2. Scheduled thickness and installed R-value. Installed R-value when compressed to a maximum of 25 percent following recommended duct wrap stretch outs.
   3. Factory-applied foil scrim vapor barrier facing.
   4. Average thermal conductivity not to exceed 0.27 (BTU-IN)/(HR-FT^2- degrees F) at a mean temperature of 75 degrees F (installed).
   5. Fungi and Bacteria Resistance:
      a. ASTM C1338.
      b. Does not breed or promote growth.
   6. Fire Hazard Classification:
      a. UL 723, ASTM E84, NFPA 255.
      b. Flame spread not exceeding 25 and smoke developed not exceeding 50.
   7. Basis of Design: Johns-Manville Microlite fiberglass duct wrap insulation.

B. Semi-Rigid Insulation for Indoor Installation:
   1. Scheduled thickness and R-value.
   2. Factory applied vapor barrier facing-white scrim foil.
   3. Average thermal conductivity not to exceed 0.23 (BTU-IN)/(HR-FT^2-degrees F) at a mean temperature of 75 degrees F.
   4. Fungi and Bacteria Resistance:
      a. ASTM C1338.
      b. Does not breed or promote growth.
   5. Moisture Adsorption:
      a. ASTM C553.
      b. Not greater than 0.5 percent moisture by volume when exposed to moisture laden air at 120 degrees F and 96 percent RH.

C. Semi-Rigid Insulation for Outdoor Installation:
   1. Scheduled thickness and R-value.
   2. Factory-applied foil scrim vapor barrier facing.
   3. Average thermal conductivity not to exceed 0.23 (Btu-IN)/(HR-FT^2- degrees F) at mean temperature of 75 degrees F.
   4. Minimum Density: 3 lbs/CuFt.
   5. Fungi and Bacteria Resistance:
      a. ASTM C1338.
      b. Does not breed or promote growth.
   6. Basis of Design: Johns-Manville #815 SPIN-GLASS fiberglass duct insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. General:
   1. Piping below ground covered with earth will not be insulated.
   2. Consider ductwork, piping and equipment as exposed, except as otherwise indicated.
   3. Consider ductwork, piping and equipment in walls, partitions, floors, pipe chases, pipe shafts and duct shafts as concealed.
      a. Consider ductwork, piping and equipment above ceilings as concealed.
   4. Provide release for insulation application after installation and testing is complete.
      a. Apply insulation on clean, dry surfaces after inspection.
   5. Provide insulation continuous through wall, roof and ceiling openings, pipe hangers, supports and sleeves.
   6. Provide insulation with vapor barrier for piping, ductwork and equipment where surfaces may be cooler than surrounding air temperatures.
      a. Provide vapor barrier (0.17 perm-IN; ASTM C553) continuous and unbroken.
      b. Hangers, supports, anchors, and related items that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.
   7. Apply specified adhesives, mastics and coatings at the manufacturer's recommended coverage per unit volume.

C. Piping Insulation – Cellular Glass:
   1. Do not insulate until satisfactory completion of required pressure testing.
   2. Apply insulation to clean, dry surfaces.
   3. Insulation should be fabricated in half sections or curved sidewall segments.
      a. Whenever the slip-on technique is not possible provide insulation neatly slit and snapped over the pipe.
   4. Fabricate and install fitting cover insulation according to manufacturer's recommendations.
   5. Seal joints, slits, miter-cuts and other exposed edges of insulation with adhesive, recommended by the insulation manufacturer, to ensure complete vapor barrier.

D. Piping Insulation - Fiberglass:
   1. Apply over clean dry pipe.
      a. Butt all joints together firmly.
   2. Seal joints, slits, miter-cuts and other exposed edges of insulation as recommended by the insulation manufacturer.
   3. Insulate fittings, valves, and flanges with insulation thickness equal to adjacent pipe.
   4. PVC Pipe Jacket:
      a. Apply jacketing with a minimum of 1-inch overlap.
         1) Weld longitudinal and circumferential seams with adhesives as recommended by manufacturer.
      b. Provide slip-joints every 30 feet and between fittings if distance exceeds 8 feet.
         1) Construct slip-joints by overlapping jacket sections 6 to 10 inches.
      c. Provide pre-molded PVC covers of same material and manufacturer as jacket for fittings, valves, flanges, and related items in insulated piping systems.

5. Aluminum Pipe Jacket:
    a. Field-applied aluminum jacket with vapor-sealed longitudinal and butt joints.
    b. Provide smooth and straight joint with a minimum 2-inch overlap.
    c. Secure joints with corrosion-resistant screws spaced 0.25- to 0.50-inch back from edge.
    d. Center spacing of screws 5 inches maximum or as required to provide smooth tight-fitted joints.
    e. Place joints on least exposed side of piping to obtain neat appearance.

E. Ductwork Insulation - Fiberglass:
1. Flexible Insulation:
    a. Butt edges tightly.
        1) Secure insulation with Benjamin Foster 85-20 adhesive applied in 6-inch strips on 12-inch centers and/or pins, applied on not more than 18-inch centers so that the insulation conforms to the duct surfaces uniformly and firmly.
    b. Seal joints with facing overlap or 4-inch wide strips of like facing material adhered and stapled in place.
    c. Properly seal any penetration in vapor barrier facing with Benjamin Foster 85-20.
    d. Cut insulation slightly longer than the perimeter of the duct to ensure full thickness at corners.
2. Semi-Rigid Insulation and Duct Interior Lining Board:
    a. Impaling over pins.
        1) Apply insulation with edges tightly butted.
        2) Apply insulation with mechanically welded fasteners to the duct and secured with speed clips.
        3) Clip pins off close to clip.
        4) Space pins as required to hold insulation firmly against duct surface but not less than one pin per 1.5 square feet.
        5) Seal joints and speed clips with 3-inch wide strip of facing adhered with Benjamin Foster 85-20 adhesive.
    b. If the welded pin method is impossible, secure insulation to the duct with Benjamin Foster 85-20 adhesive.
        1) Cover the entire surface of duct with adhesive.
        2) Use corner metal angle to protect edge of insulation.
        3) Protect edge of insulation.
        4) Seal joints as above.
    c. For outdoor application finish with Benjamin Foster #4610 weatherproof mastic with white glass fabric membrane.

F. Install interior duct lining board as indicated above.
1. Overall length shall be as indicated on the Drawings or a minimum of 10 linear feet past any type of air supply fan.

3.2 REPAIR

A. Whenever any factory applied insulation or job-applied insulation is removed or damaged, replace with the same quality of material and workmanship.

(continued)

SCHEDULE 40 42 00 - PROCESS PIPING INSULATION

PFD SHEET	SERVICE/ LOCATION	PROCESS FLUID	PIPE SIZE (IN)	PIPE MATERIAL	INSULATION THICKNESS (IN)	INSULATION TYPE	JACKET	DESCRIPTION
750-M-01	PRIMARY EFFLUENT CHANNEL	PAL	8, 6, 4	STAINLESS STEEL	2	FIBERGLASS	ALUM	HEADER TO DIFFUSERS
840-M-01	BCCT	PAL	10, 20	STAINLESS STEEL	2	FIBERGLASS	ALUM	BCCT CENTER CHANNELS
840-M-01	BCCT	PAL	10	STAINLESS STEEL	2	FIBERGLASS	ALUM	BCCT OUTFALL

SCHEDULE 40 41 13 - PROCESS PIPING HEAT TRACING CABLE WITH INSULATION

PFD SHEET	SERVICE/ LOCATION	PROCESS FLUID	CONCENTRATION (%)	PIPE SIZE (IN)	PIPE MATERIAL	TOTAL LENGTH (FT)	NO. OF RUNS	INSULATION THICKNESS (IN)	INSULATION TYPE	JACKET	HT PURPOSE	FLOW RANGE (GPM)	FREEZING POINT (F)	STORAGE/PUMP LOWEREST ALLOWED TEMP (F)	PIPE CONTENT MAINTENANCE TEMP (F)
840-M-10	Exterior piping	SBS		1	DIP	55	2	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		45-50	55	55-65
	Exterior piping	CHF		1.5	CVP	101.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		32	35	45
	Exterior piping	EWH		8	DIP	27	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
	Trench	PAC		20	CVP	180.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
840-M-11	Trench	PAC		20	CVP	152.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
	Trench	PAC		10	SSP	45.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
	Exterior piping	SBS		2	CVP	142	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		45-50	55	55-65
	Exterior piping	SBS		1	CVP	33	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		45-50	55	55-65
840-M-12	Exterior piping	SBS		2	CVP	201.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		45-50	55	55-65
	Exterior piping	SHC		1.5	CVP	193.5	2	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		5	55	50-55
842-M-10	Exterior piping	SBS		2	CVP	61	2	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION		45-50	55	55-65
900-M-11	Trench	TRANSFER PUMP LINE		2	CPVC	34.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
	Trench	FEED LINES TO PUMPS		2	CPVC	33	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
	Trench	EYEWASH H2O LINE		2	CPVC	15.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				
	Trench	CONTAINMENT PIPE		2	CPVC	4.5	1	1.5	CELLULAR GLASS	PVC	FREEZE PROTECTION				

END OF SECTION

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SECTION 40 61 13

PROCESS CONTROL SYSTEMS GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Owner project covers the Combined Sewer Overflow (CSO) Bypass and Disinfection systems. The control system will provide the automated controls, remote monitoring, and collection of historical operating data for the CSO Bypass and associated process areas.

B. The CSO control system utilize existing Ovation Controller Cabinets and include new Ovation Controller Cabinets to serve the equipment for the Flow Regulator Chambers, CSO Bypass Channel, Aeration Basins, BCCT Channels, BCCT Influent and Effluent Chambers, Dewatering Pump Station, Bypass Disinfection Chemical Building, EFW Building, Dechlorination Building, Sampling Building and Defoamer Building. Presently, no additional Operator Workstations are anticipated for this project.

C. The Owner (ALCOSAN) and Owner's Application Engineer (OAE) are responsible for furnishing, programming, configuration and startup of the CSO Bypass and Disinfection Distributed Control System (DCS).

D. The Owner and OAE are responsible for furnishing, programming, configuration and startup of the DCS communication networks hardware.

E. The Electrical Contractor and the Electrical Contractor's System Integrator (System Integrator) is responsible for the hardware installation of the DCS hardware which includes providing housekeeping pads, installing cabinets, wiring, wiring terminations, patch panels and cable management system, I/O checks, loop checks, and assisting with functional testing and startup. The System Integrator work described in this Section shall be part of the Electrical Contractor scope of work.

F. The Electrical Contractor is responsible for the copper and fiber cable installation and termination of the DCS communication networks.

G. The functions shown on the contract P&ID drawings combined with the Instrument List, I/O List, elementary schematics and Functional Descriptions frame the DCS scope and requirements.

H. The existing Operator Workstation HMI shall be configured by the OAE, and is the main point of operator interface for the facility control.

I. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements
   2. Division 01 - General Requirements
   3. Section 10 44 10 – Process Signage
   4. Section 40 61 93 - DCS-Input/Output Database and Attachment A, DCS Input-Output List

5. Section 40 61 97 - Process Control Systems Instrument List and Attachment A, Instrument List
6. Section 40 61 98 – Functional Control Descriptions
7. Section 40 63 43 – DCS
8. Section 40 66 33 – Fiber Optic Communications Systems
9. Section 40 67 00 – Variable Frequency Drives
10. Section 40 69 00 - OEM Control Panels
11. Section 40 71 00 - Flow Instrumentation
12. Section 40 72 00 - Level Instrumentation
13. Section 40 73 00 - Pressure Instrumentation
14. Section 40 75 00 - Process Liquid Analytical Measurement
15. Section 40 91 10 - Miscellaneous Meters and Transmitters

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Canadian Standards Association (CSA).
   2. FM Global (FM).
   3. The International Society of Automation (ISA):
      a. 7.0.01, Quality Standard for Instrument Air.
      b. S5.1, Instrumentation Symbols and Identification.
      c. S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems.
      d. S5.4, Standard Instrument Loop Diagrams.
      e. S20, Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
   4. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   5. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
   6. National Institute of Standards and Technology (NIST).
   7. Underwriters Laboratories, Inc. (UL):
      a. 913, Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.

B. For additional requirements, reference Section 01 42 19, Reference Standards and Abbreviations.

C. Qualifications:
   1. System Integrator Qualifications:
      a. The System Integrator shall demonstrate and adhere to the following qualifications:
         1) Shall be a member in good standing of the Control System Integrators Association (CSIA) or endorsed by other industry organizations. Certified members of CSIA preferred.
         2) System Integrator must provide proof of successful completion of previous projects over the prior three years, at minimum, and shall be subject to one or more audits, at the Owner's discretion, before, during, or after the project. Successful project completion includes, but is not limited to, delivery in accordance with Contract obligations, delivery within the Project Schedule, and delivery of prompt positive response to field failures.
         3) System Integrator shall supply examples of and references from at least three similar projects that they have successfully completed within the past five years involving the following communications networks.
            a) Modbus.
            b) Ethernet/IP.
         4) System Integrator shall have an office or location staffed with competent engineers that shall be used for the work within 150 miles of the job site.
         5) System Integrator shall have ISO 9001 Certification. If System Integrator does not have this certification, then they shall be subject to a quality management audit by the Owner or the Owner's representative.
         6) The System Integrator shall supply detailed resumes and work experience for the staff that shall be working on the project. This requirement shall apply both to office staff and field staff of the System Integrator. Because of the highly technical and skilled nature of the work, the Owner shall retain the right of individual approval and removal of any System Integrator

1.3 DEFINITIONS

A. Calibrate:
   1. To standardize a device so that it provides a specified response to known inputs.

B. Hazardous Areas:
   1. Class I, II or III areas as defined in NFPA 70.

C. Highly Corrosive and Corrosive Areas:
   1. Rooms or areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.

D. Intrinsically Safe Circuit:
   1. A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under test conditions as prescribed in UL 913.

1.4 SYSTEM DESCRIPTION

A. Control System Requirements:
   1. This specification section provides the general requirements for the control system.
   2. The control system consists of all primary elements, transmitters, switches, controllers, computers, communication devices, indicators, panels, signal converters, signal boosters, power supplies, and other devices required to provide complete control of the NEF Facility as specified in the Contract Documents.

1.5 SYSTEM INTEGRATOR RESPONSIBILITIES:

A. System Integrator shall be responsible for the integration of new devices with existing devices as required, and with devices provided under other sections with the objective of providing a completely integrated control system .

B. The System Integrator shall perform the following Work in conformance with the Contract Drawings and Specifications:
   1. Provide, calibrate, establish communication and basic field operational startup of all field instruments identified in the Specifications.
   2. Design, develop, and electronically draft loop drawings for all instrumentation and non-DCS (non-Emerson) control panels.
   3. For all non-DCS (non-Emerson) controls panels:
      a. design, develop, and electronically draft loop drawings and control panel designs.
      b. Prepare the test plan, and the spare parts submittals.
      c. Maintain responsibility for all warranty obligations for control system hardware.
      d. Fabricate non-DCS (non-Emerson) panels in a UL-approved panel shop
      e. Install PLC panels, remote I/O cabinets, and other panels containing devices that interface with the PLC or HMI.Perform Factory Acceptance Tests.
      f. Furnish, install, and configure the network components to communicate and operate as outlined in the Contract Documents.
      g. Oversee, document, and certify loop testing for all non-DCS items (motor control centers, etc.).
      h. Oversee and document, system commissioning.
      i. Conduct the site acceptance test
      j. Prepare Owner's Manuals.
      k. Prepare Record Drawings

C. Integration of instrumentation and control devices being provided under other Sections

1. Develop all requisite loop drawings and Record Loop Drawings associated with equipment provided under other Divisions of these Specifications and per the ALCOSAN Control System Guidelines.
2. Resolve signal, power, or functional incompatibilities.

D. Integration with network components being supplied by Owner.

1.6 SUBMITTALS

A. Shop Drawings:
1. See Section 01 33 00, Submittals, for requirements for the mechanics and administration of the submittal process.
2. Submittals shall be original printed material or clear unblemished photocopies of original printed material.
   a. Facsimile information is not acceptable.
3. Limit the scope of each submittal to one specification section.
   a. Each submittal must be submitted under the specification section containing requirements of submittal contents.
4. Product technical data including:
   a. Acknowledgement that products submitted meet requirements of specification section(s) referenced.
   b. Equipment catalog cut sheets.
   c. Instrument data sheets:
      1) ISA S20 or approved equal.
      2) Separate data sheet for each instrument type and range.
   d. Materials of construction.
   e. Minimum and maximum process ranges and units.
   f. Environmental limits of components including temperature and humidity limits.
   g. Size and weight.
   h. All required mounting hardware and accessories.
   i. Recommended spare parts and consumable supplies.
   j. Electrical power requirements and wiring diagrams.
   k. NEMA ratings.
   l. Submittals shall be marked with arrows to show exact model number, part number, and features to be provided.
5. Loop diagrams per the ALCOSAN Control System Guidelines.
6. Process connected instrument installation details containing the following minimum information:
   a. Bill of materials providing as a minimum the following information:
      1) Tube material and size.
      2) Connection size.
      3) Fitting size, material, and rating.
      4) Valve type and material.
      5) Instrument description, manufacturer and model.
      6) Pipe stand and mounting type, size and material.
   b. Required elevations and dimensions.
7. Loop diagrams as specified in this Section.

8. Panel fabrication drawings and wiring diagrams.
9. DCS equipment support/PAD drawings.
10. Drawings, systems, and other elements are represented schematically in accordance with ISA S5.1 and ISA S5.3.
    a. The nomenclature, tag numbers, equipment numbers, panel numbers, and related series identification contained in the Contract Documents shall be employed exclusively throughout submittals.
11. All Shop Drawings shall be modified with as-built information/corrections.
12. All panel and wiring drawings shall be provided in both hardcopy and softcopy, and follow ALCOSAN Standard Requirements..
    a. Furnish electronic files via eBuilder, or USB memory drive, CD-ROM or DVD-ROM media, and any other media required per ALCOSAN Control Systems Guidelines and ALCOSAN CAD Standards, Guidelines and Procedures Manual.
    b. Drawings in AUTO CAD format shall adhere to ALCOSAN CAD Standards, Guidelines and Procedures Manual.
13. Provide a configuration and parameter setting summary sheet for each field configurable device.
14. Certifications:
    a. Documentation verifying that calibration equipment is certified with NIST traceability.
    b. Approvals from independent testing laboratories or approval agencies, such as UL, FM or CSA.
        1) Certification documentation is required for all equipment for which the specifications require independent agency approval.
15. Testing Reports: Source quality control reports.

B. Contract Closeout Information:
    1. Operation and Maintenance Manual:
        a. General: Information in the Operation and Maintenance Manual shall be based upon the approved Shop Drawing submittals as modified for conditions encountered in the field during the work, as well as detailed documentation of the implementation of the work. Reference Section 01 33 04, Operation and Maintenance Manuals, for full Operation and Maintenance Manual Requirements or requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
        b. The Operation and Maintenance Manual shall have the following organization:
            1) Section A - Loop Descriptions
            2) Section B – Loop Drawings.
            3) Section C - I/O List.
            4) Section D – Panel Drawings and Wiring Diagrams.
            5) Section E – Instrument List.
            6) Section F – As-built ISA-TR20 Operating Parameter, Device Specification, and General or Special Requirements Forms.
            7) Section G – Instrument Calibration Forms
            8) Section H - Instrument Installation Details.

9) Section I - Manufacturer Cut Sheets and Shop Drawings.
10) Section J - Test Results.
11) Section K – Fully commented copy of DCS program (to be inserted after successful completion of the Performance Test) provided by the Owner's Application Programmer.
12) Section L – HMI and OIT Graphic Control Screens (to be inserted after successful completion of the Performance Test) provided by the Owner's Application Programmer.

c. Attachment A to this Section 40 61 13 is a comprehensive I/O List that includes parameters listed below. The final format for the list will be provided to the System Integrator during construction. The Engineer has furnished an initial I/O listing in Attachment A.
1) Tag and Description.
2) Signal type and level.
3) Signal range, engineering units, and setpoints.
4) Alarm High, High-High, Low, Low-Low and Alarm Class information.
5) "Signal From" details including panel, terminal block, and terminal.
6) Power Source.
7) Termination details including panel, terminal block, and terminal.
8) I/O address.

d. A comprehensive Instrument List including parameters listed below is included as Attachment A to Section 40 61 97, Process Control Systems Instrument List. The final format for the list will be provided to the System Integrator during construction.
1) Tag, equipment location, and control loop description.
2) Instrument type, service, size and connection.
3) Actual calibration ranges and setpoints.
4) Manufacturer and model.
5) Specification section and Drawing number references.
6) Submittal number, ISA data sheets numbers, and installation detail number references.
7) Signed forms from System Checkout and Start-up, Commissioning, and Performance Testing shall be included in Section J, Test Results.

e. Initially, draft Operation and Maintenance Manuals shall be submitted for review after return of favorably reviewed Shop Drawings and data required herein. Following the Engineer's review, the Manuals shall be revised and amended as required and the final Manuals shall be submitted 15 days prior to start-up of systems.

2. Warranties: Provide copies of warranties and list of factory authorized service agents.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 65 50, Product Delivery, Storage, and Handling.

B. Do not remove shipping blocks, plugs, caps, or desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent

connections are made.

PART 2 - PRODUCTS

2.1 NEMA TYPE REQUIREMENTS

A. Provide enclosures/housing for control system components in accordance with the area designations provided on the Drawings, or as specified and shown for specific equipment.
   1. Areas Designated As Wet: NEMA Type 4.
   2. Areas Designated As Wet and/or Corrosive: NEMA Type 4X.
   3. Areas Designated as Class I Hazardous, Groups A, B, C, or D as defined in NFPA 70:
      a. NEMA Type 7 unless all electrical components within enclosure utilize intrinsically safe circuitry.
         1) Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents.
   4. Areas designated as Class II hazardous, Groups E, F, or G as defined in NFPA 70:
      a. NEMA Type 9 unless all electrical components within enclosure utilize intrinsically safe circuitry.
         1) Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents.
   5. Either architecturally or non-architecturally finished areas designated as dry, noncorrosive, and nonhazardous: NEMA Type 12.
   6. Areas designated to be subject to temporary submersion: NEMA 6P.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. Unless stated otherwise, system operating criteria are as follows:
   1. Stability: After controls have taken corrective action, as result of a change in the controlled variable or a change in setpoint, oscillation of final control element shall not exceed two cycles per minute or a magnitude of movement of 0.5 percent full travel.
   2. Response: Any change in setpoint or change in controlled variable shall produce a corresponding corrective change in position of final control element and become stabilized within 30 seconds.
   3. Agreement: Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 3 percent of full scale over a 6:1 operating range.
   4. Repeatability: For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5 percent of full travel regardless of force required to position final element.
   5. Sensitivity: Controls shall respond to setpoint deviations and measured variable deviations within 1.0 percent of full scale.
   6. Performance: All instruments and control devices shall perform in accordance with manufacturer's specifications.

2.3 ACCESSORIES

A. Provide identification devices for instrumentation system components in accordance with Section 10 14 00, Identification Devices.

B. Provide corrosion-resistant spacers to maintain 1/4-inch separation between equipment and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as clarifiers, sumps, RAS pump station, etc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wherever feasible, use bottom entry for all conduit entry to instruments and junction boxes.

B. Install electrical components per the requirements of the electrical specifications and manufacturer recommendations.

C. Panel-Mounted Instruments:
   1. Mount and wire so removal or replacement may be accomplished without interruption of service to adjacent devices.
   2. Locate all devices mounted inside enclosures so terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.

3.2 FIELD QUALITY CONTROL

A. See Section 01 75 00, Facility Start-Up.

B. Maintain accurate daily log of all startup activities, calibration functions, and final setpoint adjustments.

C. In the event that instrument air is not available during calibration and testing, supply either filtered, dry, instrument quality air from a portable compressor or bottled, dry, instrument quality air.
   1. Do not, under any circumstances, apply hydrostatic test to any part of the air supply system or pneumatic control system.

D. Pneumatic Signal Tubing Testing:
   1. Before the leak test is begun, blow clean with dry air.
   2. Test signal tubing per ISA 7.0.01, except for tubing runs of less than 10 feet where simple soap bubble testing will suffice.
   3. If a leak is detected, repair the leak and repeat the leak test.
   4. After completion of the leak test, check each signal line for obstructions.
      a. If any are indicated, remove and retest.

E. Instrumentation Calibration:
   1. Verify and document that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.

a. Utilize the Instrument Certification Sheet located at the end of this specification section (or Engineer-approved equivalent) to document on-site calibration checks.

2. Factory furnished calibration certifications are acceptable for the following:
   a. Flow meters.
   b. Pressure sensors utilized with annular sleeve.
   c. Temperature sensors.
3. On-site calibration verification is required for all other instruments, including "smart" transmitters that have been factory calibrated.
   1) Provide calibration checks at 0, 25, 50, 75, and 100 percent of span for pressure transmitters and gages. Check for both increasing and decreasing input signals to detect hysteresis.
   b. In addition to factory calibration certification, temperature sensors and gages shall be checked at a single point for conformance to required accuracy.
   c. Level transducers/transmitters shall be checked at two points in addition to zero.
   d. Analytical sensors shall be calibrated in accordance with manufacturer's recommendations.
   e. Check operation of all switches to verify actuation occurs in accordance with manufacturer's specified accuracy.
   f. Replace any instrument which cannot be properly adjusted.
   g. Stroke pneumatic control valves with clean dry air to verify control action, positioner settings, and solenoid functions.
4. Mark range, date, setpoint and calibrator's initials on each instrument by means of blue or black ink on a waterproof tag affixed to the instrument.
5. Calibration equipment shall be certified by an independent agency with traceability to NIST.
   a. Certification shall be up-to-date.
   b. Use of equipment with expired certifications shall not be permitted.

F. Loop check-out requirements are as follows:
1. Check control signal generation, transmission, reception and response for all control loops under simulated operating conditions by imposing a signal on the loop at the instrument connections.
   a. Use actual signals where available.
   b. Closely observe controllers, indicators, transmitters, HMI displays, recorders, alarm and trip units, remote setpoints, ratio systems, and other control components.
      1) Verify that readings at all loop components are in agreement.
      2) Make corrections as required.
         a) Following any corrections, retest the loop as before.
2. Stroke all control valves, cylinders, drives and connecting linkages from the local control station and from the control room operator interface.
3. Check all interlocks to the maximum extent possible.
4. Utilize the Loop Check-Out Sheet located at the end of this specification section (or Engineer approved equivalent) to document on-site calibration checks.

5. In addition to any other as-recorded documents, record all setpoint and calibration changes on all affected Contract Documents and turn over to the Owner.

END OF SECTION

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