

City of Rome, NY
Water Resource Recovery Facility Improvements Project
RFB 2024-031



Addendum No. 2

TO: All Bidders of Record

Date Issued: January 3, 2025

This addendum shall be part of the Contract Documents as provided in the Agreement for the above-referenced project. **Acknowledge the receipt of this addendum on Page 00400-5 of the Bid Documents for the project. Failure to do so may subject the bidder to disqualification.**

CLARIFICATIONS

1. See questions and answers below.
2. Please note that positions switches were added to the four (4) new check valves in the Main Pump Station.
 - a. The General Construction Contractor is responsible for purchasing and mounting the switches. The SCADA integrator will add the switches to the existing system under the existing general contract allowance.
 - b. The Electrical Construction Contractor is responsible for providing wire and conduit between each of the check valves and the existing MPS PLC and terminations at both ends. Install 3/4" conduit with six (6) #14 wires and (1) #14 ground from each check valve to the existing MPS PLC. These requirements are not shown on the electrical plans and are added to the contract under this addendum.

QUESTIONS AND ANSWERS

1. What is the existing beam size of the monorail that will be used? Is this a standard W beam type or a patented track type with the hardened flat lower flange. The lower flange width is needed to correctly applicate the trolley unit and drive method.

Response: The existing runway beam is listed as a 4-ton system. Please refer to the reference Main Pump Station Historical Structural Drawing sent with Addendum #1.

2. Is the monorail straight or does it have any curves? If it has a curve(s) what is the minimum radius?

Response: The monorail is straight. Please refer to the Contract drawings and the reference Main Pump Station Historical Structural Drawing sent with Addendum #1 for any other information.

3. What is the total length of the monorail for the festoon power supply to feed this hoist/trolley?

Response: Please refer to plans.

4. Section 412223.19 PART 2 – PRODUCTS 2.1 B. This will be spark resistant per spec. What is the nature of the working environment? Chemical, gas or corrosive or all three?

Response: The working environment is for wastewater pumping. Please refer to Sheet G-3 for area classifications.

5. Section 412223.19 2.2 Controls G. - will the radio have to meet the class – division – group specifications?

Response: The radio should be rated based on the area classification shown on Sheet G-3.

6. The specs states electric chain hoist but there is language throughout this document that refer to wire rope? In 2.3 B has mentions of machined grooves for wire rope and rope diameter. The on 2.3 C #4 it states chain. Lower down in the It states on 1 & 2 storage bucket for chains and chain guides.

Response: There is only a single hoist for the project, and it will have a chain. Section 412223.19 has been updated to disregard language related to wire rope.

7. What specification for the hoist's chain, if this is in fact an electric chain hoist will the chain material need to be supplied with?

Response: Information on the hoist chain can be found in Section 412223.19 part 2.3-C-4.

8. Is the hoist to be two speeds or will it need to be 2-step infinitely variable for the hoist and trolley motions?

Response: Two speed per the specification.

9. There are a few contradictions on the power delivery method. D. Electrification: 1. Provide junction box to connect power feeder from disconnect switch (by Division 26). 2. Tag Line: a. Cable suspended from hoist and fixed support at supply end. b. Conductor sizing/rating: ? Then it changes to = Multi-conductor, UL listed, neoprene jacketed, stranded. cable, comply with CMAA 74 and MH27.1. Note: conductors are not used on a tagline as this would be looped festoon cable that trails the hoist as it travels away from the incoming power supply side. But in the section 1.8 A – 1 letter b. = Spare Parts Section it states extra set of collector shoes which is associated to a buss bar power delivery method.

Response: Power supply will be by festoon cabling. Please see the updated Section 412223.19.

10. Some of the ductile pipe suppliers are getting confused regarding the pipe lining schedule in Section 400519, Table Exhibit A. The table shows cement lining, glass lining, P-401, etc. at various pipe applications. It shows cement lining for “Sanitary Sewer”, and “Force Mains”, and the pipe schedule on G-1 shows cement lining for all ductile pipe. We assume all ductile is to be cement lined – if that is not correct, please issue a clarification in the Addendum.

Response: Yes, all ductile iron is cement lined. The table in exhibit A of Section 400519 is for reference only. Suppliers should be referring to the pipe schedule on Drawing G-1.

11. Can you please clarify what type of conduit is required in each building and for exterior stub ups? Spec 260533.13 3.4 APPENDICES seems to contradict the schedule on drawing G-3. The schedule on G-3 indicates PVC coated steel conduit in most areas, while the table in the spec indicates mostly rigid.

Response: Please follow the schedule on Drawing G-3.

12. Article 1.4.C.1 of Section 434111 references ACI 350R. Article 1.6.K.3.b references ACI 318. ACI 350 is typical of a concrete floor tank with an embedded starter ring. Please confirm that the tank foundation can be designed in accordance with ACI 318 as this tank will have a steel floor.

Response: The foundation should be designed in accordance with ACI 318 as mentioned in Article 1.6.K.3.b of Section 434111.

13. Article 1.6.J.7.c of Section 43411 requires an interior ladder. It is not recommended to attach interior appurtenances (overflow, ladders, etc.) to tank sidewall in cold weather areas. Please confirm no interior ladder is required.

Response: No interior ladder is required per the plans. The language in the specification regarding the interior language can be omitted.

14. Article 1.6.J.7.j of Section 43411 references a retractable exterior ladder that is not accessible from ground level. The tank we built onsite in 2020 has a ladder extension to grade, which allows for connection to the specified fall protection system at ground level. Please confirm a ladder extension to grade is acceptable.

Response: A ladder extension to grade to match the tank installed in 2020 may be submitted as an alternative.

15. Article 1.8.C of Section 434111 requests a 60-month extended warranty for the glass coating. The manufacturer's standard warranty for wastewater/leachate is 36-months from the date of installation. Please confirm that the manufacturer's standard warranty is acceptable.

Response: This specification section requires different minimum periods: 12 months against defects in material and workmanship; 36 months against corrosion of the glass-coated services; 60 months for manufacturer supplied cathodic protection system.

16. Can you please confirm that the electrical contractor is not responsible to furnish any SCADA/ instrumentation/ controls packages?

Response: Per Section 011200 all instrumentation and controls work is to be completed by Aqualogics under Allowance A2 under the General Construction Contract.

17. The EC is just responsible to carry the conduit, wire, and terminations, correct?

Response: The responsibilities for the Electrical Contractor are laid out in Section 011200 part 1.8.

18. Can you confirm which contract is responsible to provide temporary power and lighting?

Response: The electrical Contractor is responsible for temporary power. A temporary power plans for MOPO are required under Section 260800 part 1.6-A-1.

19. Can you confirm if the temporary bypass system can run on the Plant's electric system, where we could connect to this, and if there is a metering cost associated with this?

Response: The temporary bypass system is a delegated design, and the specifics mentioned will be coordinated during the construction period. No investigation into the ability of the plant's current electric system has been made to determine if there is sufficient power to drive electric motor driven pumps or if diesel engine driven pumps are required though the primary MCC in this area will be replaced during the same time period as bypass pumping and unavailable as a power source. No metered cost will be required for the temporary bypass system if it can be run from the Plant's electricity.

20. In spec section 011200-5 under Electric Contract items 3 and 4, it states to basically provide terminations for instruments/instrumentation and control panels etc. Please clarify that all instrumentation equipment is provided by others. Terminations only are by Electrical Contract.

Response: Please see response to question #16 above and refer to Section 011200.

21. You noted in Addendum 1 that the entirety of the painting scope is described in notes 1 + 2 on M-4, which relates only to the Main Pump Station. Do you not want any of the new exposed pipe installed in other areas (Digester #2 Control Building, RAS MH, Filtrate PS and Flow Meter Vault, Waste Transfer station, etc.) to be painted?

Response: Notes 1 and 2 on Drawing M-4 referred to the areas to be painted in the Main Pump Station only. All new exposed piping elsewhere in the project will need to be coated in accordance with Section 099679 as specified in Section 400519. Colors should match Owner's existing piping.

22. You may want to consider modifying Specification 40 80 00 (Commissioning...). The requirements for a Commissioning Coordinator with that level of experience would require most contractors to hire additional staff, adding to the project costs - and this does not seem like a job that should really need that level of coordination for startup, it is relatively straightforward. Also, the timelines for activities like Owner trainings (120 days before startup) does not seem practical for a job of this size and complexity. Trainings would normally be done on the same trip as the startup of the equipment.

Response: Section 408000 has been revised to eliminate the need for a commissioning coordinator and to reduce the notice for trainings down to 14 days.

23. At the pre-bid it was discussed that a modification to the specification language regarding "or equal" products for the submersible solids handling pumps would be issued in an addendum, removing the requirement to submit "or-equals" to the Engineer two weeks before the bid date. Is that still your intention, or does the current specification language remain?

Response: Please refer to the revised section 432513 part 2.2-A-3 from addendum #1. Alternative submissions do not need to be submitted two weeks before the bid date. Any alternates submitted will be reviewed during the shop drawing review stage and must be found to be equal to the specified items.

24. 43 25 13 calls for a 5 day continuous operating period for each pump prior to acceptance - is this required to be one pump at a time, or all similar pumps at once?

Response: This can be done one at a time or alongside other pumps.

25. 43 25 13 calls for the Contractor to supply all water and power for the field testing of the submersible pumps - is this correct? It would seem that using plant flow to test the pumps would be

more practical, and proving power for the pumps would mean they would need to be connected to Plant power after the testing is complete.

Response: Furnished water for testing can include the plant flow that is being bypassed, but the bypass system must still be functional if issues arise while testing the pumps.

26. 43 25 13 states the pumps are to be vibration tested at full design speed. The pump capacity is 6000-7000 gpm (8.6-10 MGD). What is the timing of the Plant's average daily flows, in case we need to have personnel on site at the time of peak flows for testing purposes?

Response: Data will be provided by the City during construction based on the time of year the testing will take place. Maximum flows are typically driven by rain events and cannot be predicted with significant advanced notice though seasonally flows range between 6 and 8 MGD with daily peaks in the morning hours up until noon.

27. In reference to the Filtrate Pump Station section Note 4 shown on Sheet M-6, this note describes the "Contractor to provide Shelf spare pump for Owner. Total Pump quantity required is 2 with only 1 installed.", while the specification section 432513 – Submersible Solids Handling Pumps, states to provide 1 pump. Please clarify the quantity of Pumps supplied for the Filtrate Pump Station.

Response: Section 432513 part 1.8-A-4 indicates that one shelf spare Filtrate Pump Station wet pit submersible pump is to be provided. Ultimately the Contractor will buy two (2) of the filtrate pump station pumps, install one, and provide the other as a shelf spare.

28. Please confirm that HDPE Pipe is installed beneath the Tank to the penetrations and the Contractor is not transitioning to Ductile Iron Pipe.

Response: All intake and discharge piping underneath the tank will be DI. A HDPE to DI transition will be needed prior to going under the tank.

29. Please confirm if MJ Fittings are acceptable, in lieu of the HDPE for the Leachate and Filtrate Pipe.

Response: MJ Fittings in place of HDPE fittings is acceptable as long as they have a fusion bonded epoxy coating to protect against the materials in the pipes and meet the requirements of Section 333113 Part 2.1-A.

30. Please clarify if the Influent Filtrate Piping can be controlled without the Contractor bypassing. If confirmed, please provide the time restrictions to remove and replace the Filtrate Pump and Piping.

Response: The Filtrate pump station receives waters from several critical systems on the site. The Owner can provide a few hour shut down window, but anything longer than this will require bypassing.

31. In reference to specification section 067413 – Fiberglass Reinforced Plastic Components, there is no detail for the Grating required with any load requirements stated. Please provide a detail for the Grating required with the load requirement.

Response: The grating is indicated to be a delegated design submittal. Section 067413 Paragraph 2.1.H.1 has been updated to indicate a uniform live load of 100 lb/sq. ft. or concentrated load of 2000 lb, whichever produces the greater stress.

32. The drawings of the Main PS changed the Check valve size from 18” to 16”, but the Valve Schedule on G-1 still shows them as 18” – we will assume them to be 16”.

Response: Correct, the swing check valves on G-1 should be 16-inches, not 18-inches to match Drawing M-4.

33. The 2 valves in the Valve Schedule on G-1 originally listed on drawings MD-1 and MD-3 no longer show in the Valve Schedule – since they still show on the drawings, we will assume they are still required.

Response: Correct, the valves shown on MD-1 and MD-3 should remain on the schedule. Sheet G-1 has been revised.

34. Section 133424 Para. 1.6.B.1.a calls for 25 flame spread foam insulation. Is 20-30 (nom) 75 (max) acceptable per Johns Manville Flat ENRGY 3 CGF?

Response: No, a maximum flame spread of 25 is allowed per the specification.

35. Section 133424 Para. 2.1.B.1.e calls for wood within wall portions. June 2024 quote included (10) 4’ x 4’ target areas. Is that the correct amount?

Response: Vendor should review the Drawing E-15 to confirm the equipment that will be on or penetrating the walls to determine the number of 4’x4’ wood areas required.

36. Section 133424 Para. 2.1.D calls for 316 stainless steel anchors. Is 304 stainless steel also acceptable?

Response: 316 Stainless steel should be provided as specified.

37. Section 133424 Para. 2.1.F.1 calls for self-extinguishing (Class 1) foam. “Self-extinguishing” does not apply to any rigid polyisocyanurate foams available on the market, and the foam in the June 2024 quote was Johns Manville Flat ENRGY 3 CGF which is not Class 1. Shall the references to self-extinguishing and Class 1 be deleted?

Response: We will waive the self-extinguishing requirement, but the material will need to be class 1.

38. Section 133424 Para. 2.2.A.2.d calls for fiberglass drip cap over doors. Is aluminum drip cap also acceptable?

Response: Yes.

39. Section 133424 Para. 2.2.A.2.f calls for Schlage handle. Is an alternative (e.g. Alegis) handle also acceptable?

Response: Alternative products are allowed per Section 012500.

40. Section 133424 Para. 2.2.A.2.f calls for both panic bar egress and padlock compatibility. These two requirements are mutually exclusive. June 2024 quote included padlock hasp (not panic bar). Which is preferred, panic bar or padlock hasp?

Response: A panic bar is required for egress.

41. Section 133424 Para. 2.2.A.2.h calls for neoprene door sweep. Are plastic brush sweeps also acceptable?

Response: Yes.

42. Section 133424 Para. 2.2.C calls for neoprene base gasket and ConSeal/Bitumen/Butyl sealant in separate sentences. May we assume that both are acceptable?

Response: Yes, both are acceptable.

43. Section 133424 Para. 2.3.A.1.a calls for breaker panel (208Y/120V, 3-phase) that conflicts with Para. 2.3.A.1.b. (120/240V, single-phase). Which is correct? June 2024 quote included 120/240V single-phase. Is there a panel schedule in the drawings? May we assume the NEMA 1 reference in 2.3.A.1.b is accurate regardless?

Response: The Leachate Transfer Pump Control Panel LCP-1010 is 480V, 3PH to power leachate pumps. Leachate Transfer Station Load Center is 208V, 1PH for station building loads. Refer to one-line diagrams and panelboard schedules in drawing package. NEMA ratings on drawing G-3 take precedence.

44. Section 133424 Para. 2.3.A.1.c calls for surge protective device. Please provide preferred manufacturer and part number.

Response: Please refer to Section 2643113 for requirements.

45. Section 133424 Para. 2.3.A.2 mentions conduit. Please identify the type of conduit needed in the waste transfer pump shelter. June 2024 quote included Schedule 40 PVC.

Response: Please refer to conduit listed on the table on Drawing G-3.

46. Section 133424 Para. 2.3.A.5 calls for light close to center of structure. Are wall mounted lights also acceptable?

Response: Lights should be wall mounted since roof is removable.

47. Section 133424 Para. 2.3.A.5 calls for 30-foot candles. 2.3.A.5.a.1) calls for 50 foot-candles. May we assume 50 foot-candles is accurate?

Response: 30 foot-candles is the minimum and 50 foot-candles is the average. If the range conflicts, 50 foot-candles is preferred.

48. Section 133424 Para. 2.3.C.1 calls for Adjusting and Balancing, presumably of fan. 2.3.C.7 calls for test and balance of fan. Fan balancing is best done at the final destination after installation. Shall references to testing and balancing be deleted?

Response: Section 133424 describes the vendor package; testing should be done by the vendor after the unit is at its final destination. Arrangements will need to be coordinated with the Contractor.

49. Section 133424 Para. 2.3.C.2 calls for fan switch and fan thermostat. June 2024 quote had thermostat only (no switch). Shall the reference to fan switch be deleted?

Response: No, please include a fan switch.

50. Section 133424 Para. 2.3.C.3 calls for fiberglass intake shutter. Considering the fan is aluminum, is aluminum also an acceptable material for the intake shutter?

Response: Yes.

51. Section 133424 Para. 2.3.C.3 calls for removable T-316 stainless steel Bird screen. Is fixed (non-removable) aluminum insect screen also acceptable?

Response: Aluminum insect screen would be allowed, but the screen needs to be removable for maintenance.

52. Section 133424 Para. 2.3.C.5 calls for 240V, 4800W powder coated heater. 2.3.C.5.a calls for 120V, 1500W stainless steel heater. June quote included the former. Which of these two heaters are needed?

Response: Provide a 4800 W 240V heater equal in quality to the model called for in Part 2.3-C-5-a.

53. Section 133424 Para. 2.3.C.6 describes the thermostat for the fan with the words “at least 4.5 Kw”. May we assume this 4.5 Kw reference applies to the heater (not the fan’s thermostat)?

Response: Correct, please assume that the thermostat needs to be compatible with the heater which is at least 4.5 Kw.

54. Section 133424 Para. 2.3.C.8 calls for expensive NEMA 4X 316 stainless steel disconnect switches for fan and heater. Shall this requirement be deleted? If not, shall the NEMA rating be changed from NEMA 4X to NEMA 1 and the material be changed from 316 stainless steel to powder coated steel (to match the breaker panel)?

Response: NEMA 4X is required per Drawing G-3.

55. Section 133424 Para. 2.3.C.8 mentions “cooling”. May we assume this word is referring to the fan and NOT to an air conditioner?

Response: Correct, the enclosure will be air cooled by the fan only.

56. Sheet M-5 appears to show two penetrations through the wall of the shelter. Shall two accommodations be included with the shelter to guarantee that neither penetration causes water to seep into the wall’s interior?

Response: Yes.

57. June 2024 quote included a removable roof. Shall a removable roof be added to the shelter’s requirements (note: wall-mounted lights are highly recommended, if so)?

Response: Yes, the roof must be removable. Lights will be wall mounted.

58. Main Pump Station Wet Well – Does the wet well have any existing coating that needs to be removed prior to concrete repairs?

Response: No.

59. Note 2/C-2 calls for the GC to replace existing slab as well as the concrete curb by the new waste transfer station and new curbing at the filtrate pump station access road. Drawing C-1 appears to show in “new construction” lineweight concrete curbs all the way to the far side of sludge thickeners – see below. Can you clarify the extents of new concrete curb vs existing-to-remain?

Response: The curb replacement should be governed by the lines shown on C-2. The line weights on C-1 are not representative of the curb replacement required.

60. C-1 also shows demolition hatching following the line of the new 8” FPS pipeline. Its unclear what’s being called to be demo’d – just the paving and curb? The 4” FPS line? Or is this indicating a paved-and-curbed area that runs from flume to the filtrate pump station?

Response: The demo hatch refers to the pavement and curb in this area. Since the exact location is not clear, restoration to return to existing conditions will be required.

61. Can you please provide the manufacturer and style of the existing panel VFD, MDP, and the existing MCC?

Response: Existing VFD panelboard is GE Type CCB Style 2. MDP is Westinghouse Switchboard circa. 1970s. MCC-10 is Westinghouse Type W, but is being replaced on this project. MCC-4 is Square D Model 6.

CHANGES TO SPECIFICATIONS

Section 067413 – Fiberglass Reinforced Gratings

Article 2.1-H-1: replace article with the following:

- 1. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lb/sq. ft. or a concentrated load of 2000 lbs., whichever produces the greater stress.*

Section 133424 – Fabricated Fiberglass Structure

Article 2.2: Add item D below:

- D. Roof of enclosure will be removable and watertight. No wiring, equipment, or any other fixed objects should be attached to the roof to facilitate future removals.*

Section 400565.23 – Check Valves

Article 2.1: Add in item E below:

- E. Controls*

1. *Position switches: lever type, NEMA 7 enclosure, SPST, 120VAC, 6A, Square D Type 9007CR or approved equal.*
2. *Bracket and hardware: Type 316 stainless steel.*

Section 408000 – Commissioning of Process Systems

Article 1.3-1: Remove article.

Article 1.4: Remove article.

Article 1.6-B-5-a: Remove article.

Article 1.6-B-5-b: Change “120 days” to “14 days”.

Section 412223.19 – Monorail Hoists

Article 1.8-A-b: Remove article.

Article 1.8-A-c: Change “*wire rope*” to “*chain*”.

Article 2.3-B-4: Remove article.

Article 2.3-D-2: Replace article with the following:

2. *Festoon System:*
 - a. *Neoprene-jacketed, multi-conductor flat cables with separate control and power conductors.*
 - b. *Suspend cables from trolleys mounted on heavy-duty C-track parallel to monorail runway.*
 - c. *Construction: Non-sparking.*
 - d. *Cables:*
 - 1) *Manufacturers: Gleason Reel Div. Maysteel Products, Aero-Motive Mfg., Dresser Industries, or equal.*
 - 2) *Description: UL-listed flat cables.*
 - 3) *Minimum Rating: 85 A at 40 degrees C.*
 - 4) *Length: 110 percent of required length.*
 - 5) *Minimum Size: No. 12.*
 - 6) *Type: Stranded.*
 - e. *Festoon supporting trolleys:*
 - 1) *Furnish towing and manufacturer's standard trolleys.*
 - 2) *Tow Cables:*
 - a) *Material: Stainless steel.*
 - b) *Furnish strain-relief cable between first trolley and adjacent wall.*
 - f. *Festoon Runway (C-Track):*
 - 1) *Material: Type 316 stainless steel.*
 - 2) *Furnish polyamide tow rope assembly for trolley spacing.*
 - 3) *End Clamps: Furnish fixed end clamps with outrigger arms to support from monorail runway.*

CHANGES TO DRAWINGS

Drawing G-1:

- On the Valve Schedule change the size for the four (4) Swing Check Valves on Sheet M-4 from 18” to 16”.
- Table updated to add in the valves called for on MD-1 and MD-3 that removed on the reprint for addendum #1.

ATTACHMENTS

1. Updated Specification Section 067413 – Fiberglass Reinforced Gratings
2. Updated Specification Section 133424 – Fabricated Fiberglass Structure
3. Updated Specification Section 400565.23 – Check Valves
4. Updated Specification Section 408000 – Commissioning of Process Systems
5. Updated Specification Section 412223.19 – Monorail Hoists
6. Updated Drawing Sheet G-1: Legend, Abbreviations and Symbols

SECTION 067413 - FIBERGLASS REINFORCED PLASTIC COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes FRP gratings, frames, and supports for gratings guardrails and plates.

1.3 DEFINITIONS

- A. FRP: Refers to fiberglass reinforced plastic or glass fiber reinforced plastics.

1.4 COORDINATION

- A. Coordinate installation of anchorages for gratings, grating frames, guardrails, plates and supports.
- B. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete as specified in Division 03 or masonry as specified in Division 04. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Test Data: Certified data based on tests of actual production samples which demonstrate that products conform to specified stress and deflection requirements.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Samples for Verification: Two sets of samples from plant production that represent construction, workmanship, appearance, and surface finish. Resubmit until accepted.
 - 1. Submit 12-inch by 12-inch samples of grating and plates, illustrating surface finish, color, texture, and jointing details.
 - 2. Submit 12-inch long samples of guardrail and handrail.
 - 3. Submit full size samples of elbow, tee, wall bracket, escutcheon, end stop, rail joint connections.

- E. Delegated-Design Submittal: For FRP components, including manufacturer's published load tables and analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer confirming registration in State where project site exists.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The manufacturers of fiberglass reinforced plastic components shall be experienced in the manufacture of the items specified. Present proof as required demonstrating successful installations of the specified items under conditions similar to those of this project.
- B. Coordinate the work of this Section with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.
- C. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Transport, lift, and handle units with care, avoiding excessive stress and preventing damage; use appropriate equipment.
- B. Store in a clean dry area off the ground and protected from weather, moisture and damage; do not stack unless permitted by manufacturer.
- C. Handle products to prevent damage from abrasion, cracking, chipping, twisting, deformations, and other types of damage.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design FRP components.

- B. Resin for FRP components: Vinyl ester, integrally resistant without applied coatings to: ultra-violet radiation; high concentrations of hydrogen sulfide gas, its solutions and associated compounds; and to the wastewater occurring at the project site.
 - 1. Provide compatible and equally resistant resin as acceptable for shop and field sealing of cut edges.
- C. Colors: Integral colors acceptable to the Engineer selected from standard resin colors.
- D. Pultruded fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.
- E. Minimum physical properties for pultruded structural FRP shapes and plates:
 - 1. Tensile Strength: According to ASTM D 638.
 - a. Coupon: 30,000 psi.
 - b. Full Section in Bending: 19,986 psi at 75 degrees F.
 - 2. Modulus of Elasticity: According to ASTM D 790.
 - a. 32.3×10^6 psi at 75 degrees F.
 - b. 1.8×10^6 psi at 125 degrees F.
 - 3. Barcol Hardness: 50.
 - 4. Water Absorption: 0.75 percent (by weight), according to ASTM D 349.
 - 5. Specific Gravity: 1.66, according to ASTM D 792.
- F. Provide pultruded shapes conforming to the visual quality of ASTM D 4385.
- G. Protect pultruded and molded FRP from ultraviolet (UV) degradation with:
 - 1. Integral UV inhibitors in the resin.
 - 2. A synthetic surfacing veil to produce a resin rich surface.
- H. Structural Performance: Withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lb/sq. ft. or a concentrated load of 2000 lbs., whichever produces the greater stress.
 - 2. Limit live load deflection to $L/360$ or 1/4 inch, whichever is less.
- I. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.5.

2.2 GRATING COMPONENTS

- A. Molded FRP Gratings: Bar gratings made by placing glass-fiber strands that have been saturated with thermosetting plastic resin in molds in alternating directions to form interlocking bars without voids and with a high resin content.
 - 1. Configuration: 1-1/2-inch- square mesh, 1-1/2 inches thick or 2-inch- square mesh, 2 inches thick.
 - 2. Resin: Polyester.
 - 3. Color: Manufacturer's standard.
 - 4. Traffic Surface: Applied abrasive finish.
- B. Protect grating from ultraviolet (UV) degradation with:
 - 1. Integral UV inhibitors in the resin
 - 2. A synthetic surfacing veil to produce a resin rich surface
- C. Securely attach FRP grating to supporting members and angles using FRP with titanium fasteners. Attach each grating panel to supporting members at a minimum of four locations, two at each edge. Provide materials and incidentals required for attaching grating to angle frame and supports under this Section.
- D. Coordinate grating panel layouts with work of other Sections to provide openings for approved mechanical equipment, operators, gates, and other items which require penetrations or openings in the grating. Further subdivide grating panels and support to provide maximum panel weight of 110 lbs.

2.3 MISCELLANEOUS COMPONENTS

- A. Provide structural FRP angle frames, structural support shapes, and grit impregnated plate where required and appurtenances as indicated.
- B. Provide angle frames continuous around the opening in order to present an even and flat support for the grating except as otherwise indicated.
- C. Provide all finished surfaces of FRP items and fabrications smooth, resin rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. Provide glass fibers well covered with resin to protect against exposure due to wear or weathering.
- D. Provide all exposed surfaces smooth and true to form, consistent with ASTM D 4385.

2.4 GUARDRAIL SYSTEM

- A. Design FRP guardrail system, including connections, to meet loading and deflection requirements of OSHA and ICC AC 273.
 - 1. Basis-of-Design: Safrail Handrail System by Strongwell Corporation; Dynarail Guardrail and Handrail by Fibergrate; or equal.

- B. Provide system composed of 2-inch square FRP tubes; solid FRP connector plugs snugly fitting inside dimensions of tubes; solid 0.49-inch diameter FRP connector rods; and flattened corrugated 0.125-inch thick, 4-inch high, FRP kickplates with 0.5-inch deep corrugations and titanium drive rivets for fastening to posts.
- C. Provide FRP sleeves for removable connections to concrete and FRP baseplate assemblies with titanium fasteners for wall connections and for slab connections where shown. Provide approved epoxy cement for tube, plug and rod connections and epoxy grout for post connections set in concrete.
- D. Fabricate with continuous posts and top rail, and intermediate rails cut between posts. Miter corners and direction changes. Provide for rail expansion with internal plugs cemented one side and square, resin sealed, tube ends. Provide for kickplate expansion as detailed.

2.5 FASTENERS

- A.

2.6 FABRICATION

- A. Shop Assembly: Shop fabricate grating sections to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form FRP components from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
- F. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

2.7 FRP FRAMES AND SUPPORTS

- A. Frames and Supports for FRP Gratings and Plates: Fabricate from FRP shapes of sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
 - 1. Unless otherwise indicated, use shapes made from same resin as gratings.
 - 2. Equip units indicated to be cast into concrete or built into masonry with integral anchors.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate locations and elevations of required supports. Verify that members are properly installed to support components specified in this Section.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install assemblies in accordance with manufacturer's installations instructions. Install products plumb, level, and square, unless otherwise required by the design.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing FRP components. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry. Provide additional supports at penetrations through grating in order to meet design criteria.
- E. Fit exposed connections accurately together to form hairline joints.

3.3 INSTALLING FRP COMPONENTS

- A. Comply with manufacturer's written instructions for installing components. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for grating anchorage.

END OF SECTION 067413

SECTION 133424 – PREFABRICATED FIBERGLASS REINFORCED POLYMER STRUCTURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Engineered, prefabricated fiberglass reinforced polymer (FRP) structure complete and ready for operation as indicated on Drawings.
- 2. Provide The FRP structure with the following:
 - a. Exhaust fan with FRP hood
 - b. Heater with thermostat
 - c. FRP louver with bird screen
 - d. Enclosed and gasketed, fiberglass LED Light
 - e. GFCI outlets (minimum of 3)
 - f. Panelboard
 - g. Light switches
 - h. Doors
 - i. Lifting eyes
 - j. Stainless steel hardware

- B. Related Requirements:

- 1. Section 013300 “Submittal Procedures”
- 2. Section 017823 “Operation and Maintenance Data”
- 3. Section 033000 “Cast-in-Place Concrete”
- 4. Section 400507 “Hangers and Supports for Process Piping”
- 5. Section 400531 “Thermoplastic Process Pipe”

1.3 ACTION SUBMITTALS

- A. Copies of all materials required to establish compliance with the Specifications shall be submitted in accordance with the provisions of Section 013300. Submittals shall include at least the following:

- 1. Resin used.
- 2. Certified independent test results of the representative wall laminate.
- 3. Certified shop drawings showing the following:
 - a. Critical dimensions, jointing and connections, fasteners and anchors. All other important details of construction, dimensions, and anchor bolt locations.
 - b. Materials of construction.

- c. Anchor bolt details indicating locations, quantity, sizes, types, materials, spacing, embedment depth, and minimum edge distance.
 - d. Sizes, spacing and location of structural members, connections, attachments, openings, and fasteners.
 - e. Color.
4. Post-Installed Expansion Anchors:
- a. Design Data: Submit manufacturer's specifications and data including recommended design values and physical characteristics for expansion anchors.
 - b. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, materials and finishes for post-installed expansion anchors installed into cracked concrete and masonry.
 - c. Installation Procedures: Submit procedures stating product proposed for use, and complete installation method.
5. Post-Installed Adhesive Anchoring System:
- a. Design Data: Submit manufacturer's specifications and data including recommended design values and physical characteristics, including temperature, humidity, and moisture limitations for adhesive anchoring system.
 - b. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, materials and finishes for post-installed adhesive anchoring system installed into cracked concrete and masonry.
6. Installation Procedures: Submit procedures stating method of drilling, product proposed for use, and complete installation method.
7. Descriptive literature, bulletins, and/or catalogs of the equipment.
8. The total weight of the equipment.
9. Structural design calculations signed and sealed by a Professional Engineer registered in the State of New York.
10. A complete total bill of materials.
11. A list of the manufacturer's recommended spare parts with the manufacturer's current price for each item. Include gaskets, hardware, etc. on the list.
12. All information required by Section 013300.
13. Submittal data sheets for exhaust fan, heater, thermostat, and louver.
14. Complete data on motors and power factor correction capacitors (if required) in accordance with Section 230513: Common Motor Requirements For HVAC Equipment.
15. Complete wiring diagrams and schematics of all power systems showing wiring requirements between all system components, motors, sensors, panels, etc., including connections to work of other Sections.
16. Certification by the supplier that the equipment and materials to be provided are suitable for the service intended.
17. In the event that it is impossible to conform with certain details of the Specifications due to different manufacturing techniques, describe completely all non-conforming aspects.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Data:

1. Provide instructions specifically for this installation including all required cuts, drawings, equipment lists, descriptions, etc. required to instruct operating and maintenance personnel unfamiliar with such equipment.

- B. Project Record Documents: Record actual locations of concealed components and utilities.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Provide special tools required for normal operation and maintenance.
- B. Provide spare parts required during the first year after installation.
- C. Furnish extra materials and tools that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

- A. Perform Work according to New York Building Code standards, whichever is greater.
- B. Surface-Burning Characteristics for Insulation Installed in Concealed Locations:
 1. Foam Insulation:
 - a. Maximum Flame-Spread/Smoke-Developed Index: 25/450.
 - b. Testing: Comply with ASTM E84.
- C. Surface-Burning Characteristic for Insulation Installed in Exposed Locations:
 1. Maximum Flame-Spread/Smoke-Developed Index: 25/450.
 2. Testing: Comply with ASTM E84.
- D. Comply with New York State Building Code for submission of design calculations, reviewed Shop and erection drawings as required for acquiring permits.
- E. Provide components of each type from one manufacturer, and compatible with adjacent materials.
- F. Vapor Retarder Permeance:
 1. Maximum 1 perm.
 2. Testing:
 - a. Comply with ASTM E96/E96M.
 - b. Method: Water.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years' documented experience.

- B. Production capacity to provide work required for this Project without delay.
- C. Certified Test Results: Provide destructive test of entire fiberglass panel by an accredited Testing Laboratory and Third-Party Quality Control Agency and upon request furnish to the engineer the certified and stamped test results of the laboratory testing. The accredited Testing Laboratory must be accredited to ISO 17020 and 17025. The manufacturer shall maintain a quality assurance program that is also certified by an accredited Testing Laboratory and Third Party Quality Control Agency and furnish to the engineer the certified and stamped quality assurance program by an accredited Testing Laboratory and Third party Quality Control Agency.
- D. Erector: Company specializing in performing Work of this Section with minimum three years' experience and approved by manufacturer.
- E. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in the state of New York.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. The fiberglass structure and the accessory items shall be carefully transported, stored, handled and set in place in a manner that will prevent distortion, misalignment or other damage to the units.
- C. During storage prior to installation and following installation, but prior to placing in service, follow the manufacturer's recommendations concerning handling.
- D. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- E. Store materials according to manufacturer's written instructions.
- F. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.9 FIELD CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.10 WARRANTY

- A. Section 017700 “Closeout Procedures”: Requirements for warranties.
- B. Furnish twenty-five year manufacturer's warranty for pre-engineered structure materials and workmanship.
- C. Furnish two-year manufacturer's warranty for exterior prefinished surfaces' color coat against chipping, cracking or crazing, blistering, peeling, chalking, and fading, including coverage for weathertightness of structure enclosure elements after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In order to set a level of quality, fabricated fiberglass structures shall be provided by one of the following manufacturer's:
 - 1. Shelter Works
 - 2. Engineer approved Equal.
- B. System Description
 - 1. Structure Name: Leachate Pumping Station
 - a. Provide a weather-proof FRP structure of the following type:
 - 1) Size: 12'-0" exterior width x 15'-9" exterior length x 8'-0" wall height.
 - 2) Roof Slope: The roof pitch shall be 12° minimum.
 - 3) Roof Type: Hip roof design sloping up from all four sides.
 - 4) Roof Deck: ASTM E 108 (Class C) with less than 13 feet of flame spread.
 - b. Supply molded composite construction FRP structure suitable for installation as shown in the Drawings. Each wall shall be one single monolithic piece with a smooth satin finish on the interior and a faux brick textured appearance on the exterior. The walls and roof shall be integral with smooth radii for all corners. No roof overhang allowed. External section connection flanges are not allowed.
 - c. Walls, roof and doors shall be seamless, one-piece panels laminated with at least 1/8" thick sprayed fiberglass outside surface, core material, and at least 1/8" thick sprayed fiberglass inside surface. Walls and roof shall have continuous laminations (floor to ceiling and top-of-wall to ridge) every 12" to permanently bond inner FRP surface with outer FRP surface to provide structural integrity and prevent delamination of the fiberglass from the core material.
 - d. Walls and roof shall have minimum R-21 insulation with core consisting of minimum 3" thick foam.
 - e. Minimum 19/32" thick wood encapsulated within interior surface of wall portions for mounting equipment.
 - f. Structure shall be installed on a formed and poured concrete pad. All pad penetrations shall be coordinated with building layout.

2.2 COMPONENTS

A. Doors:

1. Quantity: (1) 6'-0" wide x 6'-8" high double door.
2. Construction:
 - a. Each door shall be one-piece molded fiberglass construction 80 inches high, 1 ¾ inches thick and 36 inches wide.
 - b. Mount door with three T-304 stainless steel ball bearing type hinges, 5 inches long, equipped with tamper-resistant, non-removable pins. Hinges shall be oriented with no fasteners exposed when door is closed. Door must be readily replaceable – the use of continuous piano hinges or fastening methods other than bolting are not acceptable.
 - c. Rubber bulb gasket with flexible lock to retain permanent grip.
 - d. One-piece, 2 ½ inches deep fiberglass drip cap over doors; drip cap to extend 2 inches each side past door.
 - e. Low profile threshold, aluminum, 1/2 inch high.
 - f. Schlage stainless steel single-point key locked classroom style, lever handle with interior panic bar egress, drop handle with accommodation for user-supplied padlock. To facilitate entry and exit from the structure, raised or integral door sills are not acceptable.
 - g. Heavy duty stainless steel, dual compression spring cushioned overhead door stop, designed for BHMA L52231 and ANSI A156.16.
 - h. Provide single-flap neoprene insert style door sweep.
 - i. Doors shall have a hydraulic closer.

B. Lifting Eyes: Provide a minimum of two removable, 3/4 inch – 10 partially threaded, eye bolts with 6-inch shank lengths.

1. Steel (5,200 lbs. work load limit).

C. Mounting Flange: 2 inches wide x 1/4-inch-thick (minimum) with closed cell neoprene sponge rubber gasket 2 inches wide x 3/8 inch thick to provide a weather tight seal around the interior of the structure perimeter. Flanges shall be pre-drilled with 7/16-inch diameter holes 24-inches on center. A sealant shall be provided to provide a weather-proof connection at the base of the structure. Sealant shall be ConSeal Bitumen/Butyl sealant or approved equal.

D. Roof of enclosure will be removable and watertight. No wiring, equipment, or any other fixed objects should be attached to the roof to facilitate future removals.

2.3 EQUIPMENT

A. Electrical

1. Panelboard:
 - a. 208Y/120 Volt, 3 Phase, 4 Wire panelboard meeting the requirements of Section 262416 "Panelboards".

- b. Surface mount type, NEMA 1 120/240V single-phase load center with 100 amp main breaker and at least 10 breaker slots and completely assembled by the panelboard manufacturer.
 - c. 10kAIC, 100Amp rated bus, with a 100Amp, main breaker and surge protective device.
 - 1) Provide 20A, 1 pole, spare breakers to fill out the panelboard for all unused circuits.
2. Provide conduit and wiring in strict accordance with Sections 260533 “Identification for Electrical Systems” and 260519 “Low-Voltage Electrical Power Conductors and Cables”, respectively. Mount conduits in accordance with Section 260529 “Hangers and Supports for Electrical Systems”.
 3. Receptacles: Minimum 3 GFCI duplex receptacles, 2 inside and 1 outside. Receptacles shall be heavy duty, specification grade of the following types and manufacturer or equal. Receptacles shall conform to Fed Spec WC596-F and meet the requirements of Section 262726 “Wiring Devices.”
 - a. Ground fault interrupter, duplex, 20 Amp, 125 Volt, 2 Pole, 3 Wire, GFCI feed thru type with "test" and "reset" buttons. Eaton; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc., or equal.
 - b. Provide weatherproof non-metallic device plates ‘Not Attended/While-In-Use’ cover, UV & corrosion resistant polycarbonate back & cover, deep cover, gasketed, horizontal or vertical mounting as required, single or double gang as required, lockable hasp, as manufactured by Thomas & Betts (Red Dot); Cooper Wiring Devices (Arrow Hart); Carlon; or equal.
 4. Switches: Weatherproof switch box, located at the exterior front of the structure. Wall switches shall be heavy duty, specification grade, toggle action, and meeting the requirements of Section 262726 “Wiring Devices.”
 5. Provide lighting layout by the structure manufacturer. Prewire necessary exterior and interior fixtures to the panel specified herein. Provide a minimum of 30-foot candles of illumination measured 2.5 foot above the floor. Place lights as close as practical to the center of each structure
 - a. Interior:
 - 1) Vapor-tight, LED light fixture(s) providing an average of 50 foot-candles on the floor area.
 - 2) (1) exit sign above door, red LED letters with battery backup and 150 lumens of egress illumination for 90 minutes in case of power outage.
 - b. Exterior:
 - 1) (1) exterior 2100 lumen LED down light operated by photocell with weatherproof switch override that prevents exterior light from illuminating when in ‘DOWN’ position.

B. Mounting:

1. Provide equipment mounting panels as required for all wall-mounted equipment. Mounting panels shall be ¾-inch thick marine grade plywood panel laminated into the walls. Coordinate dimensions and locations with CONTRACTOR.

C. HVAC

1. Refer to Division 23 for Heating Equipment, Fans, and Testing, Adjusting and Balancing.
2. Exhaust Fan: Shutter-mounted, 120V, exhaust fan with integral gravity shutter, aluminum fan blades, fiberglass 45-degree weather hood, and OSHA compliant polyester-coated wire guard. Exhaust fan to be wired to the weatherproof fan switch with thermal overload and thermostat. Fan shall be rated for a minimum of 800 cubic feet per minute with a 12-inch diameter propeller. Fan operation controlled by thermostat.
3. Louver: Gravity operated fiberglass intake shutter, with steel frame and exterior removable T-316 stainless steel Bird screen, sized at 12 inches by 12 inches (minimum). Provide fiberglass 90-degree weather hood. Manual vents are not permitted.
4. Ventilation through-wall openings shall be protected from the elements with a weather-tight fiberglass hood the same color as the shelter itself.
5. Heater: Line powered, 240V, wall heater. No separate electrical outlet required. 4,800 watt, white powder coat finish with automatic re-set thermal overload protection with indicator light and built-in thermostat.
 - a. Heater will be corrosion resistant type as manufactured by King Electrical Manufacturing Co., model PAW1215-SS or equal.
6. Thermostat: NEMA 4X electric line voltage thermostat for heat removal (summer) operation fan, 30 – 110 F temperature range. Initial set point shall be 85 degrees F. Unit shall be located within 5 feet of exhaust fan wall-mounted 240 Volt, single-phase electric and at least 4.5 Kw
7. Test and balance exhaust fan and heater per the requirements of Section 230593.
8. Provide heavy-duty NEMA 4X 316 stainless steel disconnect switches for each HVAC cooling or heater unit; by Square D, Siemens, or ABB/GE. Lockable hardware on circuit breakers for HVAC equipment may be provided in lieu of NEMA 4X disconnects where approved by the Engineer

- D. Furnish all electrical and HVAC items, pre-wired and installed by the structure manufacturer as shown on the drawings and as specified above.

2.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design the FRP structure in accordance with the New York State Building Code.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Anchorage Design:

1. Anchor bolts for anchoring FRP components to concrete structure shall be stainless steel expansion anchors or adhesive anchors that meet the requirements of Section 050519. Design of anchor bolts embedded into supporting concrete structure shall be performed in accordance with ACI 318 Chapter 17, assuming concrete is cracked and has a 28-day compressive strength of 4500 psi.

D. Structural Loading as follows or as dictated by local and state code, whichever is greater:

1. Shelter: Own dead load.
2. Standard: ASCE/SEI 7-22, Risk Category I, ground level.
3. Roof Load: 69 psf ground snow load
4. Wind Load: 101 mph
5. Seismic Load: Per local building code

2.5 SURFACE PREPARATION AND SHOP PRIME PAINTING

- A. Surface preparation and shop painting is included as a part of the work of this Section.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify that the concrete slab is level, true to plane, and of the correct dimensions to receive the mounting flange of the structure. Contractor shall correct all deficiencies before proceeding with installation.
- B. Install products in accordance with Engineer's plans and instructions, local codes, and in a manner consistent with the installation instructions and recommendations of the manufacturer.
- C. Do not remove the door spacers until all anchor bolts have been completely set and door operation has been verified.
- D. Move and position the FRP structure using the lifting eyes. The neoprene gasket provided with the structure should be positioned between the concrete slab and the structure mounting flange. Use a spreader bar to lift structure.
- E. Do not Fabricate or erect the FRP structure until:
1. The anchor bolt layout and details have been submitted to and approved by the Engineer.
 2. The foundation design and details have been finalized by the Engineer for the selected structure system.
- F. Install anchor bolts following Manufacturer's recommendations.
1. Drill and set the anchor bolts starting with one on each side of the doors. Verify the operation of the doors before installing the remaining anchor bolts.

2. Drill the anchor bolt holes to the depth and diameter required by the anchor bolt manufacturer and the qualified professional engineer.
 3. Verify operation of the doors after installation of anchor bolts and threshold.
- G. Seal the flange with sealant or grout to ensure water tightness.
- H. Install (as necessary) and test the structure accessories in accordance with the manufacturers' instructions.

3.2 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the special inspections required by the New York State Building Code.

3.3 ADJUSTING AND CLEANING

- A. Clean surfaces in accordance with manufacturer's instructions.
- B. Remove trash and debris, and leave the site in a clean condition.

END OF SECTION 133424

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SECTION 400565.23 - CHECK VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Check valves 3 inches (75 mm) and larger.
- B. Related Requirements:
 - 1. Section 400551 “Common Requirements for Process Valves”: Basic materials and methods related to valves commonly used for process systems.

1.3 COORDINATION

- A. Section 400551 “Common Requirements for Process Valves”: valve schedule
- B. Coordinate Work of this Section with piping and equipment connections as specified in other Sections and as indicated on Drawings.

1.4 SUBMITTALS

- A. Comply with Section 400551 “Common Requirements for Process Valves”.
- B. Product Data: Submit manufacturer's catalog information, indicating materials of construction and compliance with indicated standards.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Source Quality-Control Submittals: Indicate results of factory tests and inspections and provide required certifications.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- F. Qualifications Statement:

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of piping, valves and other appurtenances, connections, and invert elevations.

1.6 QUALITY ASSURANCE

- A. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.
- B. Perform Work according to City of Rome, New York standards.
- C. Maintain a copy of each standard affecting Work of this Section on Site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 400551 "Common Requirements for Process Valves".
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Protect valves and appurtenances by storing off ground.
 - 3. Protect valve ends from entry of foreign materials by providing temporary covers and plugs.
 - 4. Provide additional protection according to manufacturer instructions.

1.9 WARRANTY

- A. Furnish five-year manufacturer's warranty for check valves.

PART 2 - PRODUCTS

2.1 IRON BODY SWING CHECK VALVES 4-INCH AND LARGER - Tag Type SCV1

- A. Manufacturers:
 - 1. Kennedy Valve,
 - 2. GA Industries,
 - 3. Valve and Gate Group,
 - 4. Pratt, Mueller Co.,
 - 5. Val-Matic
 - 6. or approved equal.

B. Description:

1. Comply with AWWA C508.
2. Size: 4 inches (76 mm) and larger.
3. Type: Swing, metal disc, with hinge shaft extended from body, sealed with stuffing box, packing and gland. Furnish outside lever and control specified below or in valve schedule.
4. Seat: Resilient.
5. Minimum Working Pressure: 175 psig 4 to 12-inch diameter, 150 psig 14 to 30-inch diameter at 70 deg. F .
6. Maximum Fluid Temperature: 100 deg. F (38 deg. C).
7. Disc Controller:
 - a. Adjustable weight.
 - b. Air cylinder cushion..
8. Mounting: Horizontal or vertical.
9. End Connections: Flanged, ASME B16.42..

C. Materials:

1. Body and Cover: Ductile iron, ASTM A536.
2. Disc: Ductile iron, ASTM A536.
3. Seat: Field replaceable, Type 304 stainless steel.
4. Cover hardware: 316 stainless steel.
5. Chamber and Plunger: Bronze, ASTM B62.
6. Hinge Shaft and Key: Stainless steel.
7. Hinge Shaft Gland: A582 Type 416 Stainless Steel.
8. Packing and O-Ring: Reinforced Teflon .
9. Grease Fittings: 316 stainless steel.
10. Rubber Components: Viton.
11. Connecting Hardware: Type 304 stainless steel.

D. Finishes: As specified in Section 400551 “Common Requirements for Process Valves”.

E. Controls

1. Position switches: lever type, NEMA 7 enclosure, SPST, 120VAC, 6A, Square D Type 9007CR or approved equal.
2. Bracket and hardware: Type 316 stainless steel.

2.2 SWING CHECK VALVES 3-INCH AND SMALLER: Tag Type SCV3

A. Manufacturer:

1. Solder or thread end Hammond 1B-940, or Jenkins Figure 996.
2. Flanged end Hammond 1R-1124 or Jenkins Figure 587J.

B. Description:

1. Comply with MSS SP-71, 80.

- C. Finishes: As specified in Section 400551 “- Common Requirements for Process Valves”.

2.3 DUCK BILL CHECK VALVES 4-INCH AND SMALLER: Tag Type DBCV

- A. Manufacturers:
 1. Red Valve Company, Inc.
 2. Or approved equal.
- B. Description
 1. Type: Duck bill
 2. Minimum Working Pressure: 35 psi.
 3. Maximum Fluid Temperature: 90 deg. F.
 4. Mounting: Horizontal.
 5. End Connections: Flanged, ASME B16.5.
- C. Materials:
 1. Body: EPDM
 2. Retaining Rings: 316 stainless steel.
 3. Flange: Elastomer

2.4 SOURCE QUALITY CONTROL

- A. Section 400551 “Common Requirements for Process Valves”.
- B. Testing:
 1. Hydrostatically test check valves at twice rated pressure according to AWWA C508.
 2. Permitted Leakage at Indicated Working Pressure: None.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field dimensions are as indicated on Drawings.
- B. Inspect existing flanges for nonstandard bolt-hole configurations or design and verify that new valve and flange mate properly.

3.2 PREPARATION

- A. Thoroughly clean valves before installation.

B. Surface Preparation:

1. Touch up shop-primed surfaces with primer as specified in Section 099676.53 “Wastewater Transmission System Coatings”.
2. Solvent-clean surfaces that are not shop primed.
3. Clean surfaces to remove loose rust, mill scale, and other foreign substances by power wire brushing.
4. Prime surfaces as specified in Section 099676.53 “Wastewater Transmission System Coatings”.

3.3 INSTALLATION

- A. According to AWWA C508 and manufacturer instructions.
- B. Dielectric Fittings: Provide between dissimilar metals.

3.4 FIELD QUALITY CONTROL

- A. Inspection:
 1. Inspect for damage to valve lining or coating and for other defects that may be detrimental as determined by Architect/Engineer.
 2. Repair damaged valve or provide new, undamaged valve.
 3. After installation, inspect for proper supports and interferences.
- B. Pressure test valves with piping.

3.5 CLEANING

- A. Keep valve interior clean as installation progresses.
- B. After installation, clean valve interior of soil, grit, loose mortar, and other debris.

END OF SECTION 400565.23

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SECTION 408000 - COMMISSIONING OF PROCESS SYSTEMS

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes Requirements for each Commissioning Phase of the Project. Additional requirements are included in individual specification Sections.
- B. Discharge location of test water shall be to storm ponds, storm sewer, or sanitary sewer and shall be in compliance with applicable permits, approvals, and regulations.

1.2 DEFINITIONS

- A. Clean Water Facility Testing - Testing of complete facility utilizing clean non-potable water for purposes of confirming extended equipment/system operation prior to Process Start-up Phase. Includes verification of inter-system monitoring, interlocks and alarms in SCADA.
- B. Commissioning (“Cx”) - The process of planning, testing, and process start-up of the installation for establishing compliance with Contract requirements and demonstrating through documented verification that the project has successfully met those contractual requirements. It includes training the Owner’s personnel to operate the facility.
- C. Commissioning Phases - The Work activities of facility commissioning are grouped into the phases defined in the table below.

<u>Commissioning (Cx)</u>		
<u>Planning Phase</u>	<u>Testing and Training Phase</u>	<u>Process Start-Up Phase</u>
Owner Training Plan and Schedule	Source Testing	Process Start-up
Commissioning Schedule	Owner Training	Process Start-Up Phase
Subsystem Testing Plan	Installation Testing	Instrumentation and Controls Fine-Tuning
Facility Testing Plan	Functional Testing	
Commissioning and Process Startup Plan	Facility Testing	
	Closeout Documentation	

- D. Component - A basic building block of equipment, subsystems, and systems that requires installation or functional testing but does not have electrical connection or internal electronics. (Examples: filter effluent piping and manual isolation valves).

- E. Device - A basic building block of equipment, subsystems, and systems that requires installation or functional testing and does have electrical connection or internal electronics. (Examples: filter level transmitter or water pump pressure transmitter).
- F. DDC – Direct Digital Controls.
- G. Equipment - An assembly of component(s) and devices(s) that requires installation or functional testing. (Examples: Pump, motor, VFD, , etc.).
- H. Facility - A grouping of process areas, systems, subsystems, equipment, components, and devices (Examples: treatment plant, pump station, etc.).
- I. Functional Testing - Testing performed on a completed subsystem to demonstrate that equipment/system meets manufacturers’ calibration and adjustment requirements and other requirements as specified. Functional testing includes operating equipment/system manually in local, manually in remote (or remote manual), and automatically in remote (in remote auto). Includes verification of intra-system hard-wired and software interlocks as much as possible.
- J. Installation Testing - Testing to demonstrate that subsystem component or device (piping, power, networks, devices, etc.) is ready and meets the Project requirements in advance of functional testing. Installation testing also includes Manufacturers’ Certification of Installation and other requirements as specified to prepare equipment/system for Functional Testing. Includes verification of SCADA registration of status signals, ranges, and alarms, as well as interlocks for all wired components and vendor-supplied panels, as much as possible. Also referred to as Field Acceptance Testing.
- K. Instrumentation and Controls Fine-Tuning – Completion of SCADA integration Punch List activities and HMI screen development for plant-wide systems.
- L. *Manufacturer’s Certificate of Source Testing* - When applicable, the form is used during Source Testing for the manufacturer to confirm that the applicable source tests have been performed and results conform to the Contract Documents. The form is provided at the end of this Section.
- M. *Manufacturer’s Certificate of Installation and Functionality Compliance* - A form that is used during Installation Testing and Functional Testing. It is submitted by the end of Functional Testing to confirm that the equipment/system is installed in conformance with the Contract Documents and that it meets the Functional Testing requirements defined in the Contract Documents. A blank template of this form is provided at the end of this Section.
- N. Process Area - A grouping of systems, subsystems, equipment, components, and devices that divide a facility into functional areas. (Examples: Filter Process Area or Chemical Area).
- O. Process Start-up Phase - Operating the facility to verify performance meets the Contract Document requirements.
- P. Process Start-Up – Activities conducted after Clean Water Facility Testing and training of Owner’s personnel are complete, which are necessary to fully place systems or process

areas into operational service using the intended process fluid. Includes performance testing for those systems (or subsystems) which require specific process fluids or other conditions that cannot otherwise be practically provided during earlier commissioning phases. Includes plant-wide SCADA integration activities. Results of these activities aim to demonstrate that each system and the plant holistically performs to meet the Contract Document requirements in all operating modes.

- Q. Product - A system, subsystem or component.
- R. Source Testing – Testing at the manufacturing facility or site of assembly. Also called “Factory Testing” or “FAT”. Completion is documented using the *Manufacturer’s Certificate of Source Testing* form.
- S. Substantial Completion – Definition as per the General Conditions.
- T. Subsystem - A building block of systems made up from a grouping of components, devices, and equipment that perform a definable function. (Examples: Main Pump Station Pump No. 1 Subsystem, Standby Power Fuel Storage and Conditioning Subsystem).
- U. System - A grouping of subsystems, equipment, components, and devices that perform a definable function. (Examples: Waste holding tank, waste transfer pump, Standby Power System).
- V. TAB – Testing, adjusting, and balancing. Typically used when referring to commissioning of HVAC systems.

1.3 SUBMITTALS

- A. Qualifications:
 - 1. **Not used – Removed in addendum #2**
 - 2. Qualifications of manufacturer’s representatives.
 - 3. Qualifications of the BAS and HVAC Testing technician(s).
- B. Schedules:
 - 1. Owner Training Plan Schedule.
 - 2. Commissioning Schedule.
- C. Certificates:
 - 1. Manufacturer’s Certificate of Source Testing.
 - 2. Manufacturer’s Certificate of Installation and Functionality Compliance.
- D. Reports:
 - 1. Test reports.

E. Plans:

1. Owner Training Plan.
2. Source Test Plan.
3. Installation Testing Plan.
4. Functional Testing Plan.
 - a. Subsystem Testing Plans.
 - b. System-Wide Testing Plans
5. Clean Water Facility Testing Plan.
6. Commissioning and Process Start-Up Plans.
 - a. Process start-up.
 - b. Instrumentation and Controls Fine-Tuning
7. Commissioning and Startup Plan.

F. Documentation:

1. Preliminary documentation.
2. Final documentation.
3. Closeout documentation.

1.4 NOT USED – Removed in Addendum #2

1.5 SERVICES OF MANUFACTURER’S REPRESENTATIVES

- A. Qualification of manufacturer’s representative as specified in the Contract Documents Sections including the following:
1. Authorized representative of the manufacturer, factory trained and experienced in the technical applications, installation, operation, and maintenance of respective equipment/system with full authority by the equipment/system manufacturer to issue the certifications required of the manufacturer.
 2. Competent, experienced technical representative of equipment/system manufacturer for assembly, installation, testing guidance, and training.
 3. Refer to Section 01 43 33 – Manufacturers’ Field Services and the individual technical specification Sections where additional qualifications may be specified.
 4. Submit qualifications of the manufacturer’s representative no later than 30 days in advance of required Site activities.
 5. Representative subject to approval by Owner’s Representative.
 6. No substitute representatives will be allowed until written approval by Owner’s Representative has been obtained.
- B. Completion of manufacturer on-site services: Owner’s Representative approval required.
- C. Manufacturer is responsible for determining the time required to perform the specified services.

1. Minimum times specified in the Contract Documents are estimates.
 2. No additional costs associated with performing the required services will be approved.
 3. Manufacturer required to schedule services in accordance with the Contractor's Project schedule, up to and including making multiple trips to Site when there are separate milestones associated with installation of each occurrence of manufacturer's equipment.
- D. Manufacturer's on-site services as specified in the Contract Documents include the following:
1. Assistance during Testing and Training Phase and Process Start-Up Phase.
 2. Provide daily copies of manufacturer's representatives field notes and data to Owner's Representative.
 3. Other requirements as specified in the Contract Documents.

1.6 PLANNING PHASE

A. General:

1. Define approach and timing for Commissioning activities by phase.
2. Contractor shall update and submit to the Owner's Representative the Commissioning and Startup Plan developed during the Design phase of the Project every 6 months to incorporate information discussed at commissioning meetings and the information summarized in the next paragraph.
3. Specific commissioning activities for Source Testing, Installation Testing, Functional Testing, Clean Water Facility Testing, Process Start-Up, and Instrumentation and Controls Fine-Tuning phases are identified in individual Specifications and on Drawings. Refer to the following when developing individual and integrated test plan submittals:
 - a. Section 011000 – Summary.
 - b. Structural Drawings includes notes listing non-destructive testing requirements.
 - c. Section 099600 - High-Performance Coatings for coating testing of sample areas.
 - d. Section 400531 – Thermoplastic Process Pipe
 - e. Section 400551 – Common Requirements for Process Valves
 - f. Individual equipment sections in Divisions 43 and 46 for process mechanical equipment testing requirements.
 - g. Div 40, 43, and 46 technical Sections for testing requirements of instrumentation and SCADA integration.
 - h. Refer to summary list of major mechanical systems and subsystems in Table 01 75 17-1.07A

Table 01 75 17-1.07A Summary List of Major Mechanical Systems and Subsystems

PRIMARY SYSTEM	SUBSYSTEMS	MAJOR MECHANICAL EQUIPMENT (note 1)
Main Pump Station	Dry Well	Dry Pit Submersible Pumps
		Flow Meters
		Valves
		Sump Pump
Filtrate Pump Station	Wet Well	Wet Pit Submersible Pump
		Level Sensors
Waste Handling Tank	Pressure Level/Indicator Vault	Flow Meter
		Pinch Control Valve
		Sump Pump
	Storage Tank	Mixer
	Waste Transfer Station	Waste Transfer Pump
Valves		
Digester No. 2 Control Building	Basement	Valves

TABLE NOTES

1. List offers guidance but is not all-inclusive. Contractor shall identify all components to include in testing of a given system or subsystem in Test Plan Submittal.

B.
B.

B. Owner training plan and schedule:

1. Training outcomes:

a. Owner's operations, maintenance, and engineering staff (Owner's personnel) have the information needed to safely operate, maintain, and repair the equipment/systems provided in the Contract Documents.

2. Training objectives:

- a. To instruct personnel in the operation and maintenance of the equipment/system. Instruction shall include step-by-step troubleshooting procedures with all necessary test equipment/system.
 - b. To instruct personnel in the removal, inspection, and cleaning of equipment/system as needed.
 - c. Training tailored to the skills and job classifications of the staff attending the classes (e.g., plant superintendent, treatment plant operator, maintenance technician, electrician, etc.). Owner's Representative to provide list of staff to train to Contractor 60 days prior to training so Contractor can plan accordingly.
 - d. Provide supporting documentation, such as vendor operation and maintenance manuals.
3. Training schedule:
- a. Schedule Owner's personnel training within the constraints of their workloads through the Owner's Representative. Those who will participate in this training have existing full-time work assignments, and training is an additional assigned task, therefore, scheduling is imperative.
4. Training plan:
- a. Coordinate and arrange for manufacturer's representatives to provide both classroom-based learning and field (hands-on) training, based on training module content and stated learning objectives.
 - b. Conduct classroom training at location designated by Owner's Representative.
 - c. Scope and sequence:
 - 1) Plan and schedule training in the correct sequence to provide prerequisite knowledge and skills to trainees.
 - a) Describe recommended procedures to check/test equipment/system following a corrective maintenance repair.
5. Training scheduling coordination:
- a. **Not Used – Removed in Addendum #2.**
 - b. Complete Owner training no sooner than 14 calendar days prior to start-up of each system. Contractor shall plan to train during Installation or Functional Testing when manufacturer's representatives are typically onsite, to the maximum extent practical.
6. Submittals:
- a. Submit Training Plan Schedule 90 calendar days before the first scheduled training session, including but not limited to lesson plans, participant materials, instructor's resumes, and training delivery schedules.
 - b. Submit training documentation including the following:
 - 1) Training plan:
 - a) Training modules.

- a) Training modules.
 - b) Scope and sequence statement.
 - c) Contact information for manufacturer's instructors including name, phone, and e-mail address.
 - d) Instructor qualifications.
- 2) Training program schedule:
 - a) Format: Bar chart:
 - (1) Include in the Construction Progress Schedule.
 - b) Contents:
 - (1) Training modules and classes.
7. Training sessions:
- a. Provide training sessions for equipment/system as specified in the individual equipment/system Section.
- C. Commissioning Schedule:
1. General:
 - a. Comply with Commissioning Roles and Responsibilities Matrix specified at the end of this Section.
 - b. Submit Commissioning Schedule not less than 60 calendar days prior to planned initial commissioning of equipment and subsystems.
 - c. Submit Commissioning Schedule updates as part of the monthly schedule update and final Commissioning Schedule.
 2. Schedule requirements:
 - a. Schedule durations and float for commissioning activities to ensure Work does not fall behind schedule due to complications or delays during commissioning.
 - b. Time-scaled network diagram detailing the Work to take place in the period between 60 calendar days prior to planned initial commissioning of equipment and systems, through to the date of Substantial Completion, together with supporting narrative.
 - c. Provide detailed schedule of commissioning activities including durations and sequencing requirements.
 - 1) Identify the following activities for each subsystem, including all site work.
 - a) Testing and Training Phase:
 - (1) Source Testing.
 - (2) Owner Training.
 - (3) Installation Testing.

- (4) Functional Testing.
- (5) Clean Water Facility Testing.
- (6) Closeout Documentation.

b) Process Start-Up Phase:

- (1) Process Start-Up.
- (2) Process Operational Period.
- (3) Instrumentation and Controls Fine-Tuning.

- d. Schedule manufacturer's services to avoid conflict with other on-site testing or other manufacturers' on-site services.
- e. Verify that conditions necessary to allow successful testing have been met before scheduling services.

D. Installation and Functional Testing Plans:

1. Submit Installation Testing Plans and Functional Testing Plans for equipment, unit process subsystems, and full systems.
2. Subsystem testing plans:
 - a. Submit separate testing plans for each individual subsystem and system that include the following:
 - 1) Approach to testing including procedures, schedule, analytical methods and test equipment to be used, temporary facilities, recirculation requirements, and disposal plan.
 - 2) Test objective: Demonstrate subsystem meets the design requirements as specified in the technical Sections.
 - 3) Test descriptions, need for temporary systems (pumps, piping, etc.), shutdown requirements for existing systems, test forms, test logs, witness forms, and checklists to be used to control and document the required tests. Identify independent and dependent variables, measurement method, units, and number of data points planned for acquisition during each test.
 - 4) Test forms: Include, but not limited to, the following information:
 - a) Tag and name of equipment/system to be tested.
 - b) Test date.
 - c) Names of persons conducting the test.
 - d) Names of persons witnessing the test, where applicable.
 - e) Test data.
 - f) Applicable Project requirements.
 - g) Check offs for each completed test or test step.
 - h) Place for signature of person conducting tests and for the witnessing person, as applicable.

- 5) Define start-up sequencing of unit processes:
 - a) Include testing of alarms, interlocks, permissives, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters.
 - b) Provide detailed test procedures setting forth step-by-step descriptions of the procedures for systematic testing of equipment/system.
 - c) Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration.
 - (1) Perform initial checks in the presence of and with the assistance of the manufacturer's representative.
 - d) Demonstrate proper operation of each control loop function including mechanical, electrical, alarms, local and remote controls, instrumentation, and other equipment/system functions.
 - (1) Generate IO signals with test equipment/system to simulate operating conditions in each control mode.
- b. Owner's Representative approval of test plan is required prior to performing test.
 - 1) Revise and update test plans based on review comments, actual progress, or to accommodate changes in the sequence of activities.
 - 2) Submit test reports for each phase of testing for each equipment/system.
 - 3) Owner's Representative approval of preceding test reports is required prior to start of next test.
 - 4) Tests will be rescheduled if test plan is not approved by the required deadline.
 - a) Contractor is responsible for any resulting delay.
- c. Submit the final test procedures to the Owner's Representative.
- d. Tests may commence only after Owner's Representative has received approved test plan.
- e. Submittals:
 - 1) Submit test plans not less than 60 calendar days prior to planned installation testing of subsystem or system.
 - 2) Completed Manufacturer's Certificate of Installation and Functionality Compliance.
 - 3) Test procedures and forms: Provide signed-off copy of test forms and test reports upon completion of the test.
 - 4) Test reports:
 - a) Submit preliminary report within 1 day after testing completion.
 - b) Submit final report within 14 days after testing completion.

E. Facility Testing Plan:

1. Submit a Facility Testing Plan equivalent to the requirements of the subsystem test plans a minimum of 60 calendar days prior to Facility Testing.
2. Address all requirements set forth in the Contract Documents for this phase.
3. Plan submittal shall be consistent in terms of level of detail, approach, forms, contents, and format as the subsystem testing plans.
4. Describe plan for hydraulic flow, re-circulation requirements, and endpoint for disposal of all product water, by-products, and waste.

F. Process Start-Up Plan

1. Submit a Process Start-Up Plan for review not less than 180 calendar days prior to planned start date for process start-up.
2. Address all requirements set forth in the Contract Documents for this phase.
3. Plan submittal shall be consistent in terms of level of detail, approach, and format as the subsystem testing plans and the clean water facility testing plan.
4. Include the following information in the Process Start-Up Plan:
 - a. Pre-start-up activities.
 - b. Approach and detailed process start-up sequence.
 - c. Process Operational Period.
 - d. Description of hydraulic flow, re-circulation requirements (if any), and endpoint for disposal of all product water, by-products, and waste.
 - e. Identification of all required testing activities planned to be conducted during this phase – including any Installation Testing, Functional Testing, or Clean Water Facility Testing phase activities that are anticipated to be deferred until Process Start-Up.
 - f. Data to be acquired during this phase and sampling and analysis methodology planned.
 - g. Instrumentation and controls testing or fine-tuning planned to occur during this phase.
 - h. Description of Temporary Testing Arrangements and Test Equipment, if applicable.
 - i. Forms and checklists to be used during this phase.
 - j. Final Process Start-Up Forms and Documentations.
5. Development of the Process Startup Plan for the 30-day Process Startup Phase shall be the responsibility of the Contractor. The Owner and Engineer will provide input into the Process Startup Plan including starting dosages for all chemicals, flow requirements, and rotation schedule for equipment and basins. The Owner will implement the Process Startup Plan and operate the WTP during the Process Startup Phase. CM/GC shall provide labor and vendor/subcontractor coordination in an assistance role during the Process Startup Phase and shall be responsible for the installation of the systems per the Contract Documents. Upon Owner and Engineer review and acceptance of the Process Startup Plan, CM/GC shall be waived of any liability that may arise from any errors and omissions in the execution of the Process Startup Plan by the Owner's staff.

1.7 TESTING AND TRAINING PHASE

A. General:

1. Include specified Source Testing, Owner Training, Installation Testing, Functional Testing, Clean Water Facility Testing, and Closeout Documentation required by this Section and the technical Sections.
2. All phases of testing and training to be coordinated with restrictions and requirements as specified in Section 01 10 00 – Summary.
3. Contractor responsibilities:
 - a. Furnish labor, power, tools, equipment, instruments, and services required for and incidental to completing commissioning activities in accordance with the approved Commissioning Plans.
 - b. The on-site sewer, potable water, storm, systems shall be installed, tested, tied to the corresponding off-site system, fully functional, and have appropriate inspections and permits in place prior to the start of the Installation and Functional Testing period.
 - c. Prior to testing, verify equipment protective devices and safety devices have been installed, calibrated, and tested.
 - d. Acceptable tests: Demonstrate the equipment/system performance meets the requirements stated in the Contract Documents.
 - 1) When the equipment/system fails to meet the specified requirements, perform additional, conduct more detailed testing to determine the cause, then correct/repair/replace the causative components and repeat the testing that revealed the deficiency.
4. Owner's responsibilities:
 - a. Furnish and fill chemicals for testing activities performed by the Contractor:
 - b. Handling and fill of above chemicals and materials will be performed by Owner's personnel who will utilize the installed tanks, pads, fill piping, and associated facilities constructed by the Contractor and approved for use by the Owner's Representative.
 - c. Contractor shall be present during all filling activity to provide assistance related to any issues with installed storage, feed, delivery, containment, etc., systems.
 - d. Furnish labor required to witness testing and attend training sessions in accordance with the Commissioning Schedule agreed upon in advance.
 - e. To allow the Owner to set up contracts with chemical delivery companies, the Contractor shall give the Owner 180 days advanced notice of when bulk treatment chemicals will be required.

B. Source testing:

1. Also referred to as factory testing or factory acceptance testing (FAT).
2. Test components, devices, and equipment/system for proper performance at point of manufacture or assembly as specified in the technical Sections.
3. Notify the Owner's Representative in writing when the equipment/system is ready for source inspection and testing.

4. Source Test Plan:
 - a. As specified in this Section and other individual Specification Sections.
 - 1) Non-witnessed: Provide *Manufacturer's Certificate of Source Testing* for all instances of required source testing in individual Specification Sections.
 - 2) Witnessed: Accommodate up to two individuals (the Owner's Representative and the Engineer of Record) to be present during testing, unless otherwise specified. Provide *Manufacturer's Certificate of Source Testing* for all instances of required source testing in individual Specification Sections.
 - b. Prepared by Contractor as a result of discussions and planning emerging from regularly conducted commissioning meetings for source tests as specified in the Contract Documents.
 - c. Provide the following items for each Source Test:
 - 1) Purpose and goals of the test.
 - 2) Identification of each item of equipment/system, including system designation, location, tag number, control loop identifier, etc.
 - 3) Description of the pass/fail criteria that will be used.
 - 4) Listing of pertinent reference documents (Contract Documents and industry standards or Sections applicable to the testing).
 - 5) Complete description, including drawings or photographs, of test stands and/or test apparatus.
 - 6) Credentials of test personnel.
 - 7) Descriptions of test equipment to be used, product information, and all appropriate calibration records for the test equipment.
 - 8) Test set-up procedures.
 - 9) Detailed step-by-step test procedures.
 - 10) The level of detail shall be sufficient for any witness with a rudimentary technical aptitude to be able to follow the steps and develop confidence that the tests are being performed as planned.
 - a) All steps are significant, and all steps shall be included in the procedures.
 - 11) Sample data logs and data recording forms.
 - 12) Sample computations or analyses with the results in the same format as the final report to demonstrate how data collected will be used to generate final results.
 - a) Complete disclosure of the calculation methodologies.
 - b) Include a sample for each type of computation required for the test and analysis of the results.
 - 13) Detailed outline of the Source Test report.
 - 14) Sample test reports.

- d. Submit Source Test Plan and forms as specified herein and in the technical Sections.
 - 1) Obtain approval of the Source Test Plan at least 21 days before any scheduled test date.
 - 2) Owner's Representative approval of Source Test Plan required prior to beginning source testing.
 - 3) Schedule the testing after approval of the Source Test Plan submittal.
 - e. Indicate the desired dates for source inspection and testing.
 - 1) Notify the Owner's Representative of the scheduled tests a minimum of 30 days before the date of the test.
 - f. When process and/or bulk treatment chemicals are required, the Owner will be responsible for accepting deliveries, loading, usage, production, dosing, and operation of any chemical feed systems. Contractor shall be present during all filling and feeding activities through the startup and commissioning to aid Owner with any issues related to the installed chemical systems.
5. Test results:
- a. Prepare and submit test results with collected data attached.
6. Contractor is responsible for costs associated with Owner's Representative and Engineer of Record's representative witnessing Source Tests for re-tests, if the first test fails, is incomplete, or requires rescheduling at the fault of the Contractor or Manufacturer.
- a. Cost reimbursement for retests will include the following:
 - 1) Transportation:
 - a) Outbound travel the day before the test on commercial airline from Portland to test site, including air flight costs.
 - b) Return travel the day after the test on commercial airline from test site to Portland including air flight costs.
 - c) Rental car from hotel to and from the test site for each person for the duration between the outbound and return flights.
 - 2) Hotel costs at a facility with an American Automobile Association 4-star rating or equivalent for single occupancy room per person per day.
 - 3) Meal allowance of \$60 per person per day.
 - b. If Source Test is not ready when the witnesses arrive or if the Source Test fails, the witnesses will return home with Contractor responsible for reimbursing costs associated with the re-test trip including costs described above plus \$1600 per attendee per day (fixed amount to account for average of billing rates). Contractor is then responsible for rescheduling the Source Test and witnesses' costs associated with the additional trip including costs described above.

7. Contractor is responsible for providing fuel, chemicals, and all other consumables needed for Source Testing.
- C. Owner training:
1. Training instruction format:
 - a. The training for operations and maintenance personnel shall be provided as one entity.
 - b. Instructors shall apply adult education best practices, emphasizing learner participation and activity.
 - c. Training delivery may include problem solving, question/answer, hands-on instruction, practice, evaluation/feedback tools, and lecture.
 - d. Visual aids and hands-on practice sessions shall support training objectives.
 - e. Lecturing should be less than 30 percent of class time.
 - f. Conduct hands-on instruction according to the following descriptions:
 - 1) Present hands-on demonstrations of at least the following tasks:
 - a) Proper start-up, shutdown, and normal and alternative operating strategies.
 - b) Common corrective maintenance repairs for each group.
 - c) Recommended procedures to check/test equipment/system following a corrective maintenance repair.
 - d) Preventative maintenance points.
 - e) Calibration, if applicable.
 - 2) Use tools and equipment provided by manufacturer to conduct the demonstrations.
 - a) Submit requests for supplemental assistance and facilities with the Contractor's proposed lesson plans.
 - 3) Contractor remains responsible for equipment disassembly or assembly during hands-on training situations involving equipment disassembly or assembly by Owner's personnel.
 2. Class agenda:
 - a. Include the following information in the agenda:
 - 1) Instructor name.
 - 2) Listing of subjects to be discussed.
 - 3) Time estimated for each subject.
 - 4) Allocation of time for Owner's personnel to ask questions and discuss the subject matter.
 - 5) List of documentation to be used or provided to support training.
 - b. Owner's Representative may request that particular subjects be emphasized and the agenda be adjusted to accommodate these requests.

- c. Distribute copies of the agenda to each student at the beginning of each training class.
3. Number of students:
 - a. Estimated maximum class size: 12 persons in any one class.
 - 1) Owner's Representative will determine the actual number of students.
 - 2) Owner's Representative will provide an estimated headcount 1 week prior to the class, so that the instructor can provide the correct number of training aids for students.
4. Instructor qualifications:
 - a. Provide instructors completely knowledgeable in the equipment/system for which they are training.
 - b. Provide instructors experienced in conducting classes.
 - c. Provide instructor's technical preparation and instructional technology skills and experience.
 - d. Sales representatives are not qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction.
 - e. If, in the opinion of the Owner's Representative, an appropriately knowledgeable person did not provide the scheduled training, such training shall be rescheduled and repeated with a suitable instructor.
5. Training aids:
 - a. Instructors are encouraged to use audio-visual devices, P&IDs, models, charts, etc. to increase the transfer of knowledge.
 - b. Instructors shall provide such equipment, models, charts, etc. for each class.
 - c. Instructor is responsible for confirming with Owner's Representative in advance of each class that the classroom has or will be appropriate for the types of audiovisual equipment to be employed.
6. Classroom documentation:
 - a. Trainees will keep training materials and documentation after the session.
 - b. Operations and maintenance manuals, as specified in technical Sections:
 - 1) Provide the quantity of final, approved operations and maintenance manuals as specified in Section 01 78 23 - Operations and Maintenance Information for use during the classroom instruction.
 - 2) Owner reserves the right to delay training for a particular equipment item if the operations and maintenance manuals for that equipment are incomplete, inaccurate, or otherwise unsuitable for use by the Owner's personnel.
 - 3) No Contract Time extensions or extra costs will be allowed for training delays due to operations and maintenance manual submittal delays.
 - c. Provide supplemental documentation handouts to support instruction.

- d. Digitally record audio and video of each training session.
 - 1) Include classroom and field instruction with question and answering periods.
 - 2) Owner's Representative approval required for producer of video materials from one of the following options:
 - a) Qualified, professional video production company.
 - b) Contractor demonstrates satisfactory skill.
 - 3) Record in digital format; recording shall become property of the Owner.
 - a) Provide audio quality that is not degraded during the recording of the field sessions due to background noise, space, distance or other factors.
 - 4) Video files shall be file format and delivery medium as directed and approved by Owner's Representative.
 - 5) Provide 2 complete sets of video materials fully indexed and cataloged with printed labels stating session content and dates recorded.
 - 6) The Contractor shall provide a written release from all Claims to the recorded training material produced, if required.
- e. Training modules:
 - 1) Provide a training module for each equipment category.
 - 2) Divide each training module's instructional content into discrete lesson plans.
- f. Lesson plans:
 - 1) Provide performance-based learning objectives.
 - 2) State learning objectives in terms of what the trainees will be able to do at the end of the lesson.
 - 3) Define student conditions of performance and criteria for evaluating instructional success.
 - 4) Instruction lesson plan outlines for each trade.
 - a) Provide specific components and procedures.
 - 5) Minimum requirements:
 - a) Hands-on demonstrations planned for the instructions.
 - b) Cross-reference training aids.
 - c) Planned training strategies such as whiteboard Work, instructor questions, and discussion points or other planned classroom or field strategies.
 - d) Attach handouts cross-referenced by section or topic in the lesson plan.
 - e) Indicate duration of outlined training segments.

- 6) Provide maintenance instruction lesson plans including mechanical, HVAC, instrumentation, and electrical aspects:
 - a) Equipment operation:
 - (2) Describe equipment's operating (process) function and system theory.
 - (3) Describe equipment's fundamental operating principles and dynamics.
 - (4) Identify equipment's mechanical, electrical, and electronic components and features.
 - (5) Identify support equipment associated with the operation of subject equipment.
 - (6) Detail the relationship of each piece of equipment or component to the subsystems, systems, and process.
 - (7) Cite hazards associated with the operations, exposure to chemicals associated with the component, or the waste stream handled by the component.
 - (8) Specify appropriate safety precautions, equipment, and procedures to eliminate, reduce, or overcome hazards.
 - b) Detailed component description:
 - (9) Define Preventative Maintenance (PM) inspection procedures required on equipment in operation, spot potential trouble symptoms (anticipate breakdowns), and forecast maintenance requirements (predictive maintenance).
 - (a) Review preventive maintenance frequency and task analysis table.
 - (10) Identify each component function and describe in detail.
 - (11) Where applicable, group relative components into subsystems.
 - (12) Identify and describe in detail equipment safety features, permissive and controls interlocks.
- 7) Provide the following information in equipment troubleshooting lesson plans:
 - a) Define recommended systematic troubleshooting procedures as they relate to specific craft problems.
 - b) Provide component specific troubleshooting checklists as they relate to specific craft problems.
- 8) Provide the following information in equipment Corrective Maintenance (CM) troubleshooting lesson:
 - a) Describe recommended equipment preparation requirements as they relate to specific craft problems.

- b) Identify and describe the use of any special tools required for maintenance of the equipment as they relate to specific craft problems.
 - c) Describe component removal/installation and disassembly/assembly procedures for specific craft repairs.
 - d) Perform at least 2 hands-on demonstrations of common corrective maintenance repairs.
- (13) Additional demonstrations may be required by the Owner's Representative.
- e) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
7. Class logistics:
- a. Delivery time minimum: 2 hours.
 - b. Delivery time maximum: 4 hours.
 - 1) Longer time requires Owner's Representative approval.
 - c. Class agenda:
 - 1) Refreshment break: One 10-minute break.
 - 2) Meal break: One 45-minute break, unless otherwise specified.
 - 3) Schedule refreshment breaks and meal breaks to meet the class needs and Owner rules.
 - d. Schedule specific sessions:
 - 1) Minimum of 30 days in advance to allow Owner personnel arrangements to take place.
 - 2) At times agreed upon by the Owner's Representative, within the period 7 a.m. to 7 p.m. Monday through Friday.
 - 3) Owner's Representative approval and confirmation required for session schedules.
 - 4) Provide minimum of 2 sessions for each class unless otherwise noted.
 - a) The purpose of having multiple sessions on each class is to accommodate the attendance of as many Owner's personnel working different shifts as possible.
 - e. Coordinate with training sessions from Engineer of Record and others on operation of integrated systems.
8. Distribute Training Evaluation Form following each training session.
- a. Training Evaluation Form is included in this Section.
 - b. Return completed Training Evaluation Forms to Owner's Representative immediately after session is completed.

- c. Revise training sessions judged “Unsatisfactory” by a majority of attendees.
 - 1) Conduct training sessions again until a satisfactory rating is achieved at no additional cost to Owner.

- 9. Submittals:
 - a. Prior to the training session:
 - 1) Instructor qualifications: Due 30 calendar days prior to initial training session.
 - 2) Training course materials: Due 14 calendar days prior to initial training session.
 - a) Training agenda, lesson plan, presentation, and handouts.
 - b) Other audio-visual aids utilized during each training course.
 - c) Format: Submit electronic copy via e-Builder and provide 20 hard copies organized in notebooks at the training sessions.

 - b. Post training session:
 - 1) Training course materials: Due 14 calendar days after class completion.
 - a) Video recordings.
 - b) Class attendance sheet.
 - c) Training agenda, final lesson plan, presentation, and handouts.
 - d) Other audio-visual aids utilized during each training course.
 - e) Provide materials for all sessions of the class in a single transmittal.
 - f) Format: Submit electronic copies.

- 10. The Contractor is advised that additional training of the Owner’s personnel may be provided by Others during the commissioning period. The Contractor shall coordinate timing, content, and other logistics associated with delivery of Contractor-led training with the Owner’s Representative to properly integrate training being provided by Others into the Contractor’s overall commissioning process and schedule.
 - a. The Engineer of Record will train Owner personnel, the Contractor, and other interested parties for a minimum of five (5) Days at the Site on the intended operation of the WTP in advance of commissioning and startup. Contractor shall assume the Engineer of Record’s training will take a minimum of three separate sessions. Engineer of Record will utilize available documentation (Drawings, 3D models, vendor O&M information, control strategies, eO&M, etc.) as training aids. Contractor shall coordinate timing, content, and other logistics with Engineer of Record and Owner’s Representative to properly integrate the Engineer of Record’s training into the overall commissioning process.

D. Installation Testing:

1. Perform subsystem testing according to approved Subsystem Testing Plans.
2. Initiate activities associated with completion of the *Manufacturer's Certificate of Installation and Functionality Compliance* for all equipment (attached at end of Section; due upon completion of Functional Testing).
 - a. Manufacturer's Certificate of Installation and Functionality Compliance form is included in this Section.
 - b. Manufacturer's Certificate of Installation and Functionality Compliance certifies the equipment meets the following requirements:
 - 1) Has been properly installed, adjusted, aligned, and lubricated.
 - 2) Is free of any stresses imposed by connecting piping or anchor bolts.
 - 3) Is able to be operated as necessary for Functional Testing.
 - c. Form shall be submitted after completion of Functional Testing, as specified in this Section.
3. Installation Testing activities include, but are not limited to inspection and field testing activities specified for:
 - a. Cleaning, pressure, and leak testing of building plumbing, yard piping, and process piping;
 - b. Structural non-destructive testing;
 - c. Hydrostatic testing of cast-in-place reinforced concrete structures ;
 - d. Coating holiday testing as specified in the Division 09 coating Specifications.
 - e. Pressure and leakage testing of logical piping segments and connected equipment skids;
 - f. Electrical devices and subsystems, including completion of power system studies, grounding resistance tests, testing of relays and circuit breakers, direct-current high-potential tests on all cables that will operate at more than 2,000 volts, and testing of motor resistance amperage draw for all motors;
 - g. Instrumentation devices and subsystems, including calibration, scaling, setpoints, local circuit wiring out (verification of signal IO to vendor panels) and hard-wired interlocks at the local level plus and similar activities on IO to SCADA to the maximum extent practical; and
 - h. as specified in individual component Sections
4. Perform mechanical equipment Installation Testing for mechanical equipment components and vendor packages shall include activities as specified below and in individual equipment Sections.
 - a. Remove rust preventatives and oils applied to protect equipment during construction.
 - b. Flush lubrication systems and dispose of flushing oils.
 - 1) Recharge lubrication system with lubricant recommended by manufacturer.
 - c. Flush fuel system and provide fuel for testing and start-up.

- d. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace Defective seals. Verify all installed materials are those approved (via submittal) for the intended application with the process fluid.
 - e. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
 - f. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
 - g. Perform cold alignment and hot alignment to manufacturer's tolerances.
 - h. Adjust V-belt tension and variable pitch sheaves.
 - i. Inspect hand and motorized valves for proper adjustment.
 - 1) Tighten packing glands to ensure no leakage but permit valve stems to rotate without galling.
 - 2) Verify valve seats are positioned for proper flow direction.
 - j. Tighten leaking flanges or replace flange gasket.
 - 1) Inspect screwed joints for leakage.
 - k. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to functional testing.
5. Electrical devices and subsystems Installation Testing: As specified below and in the technical Sections.
- a. Perform insulation resistance tests on all wiring except wiring and control wiring inside electrical panels.
 - b. Perform grounding resistance tests on grounding systems.
 - c. Test and set relays and circuit breaker trip units for proper operation.
 - 1) Settings as documented in approved electrical studies performed as specified in Section 26 05 73 – Power System Studies.
 - d. Perform direct-current high-potential tests on all cables that will operate at more than 2,000 volts.
 - e. Motors:
 - 1) Windings energized to 1,000 volts DC for 1 minute.
 - a) Motor resistance measured at the end of the test and recorded.
 - 2) Check motors for actual full-load amperage draw and proper rotation.
6. Heating, ventilating, and air conditioning systems: As specified in Section 23 05 93 - Testing, Adjusting, and Balancing (TAB) for HVAC, and technical Sections.
1. Document all planned Installation Testing activities which could not be completed and/or needs repeating during the Functional Testing phase.
7. Apply all tags and signage to equipment, valves, gates, instrumentation, and exposed process piping prior to initiating Functional Testing.

E. Functional Testing:

1. Perform subsystem and system testing according to approved Functional Testing Plan(s).
2. Perform testing with air or water as appropriate.
3. Notify the Owner's Representative 5 days prior to when the Work is ready for Functional Testing.
 - a. Perform testing in the presence of the Owner's Representative.
4. Determine Functional Testing durations with Owner's Representative's input.
 - a. Durations will vary depending on the complexity and importance of the system. Note that the quantity of water available for testing use may be limited.
 - b. Target minimum Functional Test duration: 8 hours.
 - 1) Identify equipment/system that cannot be tested for a minimum of 8 hours as specified in technical Sections.
5. Perform Functional Testing as specified in technical Sections.
 - a. Perform Functional Testing in addition to the other tests (e.g., performance tests) specified in the technical Sections.
 - b. Demonstrate that the component equipment, subsystem, or system functions cohesively and in accordance with the design requirements.
 - c. Demonstrate equipment/system functions in local manual, local auto, remote manual, and remote auto to verify and document proper functionality in all specified modes.
6. Complete Raw Water System and Transmission System full pipeline pressure testing during this phase.
 - a. Repair or replace parts that operate improperly and retest.
 - b. Contractor shall inspect the raw water transmission pipeline during pressure testing and promptly notify Owner of any issues. Repairs of off-site raw water transmission pipeline and costs for retesting due to failures are excluded from the CM/GC scope of work.
7. Submit testing reports as specified in the individual Sections to the Owner's Representative for approval of Functional Testing reports.
 - a. Document any changes recommended to design setpoints, control algorithms, and interlocks which resulted from Functional Testing.
8. Provide completed *Manufacturer's Certificate of Installation and Functionality Compliance* forms for all supplied equipment and vendor packages.
 - a. Certificate form included at end of this Section.

- b. Manufacturer's signature on the completed certificate certifies that the Manufacturer, or their authorized representative, has directly verified that the installed equipment/system meets the following requirements:
 - 1) Is suitable for satisfactory full-time operation under full-load conditions.
 - 2) Operates within the allowable limits for vibration and noise.
 - 3) Electrical and instrumentation requirements:
 - a) Electrical equipment, instrumentation, and control panels are properly installed, calibrated, and functioning.
 - b) Electrical Installation Testing is complete, and test results have been approved by the Owner's Representative.
 - c) Noted deficiencies have been corrected.
 - d) Relays, circuit breakers, and other protective devices are set.
 - e) Control logic for start-up, shutdown, sequencing, interlocks, control, and emergency shutdown has been tested and is properly functioning.
 - f) Motor control is calibrated and tested.

F. Facility Testing:

1. General:

- a. Goals for Facility Testing are 1) to confirm hydraulics of the plant and installed facilities, and 2) complete acceptance tests for select systems/subsystems/components where said testing could not have been completed during earlier testing phases for physical/chemical reasons (e.g., insufficient flow).
- b. Facility Testing may involve re-circulating water using recycle pumps to return water to the front of the plant.
- c. Do not begin Facility Testing until Owner's Representative has approved submittals documenting that all Functional Testing requirements have been completed.
- d. Testing shall occur for a minimum of 7 days with all systems operational to the maximum extent possible.
- e. Perform testing in the presence of the Owner's Representative unless such presence is expressly waived in writing.
- f. Prior to the Process Start-Up Phase, the Contractors CC shall oversee plant operations.

2. Activities:

- a. Upon approved completion of preparatory activities, charge the plant with water and initiate Facility Testing.
- b. Test entire facility at the design flow for the largest single process or system train to ensure proper hydraulic performance. Measure water surface elevations and headloss through piping and major hydraulic restrictions.
 - 1) Note that process area test flows may be limited by upstream and downstream process constraints (i.e., tank and basin volumes) and/or localized recirculation capabilities.

- c. Operate equipment/subsystems/systems in unison to evaluate performance of interdependent systems to the maximum extent practical to reduce risk during the Process Start-Up Phase.
- d. Conduct remaining specified equipment/system performance tests that could not be performed during the Testing and Training Phase due to inter-system and/or treatment process dependencies.
- e. Confirm component, subsystem and system performance is consistent with Contract Documents once hydraulically integrated into the full treatment plant.
- f. Complete SCADA system testing to the maximum extent possible:
 - 1) Test complete system instrumentation, controls and PLC, HMI, and LOI programming for the facility.
 - 2) Coordinate testing of instrumentation and programming
 - 3) Perform control loop tuning.
 - 4) Document any changes recommended to design setpoints, control algorithms, and interlocks which resulted from Clean Water Facility Testing.
3. Repair or replace parts that operated improperly and retest.
4. Submit testing report as specified in the technical Sections to the Owner's Representative for approval. Identify issues encountered and corrective actions taken.

G. Closeout documentation submittals:

1. Refer to Section 01 77 00 - Closeout for closeout requirements.
2. Provide records generated during Commissioning Phase of Project as Submittals to the Owner's Representative, including but not limited to:
 - a. Training documentation.
 - b. Manufacturer's Certificate of Source Testing.
 - c. Manufacturer's Certificate of Installation and Functionality Compliance.
 - d. Daily logs of equipment/system testing identifying tests conducted and outcome.
 - e. Test forms and documentation.
 - f. Functional Testing results.
 - g. Logs of time spent by manufacturer's representatives performing services on the Site.
 - h. Equipment lubrication records.
 - i. Electrical phase, voltage, and amperage measurements.
 - j. Insulation resistance measurements.
 - k. Bearing temperature measurements.
 - l. Data sheets of control loop testing including testing and calibration of instrumentation devices and setpoints. Format: electronic copies via e-Builder.
 - m. Due date: Prior to Substantial Completion.

1.8 PROCESS START-UP PHASE

A. General:

1. The purpose of this phase is to verify performance of the installed and fully integrated facility meets the Contract Document requirements.

2. After the Water Test the Contractor's CC shall oversee the transition to plant operations. Transition to shall be done in close coordination and under the authority of the Owner's licensed operations staff. The Owner's licensed staff will then operate the facility under a permit issued by the State of New York, to send water to the overflow system outflow. The Contractor's CC shall remain on-site to witness operation and to oversee any testing deferred into this phase.
 3. Owner's Representative has the authority to terminate and/or postpone Process Start-Up Phase testing activities to protect public safety and maintain compliance with the permit.
 4. Perform process start-up in the presence of the Owner's licensed operations staff and Owner's Representative.
 5. Testing activities which were approved for deferral from earlier commissioning phases, if any, shall be completed during this phase and prior to Final Acceptance.
 6. Contractor's schedule for the commissioning phase shall be based upon the Process Startup Phase beginning immediately following the Facility Testing.
- B. Pre-startup Activities and Submittals:
1. Completion of all pipeline filling, disinfection, flushing, and testing activities required to put those systems into full time operation. These activities shall be done by Contractor in close coordination with Owner's licensed distribution system operations staff.
 2. Approval by the Owner's Representative of the Contractor's Process Start-Up Plan Submittal.
 3. Commissioning Documentation and Data Review.
 4. Start-Up Go/No-Go Decision Criteria.
 5. Building and Fire Inspection Compliance Check.
 6. Process Start-Up Sequence Review.
- C. Process Start-Up plan for review by Owner's Representative not less than 120 calendar days prior to planned commencement of process start-up activities. Include the following information in the Process:
1. Pre-start-up activities.
 2. Process Start-Up.
 3. Process Operational Period.
 4. Instrumentation and Controls Fine-Tuning.
 5. Description of Temporary Testing Arrangement, if applicable.
 6. Final Process Start-Up Forms and Documentations.
 7. Final Operational Testing Plan.
- D. Process area start-ups.
1. Process start-up individual process areas comprised of multiple interdependent systems where possible and beneficial to reduce complexity and risk of complete facility testing.
 2. Process area test flows may be limited by upstream and downstream process constraints (i.e., tank and basin volumes) and/or localized recirculation capabilities.

E. Facility-wide process start-up.

1. Upon approved completion of pre-start-up activities, perform entire facility process start-up.
 - a. Complete control loop tuning during this phase of process start-up.
 - b. Continue process start-up operations until facility meets or exceeds the Contract requirements.
2. Process control systems testing:
 - a. IO verification and control loop tuning should have been performed with water to the maximum extent possible prior to Process Start-Up. During this phase, the plant will be operating with chemicals and other process fluids as per design intent of a fully operational and integrated treatment facility.
 - b. Re-calibrate instruments where appropriate (e.g., where specific gravity, temperature, viscosity, etc. of the process fluid or true operational conditions differs from that of clean water used in testing during earlier phases). Verify ranges and setpoints for all instruments where such changes are made.
 - c. Complete any remaining open controls testing activities.
 - d. Test complete system instrumentation, controls and PLC, HMI, and LOI programming for the facility. Coordinate testing of instrumentation and programming.
3. HVAC systems start-up and testing:
 - a. Test complete HVAC system for the facility.
4. Ancillary systems start-up and testing:
 - a. Test complete security system, phone system, fire alarm system, etc. for the facility.
5. Remaining equipment/system tests:
 - a. Conduct remaining specified equipment/system performance tests that could not be performed during the Testing and Training Phase due to inter-system and/or treatment process dependencies (e.g., dewatering performance testing once process solids are available).

F. Process Start-Up Phase:

1. Duration: 30 calendar days.
2. Owner's Representative will be present for this phase.
3. Contractor to provide:
 - a. Contractor's CC to support the Owner's licensed operating staff during the Process Start-Up Phase.
 - b. Specified start-up materials and operating supplies.
 - c. Necessary craft of labor assistance, in the event of an emergency equipment failure requiring immediate attention (emergency is defined as a failure of

- function which precludes the further operation of a critical segment of or the whole of the Work) with a response time of not more than 4 hours from the time of notification.
- d. Manufacturer's authorized representative to supervise placing equipment/systems in operation and provide guidance during operational testing per applicable Section.
 - e. Necessary manufacturer's representatives and operating supplies for retesting systems that fail to pass the initial operational testing due to deficiencies in products of workmanship at no additional cost to the Owner.
 - f. List of 24-hour "on-call" representative supervisory persons who will monitor the operational testing and serve as liaison for the Owner's Representative.
 - g. Contractor shall be responsible for the additional cost of power, water, chemicals, and diesel fuel for the standby generator if failed testing requires re-testing which extends the duration of the Process Start-Up Phase beyond 30 days.
4. Owner will provide:
 - a. Operations personnel for duration of Process Start-Up Phase.
 - b. Power and water to be used over a maximum of 30-day duration during the Process Start-Up Phase. However, Contractor shall be responsible for additional costs if failed testing requires re-testing which extends the duration of the Process Start-Up Phase beyond 30 days.
 5. Execute planned Process Start-Up Phase activities in accordance with the approved Process Start-Up Testing Plan submittal.
 6. Conduct remaining specified equipment/system performance tests that could not be otherwise be performed during earlier commissioning phases due to inter-system and/or treatment process dependencies (e.g., mechanical dewatering system).
 7. Complete deferred/open control loop tuning and control systems testing and integration optimization activities.
 8. Demonstrate facility operates in conformance with Contract Document requirements.
 - a. Owner's personnel shall operate any systems used for any water produced to be distributed or used by customers.
 - b. Entire system shall continuously meet performance requirements and shall operate without fault, failure, or defect for a continuous period for the duration of the Process Start-Up Phase.
 - c. Individual equipment/system failures that are corrected within 24 hours and do not prevent the entire Project from continuously satisfying the established operational requirements shall not require the consecutive day test to be restarted unless the failure re-occurs.
 - d. Restart the consecutive test period for any of the following conditions:
 - 1) Any failure of the complete Project construction to meet operational requirements.
 - 2) When malfunctions or deficiencies cause shutdown or partial operation of the facility, or results in failure of the complete Project construction to meet operational requirements.

- 3) Any individual equipment/system failure that meets any of the following conditions:
 - a) Requires more than 24 hours to correct.
 - b) Recurs within the 24-hour correction period requiring further correction.
- e. Immediately correct defects in material, workmanship, or equipment/system which became evident during Process Start-Up Phase.

1.9 INSTRUMENTATION AND CONTROLS FINE-TUNING

A. General:

1. Duration: 90 calendar days total including 30 days during Process Start-up followed by another 60 days after the end of the Process Start-Up Phase.
2. Work to be performed and coordinated by Owner's vendor.

B. Activities and Submittals:

1. Complete instrumentation and automated controls system testing as specified in the Contract Documents to identify issues, make corrections, and fine tune control systems and optimize SCADA system, as needed.
2. Document all final setpoints and changes to control algorithms and interlocks via submittal.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 408000

MANUFACTURER'S CERTIFICATE OF SOURCE TESTING

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

Comments: _____

I hereby certify Source Testing has been performed on the above-referenced equipment/system as defined in the Contract Documents, and results conform to the Contract Document requirements. Testing data is attached.

Date of Execution: _____, 20____

Manufacturer: _____

Manufacturer's Authorized Representative Name (print): _____

(Authorized Signature)

If applicable, Witness Name (print): _____

(Witness Signature)

MANUFACTURER'S CERTIFICATE OF
INSTALLATION AND FUNCTIONALITY COMPLIANCE

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

I hereby certify that the above-referenced equipment/system has been: (Check Applicable)

- Installed in accordance with manufacturer's recommendations.
- Inspected, checked, and adjusted.
- Serviced with proper initial lubricants.
- Electrical/instrumentation and mechanical connections meet quality and safety standards.
- All applicable safety equipment has been properly installed.
- Functionally tested.
- System has been performance tested and meets or exceeds specified performance requirements.

NOTES:

Attach test results with collected data and test report.

Attach written certification report prepared by and signed by the electrical and/or instrumentation Subcontractor.

Comments: _____

I, the undersigned manufacturer's representative, hereby certify that I am (i) *a duly authorized representative of the manufacturer*, (ii) *empowered by the manufacturer to inspect, approve, and operate this equipment/system*, and (iii) *authorized to make recommendations required to ensure that the equipment/system furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.*

Date: _____, 20 _____

Manufacturer: _____

Manufacturer's Authorized Representative Name (print): _____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

COMMISSIONING

TRAINING EVALUATION FORM

EQUIPMENT/SYSTEM ITEM: _____

VENDOR/MANUFACTURER: _____

DATE: _____ NAME OF REPRESENTATIVE: _____

- | | | | | |
|--|------------|--------------|----|-----|
| 1. Was representative prepared? | Acceptable | Unacceptable | or | N/A |
| 2. Was an overview description presented? | Acceptable | Unacceptable | or | N/A |
| 3. Were specific details presented for system components? | Acceptable | Unacceptable | or | N/A |
| 4. Were alarm and shutdown conditions clearly presented? | Acceptable | Unacceptable | or | N/A |
| 5. Were step-by-step procedures for starting, stopping, and troubleshooting presented? | Acceptable | Unacceptable | or | N/A |
| 6. Were routine/preventative maintenance items clearly identified? | Acceptable | Unacceptable | or | N/A |
| 7. Was the lubrication schedule (if any) discussed? | Acceptable | Unacceptable | or | N/A |
| 8. Was the representative able to answer all questions? | Acceptable | Unacceptable | or | N/A |
| 9. Did the representative agree to research and answer unanswered questions? | Acceptable | Unacceptable | or | N/A |
| 10. Comments: _____ | | | | |

11. Overall Rating: _____ Satisfactory _____ Unsatisfactory _____

Note:

Sessions judged “Unsatisfactory” by a majority of attendees shall be revised and conducted again until a satisfactory rating is achieved.

COMMISSIONING ROLES AND RESPONSIBILITIES MATRIX

NO.	TASK	OWNER'S REPRESENTATIVE	CONTRACTOR	ENGINEER OF RECORD
Testing and Training Phase				
Source Testing				
1	Source Testing	Witness	Lead	Witness, Review
Installation Testing				
2	Electrical Conductor Testing	Witness	Lead	Witness
3	Electrical Field Acceptance Tests	Witness	Lead	Witness
4	Instrument Field Calibration	Witness	Lead	Witness
5	Network Installation Testing	Witness	Lead	Witness
6	Loop Testing	Witness	Lead	Witness
7	Pressure Testing	Witness	Lead	Witness
8	Leak Testing	Witness	Lead	Witness
9	Holiday Testing	Witness	Lead	Witness
10	HVAC Testing	Witness	Lead	Witness
11	Motor Electrical Testing	Witness	Lead	Witness
Functional Testing				
12	Network Operational Testing	Witness	Lead	Review
13	Preliminary Run Testing Local/Manual Control	Witness	Lead	Review
14	SCADA Functional Testing - Local/Remote/Manual/Auto Control Testing - Alarm Testing - Interlock Testing - Control Loop Testing	Witness	Lead	Review
15	Subsystem Start-Up and Testing	Witness	Lead	Review
16	Equipment/System Start-Up and Testing	Witness	Lead	Review
17	HVAC Start-Up and Testing	Witness	Lead	Review
18	Corrosion Control Start-Up and Testing	Witness	Lead	Review
19	Wide Area Network Communications Testing	Witness	Lead	Witness

NO.	TASK	OWNER'S REPRESENTATIVE	CONTRACTOR	ENGINEER OF RECORD
Testing and Training Phase				
20	Manufacturer's Certificate of Installation and Functionality Compliance	Witness	Lead	Witness, Review
Clean Water Facility Testing				
21	Test Water Management Plan Finalization	Support	Lead	Review
22	Clean Water Facility Testing	Witness	Lead	Witness, Review
Process Start-Up Phase				
Process Start-Up				
23	Commissioning Documentation and Data Review	Review	Support	Lead
24	Start-Up Go/No-Go Decision Criteria	Lead	Support	Review
25	Building and Fire Inspection Compliance Check	No Action	Lead	Witness
26	HVAC Functionality Check	Witness	Lead	Review
27	Start-Up Sequence Review	Support	Lead	Review
28	Temporary Testing Arrangement Finalization	Support	Lead	Support
29	Start-Up Forms Finalization	Support	Lead	Support
30	Operation Testing Plan Finalization	Review	Lead	Review
31	Test Water Management Plan Finalization	Support	Lead	Review
32	System Testing	Support	Lead	Witness
33	Control Loop Tuning	Support	Lead	Witness
34	Process Area Start-Ups	Support	Lead	Witness
35	Facility-Wide Start-Up	Support	Lead	Witness
36	Process Control Systems Testing	Support	Lead	Witness
38	HVAC Final Testing, Adjust, and Balancing	Witness	Lead	Witness, Review
Process Start-Up Phase				
39	Operational Testing	Lead	Support	Witness, Review

NO.	TASK	OWNER'S REPRESENTATIVE	CONTRACTOR	ENGINEER OF RECORD
Testing and Training Phase				
40	Final Testing Reports	Review	Lead	Review
41	Water Quality Testing and Documentation	Lead	Support, Review	Review
Instrumentation and Controls Reliability Phase				
Instrumentation and Controls Reliability Period				
42	By Owner	Lead	Support	Witness, Review
<p><u>Legend:</u></p> <p>Lead: Primarily responsible for organization, coordination, and execution of task Work product or result.</p> <p>Support: Assist the lead with organization, coordination, and execution of task work product or result.</p> <p>Witness: Observe and document completion of task Work product or result.</p> <p>Review: As necessary to accept task Work product result.</p> <p>No Action: Limited or no involvement.</p>				

SECTION 412223.19 - MONORAIL HOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manually powered monorail hoists and components, with chain hoists.
 - 2. Monorail system; including monorail runway, supplementary framing, support members and anchorage to building.
- B. Related Requirements:
 - 1. Section 099100 "Painting" for exposed piping and repair of damaged coatings.
 - 2. Section 055000 "Metal Fabrications" for connections to building structure.
 - 3. Section 262923.25 "Variable Frequency Motor Controllers Industrial" for drives for electric motors supplied.

1.3 DEFINITIONS

- A. Hoist: Motor or manual powered hoist with load hook to raise and lower a freely suspended load. Hook supported by one or more wire rope strands that reel from a drum mounted on hoist, or by one or more strands of metal chain. Standard headroom or close headroom construction.
- B. Pendant: A hand-operated controller that hangs from the electric motor-powered hoist by a cable.
- C. Trolley-Mounted Hoist: An assembly consisting of a wheeled trolley that moves along the runway and a hoist suspended from the trolley that provides for the raising and lowering of a freely suspended load.
- D. Runway: The track and support system upon which the crane travels.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer catalog information for each hoist, trolley, runway, and support system, including materials, weights, dimensions, capacities, and accessories.
 - 2. Equipment data sheets for hoist selection indicating capacity, lift distance, lift speed, motor data, weight, dimensions, and materials of construction.

3. Equipment data sheets for trolley selection indicating capacity, speed, motor data, dimensions, weight, and materials of construction.
4. Manufacturer data sheets for electrification and controls.
5. List of manufacturer's recommended spare parts.

B. Shop Drawings:

1. Indicate monorail and runway capacities, hook envelope, equipment dimensions, and hoist limits.
2. Indicate runway, trolley, hoist, motors, controls, power cabling and mounting details.
3. Indicate arrangement of runway, including curves and switches, clearances, principal dimensions, details of structural connections, and components.
4. Indicate control panel layout, including wiring diagrams, system schematics.
5. Details for connection of the monorail and runway supports to the building, and vertical and horizontal reactions imposed on the building system.
6. Supplementary framing as required to stabilize and support the monorail runway for longitudinal, transverse lateral and vertical forces, including impact.
7. Detailed bill of materials of monorail system components.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- B. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.
- C. Test and Evaluation Reports: Indicate crane certification documentation.
- D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- G. Qualifications Statements:
 1. Submit qualifications for manufacturer, installer, and licensed professional.
 2. Submit manufacturer's approval of installer.
 3. Welders: Submit qualification procedures and personnel qualifications according to AWS D14.1/D14.1M.

1.6 DELEGATED DESIGN SUBMITTALS

- A. Delegated Design Certification: As required by Division 00 and Division 01.
- B. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for sizing of runways, connections and supports. Provide all runway reactions to support framing and clarify if it includes load factors and all impact loading. Sign and seal shall be by a professional engineer registered in New York State.

- C. After the monorail systems have been installed and accepted, submit structural design calculations for the monorail system for record purposes only. Demonstrate compliance with the performance criteria specified herein. Calculations shall be prepared, stamped, and signed by a professional engineer registered in New York State. Calculations will not be reviewed by the Engineer.

1.7 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual layout and dimensioning of monorail systems.
- B. Operation and Maintenance Data:
 - 1. Submit assembly views.
 - 2. Submit list of manufacturer's recommended spare parts including part numbers and availability.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts:
 - 1. Furnish following spare parts for each monorail hoist:
 - a. One complete set of linings for each type and size of brake.
 - b. **Not used – Removed in Addendum #2.**
 - c. One chain of specified length, with end fittings.
 - d. One spare festoon cable.
 - e. One NiCad battery with battery charger.

1.9 QUALITY ASSURANCE

- A. Design and Fabrication: Comply with AISC 325, ASME B30.11, ASME B30.16 ASME HST-1, MH27.1, and OSHA 1910.179.
- B. Construction: Comply with ASME NUM-1, ASME B30.17 and OSHA 29 CFR 1926, Subpart N.
- C. Welding: Comply with AWS D14.1/D14.1M.
- D. All components to be UL listed where UL listed components are available.

1.10 QUALIFICATIONS

- A. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

- B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by manufacturer.
- C. Welders: AWS qualified within previous 12 months for employed weld types.
- D. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of New York.
- E. Structural design shall be performed by a qualified Professional Engineer registered in New York.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store materials according to manufacturer instructions.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.12 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.13 WARRANTY

- A. Furnish five-year manufacturer's warranty for monorail hoists.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Comply with CMAA 74, AISC 325 Steel Construction Manual.
- B. Service: Indoor. Class I, Division 2, Group D.
- C. Duty Class: ANSI MH27.1, A: Standby or infrequent service.
- D. Capacity: 4 tons.

- E. Provide manufacturer installed identification plates of non-corrosive metal showing the manufacturer's name, model number, capacity, power supply, and other essential information. Label the monorail with capacity, legible from the floor on both sides of the beam.
- F. Runway and Supports: Existing to be reused.
- G. Bearings:
 - 1. Type: Antifriction ball, ABMA 9 or roller, ABMA 11.
 - 2. L-10 Life: 5,000 hours.
- H. Motor:
 - 1. Hoist: 4.7 hp, 8.3 amps
 - 2. Trolley: 1.0 hp, 2.7 amps.

2.2 CONTROLS

- A. Control Panel:
 - 1. Factory mounted.
 - 2. NEMA 250 Type 4X,.
 - 3. Single-point power connection and grounding lug.
- B. Controls:
 - 1. Controls to permit inching in both directions under full load, automatically regulated accelerations, and rapid brake response.
 - 2. Pendant Push-Button Station:
 - a. Hanging from crane structure to minimum 3 feet above operating floor.
 - b. Comply with NEMA ICS 8.
 - c. Furnish mounting bracket on hoist to stow pendant when not in use.
 - d. Push Buttons: RAISE; LOWER; FORWARD, REVERSE.
 - e. Pendant cable reel suspension: Adjustable, self-holding in last position.
 - f. NEMA 250 Type 4X, fiberglass reinforced plastic.
 - g. Remote Radio Control for hoist and trolley.
 - 3. Limit Switches:
 - a. Comply with NEMA ICS 2.
 - b. Wire Rope Hoists: Adjustable upper, lower, and secondary, independently wired, upper switch.
 - c. Chain Hoists: Limit stops to prevent overtravel in both raising and lowering directions.
 - d. Trolley stop limit switch control at each terminus of runaway.
 - 4. Overload Cutoff:
 - a. Prevent hoist from applying pull that would exceed rated hoist load.

- b. De-energize raising circuit to hoist motor and reset automatically when overload is removed.
 - c. Comply with NEMA ICS 2.
- 5. Operation Sequences: Adjustable, mechanical stops to limit lift height.
- 6. Hoist Control:
 - a. Pendant Control for hoist and trolley.
 - b. Suspended from hoist.
 - c. Fixed elevation above operating floor: 3 feet.
- C. Disconnect Switch: Readily accessible from operating floor.
- D. Safety Signs: Comply with NEMA 535.

2.3 MOTOR-OPERATED MONORAIL HOISTS

- A. Manufacturers:
 - 1. Harrington Hoists, Inc.,
 - 2. Ingersoll-Rand,
 - 3. Spanco Inc.,
 - 4. Coffing Hoists.
- B. Hoists General:
 - 1. Comply with ASME HST-1, Class H3 for hoist.
 - 2. Drive: Direct-coupled motor.
 - 3. Brakes: Solenoid type.
 - 4. **Not used – removed in Addendum #2.**
 - 5. Sheaves (Pulley): Steel.
- C. Main Hoist and Trolley:
 - 1. Headroom: Standard
 - 2. Hoist Duty Class: H1
 - 3. Reeving: Single
 - 4. Chains:
 - a. Comply with ASME HST-1.
 - b. Type: Roller, Stainless Steel Type 316.
 - c. Accessories:
 - 1) Storage bucket for chain hoists with 10-foot (3-m) or greater lift.
 - 2) Chain guides.
 - 5. Hoist Suspension: Trolley.
 - 6. Hoist Capacity: 4 tons.
 - 7. Hoist Lift Distance: 16 feet
 - 8. Hoist maximum allowable headroom: 16 feet.

9. Hoist Lifting Speed: Two 11/2 fpm.
10. Hoist Motor: TEFC, variable speed.
11. Hoist Motor Power: 4.7 hp.
12. Trolley Type: Integral to hoist.
13. Trolley Drive: Electric; See article below.
14. Trolley Speed: Two 80/13 fpm .
15. Trolley Motor: TEFC, variable speed.
16. Trolley Drive Power: 1 hp.

D. Electrification:

1. Provide junction box to connect power feeder from disconnect switch (by Division 26).
2. Festoon System:
 - a. Neoprene-jacketed, multi-conductor flat cables with separate control and power conductors.
 - b. Suspend cables from trolleys mounted on heavy-duty C-track parallel to monorail runway.
 - c. Construction: Non-sparking.
 - d. Cables:
 - 1) Manufacturers: Gleason Reel Div. Maysteel Products, Aero-Motive Mfg., Dresser Industries, or equal.
 - 2) Description: UL-listed flat cables.
 - 3) Minimum Rating: 85 A at 40 degrees C.
 - 4) Length: 110 percent of required length.
 - 5) Minimum Size: No. 12.
 - 6) Type: Stranded.
 - e. Festoon supporting trolleys:
 - 1) Furnish towing and manufacturer's standard trolleys.
 - 2) Tow Cables:
 - a) Material: Stainless steel.
 - b) Furnish strain-relief cable between first trolley and adjacent wall.
 - f. Festoon Runway (C-Track):
 - 1) Material: Type 316 stainless steel.
 - 2) Furnish polyamide tow rope assembly for trolley spacing.
 - 3) End Clamps: Furnish fixed end clamps with outrigger arms to support from monorail runway.

E. Accessories:

1. Assembly and Mounting Hardware: Type 316 stainless steel.

2.4 FINISHES

A. Factory Coating:

1. Apply factory finish paint or coatings to all exposed component surfaces.
2. Apply rust inhibitive coatings to all ferrous surfaces not designated to be painted.
3. Factory surface preparation, priming, and painting to be manufacturer's standard and as specified in Division 9.
4. Finish coat colors to conform to industry standard. Submit color selections as offered.

2.5 ACCESSORIES

A. Mounting Hardware: Type 316 stainless steel.

B. Hooks:

1. Comply with ASME B30.10.
2. Material: Stainless steel.
3. Bearing: Anti-friction type, allowing 360-degree rotation of load.
4. Furnish spring-loaded safety latch.
5. Furnish nuts keyed to hook shanks by setscrew.
6. Sheaves:
 - a. Material: Forged steel.
 - b. Bearings: Permanently lubricated roller type; ABMA 11.
 - c. Minimum Diameter: 20 times rope diameter.

2.6 SOURCE QUALITY CONTROL

A. Testing:

1. Proof-test load chains with load equivalent to at least 150 percent of rated load of hoist, divided by number of chain parts supporting load.

B. Perform shop inspection and testing of completed assembly and submit shop test record.

C. Owner Inspection:

1. Make completed hoist assembly available for inspection at manufacturer's factory prior to packaging for shipment.
2. Notify Owner at least seven days before inspection is allowed.

D. Owner Witnessing:

1. Allow witnessing of factory inspections and test at manufacturer's test facility.
2. Notify Owner at least seven days before inspections and tests are scheduled.

E. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field dimensions are as indicated on Shop Drawings.
- B. Verify that items provided by other Sections of Work are ready to receive Work of this Section.

3.2 INSTALLATION

- A. According to manufacturer instructions and as indicated on Drawings.
- B. Comply with ASME B30.11, ASME B30.16, ASME B30.17,, and OSHA 1910.179.

3.3 FIELD QUALITY CONTROL

- A. Inspection: Check hoist and motors for excessive vibration and noise.
- B. Testing:
 1. Operate hoist through complete lift and lowering cycle.
 2. Verify that hoist, trolley, and controls operate as required.
 3. Verify that limit switches operate as required.
 4. Verify that pendant cable length is sufficient to permit operation from desired floor levels.
 5. Test Load Certification:
 - a. Comply with OSHA 1919.71.
 - b. Test in presence of Engineer.
- C. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than four hours on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in operation and maintenance of equipment.
- D. Equipment Acceptance:
 1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
 2. Make final adjustments to equipment under direction of manufacturer's representative.
- E. Repair damaged coatings with material equal to the original coating as specified in Section 099100 "Painting".

3.4 ADJUSTING

- A. Field-calibrate local controls and indicators.

3.5 DEMONSTRATION

- A. Demonstrate hoist operation, routine maintenance, and emergency repair procedures to Owner's personnel.

3.6 ATTACHMENTS

- A. Monorail Hoist Schedule:

- 1. MH-1:

- a. Location: Main Pump Station.
 - b. Use: To lift pumps and valves for occasional maintenance.
 - c. Type: Electric.
 - d. Hoist: Chain.
 - e. Capacity: 4 tons
 - f. Lift Height: 16 feet
 - g. Motor Hp: 4.7
 - h. Voltage: 460.

END OF SECTION 412223.19

ACTUATORS

Table with 2 columns: SYMBOL, FEATURE. Includes SOLENOID OPERATOR, HAND WHEEL, MOTOR OPERATOR.

FITTINGS

Table with 2 columns: SYMBOL, FEATURE. Includes QUICK CONNECT COUPLING, CONCENTRIC REDUCER, ECCENTRIC REDUCER, DRESSER TYPE CPLG, UNION, FLEXIBLE HOSE COUPLE, HOSE COUPLING.

VALVES & APPURTENCES

Table with 2 columns: SYMBOL, FEATURE. Includes GATE VALVE, PLUG VALVE, SWING CHECK VALVE, BALL VALVE, KNIFE GATE VALVE, SOLENOID VALVE, RPZ ASSEMBLY, KNIFE GATE VALVE WITH CHAIN WHEEL OPERATOR, FLOW METER.

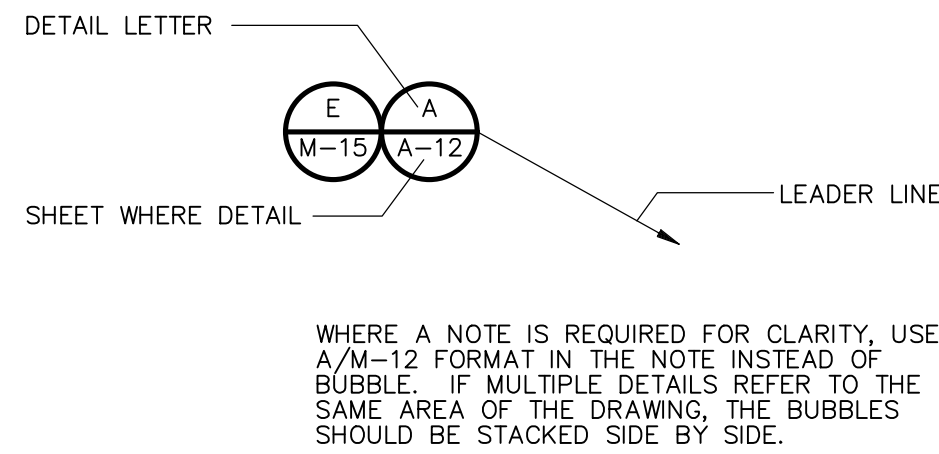
ABBREVIATIONS

Large table of abbreviations with columns for acronym, full name, and unit. Includes AS ORDERED BY ENGINEER, AMERICAN SOCIETY FOR TESTING MATERIALS, AERATION TANK, etc.

PROCESS FLOW STREAMS & ABBREVIATIONS

Table with 2 columns: SYMBOL, FEATURE. Includes DRAIN, DIGESTED GAS, DIGESTED SLUDGE, EFFLUENT DISCHARGE WATER, FINAL EFFLUENT, FILTRATE, FILTRATE PUMP STATION EFFLUENT, GRAVITY THICKENER OVERFLOW, HIGH STRENGTH ORGSNIC WASTE, HIGH STRENGTH WASTE, HOT WATER RETURN, INFLUENT, LEACHATE TRANSFER EFFLUENT, LEACHATE TRANSFER INFLUENT, NEW PLANT WATER, OLD PLANT WATER, OVERFLOW, PRIMARY EFFLUENT, PRIMARY INFLUENT, PLANT SEWER, PLANT SEWER DRAIN, PLANT SEWER RETURN, PRIMARY SLUDGE, RETURN ACTIVATED SLUDGE, RESIDUAL CHLORINE SAMPLE, RESIDUAL CHLORINE SAMPLE, SODIUM BISULFITE, SCUM, STORM DRAIN, SODIUM HYPOCHLORITE, SANITARY SEWER, SECONDARY SLUDGE, TEPID HOT WATER, THICKENED SLUDGE, UNDERGROUND ELECTRIC, POTABLE WATER, WASTE ACTIVATED SLUDGE, WASH WATER.

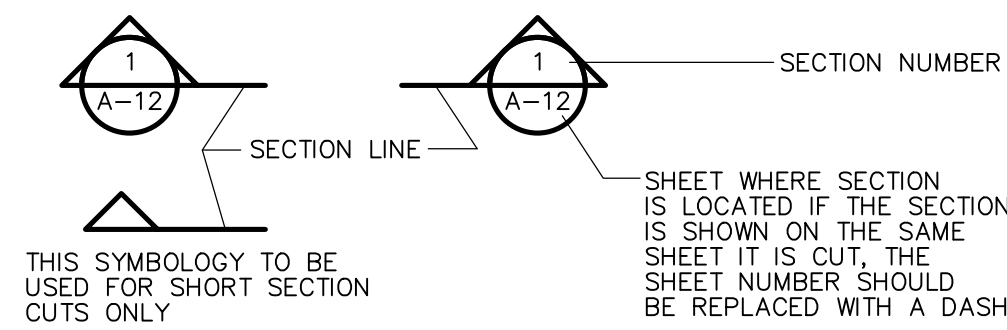
DETAIL CALL OUT SYMBOLS



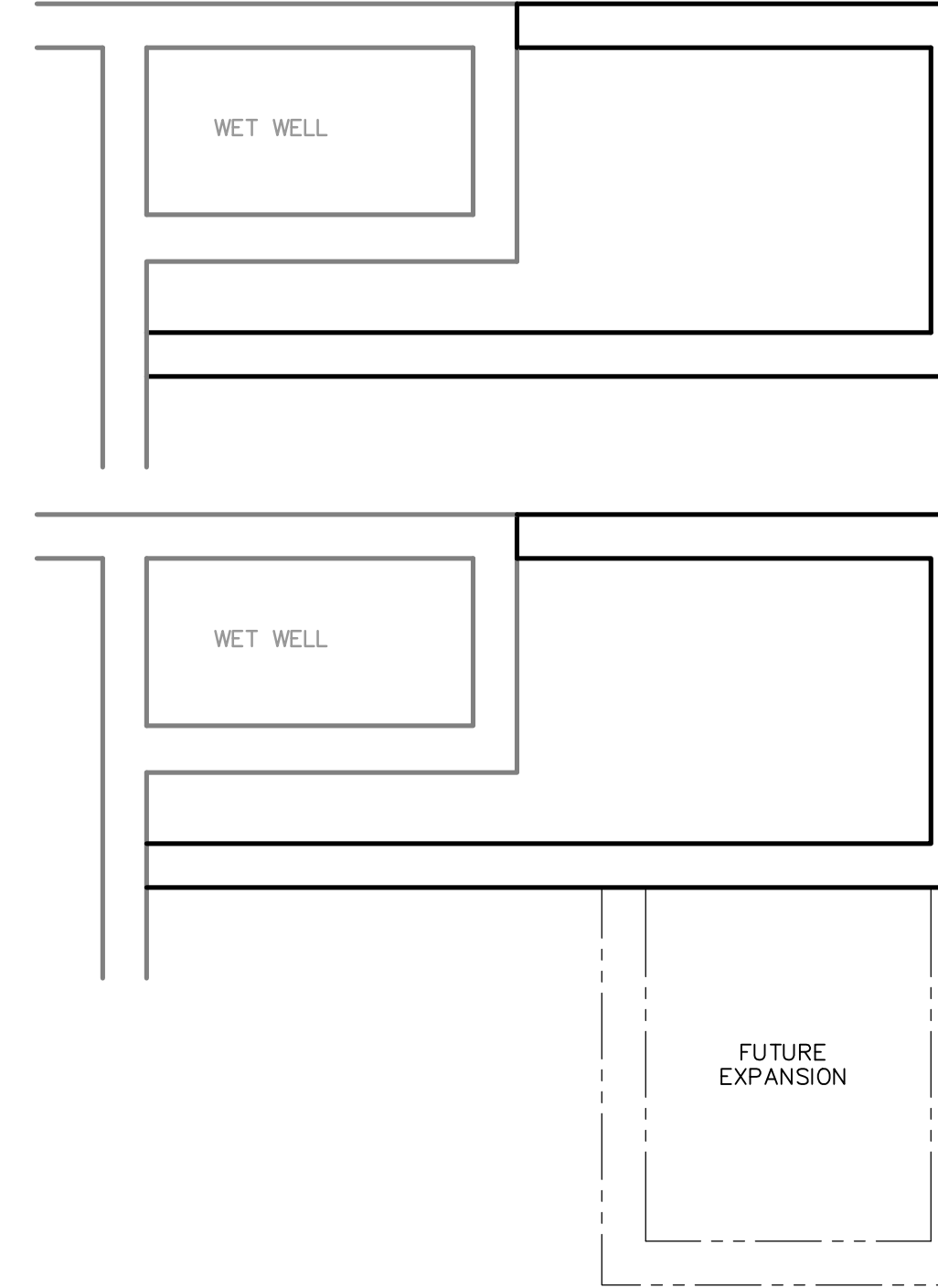
TIE POINT SYMBOL



SECTION CUT SYMBOLS



EXISTING OR FUTURE CONDITION DESIGNATION



DRAWING, SECTION AND DETAIL TITLES

SUBTITLE OR DESCRIPTION (AS REQ'D)

PLAN 1/4" = 1'-0"

SUBTITLE OR DESCRIPTION (AS REQ'D)

ELEVATION 1/4" = 1'-0"

SECTION 3/4" = 1'-0" SECTION NUMBER 1 SHEET WHERE SECTION CUT IS TAKEN * 5-6

DETAIL 3/4" = 1'-0" DETAIL LETTER A SHEET WHERE DETAIL IS TAKEN * A-3

SCHEMATIC 3/4" = 1'-0" SCHEMATIC NUMBER 1 SHEET WHERE SCHEMATIC IS TAKEN * M-6

DIAGRAM 3/4" = 1'-0" DIAGRAM NUMBER 1 SHEET WHERE DIAGRAM IS TAKEN * I-6

* IF SECTION, DETAIL, SCHEMATIC OR DIAGRAM IS DRAWN ON THE SAME SHEET THAT IT IS TAKEN FROM, REPLACE THE SHEET NUMBER WITH A HYPHEN. IF THE SECTION IS REFERENCED ON MULTIPLE SHEETS, THE SHEET NUMBER SHOWN SHOULD INDICATE THE FIRST SHEET THE SECTION IS TAKEN FROM.

Valve Schedule table with columns: Page, Valve Number, Valve Type, Valve Type Description, Size, Service, Material, Joint Type, Operator, Power, Control. Includes valves like PV, GV, SCV, KNV, ARV, PNV, DBCV.

VALVE SCHEDULE

Table with System Design Conditions and Piping columns. Includes columns for Page, SYSTEM, TEMP, WORKING PRESSURE, MATERIAL, DIAMETER, SCH/CLASS, LINING, COATING, JOINT TYPE, INSULATION, TEST PRESSURE, MEDIUM, TEST DURATION.

PIPE SCHEDULE

CIVIL SYMBOLS LEGEND

Table of civil symbols including LIGHT POLE, UTILITY POLE, HYDRANT, VALVE, TEST PIT, LIGHT POLE, UNDERGROUND ELECTRIC, UNDERGROUND GAS, WATER LINE, NON POTABLE WATER LINE, GAS RISER, OVERHEAD WIRE, CHLORINE LINE, INDEX CONTOUR, INTERMEDIATE CONTOUR, DEMOLITION, DUCT BANK, MAPLE TREE, OTHER FENCE, ELECTRIC MANHOLE, SANITARY SEWER MANHOLE, CATCH BASIN, ROUND CATCH BASIN, STORM SEWER MANHOLE, TRAFFIC HAND HOLE, HYDRANT, WATER SERVICE.

Vertical text on the left margin: XREFS: [CDMS_2234] Images: [HAINESRW Time: 1/3/2025 7:54:16 AM Last saved by: HAINESRW Time: 1/3/2025 7:54:16 AM pw:\cdm\smith-0202-pw.bentley.com\pw_ext\21984\276880\04 Design Services NM_10% 01 General\10 CADD\GSY00001.dwg ©2024 CDM SMITH ALL RIGHTS RESERVED. REUSE OF DOCUMENTS: THESE DOCUMENTS AND DESIGNS PROVIDED BY PROFESSIONAL SERVICE, INCORPORATED HEREIN, ARE THE PROPERTY OF CDM SMITH AND ARE NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

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CROSS CHK'D BY: M. MCCOSKEY
APPROVED BY: G. BOLD
DATE: NOVEMBER 2024



CITY OF ROME
ONEIDA COUNTY, NEW YORK
WATER RESOURCE RECOVERY
FACILITY IMPROVEMENTS

LEGEND, ABBREVIATIONS AND SYMBOLS



WARNING: THIS IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2 OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR TO ALTER IN ANY WAY PLANS, SPECIFICATIONS, PLATES OR REPORTS TO WHICH THE SEAL OF A PROFESSIONAL ENGINEER OR LAND SURVEYOR HAS BEEN ATTACHED.

PROJECT NO. 21984-276880
FILE NAME: GSY00001

SHEET NO.

G-1

BID SET - FOR CONSTRUCTION