11 North Water St.
Suite 10290, Office 1080
Mobile AL, 36602

www.GarverUSA.com

ADDENDUM NO. 1

Date:	**January 23, 2026**
Project Name:	**MAWSS Stickney WTP Solids Upgrades**
Owner:	**Mobile Area Water and Sewer System**
Garver Project No.	**W10-2401551**

This addendum shall be a part of the Plans, Contract Documents and Specifications to the same extent as though it were originally included therein, and it shall supersede anything contained in the Plans, Contract Documents, and Specifications with which it might conflict. This addendum, including all attachments, shall become part of the Contract and all provisions of the Contract shall apply thereto, with exception of any items listed under "Other Project Information" at the end of this Addendum No. 1, which are supplements provided for the Contractor's convenience. The time provided for completion of the Contract has not been changed as noted in this addendum. Acknowledgement of receipt of this addendum must be noted in the appropriate section of the Proposal and included with the Contract Documents.

A. PART 1 – CONTRACT DOCUMENTS
   1. Remove the following Part 1 sections in their entirety and replace with the same, attached hereto:
      a. Proposal

B. PART 3 - TECHNICAL SPECIFICATIONS
   1. Add the following specification sections to the Contract Documents, attached hereto:
      a. 40 61 13 – Process Control System General Provisions
      b. 40 70 00 – Instrumentation for Process Systems
      c. 41 22 23.19 – Manual Trolley Hoist

   2. Remove the following specification sections in their entirety and replace with the same, attached hereto:
      a. 01 20 00 Price and Payment Procedures
      b. 09 96 00 High Performance Coatings and associated data sheet
      c. 46 43 21.16 Clarifier Mechanism

C. DRAWINGS
   1. No items for Drawings are included in this addendum.

D. STANDARD DETAILS

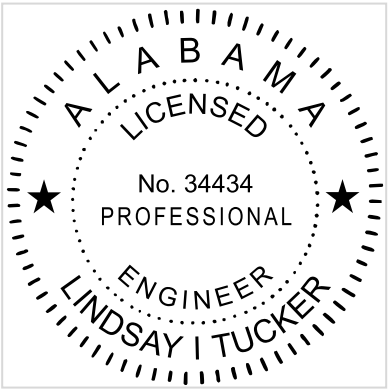
1. Add the following standard detail with the attached hereto:
    a. D44/4264-030 - V-Notch Effluent Weir & Scum Baffle Detail

E. OTHER PROJECT INFORMATION (uploaded to the Q&A section of the plan room)

1. Pre-Bid Meeting Minutes
2. Geotechnical Report
3. Record Drawings (Select Sheets) of Electrical Work by Others

By: _____

Lindsay I. Tucker, P.E.
Project Manager



Attachments:

A. Specifications
    1. Proposal
    2. 01 20 00 Price and Payment Procedures
    3. 09 96 00 High Performance Coatings and associated data sheet
    4. 40 61 13 – Process Control System General Provisions
    5. 40 70 00 – Instrumentation for Process Systems
    6. 41 22 23.19 – Manual Trolley Hoist
    7. 46 43 21.16 Clarifier Mechanism
B. Standard Details
    1. D44/4264-030 - V-Notch Effluent Weir & Scum Baffle Detail

END OF ADDENDUM NO. 1

PROPOSAL

TO: BOARD OF WATER AND SEWER COMMISSIONERS OF THE CITY OF MOBILE ALABAMA

Submitted: _____

(Date)

The undersigned, as Bidder, hereby declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the place where the Work is to be done; that he has examined the Plans and Specifications for the Work and all Contract Documents relative thereto, and has read the Board's Standard Specifications and all General Conditions and Special Provisions furnished; and that he has satisfied himself relative to the Work to be performed.

The Bidder proposes and agrees, if this Proposal is accepted, to contract with the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, in the form of contract specified to furnish all materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the following Work:

_____

_____

PROJECT NO._____

in full and complete accordance with the shown, noted, described and reasonably intended requirements of the Plans, Specifications and all other Contract Documents to the full and entire satisfaction of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and other Contract Documents for the lump sum or unit prices listed opposite each item.

It is agreed that the description under each item, being briefly stated, implies, although it does not mention, all incidentals and that the prices stated are intended to cover all such work, materials and incidentals as constitute Bidder's obligations as described in the Specifications and any details not specifically mentioned, but evidently included in the Contract shall be compensated for the item in which it most logically is included.

The quantities for bid items listed on the Proposal sheet are estimated quantities only for the purpose of comparing bids. Any differences between these estimated quantities and actual quantities required for this Contract shall not be taken as a basis for claims by the Contractor for extra compensation. Compensation will be based on the lump sum or unit prices and actual construction quantities.

The Bidder further proposes and agrees hereby to commence the Work with an adequate force, plant and equipment at the time stated in the notice to the Contractor from the Engineers to proceed, and fully complete performance within 365 consecutive calendar days from and after the date stated in said notice.

The undersigned further agrees that, in case of failure on his part to execute the said Contract and the bond within 10 consecutive calendar days after written notice being given of the award of the Contract, the check or bid bond in the amount of 5 percent of this bid accompanying this bid, and the monies payable thereon, shall be paid into the funds of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama as liquidated damages for such failure; otherwise the check or bid bond accompanying this Proposal shall be returned to the undersigned:

Attached hereto is a certified check on the

_____

_____ Bank of _____ or a Bid

Bond for the sum of _____

_____ Dollars ($_____)

made payable to the Board of Water and Sewer Commissioners of the City of Mobile Alabama.

By _____

(Legal Signature)

_____

(Printed Name and Title)

Witness: _____

(Legal Signature)

Witness: _____

(Legal Signature)

ADDRESS:

_____

_____

CONTRACTOR'S LICENSE NO:

_____

BIDDER acknowledges receipt of the following ADDENDA:

_____

_____

_____

MAWSS STICKNEY WATER TREATMENT PLANT SOLIDS UPGRADES
BID FORM

No.	Item	Unit	Quantity	Unit Price	Total Item Price
1	Mobilization and Demobilization (maximum of 5% of base bid)	LS	1		
2	Facility 05 – Site Civil	LS	1		
3	Facility 72 – Splitter Box	LS	1		
4	Facility 74 – Gravity Thickener	LS	1		
5	Facility 76 – Sludge Pump Station	LS	1		
7	Additional Concrete Pavement	SY	250		
8	Additional Asphalt Pavement	SY	250		
9	Owner's Contingency Allowance	LS	1	N/A	$200,000

TOTAL BID PROPOSAL AMOUNT $_____

FAILURE TO FULLY COMPLETE THIS PAGE AND INCLUDE A HANDWRITTEN SIGNATURE MAY BE CAUSE FOR REJECTION OF BID.

SSO AND UNPERMITTED DISCHARGE PREVENTION NOTIFICATION:

Sanitary Sewer Overflows (SSOs) and unpermitted discharges of wastewater to the environment are a violation of Federal and State laws, as well as a breach of this Contract. The Contractor and associated subcontractors, vendors, and other entities and persons chosen to complete this Work shall not, through act or omission, discharge untreated wastewater to the environment or cause wastewater to back up into a building. The Contractor hereby agrees to indemnify the Owner if the Owner is assessed penalties or fines, receives regulatory actions, or has claims, actions, or suits filed against it by any person or entity as a result of SSOs or unpermitted discharges caused by act or omission of the Contractor and/or any entity or person performing Work in the Contractor's behalf under this Contract. The Contractor shall reimburse the Owner for all damages, losses, penalties, fines, judgments, interest, costs, and expenses of every nature incurred by the Owner, including but not limited to reasonable attorney's fees, arising from or associated with each SSO or unpermitted discharge. In addition, the Contractor shall pay the following penalties to the Owner for SSOs and unpermitted discharges caused by the Contractor or any entity or person performing Work in the Contractor's behalf, regardless of whether such SSOs or discharges reach waters of the State.

ESTIMATED VOLUME SPILLED	PENALTY AMOUNT
0 to 10,000 gallons	$1,000
10,001 to 25,000 gallons	$2,000
25,001 to 50,000 gallons	$2,500
50,001 to 150,000 gallons	$3,000
More than 150,000 gallons	$6,000

I, having authority to execute this document, have reviewed the above Notification, therein.

_____

Contractor Name

_____

Street City

_____

Signature

SECTION 01 20 00 – PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Cash allowances.
   2. Contingency allowances.
   3. Testing and inspection allowances.
   4. Schedule of Values.
   5. Application for Payment.
   6. Partial Payments.
   7. Defect assessment.
   8. Unit prices.
   9. Alternates.

B. Refer to Specification 01 32 16 for monthly schedule requirements for processing Contractor's progress payments.

1.2 BID ITEM DESCRIPTIONS

A. The Basis of Payment will be as established in the Contract Documents and as described below:
   1. Bid Item 1: Mobilization/Demobilization
      a. The Work shall consist of the mobilization and demobilization of the Contractor’s forces, equipment, insurance, and performance and payment bonding necessary for performing the work required under the Contract. Payment shall be at the lump sum price and shall include all labor, materials, tools, equipment, permits, bonds, insurance, overhead and profit, and other required costs necessary to move personnel, equipment, materials, tools, supplies, and incidentals to the project site prior to beginning work and to move personnel, equipment, materials, tool, supplies, and incidentals from the project site immediately after project acceptance. Mobilization shall include completion of closeout procedures specified in Section 01 77 00, Closeout Procedures, permitting fees, shop drawing submittal, schedule of valves, project schedules, construction meetings, temporary site fencing, storage yard, and project signage.
      b. Total payment for this bid item shall not exceed 5 percent of the contractor's base bid price. Payments for mobilization shall not exceed 75% of the total item. A minimum of 25% will be retained until such time that demobilization is complete, and the areas disturbed have been fully restored and accepted by the Owner.
   2. Bid Item 2: Facility 05 - Site Civil
      a. All work as defined in the Contract Documents for Facility 05 - Site Civil. Payment shall be full compensation at the lump sum price for all work, labor, and materials for the construction of improvements defined in the Contract Documents, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item. This item includes but is not limited to all site work, erosion and sediment control, excavation, dewatering, grading and drainage, yard piping/valving between each facility, yard hydrants, pipe testing, pipe connections, aerial decant piping and pipe supports, aerial clearance bars and signage, electrical duct banks, junction boxes, bollards, site lighting, sidewalks, paving, and site restoration. This work also includes demolition of the existing sludge pump station and abandonment of existing utilities being replaced as part of this project, such as the existing chlorine dioxide line.
   3. Bid Item 3: Facility 72 - Splitter Box

a. All work as defined in the Contract Documents for Facility 72 - Splitter Box. Payment shall be full compensation at the lump sum price for all work, labor, and materials for the construction of improvements defined in the Contract Documents, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item. This item includes but is not limited to piping within the structure footprint, slide gates, lighting, stair and handrail construction, weirs, finishes, and platform grating. The above-grade EQ piping, static mixer, valves, flow meter, and injection quill are part of Site Civil Work.

4. Bid Item 4 Facility 74 - Clarifier South
   a. All work as defined in the Contract Documents for Facility 74 - Clarifier South. Payment shall be full compensation at the lump sum price for all work, labor, and materials for the construction of improvements defined in the Contract Documents, except those items listed separately. Payment shall include shutdown operations, start-up, training, commissioning, operations and maintenance manuals, and other required costs necessary to complete all Work, as defined in the Contract Documents, unless listed separately in the bid form. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item. This item includes but is not limited to piping and fittings within the structure's footprint, sludge collection and skimming equipment installation, scum box, weir and baffle installation, weir brush installation, access platform, lighting, finishes, and electrical and controls.
5. Bid Item 4 Facility 76 - Sludge Pump Station
   a. All work as defined in the Contract Documents for Facility 76 - Sludge Pump Station. Payment shall be full compensation at the lump sum price for all work, labor, and materials for the construction of improvements defined in the Contract Documents, except those items listed separately. Payment shall include shutdown operations, start-up, training, commissioning, operations and maintenance manuals, and other required costs necessary to complete all Work, as defined in the Contract Documents, unless listed separately in the bid form. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item. This item includes but is not limited to piping, valving, fittings, flow meters, instruments, pipe supports, polymer feed system, pumps, motors, electrical and controls, HVAC, tepid water system, monorail, and all building components.
6. Bid Item 8: Additional Concrete Pavement
   a. Full compensation on a unit price basis for all work, labor, and materials to install additional concrete pavement above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order.
7. Bid Item 9: Additional Asphalt Pavement
   a. Full compensation on a unit price basis for all work, labor, and materials to install additional asphalt pavement above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order.
8. Bid Item 10: Owner's Contingency Allowance
   a. This contingency allowance provides a method for payment for work items that arise during construction that are deemed out of the scope of the Lump Sum and Unit Prices above and agreed upon by the Owner before the work is performed or materials are ordered. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, funds remaining shall be credited to Owner by Change Order.

1.3 CASH ALLOWANCES

A. Costs Included in Cash Allowances:
   1. Cost of product to Contractor or Subcontractor, less applicable trade discounts; delivery to Site and applicable taxes unless stated otherwise.

B. Costs Not Included in Cash Allowances but Included in Contract Price:
   1. Product handling at Site including unloading, uncrating, and storage; protection of products from elements and from damage; labor for installation and finishing unless stated otherwise; and overhead and profit.

C. Engineer Responsibilities:
   1. Consult with Contractor for consideration and selection of products.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

D. Contractor Responsibilities:
   1. Assist Engineer in selection of products.
   2. Obtain proposals from suppliers and offer recommendations.
   3. Upon notification of selection by Engineer or Owner, execute purchase agreement with designated supplier.
   4. Arrange for and process Shop Drawings, Product Data, and Samples. Arrange for delivery.
   5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. Expenditure of any portion of Cash Allowances shall only be done with authorization by Owner and Engineer. Cash Allowances are estimated amounts and final payment shall be based on actual costs as authorized by Change Order and the Contract Price shall be correspondingly adjusted.

F. Refer to the Bid Form for Cash Allowance schedule and descriptions.

1.4 CONTINGENCY ALLOWANCES

A. Refer to the Bid Form for Contingency Allowance schedule.

B. Include in Contract a stipulated sum/price of $200,000 for use upon Owner's instruction as a contingency allowance.

C. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead, and profit will be included in Change Orders authorizing expenditure of funds from this contingency allowance.

D. Funds will be drawn from contingency allowance only by Change Order.

E. At closeout of Contract, funds remaining in contingency allowance will be credited to Owner by Change Order.

1.5 SCHEDULE OF VALUES

A. Submit electronic file to Project website of schedule on Progress Estimate schedule on EJCDC C-620 or form approved by Engineer and Owner. Document shall be a Microsoft Excel file type.

B. Apparent “low-bidder” shall submit a preliminary Schedule of Values as electronic file within 2 days after bid opening.

C. Submit complete Schedule of Values as electronic file to Project website within 10 days after date of Owner-Contractor Agreement.

D. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify mobilization, bonds and insurance, progress schedule development, startup and commissioning, contract closeout, and demobilization as separate line items.

E. Include in each line item amount of allowances as specified in this Section. For unit cost allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.

F. Include within each line item, direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders with each Application for Payment.

H. An unbalanced or front-loaded schedule of values, or a schedule of values substantially different than the preliminary schedule, will not be accepted.

I. Summation of the complete schedule of values representing all Work shall equal the Contract Price.

1.6 APPLICATION FOR PAYMENT

A. Submit electronic file to project management website of each Application for Payment on EJCDC C-620 – Contractor's Application for Payment or similar form approved by Engineer and Owner.

B. Content and Format:
   1. Use Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period:
   1. Submit at intervals stipulated in the Agreement.

E. Submit submittals with transmittal letter as specified in Section 01 33 00 – Submittal Procedures.

F. Substantiating Data:
   1. When Engineer requires substantiating information, submit data justifying dollar amounts in question.
   2. Include with Application for Payment:
      a. Current construction photographs specified in Section 01 33 00 – Submittal Procedures.
      b. Partial release of liens from major Subcontractors and vendors.
      c. Record Documents as specified in Section 01 77 00 – Closeout Procedures, for review by Owner, which will be returned to Contractor.
      d. Affidavits attesting to offsite stored products.
      e. Construction Progress Schedule, revised and current as specified in Section 01 33 00 – Submittal Procedures.

1.7 PARTIAL PAYMENTS FOR STORED MATERIALS

A. No payments will be made for materials and equipment delivered or stored unless shop drawings and preliminary operations and maintenance manuals are accepted by Engineer. Thereafter, partial payments for materials and equipment delivered and stored, but not yet incorporated into the Work, shall not exceed 90% of the material value.

B. Storage must meet General Conditions requirements, be deemed acceptable by the Engineer and Owner, be located on the Site or a location agreed to by Engineer and Owner, and meet the documented storage recommendations from the Material Manufacturer.

1.8 PARTIAL PAYMENTS FOR UNDELIVERED FABRICATED EQUIPMENT

A. No partial payments will be made for project-specific fabricated equipment except those specifically listed below and under the terms listed herein. Undelivered “Off the shelf” or catalog items are not eligible for partial payment.

B. Payment shall not exceed 15% of the equipment value, not including shipping and handling charges.

C. Payment will only be made when conditions below are met:
   1. Shop drawing and preliminary operations and maintenance manual acceptance by Engineer.
   2. Equipment is adequately insured, maintained, stored, and protected by appropriate security measures.
   3. Each equipment item is clearly marked and segregated from other items to permit inventory and accountability.
   4. Authorization has been provided access to storage site for Engineer and Owner.

1.9 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Engineer or Owner, it is not practical to remove and replace the Work, Engineer or Owner will direct appropriate remedy or adjust payment. Potential remedies may include:
   1. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Engineer or Owner.
   2. Defective Work will be partially repaired according to instructions of Engineer or Owner, and unit sum/price will be adjusted to new sum/price at discretion of Engineer or Owner.

C. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.

D. Authority of Engineer or Owner to assess defects and identify payment adjustments is final.

E. Nonpayment for Rejected Products:
   1. Payment will not be made for rejected products for any of the reasons below:
      a. Products wasted or disposed of in a manner that is not acceptable.
      b. Products determined as unacceptable before or after placement.
      c. Products not completely unloaded from transporting vehicle.
      d. Products placed beyond lines and levels of the required Work.
      e. Products remaining on hand after completion of the Work.
      f. Loading, hauling, and disposing of rejected products.

1.10 UNIT PRICES

A. Engineer will take measurements and compute quantities accordingly. Provide assistance in taking of measurements.

B. Unit Quantities:
   1. Quantities and measurements indicated on Bid Form are for Contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Actual quantities provided shall determine payment.
   2. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.
   3. When actual Work requires 25% or greater change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.

C. Payment Includes:
   1. Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; overhead and profit.

D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

E. Measurement of Quantities:
   1. Weigh Scales:
      a. Inspected, tested, and certified by applicable Alabama weights and measures department within past year.
   2. Platform Scales:
      a. Of sufficient size and capacity to accommodate conveying vehicle.
   3. Metering Devices:
      a. Inspected, tested, and certified by applicable department within past year.
   4. Measurement by Weight:
      a. Concrete reinforcing steel, rolled or formed steel, or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
   5. Measurement by Volume:
      a. Measured by cubic dimension using mean length, width, and height or thickness.
   6. Measurement by Area:
      a. Measured by square dimension using mean length and width or radius.
   7. Linear Measurement:
      a. Measured by linear dimension, at item centerline or mean chord.
   8. Stipulated Sum/Price Measurement:
      a. Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.

1.11 ALTERNATES (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 09 96 00 – HIGH–PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. There are several locations of specific painting/marking requirements on this project, particularly at the aerial decant pipe crossing and bollard at the pipe supports. Refer to Sheet 05-C501 and 05-C102 of the Drawings.

B. This Section Includes:
   1. High-performance coatings and special preparation for surfaces of piping and process equipment, and other surfaces in contact with process water and wastewater.

C. Related Sections:
   1. Section 09 90 00 – Painting and Coating.

1.2 REFERENCES

A. Federal Specification Unit:
   1. FS A-A-3054 – Paint, Heat Resisting (204°C).
   2. FS AA-3120A – Paint: For Swimming Pools.
   3. FS TT-C-555B – Coating, Textured (for Interior and Exterior Masonry Surfaces).
   4. FS TT-P-28H – Paint, Aluminum, Heat Resisting.

B. Master Painters Institute:
   1. MPI – Approved Products List.
   2. MPI – Architectural Painting Manual.

C. SSPC (The Society for Protective Coatings):
   1. SSPC – Painting Manual, Volume 2: Systems and Specifications.
   2. SSPC-Paint 16 – Coal Tar Epoxy-Polyamide Black (or Dark Red).
   3. SSPC-SP 2 – Hand Tool Cleaning.
   4. SSPC-SP 3 – Power Tool Cleaning.
   5. SSPC-SP 5 – White Metal Blast Cleaning.
   6. SSPC-SP 6 – Commercial Blast Cleaning.
   7. SSPC-SP 7 – Brush-Off Blast Cleaning.
   8. SSPC-SP 10 – Near-White Metal Blast Cleaning.
   9. SSPC-SP 11 – Power Tool Cleaning to Bare Metal.
   10. SSPC-SP 13 – Concrete Surface Preparation.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:
   1. Schedule of proposed coating materials.
   2. Schedule of surfaces to be coated with each coating material.

C. Product Data:
   1. Submit manufacturer information indicating coating materials, performance ratings and description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and manufacturer's standard color chips:
   2. Data Sheets:

a. For each paint system, furnish a Paint System Data Sheet (PSDS), the Manufacturer's Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system. The PSDS form is appended to the end of this section.
b. Submit required information on a system-by-system basis.
c. Furnish copies of paint system submittals to the coating applicator.
d. Indiscriminate submittal of Manufacturer's literature only is not acceptable.
e. Regulatory requirements – Submit data concerning:
1) Volatile organic compound limitations.
2) Coatings containing lead compounds and PCBs.
3) Abrasives and abrasive blast cleaning techniques, and disposal.
4) NSF certification of coatings for use in potable water supply systems.

3. Include MPI – Approved Products Lists with proposed products highlighted.

D. Samples:
1. Submit two square drawdowns or brushouts of topcoat finish samples 8 in. by 8 in. in size, illustrating colors for selection. Identify each sample as to finish, formula, color name and number and sheen name and gloss units.

E. Manufacturer's Certificate:
1. Certify that products meet or exceed specified requirements.

F. Manufacturer Instructions:
1. Submit special procedures, perimeter conditions requiring special attention.
2. Include:
a. Special requirements for transportation and storage.
b. Mixing instructions.
c. Shelf life.
d. Pot life of material.
e. Precautions for applications free of defects.
f. Surface preparation.
g. Method of application.
h. Recommended number of coats.
i. Recommended dry film thickness (DFT) of each coat.
j. Recommended total dry film thickness (DFT).
k. Drying time of each coat, including prime coat.
l. Required prime coat.
m. Compatible and noncompatible prime coats.
n. Recommended thinners, when recommended.
o. Limits of ambient conditions during and after application.
p. Time allowed between coats (minimum and maximum).
q. Required protection from sun, wind, and other conditions.
r. Touchup requirements and limitations.
s. Minimum adhesion of each system submitted as specified in ASTM D 4541.

G. Qualifications Statements:
1. Submit qualifications for manufacturer and applicator.
2. Submit manufacturer's approval of applicator.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for submittals.

B. Operation and Maintenance Data:
1. Submit maintenance and cleaning requirements for coatings, repair, and patching techniques.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for maintenance materials.

B. Extra Stock Materials:
   1. Furnish 5 gal. of each color of each type of coating specified, for Owner's maintenance use.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.6 QUALITY ASSURANCE

A. MPI Standards:
   1. Comply with indicated MPI standards.
   2. Products: Listed in MPI – Approved Products List.

B. Quality Assurance Submittals:
   1. Quality Assurance plan.
   2. Qualifications of coating applicator including List of Similar Projects and List of References substantiating experience.
   3. Factory Applied Coatings: Manufacturer's certification stating factory applied coating system meets or exceeds requirements specified.
   4. If the Manufacturer of finish coating differs from that of shop primer, provide both Manufacturers' written confirmation that materials are compatible.
   5. Manufacturer's written instructions and special details for applying each type of paint.
   6. Manufacturers' Certification of Proper Installation.

C. Certifications:
   1. All paints and coatings to be used on this project comply with current federal, state, and local VOC regulations.

D. Compatibility of coatings:
   1. Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.

E. Services of coating manufacturer's representative:
   1. Arrange for coating manufacturer's representative to attend preinstallation conferences. Make periodic visits to the project site to provide consultation and inspection services during surface preparation and application of coatings, and to make visits to coating plants to observe and approve surface preparation procedures and coating application of items to be "shop primed and coated".

1.7 QUALIFICATIONS

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

B. Applicator Qualifications:
   1. Company specializing in performing Work of this Section with minimum five years' experience applying specified type or types of coatings under conditions similar to those of the Work and approved by manufacturer.
   2. Provide qualifications of applicator and references listing 5 similar projects completed in the past 2 years.
   3. Manufacturer approved applicator when manufacturer has approved applicator program.

4. Approved and licensed by polymorphic polyester resin manufacturer to apply polymorphic polyester resin coating system.
5. Approved and licensed by elastomeric polyurethane (100% solids) manufacturer to apply 100% solids elastomeric polyurethane system.
6. Applicator of offsite application of coal tar epoxy shall have successfully applied coal tar epoxy on similar surfaces in material, size, and complexity as on the Project.

C. Regulatory requirements:
1. Comply with governing agencies regulations by using coatings that do not exceed permissible volatile organic compound limits and do not contain lead:
   a. Do not use coal tar epoxy in contact with drinking water or exposed to ultraviolet radiation.
   b. Perform surface preparation and painting as specified in recommendations of:
      1) Paint Manufacturer's instructions.
      2) SSPC-PA Guide No. 3, Guide to Safety in Paint Applications.
      3) Federal, state, and local agencies having jurisdiction.

1.8 MOCKUPS

A. Unless otherwise specified, before painting work is started, prepare minimum 8 in. by 10 in. samples with type of paint and application specified on similar substrate to which paint is to be applied.

B. Furnish additional samples as required until colors, finishes, and textures are approved.

C. Approved samples to be the quality standard for final finishes.

D. Field samples:
1. Prepare and coat a minimum 100 ft^2 area between corners or limits such as control or construction joints of each system.
2. Approved field sample may be part of Work.
3. Obtain approval before painting other surfaces.

E. Section 01 40 00 – Quality Requirements: Requirements for mockup.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver new unopened containers.

B. Do not deliver materials aged more than 12 months from manufacturing date.

C. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

D. Container Labeling:
1. Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

E. Inspection:
1. Accept materials on Site in manufacturer's sealed and labeled containers.
2. Inspect for damage and to verify acceptability.

F. Store materials in ventilated area and as specified in manufacturer instructions.

G. Remove unspecified and unapproved paints from Project site immediately.

H. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection as specified in manufacturer instructions.
   3. Take precautions to prevent fire and spontaneous combustion.

I. Shipping:
   1. Where precoated items are to be shipped to the site, protect coating from damage. Batten coated items to prevent abrasion.
   2. Use nonmetallic or padded slings and straps in handling.

1.10 AMBIENT CONDITIONS

A. Section 01 50 00 – Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions:
   1. Do not install materials when temperature is below 55°F or above 90°F.

C. Subsequent Conditions:
   1. Maintain above temperature range, 24 hours before, during, and 72 hours after installation of coating.

D. Provide lighting level of 80 fc, measured mid-height at substrate surface.

E. Restrict traffic from area where coating is being applied or is curing.

1.11 WARRANTY

A. Section 01 77 00 – Closeout Procedures: Requirements for warranties.

B. Furnish Manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of work specified in this Specification section found defective during a period of 1 yr. after the date of Substantial Completion.

C. Contractor and paint Manufacturer shall jointly and severally furnish guarantee.

D. Include coverage for bond to substrate, and degradation of chemical resistance.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Coating materials shall be especially adapted for use in water and wastewater treatment plants.

B. Coating materials used in contact with potable water supply systems shall be certified to NSF 61.

2.2 HIGH–PERFORMANCE COATINGS

A. Manufacturers:
   1. High Performance Coatings Manufacturers (Choose ONE):

a. Carboline: Carboline, St. Louis, MO.
b. Ceilcote: International Protective Coatings, Berea, OH.
c. Dampney: The Dampney Company, Everett, MA.
d. Devoe: International Protective Coatings, Louisville, KY.
e. Dudick: Dudick, Inc., Streetsboro, OH.
f. GET: Global Eco Technologies, Pittsburg, CA.
g. Henkel: Henkel North America, Madison Heights MI.
h. IET: Integrated Environmental Technologies, Santa Barbara, CA.
i. Induron Protective Coatings, Birmingham, AL.
j. PPG Amercoat: PPG Protective & Marine Coatings, Brea, CA.
k. Raven Lining Systems, Broken Arrow, OK.
l. Rustoluem : Rustoleum Corp., Sommerset, NJ.
m. Sanchem: Sanchem, Chicago, IL.
n. Sauereisen: Sauereisen, Pittsburgh, PA
o. Superior: Superior Environmental Products, Inc., Addison, TX.
p. S-W: Sherwin-Williams Co., Cleveland, OH.
q. Tnemec: Tnemec Co., Kansas City, MO.
r. Wasser: Wasser High Tech Coatings, Kent, WA.
s. ZRC: ZRC Worldwide Innovative Zinc Technologies, Marshfield, MA.
t. Or Approved Equal.

2. Preparation And Pretreatment Materials:
   a. Metal pretreatment (Choose ONE):
      1) Henkel: Galvaprep 5.
      2) International: AWLGrip Alumiprep 33.
      3) Or Approved Equal.
   b. Surface cleaner and degreaser (Choose ONE):
      1) Carboline Surface Cleaner No.3.
      2) Devoe: Devprep 88.
      3) S-W: Clean and Etch.
      4) Or Approved Equal.
3. Coating Materials:
   a. Alkali resistant bitumastic (Choose ONE):
      1) Carboline: Bitumastic No. 50
      2) Sherwin Williams: Targuard
      3) Wasser: MC-Tar
      4) Or Approved Equal.
   b. Wax coating:
      1) Sanchem: No-Ox-Id A special.
      2) Or Approved Equal.
   c. High solids epoxy (self-priming) not less than 72% solids by volume (Choose ONE):
      1) Carboline: Carboguard 891.
      2) Devoe: Bar Rust 233H.
      3) Induron: PE-70
      4) PPG Amercoat: Amerlock 2.
      5) S-W: Macropoxy 646.
      6) Tnemec: HS Epoxy Series N140.
      7) Or Approved Equal.
   d. Aliphatic or aliphatic-acrylic polyurethane (Choose ONE):
      1) Carboline: Carbothane 134 VOC.
      2) Devoe: Devthane 379.
      3) PPG Amercoat: Amershield VOC.
      4) S-W: High Solids Polyurethane [CA].
      5) Tnemec: Endura-Shield II Series 1075 (U).
      6) Or Approved Equal.

e. Epoxy Novolac: Multi-component aggregate-filled epoxy system specifically designed for exposure to municipal wastewater. (Choose ONE):
   1) Sauereisen: Sewergard No. 210, 210S, or 210GL
   2) Carboline: Plasite 4550 S
   3) Devoe: Devmat 100
   4) Raven 410
   5) Or Approved Equal.
f. High temperature coating 150 – 350°F (Choose ONE):
   1) Carboline: Thermaline 4900.
   2) Dampney: Thermalox 245 Silicone – Zinc Dust.
   3) PPG Amercoat: Amerlock 2/400 GFK.
   4) Or Approved Equal.
g. High temperature coating 400 to 1,000°F (dry) (Choose ONE):
   1) Carboline: Thermaline 4700.
   2) Dampney: Thermolox 230C Series Silicone.
   3) Devoe: HT-12, High Heat Silicone.
   4) Or Approved Equal.
h. High temperature coating up to 1,400°F:
   1) Dampney: Thermalox 240 Silicone Ceramix.
   2) Or Approved Equal.
i. Asphalt varnish: AWWA C 500.
j. Protective coal tar:
   1) Not Acceptable
k. Coal tar epoxy:
   1) Not Acceptable
l. Coal tar:
   1) Where coal tar, coal tar epoxy, or coal tar mastic are specified or indicated on the Drawings, use coal tar epoxy substitute in their place. Coal tar shall not be allowed.
m. Coal Tar Epoxy Substitute Manufacturer:
   1) Tnemec: Series 431
   2) Or Approved Equal.
n. Vinyl ester: Glass mat reinforced, total system 125 mils DFT. (Choose ONE):
   1) Carboline: Semstone 870.
   2) Ceilcote: 6640 Ceilcrete.
   3) Dudick: Protecto-Flex 800.
   4) Tnemec: Chembloc Series 239SC.
   5) Or Approved Equal.
o. Elastomeric polyurethane, 100% solids, ASTM D16, Type V, (Urethane P):
   1) GET: Endura-Flex EF-1988.
   2) Or Approved Equal.
p. Anti-slip floor coatings:
   1) PPG: SFT675
q. Concrete floor coatings (Choose ONE):
   1) Carboline: Semstone 140SL.
   2) Devoe: Devran 124.
   3) Dudick: Polymer Alloy 1000.
   4) Tnemec: Tneme-Glaze Series 282.
   5) O Approved Equal.
r. Waterborne acrylic emulsion (Choose ONE):
   1) S-W: DTM Acrylic B66W1.
   2) Tnemec: Tneme-Cryl Series 6.
   3) Or Approved Equal.
s. Galvanizing Zinc Compound:
   1) ZRC: Cold Galvanizing Compound.
   2) Other Approved Equal.

2.3 COATING SYSTEMS

A. Coatings:
   1. Description:
      a. Complete multicoat systems formulated and recommended by manufacturer for intended applications and in indicated thicknesses.
      b. Specified number of coats does not include primer or filler coat.
   2. Lead content: None.
   3. Chromium Content as Zinc Chromate or Strontium Chromate: None.
   4. Maximum VOC Content: As required by applicable regulations.
   5. Colors: As selected from manufacturer's standard colors or indicated on Drawings.

B. System 1 Submerged Metals – Potable Water – High-Solids Epoxy Coating:
   1. Description: High-solids, two-component epoxy.
   2. Exposure: Moderate.
   3. Surface Prep: Abrasive Blast, or Centrifugal Wheel Blast (SP 5)
   4. Number of Coats: One.
   5. Finish: Low gloss
   6. Minimum Solids Content: 78% by volume.
   7. Minimum Dry Film Thickness Per Coat: 6 mils.
   8. Primer: High Solids Epoxy (Self Priming)

C. System 4: Exposed Metal – Mildly Corrosive – Polyurethane Coating:
   1. Description: Solvent-based, two-component, pigmented polyurethane.
   2. Exposure: Moderate.
   3. Surface Prep: Abrasive Blast (SP 10)
   4. Number of Coats: One.
   5. Finish: Semi-Gloss.
   6. Minimum Solids Content: 69% by volume.
   7. Minimum Dry Film Thickness Per Coat: 3 mils.
   8. Primer: As recommended by painting system manufacturer.

D. System 13: Sliding Metal:
   1. Description: Wax coating.
   2. Surface Prep: Solvent Clean (SP 1), followed by Hand Tool (SP 2), Power Tool (SP 3), or Brushoff Blast (SP 7)
   3. Number of Coats: One.
   4. Minimum Dry Film Thickness Per Coat: 30 mils.

E. System 15: Aluminum and Dissimilar Metal Insulation:
   1. Description: Alkali Resistant Bitumastic or Coal-Tar Epoxy Substitute.
   2. Surface Prep: Solvent Clean (SP 1)
   3. Number of Coats: One.
   4. Minimum Dry Film Thickness Per Coat: 18 mils.

F. System 19: Concrete/CMU – Immersion Highly Corrosive – Novolac Epoxy:
   1. Description: Epoxy Novolac.
   2. Exposure: Severe.
   3. Surface Prep: (SP 13)
   4. Filler: Per Manufacturer’s Recommendations.
   5. Primer: As recommended by painting system manufacturer.
   6. Number of Coats: Two.
   7. Minimum Dry Film Thickness Per Coat: 40 mils minimum or as noted otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 – Closeout Procedures: Requirements for application examination.

B. Substrates:
   1. Verify that substrate surfaces are ready to receive Work of this Section as indicated by coating manufacturer.
   2. Obtain and follow manufacturer instructions for examination and testing of substrates.
   3. Cementitious Substrates: Do not begin application until substrate has cured minimum 28 days and measured moisture content is not greater than 16%.

C. Masonry:
   1. Verify that masonry joints are struck flush.

D. Wood:
   1. Do not begin application if substrate has moisture content greater than 12%.

3.2 GENERAL PROTECTION

A. Protect adjacent surfaces from coatings and damage. Repair damage resulting from inadequate or unsuitable protection:

B. Protect adjacent surfaces not to be coated from spatter and droppings with drop cloths and other coverings:

C. Mask off surfaces of items not to be coated or remove items from area.

D. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being coated and in particular, surfaces within storage and preparation area.

E. Place cotton waste, cloths, and material which may constitute fire hazard in closed metal containers and remove daily from site.

F. Remove electrical plates, surface hardware, fittings, and fastenings, prior to application of coating operations. Carefully store, clean, and replace on completion of coating in each area. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

3.3 PREPARATION

A. Section 01 70 00 – Execution Requirements: Requirements for application preparation.

B. Clean surfaces of loose foreign matter.

C. Remove substances that would bleed through finished coatings; if removal is not possible, seal surface with shellac.

D. Remove finish hardware, fixture covers, and accessories and store.

E. Prepare surfaces as specified in coating manufacturer's instructions, unless more stringent requirements are specified in this Section.

F. Protect surfaces listed from abrasive blasting by masking, or other means:
   1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
   2. Machined surfaces for sliding contact.
   3. Surfaces to be assembled against gaskets.
   4. Surfaces of shafting on which sprockets are to fit.
   5. Surfaces of shafting on which bearings are to fit.
   6. Machined surfaces of bronze trim, including those slide gates.
   7. Cadmium-plated items, except cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment requiring abrasive blasting.
   8. Galvanized items, unless scheduled to be coated.

G. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by entering sand or dust.

H. Concrete:
   1. Allow new concrete to cure for minimum of 28 days before coating.
   2. Clean concrete surfaces of dust, mortar, fins, loose concrete particles, form release materials, oil, and grease. Fill voids so that surface is smooth. Etch or brush off-blast clean as specified in SSPC SP-7 to provide surface profile equal to 40-grit – 60-grit sandpaper, or as recommended by coating manufacturer. All concrete surfaces shall be vacuumed clean prior to coating application.

I. Galvanized Surfaces:
   1. Degrease or solvent clean (SSPC SP-1) to remove oily residue.
   2. Power tool or hand tool clean or whip abrasive blast.
   3. Test surface for contaminants using copper sulfate solution.
   4. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded physically, such as bolts, nuts, or preformed channels.

J. Ductile iron pipe and fittings to be lined or coated:
   1. Abrasive blast clean as specified in NAPF 500-03.

K. Sherardized, aluminum, copper, and bronze surfaces:
   1. Prepare as specified in coating manufacturer's instructions.

L. Shop primed metal:
   1. Certify that primers applied to metal surfaces in the shop are compatible with coatings to be applied over such primers in the field.
   2. Remove shop primer from metal to be submerged by abrasive blasting as specified in SSPC SP-10, unless greater degree of surface preparation is required by coating manufacturer’s representative.
   3. Correct abraded, scratched, or otherwise damaged areas of prime coat by sanding or abrasive blasting to bare metal as specified in SSPC SP-2, SP-3, or SP-6, as directed by the Engineer.
   4. When entire shop priming fails or has weathered excessively (more than 25% of the item), or when recommended by coating manufacturer’s representative, abrasive blast shop prime coat to remove entire coat and prepare surface as specified in SSPC SP-10.
   5. When incorrect prime coat is applied, remove incorrect prime coat by abrasive blasting as specified in SSPC SP-10.
   6. When prime coat not authorized by Engineer is applied, remove unauthorized prime coat by abrasive blasting as specified in SSPC SP-10.
   7. Shop applied bituminous paint or asphalt varnish: Abrasive blast clean shop applied bituminous paint or asphalt varnish from surfaces scheduled to receive non-bituminous coatings.

M. Cadmium-plated, zinc-plated, or sherardized fasteners:

1. Abrasive blast in same manner as unprotected metal when used in assembly of equipment designated for abrasive blasting.
2. Abrasive blast components to be attached to surfaces which cannot be abrasive blasted before components are attached.
3. Grind sharp edges to approximately 1/16 in. radius before abrasive blast cleaning.
4. Remove and grind smooth all excessive weld material and weld spatter before blast cleaning as specified in NACE SP0178.

N. Mechanical And Electrical Equipment Preparation:
1. Identify equipment, ducting, piping, and conduit as specified in:
   a. Section 22 05 53 – Mechanical Identification.
   b. Section 26 05 53 – Identification for Electrical Systems.
2. Remove grilles, covers, and access panels for mechanical and electrical system from location and coat separately.
3. Prepare and finish coat-primed equipment with color selected by the Engineer.
4. Prepare and prime and coat insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with prefinished coating.
5. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
6. Prepare and coat interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
7. Prepare and coat dampers exposed immediately behind louvers, grilles, convector, and baseboard cabinets to match face panels.
8. Prepare and coat exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
9. Prepare and coat both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
10. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming and numbering, as specified in Contract Documents.

3.4 APPLICATION

A. General
1. Apply primer to each surface, unless specifically not required by coating manufacturer.
2. Apply coatings as specified in manufacturer's instructions.
3. Coat metal unless specified otherwise:
4. Aboveground piping to be coated shall be empty of contents during application of coatings.
5. Verify metal surface preparation immediately before applying coating as specified in SSPC SP COM.
6. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
7. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
8. Prime shop primed metal surfaces. Spot prime exposed metal of shop primed surfaces before applying primer over entire surface.
9. Multiple coats:
10. Apply minimum number of specified coats.
11. Apply additional coats when necessary to achieve specified thicknesses.
12. Apply coats to thicknesses specified, especially at edges and corners.
13. When multiple coats of same material are specified, tint prime coat and intermediate coats with suitable pigment to distinguish each coat.

14. Lightly sand and dust surfaces to receive high gloss finishes, unless instructed otherwise by coating manufacturer.
15. Dust coatings between coats.
16. Coat surfaces without drops, overspray, dry spray, runs, ridges, waves, holidays, laps, or brush marks.
17. Remove spatter and droppings after completion of coating.
18. Apply coating by brush, roller, trowel, or spray, unless method of application is required by coating manufacturer's instructions or these Specifications.
19. Plural component application: Drums shall be premixed each day. All gauges shall be working order prior to the start of application. Ratio checks shall be completed prior to each application. A spray sample shall be sprayed on plastic sheeting to ensure set time is complete prior to each application. Hardness testing shall be performed after each application.
20. Spray application:
    a. Stripe coat edges, welds, nuts, bolts, difficult to reach areas by brush before beginning spray application, as necessary, to ensure specified coating thickness along edges.
    b. When using spray application, apply coating to thickness not greater than that recommended in coating manufacturer's instructions for spray application.
    c. Use airless spray method, unless air spray method is required by coating manufacturer's instruction or these Specifications.
    d. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.
21. Drying and recoating:
    a. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
    b. For submerged service the Contractor shall provide a letter to the Engineer that the lining system is fully cured and ready to be placed into service.
    c. Limit drying time to that required by these Specifications or coating manufacturer's instructions.
    d. Do not allow excessive drying time or exposure which may impair bond between coats.
    e. Recoat epoxies within time limits recommended by coating manufacturer.
    f. When time limits are exceeded, abrasive blast clean and de-gloss clean prior to applying another coat.
    g. When limitation on time between abrasive blasting and coating cannot be met before attachment of components to surfaces which cannot be abrasive blasted, coat components before attachment.
    h. Ensure primer and intermediate coats of coating are unscarred and completely integral at time of application of each succeeding coat.
    i. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.
    j. Leave no holidays.
    k. Sand and feather into a smooth transition and recoat and recoat scratched, contaminated, or otherwise damaged coating surfaces so damages are invisible to naked eye.
22. Concrete:
    a. Apply first coat (primer) only when surface temperature of concrete is decreasing in order to eliminate effects of off-gassing on coating.
    b. Prior to priming, patch with masonry filler to produce smooth surface.

B. ALKALI RESISTANT BITUMASTIC
1. Preparation:
    a. Prepare surfaces as specified in general preparation requirements.
2. Application:

a. Apply as specified in general application requirements.
b. Apply at least 2 coats, 8 mils – 14 mils dry film thickness each.

C. HIGH SOLIDS EPOXY SYSTEM
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
b. Abrasive blast ferrous metal surfaces to be submerged at jobsite as specified in SSPC SP-5 prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces as specified in SSPC SP-10.
c. Abrasive blast non-submerged ferrous metal surfaces at jobsite as specified in SSPC SP-10, prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces as specified in SSPC SP 6.
d. Abrasive blast clean ductile iron surfaces at jobsite as specified in SSPC SP-7.
2. Application:
a. Apply coatings as specified in general application requirements.
b. Apply minimum 2-coat system with minimum total dry film thickness (DFT) of 12 mils.
c. Recoat or apply succeeding epoxy coats within time limits recommended by manufacturer. Prepare surfaces for recoating as specified in manufacturer's instructions.
d. Coat metal to be submerged before installation when necessary, to obtain acceptable finish, and to prevent damage to other surfaces.
e. Coat entire surface of support brackets, stem guides, pipe clips, fasteners, and other metal devices bolted to concrete.
f. Coat surface of items to be exposed and adjacent 1 in. to be concealed when embedded in concrete or masonry.

D. HIGH SOLIDS EPOXY AND POLYURETHANE COATING SYSTEM
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
b. Prepare concrete surfaces as specified in general preparation requirements.
c. Touch up shop primed steel and miscellaneous iron.
d. Abrasive blast ferrous metal surfaces at jobsite prior to coating. Abrasive blast clean rust and discoloration from surfaces.
e. Degrease or solvent clean, whip abrasive blast, power tool, or hand tool clean galvanized metal surfaces.
f. Lightly sand (de-gloss) fiberglass and poly vinyl chloride (PVC) pipe to be coated and wipe clean with dry cloths, or solvent clean as specified in coating manufacturer's instructions.
g. Abrasive blast clean ductile iron surfaces.
2. Application:
a. Apply coatings as specified in general application requirements.
b. Apply 3 coat system consisting of:
1) Primer: 4 mils – 5 mils dry film thickness high solids epoxy.
2) Intermediate coat: 4 mils – 5 mils dry film thickness high solids epoxy.
3) Topcoat: 2.5 mils – 3.5 mils dry film thickness aliphatic or aliphatic-acrylic polyurethane topcoat.
c. Recoat or apply succeeding epoxy coats within 30 days or within time limits recommended by manufacturer, whichever is shorter. Prepare surfaces for recoating as specified in manufacturer's instructions.

E. EPOXY NOVOLAC SYSTEM
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
b. Prepare concrete to obtain clean, open pore with exposed aggregate as specified in manufacturer's instructions.

c. Prepare ferrous metal surfaces as specified in SSPC SP-5, with coating manufacturer's recommended anchor pattern.
d. Complete application of prime coat within 6 hours of abrasive blast cleaning. When cleaned surfaces rust or discolor, abrasive blast surfaces as specified in SSPC SP-5.
e. When handling steel, wear gloves to prevent hand printing.
f. Adjust pH of concrete to within 7 pH – 11 pH before applying prime coat.

2. Application:
a. Apply coatings as specified in general application requirements and as specified in manufacturer's instructions.
b. Continue to monitor dew point. Dew point shall remain 5 degrees above ambient temperature for a minimum of 8 hours after application of coating.

F. CONCRETE FLOOR COATINGS

1. Preparation:
a. Prepare surfaces as specified in general application requirements and as specified in coating manufacturer's instructions.

2. Application:
a. Apply primer if required by coating manufacturer.
b. Apply 1 or more coats as recommended by coating manufacturer to receive a minimum total dry film thickness of 25 mils, color as selected by Owner.

3. Final topcoat shall include nonskid surface, applied as specified in coating manufacturer's instructions.

G. WATERBORNE ACRYLIC EMULSION

1. Preparation:
a. Remove all oil, grease, dirt, and other foreign material by Solvent Cleaning as specified in SSPC SP-1.
b. Lightly sand all surfaces and wipe thoroughly with clean cotton cloths before applying coating.

2. Application:
a. Apply 2 or more coats to obtain a minimum dry film thickness (DFT) of 5.0 mils.

3.5 FIELD QUALITY CONTROL

A. Section 01 75 00 – Startup Testing and Training: Requirements for testing, adjusting, and balancing.

B. Each coat will be inspected. Strip and remove defective coats, prepare surfaces and recoat. When approved, apply next coat.

C. Control and check dry film thicknesses and integrity of coatings.

D. Measure dry film thickness with calibrated thickness gauge.

E. Dry film thicknesses on ferrous-based substrates may be checked with Elcometer Type 1 Magnetic Pull-Off Gage or Positector 6000.

F. Verify coat integrity with low-voltage sponge or high-voltage spark holiday detector, as specified in SP0188 06. Allow Engineer to use detector for additional checking.

G. Check wet film thickness before coal tar epoxy coating cures on concrete or nonferrous metal substrates.

H. Arrange for services of coating manufacturer's field representative to provide periodic field consultation and inspection services to ensure proper surface preparation of facilities and items to be coated, and to ensure proper application and curing:
   1. Notify Engineer 24 hours in advance of each visit by coating manufacturer's representative.
   2. Provide Engineer with a written report by coating manufacturer's representative within 48 hours following each visit.

3.6 CLEANING

A. Section 01 77 00 – Closeout Procedures: Requirements for cleaning.

B. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from Site.

C. Clean surfaces immediately of overspray, splatter, and excess material.

D. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.7 PROTECTION

A. Section 01 77 00 – Closeout Procedures: Requirements for protecting finished Work.

B. Protect adjacent surfaces and materials not receiving coating from overspray.

C. Mask when necessary to provide adequate protection and repair damage.

3.8 SCHEDULE OF ITEMS NOT REQUIRING HIGH-PERFORMANCE COATING

A. General: Unless specified otherwise, the items do not require high-performance coating:
   1. Items that have received final coat at factory and not listed to receive coating in field.
   2. Aluminum, brass, bronze, copper, plastic (except PVC pipe), rubber, stainless steel, chrome, Everdur, or lead.
   3. Buried or encased piping or conduit.
   4. Exterior faces of concrete walls (opposite to face in contact with liquid), interior faces of concrete walls more than 2ft below normal operating water surface level, or concrete slabs NOT at top of wall or within 2ft below normal operating water surface level.
   5. Galvanized steel wall framing, galvanized roof decking, galvanized electrical conduits, galvanized pipe trays, galvanized cable trays, and other galvanized items:
      a. Areas on galvanized items or parts where galvanizing has been damaged during handling or construction shall be repaired:
         1) Clean damaged areas by SSPC SP-1, SP-2, SP-3, or SP-7 as required.
         2) Apply 2 coats of a Galvanizing Zinc Compound as specified in manufacturer’s instructions.
   6. Grease fittings.
   7. Fiberglass ducting or tanks in concealed locations.
   8. Steel to be encased in concrete or masonry.

3.9 SCHEDULE OF SURFACES TO BE COATED

A. See attached schedule for a list of items to be coated. Schedule may not list all items that require a coating – coat unlisted surfaces with same coating system as similar listed surfaces. Color coat all piping as specified in Section 40 23 39 – Process Piping.

END OF SECTION

SURFACES TO BE COATED	COATING SYSTEM	FIELD/FACTORY	NOTES
Ductile Iron Piping including Fittings, Valves, Couplings, Wall Pipes, Sleeves, and related items			
Submerged in Potable or Non-Potable Water	1	Factory Primed/Field Finished	Clarifier South submerged piping
Exposed – Mildly Corrosive	4	Factory Primed/Field Finished	Interior exposed piping in Sludge Pump Station. Exterior exposed piping at Static Mixer, Splitter Box, Aerial Decant, and Sludge Pump Station.
Structural Steel and related metals			
Submerged in Potable or Non-Potable Water	1	Factory Primed/Field Finished	Submerged metals in Clarifier South (other than 316 SST)
Aluminum Surfaces including Grating, Handrails, Checker Plate, Stairs, and related items			
Aluminum grating in contact with dissimilar metals (other than stainless steel), or in contact with masonry, grout, or concrete	15	Factory Primed/Field Finished	Splitter Box, Sludge Pump Station, and Clarifier South
Handrail Bases	15	Factory Primed/Field Finished	Splitter Box and Clarifier South
Aluminum in contact with dissimilar materials (other than stainless steel)	15	Factory Primed/Field Finished	Splitter Box and Clarifier South
Stair Connections to Concrete	15	Factory Primed/Field Finished	Splitter Box and Clarifier South
Mechanical Equipment			
Slide Gates - Gate Guides	1	Factory Primed/Field Finished	Splitter Box
Slide Gates - Sliding Metal	13	Factory Primed/Field Finished	Splitter Box
Clarifier Mechanisms	Submerged - **1** Exposed - 4	Factory Primed/Field Finished	Clarifier South
Sludge Pumps	Exposed - **4**	Factory Primed/Field Finished	Sludge Pump Station
Static Mixer and Flow Meter	Exposed - **4**	Factory Primed/Field Finished	Splitter Box (Upstream)

SURFACES TO BE COATED	COATING SYSTEM	FIELD/FACTORY	NOTES
Concrete			
Open Structures holding water in primary treatment, biological treatment, or solids treatment processes - Two (2) feet below the water surface and above including top of walkways	19	Field Coated	Splitter Box and Clarifier South

SECTION 40 61 13 – PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work to furnish all materials, labor, equipment, tools, supplies, and incidentals necessary for the installation and testing of all process control systems.

B. Related Sections:
   1. Section 40 61 96 – Process Control Descriptions
   2. Section 40 66 33 – Fiber Optic Communication Systems
   3. Section 40 67 23 – Control Panels
   4. Section 40 70 00 – Instrumentation for Process Systems

1.2 DEFINITIONS:

A. SCADA:
   1. Supervisory Control and Data Acquisition

B. HMI:
   1. Human Machine Interface (Graphical Screens, Text Displays)

C. OIT:
   1. Operator Interface Terminal

D. PLC:
   1. Programmable Logic Controller

E. I/O:
   1. Input/Output

F. VFD:
   1. Variable Frequency Drive

G. SSRVS:
   1. Solid State Reduced Voltage Starter (“Soft Starter”)

H. RTU:
   1. Remote Telemetry Unit

I. MTU:
   1. Master Telemetry Unit

J. MCC:
   1. Motor Control Center

K. Operating Program:
   1. Operating system, SCADA, or other core software.

L. Integrated Operating Platform:
   1. System of installed, connected, and configured hardware, operating programs, and networking equipment.

M. PLC and HMI Programming:
   1. Software configuration of operating programs to implement process control strategies.

N. Control System Specialist:
   1. A company specializing in process control hardware and software, including instrumentation, PLCs, networking, installation, and configuration.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Instrument Installation Details.
   2. Certified Calibration Sheets.
   3. Complete and detailed instruction manuals on each item furnished including but not limited to all devices and instruments. Information to be contained in the instruction manuals shall include but not be limited to drawings, dimensions, manufacturer's recommendations, ratings, performance charts, power requirements, schematics, maintenance requirements and procedures, calibration recommendations and procedures, repair instructions, complete and recommended spare parts lists and related information.
   4. Proposed tagging and attachment materials and methods.

C. Shop Drawings:
   1. Shall be submitted for approval by the Engineer.
   2. The Contractor shall submit to the Engineer, for approval, Shop Drawings of the equipment to be installed to meet the sections. The Drawings shall be supported by notes or written directions as required to fully define the installation. The submission shall be made as soon as feasible after award of the Contract and, in any event, shall be submitted and approval obtained before installation of the equipment.
   3. The information required on the Shop Drawings shall include, but is not necessarily limited to:
      a. Full and complete specifications covering the equipment proposed to be furnished.
      b. Detail Drawings showing plan, network connections and elevation dimensions of the equipment proposed to be furnished.
      c. Guarantees of performance of the equipment proposed to be furnished.
      d. Nearest location of factory maintenance and service facilities that will be available to service the equipment offered.
      e. To scale plans, sections and elevations detailing entire installation. Include mounting hardware, brackets, assemblies, and other devices as required for a complete installation.
   4. Control panels:
      a. Panel and subpanel layout
      b. Point-to-Point Wiring and Interconnection Diagrams
      c. System hardware

D. Contract Closeout Submittals:
   1. Project Record Documents
   2. Operating and Maintenance Data
   3. Warranty
      a. See Section 01 78 36 – Warranties and Bonds for additional requirements.
   4. Final as-built copies of documented PLC and HMI programs for vendor supplied equipment packages, on electronic media, suitable for future troubleshooting or modifications by others.

E. Instrumentation and control testing documents shall be submitted for approval by the Engineer:

1. Credentials of technicians doing the inspection and testing.
2. Written certification as detailed under testing requirements in this section.

1.4 QUALITY ASSURANCE

A. The Contractor shall designate in writing the qualified Control System Specialist, including a detailed listing of the firm, resumes and work history of each person working on the project, and project specific references. The qualifications of the Control System Specialist shall be subject to approval of the Owner and the Engineer.

B. The minimum qualifications for the Control System Specialist shall include:
1. An established firm in operation as a control and automation company for a minimum of 5 years, with demonstrated water and wastewater industry experience.
2. Staffed with experienced personnel capable of executing the required aspects of the project.

1.5 SCOPE OF WORK

A. The Contractor shall engage the services of a Control System Specialist, who shall furnish all materials, equipment, labor, and services to achieve a fully functional process control system for this project.
1. [The Control System Specialist shall be Automation Control Service, LLC. Contact: Ken Faul, ken.faul@autoconserv.com, (850-477-8440).

B. The Control System Specialist shall be responsible for providing and installing all instrumentation, PLC control panels, computer equipment, networking equipment, and other control system hardware as specified for a complete process control system installation.

C. In general, the Control System Specialist shall:
1. Provide PLC programming and HMI screen development to implement process control of equipment as described within Section 40 61 96 – Process Control Descriptions.
2. Furnish, install, configure, and calibrate instrumentation as detailed on the drawings and in the sections.
3. Fabricate and install all control panels as specified in Drawings, except for those provided as part of a vendor supplied equipment package. Terminate all field control wiring inside control panels.
    a. Where existing control panels are being replaced with new, field investigate and develop as-builts of the existing instrumentation and control installation to identify and label all I/O and communication wiring entering the existing panels. The contractor shall be responsible for properly identifying and labelling all existing wiring and reconnecting to the new control panel. Perform point-to-point wiring checks and startup testing for reconnected existing components and wiring following the same requirements as new equipment.
4. Provide all hardware required to properly communicate between all control panels and remote sites, whether or not explicitly identified in the drawings or sections.
5. Install networking equipment and communication cables between control devices as specified in Drawings and sections. Provide configuration of equipment, including network switches and firewalls, to ensure proper communication between all devices associated with the integrated operating platform.
6. Provide all instrumentation and control device relocation work associated with the relocation of equipment, including disconnecting all existing wiring and conduit and terminating, calibrating, and replacing service to relocated equipment.
7. Modification to existing instrumentation and control systems as required to new and existing equipment to maintain process operations.

8. Provide overall coordination, installation, supervision, and installation of control panels, instrumentation, computer hardware, networking systems, and other miscellaneous control system components as specified.
9. Provide coordination with the Contractor and participate in all meetings as directed by the sections or Contractor.
10. Execute the testing procedures outlined in this document.

D. Vendor system packages may be provided under other sections of this contract that may interface with the process control system via communications protocol and/or hardwired I/O. Refer to the associated sections and the contract drawings for additional details. The Control System Specialist shall be responsible for coordination, furnishing, installing, and configuring any communication devices or drivers necessary to ensure proper communication with each of the vendor-furnished systems.

E. Vendor system packages may include instrumentation or control panels that shall be installed and configured by the Control System Specialist as specified in vendor instructions. Upon satisfactory installation, configuration, and calibration, the Control System Specialist shall coordinate with each vendor to inspect finished work. The Control System Specialist shall submit documentation indicating that the vendor has inspected and approved the installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection:
1. Delivery, storage, and handling shall be as specified in Manufacturer’s recommendation and the requirements of other sections herein.

1.7 PROJECT AND SITE CONDITIONS

A. Environmental Requirements:
1. Instrumentation and control elements may be installed outdoors exposed to sun, rain and excessive humidity and shall be capable of continuous operation without significant reduction of their operating life under the ambient conditions below:
   a. Temperature:
      1) (-25)°C – 80°C
   b. Pressure:
      1) 650 mm Hg – 800 mm Hg
   c. Relative Humidity:
      1) 20% – 100% condensing
   d. Vibration Frequency:
      1) 10 Hz – 2000 Hz
   e. Vibration Position:
      1) 1.5 mm peak-to-peak
   f. Vibration Acceleration:
      1) 10 G.

B. Where the ratings of individual components cannot meet the requirements, provide suitable means of physical protection. Suitable physical protection shall consist of an assembly which meets the requirements listed, while limiting the ambient conditions at the non–conforming component to 90% of the component's rating (Example: A component rated for vibration at only 5 G. acceleration would be required to be combined with vibration isolation to limit the acceleration of the component to 4.5 G. when subjected to ambient acceleration of 10 G. from 10 Hz – 2000 Hz.).

C. Operating Environmental Conditions:

1. All instruments and control devices provided shall be rated for continuous operation in their installed operating environment and shall be capable of continuous operation at the operating conditions without significant reduction of their operating life.

D. All controlling devices shall be NEMA or IEC rated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. All meters, instruments, control units, and other components shall be the most recent field proven models marketed by their respective manufacturers at the time of the submittal of the shop drawings unless otherwise specified to match existing equipment.

B. Analog measurements and control signals shall be electrical and shall vary in direct linear proportion to the variable being measured. All analog signals whether inputs or outputs shall be 4 mA – 20 mA DC unless otherwise noted. The analog input signals shall maintain loop integrity with the installation of properly sized resistors across the input terminals. Provide surge protection for all analog signal terminations.

C. All of the elements, instruments, accessories, and assemblies shall be installed as specified in the manufacturer's installation instructions, and as detailed on the Drawings. Shielded instrumentation cables shall be used for all analog signals from the instruments to the programmable logic controller panels. Separate conduits shall be used for instrument power, instrument signals, and fiber optic cables.

D. All instruments installed outdoors subject to direct sunlight shall include a stainless-steel sunshade.

E. All digital outputs shall be isolated from the field equipment through an interposing relay. The relays shall be mounted inside the cabinet housing the associated programmable logic controller as shown on Drawings.

F. The Contractor shall make the necessary power connections and signal connections from the field devices (i.e., instruments, control valves, etc.) to the programmable logic controllers.

G. The Contractor shall configure and verify proper operation of the Integrated Operating Platform, included but not limited to:
   1. The computers, PLCs, OITs, networking hardware, surge protection devices, uninterruptible power supplies, and other incidental equipment shall be configured and installed as shown on the Drawings and as specified herein.
   2. All networked devices shall be configured for proper communication via the topology and protocol shown on the Drawings or specified herein.
   3. Verify that all system devices power up, function, and properly communicate prior to commencing any startup or testing procedures as described herein.

3.2 SYSTEM WIRING COORDINATION

A. The Control System Specialist shall develop complete point-to-point interconnection wiring termination sheets for all control connections to be provided for the project. The sheets shall identify all external interconnecting wiring associated with all new control panels or existing control panels.

1. Develop point-to-point interconnection wiring termination sheets for performance of the Work and to document terminations.
2. Use information from shop drawings, record drawings, plan drawings, and field inspections to develop sheets. Contractor shall field investigate the existing installation to determine the connections for equipment that is to remain and reconnected.
3. The interconnection wiring termination sheets shall include:
    a. External wiring for each piece of equipment, panel, instrument, local control stations, and other field devices with an electrical connection.
    b. Numbered terminal block identification for each wire termination.
    c. Identification of the assigned wire numbers for all interconnections.
    d. Conduit tags, terminal numbers, and pull box identifications through which wiring is routed between end points.
    e. Identification equipment documents from which the wire numbering and termination information was obtained.
4. Conduct point-to-point wiring checks to determine that wiring and terminations are installed in compliance with the point-to-point interconnection diagrams. The Control System Specialist shall document all wiring checks and signoff on completed wiring termination sheets. Submit signed documentation to Owner and Engineer.

3.3 TESTING AND INSTALLATION REQUIREMENTS

A. Testing and Installation Requirements:
1. The Contractor shall be required to coordinate the following services during construction related to the testing and installation of the process control system. The complete system testing shall include all PLCs, computer systems, SCADA software and hardware, network devices, interconnecting cables, and other peripheral devices required for a complete and functional system. The testing of the system shall occur in stages as defined below. The Contractor shall develop and submit proposed testing procedures and documentation for each test. Testing documentation shall include signature lines for representatives of the Control Systems Specialist, Engineer, and Owner. Signatures shall be provided for each portion of the test, including a final signoff indicating satisfactory completion of the entire test. Any deviations from the test procedure or corrections made during test must be recorded on the documentation and initialed by individual making the record. Testing documentation submittals must be approved by the Engineer prior to the scheduling of any actual tests.

B. Site Readiness Test:
1. A Site Readiness Test shall be performed after the installation of all control system components including PLC control panels, communications, control wiring, device configurations, instrument calibrations, motor controllers, and variable frequency controllers as specified in the Contract Documents. The test will be witnessed by, at minimum, representatives of both the Engineer and Owner. Additional witnesses may be present at the Engineer or Owner's discretion. The Control System Specialist shall provide notice to the Engineer a minimum of thirty (30) days in advance of the test.
2. The purpose of this test is for the Control System Specialist to verify:
    a. All instruments have been properly configured and calibrated.
    b. All field control wiring has been properly installed and terminated.
    c. All PLC control panel hardware is operating and communicating properly.
    d. The installation is ready to load PLC and HMI programming and begin functional process control testing.
3. Site Readiness Test shall include energization and testing for correct hardware integration of all system components, including PLC remote I/O assemblies, and reliable communications between components with correct protocols.
4. Provide point-to-point wiring checks for continuity between field devices to final PLC I/O terminations.

5. To the greatest extent possible, the Control System Specialist shall check I/O under process conditions to the end elements. For example, I/O for valve limit switches shall be checked by operating the valve to fully open and closed positions, rather than using jumpers or other means to simulate valve operation. Any testing performed that could upset or affect any live process shall be coordinated with the Owner.
6. Provide verification and documentation of normally closed or normally open contacts for discrete I/O signals.
7. Discrete inputs shall be tested by operating the end device to force a signal change. Observe results on all indicators such as PLC register, panel light, etc.
8. Discrete output signals shall be tested by forcing a value in the PLC register. Observe that the connected equipment properly responds.
9. Analog inputs shall be verified at 0%, 25%, 50%, 75%, and 100% of span. Observe results on all indicators such as PLC register, digital panel meters, etc.
10. Analog outputs shall be tested by entering values in the PLC register to force the outputs at 0%, 25%, 50%, 75%, and 100% of span. Observe that the connected equipment properly responds.
11. Personnel performing the test shall have International Society of Automation (ISA) Certified Control Systems Technicians (CCST) or equivalent credentials as approved by the Engineer or Owner.
12. The Control System Specialist shall submit completed testing documentation as record to the Engineer upon satisfactory completion of the Site Readiness Test.

C. Functional System Test:
1. Upon the Engineer's approval of the Site Readiness Test load the PLC and HMI programming to begin functional testing of control strategies.
2. The test will be witnessed by, at minimum, representatives of both the Engineer and Owner. Additional witnesses may be present at the Engineer or Owner's discretion. Although the Control System Specialist must provide notice to the Engineer a minimum of thirty (30) days in advance of the test, the Functional System Test may be performed consecutively with the Site Readiness Test if approved by the Engineer and Owner ahead of time.
3. The purpose of the functional system testing is to implement and test the automatic and manual process control strategies through PLC and HMI programming.
4. The Control System Specialist shall be available to assist with equipment operations, as necessary.
5. For this test, all equipment shall be installed, calibrated, and functioning as required in the contract documents.
6. Each analog and discrete I/O signal will be checked through the PLC to the HMI screens to verify proper mapping of tags.
7. Functionality of the system will be checked to ensure conformance with process control strategies.
8. PLC control loops will be tuned to achieve stable process control.
9. If during the Functional System Test the Engineer, or Owner finds that process control is not achievable due to errors in the installation, the functional testing shall stop, and the Control System Specialist shall correct the installation and repeat the Site Readiness Test at no additional cost to the Owner.

D. Final Acceptance Test:
1. After the system has been started up and running in automatic control to the greatest extent possible as determined by the Engineer/Owner, the Control System Specialist shall conduct a Final Acceptance test of the completed installation. The test shall start after satisfactory completion of all previous tests, the Engineer has received marked record (as-built) drawings from the Contractor, and when directed by the Owner/Engineer.
2. During this test, the Owner and Engineer shall have full use of the system. The duration of the test shall be 30 days.

3. Control System Specialist personnel shall be readily available to address issues onsite during the acceptance test.
4. The system shall operate with 100% reliability during the test period. Failure shall be defined as the inability to control or indicate status of specified inputs or outputs or any specified function of the control systems as described herein caused by defective hardware or software furnished in this project. Failure of hardware or software shall require repair or remedy of the defect to the satisfaction of the Engineer/Owner within 2 days. If the problem cannot be repaired in this time, the test shall be aborted and restarted after the problem is corrected and when directed by the Owner/Engineer. Restarting and satisfactory completion of the test shall be conducted at no additional cost to the Owner.
5. Throughout the duration of the test, no modifications shall be made to the system without prior approval from the Engineer or Owner.

3.4 TRAINING, STARTUP ASSISTANCE, & WARRANTY

A. Training:
1. The Contractor shall provide training for the purpose of familiarizing Owner's personnel with the process control system. All training shall be as scheduled by the Owner. The training shall be scheduled a minimum of thirty (30) days in advance of when it is to be given. Proposed training materials, including a detailed training agenda itemizing relative emphasis on various topics of each course, shall be submitted to the Owner and Engineer at least fourteen (14) days in advance of when the training is to begin. The course content shall include, but not be limited to, a description of system philosophy, all major hardware components utilized in the system and hardware maintenance practices.

B. Startup Assistance:
1. The Contractor shall be responsible for furnishing a qualified technical representative who shall supervise the installation of equipment and/or install equipment, and who shall test, adjust, field calibrate, and fully commission all flow metering equipment, instrumentation equipment, control equipment, and accessories specified herein and required as integral components of the complete systems. The commissioning will be deemed to be complete only after all systems are found to be performing satisfactorily following the final balancing of plant operation. The guarantee period, during which all defective materials shall be replaced, and all faulty workmanship will be corrected at no cost to the Owner, shall begin with the date on which the commissioning is judged to be complete.

C. Service:
1. Manufacturers shall provide as part of the equipment cost sufficient days of service by a factory-trained service engineer specifically trained on the type of equipment herein specified to assist the Contractor during installation and startup. The service time shall be sufficient to place the units in satisfactory service and instruct the Owner's personnel in proper operation and maintenance of the equipment.
2. A minimum of three (3) days service Engineer time shall be provided.

D. Maintenance Instruction:
1. Operating and maintenance instructions, along with a separate parts list, shall be furnished in three (3) copies to the Owner. Operating instructions shall also incorporate a functional description of the system, including the system schematics which reflect "as-built" modifications. Maintenance requirements particular to the system shall be clearly defined, along with calibration and test procedures.

E. Warranty:
1. All equipment and workmanship furnished under this contract shall be guaranteed to be free of defects in materials and workmanship for a period of one (1) year from and after

the date of final acceptance of the work by the Owner, and any such defects which appear within the stipulated guaranty period shall be repaired, replaced, or made good without charge. This guarantee shall include the capacity and integrated performance of the component's parts.

END OF SECTION

SECTION 40 70 00 – INSTRUMENTATION FOR PROCESS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work for furnishing all materials, labor, equipment, tools, supplies, and incidentals for installation of all instrumentation equipment. The work shall include every item of construction necessary for a complete and acceptable installation.

B. Related Sections:
   1. Section 40 61 13 – Process Control System General Provisions.
   2. Division 40 – Process Integration Instrumentation Sections.

1.2 REFERENCES

A. ISA:
   1. S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves
   2. S50.1 – Compatibility of Analog Signals for Electronic Industrial Process Instruments
   3. S51.1 – Process Instrumentation Terminology
   4. S51.1 – Sec. 5 – Test Procedures

B. NSF International:
   1. NSF 61 – Drinking Water System Components – Health Effects.
   2. NSF 372 – Drinking Water System Components – Lead Content.

1.3 COORDINATION

A. Section 01 30 00 – Administrative Requirements.

B. Coordinate Work of this Section with piping Work.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Submit manufacturer information for system materials and component equipment, including connection requirements.

C. Shop Drawings:
   1. Specify system materials and component equipment.
   2. Submit installation requirements and other details.

D. Manufacturer's Certificate:
   1. Certify that products meet or exceed specified requirements.

E. Source Quality-Control Submittals:
   1. Specify results of factory tests and inspections.

F. Field Quality-Control Submittals:
   1. Specify results of Contractor-furnished tests and inspections.

G. Manufacturer Reports:
   1. Certify that equipment has been installed as specified in manufacturer instructions.

H. Qualifications Statement:
   1. Submit qualifications for manufacturer.

I. Closeout Submittals
   1. See Section 01 77 00 – Closeout Procedures for requirements.
   2. Project Record Documents:
      a. Record actual locations and final orientation of equipment and accessories.

1.5 QUALITY ASSURANCE

A. Make sure that materials of construction of wetted parts are compatible with process liquid.

B. Materials in Contact with Potable Water:
   1. Certified to NSF 61 and NSF 372.

1.6 QUALIFICATIONS

A. Manufacturer:
   1. Company specializing in manufacturing products specified with minimum three years of documented experience.

1.7 SOURCE QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements for testing, inspection, and analysis.

B. Certificate of Compliance:
   1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance specifying that Work performed at manufacturer's facility conforms to Contract Documents.

C. Similar instruments shall be by the same Manufacturer to the extent practical.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection:
   1. Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store equipment as specified in manufacturer instructions.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection as specified in manufacturer instructions.

1.9 WARRANTY

A. See Section 01 78 36 – Warranty and Bonds, and individual instrument sections for additional or longer warranty requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Furnish instruments as specified in the individual instrument specifications. Instruments for services not listed shall be equal in quality, performance, and environmental and functional characteristics as instruments listed and shall be approved in writing by the Owner.

2.2 INSTRUMENT ACCESSORIES

A. Instrument and Control Device Tags:
   1. Each field mounted instrument or control device shall be identified by its unique tag number as it appears in the contract documents. The tag number shall be stamped on a 1 in. by 2 in. stainless steel tag permanently attached to the instrument by braided stainless steel wire which has been sealed by an approved method such that the wire must be cut, or the seal broken to remove the tag. The tag number shall not be stamped on the nameplate of the instrument. This requirement shall be documented on the Instrumentation Section Sheet.

B. Sunshades:
   1. Furnish stainless steel sunshades for all outdoor instruments not shaded by adjacent or integral equipment.

C. Process Tubing:
   1. Stainless Steel, ASTM A 269, TP316, seamless, annealed, 1/2 in. by 0.065 in. W.T. minimum.

D. Pneumatic Supply Tubing:
   1. Stainless Steel, ASTM A 269, TP316, seamless, annealed, 1/2 in. by 0.065 in. W.T., 3/8 in. by 0.049 in. W.T. and 1/4 in. by 0.035 in. W.T. minimum.

E. Fittings:
   1. 316 Stainless Steel ferrule type, Swagelok or equal.

F. Pipe Stand Type Supports for Instrumentation:
   1. Pipe stands shall be stainless steel using welded fabrications with 2 in. schedule 40 pipe, 2 in. square tube by 0.188 in. thick, 3/8 zinc/cadmium plated hardware, 1/2 in. expansion anchors, 12 gauge mounting channel and 1/4 in. thick stainless-steel plate as a minimum. Supply U-bolts or cable mounts, as necessary. Acceptable alternatives include engineered pipe stand systems such as O'Brien Saddlepak.

G. Enclosures for outdoor locations:
   1. Furnish and install NEMA 4X enclosures. All outdoor enclosures with instrumentation accessible in enclosure door shall have a stainless steel sunshade.

2.3 INSTRUMENTATION CABLING

A. Instrumentation signal wiring shall meet the following requirements:
   1. 18AWG minimum stranded tinned copper twisted pairs and triads as applicable for the application.
   2. Color code shall be black/red pair (black/red/white triad).
   3. Individually shielded with shield drain wires.
   4. Insulation to be polyethylene PE or PVC.
   5. Outer jacket to be black polyvinyl chloride PVC.

2.4 CALIBRATION

A. Order instruments factory calibrated to the range specified in calibration sheets indicating certification of traceability to National Institute of Standards and Technology (NIST). Instruments shall be ranged as specified in the specification or as directed by Engineer.

2.5 FABRICATION

A. Materials of Construction:
   1. Provide 316 Stainless Steel for wetted and other parts unless otherwise specified.

2.6 HAZARDOUS LOCATION APPROVALS

A. Where installed within a hazardous location, instruments shall bear agency approvals for the identified class, division, and group of the hazardous location.

B. Hazardous location boundaries shall be as defined by NFPA 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities. Consult the Engineer or Authority Having Jurisdiction for a determination when hazardous location identification is uncertain.

C. Provide intrinsically safe wiring methods for connection of instruments located within a hazardous location.

2.7 DIAPHRAGM PRESSURE SEALS

A. Provide diaphragm type pressure seals with all pressure instrumentation including gauges, switches, and transmitters, for all process applications other than filtered water (unless specified to be provided with an annular style seal).

B. Seals shall be 316L stainless steel housing and include a flushing port in the lower housing.

C. Manufacturers and Products:
   1. Ashcroft Model 201 or equal

2.8 ANNULAR PRESSURE SEALS

A. Where specified in Drawings, provide annular style isolation ring pressure seals installed in-line with process piping for pressure instrumentation connection.

B. See Section 40 05 06 – Process Piping Specialties for requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 – Closeout Procedures for installation and examination requirements.

B. Verify that items provided by other Sections of Work are ready to receive Work of this Section.

3.2 INSTALLATION

A. Coordinate location and orientation of instrumentation with final equipment installations.

B. Ensure that instruments are located to be easily accessible for maintenance.

C. Install sensing elements at the point of measurement and route sensing line or cable to the transmitter. Cables from sensors to transmitters shall be installed in conduit where subject to physical damage, and exposed cabling shall be limited to no more than 6 feet. Provide conduit cord connector fitting when transitioning from conduit to exposed cable. Provide strain relief grips where required for vertical cable support. Factory cords shall be trimmed to length to avoid excessive cable loops.

D. Install transmitters 4 ft 6 in. above grade or platform in an easily accessible location adjacent to the sensor location. Mount on pipe stanchion or support designed for the purpose individually or grouped with other transmitters.

E. Surge Protection
   1. 2-wire Loop Powered Instruments: Furnish and install surge protector, Emerson EDCO SS65 or equal, in each 4 mA – 20 mA current loop, adjacent to each respective instrument.
   2. 4-wire Separately Powered Instruments: Furnish and install 120VAC/24VDC combination surge protector, EDCO SLAC-12036 or equal, adjacent to each respective instrument.

F. Steel supports shall be as specified in this Section and all other sections.

G. Process connections for instrumentation shall be as specified in piping sections and other section requirements.

H. Provide block valves at taps for pressure or sampling sensor lines. Provide plugged tees at taps suitable for rodding or blowing out taps. Make pipe taps with weld-o-let type fittings or equal. Install block valves suitable for the service and rated as the pipe at each tap, generally use NPT threaded ball valves. Use materials rated for the service and transition to tubing for sensor runs. Use 1/2 in. OD 316 SS tubing or as specified in Drawing details.

I. Tubing and Fittings:
   1. Install tubing and fittings in a neat, orderly, and functional manner; level and plumb except as required, noted on approved drawings, or specified. Make offsets required for fittings or equipment level in the horizontal plane to prevent high or low spots.

J. Conduit and fittings:
   1. Install conduit as required. Provide a cast body tee fitting at the instrument connections at the low point of all conduit runs below the instrument with a drain fitting for condensate. Make connections from instrument to tee with liquid-tight flexible conduit and use sealing compound inside the conduit and shrink-fit tubing over the outside of the connection to prevent entry of water into the instrument. Heat trace and insulate all liquid filled lines and the sensing body of all instruments connected to liquid service in exterior locations.

K. Calibration:
   1. Calibrate each and every instrument connected to the work of this contract in its range, whether furnished under this contract, Owner-furnished, or existing, and fill out a signed and dated five point calibration sheet and install an initialed and dated calibration sticker. Notify the Owner in writing immediately of any instrument which will not calibrate. Instruments that do not calibrate will require the onsite services of a factory authorized representative at no cost to the Owner.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements for inspecting and testing.

B. Testing:

1. Test and calibrate instruments to demonstrate that they meet specified accuracy requirements.

C. Manufacturer Services:
   1. Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 1 days 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. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.4 DEMONSTRATION

A. Section 01 75 00 – Startup Testing and Training.

B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION

SECTION 41 22 23.19 – MANUAL TROLLEY HOIST

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. The Work necessary to furnish and install a trolley and hoist system for a monorail for removing pumps as specified herein and as indicated on the drawings. All related equipment, material, and appurtenances shall be provided for a complete and function system.

B. Related Sections:
1. Section 05 50 00 – Metal Fabrications
2. Section 09 90 00 – Painting and Protective Coatings

C. General Requirements:
1. The equipment specified herein is included in the Manufacturer/Subcontractor Form. Refer to the Bid Form and the Instructions to Bidders for additional requirements.

D. Unit Responsibility:
1. The Work requires that the hoist and trolley complete with all accessories and appurtenances be the end product of one responsible system manufacturer or responsible system supplier. Unless otherwise indicated, the Contractor shall obtain each system from the responsible supplier of the equipment, which supplier shall furnish all components and accessories of the system to enhance compatibility, ease of operation and maintenance, and as necessary to place the equipment in operation in conformance with the specified performance, features, and functions without altering or modifying the Contractor 's responsibilities under the Contract Documents. The Contractor is responsible to the Owner for providing the equipment systems as specified.

2. Contractor shall verify that trolley system is compatible with the bottom flange of a galvanized steel W8x24 monorail beam (Flange Width=6 1/2"; Flange Thickness=3/8")

1.2 REFERENCES

A. AISC:
1. 348 – Specification for Structural Joints Using ASTM A325 or A490 Bolts

B. ASME International:
1. B30.16 – Overhead Hoists (Underhung)
2. HST-3 – Performance Standard for Manually Lever Operated Chain Hoists

C. ASTM International:
1. A275 – Standard Practice for Magnetic Particle Examination of Steel Forgings
2. A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
3. A563 – Standard Specification for Carbon and Alloy Steel Nuts
4. F959 – Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

D. MMA:
1. MH27.1 – Specifications for Patented Track Underhung Cranes and Monorail Systems

E. AWS:

1. D14.1 – Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment
2. D1.1 – Structural Welding Code – Steel

1.3 SUBMITTALS

A. Subject to requirements for Section 01 33 00 – Submittal Procedures.

B. Action Submittals:
1. Shop Drawings:
   a. Equipment Assembly: Make, model, and weight of each.
   b. Manufacturer's Catalog: Product information, descriptive literature, dimensional layouts, specifications, standard and specialized equipment assembly cuts, and identification of materials of construction.
   c. Detailed Drawings:
      1) Structural, Mechanical, and Electrical: Show equipment fabrications and interface with other items including dimensions, size, and locations of connections to other work, and weights of associated equipment.
   d. Painting/Coating System(s): Include manufacturer's descriptive technical catalogue literature and specifications.
   e. Structural Loads: static, dynamics loads to be transferred into monorail beam
   f. Motor nameplate with all information as identified below.

C. Informational Submittals:
1. Test Reports:
   a. Operational tests
   b. Hook test
   c. No-load test
   d. Load test
2. Certificates:
   a. Overload test certificate
3. Operation and Maintenance Data:
   a. Operation and maintenance manual

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage:
1. Inspect materials delivered to site for damage; unload and store with minimum handling. Materials shall be stored onsite in enclosures or under protective coverings. Protest materials NOT suitable for outdoor storage to prevent damage during periods of inclement weather, including subfreezing temperatures, precipitation and high winds. Store materials susceptible to deterioration by direct sunlight under cover and avoid damage due to high temperatures. DO NOT store materials directly on ground. When special precautions on outside of equipment or its crating.

B. Handling:
1. Handle materials in such a manner as to ensure delivery to final location in undamaged condition. Make repairs to damaged materials at no cost to Owner.

1.5 QUALITY ASSURANCE

A. Certificates:
1. Overload Test Certificate: Submit a statement that the hoist system can be periodically load tested to 125% of rated load.

B. Manufacturer's Certificate of Compliance, as specified in Division 01 – General Requirements.

C. Test Procedures

D. Test results, reports, and certifications

E. Special shipping, storage, protection, and handling instructions

F. Manufacturer's Certificate of Proper Installation

G. Contract Closeout Submittals:
   1. Service records for maintenance performed during construction.

1.6 OPERATION AND MAINTENANCE DATA

A. O&M Manuals:
   1. Content, form, and schedule for providing as specified in Section 01 77 00 – Closeout Procedures.

B. Maintenance Summary Forms:
   1. As specified in Section 01 77 00 – Closeout Procedures.

1.7 WARRANTY

A. Provide warranty for a period of 24 months after the final acceptance of the equipment by the Owner and Engineer. The warranty shall stipulate that the equipment furnished is suitable for the purpose intended and free from defects of material and workmanship for the duration of the warranty. In the event the equipment fails to perform as specified, the Manufacturer shall promptly repair or replace the defective equipment without additional cost to the Owner.

B. Spare parts identified within this specification shall NOT be used to address warranty repairs.

C. See Section 01 78 36 – Warranties and Bonds for additional requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Where a manufacturer's standard equipment name and/or model number is listed, the equipment system shall be provided and modified as required to conform to the performance, functions, features, and materials of construction as specified herein.

B. Acceptable Manufacturers:
   1. Yale Hoists
   2. Harrington Hoists
   3. Budgit Hoist
   4. Columbus McKinnon Corporation

C. The details for dimensions are indicated on the drawings.

2.2 TROLLEY HOIST SYSTEM

A. Conform to MMA MH27.1, Class C

B. Provide:

1. Hoist Type:
   a. Hand Chain Hoist
2. Trolley Type:
   a. Push Trolley
3. Capacity:
   a. 1 Ton
4. Lift:
   a. See drawings for lift height required.
5. Hoist and Trolleys shall be designed to withstand all stresses imposed under safe operation conditions while handling loads within the rated capacity. Load bearing parts shall be designed such that the static stress, calculated for rated load, shall NOT exceed 20% of the ultimate strength of the material.
6. The breaking system shall be capable under normal operating conditions with rated load to stop and hold load when chain is released.
7. Material: Shafts, keys, couplings, sprockets, and chains shall be steel. All gears shall be steel except for worm gears, which shall be bronze or steel. Trolley wheels and axles shall be made from high strength forged steel and shall be precision machined to assure concentricity of axle and tread.
8. Bottom block shall be completely shrouded for safety and fabricated from steel. Sheaves shall be forged or rolled steel, running on antifriction bearings. Hooks are to be forged steel supported by antifriction bearings. Hooks shall be equipped with latches unless the application makes the use of the latch impractical. When required, a latch shall be provided to bridge the opening of the hook for the purpose of retaining slings, chains, etc., under slack conditions.
9. Safety: Comply with the mandatory and advisory safety requirements of ASME B30.11, ASME B30.16 and 29 CFR 1910.179.
10. Design shall be such to facilitate easy installation or removal of wheels at any point along the track system without removing the carrier assembly from the track.

2.3 TROLLEY

A. Trolley shall meet all applicable requirements of MMA MH27.1 and ASME HST-3 and as stated herein. Trolley shall have elastomeric bumpers to engage runway stops.

B. Shall be compatible with steel W8x24 section used for monorail.

2.4 BRAKES

A. Provide hoist with a mechanical load brake capable of holding 130% of the rated hoist capacity.

2.5 LOAD BLOCK AND HOOK

A. Construct load blocks of steel. Provide forged steel, swivel type hook with hook nut keyed to hook shank by means of a setscrew installed in a plane parallel to the longitudinal axis of the hook shank or other similar easily removable securing device. Provide hook with spring loaded steel safety latch for closing the hook throat opening. The hook and hook nut shall be unpainted. Permanently mark hook and hook nut with an identification number.

B. Hook and Hook Nut Magnetic Particle Inspection:
   1. Magnetic particle inspect the hook and nut over the entire area in accordance with ASTM A275. Acceptance standard shall be no defects. A defect is defined as a linear indication that is greater than 1/8 inch long whose length is equal to or greater than three times it width.

2.6 BEARINGS

A. All bearings except those subject to a small rocker motion shall be antifriction type. Bearings NOT considered lifetime lubricated by the manufacturer shall be provided with a means for lubrication.

2.7 IDENTIFICATION PLATES

A. Provide identification plates of noncorrosive metal with clearly legible permanent lettering giving the manufacturer's name, model number, capacity in pounds and other essential information or identification. Identification plate shall indicate that lifted load shall not exceed 1 ton.

2.8 CRANE STOP

A. Capable of stopping trolley per ASME HST-3 criteria.

B. Compatible with steel W8x24 section used for monorail.

2.9 PAINTING SYSTEM

A. Provide a primer and a finish coat. Blast clean all components prior to painting. Paint coats shall be smooth and even, free of runs, sags, orange peel or other defects.

B. Provide painting system as specified in Section 09 90 00 – Painting and Protective Coatings.

PART 3 - EXECUTION

3.1 ERECTION AND INSTALLATION

A. Erect and install the hoist system, complete in accordance with the approved submittals and in condition to perform the operational and acceptance tests.

3.2 FIELD QUALITY REQUIREMENTS

A. Inspector:
   1. The Contractor shall provide an Inspector to perform all post-erection inspection and operational tests. The inspector shall be a licensed or certified individual in this field.

B. Post-Erection Inspection:
   1. After erection, the Inspector, Contractor and the Engineer or Owner shall jointly inspect the hoist systems and components to determine compliance with specifications and approved submittals. The Contractor shall notify the Owner seven (7) days before the inspection. Provide a report of the inspection indicating the hoist system is considered ready for operational tests.

C. Operational Tests:
   1. After erection and inspection, test the hoist and trolley as specified herein. Test the systems in service to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacturer, installation, and workmanship. Rectify all deficiencies disclosed by testing and retesting the system or component to prove the hoist system is operational. The Contractor shall furnish loads for testing, operating personnel, instruments, and all other necessary apparatus.

D. Test Data:

1. Record test data on appropriate test record forms suitable for retention for the life of the hoist system. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected.

E. Hook Test:
   1. Measure hook for hook throat spread before and after load test. Establish a throat dimension base measurement by installing two tram points and measuring the distance between these tram points (greater or less than 1/64-inch). Record this base dimension. Measure the distance between tram points before and after load test. An increase in the throat opening by more than 5% from the base measurement shall be cause for rejection.

F. No-Load Test:
   1. Hoist: Raise the load hook the full operating lift distance and verify satisfactory operation of hoist and correct any deficiencies.
   2. Trolley: Operate trolley assembly the full length of the monorail in both directions. Verify satisfactory operation and correct any deficiencies.

G. Load Test:
   1. 125% (plus 5%, minus 0%) of rated capacity.
   2. Hoist Static Test: Raise test load approximately one foot above the floor and hold for 10 minutes. Observe load lowering that may occur which will indicate malfunction of hoisting component or brake. Lower the test load to the floor until the hoist line is slack. Correct any deficiencies as required by manufacturer.
   3. Hoist Dynamic Test: Raise the test load to approximately 5 feet above the floor. Lower the load back to the floor. Stop the test load at least once while lowering and observe proper brake operation. Wait 5 minutes then repeat the above cycle. Correct any deficiencies as required by manufacturer.
   4. Trolley Test: With test load hoisted to a height of one foot above the floor, operate trolley the full distance of the monorail in both directions. Observe for any malfunctioning of the trolley assembly and monorail system. Correct any deficiencies as required.

END OF SECTION

SECTION 46 43 21.16 – CLARIFIER MECHANISM

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the Work necessary to completely furnish and install the clarifier mechanism, all related equipment, material and appurtenances.

1.2 GENERAL

A. Equipment Numbers: See Supplemental Data Sheet(s) at end of section.

B. Like items of equipment provided hereinafter shall be the end products of one manufacturer to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.

C. Unit Responsibility: The Work requires that the clarifier mechanism, including but not limited to drives, collector arms with pickets, skimmer arms, scum beach, feedwell, walkways, local control panels, instruments, and components, complete with all accessories and appurtenances be the end product of one responsible system manufacturer or responsible system supplier. Unless otherwise indicated, the Contractor shall obtain each system from the responsible supplier of the equipment, which supplier shall furnish all components and accessories of the system to enhance compatibility, ease of operation and maintenance, and as necessary to place the equipment in operation in conformance with the specified performance, features, and functions without altering or modifying the Contractor's responsibilities under the Contract Documents. The Contractor is responsible to the Owner for providing the equipment systems as specified herein.

D. Contractor is responsible for providing and installing the FRP weirs, baffles, and weir/launder brush system. See Section 2.9 and 2.10 of the specification for more requirements.

E. General Requirements: See Division 01, GENERAL REQUIREMENTS, which contains information and requirements that apply to the work specified herein and are mandatory for this project.

1.3 REFERENCES

A. The following is a list of standards which may be referenced in this Section:
   1. American Gear Manufacturers Association (AGMA): 908-B89, Geometry Factor for Determining the Pitting Resistance and Bending Strength of Spur, Helical, and Herringbone Gear Teeth.
   2. American Institute of Steel Construction (AISC): Specifications for the Design, Fabrication, and Execution of Structural Steel for Buildings.
   3. American National Standards Institute/American Bearing Manufacturers Association (ANSI/ABMA): 9 & 11, Load Ratings and Fatigue Life for Ball Bearings and Roller Bearings.
   4. American National Standards Institute/American Gear Manufacturers Association (ANSI/AGMA):
      a. 2000-A88, Gear Classification and Inspection Handbook Tolerances and Measuring Methods for Unassembled Spur and Helical Gears.
      b. 2001-C95, Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth.
      c. 2002-B88, Tooth Thickness Specification and Measurement.
      d. 2003-B97, Rating the Pitting Resistance and Bending Strength of Generated Straight Bevel, Zerol Bevel, and Spiral Bevel Gear Teeth.
      e. 2004-B89, Gear Materials and Heat Treatment Manual.

f. 2009-A98, Bevel Gear Classification, Tolerances and Measuring Methods.
g. 6001-D97, Design and Selection of Components for Enclosed Gear Drives.
h. 6010-F97, Standard for Spur, Helical, Herringbone and Bevel Enclosed Drives.
i. 6022-C93, Design Manual for Cylindrical Worm gearing.
j. 6034-B92, Practice for Enclosed Cylindrical Worm gear Speed Reducers and Gear motors.
k. 9005-D94, Industrial Gear Lubrication.

5. American Society of Mechanical Engineers (ASME): B29.1M, Precision Power Transmission Roller Chains, Attachments, and Sprockets.
6. American Welding Society (AWS): B2.1, Standard for Welding Procedure and Performance Qualification.
   a. D1.1, Structural Welding Code – Steel.
   b. QC 1, Standard for AWS Certification of Welding Inspectors.
7. ASTM International (ASTM):
   a. A36/A36M, Standard Specification for Carbon Structural Steel.
   b. A48, Standard Specification for Gray Iron Castings.
   c. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   d. A148/A148M, Standard Specification for Steel Castings, High Strength, for Structural Purposes.
   e. 6A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   f. A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
   g. A276, Standard Specification for Stainless Steel Bars and Shapes.
   h. A283/A283M, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
   i. A285/A285M, Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength.
   j. A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   k. A384, Standard Practice for Safeguarding Against Warpage and Distortion during Hot-Dip Galvanizing of Steel Assemblies.
   l. A385, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
   m. A536, Standard Specification for Ductile Iron Castings.
   n. A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   o. D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
8. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
   a. NEMA MG-1.

1.4 DEFINITIONS

A. Alarm Torque: 90 percent of design running torque.

B. Cutout Torque: 120 percent of design running torque.

C. Design Running Torque:
1. Torque used to select size, strength, and type of materials and components for mechanism and drive system.
2. At which or below will provide continuous 24 hour per day mechanism operation for period of not less than 20 years at design torque condition and rotational speed without damage, permanent deformation or overload.
3. Equal to 50 percent on overload device scale.

D. Slenderness Ratio: Ratio of unbraced length to least radius of gyration.

E. Submerged Metal: Metal below gear head drive and a plane 18 inches above weir elevation indicated.

F. Ultimate Torque: 150 percent of design running torque and below which no portion of mechanism will be damaged if operated for only a short period of time (a few seconds) and equal to 100 percent on overload device scale.

G. Certified Welding Inspector (CWI): As defined in AWS QC 1.

1.5 SUBMITTALS

A. General: Administrative, shop drawings, samples, quality control and contract close-out submittals shall conform to the requirements of Section 01 33 00, SUBMITTAL PROCEDURES.

B. In addition to the requirements of Section 01 33 00, SUBMITTAL PROCEDURES, submit the following additional specific information:
   1. Shop Drawings:
      a. Equipment Assembly: Make, model, weight, and horsepower of each.
      b. Manufacturer's Catalog: Product information, descriptive literature, dimensional layouts, specifications, standard and specialized equipment assembly cuts, and identification of materials of construction.
      c. Detailed Drawings:
         1). Structural, Mechanical and Electrical: Show equipment fabrications and interface with other items including dimensions, size, and locations of connections to other work, and weights of associated equipment.

         2). Structural and Mechanical: Details of walkway bridge, rotating rake arms.

      d. Design Details:
         1). Running, Alarm, Cutout, and Ultimate Torque ratings of drive unit assembly.

         2). Ultimate Torque load capabilities of drive unit assembly, torque cage, rotating rake arms.

      e. Hydraulic calculations for feedwell, column pipe, and column port opening sizing, including velocities and headlosses.
      f. Certification of Structural Calculations: Letter of certification for structural design of mechanism, shall be signed and sealed by registered professional engineer (Designer). Copies of detailed structural design calculations shall not be submitted for review. If submitted, calculations will be returned without review.
      g. Structural Loads: Static, dynamic, and torque reaction loads to be transferred into structure at center column and Access Bridge support locations.
      h. Details of torque sensing and load indication device.
      i. Certificate of completion by manufacturer of mechanism overload devices settings.
      j. Identification of outside utility requirements for each component such as air, water, and power.
      k. Power and control wiring diagrams, including terminals and numbers.
      l. Functional description of internal and external instrumentation and controls to be supplied including list of parameters monitored, controlled, or alarmed.
      m. Painting/Coating System(s): Include manufacturer's descriptive technical catalogue literature and specifications.
      n. Diameter of ball race.

o. Motor nameplate data per NEMA MG-1, motor manufacturer and any appurtenances.
p. Functional and Performance test description and results.

2. Quality Control Submittals:
   a. Designer qualifications:
      1). Designer: Professional engineer registered in the State of Alabama.

      2). Must show 10 years' experience with clarifier mechanism design.

   b. Manufacturer's Certificate of Compliance, in accordance with Division 01, GENERAL REQUIREMENTS.
   c. Special shipping, storage and protection, and handling instructions.
   d. Test procedures.
   e. Test results, reports, and certifications.
   f. List 10 installations of equipment in successful operation similar to equipment specified.
   g. Operation and Maintenance Data: As specified in Division 01, GENERAL REQUIREMENTS.
   h. Manufacturer's Certificate of Proper Installation.
3. Contract Closeout Submittals: Service records for maintenance performed during construction.

1.6 OPERATION AND MAINTENANCE DATA

A. O&M Manuals: Content, form, and schedule for providing as specified in Section 01 78 23, OPERATION AND MAINTENANCE DATA.

B. Maintenance Summary Forms: As specified in Section 01 78 23, OPERATION AND MAINTENANCE DATA.

1.7 WARRANTY

A. Provide warranty for a period of 24 months after the final acceptance of the equipment by the Owner and Engineer. The warranty shall stipulate that the equipment furnished is suitable for the purpose intended and free from defects of material and workmanship for the duration of the warranty. In the event the equipment fails to perform as specified, the Manufacturer shall promptly repair or replace the defective equipment without additional cost to the Owner.

B. Spare parts identified within this specification shall not be used to address warranty repairs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Where a manufacturer's standard equipment name and/or model number is listed, the equipment system shall be provided as modified to conform to the performance, functions, features, and materials of construction as specified herein.

B. Materials, equipment, and accessories specified in this Section shall be products of:
   1. Evoqua
   2. Ovivo

2.2 GENERAL REQUIREMENTS

A. Furnish units meeting performance and design requirements as specified and as shown on the Drawings.

B. Performance Requirements:
1. Separate solids from clear liquid through settling.
2. Collect and convey thickened solids to center hopper by rake mechanism.
3. Capable of normal operation with solids stored in the unit.
4. Collect floating scum from the surface and discharge it to an outlet scum trough.

C. Design Requirements:
1. Design Running Torque: Drive unit shall be sized such that all gearing meets Design Running Torque in accordance with AGMA 2001 and 6034. Design Running Torque shall be selected by Manufacturer for service conditions specified.
2. Rotational Speed: Constant tip speed between 8-10 ft/min. Manufacturer to justify recommended design tip speed.
3. Capable of withstanding, without failure or permanent deformation of any part, torque load of at least 150% of Design Running Torque and loads generated while sweeping in clarifier floor bottom grout.
4. Gears, Bearings, Chains, and Sprockets: Above water surface of clarifier.
5. Drive Mechanism: Design to allow removal of internal gears, balls, and strip liners without walkway bridge removal.
6. Base design upon all-welded construction except at locations requiring periodic field adjustment and as specifically approved.
7. At Ultimate Torque load, stresses in members shall not exceed 90 percent of material yield strength.
8. Slenderness Ratio: Maximum of 200 for any compression member and maximum of 300 for any tension member.

2.3 SUPPLEMENTS

A. See supplemental data sheets to this Section for additional equipment system product, component, and accessory information and requirements.

2.4 CENTER DRIVE UNIT ASSEMBLY

A. Ultimate Torque Rating: Not less than 200 percent of Design Running Torque.

B. Motor, Primary and Final Speed Reducers: Separately and independently mounted at center gear head drive platform.

C. Electric Drive Motor: In accordance with Division 26.

D. General:
1. Major drive components, main gears, and bearings shall be designed to allow for separate and individual replacement by plant personnel to facilitate efficient and economical repairs.
2. All bearings shall be designed for a minimum B-10 life of 200,000 hours.

E. Primary Speed Reducer:
1. Horizontally mounted cylindrical-worm or helical-worm gear motor type with gears supported by anti-friction bearings. Connected to secondary speed reducer via a chain.
2. AGMA 6034-B92 and AGMA Service Classification II.
3. The gear motor primary speed reducer shall drive the final worm gear reducer through a #80 roller chain and steel sprockets enclosed in a polyethylene or stainless steel guard.

4. Oil Fill, Drain and Level Indicator Devices, and Lubricant: ANSI/AGMA 9005-D94.

F. Chain Drive:
1. Roller Chain: Standard, ANSI B29.1.
2. Connect drive sprocket on primary speed reducer to driven sprocket on secondary speed reducer input shaft.
3. Sprockets and chain shall be designed for the connected horsepower of the drive with a minimum service factor of 4.0. Provision shall be made for adjustment of chain tension.

G. Secondary Speed Reducer
1. Cylindrical-Worm and Worm-Gear Type:
   a. Shafts supported by antifriction bearings and output shaft directly driving pinion gear of low-speed main bearing assembly.
2. Load Capacity and Torque Rating: AGMA 6034-B92.
3. Design: ANSI/AGMA 6022-C93.
4. Output Shaft: One-piece output extending through worm-gear and low speed main gear drive pinion without intermediate couplings.
5. Worm: Steel, heat treated, ANSI/AGMA 2004-B89, ground and polished.
6. Worm-Gear: Centrifugally cast, high silicon bronze copper alloy, or ductile iron.
7. Bearings: ABMA L-10, life of 180,000 hours minimum.
8. Oil fill, drain and level indicator devices, and lubricant conforming to ANSI/AGMA 9005-D94.
9. Enclosure: Cast iron ASTM A48, Class 40 minimum housing, and registered fit mounted to gear head drive platform.

H. Low Speed Final Reduction
1. Enclosed turntable, continuous multipoint contact contoured raceway type with hardened surfaces and balls (Precision bearings).
   a. Ring Gear: Internal or external toothed, spur pinion gear driven, attached to secondary speed reducer output shaft.
2. Low Speed Gearset:
   a. Design and Rated: ANSI/AGMA 2001-C95.
   b. Service Factor: Minimum 1.5 based upon Design running Torque. Power Rating:
      1). Lower of pitting resistance and bending strength ratings for pinion and gears.
      2). Based upon continuous 24 hours per day service at Design Running Torque for 180,000 hours minimum.
   c. Spur Pinion Gear:
      1). Steel: Heat treated; integral with or keyed to its shaft.
      2). Wall Thickness (Above Keyway): Minimum depth of one tooth.
   d. Ring Gear:
      1). Solid one-piece construction or split construction of ductile (nodular) iron (ASTM A536), cast steel (ASTM A148), or heat-treated alloy steel.
      2). Split Gear Construction:
         a. Machined, minimum two alignment dowels, joined with Type 316 stainless steel bolts.
         b. Allowable Stresses (Calculated): Reduced to 85 percent joint efficiency for split gear construction.
      3). Bolt to center torque cage that support and rotate collection mechanism.
   e. Teeth: Full depth, ANSI/AGMA 2001-C95.
3. Main Bearing:
   a. Ball Raceway Diameter: The main bearing shall have a minimum pitch diameter of 60 inches to assure stability without the necessity of underwater guide shoes and shall include chrome alloy steel balls, minimum 1.25 inch diameter, which shall bear vertically and horizontally upon a four point contact precision bearing assembly fitted into the turntable base and the worm gear. The bearing assembly shall be such that

the B10 life of the liner is a minimum of 50 years based on the mechanism speed and a uniformly distributed load due to the rotating mechanism.

4. Ring Gear, Pinion Gear, and Main Bearing Ball Races:
   a. Oil bathed, steel dust shield, and felt or neoprene seal protected.
   b. Oil fill, drain and level indicator devices, and lubricant conforming to ANSI/AGMA 9005-D94.
   c. Casing with manual condensate drain.
5. Oil filling and level pipe, drain plug, and sight gauge. Attach pipe to turntable bottom within base center for easy access.

I. Mechanism Overload Device:
1. Mechanical or Hydraulic
   a. Mechanical or Hydraulic: Actuate integral contacts to indicate impending overload and shutoff drive motor at predetermined load.
   b. Impending Overload Contact (Alarm Torque): Actuate at 90 percent of Design Running Torque.
   c. Motor Shutdown Contact (Cutout Torque): Actuate at 120 percent of Design Running Torque.
   d. Contacts: Single-pole, double-throw rated 5 amps, 120V ac.
   e. Enclosure: NEMA Type 4X cast epoxy coated aluminum.
   f. Indicating Pointer: Indicate relative load on graduated scale up to Ultimate Torque.
   g. The pointer shall provide a visual reading of the relative worm gear output torque on a 0 to 100 percent graduated scale. The 100 percent reading shall equal the 100 percent drive rating as specified.
2. Shear Pin
   a. A safety shear pin shall also be included in the design to prevent overload. Manufacturer shall include their standard shear pin appropriate for the design of their manufactured equipment and process application.

2.5 INFLUENT FEED WELL AND INLET PIPE

A. Steel, ASTM A276 316 Stainless Steel, minimum 3/16-inch thick plates and minimum 1/4-inch thick shapes.

B. Feed Well Configuration:
1. The feed well shall efficiently and evenly disperse the influent liquid into the tank without disturbance and provide a flocculation zone. The depth of the feedwell shall be such as to provide proper detention time and an exit velocity at maximum flow that will not scour the settled sludge.
2. Extend minimum 6 inches above clarifier static liquid level.
3. Influent feed well depth below clarifier static liquid level.
4. Feed well diameter: As indicated on data sheets.
5. Provide scum ports equally spaced around the periphery of the well to release trapped scum at the water level. Ports to include baffles to prevent short circuiting to the weirs.
6. The feedwell shall rotate with the mechanism and be sufficiently supported by structural member. The supports for the feedwell shall be located either above the liquid extending from the cage or bridge, or on the rake arms. Submerged supports from the rake arms shall be designed so as to minimize horizontal flow disruption.
7. Include steel stiffeners at the top and bottom of the feed well to maintain shape and rigidity.

C. Inlet Pipe:
1. 18” Inlet pipe to be fed from the bottom of the clarifier through the center column as shown on the Drawings.
2. Provide all necessary pipe supports, brackets, and accessories to properly support the influent pipe to the manufacturer-supplied mechanism and associated components.

2.6 STATIONARY CENTER INFLUENT COLUMN

A. A stationary cylindrical steel influent column of ¼" minimum wall thickness shall be provided. One end shall have a support flange for bolting to the tank floor over the influent line, with a similar flange at the top for supporting the drive unit and walkway. The structure and anchor bolts shall provide adequate support for the entire mechanism dead load plus live load and torque with an adequate factor of safety to eliminate excessive deflection or vibration. Suitable openings shall be provided in the upper portion of the column to allow unrestricted passage of the flow into the energy dissipating inlet. Maximum acceptable velocity through openings is 2 ft/s.

B. Prior to the center column being grouted in place, the drive unit shall be installed, positioned and leveled.

2.7 CENTER CAGE

A. Center cage shall be of steel box construction, a minimum of square. The cage shall be provided with connections for the two (2) sludge rake arms and feedwell supports. The top of the cage shall be bolted to the main gear which shall rotate the cage and attached components.

B. The minimum angle size used for construction of the cage and rake arms shall be 2"x2"x1/4" members. Cage shall be designed such that calculated stresses do not exceed current AISC specifications.

2.8 RAKE ARMS

A. Quantity: Two Rake Arms per mechanism: Rake arms to be stainless steel truss construction or stainless steel channel with stainless steel raking blades and adjustable stainless-steel squeegees. Rake arms to be supported from center shaft. Raker blades shall be properly spaced to complete raking of the basin floor twice per revolution.

B. Pickets: The clarifier mechanism shall be provided with pickets, which rotate with the rake arms. The pickets shall be constructed of 316 stainless steel . Pickets shall be spaced evenly along the rake arm at intervals recommended by the manufacturer.

C. Type 316 Stainless Steel angular and tubular elements. Designed to meet or exceed current AISC Specifications when continuous torque of the drive unit is applied.

D. Scraper blades shall be designed for sufficient residuals transport capacity to handle the design solids loading rate with the depth of the blade varying from a minimum at the tank periphery to a maximum at the tank center.

E. Squeegees: Materials: 20-gauge Type 316 stainless steel.
   1. Bolts, Nuts, and Washers: Type 316 stainless steel.
   2. Vertical Alignment: Between 1/2-inch minimum and 1-inch maximum clearance above grouted clarifier bottom. Designed for a 2-inch minimum adjustment in the vertical plane.
   3. Attached to stainless steel residuals scraper blades.

2.9 SCUM COLLECTION

A. Skimmer arms and scum beach shall be constructed of 316 stainless steel unless noted otherwise.

B. Surface skimming equipment shall be furnished with the clarifier. It shall be arranged to have the surface scum swept along an angled blade to the skimmer assembly attached at the end of the blade. The surface of the clarifier shall be swept twice per revolution.

C. The skimmer blade shall be tangential to the rotating feedwell and be supports by vertical supports from the rake arm. The skimmer assembly shall have a pivoting aluminum skimmer device equipped with a manual out-of-service lock out feature. The skimmer shall have neoprene rubber wipers on all three sides to form a pocket to trap the scum and discharge to the scum beach that is attached to the tank wall.

D. The scum beach and trough shall be fabricated from 1/4-in thick 316 stainless steel plate and supported from the effluent launder or tank wall by structural braces.
   1. The scum beach width shall have a minimum length of 4-feet of sloped ramp and 3-feet of horizontal extension along the tank effluent baffle including the adjustable approach ramp.
   2. The scum beach shall have a 6-in diameter pipe connected to the adjacent scum box with a flexible connector, located as indicated on the Drawings for the scum discharge pipe.
   3. If required by the equipment arrangement, provide a counterweight to the rake arm to balance the scum skimmer arms during rake arm motion.

E. The scum baffles shall be provided, where required as indicated on clarifier data sheets, to prevent scum from flowing over the weirs and entering the effluent trough.
   1. The baffle shall consist of 1/4" thick x 12" deep fiberglass sections constructed of molded fiberglass in accordance with Section 06 80 17, FIBERGLASS REINFORCED PLASTIC FABRICATIONS. The baffle sections shall be curved and fastened to the launder wall with adjustable FRP support brackets and 316 stainless steel fasteners and anchor bolts.

2.10 ACCESS WALKWAY

A. Steel Access Walkway Support System:
   1. All-welded steel truss construction supported rigidly at one end on clarifier wall with thermal expansion compensating anchorage.
      a. Contractor shall be responsible for field verifying and coordinating dimensions and other pertinent information with Manufacturer, as necessary for proper installation.
      b. See Drawings for additional information regarding walkway layout.
   2. Diagonally cross brace as necessary to carry loads and produce required clear walkway width.

B. Bridge Design:
   1. Maximum Vertical Deflection: 1/360 of span under uniform 50-pound per square foot of walkway surface live load, plus dead load. Camber for 1/3 live load plus dead load.
   2. Maximum Horizontal Deflection: 1/360 of span under uniform horizontal loading of 50 pounds per square foot.
   3. Walkway Surface Elements: Do not utilize to reduce calculated bridge deflections.
   4. Designed to support mechanism.

C. Provide a minimum 8’0” x 10’0” rectangular platform with a minimum 2’0” working clearance around the drive.

D. Walkway Surface: 1-1/4-inch minimum thickness aluminum grating and extend in width to at least guardrail/handrail supports.

E. Walkway Width: 36 inches minimum clear between guardrails/handrails.

F. Guardrails/Handrails:
   1. Extend all along both sides of bridge and all around center platform.
   2. Anodized Aluminum: In accordance with Division 05, METALS.
   3. Attach top and intermediate rails specified to bridge elements using standard premanufactured wall bracket units. Truss members may be used as handrails if designed to meet OSHA standards.

G. Kickplates:
   1. Anodized Aluminum: In accordance with Division 05, METALS.
   2. Four-inch minimum high by 3/16-inch minimum thickness anodized aluminum, attached with Type 316 stainless steel fasteners.
   3. Located around center platform perimeter and full length of both sides of access walkway

2.11 WEIRS AND BAFFLE PLATES

A. Contractor is responsible for providing and installing FRP weirs and baffle plates.

B. Weirs and baffles shall be constructed of fiberglass reinforced plastic (FRP) as specified in Section 06 80 17, Weirs.

C. Weirs shall be V-notch type and fastened to the tank using wall using 316 stainless steel anchor bolts and FRP washers for vertical adjustment.

2.12 LAUNDER BRUSHES

A. Manufacturers:
   1. Ford Hall Company.
   2. Approved Equal

B. Contractor to provide and install brush cleaning system in the clarifier. The system shall be manufactured to meet the conditions below.
   1. Ambient temperature: 10° - 110°F
   2. Water temperature: 68°F
   3. Application: WTP Solid thickening, uncovered
   4. Clarifier Diameter: 110’
   5. Weir Type: Compatible with FRP V-notch weirs

C. System shall be custom designed, field assembled and installed.

D. System shall consist of attachment sleeves mounted to the skimmers of the clarifier, a mainframe member to which the individual brush arms are attached, collars, spring mounts, brush arms, and an assortment of springs to provide the biasing forces. Additionally, a ramp shall be attached to the scum beach to provide for trouble free entrance and exit of the inner baffle brush assembly. Furthermore, a bridging ramp shall also be positioned over the effluent discharge outlet to support the launder brush assembly as it passes. All metallic parts of the automated brush system and ramps shall be made of stainless steel.

E. Brushes shall be designed by the manufacturer to average 24 hour/day, 7 days per week operation for a continuous year. Brushes shall be UV resistant.

F. Weir Wolf system must include a 24-month warranty on all parts, beginning with Final Acceptance of the project.

2.13 ELECTRICAL COMPONENTS AND ACCESSORIES

A. General:
   1. Conform to Division 26, ELECTRICAL.
   2. Provide all necessary electrical components and wiring for a complete, functional system.
   3. Where indicated, motor starters for constant-speed, 460-volt motors shall be provided in a separate motor control center specified in Division 26, ELECTRICAL. Provide all necessary control functions to properly interface with this motor starter.

B. Wiring: The Drawings and Specifications indicate the anticipated wiring for the equipment provided under this section. If additional wiring is required, or if required wiring does not match what is indicated, the Contractor shall make the necessary modifications to the electrical wiring and documentation as part of the lump sum price. Wiring shall meet the requirements of Division 26, ELECTRICAL, and NFPA 70. Insulation shall be rated 600 volts, minimum. Low-voltage (24V) signals shall be run in twisted, shielded pair cable.

C. Electrical Raceways: Electrical wiring shall be installed in conduit meeting the requirements of Division 26, ELECTRICAL. Raceways shall be installed in accordance with Division 26, ELECTRICAL, and NFPA 70.

2.14 INSTRUMENTATION AND CONTROLS

A. All instrumentation and control components shall be provided in accordance with the requirements of Division 26.

B. General: The Drawings and these Specifications depict the minimum functional requirements of the control system to be provided. Provide all items not specifically called out which are required to implement the functions described herein. The supplier shall provide all instrumentation and controls necessary to provide a safe and operable system. The specific control system proposed shall be subject to the approval of the Engineer.

C. Instrumentation: Provide and install an electromechanical torque sensing-device that is actuated by thrust from the worm gear. The device shall provide indication of torque sensed and shall provide two independently adjustable SPDT torque alarm contacts (HIGH and HIGH-HIGH). The device shall be mounted in a NEMA 4X enclosure with an integral conduit box and terminals. Contacts shall be rated for a minimum of 5A at 120V ac.

D. Control Panel, General:
1. Enclosure: Corrosion resistant, NEMA 4X stainless steel, suitable for installation outdoors.
2. Power- 480 volts, 3-phase, 60-Hz.
3. Main Disconnect: Circuit breaker interlocked with door handle.
4. In general, the control panel shall include the following components:
    a. Panel space heater with thermostat.
    b. Motor starters for each motor associated with the panel.
    c. Surge Arrestor
    d. Phase monitor
    e. Control power transformer
    f. Control relays
    g. Solid State Overload Relay
    h. Terminal points for interconnection with ancillary equipment.
5. The control panel shall meet U.L. requirements and shall be U.L. 508A listed as a complete assembly. The control panel shall be completely pre-wired and factory tested prior to shipment.

E. Control Panel Operator Interfaces: The control panel shall at a minimum be provided with the following functions on the face of the panel.
1. Hand switches and other controls:
    a. Clarifier HAND/OFF/REMOTE switch
    b. Reset
    c. HIGH TORQUE alarm horn silence
2. Alarms:
    a. Clarifier Fault Light
    b. 90% HIGH TORQUE Light
    c. 120% Cutoff Torque Light
3. Status:

a. Clarifier Running Light
b. Elapsed Time Meter

F. External Interfaces: Provide the following interfaces between the control panel and items outside the system package.
1. Dry Contact Inputs:
a. Clarifier Enable
2. Dry Contact Outputs:
a. Run status
b. Hand/Off/Auto switch in REMOTE status
c. Motor high temperature
d. Phase loss
e. Motor overload
f. 90% TORQUE alarm
g. 120% TORQUE alarm

2.15 DISSIMILAR METALS

A. Isolate dissimilar metals or connectors to prevent direct contact and electrical conductivity.
1. Use 1/8-inch thick continuous neoprene gasket to insulate aluminum gratings, checker plate and handrail post bases from access walkway support bridge and other components.
2. Use PTFE-coated fasteners at bolted connections of dissimilar metals.

2.16 ACCESSORIES

A. Lifting Lugs: Contractor to provide on equipment assemblies and components weighing over 100 pounds.

B. Anchor Bolts: Provide coated Type 316, stainless steel bolts, sized by equipment manufacturer and at least 1/2 inch in diameter.

C. Equipment Identification Plates: Provide 16-gauge, Type 316 stainless steel, identification plate securely mounted on each separate equipment component and panel in a readily visible location. Plate shall bear 1/4-inch high engraved block type black enamel filled equipment identification number and letters.

2.17 TOOLS AND SPARE PARTS

A. Tools: The work includes furnishing two complete set of special tools recommended by the manufacturer for maintenance and repair of each separate type of equipment; tools shall be stored in tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

B. Spare Parts:
1. All equipment shall be furnished with the specified manufacturers spare parts, as indicated in the individual equipment sections.
2. Spare parts shall be tagged by project equipment number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate). Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping. Spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box with hinged wooden cover and locking clasp. Hinges shall be strap type. The box shall be painted and identified with stenciled lettering stating the name of the equipment, equipment

numbers, and the words "spare parts." A neatly typed inventory of spare parts shall be taped to the underside of the cover.

3. At a minimum furnish, tag, and box for shipment and storage the following spare parts and special tools:

Item	Quantity
Gaskets, O-rings, keys, dowels, and pins	One complete set per unit
Gear reducer bearings and seals	One complete set per unit
Shear pins of each different size	Six per unit
Drive chain and/or belts	One set each type and size per unit
Special tools required to maintain or dismantle drive unit except for low speed main bearing, but including that required for removal/insertion of main bearing race balls	One complete set

2.18 FABRICATION

A. General: Fabricate bridge truss in maximum lengths permissible by manufacturer to limit number of truss sections to be welded in the field.

B. Shop Assembly:
1. Shop fabricate and assemble mechanism components in the largest sections practicable and permitted by transportation carrier regulations.
2. Properly match-mark units for ease of field erection.
3. Completely assemble center drive unit in manufacturer’s shop and test to assure proper operation, and calibration of torque controls.
4. Completely shop assemble and test control panels.
5. Divide large assemblies into flanged sections. Bolt together with Type 316 stainless steel fasteners and provide continuous field seal welds at all connections.

C. Shop/Factory and Field Finishing:
1. Exposed metal surfaces of motors, gear reducers, and assemblies shall be factory prepared and primed and field finish coated in accordance with Section 09 90 00 Painting and Protective Coatings, System No. 3.
2. Seal welding shall be provided for submerged welded joints. Skip welds are not acceptable.

PART 3 - EXECUTION

3.1 ASSEMBLY AND PREPARATION FOR SHIPMENT

A. Each drive unit, including motor, shall be completely factory assembled, aligned, and securely crated for shipment. Accessory equipment which cannot be shipped assembled to the unit, such as shafts, baseplates, impellers, spare parts, and anchorage materials, shall be separately crated, clearly marked as to the contents, and shipped on the same shipment as the drives.

B. For shipment, exposed surfaces subject to rust, such as mounting flange faces, etc., shall be covered with a rust-preventive compound such as Kendall No. 5, or equal.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 60 00, PRODUCT REQUIREMENTS.

B. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

C. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

D. Protection of Equipment: Equipment that is capable of being contained based on size shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. Equipment too large to box shall be secured and protected during delivery as recommended by the manufacturer. Equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Mechanisms, motors, drives, electrical equipment, and other equipment with anti-friction or sleeve bearings shall be stored in weather-tight and heated storage facilities prior to installation. For extended storage periods, plastic equipment wrappers shall not be used to prevent accumulation of condensate in gears and bearings.

3.3 INSTALLATION

A. The Contractor shall install the clarifier as shown on the drawings.

B. Installation shall be by the Contractor with coordination from Manufacturer.

C. Anchor Bolts: Provide templates and specify bolts for furnishing by Contractor.

D. Manufacturer shall coordinate with Contractor during all phases of installation to ensure that manufacturer's representative is present during critical installation operations.

3.4 FIELD QUALITY CONTROL

A. Prior to placement of clarifier into service, check weir plate settings by filling the clarifier with water to design elevation shown on the Drawings. Readjust as recommended by Engineer.

B. Weirs: Level to within plus or minus 1/16 inch of design elevation.

C. Functional Tests: Conduct on each mechanism. Test for continuous 3-hour period without malfunction, as witnessed by and approved by Owner or Engineer.

D. Performance Test:
   1. Conduct on each completed assembly in accordance with accepted test procedures.
   2. Perform under actual or approved simulated operating conditions.
   3. Perform to confirm mechanical and structural compliance with specified torque requirements.
   4. Load each mechanism to 120 percent of Design Running Torque to demonstrate mechanism's structural capability to withstand resulting loads.
      a. Apply loads to mechanism's rake arms through cables or other means anchored to basin floor or wall.
      b. Accomplish testing with machine in operation.
      c. Conduct static torque test on mechanism. Anchor both collector arms, start collector drive, and load drive to 120 percent of Design Running Torque to demonstrate mechanism's structural capability to withstand resulting loads.
   5. Replace shear pins after torque testing is completed. Spare parts shall not be used.

3.5 MANUFACTURER'S SERVICES

A. A manufacturer's representative for the equipment specified herein shall be present at the job site for the minimum person-days listed for the services herein under for each unit provided, travel time excluded:
   1. Installation, Startup, and Testing Services:
      a. 3 person-day for installation assistance, inspection, and Certificate of Proper Installation prior to grouting.
      b. 1 person-day for functional and performance testing.
      c. Provide Qualifications of Manufacturer's Representative.
   2. Training Services:
      a. 1 person-day of jobsite training of Owner's personnel.
      b. Training of Owner's personnel shall be at such times and at such locations as required and approved by the Owner.

B. See Section 01 79 00, DEMONSTRATION AND TRAINING.

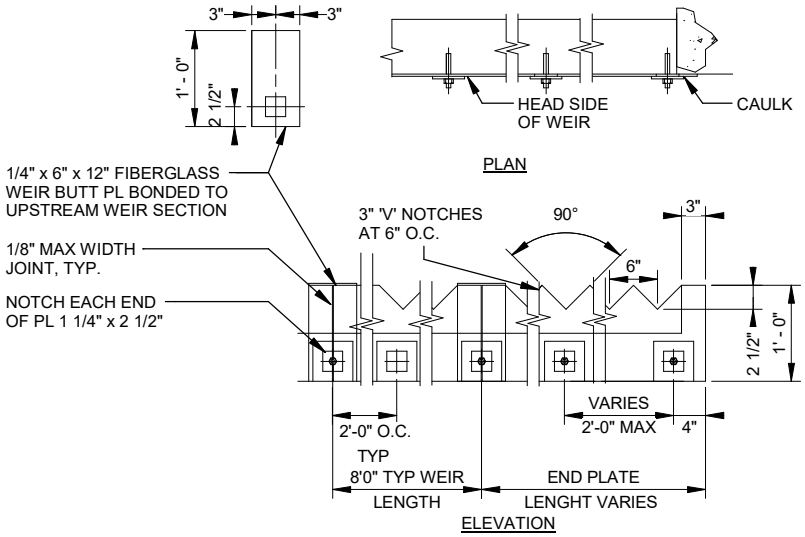
3.6 MANUFACTURER'S CERTIFICATES

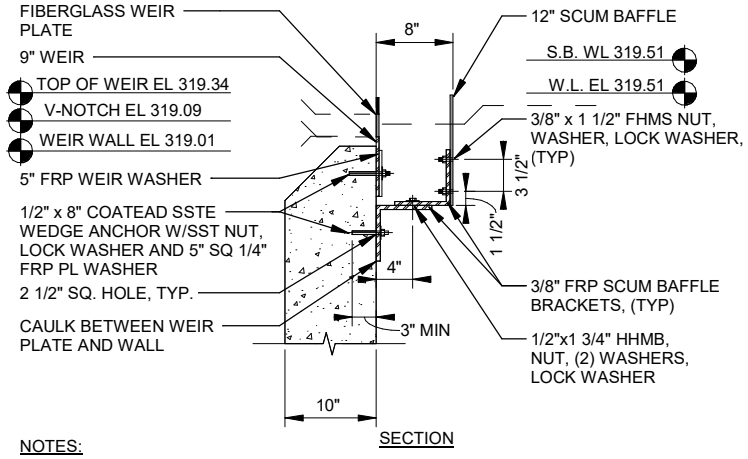
A. Provide Manufacturer's certificate(s) in accordance with Section 01 79 00, DEMONSTRATION AND TRAINING.

3.7 SUPPLEMENTS

A. Supplements listed below are part of this Specification.
   1. 44 43 21.16.1 DS – Clarifier Mechanisms Data Sheet

END OF SECTION





NOTES:

1. ALL PARTS EXCEPT FASTENERS SHALL BE FIBERGLASS REINFORCED PLASTIC (FRP) PER SPECIFICATIONS.
2. ALL FASTENERS SHALL BE SST PER SPECIFICATION.
3. 5/8" DIA SST THREADED ROD ADHESIVE ANCHORS WITH 5" EMBEDMENT MAY BE SUBSTITUTED FOR ANCHOR BOLTS.
4. CONTRACTOR SHALL SURVEY ELEVATION OF EXISTING V-NOTCH WEIR AND INSTALL NEW WEIR AT SAME ELEVATION. THE ELEVATIONS SHOWN ON THE WEIR DETAIL MAY REQUIRE ADJUSTMENT BASED ON SURVEY ELEVATIONS.

REV	DATE	DESCRIPTION	BY

GARVER

MAWSS STICKNEY WTP SOLIDS UPGRADES

MOBILE, ALABAMA

STICKNEY WTP SOLIDS UPGRADES

V-NOTCHED EFFLUENT WEIR & SCUM BAFFLE DETAIL

DIVISION D44

SECTION - DETAIL NO. 4264-030

JOB NO.: 2401551 | DETAIL NOT TO SCALE | DATE: 12/30/2025