

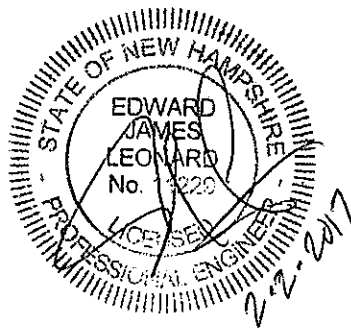
ADDENDUM NO. 2

TO

EXETER, NEW HAMPSHIRE

CONTRACT NO. 1 – WASTEWATER TREATMENT FACILITY UPGRADES

NHDES SRF PROJECT NO. CS-330130-15



FEBRUARY 2017

PREPARED BY:
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ADDENDUM NO. 2

EXETER, NEW HAMPSHIRE

CONTRACT NO. 1 – WASTEWATER TREATMENT FACILITY UPGRADES

As a point of clarification, it should be understood that the Contract Documents govern all aspects of the project. Informal discussions held over the telephone and/or during the pre-bid meeting are informational only. All official changes to the Contract Documents are made only by addenda. The following changes and additional information are hereby made a part of the Contract Documents. All Bidders shall acknowledge receipt and acceptance of this Addendum by signing and sending back the confirmation page. Bids submitted without acknowledgement of receipt of this addendum may be considered non-responsive.

SPECIFICATIONS

1. Section 00020 – Advertisement for Bids. **DELETE** the phrase “Sealed Bids for the construction of Contract No. 1 - Wastewater Treatment Facility Upgrade will be received, by the Town of Exeter, at the office of the Town Office Building (10 Front Street, Exeter, NH, 03833, until 4:00 PM local time on February 13, 2017.” and **REPLACE** with the phrase “Sealed Bids for the construction of Contract No. 1 - Wastewater Treatment Facility Upgrade will be received, by the Town of Exeter, at the office of the Town Office Building (10 Front Street, Exeter, NH, 03833, until 4:00 PM local time on February 27, 2017.”
2. Section 00310 – Bid Form. **DELETE** in its entirety and **REPLACE** with the attached version.
3. Section 00510 – Agreement, Article 4.04 Special Damages: **DELETE** the Article 4.04A and **REPLACE** with “A. Not Used”. **DELETE** the text in Article 4.04B and **REPLACE** with “B. Not Used”.
4. Section 01010A – Summary of Work. **ADD** the following paragraph immediately following paragraph 01010A-3.1.B.5.I:
“m. The existing Control Building local control panel (MTU) and new Control Building Control Panel (CBCP) shall both be available and on-line until all remote pump stations are transitioned from the MTU to the CBCP.”
5. Section 01050 – Coordination. **ADD** the following paragraph immediately following paragraph 01050-1.2.I:
“J. Application Engineering Services Supplier (AESS):
 1. The AESS will be under a separate contract with the Owner. The scope of services between the AESS and the Owner will match the duties and responsibilities outlined in Division 13 and will provide for the construction sequence outlined in Section 01010A-3.1.B, including temporary chemical hypochlorite and bisulfite chemical feed systems. Alternative construction sequence approaches which change the AESS effort will need to be coordinated/negotiated between the Contractor, Owner and AESS such that there is no net additional cost to the Owner.
 2. The Contractor shall be responsible for proactive schedule coordination with the AESS.
 3. A coordination meeting between the Contractor, Owner, Engineer and AESS shall be held within 30 days of the Notice to Proceed in order to coordinate schedule requirements for the project in advance of the detailed schedule submittal required for Interim Milestone No. 1.
 4. The Contractor’s schedule shall include specific milestone dates for Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) in order to provide an orderly WWTF start-up process as defined in Section 01800, 13440 and 13444.
 5. The Contractor shall provide the AESS a minimum of 4 weeks’ notice prior to tentative FAT and SAT dates and shall provide a 72 hour notice prior to the final FAT and SAT dates based on completed pre-checkouts by the Contractor and appropriate subcontractors.

6. All communication between the Contractor and the AESS regarding schedule shall be in writing between the Contractor Project Manager to the AESS Project Manager with a copy to the Engineer Project Manager.

6. Section 01150A – Measurement and Payment. For Paragraph 01150A-1.9:
- a. **DELETE** Paragraph 01150A-1.9.A.2 in its entirety and **REPLACE** with “(2) Not used”.
 - b. **DELETE** Paragraph 01150A-1.9.A.5 in its entirety and **REPLACE** with “(5) Not used”.
 - c. At the end of Paragraph 01150A-1.9.A.7, **ADD** the following phrase: “The unit price for ledge excavation and disposal for areas identified in Section 00800 SC-20 Part D, Attachment B as Building shall be paid under Item 7A as shown on the Bid Form. The unit price for ledge excavation and disposal for areas identified in Section 00800 SC-20 Part D, Attachment B as Heavy shall be paid under Item 7B as shown on the Bid Form.”
 - d. **DELETE** Paragraph 01150A-1.9.A.14 in its entirety and **REPLACE** with “(14) Not used”.
7. Section 01310 – Construction Schedules. **DELETE** in its entirety and **REPLACE** with the attached version.
8. Section 01340 – Submittals. **DELETE** paragraph 01340-1.2.F.2 and **REPLACE** with “2. Once completed, the Contractor shall provide one hard copy set for the Resident Project Representative.”
9. Section 01800 – Equipment Startup, Certification and Operator Training. **DELETE** paragraph 01800-3.4 in its entirety and **REPLACE** with the attached modified paragraph 01800-3.4.
10. Section 02200 – Earthwork, Paragraph 2.1.H, Compacted Granular Fill. **DELETE** the gradation table and **REPLACE** with the following gradation table and note:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
3 inch	100
No. 4	30-80
No. 40	10-50
No. 200	0-8

Note: Compacted Granular Fill is also referred to as Compacted Select Fill in some specifications and details.

11. Section 11000 – Equipment-General, Paragraph 2.16, Electrical Controls. **ADD** the following paragraph immediately following paragraph 11000-2.16.D:

- E. Manufacturer-provided control panels shall have the capability of being monitored and controlled, via the Industrial Ethernet Network. The project Application Engineering Services Supplier (AESS) will incorporate the Manufacturer provided monitoring and control functions into the head end SCADA system.
 - 1. The equipment manufacturer shall be responsible for:
 - a. Providing the necessary hardwire controls, PLC programming, and local Operator Interface application, as described in this section, to appropriately monitor and control their equipment and appurtenant equipment.
 - b. Delivering a control panel that has been fully Factory Tested as described in Section 13444.
 - c. As stated further in this section, the equipment manufacturer’s control system shall interface with appurtenant equipment which is controlled by one or more Division 13 control panel(s). The equipment manufacturer shall be responsible for requesting a list of PLC tags, they require to monitor and control the appurtenant equipment, from the AESS.
 - d. The equipment manufacturer shall provide a PLC register list to the AESS with the format, name, description, and units (with scale noted e.g. a decimal value converted

to an integer format). The register list shall be provided as a Microsoft Excel file. This list shall provide functionality for full monitoring, control, and alarming at SCADA and shall include but not be limited to the following:

- i. Complete status, control, and alarming
 - ii. All analog process values
 - iii. All digital inputs to the PLC
 - iv. Process control setpoints and time delays
 - v. Alarm setpoints with enable/disable and time delays
 - vi. All totalized values including runtimes, flow totals, etc.
- e. Providing a field technician who is authorized to make programming changes to the equipment manufacturer's control system during startup and commissioning. Coordination between the field technician and AESS during startup and commissioning will be required.
 - f. Providing contact information (name, title, mobile phone number, and email) of qualified field technician responsible for PLC and Operator Interface programming of the equipment manufacturer's control system to AESS and Contractor 4 weeks before startup for SCADA integration coordination and scheduling/meeting purposes.
 - g. Providing screenshots of Operator Interface application to the AESS.
2. The AESS will be responsible for:
 - a. Head end SCADA integration for the equipment manufacturer's control system.
 - b. Providing IP address for the PLC and Operator Interface to the equipment manufacturer.
 - c. Providing a PLC tag list to the equipment manufacturer for monitoring and control of appurtenant equipment in the equipment manufacturer's control system.
 - d. Working with the equipment manufacturer's field technician during startup and commissioning of the process equipment control system.
 3. This is applicable to the following panels:
 - a. Mixing Air Valve Control Panel (MVCP) and Valve Control Panels (VP1, VP2, VP3), Section 11223C
 - b. Dewatering Control Panels (DCP1, DCP2), Section 11365C
 - c. Polymer Panels (PBU1, PBU2), Section 11232A
 - d. Sludge Blower Control Panels (SLCP1, SLCP2), Section 11373S
 - e. Aeration Blower Control Panels, (ACP1, ACP2, ACP3), Section 11373S
 - f. UV Control Panel (UVCP), Section 11234

12. Section 11000 – Equipment – General. In paragraph 2.17.E **DELETE** the phrase “E. Process Isolator (Diaphragm Ring Seal): As specified in the appropriate Division 11 specifications and as indicated on the Drawings” and **REPLACE** with “E. Process Isolator (Diaphragm Ring Seal): Shall be provided for all gauges on Wastewater/Sludge and Polymer applications and as specified in the appropriate Division 11 specifications and as indicated on the Drawings. All other gauge applications shall be provided with diaphragm seals as specified in 2.17.D.”

13. Section 11231 – Liquid Chemical Feed System. For paragraph 1.2.A **ADD** the following immediately after 1.2.A.4:

- “5. All liquid chemicals after start-up and performance testing, shall be purchased by the Owner. Contractor shall coordinate with the Owner to have liquid chemicals ordered and delivered in advance of needing the Chemical Feed Systems to be placed in service. Contractor shall reimburse Owner for chemicals used during start-up and testing.”

14. Section 11330 – Mechanical Bar Screen. **ADD** the following at the end of paragraph 2.1.C “The lower portion of the bar rack shall be curved and extend to the invert of the channel.”

15. Section 11378B – Fine Bubble Aeration Systems. For paragraph 2.1.A.1 – Aeration Grid Nominal Dimensions (each), **CHANGE** Width for Grid No. 1 through Grid No. 7 from 26’ to 36’-2”.
16. Section 13440 – Instrumentation and Process Control. **DELETE** Part 1 of the specification in its entirety and **REPLACE** with the attached version. The remainder of the specification is unchanged by this addendum.
17. Section 13442 – Programmable Logic Controllers. **DELETE** the specification in its entirety and **REPLACE** with the attached version.
18. Section 13444 – Control Panels.
 - a. **DELETE** Part 1 of the specification in its entirety and **REPLACE** with the attached version.
 - b. In Paragraph 2.1.G.1.d, **DELETE** the sentence beginning “For SCADA hardware...” and **REPLACE** with “d. Not used”.
 - c. In Paragraph 2.1.G.1.g., **ADD** the phrase “The enclosure ratings shall be NEMA 12 or NEMA 4X”.
 - d. In Paragraph 2.1.G.2.f.1.a, **DELETE** the sentence beginning “Cooling fans...” and **REPLACE** with “a. Not used”.
 - e. In Paragraph 2.1.G.2.i, **DELETE** the word “fluorescent” and **REPLACE** with the word “LED”.

DRAWINGS

1. Drawing C-38: **ADD** the attached HEADWALL SECTION detail shown on Figure C1.
2. Drawing I-9: **DELETE** the control loop diagrams for JOCKEY SLUDGE SCREW CONVEYOR, SLUDGE SCREW CONVEYOR NO. 3 and SLUDGE SCREW CONVEYOR NO. 4 and **REPLACE** with the control loop diagrams for the same equipment, attached to this addendum as Figure II.
3. Drawing E-17: **ADD** a IS-PB (provided by Division 13) near the control panel CBCP in the Electrical Room. IS-PB will connect to the level transmitter LE/LT-790A conduit S23. IS-PB shall be powered from the control panel PBCP, run ¾” conduit with 2#12, and 1 #12 GND and ¾” conduit with 1-2#16TWS to the IS-PB from the control panel PBCP.
4. Drawing E-27:
 - a. **CHANGE** the tag name of chemical tank LIT/LE-391 to LE/LT-391.
 - b. **DELETE** Conduit P622.
 - c. **DELETE** No. 11 Equipment Balloon.
 - d. **CHANGE** the tag name of eyewash FS-91 to FSH-91.
 - e. **ADD** a IS-PB (provided by Division 13) near the control panel PBCP in the electrical room. IS-IB will connect to the float switch conduit C623, for LSL and LSHH 708. IS-PB shall be powered from the control panel PBCP, run ¾” conduit with 2#12, and 1 #12 GND and ¾” conduit with 6#16 to the IS-PB from the control panel PBCP.
5. Drawing E-30:
 - a. **CHANGE** the tag name of chemical tank LE-381 to LE/LT-381.
 - b. **DELETE** LIT-381 and Conduit P411
6. Drawing E-51, MAGNESIUM HYDROXIDE SLURRY SYSTEM MIXER: **DELETE** the NC contact CR2 in starter portion of schematic.
7. Drawing E-59, SUPPLEMENTAL CARBON CONTROL PANEL RCP-3:
 - a. **DELETE** LE-381 and manufactures /conduit cable.
 - b. **CHANGE** LIT-381 to LE/LT-381
 - c. **DELETE** Conduit P411
 - d. **CHANGE** conduit S400 to go from RCP-3 to CFCP-381

- e. **CHANGE** conduit S401 to go from CFCP-381 to LE/LT-381
8. Drawing E-60, SEPTAGE BUILDING CONTROL PANEL SBCP: **CHANGE** symbol for conduit fill from MS-SEPP-1 to control panel SBCP from 8#14 to 14#14.
9. Drawing E-60, PUMPING BUILDING CONTROL PANEL PBCP:
- a. **DELETE** LE-391 and manufactures /conduit cable.
 - b. **CHANGE** LIT-391 to LE/LT-391
 - c. **DELETE** Conduit P622 to “Not Used”
 - d. **CHANGE** conduit S615 to go from PBCP to CFP-391
 - e. **CHANGE** conduit S614 to go from CFP-391 to LE/LT-391
10. Drawing E-62, UV CONTROL PANEL UVCP: **CHANGE** AE/AIT-500 to be shown as two separate devices. Provide manufactures cable in ¾” conduit between AIT-500 and AE-500.
11. Drawing E-65, AERATION TANK CONDUIT AND WIRE SCHEDULE:
- a. **CHANGE** Conduit P411 to “Not Used”
 - b. **CHANGE** conduit S400 to go from RCP-3 to CFCP-381
 - c. **CHANGE** conduit S401 to go from CFCP-381 to LE/LT-381
12. Drawing E-67, DEWATERING BUILDING CONDUIT AND WIRE SCHEDULE:
- a. **CHANGE** conduit fill for C510, C521 from 4#14 to 10#14.
 - b. **CHANGE** conduit fill for C526,C528,C530,C532 from 10#14 to 16#14
13. Drawing E-68, PUMPING BUILDING CONDUIT AND WIRE SCHEDULES:
- a. **CHANGE** Conduit P622 to “Not Used”
 - b. **CHANGE** conduit S615 to go from PBCP to CFP-391
 - c. **CHANGE** LIT-391 to LE/LT-391
 - d. **CHANGE** conduit S614 to go from CFP-391 to LE/LT-391
 - e. **CHANGE** conduit fill for C610,C611,C612 from 10#14 to 18#14
14. Drawing E-69, DISINFECTION STRUCTURE CONDUIT AND WIRE SCHEDULES: **CHANGE** the following items in the schedule:

C717	3/4"	10#14	UV BALLAST CABINET CHANNEL 1	UV CONTROL PANEL UVCP
C737	3/4"	10#14	UV BALLAST CABINET CHANNEL 2	UV CONTROL PANEL UVCP
C761	3/4"	4#14	UV CONTROL PANEL UVCP	UVT-1 (AE/AIT-500)

SIGNIFICANT QUESTIONS AND RESPONSES DURING THE BIDDING PERIOD

1. Q: Please clarify what drawings apply to Bid Item 14, Disinfection System Upgrades. The work is not indicated on the drawings making breakout pricing from subs and suppliers unlikely.
R: Bid Item 14 will be deleted. Refer to revisions to Section 00310 and 01150A.
2. Q: Refer to the Bid Form. Will the unit prices for the additional work be based on building or heavy wage rates?
R: The wage determination for the unit price work will be determined based on how the work is defined in Section 00800 SC-20 B-1. Several items are only applicable to one wage determination (i.e., paving/heavy, compacted screened stone/heavy). Several items are applicable to both wage determinations but the wage difference is relatively minor (i.e., compacted granular fill, earthwork excavation). One item is applicable to both wage determinations and the wage difference is significant (i.e., ledge removal). Several bid items have been modified or deleted. Refer to revisions to Section 00310 and 01150A.

3. Q: Using precast post-tensioned concrete structures for the Exeter NH upgrade may help to lower the costs of the bid and help with scheduling on the project. Will precast, post-tensioned concrete structures be considered as an equivalent alternative to cast-in-place concrete for this project?
R: Wright-Pierce has been tasked by the Town to evaluate the use of precast post-tensioned concrete structures for the construction of all tankage on the project. Once the evaluation has been completed the decision will be included in a subsequent Addendum. Due to the additional time required to complete the due diligence, the Bidding Phase will be extended as noted above.
4. Q: Is there an updated copy of the AOC? The Agreement refers to Special Damages in Paragraph 4.04 which include fines from EPA. There is no mention of fines in the copy of the AOC dated June 24, 2013. Also the dates in that AOC are about a year off.
R: A schedule extension was requested and approved by EPA in a letter dated June 27, 2016. The dates requested and approved are March 31, 2017 for initiation of construction and March 31, 2019 for substantially completing the AOC-related project elements.
5. Q: The Agreement includes provisions for Special Damages which include engineering and other charges that appear to be in addition to the specified Liquidated Damages provided for in Paragraph 4.03. Please either specify what these engineering and other charges will be or verify that these are intended to be included in the Liquidated Damages amount. If neither of the EPA fines or the engineering charges are intended to be levied, please strike this Paragraph from the Agreement.
R: Refer to revisions to Section 00510 above.
6. Q: Will the successful GC be provided with any additional copies of the Contract Drawings and Specifications upon award?
R: Yes, refer to 00800 SC-2.02.
7. Q: Please verify that Contract retainage will be reduced to 2% on all items identified as “AOC Elements of the Work” upon successful completion of that work in accordance with the Interim Milestone No. 3.
R: Once Interim Milestone No. 3 is achieved, retainage will be reduced on those elements of the Work in accordance with Agreement and General/Supplemental Conditions.
8. Q: Will Engineer provide Grid Coordinates (N, E) for Contractor’s use in layout of site structures and features? Supplementary Conditions Paragraph 4.03 states the Contractor shall employ a licensed surveyor to set reference points and monuments. Is this intended to require a licensed surveyor only when a reference point or monument is lost or destroyed or will the Contractor be required to use a licensed surveyor for initial site layout? The respective Paragraph 4.03 in the General Conditions states the initial survey and establishment of reference points will be by the Engineer. Please clarify.
R: There are several horizontal control points with established northing and easting coordinates located throughout the project area. These will be provided to the Contractor along with the electronic files as noted in Note #2 on the Layout Drawings. A licensed surveyor will only be required for resetting any property monuments or horizontal control points that are disturbed during the construction.
9. Q: Please verify that “Industrial” Wage Rates do not apply to this Project.
R: The Laborer: Common or General Union Classification/Rate (LABo0976-001) listed in the Building wage decision (NH13) as applicable to “Industrial Work Only” does not apply to this project.
10. Q: Please provide costs for Engineer’s supervision should Contractor elect to work on weekends or Owner observed holidays.
R: The Owner will budget RPR time to allow for coverage of up to 12 hours per day, Monday to Friday, consistent with the extended work hours identified in Section 00800 SC-7.02. Costs for Saturday/Sunday/Holiday Resident Project Representation are estimated at \$1250 per day for one RPR for up to 12 hours per day. The Owner will review whether the weekend/holiday time can be absorbed into the weekly coverage schedule based on on-going work activities and, if not, would expect reimbursement from the Contractor.

11. Q: Please clarify where diaphragm seals are needed on gauge assemblies. Usually these are on solids service/ wastewater lines and chemical feed lines, but not on plant (process) water, seal water, or air lines. The spec seems to say that diaphragms are needed on all gauges, but that isn't really clear in the 11000.2.17.A description. These cost about \$400 each, so it adds up if used on ALL types of services.
- R: Diaphragm Seals or Process Isolator Diaphragm Ring Seals shall be provided on all gauges. Refer to paragraph 11000-2.17.D (Diaphragm Seals) and paragraph 11000-2.17.E (Process Isolator Diaphragm Ring Seal) for the appropriate diaphragm seal material for each specific application and see addendum above for further clarification.
12. Q: What is the scope of the pre-engineered building spec? It looks like the maintenance building is pre-engineered, and I'm not sure if the disinfection structure is also pre-engineered. Please let me know which buildings shall adhere to 13121.
- R: The design intent is that the Maintenance Building is pre-engineered and covered under specification 13121. The Disinfection Structure and Parshall Flume Structure are site built. If a pre-engineered building company is interested in constructing the Disinfection Structure and/or Parshall Flume Structure, that will be acceptable as well.
13. Q: Please expand on Note 4, DWG E-18 in regards to ALT A. Is this note saying that the base bid work only includes the following pertaining to the Septage Building: Duct bank & Electric Room Lighting (Which either currently is, or is to be, fed from the Control Building?)
- R: Yes, the Base Bid work includes Room Lighting, Lighting Circuit which is to be fed from the Control Building and the Conduit Duct Bank.
14. Q: Please confirm if the following are part of ALT A: Feeder Conductors in duct bank from the Main Switchboard (Dewatering Building), MCC-SEP and all distribution, feeders, branch wiring etc. downstream, Demo of Electrical on DWG E-18, Any other electrical work shown on DWG E-18.
- R: Bid Alternate A includes, the Feeder Conductors in the duct bank from the Main Switchboard (Dewatering Building), the MCC-SEP and all distribution, feeders, branch wiring, etc. downstream and any other electrical work shown on drawing E-18 besides the lighting in the Electric Room. The demolition of electrical on drawing E-18 is part of the Base Bid work.
15. Q: Are town permit fees intended to be waived for the project?
- R: Permits must be obtained by the Contractor, but the Town will waive permit fees for the project.
16. Q: Section 16010 1.1 G. 2. m. suggests that the contractor provide telephone interface equipment. However, section 16740 1.1 B indicates that the interface is by the Telephone Company. Please Clarify.
- R: Any interface equipment used for communications shall be provided by the Telco Company.
17. Q: In reference to 16050 2.1 D, although outlet and device boxes are available as PVC-Coated, pull and junction boxes are not, to our knowledge. Is it permissible to use NEMA 4X rated Stainless Steel boxes in these applications? If not, please provide resource information for PVC-Coated pull boxes.
- R: Yes.
18. Q: In reference to 16050 2.1 I, J, K: Are disconnect switches and enclosed breakers in areas designated NEMA 1/12 required to have a gasket?
- R: If equipment is rated for NEMA 12 with gaskets, then yes.
19. Q: In reference to 16040 2.1 N: Can galvanized strut and galvanized 4" C channel (where applicable) be utilized in NEMA 1/12 locations?
- R: Yes
20. Q: In areas designated NEMA 1/12 on Drawing E-1: Are conduit entrances to boxes, enclosures, etc. acceptable utilizing (2) locknuts, or are "Myers" hubs required essentially on every conduit entry

in to a field drilled or punched hole? This question is being asked in reference to 16050 3.1 I.

R: Myers hubs are required.

21. Q: In reference to 16050 3.1 B. 1. a.: Is underground conduit containing Fiber Optic cable required to be rigid steel, considering there is no electrical signal to interfere with? Also, what about the 2" spare conduit S16 that runs in parallel with the F.O. throughout the site?

R: PVC is acceptable for F.O. and S16.

22. Q: Will the exterior space in close proximity to entry doors be considered a classified location when the entry door opens to a hazardous location? If so, please define the parameters of this area and address, if applicable, any devices and/or equipment being shown mounted at entry doors (exterior wall packs, remote heads, etc.)

R: Classification areas that are CLASS 1 DIVISION 1, shall have a CLASS 1 DIVISION 2 area within specified radius in compliance with NFPA 820.

23. Q: On drawing E-52, a local control station is shown for SEPP-1. However, it is not shown on drawing E-18. Please clarify if these is to be a local control station, and if so, where it should be located considering the motor is submersible.

R: The disconnect for SEPP-1 is shown on the Lower Floor Modification Plan.

24. Q: On drawing E-21, disconnects are shown for both grinders in the basement. However, these disconnects are not shown on the one-line on drawing E-11. Please advise.

R: If grinder control panel is located within line of site of grinders then disconnects are not required for the Grinders.

25. Q: Who is to provide the diesel fuel for the generator start-up/load bank. Additionally, is the fuel tank required to be filled again after start-up?

R: Contractor shall provide fuel for start-up and performance testing, fill-up shall be provided by Owner after start-up and performance testing are completed.

26. Q: Section 16406 2.1 A. 6. Indicates the ATS to be provided and warranted by the generator supplier. However, section 16415 1.1 B indicates the ATS to be provided by the switchboard supplier. Please advise.

R: ATS shall be provided by Switchboard supplier and warranted by switchboard supplier.

27. Q: Drawing E-1 seems to indicate that equipment such as the Switchboard, MCC's, Panels, etc. should be NEMA 12. However, the specifications do not appear to require a NEMA 12 rating on this equipment. Please advise if NEMA 1 rating is sufficient for equipment in areas designated NEMA1/12.

R: NEMA 1 shall be acceptable.

28. Q: Confirm that 16450 3.1 F refers to the equipment grounding conductor in the conduit, and is saying that the conduit itself cannot be used as the sole means of clearing a fault.

R: An equipment ground is required in each conduit.

29. Q: In reference to 16950, can the megger testing, phase rotation verification and ground checks described be performed by the contractor? This is the most practical as wire can be pulled, tested and terminated as needed.

R: Outside Testing agency shall be used for this project.

30. Q: Also, does 16950 1.3 P-R require the field testing of all newly provide starters and circuit breakers on the new switchboard and all new MCC's in addition to MFG tests?

R: No, MFG tests are acceptable.

31. Q: For the Fire Alarm System, generally, would Edwards be considered an acceptable?

R: We are not familiar with Edwards fire alarm systems. The determination would need to be made based on submittal review under Article 7.04 or 7.05 of the General Conditions during the construction phase.

32. Q: What fiberglass structures are covered under specification 13120 – Fiberglass Structures?

R: The Influent Automatic Sampler (AS-155) requires a heated fiberglass structure as shown on PR-15. The Supplemental Carbon Area, as shown on PR-26, and the Yard Pump Station, as shown on PR-34, also have fiberglass enclosures.

33. Q: Is there a list of additional job classifications needed for this project?

R: A list of job classifications for the Heavy and Building wage determinations which will likely need to be requested include but are not limited to the following:

Heavy

Crane Operator (operator)
Concrete Finisher (skilled)
Carpenter (skilled)
Grader Operator (operator)
Paver Operator (operator)
Roller Operator (operator)
Ironworker (skilled)
Pipefitter (skilled)
Painter (skilled)
Driller (operator)
Blaster (skilled)
Millwright (skilled)

Building

Crane Operator (operator)
Driller (operator)
Blaster (skilled)
Millwright (skilled)
Mason (skilled)
Insulator(skilled)

SECTION 00310

BID FORM

PROJECT IDENTIFICATION: Contract No. 1 - Wastewater Treatment Facility Upgrades

THIS BID IS SUBMITTED TO: Town of Exeter
10 Front Street
Exeter, New Hampshire 03833

ARTICLE 1 – BID RECIPIENT

- 1.01 This Bid is submitted to the Owner, as identified above.
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	<u>Addendum, Date</u>
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

BID SCHEDULE

Item No.	Quantity	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
1	Lump Sum	Wastewater Treatment Facility Upgrade – Complete, except as noted below. The Sum of \$ _____ _____	\$ _____	\$ _____
Per Lump Sum				
2	n/a	Not used	XXX	XXX
3	500 CY*	Additional Compacted Granular Fill (Min. \$5.00/C.Y. - Max. \$25.00/ C.Y.) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Cubic Yard				
4	500 CY*	Additional Compacted Screened Stone (Min. \$5.00/C.Y. - Max. \$25.00/ C.Y.) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Cubic Yard				
5	n/a	Not Used	XXX	XXX

Item No.	Quantity	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
6	1,000 CY*	Additional Earthwork Excavation and Disposal (Min. \$3.00/C.Y. Max. \$15.00/C.Y.) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Cubic Yard				
7A	900 CY*	Ledge Excavation and Disposal - Building (Min. \$40/C.Y. Max. \$120/C.Y.) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Cubic Yard				
7B	8,000 CY*	Ledge Excavation and Disposal - Heavy (Min. \$40/C.Y. Max. \$120/C.Y.) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Cubic Yard				
8	500 SF*	Additional "Normal Duty" Pavement including Aggregate Base and Subbase (Min. \$5/SF Max. \$10/SF) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Square Foot				
9	500 LF*	Crack Repairs to Existing Concrete Tanks and Structures (Min. \$25/LF, Max. \$75/LF) The Sum of \$ _____ _____	\$ _____	\$ _____
Per Linear Foot				

Item No.	Quantity	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
10	23,710 WT*	Sludge Excavation from Sludge Storage Lagoon and Disposal Off-Site The Sum of \$ _____ _____	\$ _____	\$ _____
Per Wet Ton				
11	1,030 DT*	Sludge Pumping from Lagoons 2 and 3 in to Lagoon 1 The Sum of \$ _____ _____	\$ _____	\$ _____
Per Dry Ton				
12	Allowance	Utility Allowance (Electric and Gas Services) The Sum of \$ <u>Fifty-five thousand</u> _____	<u>\$55,000</u>	<u>\$55,000</u>
Cash Allowance				
13	Allowance	Wedeco Ultraviolet Disinfection Equipment and Manufacturer's Services The Sum of \$ _____ <u>Three hundred fifty-five thousand</u>	<u>\$355,000.00</u>	<u>\$355,000.00</u>
Cash Allowance				
14	n/a	Not Used	XXX	XXX

* Indeterminate quantities assumed for comparison of bids. Quantities are not guaranteed. Payment will be based on actual quantities constructed.

SUBTOTAL (BASE BID): Total of Items 1 through 14 above.

_____ \$ _____
 _____ (use figures)
 _____ (use words)

BID ALTERNATES

Item No.	Estimated Quantity	Brief Description of Item with Unit Bid Price in Words	Amount In Figures
15	Lump Sum	Bid Alternate A – ADD Septage Building, Forcemain and Appurtenances TOTAL BID ALTERNATE A _____	_____ \$ _____
Per Lump Sum			
16	Lump Sum	Bid Alternate B – ADD Snow Dump Area TOTAL BID ALTERNATE B _____	_____ \$ _____
Per Lump Sum			
17	Lump Sum	Bid Alternate C – ADD Cost for Gorman-Rupp Self-Priming Pumps, No Equal. TOTAL BID ALTERNATE C _____	_____ \$ _____
Per Lump Sum			

SUBTOTAL (BID ALTERNATES): Total of Items 15 through 17 above.

_____ (\$ _____)
 (use figures)

 (use words)

TOTAL BID (BASE BID PLUS BID ALTERNATES) Total of Items 1 through 17 above.

_____ \$ _____
 (use figures)

 (use words)

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages and special damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security;
 - B. Federal Provisions Forms:
 - 1. EPA Form 6100-3 (per DBE Sub-Contractor)
 - 2. EPA Form 6100-4
 - 3. D-7.11 (Bidder's American Iron and Steel Acknowledgment)

ARTICLE 8 – DEFINED TERMS

- 8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

By:

[Signature] _____

[Printed name] _____

(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:

[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

Bidder's License No.: _____

(where applicable)

SECTION 01310CONSTRUCTION SCHEDULESPART 1 - GENERAL1.1 DESCRIPTION

- A. Work Included: Prepare, monitor, update and distribute construction progress and construction schedules, as specified herein, for the duration of the Project.
1. Initial Project Schedule
 2. Construction Baseline Schedule
 3. Construction Progress Updates
- B. Definitions:
1. Activity – A discrete part of the Work that can be planned, scheduled and monitored and completed
 2. Duration – The amount of time necessary to complete an activity or series of activities.
 3. Critical Path – The longest chain of interdependent activities through the Project Work schedule which establishes the minimum overall duration and which has no float.
 4. Float - Total float is the period of time for each non-critical path activity, and succeeding activities, where the activity can be delayed before becoming part of the critical path. The float time in the schedule belongs to the project and is not for the exclusive use or benefit of the Owner or Contractor.
- C. Initial Project Schedule:
1. Overview bar chart plan. The overview bar chart shall indicate the major components of the project work and the sequence relations between major components and subdivisions of major components and shall include the following:
 - a. Identification of subdivisions of major components into activities such as excavation, foundation subgrade preparation, foundation concrete, structural concrete, major mechanical work, major electrical work, heating and ventilation work, etc.
 - b. Planned durations and start dates for each subdivision work item.
 - c. Each component shall be plotted on time scale sheets.
 2. The Initial Project Schedule shall place particular emphasis on the activities required in the first 90 days, including mobilization, permits, submittals and initial site work.
- D. Baseline Project Schedule:
1. Narrative Report: A description of the construction methods and overall approach to be employed on the Project.
 2. Construction Schedule:
 - a. The construction schedule shall be developed in Gantt-chart format using critical path method analysis. The schedule shall describe the activities to be accomplished, their logical relationships and show the critical path.
 - b. Identify work of separate phases and logically grouped activities.

- c. Provide a separate horizontal schedule line for each trade or operation and show concurrent and preceding activities.
 - d. Present in chronological order the beginning of each trade or operation showing duration and float time.
 - e. All construction activities and procurement shall be indicated in a time-scaled format and a calendar time-line shall be shown along the entire sheet length. Each activity arrow shall be plotted so that the start and finish dates are accurately represented on the calendar.
 - f. All activities shall be shown using symbols that clearly distinguish between critical path activities, non-critical path activities and float for each non-critical activity.
 - g. All activities shall indicate activity number, work duration, early start, late start, total float, responsible party (e.g., Contractor, Subcontractor, Owner, Engineer, Application Engineering Services Supplier, etc.) and dollar value based on the schedule of values.
 - h. Identify key milestones and activities, including:
 - i. Notice to Proceed
 - ii. Interim Milestone contract dates
 - iii. Substantial and Final Completion contract dates
 - iv. Procurement
 - v. Submittals, including review time
 - vi. Fabrication
 - vii. Delivery
 - viii. Installation
 - ix. Curing time
 - x. Special Inspections
 - xi. Start-up
 - xii. Testing
 - xiii. Punchlist
 - xiv. Record drawings
 - xv. Project cleanup
 - xvi. Project closeout
 - xvii. Date Schedule Prepared
 - i. Provide separate sub-schedules, if requested by the Owner or Engineer.
- E. Construction Progress Updates:
1. Narrative Report:
 - a. The status of major project components and materials procurement/deliveries, including percent complete, amount of time ahead or behind schedule.
 - b. Explanations for any schedule changes, including changes to the logic or to activity duration.
 - c. Explanations for lack of work on critical path activities intended to be performed during the previous month.
 - d. Identification of delays encountered during the reporting period.
 - e. Identification of inclement weather delays and impacts.
 - f. Any other items specifically requested by the Engineer or Owner.

2. Construction Schedule:
 - a. Show all changes occurring since previous submission, including changes in scope, modified activities, revised projections
 - b. Indicate progress of each activity, show completion dates or percentage completion.
 - c. Provide separate sub-schedules, if requested by the Owner or Engineer.
3. Look-Ahead Report
 - a. Focused 6 week look-ahead schedule in Gantt-chart format identifying key activities extracted from the full construction schedule.
4. Schedule Recovery Measures:
 - a. Identification of affirmative measures that Contractor will make to working hours, working days, crew size(s), equipment available, and/or construction sequences in order to realign the project with the Construction Baseline Schedule.

1.2 QUALIFICATIONS

- A. The individual preparing the schedules and reports shall be experienced with developing critical path method schedules using Microsoft Project, Primavera or equivalent software tools. Qualifications statement shall include a description of the construction projects on which the individual has successfully applied computerized critical path method schedule on at least two projects of a similar nature, scope, and value as the current project.

1.3 SUBMITTALS

- A. Submit qualifications statement identifying the individual who shall fulfill the obligations of this specification. Contractor shall identify whether this work is being carried out by an independent consultant or in-house staff.
- B. Submit Initial Project Schedule within 10 days of Notice to Proceed.
- C. Submit Baseline Project Schedule within 60 days of Notice to Proceed (Interim Milestone No. 1).
- D. Submit Construction Progress Updates on a monthly basis for the duration of the project. Construction Progress Updates shall be submitted with each Application for Progress Payment.
- E. Submit 6 paper copies of the Initial Project Schedule, Baseline Project Schedule and all Construction Schedule Updates.

1.4 COORDINATION

- A. Contractor shall coordinate construction activities and durations with subcontractors and other parties to the Contract to obtain commitments on work durations and to coordinate proper work flow and construction sequence.

END OF SECTION

- E. Refer to individual equipment specification sections for further requirements.
- F. The manufacturer representative shall fill out the Equipment Training Certification form included within this Section. Training will not be considered complete until this form has been provided to the Engineer.

3.4 TREATMENT PLANT START-UP AND INITIAL OPERATION

- A. Tagging System
 - 1. A tagging system shall be used to allow for visual identification of the status of equipment testing.
 - 2. Tags shall be furnished by the Contractor and shall have spaces for the Contractor and Engineer to initial/ sign. Tags shall be colored as follows:
 - a. Yellow Tag - Preliminary check completed, as defined herein.
 - b. Red Tag - Final Acceptance Tests completed, as defined herein.
 - 3. Tags will be signed and dated by the Engineer upon acceptance, and shall remain attached to the item until ordered removed by the Engineer.
- B. Treatment Plant Start-Up and Initial Operation shall consist of multiple phases conducted in the following order:
 - 1. Equipment Start-Up - As specified in Paragraph 3.1 of this Section. Demonstrate that:
 - a. Equipment is installed as specified and as shown on the Drawings.
 - b. Equipment is prepared for operation in accordance with the Contract Documents and with Manufacturer's written instructions.
 - c. Provide executed copy of Equipment Start-up Certification Form to the Engineer and RPR.
 - d. Affix "Yellow Tag" to equipment
 - 2. Certified Equipment Testing - As specified in Paragraph 3.2 of this Section. Demonstrate that:
 - a. All requirements of the Contract Documents have been met, including all manual, automatic and safety control features.
 - b. Demonstrate all system components work together during continuous operation as well as start-up and shut-down conditions.
 - c. Provide executed copy of Equipment/System Testing Form to the Engineer and RPR.
 - d. Affix "Red Tag" to equipment.
 - e. All equipment must have a Red Tag prior to proceeding with Treatment Plant Start-up.
 - 3. Pre-Testing
 - a. Pre-testing shall consist of testing independent unit processes and/or control panels that do not require flowing water to complete test. Specific examples consist of:
 - i. Supplemental Carbon chemical storage and feed system
 - ii. Magnesium Hydroxide slurry chemical storage and feed system
 - iii. Sodium Hypochlorite chemical storage and feed system
 - iv. Aeration Tank Blowers
 - v. Compressed Air Mixing System compressors
 - vi. All control panels (CBCP, HBCP, DBCP, RCP1/2/3, etc.)
 - vii. Variable frequency drives

- viii. SCADA workstations
 - 4. Clear Water Testing - As specified below.
 - 5. Activated Sludge Process Seeding - As specified below.
 - 6. Treatment Plant Start-Up and Initial Operation:
 - a. Treatment Plant Startup shall consist of continuous, 24-hour assistance by the Contractor, during which period the Owner's operating personnel will work directly with the Contractor to operate the plant.
 - b. The Owner shall be responsible for the operation of the plant, including the positioning of valves, gates, switches, proper operation of equipment devices, controls and associated components.
 - c. The Owner shall perform normal and routine operation and maintenance functions of the plant, such as start-up and shut-down of the plant, disposal of residuals, ordering of chemicals, etc.
 - d. Non-routine operations or abnormal maintenance items, such as cleaning a clogged pump, etc., shall be performed by the Contractor. When necessary, adjustments of equipment shall be made during the Start-Up and Initial Operation period.
 - e. Qualified Manufacturer's Representative shall perform equipment adjustments, when adjustments are necessary.
 - f. Substantial Completion shall not be granted until the treatment plant is meeting specified performance criteria and meeting the current permit limits for a period of 2 weeks.
- C. Clear Water Testing
- 1. Prior to the start of Treatment Plant Startup, Contractor shall conduct Clear Water Testing with the AESS and in the presence of the Engineer.
 - 2. Clear Water Test shall demonstrate the ability of the treatment facility, or components of various unit processes thereof, to convey water at the design flows as required below. At a minimum, the Clear Water Test shall demonstrate:
 - a. The ability of the pumping systems to meet design flows under simulated normal operation.
 - b. The ability of weirs or other flow control devices to maintain the hydraulic profile at the plant.
 - c. The conveyance capacity of interconnecting piping systems.
 - d. Other criteria related to system operation and performance as specified and as determined by the Engineer.
 - e. During this time, Certified Equipment Testing shall be completed for all equipment that cannot be completed in the Pre-Testing phase.
 - 3. The following unit processes shall be tested to verify hydraulic conveyance:
 - a. Headworks
 - b. Splitter Structure #2
 - c. Aeration Tanks and Internal Recycle Pumps
 - d. Splitter Structure #3
 - e. Secondary Clarifiers and Return Sludge pumping equipment
 - f. UV Disinfection system
 - g. Effluent Parshall Flume

- h. All manholes and site piping
4. Procedure:
- a. Contractor shall provide a sufficient volume of water as required for Clear Water Test. Water shall be WWTF plant effluent made available to the Contractor (and pumped by the Contractor).
 - b. Contractor shall produce flows at the rates and locations sufficient to adequately conduct the system Clear Water Testing, and as required by the Engineer. Contractor shall provide pumping equipment and meters as required.
 - i. Temporary pumping shall be from the effluent Parshall Flume Structure to the Headworks Building influent box. Temporary pumping system shall allow for testing of various flow rates for the new WWTF equipment and controls.
 - c. Pumping Systems: Minimum requirement shall be to verify pumping rates, pressure and satisfactory operation of pumps.
 - d. Hydraulic Control Devices: Contractor shall be responsible for measuring weirs elevations, and control structure crest or inverts, to determine head and flow rates. Elevations of all weirs and inverts shall be verified to the nearest 0.005 feet by a licensed surveyor. Contractor to make all adjustments required.
 - e. Contractor shall be responsible for storage and disposal of test water at the conclusion of the test, or each stage of the test. Disposal shall be in accordance with all applicable local, State and Federal regulations. Contractor shall be responsible for contacting such agencies and for obtaining written authorization for test water disposal.
- D. Aeration Tank Seeding
- 1. Prior to the start of Treatment Plant Start-up, the Owner shall make arrangements with a nearby local wastewater treatment plant to obtain activated sludge for seeding the aeration tanks.
 - 2. The treatment process of the seed source shall be comparable to the intended process for the seeded plant. Types of comparable process considerations shall include but not be limited to requirements for biological nutrient removal (nitrogen or phosphorus) and other factors deemed appropriate by the Engineer.
 - 3. Seed volume required shall be minimum 5% (and up to 10%) of the new aeration tank volume. Seed shall be taken from the activated sludge or waste sludge stream at the "source plant".
 - 4. Owner shall be responsible for making all arrangements for contacting the source plant, obtaining and transporting seed to the plant.
 - 5. Owner, Contractor and Engineer shall coordinate with the plant operator for process monitoring during the seeding procedure.
 - 6. During the seeding process:
 - a. Contractor shall pump sewage from the southwest corner of Lagoon 1 to the Headworks Building influent box at 1,000-gpm in order to provide a "food source" for the activated sludge OR Contractor can complete the Main Pump Station forcemain connections to the Headworks Building

EQUIPMENT STARTUP, CERTIFICATION AND OPERATOR TRAINING

- b. Contractor shall pump new WWTF effluent from SMH-6 to the southeast corner of Lagoon 1 at 1,000-gpm.
- E. The following time frames shall be anticipated from prior to the substantial complete date for Interim Milestone 3:
1. Pre-Testing – 2 weeks, minimum
 2. Clear Water Testing – 4 weeks, minimum
 3. Activated Sludge Process Seeding – 2 weeks, minimum
 4. Treatment Plant Startup and Initial Operation - 2 weeks, minimum
 5. Total Time – 10 weeks, minimum
- F. On-Site/ On-Call Time Requirements for Testing Period for Interim Milestone 3:
1. General Contractor shall assign a superintendent or foreman to the plant during the full testing period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
 - a. On-Site: First 8 weeks of testing
 - b. On-Call: Remainder of Start-up and Initial Operation period
 2. Electrical Subcontractor shall assign one master electrician to the plant during the full testing period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
 - a. On-Site: First 8 weeks of testing
 - b. On-Call: Remainder of Start-up and Initial Operation period.
 3. System Integrator/ Instrumentation Subcontractor shall assign one instrument and control panel technician who is familiar with all field devices for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
 - a. On-Site: First 6 weeks of testing
 - b. On-Call: Remainder of Start-up and Initial Operation period.
 4. All on-call individuals shall be capable of arriving at the plant within 4 hours of notification.
 5. Monitoring plant performance during this period shall be performed by Owner's personnel.

SECTION 13440

INSTRUMENTATION AND PROCESS CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. General Requirements and Definitions:

1. A single System Integrator shall furnish all services and equipment as shown on the Instrumentation Drawings, specified herein and in the following Specification sections:

<u>Section</u>	<u>Title</u>
13442	Programmable Logic Controllers
13444	Control Panels
13445	Communications Network
13455	Radio System Network
13460	Fiber Optic Cabling

2. The System Integrator shall provide all labor, materials, equipment, operations, methods and procedures as indicated in the Contract Documents.
3. All systems shall be adjusted, tested, inspected and turned over to the Owner in perfect working order.
4. The words "provide", "supply", "supply and install", "install", "furnish" or "furnish and install" shall mean a complete and properly functioning installation performed by the System Integrator unless otherwise noted. The System Integrator shall design and coordinate the Instrumentation & Process Control system for proper operation with related equipment and materials furnished by others under other sections of these Specifications and with related existing equipment.
5. Refer to Civil, Instrumentation, and Electrical Drawings to coordinate material and equipment locations. Refer to the Process Drawings for locations and connection to primary instrumentation, control valves and process equipment. Refer to the Electrical Drawings for the location of transmitters, control stations, motor drives and centers, variable speed drives, control panels, network, and computer equipment.

B. Work Included:

1. All PLC, HMI, and SCADA programming as described in Section 13441 shall be provided under a separate contract by the Application Engineering Services Supplier (AESS). In addition to programming, responsibilities of the AESS shall include:
 - a. Division 13 Submittal and Shop drawing review
 - b. Providing SCADA software licenses, Computers, Tablets, and accessories as specified in Section 13443.

- c. Take part in site acceptance testing, commissioning and startup of process control systems.
 - d. Process Control System Training.
 - e. Removing all unnecessary PLC and SCADA programming for any modified or abandoned equipment.
 - f. Provide all IP addresses for each device connected to the process control network.
 - g. Configure CBCP as a Master Terminal Unit to communicate with the remote Pump Stations. Re-establish communications for all monitoring, process control and alarms as required for use at SCADA.
2. Overlapping responsibilities are required by Division 11, the System Integrator, and the AESS: Contractor shall provide coordination between all parties.
 3. System Integrator shall test and verify all hardware connections , I/O and communications, all software connections, PLC to PLC, HMI to PLC, SCADA to PLC, and all networking equipment. The System Integrator shall provide basic programming as necessary. It shall be the responsibility of the System Integrator to test and verify that all new equipment and related existing equipment is working properly prior to the AESS's scheduled start date.
 4. System Integrator shall take part in Site Acceptance Testing (SAT) as defined in this section and in Section 13444.
 5. Control Panels and network equipment:
 - a. The System Integrator shall furnish the Division 13 control panels as specified in Section 13444 and as indicated on the Instrumentation and Electrical Drawings.
 - b. Each Building Control Panel shall include an Industrial Panel PC (HMI) to be integrated with the existing SCADA System.
 - c. The System Integrator shall furnish, install, configure and optimize all network and data communication equipment as specified in Section 13445 and as indicated on the Instrumentation and Electrical Drawings.
 - d. The System Integrator shall furnish and test all fiber optic cabling, patch panels, boosters, etc as specified in Section 13460.
 - e. The Contractor shall be responsible for coordination; including meetings, communications, schedule development, and necessary integration
 - f. All control and communication panels shall be constructed in conformance with UL 508A and bear the UL 508A seal confirming the construction. UL inspection and seal application can be accomplished at the panel fabrication facility or by field inspection by UL inspectors. Obtaining the UL seal and any inspections shall be provided at no additional cost to the Owner.
 - g. Coordinate with the manufacturers of supplied equipment for specific instrumentation and control requirements. Any deviation in instrumentation or electrical required for supplied equipment will be provided at no additional cost to the Owner.
 6. Pre Instrumentation Meeting:

- a. A Pre Instrumentation Meeting will be scheduled by the Contractor and include the Contractor, Engineer, Owner, System Integrator and the AESS prior to the submission of the Division 13 shop drawings.
7. Field Instruments:
 - a. Furnish and install the instrumentation as shown on the Drawings and listed in the Instrumentation Schedule at the end of this Section. The locations of the instruments are shown on the Process and Electrical Drawings.
8. Miscellaneous:
 - a. Furnish and install all transducers, media converters, protocol converters, terminals, transformers, interposing or pilot relays (for both new and existing equipment), signal transmitters, signal splitters/boosters, intrinsic safety barriers, power supplies, power supply connections and other miscellaneous instrumentation required to make a complete system.
 - b. Furnish and install all vendor or manufacturer cables and appurtenances between primary instruments and the transmitters, receiving instruments or destination terminals. All methods, materials and supplies will meet the requirements of Division 16.
 - c. Furnish mounting hardware for each instrument. The System Integrator will provide information on the proper installation for each instrument and shall supervise the installation. Process taps and an isolation valve will be provided under Mechanical in Division 11 and 15. Coordinate the size and type of connection required.
9. Acceptance Testing:
 - a. A Factory Acceptance Test will be performed on each Division 13 control panel prior to being delivered to the site. The Factory Acceptance Test requirements are described in Section 13444 – Control Panels.
 - b. A Site Acceptance Test will be performed on each Division 13 control panel after the installation at each site. The Site Acceptance Test requirements are described in Section 13444 – Control Panels.
10. O&M Documentation:
 - a. System Integrator to provide complete O&M documentation as listed under paragraph 1.4 including final ISA instrument data sheets with updated calibration data, panel diagrams, point to point ISA S5.4 diagrams, O&M Manuals bound into Volumes.
 - b. AESS to provide complete PLC programs, SCADA screen printouts, and operator terminal screen printouts bound into Volumes.
 - c. Include FAT and SAT documentation in O&M
11. Demolition:
 - a. Remove and/or relocate existing equipment as indicated on the Drawings.
 - b. Deliver items not reused to Owner.
12. Coordination:
 - a. Process Instrumentation and Process Control Systems will be provided under Division 11, where specified. The System Integrator and the AESS

- shall coordinate with the instrumentation and control systems provided under these sections.
- b. The System Integrator shall coordinate with the AESS to provide protocols for communication, data network IP addresses and subnet masks between all control panels provided under this project and all existing PLC-based control panels.
 - c. Conduit and wiring (not including integral or vendor furnished cables) will be provided under Division 16 and as shown on the Electrical Drawings. Provide control panel electrical schematics, front/mid/rear panel layouts, and interconnecting wiring diagrams to be used by the electrical subcontractor to properly terminate the wiring at each control panel, transmitter or other instrumentation device provided under this section.
 - d. Provide manufacturer recommended installation and mounting requirements for each instrument to be connected to process equipment, piping or fittings requiring a process connection such as NPT taps, sample piping and process line insertion. The System Integrator will supervise and provide guidance on proper installation of instrumentation equipment. This shall include manufacturer's recommended mounting installation heights and locations for gas detection sensors, clearances for level sensors per manufacturer's blanking distance, etc.
- C. Related Work Specified Elsewhere:
1. Coordination is specified in Division 1.
 2. Manufacturer's control systems for process equipment are specified in each section of Division 11.
 3. Control Valve Actuators are specified in Division 15.
 4. HVAC Control Systems are specified in 15604.
 5. Electrical is Specified in Division 16.
- D. Related Work by Others under this Contract:
1. Local control stations (including E-stops, local hand switches, speed pots, and local indicating lights) and equipment control panels (i.e. MCCs, VFDs), indicated on Electrical Drawings.
- E. Demonstration of Complete Instrumentation and Process Control System:
1. The Owner will assume no liability or responsibility for any portions of the installation under this Contract until they are demonstrated by the Contractor and accepted by the Engineer in writing. Final demonstrations shall be made only after the Engineer is satisfied that the work has been completed in accordance with the intent of the Contract Documents.
 2. Provide the services of authorized manufacturers' representatives to instruct the Owner's representatives in the proper operation of each instrument and control panels installed under this Contract.
 3. Pay all charges or fees, including the cost of any special test equipment, factory engineers, etc., necessary for the proper performance of the specified tests, demonstrations and instructions.

4. Schedule all demonstrations at the convenience of the Engineer and the Owner as described in Section 13444.
- F. Removals, Relocations and Rearrangements:
1. Examine the existing site for the work of all trades, which will influence the cost of the work under Division 13. This work shall include removals, relocations and rearrangements relating to the work of all trades which may interfere with, disturb or complicate the performance of the work under Division 13; and relating to the work involving systems, equipment and related service lines which shall continue to be utilized as part of the finished project.
 2. Provide in the bid a sufficient amount to include all removals, relocations, rearrangements and reconnections herein specified, necessary or required to provide approved operation and coordination of the combined new and existing systems and equipment.

1.2 TESTING AND CALIBRATION:

- A. Procedures Prior to System Start-up:
1. The Contractor shall coordinate the work of the system manufacturer's service personnel as necessary. This shall include the installation, interconnection, testing, and calibration of the instruments, and the scheduling of the manufacturer's service personnel.
 2. Instrument Calibration:
 - a. Calibrate each instrument in the presence of the Owner and Engineer using manufacturer's recommended calibration procedure and standards.
 - b. Provide calibration sheet if factory calibrated (per the scaled range in the instrumentation schedule) by the instrument manufacturer.
 - c. Verify that each instrument is properly installed and that the control system is properly scaled for the output signal. Provide digital averaging/filtering where required for a smooth and responsive signal.
 - d. Each instrument will be provided with an adhesive sticker declaring the date of certified calibration and initialed by the factory authorized field personnel.

1.3 QUALITY ASSURANCE

- A. All materials provided under this Contract shall be equal in quality, appearance and performance to that specified herein and shall be subject to the approval of the Engineer. Verify the availability of all materials proposed to be used in the execution of the work prior to submitting same for the Engineer's approval. The discontinuance of production of any material or product after approval has been granted shall not relieve the Contractor from furnishing an Engineer approved alternate of comparable quality and design without additional cost.
- B. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in manufacture of such products and shall be manufacturer's latest standard design that complies with Specification requirements. Products shall essentially duplicate material and equipment that have been in satisfactory local use at least three years.

- C. The Contractor shall have supplied comparable systems to those specified herein and shall maintain engineering and service departments capable of designing and maintaining these systems. Provide, for a period of 12 months from the date of final acceptance of the work, all necessary supervision, labor, materials, and equipment, in order to correct any defects in any system due to faulty materials, equipment, installation methods, or workmanship and consequent damage resulting from such defects. This work shall be scheduled during normal working hours and at the convenience of the Owner.
- D. System Integrator:
1. The Contractor's attention is directed to the fact that the instrumentation is an integrated system and as such, shall be furnished by one supplier, who shall provide all of the equipment and appurtenances regardless of manufacturer, and be responsible to the Contractor for satisfactory operation of the entire system provided. Substitutions on functions specified will not be acceptable.
 2. The exception shall be where instrumentation and control packages are furnished by respective equipment manufacturers as required in Division 11. All necessary provisions will be made to ensure a proper interface between the main process instrumentation and control packages specified within this section and those provided under Division 11. The Contractor shall provide Division 11 startup reports which demonstrate proper operation of Division 11 equipment and associated Division 11 control systems.
- E. Acceptable System Integrators:
1. LCS Controls Inc., Rochester, VT
 2. Northeast System Controls & Engineering, Inc., Laconia, NH
 3. Electrical Installations Inc., Moultonboro, NH
 4. AEC Engineering, Freeport, ME
 5. Aaron Associates, Waterbury, CT
 6. R.E. Erickson Co. Inc., Walpole, MA
 7. Results Engineering Inc., Saco, ME
 8. NIC Systems Corp., Plantsville, CT
 9. Harbor Controls, North Kingstown, RI
 10. Or equal, having a minimum of 5 years' experience in supplying comparable systems.
- F. The System Integrator may be provided with certain items by others for inclusion within their Control Panels. These items are shown as manufacturer's equipment on the Instrumentation Drawings.

1.4 SUBMITTALS TO THE ENGINEER

- A. Shop Drawings and Samples:
1. Submit Shop Drawings and O&Ms in accordance with General Conditions Section 01340 and as indicated herein.
 2. Shop Drawings shall be thoroughly checked by the Contractor for compliance with the Contract Documents. Verify that all equipment and materials he proposed to be provided will fit into available space and maintain specified

clearances, and that all equipment is compatible with system operation. The submittal of any Shop Drawing implies that the Contractor has reviewed this Shop Drawing and that the above requirements have been met.

3. Shop Drawings shall consist of:
 - a. Project name and location
 - b. Contractor's name
 - c. Index Sheet - Listing the equipment being submitted utilizing equipment designations, or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/type and catalog number.
 - d. Manufacturer's scale or dimensioned drawings along with standard catalog number.
 - e. Equipment ratings, service clearances and configuration.
 - f. Listing of accessories to be furnished
 - g. Panel wiring diagrams showing the location of each mounted component, front panel elevation(s), internal wiring diagram of each component including terminal numbers.
 - h. Bill-of-Material Table showing a complete listing of the components in each control panel. Table shall include separate columns for the following: Item Number, Quantity, Manufacturer, Part number, Description, Designator Tag, Supplier name and phone number.
 - i. ISA S5.4 loop diagrams or equivalent showing point to point wiring for all instrumentation equipment including terminal numbers. Prior to final completion, update the above drawings with wire numbers and color provide by the Electrical Subcontractor.
 4. All material shall be contained in one submission; partial submissions will not be accepted.
 5. Submissions shall be in the form of individual binders, of the quantity indicated in the General Conditions. Each equipment type shall be separated by index tabs with typewritten titles.
- B. Maintain properly documented and witnessed test and checkout reports and submit these to the Engineer. No form of energy shall be applied to any part of the instrumentation system prior to receipt by the Engineer, from the Contractor, of the supplier's certified statement of approval of the installation and containing his authorization to energize the system, except that the supplier's serviceman may do so for the purpose of check-out as described herein.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Coordinate material and equipment delivery with the project schedule. Notify the Engineer immediately, in writing, if material or equipment delivery will adversely affect the project schedule, include documentation from equipment suppliers indicating the revised delivery dates and the reason for the delay.
- B. Coordinate delivery of equipment directly to other vendors where instrumentation supplied under this section has to be installed in panels supplied under other specification sections.

- C. Exercise care during loading, transporting, unloading and handling of materials to prevent damage.
- D. Check for defective or damaged materials, and for incomplete equipment shipments within seven days after equipment delivery to the project site.
- E. Store materials and equipment on the construction site in enclosures or under protective covering in order to assure that materials and equipment are kept undamaged, clean and dry.
- F. Replace or repair, to the satisfaction of the Engineer, all materials and equipment that are defective or that have been damaged during installation, at no additional cost to the Owner.

1.6 O&M REQUIREMENTS:

- A. Upon completion of the work and before request for final payment, deliver to the Engineer six bound sets of full and complete directions pertaining to the operation and maintenance of all equipment and systems installed under this Contract. These directions shall be typewritten on 8-1/2" by 11" sheets neatly bound with index tabs, and shall be accompanied by plans, diagrams, etc., of the work installed, parts lists, etc., necessary for the guidance of the Owner in operating, altering or repairing the installation. In addition to the foregoing, furnish the Engineer with a written statement from the Owner indicating that he is satisfied with the operating instructions given.
- B. Provide the Owner with a list of local service departments of duly authorized distributors of materials and equipment of the type installed, which will stock the manufacturer's standard parts, etc. This may be included on the bill-of-materials.
- C. At the completion of the installation, provide six copies of reproducible Record Drawings on sheets no less than 11" x 17" (8.5" by 11" for ISA S5.4 drawings), indicating the final configuration of all systems as they were installed. Symbols, equipment designations, instrument ISA designations, etc., shall be consistent with the Contract Documents. Provide exact locations of all work which has been concealed in concrete, masonry or underground. The following diagrams shall be included:
 - 1. Control Panel diagrams on 11" by 17" sheet showing the front face and panel mounted equipment with full listing of components including names, descriptions and model numbers for each component. One copy of the panel diagrams will be laminated for insertion into the pocket inside each control panel.
 - 2. Point to Point terminal wiring diagrams for all field instruments, motor starters, equipment drives, valve actuators and other field equipment connected to the control system. All diagrams will meet ISA S5.4 standards requirements for loop diagrams on 8½" by 11" or 11" by 17" sheets, showing one loop per sheet.
 - 3. All drawings will be provided to the Owner as record drawings in either AutoCAD DWG format or Adobe PDF format.

4. Panel wiring diagrams showing the location of each mounted component, front panel elevation(s), internal wiring diagram of each component including terminal numbers on 11" by 17" sheets.
- D. O&M Manual Organization: The operations and maintenance manuals shall be organized in three ring binders with a maximum size of 4". The following is a proposed outline for the O&M Manual(s):

Table of Contents

Section 1 - Reserved for description of system by Owner

Section 2 - Field Instruments (arranged alphabetically by Tag No.)

2.1 ISA instrument calibration data sheets and instrumentation listing

2.2 O&M literature for each type of instrument with labeled dividers

2.3 Instrument configuration data

Section 3 - Panel Equipment (arranged alphabetically by manufacturer)

3.1 Bill-of-Material Table

3.2 O&M and Manufacturer's literature

Section 4 - Miscellaneous devices (arranged alphabetically by manufacturer)

4.1 Bill-of-Material Table

4.2 O&M and Manufacturer's literature

Section 5 - Drawings

5.1 Panel fabrication and assembly drawings

5.2 Panel wiring diagrams

5.3 Interconnection wiring diagrams

5.4 ISA S5.4 loop diagrams (optional)

Section 6 - PLC

6.1 CPU, memory capacity, comm ports

6.2 Rack Layout and module configuration

6.3 I/O List

6.4 PLC communication parameters/ port configuration

Section 7 -Miscellaneous Data

7.1 Data Networking Equipment List

7.2 Data Networking Equipment Configuration, Layout, and Security Access.

7.3 Fiber Optic Cable installation pull-test, and signal test reports.

7.4 Radio telemetry Startup Testing results, license details, signal strength report, path profile, communication parameters, ERP, addresses, polling parameters, etc.

The cover and edge of each volume shall contain the following information:

Project Name

Owner's Name

Instrumentation and Control System

Operations and Maintenance Manual

Sections 13440, 13442, 13444, 13445, 13446, 13455 and 13460

Volume X of Y

Subcontractor Name, Date

- E. Electronic O&M Information:
 - 1. In addition to the electronic version of O&M data, provide whenever possible a hard copy O&M of all equipment manuals. Electronic version shall be in Adobe TM reader (pdf) format. Graphic files should be in GIF or JPEG format.
 - 2. Provide electronic files for all custom-developed manuals in Adobe TM reader (pdf) format.
 - 3. Supply all electronic files on 4.8 GB DVD-R media.
- F. Retrofit Documentation The Contractor and System Integrator shall investigate, diagnose, repair, update and distribute all pertaining documentation of deficiencies which become evident during the warranty period. All such documentation shall be submitted to the Engineer within 30 days of solving the problem.

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[PART 2 RESUMES PER ORIGINAL SPECIFICATION]

SECTION 13442

PROGRAMMABLE LOGIC CONTROLLERS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, install, program and test the programmable logic controllers (PLCs) as shown in the Instrumentation Drawings and described in Specification Sections 13440 and 13442 herein. Industrial Panel PC Human Machine Interfaces (HMIs) and Operator interface terminals (OITs) will be provided to monitor and control operating parameters within the PLCs.
- B. Work Included: Furnish, install, configure, wire, and test the uninterruptable power supply (UPS) and maintenance bypass switch (MBS) as shown in the Instrumentation Drawings and described in Specification Sections 13440 and 13442 herein.
- C. Related Work Specified Elsewhere.
- | Section | Title |
|-------------|---|
| 13440 | Instrumentation and Process Control |
| 13444 | Control Panels |
| 13445 | Communications Network |
| 13455 | Radio System Network |
| 13460 | Fiber Optic Cabling |
| Division 16 | Electrical Requirements |
| | Electrical and Instrumentation Drawings |
- D. Provide a complete software license package, in the name of the Owner, of all programming software, drivers, hardware interface and cables used to configure the following for programming/reprogramming all provided and related equipment:
1. Division 13:
 - a. n/a
 2. Division 11
 - a. Dewatering Control Panel OITs, (OIT-D1 and OIT-D2)

1.2 QUALITY ASSURANCE

- A. The PLCs and OITs form an integral part of the overall control system for the facility and as such all PLCs and OITs shall be the product of one manufacturer. The Contractor shall provide all coordination as necessary to ensure that all PLCs and OITs, whether provided by the System Integrator, individual equipment manufacturers or others, are by the same manufacturer.
- B. The manufacturer or its authorized representative shall provide complete technical support for all of their products.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions of the Construction Contract, Section 01340 (Submittals) and Section 13440.

1.4 DELIVERY, STORAGE AND HANDLING

- A. In accordance with Section 13440.

PART 2 PRODUCTS

2.1 GENERAL

- A. The PLC shall consist of rugged components designed specifically for industrial environments. The PLC shall consist of a power supply and one or more racks containing a central processing unit (CPU) module, I/O modules, PLC memory, and PLC network interface module(s). All components shall be housed in structurally secure enclosures.
- B. The central processing unit CPU shall be modular and fully enclosed within a durable plastic shroud. When mounted on the system base, the modular CPU shall not occupy more than one available slot.
- C. The I/O system shall be modular. Each module shall be fully enclosed within a durable plastic shroud. When mounted on the system base, each I/O module shall not occupy more than one available slot.
- D. All components within the controller family shall be manufactured with a high degree of durability. All switches and other operator controlled devices shall be of the size and durability for their intended use as is normally offered for industrial applications. All signal and/or rack expansion cables furnished by the manufacturer shall be constructed so as to withstand, without damage, all normal use and handling.
- E. In order to minimize spare parts stocking requirements, the controller family shall have a high degree of interchange ability. The system shall incorporate a modular design using plug in assemblies with pin and socket connectors. Wherever possible, all assemblies and sub-assemblies performing similar functions shall be interchangeable. The system design shall accommodate the replacement of assemblies/modules without having to disconnect field wiring. Wherever possible, removable connectors shall be used to connect field wiring to the individual circuit board assemblies. All major assemblies and sub-assemblies, circuit boards, and devices shall be identified using permanent labels or markings each of which indicates the manufacturer's catalog number and a product manufacturing date code.
- F. Refer to the control panel descriptions in Specification Section 13444, article 2.2.

2.2 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

- A. The Programmable Logic Controller (PLC) shall be capable of performing the functions and handling the network communications as described in Division 11 and Division 13.

- B. The following Control Panels provided by Division 11 shall have a PLC:
 - 1. DCP1
 - 2. DCP2
- C. The following Control Panels provided by Division 13 shall have a PLC:
 - 1. CBCP
 - 2. SBCP
 - 3. HBCP
 - 4. DBCP
 - 5. PBCP
 - 6. DSCP
- D. PLC Min. Memory: 1 MB of programmable memory with battery backed-up static RAM.
- E. Max. Scan Time: 1 ms/K
- F. Max. Bit Execution Time: 0.4 microseconds
- G. Power: 110/220 VAC power supply. Each PLC and Remote I/O Module shall be powered by an uninterruptible power supply (UPS)
- H. Required agency approvals:
 - 1. UL Listed (UL 508)
 - 2. CSA Certified (CSA 142)
- I. PLC External Communications: Ethernet/IP and Serial
- J. Provide memory module and battery backup.
- K. PLC and Remote I/O Requirements:
 - 1. Discrete Inputs: 120 VAC and 24 VDC as required, maximum of 16 points per module.
 - 2. Discrete Outputs: 120 VAC Relay outputs. Maximum of 16 points per module.
 - 3. Analog Inputs: 4-20 mA DC, minimum 12-bit resolution. Maximum 8 channels per module. Provide differential Inputs.
 - 4. Analog Outputs: 4-20 mA DC, minimum 12-bit resolution. Maximum 8 channels per module. Provide differential Outputs.
- L. Future Connections: Provide a minimum of the following for future connections:
 - 1. 20% additional discrete inputs per PLC (rounded up) wired to terminal blocks
 - 2. 20% additional discrete outputs per PLC (rounded up) wired to interposing relays and terminal blocks
 - 3. 10% with a minimum of four (4) additional analog inputs per PLC wired to terminal blocks
 - 4. 10% with a minimum of two (2) additional analog outputs per PLC wired to terminal blocks
 - 5. two (2) module spaces for future input, output, or special modules
- M. Spare Parts: Provide a minimum of the following spare parts for Division 13 panels only:
 - 1. one (1) PLC Processor
 - 2. one (1) PLC Power Supply
 - 3. one (1) Analog Input Module
 - 4. one (1) Analog Output Module

5. one (1) Digital Input Module
 6. one (1) Digital Output Module
 7. one (1) Specialty Communication Module (Remote I/O – Ethernet)
 8. one (1) Specialty Communications Module (Modbus)
- N. Acceptable Specialty Communications Module (Remote I/O - Ethernet):
1. Allen Bradley Ethernet/IP Adaptor 1769-AENTR
 2. Or equal
- O. Acceptable Specialty Communications Module (Modbus):
1. Prosoft Series MVI69
 2. Or equal
- P. Acceptable Programmable Logic Controller (PLC):
1. Allen Bradley CompactLogix Series L3x
 2. No equal

2.3 MICRO PROGRAMMABLE LOGIC CONTROLLER (mPLC)

- A. The Programmable Logic Controller (PLC) shall be capable of performing the functions and handling the network communications as described in Division 11 and Division 13.
- B. The following Control Panels provided by Division 11 shall have a mPLC:
1. Polymer Panel No. 1
 2. Polymer Panel No. 2
- C. The following Control Panels provided by Division 13 shall have a mPLC:
1. N/A
- D. Min. Memory: 12 Kilobytes of programmable memory with battery backed-up static RAM and memory module.
- E. Max. Scan Time: 1 ms/K
- F. Max. Bit Execution Time: 0.4 microseconds
- G. Power: 110/220 VAC power supply.
- H. Mounting: DIN rail mounted
- I. Required agency approvals:
1. UL Listed (UL 508)
 2. CSA Certified (CSA 142)
- J. External communications: Each PLC shall contain both an RS-232/485 Port and an Ethernet port.
- K. I/O Requirements:
1. Discrete Inputs: 120VAC
 2. Discrete Outputs: 120VAC relay outputs.
 3. Analog Inputs: 4-20mA, minimum 15-bit resolution. Provide differential inputs.
 4. Analog Outputs: 4-20mA, minimum 12-bit resolution. Provide differential outputs.
- L. Future Connections: Provide a minimum of the following spare inputs/outputs for future connections:
1. 10% additional discrete inputs (DI) per PLC.

2. 10% additional discrete outputs (DO) per PLC.
 3. 10% with a minimum of two (2) spare analog inputs (AI) per PLC.
 4. 10% with a minimum of two (2) spare analog outputs (AO) per PLC.
 5. Space in the control panel for two additional I/O modules
 6. All available spare discrete inputs, analog outputs, and analog inputs shall be wired to field terminal strips. All available spare discrete outputs shall be connected to interposing relays with the relay contacts connected to field terminal strips.
- M. Spare Parts: none
- N. Acceptable Programmable Logic Controller (PLC)
1. Allen Bradley MicroLogix 1400.
 2. No equal.

2.4 OPERATOR INTERFACE TERMINALS FOR Micro PLCs

- A. General: Provide an Operator Interface Terminal (OIT) at each control panel with a Micro PLC to continuously indicate status of equipment, change operational parameters and indicate alarm status as described in Division 11 and Division 13. The OIT shall be fully compatible with the PLC provided.
- B. The following Control Panels provided by Division 11 shall have an OIT for Micro PLCs:
1. Polymer Panel No. 1
 2. Polymer Panel No. 2
- C. The following Control Panels provided by Division 13 shall have an OIT for Micro PLCs:
1. N/A
- D. Screen Size: Minimum of 8-inch color active matrix screen with a minimum resolution of 800 by 600 pixels with field replaceable backlight.
- E. Interface: Touchscreen rated at 1 million cycles (minimum).
- F. Memory: 64 MB minimum application and graphic memory. The OIT shall also include a compact flash port. Provide a compatible SD card.
- G. Clock: Provide integral real time clock with battery backup.
- H. Communication: RS-232, Ethernet and USB ports.
- I. Power: 120 VAC or 24 VDC
- J. Operating Temperature: 32-130°F
- K. Enclosure: NEMA 4X
- L. Provide a licensed copy, in the name of the Owner, of all programming software, drivers, hardware interface and cable used to configure the OIT.
- M. Provide programming time required to configure OIT interface
- N. Provide all cables required to connect the OIT to the network or PLC.
- O. The integrated OIT software shall have the following features:
1. Trending
 2. Data Logging
 3. Alarms
 4. Graphic Symbols

- 5. Animation
- P. Acceptable Operator Interface Terminal (OIT):
 - 1. Automation Direct C-More EA9 Series
 - 2. Maple Systems HMI5097DXL
 - 3. Allen Bradley PanelView Plus Compact
 - 4. Or Equal

2.5 OPERATOR INTERFACE TERMINALS for PLCs

- A. General: Provide an Operator Interface Terminal (OIT) at each control panel with a PLC to continuously indicate status of equipment, change operational parameters and indicate alarm status as described in Division 11 and Division 13. The OIT shall be fully compatible with the PLC provided.
- B. The following Control Panels provided by Division 11 shall have an OIT:
 - 1. DCP1
 - 2. DCP2
- C. The following Control Panels provided by Division 13 shall have an OIT:
 - 1. N/A
- D. Screen Size: 10.4-inch color active matrix screen with a minimum resolution of 640 by 480 pixels with field replaceable backlight.
- E. Interface: Touchscreen rated at 1 million cycles (minimum).
- F. Memory: 64 MB minimum application and graphic memory. The OIT shall also include a compact flash port. Provide a compatible SD card.
- G. Clock: Provide integral real time clock with battery backup.
- H. Communication: RS-232, Ethernet and USB ports.
- I. Power: 120 VAC or 24 VDC
- J. Operating Temperature: 32-130°F
- K. Enclosure: NEMA 4X
- L. Provide programming time required to configure OIT interface.
- M. Provide all cables required to connect the OIT to the network or PLC.
- N. The integrated OIT software shall have the following features:
 - 1. Trending
 - 2. Data Logging
 - 3. Alarms
 - 4. Graphic Symbols
 - 5. Animation
- O. Acceptable Operator Interface Terminal (OIT):
 - 1. Allen Bradley PanelView Plus 7
 - 2. No equal

2.6 INDUSTRIAL PANEL PC HUMAN MACHINE INTERFACE (HMI)

- A. General: Provide an Industrial Panel PC with color touchscreen interface at the control panel to continuously indicate status of and control equipment, change operational parameters and indicate alarm status as described in Section 13441. The HMI shall be fully compatible with the SCADA System, SCADA Server, PLCs provided, network communication protocol and with the SCADA software.

- B. The following Control Panels under Division 13 will have an industrial PC:
 - 1. CBCP
 - 2. SBCP
 - 3. HBCP
 - 4. DBCP
 - 5. PBCP
 - 6. DSCP
- C. Screen Size: Minimum 18-inch LCD screen with minimum resolution 1080p with 16:9 aspect ratio. LCD screen size shall be coordinated with control panel size for proper mounting.
- D. Interface: Analog Resistive Color LCD touch screen with backlight.
- E. Ports: minimum two (2) USB version 2.0 or 3.0 ports.
- F. Processor: Minimum 2 GHz dual-core Intel processor.
- G. Memory: Minimum of 4 GB RAM
- H. Hard Drive: Solid State Hard Drive with minimum 60 GB storage.
- I. Communication: Ethernet 100BaseT port (RJ-45).
- J. Power: 120 VAC
- K. Operating Temperature: 32-122°F
- L. Enclosure: NEMA 4X front face
- M. Operating System: 64-bit Windows Operating System compatible with the SCADA Servers.
- N. Provide all cables required to connect the operator terminal to the PLC or network.
- O. Provide a licensed copy, in the name of the Owner, of all required OEM software, drivers, hardware interface, and cables used.
- P. Acceptable HMI manufacturers:
 - 1. Advantech
 - 2. Nematron
 - 3. AxiomTek
 - 4. Phoenix Contact
 - 5. or Equal

2.7 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

- A. Provide a uninterruptible 120-volt backup power supply for each PLC, OIT, Ethernet switch or other device as shown on the Drawings to maintain continuous operation of PLCs, operator interface terminals, Ethernet switches, monitoring instrumentation and control and process circuits during a power outage.
- B. UPS type shall be provided as a continuous-duty, on-line, solid state, double conversion, single-phase 120 VAC input, single-phase 120VAC true sinewave output uninterruptible power system with auto-bypass. The UPS shall be provided with surge arresting capabilities to prevent sudden surges to the attached electrical control systems.
- C. The UPS will be inside the control panel, located in the bottom section of floor stand type control panels or provided an independent wall mounted enclosure. The UPS shall be installed per UL 508 requirements.

- D. Provide appropriate maintenance bypass switch as specified herein to easily remove and bypass the UPS.
- E. The UPS shall have “hot-swappable” batteries and be capable of being replaced with the UPS in operation. The run time operation of the UPS shall be accomplished using batteries mounted within the UPS enclosure and supplemented as necessary with batteries in an enclosure to provide the battery runtime specified herein. The battery enclosure shall match the main UPS enclosure as closely as possible.
- F. The UPS shall be type rated for industrial use and capable of supplying standby power to all connected control panel equipment and circuits for a minimum of fifteen (15) minutes at full load. UPS minimum rating shall be 1000 VA.
- G. Acceptable manufacturers:
 - 1. Schneider Electric APC Smart-UPS
 - 2. Liebert GXT3 Series
 - 3. Eaton Powerware
 - 4. or equal.

2.8 MAINTENANCE BYPASS (MBP)

- A. Each UPS shall be provided with a two-position external maintenance bypass switch and outlet system to permits the UPS to be removed for repair or maintenance without causing power disruption to the connected power loads. The external bypass switch shall be a snap-action type with switching speed 10ms or less independent of operator action. External bypass switch positions shall be labeled UPS and UTILITY. The bypass switch shall be capable of switching the required amps for the UPS system.
- B. For UPS units up to and including 3 KVA, furnish Liebert MicroPOD, Tripp-Lite PDUB20, or equal
 - 1. Substitution of standalone switches, such as Electroswitch series 103 snap action switch (or equal), along with custom plugs, receptacles, and appropriate wiring to achieve the specified functionality is acceptable.
 - 2. For UPS units above 3 KVA, substitute standard manufacturers Maintenance Bypass switch offering or standalone switches as indicated above.

PART 3 EXECUTION

In accordance with Section 13440

END OF SECTION

SECTION 13444

CONTROL PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Includes: Furnish install, and test the control panels as shown in the project documents. Testing shall include Factory Acceptance Test (FAT) and Site Acceptance Test (SAT). Refer to Section 13440-Work Included for Division 13 System Integrator and Application Engineering Services Supplier (AESS) division of responsibilities for FAT and SAT.
- B. Division 13 and Division 11 control panels:
1. These specifications are detailed with separate requirements for each division indicated with division name (Division 13) or (Division 11).
 2. Requirements not directed at a particular division are required for both Division 11 and Division 13 control panels.
 3. The words "System Integrator", if not specified by division, shall include requirements for the Division 13 System Integrator and the OEM System Integrator.
- C. Related Work Specified Elsewhere:
- | Section | Title |
|-------------|---|
| 13440 | Instrumentation and Process Control |
| 13442 | Programmable Logic Controllers |
| 13445 | Communications Network |
| 13455 | Radio System Network |
| 13460 | Fiber Optic Cabling |
| Division 16 | Electrical Requirements |
| | Electrical and Instrumentation Drawings |

1.2 CONTROL SYSTEM TESTING:

- A. Control Panel Testing:
1. Factory Acceptance Test (FAT): A witnessed (Division 13) or non-witnessed (Division 11) Factory Acceptance Test and verification for all deliverable equipment, software, and associated documentation shall be performed prior to shipment of control systems. The factory tests shall be performed to verify that the control systems are manufactured and assembled correctly, are operating as designed, and are in compliance with the contractual requirements for the deliverables. The Factory Acceptance Test shall be performed by the System Integrator and witnessed (Division 13) by the Owner or Owner's representative. The Factory Acceptance Test shall be performed by the Original Equipment Manufacturer (OEM) System Integrator (Division 11) with documentation to be supplied prior to startup.

2. The FAT shall include documented verification and integrated testing of all components. These tests shall include the following.
 - a. Visual Inspections: The following inspection checks shall be performed on all deliverable hardware items, as a minimum:
 - 1) I/O Subsystem physical layout
 - 2) Power supply mounting
 - 3) Power cable routing
 - 4) Data cable routing and mounting
 - 5) Wiring runs properly separated and installed
 - 6) Fans, blowers, and heaters are unobstructed
 - 7) Power supply and power conditioning equipment correctly installed
 - 8) Wire numbering and color coding
 - 9) Device labeling
 - 10) Enclosure integrity
 - 11) Paint work
 - 12) Control panel lighting
 - 13) Panel and enclosure ground connections
 - 14) Provide photos of inside and outside panel
 - b. I/O Point Checkout:
 - 1) The System Integrator shall perform a complete checkout for every I/O point from the field wiring terminal strip to the PLC register. The System Integrator shall test every input and output point including spares for proper operation. Test signals shall be generated to verify the operation of each Analog Input (AI) and Discrete Input (DI) including connected interposing relays, intrinsically safe circuits and relay circuits. Each Analog Output (AO) and Discrete Output (DO) shall be also tested for proper operation including control circuits, isolation relays, signal conditioner/isolators and other required control circuits.
 - 2) The System Integrator shall demonstrate that signals are being received at the PLC for the proper analog-to-digital conversion when reporting from 4 mA to 20 mA.
 - 3) The System Integrator shall develop a point checkout form for each I/O point. The point checkout form shall include the point ID, description, all checks performed for the point, date and time of the check, and a signoff block for the System Integrator. For each item checked, the form shall include both the expected value/result and the actual value/result witnessed.
 - 4) The following items shall be checked for each I/O point:
 - a) For each analog input point, the following values shall be checked:
 - (1) Value at 0% of full scale
 - (2) Value at 25% of full scale

- (3) Value at 50% of full scale
 - (4) Value at 75% of full scale
 - (5) Value at 100% of full scale
 - b) For each analog output point, the following values shall be checked:
 - (1) Milliamp reading at 0% of full scale
 - (2) Milliamp reading at 25% of full scale
 - (3) Milliamp reading at 50% of full scale
 - (4) Milliamp reading at 75% of full scale
 - (5) Milliamp reading at 100% of full scale
 - c) For each discrete input point, the following items shall be checked:
 - (1) For status points, proper indication
 - d) For each discrete output point, the following items shall be checked:
 - (1) Proper operation
3. Post FAT Access: After the FAT for each Division 13 control panel, the AESS will be provided access to the panel and working space at the control panel shop to upload the PLC and SCADA programming and test each of the control functions prior to the panel being shipped to the construction site. The AESS will be provided two (2) days of access for each control panel under this section.
4. 48 Hour Burn In Test:
 - a. A 48-hour continuous run of each control panel shall be performed prior to FAT. The test shall be passed if no function is lost and no hardware failure occurs. Hardware failure is defined for this test as the loss of a major piece of hardware, such as a PLC processor, I/O board, power supply, UPS, other panel equipment, or improper operation by the controller.

1.3 SITE ACCEPTANCE TESTING

- A. Procedures Prior to Site Acceptance Testing and Start-up:
 1. Scheduling: refer to Section 01050
 2. Prior to the Site Acceptance Test (SAT), the system integrator shall:
 - a. Certify that the Division 13 control panels are installed properly, powered and fully operational.
 - b. Verified field wiring terminations.
 - c. Instruments are field or factory calibrated with proper output scaling to the control panel.
 3. The Contractor shall coordinate the work of the system integrators service personnel as necessary. This shall include the installation, interconnection, testing, and calibration of the instruments, and the scheduling of the manufacturer's service personnel.

4. The system integrator shall provide supervisory services of a factory-trained service engineer/technician who is specifically trained on the type of equipment herein specified, shall be provided during construction to assist the Contractor in the methods of installing conduit, mounting, wire termination and the methods of protecting all of the equipment prior to placing it into service.
- B. Onsite Control System Startup:
1. Site Acceptance Test (SAT): A witnessed Site Acceptance Test shall be conducted to verify that each instrument, device and drive system is connected properly to the control panel and that all functions of the control panel are operating as specified. During the SAT, the system integrator will provide test support personnel on an on-call basis. The System Integrator's test support personnel shall be qualified to resolve and correct problems encountered with the instrumentation and control panels.

1.4 QUALITY ASSURANCE

- A. The specifications direct attention to certain required features of the equipment but do not purport to cover all details entering into its design and construction. Nevertheless, the Contractor shall furnish the control panels complete in all details and ready for operation.
- B. The control panels are an essential component of an integrated system with all plant controls and as such shall be supplied by the System Integrator in accordance with Section 13440.

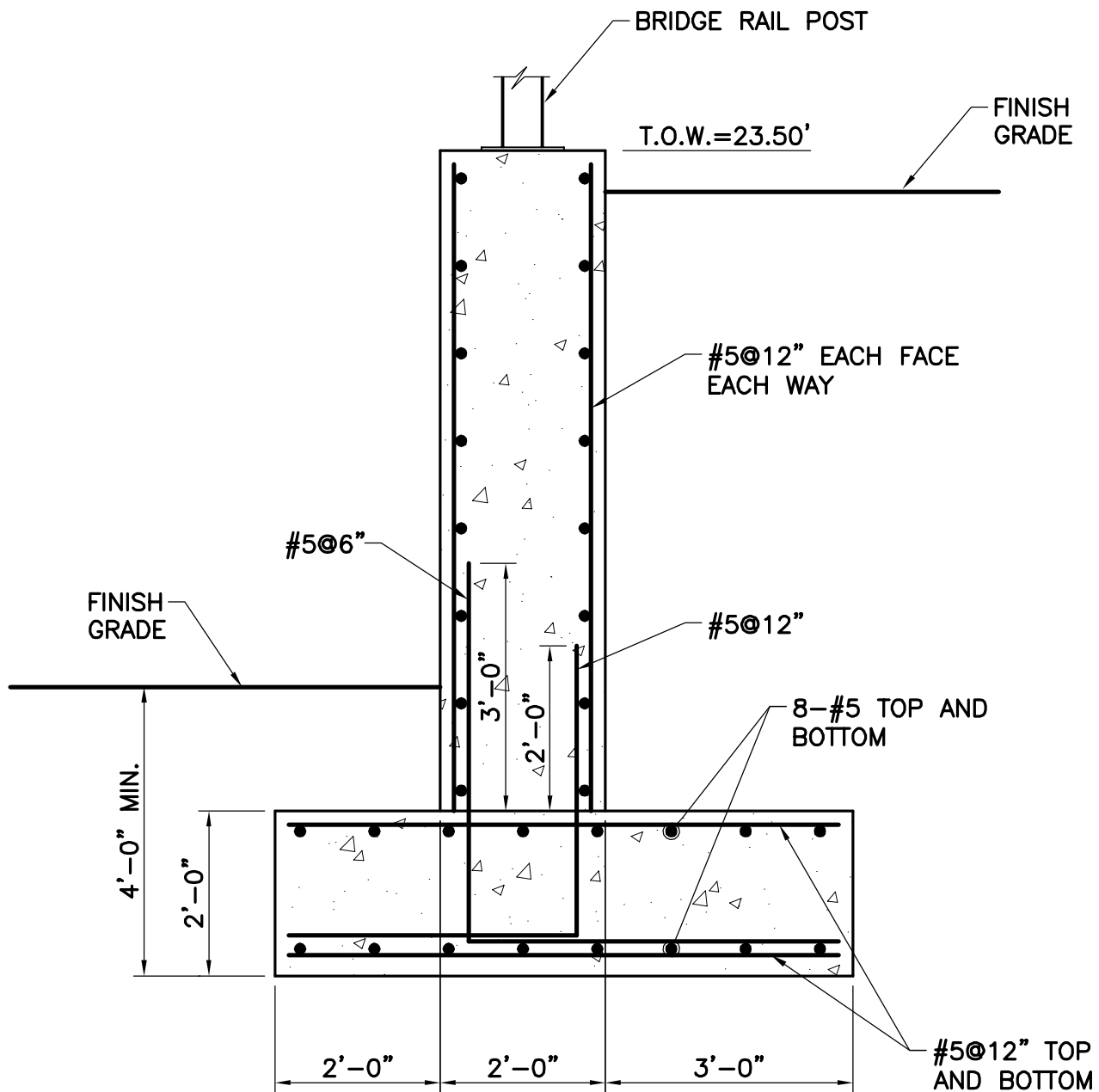
1.5 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions of the Construction Contract, Section 01340, Submittals, and Section 13440.
1. Control Panel Layouts, Wiring Diagrams, Network/Communication Diagrams
 2. Bills of Materials
 3. FAT Report

1.6 DELIVERY, STORAGE AND HANDLING

- A. In accordance with Section 13440.

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[PART 2 RESUMES PER ORIGINAL SPECIFICATION]

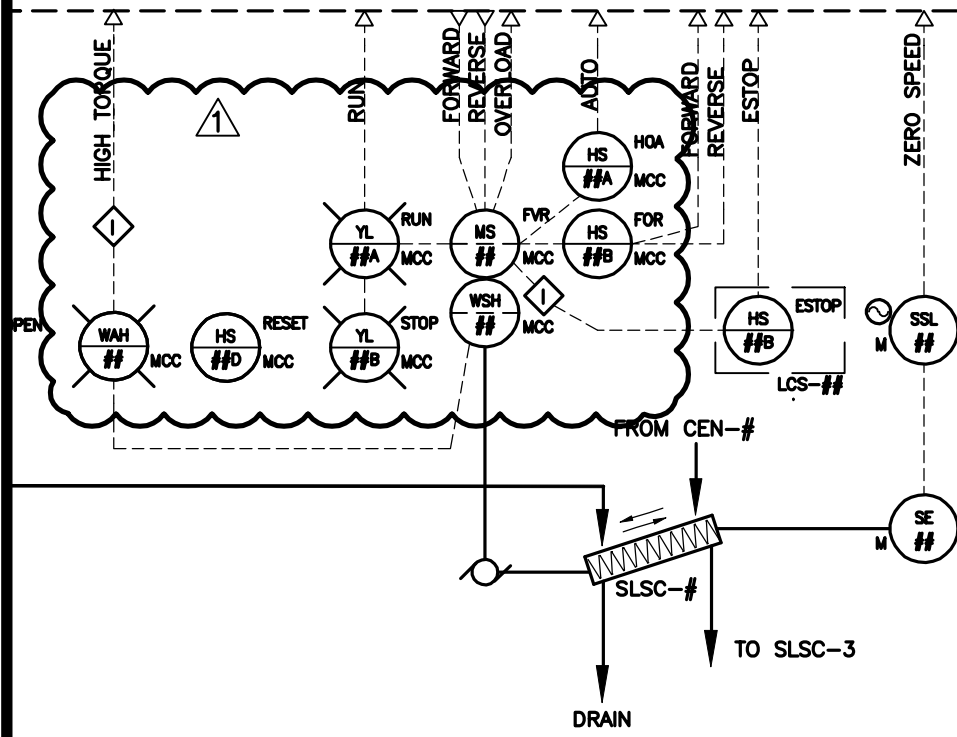


NOTE:
REFER TO STRUCTURAL
DRAWINGS FOR TYPICAL
STRUCTURAL DETAILS.

HEADWALL SECTION

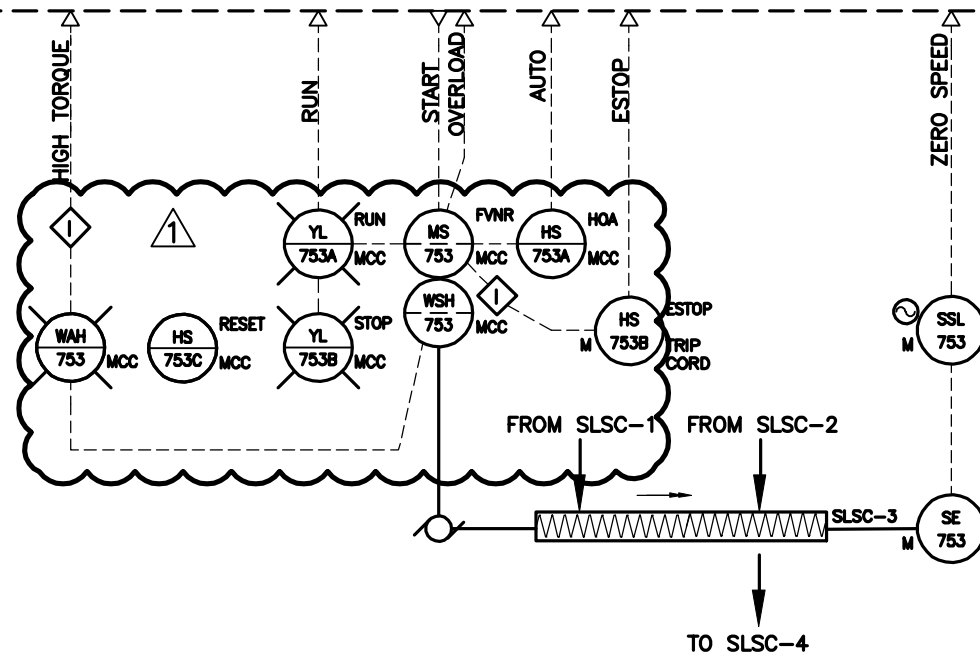
SCALE: 1/2"=1'-0"

EXETER, NEW HAMPSHIRE CONTRACT NO. 1 WASTEWATER TREATMENT FACILITY UPGRADES		NO.	REVISIONS	DRAWN BY	APP'D
		1	DRAINAGE HEADWALL SECTION	RJB	JDP
PROJ NO: 12883		DATE: JAN. 2017	2		
WRIGHT-PIERCE Engineering a Better Environment			3		
ADDENDUM NO. 2 REFERENCE: DWG C-38				FIGURE: C1	

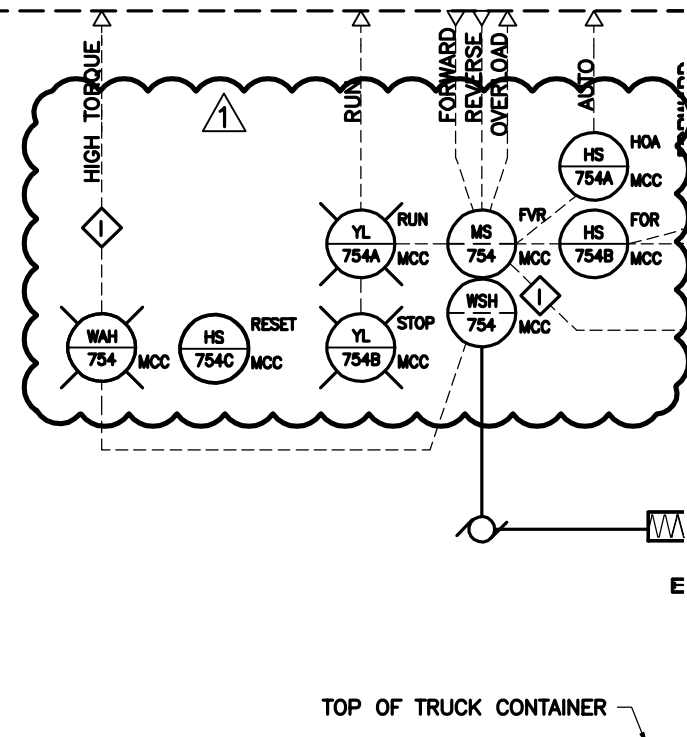


JOCKEY SLUDGE SCREW CONVEYORS
(TYP OF 2)

SLUDGE SCREW CONVEYOR NO. 1 SLSC-1: ## = 751
SLUDGE SCREW CONVEYOR NO. 2 SLSC-2: ## = 752



SLUDGE SCREW CONVEYOR NO. 3
LOOP 753



SLUDGE SCREW CONVEYOR NO. 4
LOOP 754

EXETER, NEW HAMPSHIRE CONTRACT NO. 1 WASTEWATER TREATMENT FACILITY UPGRADES PROJ NO: 12883B-C1 DATE: JANUARY 2017	NO.	REVISIONS	DRAWN BY	APP'D
	1	FRONT PANEL EQUIPMENT MOVED TO MCC	AJM	AJM
	2			
	3			
ADDENDUM NO. 2 REFERENCE: DWG I-9				FIGURE: 11
WRIGHT-PIERCE Engineering a Better Environment				