Krebs Engineering, Inc.
15 Lagrange Street
Newnan, GA 30263
470-724-5050
January 20, 2023

ADDENDUM NO. 3

CONTRACT NO.: 20518
OWNER: COWETA COUNTY WATER & SEWERAGE AUTHORITY
PROJECT: SHENANDOAH WASTEWATER TREATMENT FACILITY IMPROVEMENTS
BID DATE: January 31, 2023
TO: ALL PROSPECTIVE CONTRACTORS AND SUPPLIERS

The changes, modifications, and/or additions covered by and set forth in this Addendum No. 3 shall become part of and be incorporated in the Specifications, Contract Documents, and Bid Documents for the above referenced project:

CONTRACT CLARIFICATIONS TO BE PROVIDED BY ADDENDUM:

AD3.1 PAVEMENT UNIT PRICES

1. Please confirm that the unit price for asphalt paving in the bid form is to pay for All asphalt paving as shown on the drawings. Will this unit also be used for additional full depth paving required due to work in other trades i.e. pipe crossings.
    a. Proposal Form Item No. 9, Asphalt Paving Section is for all new asphalt paving as identified on Sheet C3-01.
    b. Proposal Form Item No. 10, Mill and Resurface Existing Asphalt Paving is for all asphalt mill & overlay as identified on Sheet C3-01.
    c. Pipe crossing underneath roadways shall be completed per detail G1 on Sheet DT-04. The final roadway pavement shall be completed per Sheet C3-01 pavement surface identification.
2. Please confirm that unit price for concrete paving in the bid forms is to pay for ALL concrete paving as shown on the drawings.
    a. Proposal Form Item No. 11, Concrete Paving Section is for all new concrete paving as identified on Sheet C3-01.

DRAWING CLARIFICATIONS TO BE PROVIDED BY ADDENDUM:

AD3.2 DRAWING S0-01

1. Please clarify thickness of stone required under slabs for all new structures.
    a. A note has been added to S0-01 regarding stone required under slabs.

AD3.3 DRAWING C16-01

1. Please provide structural drawings for the Septage Receiving Station shown on C16-01.
    a. See Sheet S0-02 for structural drawings.

AD3.4 **DRAWING C8-03, C8-05, C11-06**

1. The drawings call for three Panels listed below. (C8-03 - Filter Control Panel, C8-05 - Filter System for Samples Control Box, C11-06 - Filter Sample Control Panel) Please confirm if these panels are to be provided per Specification 44 42 56.16 that was added in Addendum #1? Also please confirm if any pumps are to be provided with these systems, and if so, please provide further details?
    a. Each of the three (3) referenced panels/boxes shown on the civil plans are part of the instrumentation filter systems. See instrument specifications & SCADA Integrator's scope for descriptions and scope delineations.

AD3.5 **DRAWING S0-02**

1. Please provide structural drawings for the Septage Receiving Station shown on C16-01.
    a. See sheet S0-02

AD3.6 **DRAWING C11-02, C11-04**

1. In reference to sheet C11-02 and C11-04, these call for aluminum checkered plate covers. Would it be considered to provide solid aluminum plank grating instead?
    a. Solid aluminum plank shall be considered an approved equivalent to aluminum checkered plate covers. Solid aluminum plank will be required to meet requirements outlined in Section 05 53 00 METAL GRATING AND STAIRS, including loading requirements and any supports not shown on drawings. Solid aluminum plate shall have a non-slip finish, be constructed into removable panel widths, and shall have 2 drop lift handles per panel.

AD3.7 **DRAWING C11-02**

1. "Existing Filters" drawing C11-02 What is the depth of the existing grating that is to be replaced with aluminum chk'd plates?
    a. Specification 055300 – Metal Gratings and Stairs, 1.6 Project Conditions, requires contractor verification of field measurements/conditions. The estimated depth of the existing grating is approximately 2.5”.

AD3.8 **DRAWING C11-04**

1. "New Filters" drawing C11-04. There will be structural supports required for the chk'd plates but there are none called for.

a. Structural supports are to be provided by the grating manufacturer. Specification 055300 – Metal Gratings and Stairs, 1.3 Performance Requirements, provides structural requirements for grating.

AD3.9 **DRAWING C10-03, S10-01**

1. " RAS/WAS drain pump station" drawing C10-03 and S10-01. There will be structural grating supports required for the 14'x32'-8" area but there are none shown.
    a. Structural supports are to be provided by the grating manufacturer. Specification 055300 – Metal Gratings and Stairs, 1.3 Performance Requirements, provides structural requirements for grating.

AD3.10 **DRAWING E0-04**

1. Please provide schedules for panels UV-PDC1 and UV-PDC2 (shown on page E0-04).
    a. UV-PDC1 and UV-PDC2 are the power distribution centers furnished by the UV system supplier. See plans for associated field circuitry requirements. See UV system specifications for additional requirements.

AD3.11 **DRAWING C8-05, S8-02**

1. "Aeration Basin" drawing C8-05 and S8-02. Will new handrails be required at the relocated beams? Will new grating be required for the relocated beams? If new grating is steel as shown what would be the finish?
    a. Handrails are required on the relocated bridge/walkway. If existing handrails are not used by the contractor, new handrails are required.
    b. Grating is required on the relocated bridge/walkway. If existing grating is not used by the contractor, new grating is required per Section 05 53 00 GRATINGS AND STAIRS.
    c. If new grating is elected to be installed, grating shall be aluminum grating per Section 05 53 00 GRATINGS AND STAIRS.

AD3.12 **DRAWING DT-02**

1. Please provide clarification on what grade stainless steel is required for the pipe supports (i.e. 304SS, 316SS, etc..).
    a. Grade 304 stainless steel shall be used for pipe supports.

SPECIFICATION CLARIFICATIONS TO BE PROVIDED BY ADDENDUM:

AD3.13 **SPECIFICATION 444213.16 – DIFFUSER EQUIPMENT**

1. Can you please provide a list of approved manufacturers for Specification 44 42 13.16 Diffuser Equipment that was added in Addendum #1?

a. Converted Digesters are to be fine bubble aeration systems. Please see revised Section 44 42 13.16 DIFFUSER EQUIPMENT. All diffuser manufacturer equipment is not shown on drawings for clarity.

AD3.14 **SPECIFICATION SECTION 444413 – CHEMICAL FEED EQUIPMENT**

1. In Part 2 – PRODUCTS, 2.9, NCLEAR (CALCIUM SILICATE) BATCH SYSTEM, the design solution concentration shall be approximately 3-10% depending on operator preference. NClear previously recommended 3.1% solution, as used during their pilot study at the plant. A range of 3-10% should be assumed in mixer design.

AD2.15 **SPECIFICATION SECTION 444626 – SPIRAL BLADE CLARIFIER**

1. Please confirm the required slope is 0.5 in 12 with bottom center elevation at 786.21.
    a. Refer to Specification section 444626, 1.3.A
        i. The design criteria shall be based on two (2) clarifiers in service.
        ii. The bottom slope, coordinated with the contractor, shall be 0.65 inches per foot.
    b. The bottom center elevation of the clarifier top of slab shall be 786.21, as shown in Sheet C9-02.

SPECIFICATIONS TO BE REPLACED BY ADDENDUM:

AD3.16 **PROPOSAL FORM**

1. Replace the PROPOSAL FORM in its entirety with the attached. Payment line items have been modified for the Item Nos. 8, 9, 10, and 11.

AD3.17 **SPECIFICATION SECTION 012200 – UNIT PRICES**

1. Replace Specification Section 012200 in its entirety with the attached. Payment unit price quantities have been modified for the Item Nos. 8, 9, 10, and 11.

AD3.18 **SPECIFICATION SECTION 055000 – METAL FABRICATIONS**

2. Replace Specification Section 055000 in its entirety with the attached.

AD3.19 **SPECIFICATION SECTION 055300 – GRATINGS AND STAIRS**

1. Replace Specification Section 055300 in its entirety with the attached.

AD3.20 **SPECIFICATION SECTION 331118 – PLASTIC PIPE AND FITTINGS**

1. Replace Specification Section 331118 in its entirety with the attached. In PART 2 – PRODUCTS, 2.2 PLASTIC PIPE AND FITTINGS, A. GENERAL

SERVICE, “15. High Density Polyethylene (HDPE) pipe, 6-inch to 8-inch diameter shall be pressure rating DR 9” has been added.

AD3.21 **SPECIFICATION SECTION 444213.16 – DIGESTER EQUIPMENT**

1. Replace Specification Section 444213.16 in its entirety with the attached. Approved Manufacturers and diffuser design data have been modified.

AD3.22 **SPECIFICATION SECTION 444256 – SUBMERSIBLE WASTEWATER PUMPS**

1. Replace Specification Section 444256 in its entirety with the attached. The Drain Pump data has been updated.

DRAWINGS TO BE REPLACED BY ADDENDUM:

AD3.23 **DRAWING S0-01**

1. Replace Sheet S0-01 – General Structural Notes with the attached. See clouded revision for Site and Foundation note addition.

AD3.24 **DRAWING C11-05**

1. Replace Sheet C11-05 – Filters Sections and Details with the attached. The sump pump and associated piping have been shown.

AD3.25 **DRAWING C15-03**

1. Replace Sheet C15-03 – Solids Handling Building Enlarged Plan with the attached. Bollard and guard chain have been shown near the solids hopper.

SPECIFICATIONS TO BE ADDED BY ADDENDUM:

AD3.26 **SPECIFICATION SECTION 075400 – PVC MEMBRANE ROOFING**

1. Add the attached Specification Section 075400.

INFORMATION ADDED BY ADDENDUM TO APPENDIX

AD3.27 **APPENDIX F – SCADA INTEGRATOR PROPOSAL**

1. The MR Systems proposal has been added to Appendix F.

This Addendum No. 3 shall be attached to the front of your set of specifications and made a part of the Contract Documents. Receipt of this Addendum No. 3 shall be acknowledged on Page of the Proposal Form.

Krebs Engineering, Inc.

By_____

PROPOSAL FORM

MADE BY _____

ADDRESS _____

TO:

The undersigned, as Bidder, proposes and agrees, if this Bid is accepted, to enter into a Contract with **Coweta County Water & Sewerage Authority**, in the form of Contract specified and shown in the attached Contract Documents, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation, and labor necessary to complete the construction of the **Shenandoah Wastewater Treatment Facility Improvements, Project Number 20518** as described in the Advertisement for Bids, and in the Contract Documents, which are hereby referred to and made a part of the same extent as if fully set out herein, and in full and complete accordance with the shown, noted, described and reasonably intended requirements of the Contract Documents, to the full and entire satisfaction of the Owner, with a definite understanding that no money will be allowed for extra work except as set forth in the attached Instructions to Bidders, General Conditions, and other Contract Documents, based on the following pricing:

ITEM NO.	APPROX. QUANTITIES	DESCRIPTION OF ITEM	UNIT PRICE	TOTAL PRICE FOR ITEM
1	1	Mobilization/Demobilization Lump Sum		
2	1	**Shenandoah WWTF Improvements:** Furnish and install all labor, materials, equipment, and appurtenances for the construction of the WWTP improvements, site grading and storm sewer improvements, selective demolition, yard piping, existing influent pump station, new headworks, new BNR aeration basin, new aeration basin blower/electrical building, improvements to the existing aeration basin (fine bubble diffusers, mixers, and BNR), new final clarifiers, new RAS/WAS pump station, additional (new) tertiary filters, new UV disinfection, new tertiary disk filters, new cascade (post) aeration, conversion of the existing final clarifiers to aerobic digesters, new solids handling facilities, chemical feed systems, and all miscellaneous yard piping, and other associated improvements. Lump Sum		
3	1	**Electrical** Furnish and install all labor, materials, equipment, and appurtenances for the electrical improvements associated with the construction of the WWTF improvements. Lump Sum		
4	1	Owner pre-purchased Biological Nutrient Removal System, by **Xylem-Sanitaire** Lump Sum	$728,300	$728,300
5	1	Owner pre-purchased UV Disinfection System by **Trojan Technologies** Lump Sum	$603,110	$603,110
6	1	Owner pre-purchased Solids Dewatering System by **FKC Co., Ltd.** Lump Sum	$912,843	$912,843

ITEM NO.	APPROX. QUANTITIES	DESCRIPTION OF ITEM	UNIT PRICE	TOTAL PRICE FOR ITEM
7	1	Owner pre-purchased Solids Biosolids Drying System by **BCR Environmental Corp.** Lump Sum	$4,356,754	$4,356,754
8	1	SCADA PLC Programing, Equipment, and Field Instruments by **MR Systems** Lump Sum	$1,483,676	$1,483,676
9	2,750 SY	Asphalt Paving Section Per Square Yard		
10	4,600 SY	Mill and Resurface Existing Asphalt Paving Per Square Yard		
11	2,000 SY	Concrete Paving Section Per Square Yard		
		TOTAL PRICE FOR BASE BID $		

BASE BID: For construction complete as shown and specified in table above, the sum of

_____

Dollars

($_____).

ADDENDA: The Bidder acknowledges receipt of Addenda Nos. _____ , _____ , _____ , _____,_____, _____, _____ .

ALTERNATES: If alternates as set forth in the Contract Documents are accepted, the following adjustments are to be made to the Base Bid.

ITEM NO.	ALTERNATE DESCRIPTION	TOTAL ADD OR DEDUCT PRICE FOR ITEM
A1	Alternate to Furnish and Install base bid equivalent Tertiary Disk Filters – Circle one of the approved manufacturers below Five Star Filter Equipment equivalent Beacon Water Technologies equivalent Lump Sum	$

The award of the Contract will be based on the total/sum of the base bid price and the alternates (if any) selected by the Owner. The Owner will receive bids and all pricing will be read aloud, but the project will not be awarded until the bids are evaluated and a determination is made on which

alternates are selected. Once the Alternates have been selected, the final bid amount will be calculated (base bid price plus adjustments for any alternate selected) for each bid submitted, and if an award is made, the project will be awarded to the responsive bidder with the lowest final bid amount.

The Bidder declares that he/she has examined the site of the work, and has familiarized himself/herself with the existing and proposed/new facilities (including the location, nature, sizes/dimensions, current and intended future use, etc.). The Bidder declares that he/she has fully informed himself/herself of conditions that would affect the proposed work, that, prior to the tender of his/her bid, he/she has examined the Contract Documents for the work and has read all special instructions and provisions contained in the Documents, and that he/she has satisfied himself/herself with respect to the quality and extent of work to be performed. The Bidder declares that the firm, the project manager and the superintendent are qualified and meet or exceed the experience requirements as outlined in the Instructions to Bidders and/or elsewhere in the Contract Documents.

The Bidder declares that he/she understands that, when quantities of work for which unit price bids are requested in the Proposal, such quantities are approximate only and are subject to either increase or decrease, that, should the quantities of any of the work items be increased, the Bidder proposes to perform the additional work at the unit prices bid by him, that, should the quantities of any of the work items be decreased, payment will be made only for the actual quantities of work performed and such payment will be based upon the unit prices bid by him/her, and that he/she shall make no claim for profits anticipated on the decrease in quantities of work. Actual quantities will be paid for as the work progresses, in accordance with the provisions of the Contract Agreement, and such quantities shall be subject to final measurements and determinations made upon completion of the work.

The Bidder understands that the Owner reserves the right, in the Owner's discretion, to reject any or all bids, to waive any informality in any bid, and to accept any bid considered to be advantageous to the Owner.

The Bidder agrees that his/her bid shall be valid for a period of sixty (60) calendar days after the date set for receipt of bids, and shall not be withdrawn for a period of sixty (60) calendar days after the date set for receipt of bids.

The Bidder has attached hereto a Bid Bond executed by a Surety Company authorized to do business in the state in which the project is located (with valid Power-of-Attorney attached), or a cashier's check drawn on a bank in the state in which the project is located, in favor of (made payable to) **Coweta County Water & Sewerage Authority**, the amount of 5% of the bid amount (total).

The Bidder agrees that, should he/she be notified that his/her Bid on the work has been accepted, he/she will, within ten (10) days from receipt of such notice, execute the formal Contract Agreement bound herein, and will furnish with the Contract evidence of Insurance Coverage of his/her construction operations and all of his/her operations associated with the project, all in accordance with the requirements of the General Conditions.

The Bidder further agrees that, in case of failure on his/her part to execute said Contract Agreement and to furnish all Bonds required by the Contract Documents, within ten (10) consecutive calendar days after receipt of notice of award of Contract to him, the monies payable to the Obligee of his/her Bid Bond, in accordance with the terms and conditions of the Bond, shall

be paid to the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure on the part of the Bidder.

The Bidder hereby agrees that, should the work under the Contract be awarded to him/her, he/she will commence work under this Contract on or before a date to be specified in written "Notice to Proceed" given by the Owner, and that he/she will achieve Substantial Completion of the Contract within **670** consecutive calendar days following the Notice to Proceed, and will achieve Final Completion of the Contract within **730** consecutive calendar days following the Notice to Proceed. The Bidder agrees to pay, as liquidated damages, the sum of **$1,500** for each consecutive calendar day after the date set for Substantial Completion of the work until such time as Substantial Completion has been achieved. Once Substantial Completion has been achieved, the Bidder will not be assessed additional liquidated damages unless and until he/she fails to meet the Final Completion Date. If the Bidder fails to meet the Final Completion date, then he/she agrees to pay, as liquidated damages, the sum of **$1,500** for each consecutive calendar day after the date set for Final Completion of the work, all as provided in the General Conditions. At no time shall the Bidder pay more than **$1,500** per calendar day for liquidated damages. **The Bidder agrees that, once the Substantial and/or Final Completion dates have passed, the Owner/Engineer will begin deducting liquidated damages from the monthly progress payments.** The Bidder further agrees that he/she will not make any claim for extra compensation should completion of work under the Contract be affected in advance of the time specified hereinabove.

The undersigned Bidder states that he/she fully understands the meaning of "low, responsive, responsible Bidder", as defined in these Documents, and that these criteria will be applied in the evaluation of this Bid.

The undersigned, as Bidder, hereby declares that the name (or names) of the only person (or persons) interested in this Proposal, as principal (or principals), is (or are) as herein below set out and that no person other than that (or those) herein below stated has any interest in this Proposal, or in the Contract to be entered into; that this Proposal is made without connection with any other person, firm or corporation making a proposal; and that it is in all respect fair and in good faith, without collusion or fraud.

Following are the names and addresses of all persons, firms, and corporations interested in the foregoing bid:

_____

_____

_____
(Type or Print Name and Address of Firm)

_____
(Type or Print Contractor License No.)

_____
(Type or Print Name and Title of Officer/Legal Representative of Firm Submitting Bid)

_____
(Signature of Officer/Legal Representative of Firm Submitting Bid)

_____
(Type or Print Date)

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 UNIT PRICES

A. Unit prices are based on estimated quantities of items, but the Contractor shall be paid based on the actual measured quantity of each unit price item that is furnished and/or installed. Unit prices shall include all labor, delivery, materials, equipment, services, overhead, and profit attributable to each unit price item. Once the actual quantities are known, then a Change Order will be issued to incorporate the quantity increase or decrease into the Work.

B. Refer to individual Specification Sections for additional information.

C. The Contractor shall measure the unit price quantities furnished and/or installed, but the Owner shall have the right to verify the Contractor's measurements with Owner's forces and/or independently at Owner's expense.

D. List of Unit Price Bid Items: A schedule and description of the unit price bid items included in this Contract are provided below:

1. Unit Price Bid Item No. 9: Install 2,750 square yards of Asphalt Paving Section per the Contract Documents.
   a. Description: Furnish and Install Asphalt Paving Section per the Contract Documents. Unit price shall include all necessary labor, equipment, and material to provide new asphalt paving section at the locations as directed.
   b. Unit of Measurement: Per square yard of asphalt paving section installed.
2. Unit Price Bid Item No. 10: Install 4,600 square yards of Mill and Resurface Existing Asphalt Paving per the Contract Documents.
   a. Description: Furnish and Install Mill and Resurface Existing Asphalt Paving per the Contract Documents. Unit price shall include all necessary labor, equipment, material, and material disposal to mill and resurface existing asphalt paving at the locations as directed.
   b. Unit of Measurement: Per square yard of Mill and Resurface Existing Asphalt Paving installed.
3. Unit Price Bid Item No. 11: Install 2,000 square yards of Concrete Paving Section per the Contract Documents.
   a. Description: Furnish and Install Concrete Paving Section per the Contract Documents. Unit price shall include all necessary labor, equipment, and material to provide new concrete paving section at the locations as directed.
   b. Unit of Measurement: Per square yard of concrete paving section installed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 22 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Steel framing and supports for benches.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Structural-steel door frames.
5. Miscellaneous steel trim including steel angle corner guards and steel edgings.
6. Metal bollards.
7. Ladder Safety Cages
8. Floor Doors or Vault Doors
9. Guard Chains
10. Safety Treads
11. Metal Finishes

B. Products furnished, but not installed, under this Section:
1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F , ambient; 180 deg F , material surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
1. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Floor Doors
   1. Halliday Hatches
   2. Thompson Fabricating Co.
   3. Bilco
   4. Approved Equivalent

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 , Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches , with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with primer specified in Division 09 Section "High-Performance Coatings" where indicated.

2.8 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
   1. Provide mitered and welded units at corners.

2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with primer specified in Division 09 Section "High-Performance Coatings."

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops, unless otherwise indicated. Continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.
1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Prime exterior steel frames with primer specified in Division 09 Section "High-Performance Coatings."

2.10 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Prime exterior miscellaneous steel trim with primer specified in Division 09 Section "High-Performance Coatings."

2.11 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe .

1. Where bollards are indicated to receive controls for door operators, provide necessary cutouts for controls and holes for wire.
2. Where bollards are indicated to receive light fixtures, provide necessary cutouts for fixtures and holes for wire.

B. Prime bollards with primer specified in Division 09 Section "High-Performance Coatings."

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Division 09 Section "High-Performance Coatings."

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

2.14 LADDER SAFETY CAGES

A. General: Fabricate ladder safety cages for ladders longer than 24 feet unless a ladder safety system is provided, or as required by ANSI A14.3. Assemble by welding or riveting.

B. Fasten assembled safety cage to ladder rails and adjacent construction by welding or riveting, unless otherwise indicated.

2.15 FLOOR DOORS OR VAULT ACCESS DOORS

A. Floor doors or vault access doors shall be furnished and installed where indicated and shall conform to the following requirements:

1. Doors shall be of aluminum construction. Finish of aluminum shall be "mill finish" with bituminous coating applied to exterior of frame.
2. Door shall be diamond pattern plate not less than 1/4" thickness.
3. Doors shall be reinforced so as to withstand live load of 300 psi
4. Doors shall be watertight construction.
5. Door (each leaf) shall be equipped with heavy forged brass hinges, stainless steel pins, spring operators, automatic hold-open arm with release handle, and snap lock with removable handle.
6. Frames shall be fabricated from extruded aluminum channel metal with a thickness of not less than 1/4".
7. Frames shall be equipped with anchor flange around perimeter for embedment in monolithic concrete.
8. 1½" diameter drainage coupling shall be located in bottom of channel frame; and drain piping shall be furnished and installed (if indicated).
9. All hardware shall be stainless steel.

2.16 GUARD CHAINS

A. Guard chains shall be furnished and installed for closing openings between terminations of pipe railing and shall conform to the following requirements:

1. Shall be welded steel link 3/16" round stock, weighing not less than 43#/100 LF.
2. Each end of each chain length shall be equipped with snap hooks to fasten in eyes of 5/16" eye-bolts.
3. Chain and accessories shall be hot-dipped galvanized.
4. Eye-bolts shall be stainless steel, shouldered type, bolted through terminal posts of railing or anchored at other terminations, and with adapter blocks (aluminum) each side of post.
5. Guard chains shall be double drape for 2-level railing system.
6. Terminal posts shall be stiffened by reinforcing bars as specified in these Specifications.

2.17 SAFETY TREADS

A. All stairs and steps shall be equipped with safety treads as hereinafter specified.

B. Details of patterns of manufactured or fabricated items shall be submitted to the Engineer for review.

C. Treads of exterior and interior concrete steps shall be constructed with non-slip abrasive finish integral with the monolithic step concrete.

D. Stair landings (both top and bottom) shall be equipped with either extruded or cast aluminum safety treads.

1. Extruded aluminum shall be Alloy 6063-T5. Grooves shall be filled with aluminum oxide or silicon carbide.
2. Metal tread shall not be less than 1/4" in thickness
3. Metal tread shall have length equal to width of stair.
4. Tread for top landing shall conform to the following requirements:

    a. Shall have lip nose.
    b. Shall not be less than 4" in width (from back of lip).
    c. Top of tread shall be set flush with finished concrete surface of landing.

5. Tread for bottom landing shall conform to the following requirements:

    a. Shall not be less than 1/4" in thickness.
    b. Shall have overall width not less than 4".
    c. Shall be without lip nose.
    d. Shall be set as described hereinabove.

6. All treads shall be securely anchored in concrete landings by means of carbon steel wiring anchors with stainless steel screws.
7. Cast safety treads shall conform to the following requirements:

    a. Shall be cast from high quality aluminum.
    b. Shall be of diamond pattern.
    c. Shall have non-slip wearing surface comprised of aluminum oxide or silicon carbide grit integrally cast in the surface.
    d. Treads shall have minimum thickness of 5/16".
    e. Shall be of configurations and dimensions as specified hereinabove for top and bottom landing treads of extruded aluminum.
    f. Shall be anchored as specified hereinabove.

8. All stair assemblies shall be equipped with safety treads as specified hereinabove.

9. Patterns and types shall be suitable for incorporation in the particular type of construction of the stair assembly.

    a. For closed plate risers, treads with nosing and back toe bolted to risers and clip angle supports.
    b. For open risers, reinforced treads (complete with nosings and back toes) bolted to stringers.
    c. For grating construction, tread with lip nosing supported by and fastened to grating.

        1) Depth of tread (extending back from lip) not less than 4".
        2) Top of safety tread flush with top of grating.
        3) Length of tread shall be equal to full width of stair or step.

2.18 METAL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.

B. Steel and Iron Finishes:

1. Galvanizing: Hot-dip galvanize items after fabrication as indicated to comply with applicable standard listed below:

a. ASTM A 123, for galvanizing steel and iron products.
b. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

a. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
b. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

C. Stainless Steel Finishes:

1. Remove tool and die marks and stretch lines or blend into finish.
2. Grind and polish surfaces to produce uniform, directionally textured, polished finish as indicated, free of cross scratches. Run grain with long dimension of each piece.Bright, Directional Polish: No. 4 finish.
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

D. Aluminum Finishes:

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes. Finish aluminum as indicated on Drawings.
2. As-Fabricated Finish (mill finish): AA-M10 (Mechanical Finish: as fabricated, unspecified).
3. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 53 00 – METAL GRATINGS AND STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Metal bar gratings.
2. Heavy-duty metal bar gratings.
3. Metal frames and supports for gratings.
4. Metal Stair Systems
5. Extruded-aluminum plank gratings.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:

1. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
2. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 60 lbf/sq. ft. Limit deflection to L/360 or 1/4 inch, whichever is less.
3. Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. Limit deflection to ¼ inch.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Formed-metal gratings.
2. Extruded-aluminum gratings.
3. Clips and anchorage devices for gratings.
4. Paint products.

B. Shop Drawings: Show fabrication and installation details for gratings and metal stair systems. Include plans, elevations, sections, and details of connections. Show all penetrations of grating. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineer and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of gratings and or stair systems that are similar to those indicated for this Project in material, design, and extent.

B. Fabricator Qualifications: A firm experienced in producing gratings and or stair systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Metal Bar Grating Standards: Comply with applicable requirements of the following:

1. Non-Heavy-Duty Metal Bar Gratings: Comply with NAAMM MBG 531, "Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads."
2. Heavy-Duty Metal Bar Gratings: Comply with NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."

D. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where gratings and stair systems are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating gratings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.7 COORDINATION

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Bar Gratings and Stair Systems:

a. Thompson Fabricating Company
b. Alabama Metal Industries Corp.
c. All American Grating, Inc.
d. Barnett/Bates Corp.
e. Harris Steel Ltd.; Fisher & Ludlow Div.
f. IKG Borden.
g. Klemp Corp.
h. Ohio Gratings, Inc.
i. Seidelhuber Metal Products, Inc.
j. Tru-Weld Grating, Inc.

2.2 ALUMINUM

A. Extruded Bars and Shapes: ASTM B 221, alloys as follows:

1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
2. 6061-T1, for grating crossbars.

2.3 FASTENERS

A. Fasteners for Aluminum Gratings: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc-plated steel, or other material warranted by the manufacturer to be compatible with aluminum gratings and other components.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Plain Washers: Round, carbon steel, ASME B18.22.1.

D. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in

concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.4 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated.

E. Fit exposed connections accurately together to form hairline joints.

F. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

1. Fabricate toeplates to fit grating units and weld to units in shop, unless otherwise indicated.
2. Fabricate toeplates for attaching in the field.
3. Toeplate Height: 4 inches, unless otherwise indicated.

2.5 FLOOR GRATINGS

A. Floor gratings shall be furnished and installed as indicated and shall conform to the following requirements:

1. Set in angle frames embedded and anchored in monolithic concrete.
2. Set in angle frames forming metal platforms or walkways.

B. All walkways shall be held firmly in place by removable metal clips.

1. Clips shall not project above surface of grating or walkway.

C. Frames and accessories shall be of same material and finish as grating.

D. Where openings are cut in floor gratings to permit passage of valve stems or for other purposes, such openings shall be banded with 1/8" bar stock of same depth as grating.

E. Floor grating shall conform to the following requirements:

1. Fabricated from straight extruded aluminum I-bars (Alloy 6063-T6) laced together by interlocking cross-bridges or spacers, securely fastened to the bearing bars.
2. Ends of spans shall be closed with flat bars to form box panels.
3. Tread surfaces shall be non-skid type, with longitudinal grooves performed by the extrusion process.
4. Cutouts shall be made in tread surfaces between bearing bars to form alternate rectangular pattern.
5. Grating shall be designed to safely support uniform load of not less than 250 psf; but in no case shall depth of grating be less than 1½".

2.6 METAL BAR GRATINGS

A. Fabricate pressure-locked, rectangular bar aluminum gratings as follows:

1. Grating Mark P-7-4 (1 x 1/8) ALUMINUM: 1-by-1/8-inch bearing bars at 7/16 inch o.c., and crossbars at 4 inches o.c.
2. Grating Mark P-15-4 (1-1/2 x 3/16) ALUMINUM: 1-1/2-by-3/16-inch bearing bars at 15/16 inch o.c., and crossbars at 4 inches o.c.
3. Grating Mark P-19-4 (2 x 3/16) ALUMINUM: 2-by-3/16-inch bearing bars at 1-3/16 inches o.c., and crossbars at 4 inches o.c.
4. Grating Mark: As indicated, but with bearing bar size not less than that required to comply with structural performance requirements.

B. Fabricate pressure-locked, I-bar aluminum gratings as follows:

1. Grating Mark P-15-2 (1 I-Bar) ALUMINUM: 1-inch I-bar bearing bars at 15/16 inch o.c., and crossbars at 2 inches o.c.
2. Grating Mark P-19-4 (1-1/2 I-Bar) ALUMINUM: 1-1/2-inch I-bar bearing bars at 1-3/16 inches o.c., and crossbars at 4 inches o.c.
3. Grating Mark: As indicated.
4. Grating Mark: As indicated, but with bearing bar size not less than that required to comply with structural performance requirements.

C. Fabricate welded, heavy-duty steel gratings as follows:

1. Grating Mark W-19-4 (2 x 1/4) STEEL: 2-by-1/4-inch bearing bars at 1-3/16 inches o.c., and crossbars at 4 inches o.c.
2. Grating Mark W-30-4 (3 x 3/8) STEEL: 3-by-3/8-inch bearing bars at 1-7/8 inches o.c., and crossbars at 4 inches o.c.
3. Grating Mark W-38-4 (5 x 3/8) STEEL: 5-by-3/8-inch bearing bars at 2-3/8 inches o.c., and crossbars at 4 inches o.c.
4. Grating Mark: As indicated.

5. Grating Mark: As indicated, but with bearing bar size not less than that required to comply with structural performance requirements.

D. Aluminum Finish: As follows:

1. Mill.

E. Fabricate removable grating sections with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

1. Provide not less than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
2. Provide not less than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
3. Provide not less than four weld lugs for each grating section composed of rectangular bearing bars 3/16 inch or less in thickness and spaced less than 15/16 inch o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
4. Provide not less than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
5. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.

a. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Grate-Fast" by Struct-Fast Inc.

b. Product: Subject to compliance with requirements, provide "Grate-Fast" by Struct-Fast Inc.

F. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge-band openings in grating that interrupt four or more bearing bars with bars of the same size and material as bearing bars.

G. Do not notch bearing bars at supports to maintain elevation.

2.7 GRATING FRAMES AND SUPPORTS

A. Aluminum Frames: Fabricate frames for aluminum gratings from extruded-aluminum shapes to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections. Cut, drill, and tap units to receive hardware and similar items.

B. Equip units with integrally welded anchors for casting into concrete or building into masonry.

1. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.8 METAL STAIRS

A. Metal Stairs: Metal stairs and anchorages shall be designed, stamped and sealed by a professional engineer in accordance with the “quality Assurance” section of this specification.

B. Metal Stairs shall be of aluminum construction.

C. The metal stair shall generally conform in size to those indicated within the Construction Documents.

D. Stair system provider shall ensure that the system provided meets all codes and regulations, OSHA or otherwise.

E. Metal stairs shall be manufactured by one single entity. This is inclusive of, but not limited to: structural members, stair treads, stair stringers, handrails and connections.

F. The stair system shall meet the design load specified in the “Performance Requirements” section of this specification and any applicable regulations for stairs. Whichever is stricter.

G. Stair treads and landings should have an anti skid top finish and shall be constructed of aluminum grating.

2.9 ALUMINUM SHIP'S LADDERS

A. Provide ship's ladders where indicated. Fabricate of open-type construction with structural-aluminum channel or aluminum plate stringers, aluminum pipe handrails, and aluminum bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation.

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish gratings, frames, and supports after assembly.

2.11 EXTRUDED-ALUMINUM PLANK GRATINGS

A. Provide extruded-aluminum plank gratings in type, size, and finish indicated or, if not indicated, as recommended by manufacturer for indicated applications and as needed to support indicated loads.

1. Type: Extruded-aluminum planks approximately 6 inches wide with multiple flanges approximately 1.2 inches o.c., acting as bearing bars connected by a web that serves as a walking surface. Top surface has raised ribs to increase slip

resistance.
2. Depth: 1 inch.
3. Depth: 1-1/2 inches.
4. Depth: 2 inches.
5. Depth: As needed to support indicated loads.
6. Perforations: None.
7. Perforations: Rectangular, 19/32 by 3 inches, with adjacent rows staggered.
8. Perforations: 19/32 inch square, with adjacent rows aligned.
9. Finish: Mill, as fabricated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings and stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Grating frames shall be embedded into new concrete faces unless grating is being installed on an existing surface.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach non-removable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

3.3 INSTALLING METAL STAIRS

A. General: Install stairs to comply with recommendations of metal stair standards that apply to metal stairs of type and size indicated, including installation clearances and standard anchoring details.

B. Anchor metal stairs to adjacent structure and floor.

END OF SECTION 05 53 00

SECTION 075400 – PVC MEMBRANE ROOF SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

The project consists of installing Carlisle SynTec's Sure-Flex PVC Adhered Roofing System on new and existing rigid insulation, on new and existing roof decking

1.02 EXTENT OF WORK

Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the Sure-Flex 60-mil thick white reinforced PVC (polyvinyl chloride) reinforced membrane adhered roofing system including flashings and insulation as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details.

A. The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.

B. The roofing contractor shall confirm all given information and advise the building owner, prior to bid, of any conflicts that will affect their cost proposal.

C. Any contractor who intends to submit a bid using a roofing system other than the approved manufacturer must submit for pre-qualification in writing fourteen (14) days prior to the bid date. Any contractor who fails to submit all information as requested will be subject to rejection. Bids stating "as per plans and specs" will be unacceptable.

1.03 SUBMITTALS

A. Prior to starting work, the roofing contractor must submit the following:

1. Shop drawings showing layout, details of construction and identification of materials.

2. A sample of the manufacturer's Membrane System Warranty.

3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.

4. Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal 27-mil or thicker, depending on membrane thickness.

5. Certification of the manufacturer's warranty reserve.

B. Upon completion of the installed work, submit copies of the manufacturer's final inspection to the specifier prior to the issuance of the manufacturer's warranty.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.

B. Comply with the manufacturer's written instructions for proper material storage.

1. Store Sure-Flex membrane on provided pallets in the original undisturbed plastic wrap and cover with light colored breathable waterproof tarpaulins in a cool, shaded area. Sure-Flex membrane that has veen exposed to the elements must be prepared with Carlisle PVC and KEE HP Membrane Cleaner prior to hot air welding.

2. Store curable materials (adhesives and sealants) between 60°F and 80°F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60°F minimum temperature before using.

3. Store materials containing solvents in dry, well ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.

C. Insulation must be on pallets, off the ground and tightly covered with waterproof materials.

D. Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

1.05 WORK SEQUENCE

A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.

B. Do not disrupt activities in occupied spaces.

1.06 USE OF THE PREMISES

A. Before beginning work, the roofing contractor must secure approval from the building owner's representative for the following:

1. Areas permitted for personnel parking.

2. Access to the site.

3. Areas permitted for storage of materials and debris.

4. Areas permitted for the location of cranes, hoists and chutes for loading and unloading materials to and from the roof.

B. Interior stairs or elevators may not be used for removing debris or delivering materials, except as authorized by the building superintendent.

1.07 EXISTING CONDITIONS

If discrepancies are discovered between the existing conditions and those noted on the drawings, immediately notify the owner's representative by phone and solicit the manufacturer's approval prior to commencing with the work. Necessary steps shall be taken to make the building watertight until the discrepancies are resolved.

1.08 PRECONSTRUCTION CONFERENCE

A. A pre-bid meeting will be held at the job site. Contact the owner's representative if there are any questions.

B. Prior to bid submittal, the roofing contractor should schedule a job site inspection to observe actual conditions and verify all dimensions on the roof. The job site inspection may occur on the day of the pre-bid meeting or prior to such a meeting. Should access to the roof be necessary before or after the pre-bid meeting, the contractor must contact the owner's representative to coordinate an appropriate time.

C. Any conditions which are not shown on the shop drawings should be indicated on a copy of the shop drawing and included with bid submittal if necessary to clarify any conditions not shown.

1.09 TEMPORARY FACILITIES AND CONTROLS

A. Temporary Utilities:

1. Water, power for construction purposes and lighting are available at the site and will be made available to the roofing contractor.

2. Provide all hoses, valves and connections for water from a source designated by the owner when made available.

3. When available, electrical power should be extended as required from the source. Provide all trailers, connections and fused disconnects.

B. Temporary, Sanitary Facilities

Sanitary facilities will not be available at the job site. The roofing contractor shall be responsible for the provision and maintenance of portable toilets or their equal.

C. Building Site:

1. The roofing contractor shall use reasonable care and responsibility to protect the building and site against damages. The contractor shall be responsible for the correction of any damage incurred as a result of the performance of the contract.

2. The roofing contractor shall remove all debris from the job site in a timely and legally acceptable manner so as to not detract from the aesthetics or the functions of the building.

D. Security:

Obey the owner's requirements for personnel identification, inspection and other security measures.

1.10 JOB SITE PROTECTION

A. The roofing contractor shall adequately protect building, paved areas, service drives, lawn, shrubs, trees, etc. from damage while performing the required work. Provide canvas, boards and sheet metal (properly secured) as necessary for protection and remove protection material at completion. The contractor shall repair or be responsible for costs to repair all property damaged during the roofing application.

B. During the roofing contractor's performance of the work, the building owner will continue to occupy the existing building. The contractor shall take precautions to prevent the spread of dust and debris, particularly where such material may sift into the building. The roofing contractor shall provide labor and materials to construct, maintain and remove necessary, temporary enclosures to prevent dust or debris in the construction area(s) from entering the remainder of the building.

C. Do not overload any portion of the building, by either use of or placement of equipment, storage of debris, or storage of materials.

D. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.

E. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains, if required. At completion, test drains to ensure the system is free running and drains are watertight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.

F. Store moisture susceptible materials above ground and protect with waterproof coverings.

G. Remove all traces of piled bulk material and return the job site to its original condition upon completion of the work.

1.11 SAFETY

The roofing contractor shall be responsible for all means and methods as they relate to safety and shall comply with all applicable local, state and federal requirements that are safety related. Safety shall be the responsibility of the roofing contractor. All related personnel shall be instructed daily to be mindful of the full time requirement to maintain a safe environment for the facility's occupants including staff, visitors, customers and the occurrence of the general public on or near the site.

1.12 WORKMANSHIP

A. Applicators installing new roof, flashing and related work shall be factory trained and approved by the manufacturer they are representing.

B. All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the building owner's satisfaction.

C. There shall be a supervisor on the job site at all times while work is in progress.

1.13 QUALITY ASSURANCE

A. The Sure-Flex Membrane Roofing System must achieve a UL Class A.

B. The specified roofing assembly must have been successfully tested by a qualified testing agency to resist the design uplift pressures calculated according to

ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"
American Society of Civil Engineers (ASCE 7)
International Building Code (IBC)
DORA (Directory of Roof Assemblies)

C. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.

D. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least five (5) years successful experience installing single-ply PVC roofing systems and having installed at least one (1) roofing application or several similar systems of equal or greater size within one year.
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E. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified including operation of hot air welding equipment and power supply. Provide at least one thoroughly trained and an experienced superintendent on the job at all times roofing work is in progress.

F. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the specifier. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the specifier's consideration.

G. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the building owner seventy-two (72) hours prior to the manufacturer's final inspection.

1.14 JOB CONDITIONS, CAUTIONS AND WARNINGS

Refer to Carlisle's Sure-Flex specification for General Job Site Considerations.

A. Safety Data Sheets (SDS) must be on location at all times during the transportation, storage and application of materials.

B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

C. When loading materials onto the roof, the Carlisle Authorized Roofing Applicator must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.

D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

F. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.

G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

H. New roofing shall be complete and weather tight at the end of the work day.

I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.15 WARRANTY

A. Provide manufacturer's 20 year, Total System Warranty covering both labor and material with no dollar limitation. The maximum wind speed coverage shall be peak gusts of 72 mphmeasured at 10 meters above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.

B. Pro-rated System Warranties shall not be accepted.

C. Evidence of the manufacturer's warranty reserve shall beincluded as part of the project submittals for the specifier's approval.

PART 2 PRODUCTS

2.01 GENERAL

A. All components of the specified roofing system shall be products of Carlisle SynTec or accepted by Carlisle SynTec as compatible.

B. All products (including insulation, fasteners, fastening plates, pre-fabricated accessories and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the warranty.

2.02 MEMBRANE

Furnish Sure-Flex PVC 60-mil thick white polyester reinforced PVC (polyvinyl chloride) membrane as needed to complete the roofing system. Membrane thickness over the reinforcing scrim (top-ply thickness) shall be nominal .016-mil or thicker.

A. Membrane with white color shall have an SRI (solar reflectance index) not less than 107 in accordance with ASTM E 1980.

2.03 INSULATION/UNDERLAYMENT

A. When applicable, insulation shall be installed in multiple layers. The first and second layers of insulation shall be mechanically fastened to the substrate in accordance with the manufacturer's published specifications.

B. Insulation shall be as supplied by Carlisle SynTec.

Carlisle Insulbase Polyisocyanurate – A foam core insulation board covered on both sides with a medium weight fiber-reinforced felt facer meeting ASTM C 1289-06, Type II, Class 1, Grade 2 (20 psi) or Grade 3 (25 psi). The product is available in 4’ x 8’ standard size with a thickness from 1 to 4 inches. 4’ x 4’ tapered panels are also available.

2.04 FASTENING COMPONENTS

A. Insulation Adhesive:

1. Flexible FAST Adhesive: An elongating impact resistant two component (Part A and B), extrusion applied, low rise adhesive for bonding insulation to various surfaces. Packaging formats include 50 and 15 gallon drums, Dual Tanks, Dual Cartridges and 5-gallon Jugs. When extruded at 12” on center the coverage rate is 3,500-3,700 sq.ft. per set of Dual Tanks, 400-600 sq.ft. per carton of Dual Cartridges or 2,000-2,500 sq.ft. per set of 5-gallon Jug Adhesive.

   a. Adhesive to provide 150% elongation in conjunction with fleece backed membrane – ASTM D412

   b. MDI content of Part A material less than 25%

2.05 ADHESIVES, CLEANERS AND SEALANTS

All products shall be furnished by Carlisle and specifically formulated for the intended purpose.

Low VOC PVC Bonding Adhesive: A high strength solvent-based contact adhesive that allows bonding of PVC membrane to various porous and non-porous substrates. It is specially formulated using a blend of VOC exempt and nonexempt solvent to be in compliance with the state of California Clean Air Act of 1988 (updated in 1997) and as further requlated by California's Air Quality Control Districts listing VOC grams per liter limitations. This product also meets the <250 gpl VOC content requirements of the OTC Model Rule for Singel Ply Roofing Adhesives.

Carlisle CAV-GRIP III Low-VOC Aerosol Contact Adhesive/Primer: a low-VOC, methylene chloride-free adhesive that can be used for a variety of applications including: bonding Sure-Weld membrane to various surfaces, enhancing the bond between Carlisle's VapAir Seal 725TR and various substrates, priming unexposed asphalt prior to applying Flexible FAST Adhesive and for adhering Sure-Seal/Sure-Weld/Sure-Flex FleeceBACK and Sure-Seal EPDM or Sure-Weld TPO membrane to vertical walls. Coverage rate is approximately 2,000-2,500 sq. ft. per #40 cylinder and 4,000-5,000 sq. ft. per #85 cylinder as a primer, in a single-sided application and 750 sq. ft. per #40 cylinder and 1,500 sq. ft. per #85 cylinder as an adhesive for vertical walls, in a double-sided application.

2.06 METAL EDGING AND MEMBRANE TERMINATIONS

A. General: All metal edging s shall be tested and meet ANSI/SPRI ES-1 standards and comply with International Building Code.

1. SecurEdge 400: a coping or fascia, snap-on edge system consisting of a 22 gauge galvanized metal water dam and .040" thick aluminum, Kynar 500 finish. Metal fascia color shall be as designated by the Owner's Representative. ANSI/SPRI ES-1 Certified.

B. Drip Edge: a metal fascia/edge system with a 22 or 24 gauge continuous anchor cleat and .032 inch thick aluminum or 24 gauge steel fascia. Metal fascia color shall be as designated by the Owner's Representative.

C. SecurEdge Coping: incorporates a 20 gauge anchor cleat with 4 pre-slotted holes, a concealed joint cover and 10 foot continuous sections of coping cap; can accommodate minimum 5 " wide parapet walls. Metal coping cap color shall be as designated by the Owner's Representative.

D. Termination Bar: a 1" wide and .098" thick extruded aluminum bar pre-punched 6" on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.

E. SecurEdge Term Bar Fascia: A 1.75" wide formed aluminum termination bar with pre-slotted fastening holes for ease of locating and installing. The decorative cover is available in 0.040" aluminum or 24-gauge galvanized steel. SecurEdge Term Bar Fascia

is manufactured in 12’ lengths for fewer joints/seams, fewer sections to handle and faster installation.

2.07 WALKWAYS

Protective surfacing for roof traffic shall be Sure-Flex PVC Walkway Rolls installed per manufacturer’s requirements or concrete pavers loose laid over an approved slip sheet (pavers not recommended for slopes greater than 2” in 12”).

PART 3 EXECUTION

3.01 GENERAL

A. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, job site considerations and weather restrictions.

B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

3.02 VAPOR RETARDERS

A. General:

The use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly should be investigated, especially on projects with high interior humidity, such as, swimming pools, breweries, pulp mills, etc.

B. In the generally temperate climate of the United States, during the winter months, water vapor flows upward from a heated, more humid interior toward a colder, drier exterior. Vapor retarders are more commonly required in northern climates than in southern regions, where downward vapor pressure may be expected and the roofing membrane itself becomes the vapor retarder.

C. On cold storage/freezer facilities, the perimeter details must be selected to provide an air seal and prevent outside air from infiltrating and condensing within the roofing assembly.

D. Consult the latest publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) for specific information.

E. If insulation is to be adhered to the vapor retarder with Flexible FAST Adhesive, the vapor retarder must be compatible and shall be fully adhered to the substrate. Available products include Carlisle supplied “peel and stick” rubberized asphalt membrane with compatible film coating (Carlisle 725 Air and Vapor Barrier), and spray or roller applied butyl coatings. Installation requirements for Carlisle’s 725 Air and Vapor Barrier are identified in Carlisle published specification.

F. For metal decks, VapAir Seal MD Air and Vapor Barrier is specifically designed for direct application to fluted steel decks. It may also be used in conjunction with either Carlisle’s

CAV-GRIP III on vertical wall surfaces, such as structural concrete, gypsum, Securock, DensDeck Prime, DensDeck StormX Prime and plywood substrates.

G. VapAir Seal MD Installation:

1. Surface Preparation: The surface shall have a smooth finish and be free of voids, spalled areas, sharp protrusions, loose aggregate, laitance and form release agents. In the event of rain, concrete must be allowed to dry before primer is applied.

2. Primer: Surfaces to receive VapAir Seal MD Air and Vapor Barrier must be clean and dry. Prime with CCW 702 or 702LV or CAV_GRIP III Primer. Apply Primer by spray, brush or with a long nap roller at the applicable coverage rate noted above. At 75° F allow primer to dry 1 hour minimum. Primer has a satisfactory cure when it will not transfer when touched. Prime only areas to be waterproofed the same day. Re-prime if area becomes dirty.

3. Application: Apply VapAir Seal MD Air and Vapor Barrier to the metal deck from low to high point, in a shingle fashion, so that laps will shed water. Overlap all edges at lease 2-1/2". End laps shall be staggered. Place either a 6” wide section of 24 gauge sheet metal or a 6” wide section of VapAir Seal MD directly on the metal under each end lap, perpendicular to the end lap, to ensure a solid surface to roll the end lap together. Seams and end laps must be rolled with a 2” seam roller or stand-up seam roller. Place membrane carefully so as to avoid wrinkles and fish mouths. Immediately after installation, broom the sheet to ensure proper contact to the metal.

4. Insulation Installation: Ensure surface of VapAir Seal MD Air and Vapor Barrier is dry prior to installing insulation. Place insulation over the surface and mechanically fasten to the roof deck accordance with this Carlisle Specification.

3.03 INSULATION PLACEMENT AND ATTACHMENT

A. Install insulation or membrane underlayment over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch. Stagger joints horizontally and vertically if multiple layers are provided.

B. Secure insulation to the substrate with the required mechanical fasteners or insulation adhesive Sure-Seal FAST Adhesive or OlyBond 500 BA adhesive in accordance with the manufacturer’s specifications.

3.04 MEMBRANE PLACEMENT AND ATTACHMENT

A. Position Sure-Flex membrane over the acceptable substrate. Fold membrane sheet back onto itself so half the underside of the membrane is exposed.

B. Apply Bonding Adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area. Do not apply Bonding Adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

1. Roll the coated membrane into the coated substrate while avoiding wrinkles.

Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.

2. Fold back the unbonded half of the sheet and repeat the bonding procedures.

C. Position adjoining sheets to allow a minimum overlap of 2 inches to provide a minimum 1-1/2” hot air weld.

D. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously.

3.05 MEMBRANE HOT AIR WELDING PROCEDURES

A. Heat weld the Sure-Flex membrane using an Automatic Heat Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller immediately after the welder causes the membrane step off to ensure a continuous hot aire welded seam.

B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes).

C. Repair all seam deficiencies the same day they are discovered.

D. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete. Cut Edge Sealant is not required on horizontal or vertical splices.

3.06 FLASHING

A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using Sure-Flex reinforced membrane. Sure-Flex non-reinforced membrane can be used for flashing pipe penetrations, Sealant Pockets, and scuppers, as well as inside and outside corners, when the use of pre-molded accessories is not feasible.

B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.08 DAILY SEAL

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

3.09 CLEAN UP

A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

END OF SPECIFICATION

SECTION 33 11 18 - PLASTIC PIPE AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Plastic pipe and fittings including the following:

1. Plastic pipe and fittings
2. Fiberglass pipe and fittings
3. Cleanouts

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. B. Shop Drawings: Include the following.

1. Detail each equipment assembly, include make, model weight, and indicate installation details, dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
2. Complete catalog information, descriptive literature, materials of construction, wheels, gears and bearing, trolley drive system, brakes, stating system, variable speed drive system, conductors (bus bar, festoon, cable reel), controls, remote control system, and accessories.
3. Power and control wiring diagrams, including terminals and numbers.
4. Motor nameplate data in accordance with NEMA MG 1 and include any motor modifications.
5. Factory finish system.

1.4 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall provide the proper equipment, tools and facilities necessary for the efficient prosecution of the work.

1. Materials damaged in unloading, handling or installation shall be promptly discarded and removed from the area of the work.
2. No pipe shall be unloaded or moved by allowing the pipe to roll, slide or fall to the ground or to cushions placed on the ground.
3. No pipe, fittings, valves, etc., shall be unloaded by inserting loader blades, teeth, etc., into the pipe interior.

B. Pipe shall be stored on racks or timbers in such a manner that pipe ends are above the ground surface.

1. When pipe is to be moved it shall not be dragged or rolled but shall be lifted by use

of a sling designed to prevent damage to the pipe coatings.
2. Should an intermediate placement of the pipe along the side of the trench be required, the pipe shall be placed on racks or timbers along the side of the trench in manner as specified hereinabove.

C. Each length or section of pipe shall be cleaned immediately before being placed in the trench and joined.

1. Cleaning shall be accomplished by use of a tight swab or other suitable cleaning device.
2. If necessary, a brush pig shall be run through the section of pipe prior to final swabbing.
3. Pipe ends shall be wiped clean before the pipe is joined.

PART 2 - PRODUCTS

2.1 PIPE MATERIAL AND FITTINGS

A. The contractor shall carefully examine all pipe and piping materials before placing them in the work. If any such pipe or materials should be found to be defective, the Contractor shall promptly notify the Engineer and discard such pipe and materials.

B. The interior of all pipe, fittings, valves and accessories shall be kept free from dirt and foreign material.

1. Suitable bulkheads shall be used to block or plug ends of piping at the close of each work day and when work on a particular section of piping is temporarily discontinued.
2. Should dirt, mud, concrete, latence, paint or other foreign materials be allowed to enter the piping or any section of piping, such piping or section of piping shall immediately be cleaned.

C. Piping materials shall be of the types, classes and sizes shown or as specified in the piping schedule.

2.2 PLASTIC PIPE AND FITTINGS

A. General Service

1. Plastic pipe shall be of types as hereinafter specified or as shown on the Drawings.
2. The particular Type, Grade and Schedule of pipe used for a particular installation shall be suitable for the service intended.
3. PVC pipe shall be manufactured from rigid polyvinylchloride compounds meeting the requirements of ASTM D1784, latest revision, Class 12454-B.
4. Pipe shall meet requirements of ASTM D1785 latest revision Type 1.
5. Pipe shall be Schedule 80 unless otherwise indicated, and shall be furnished with threaded ends suitable for connection to fittings, companion flanges, and flanged valves.
6. Fittings shall meet the requirements of ASTM D2464, latest revision.
7. All pipe, fittings and valves shall be manufactured from molding compounds

meeting the requirements of ASTM D1784, latest revision, Class 12454-B as specified hereinabove so as to ensure compatibility of materials.

8. Materials from which pipe, fittings and valves are manufactured shall have been tested and approved by the National Sanitation Foundation and shall be suitable for service associated with the production of potable water.
9. PVDF pipe shall be manufactured from natural polyvinylidene fluoride compound meeting the requirements of ASTM D3222, latest revision, and having a minimum tensile strength of 7100 psi at 73°F when tested in accordance with ASTM D638, latest revision.
10. Pipe shall have nominal pipe sizes and wall thicknesses as given for Schedule 80 pipe in Table 2 of ASTM D1785, latest revision, unless otherwise indicated.
11. Fittings may be either socket fusion type meeting the requirements of ASTM D2657, latest revision, or threaded type having dimensions and tolerances in accordance with ASTM D2464, latest revision, according to the manufacturer's recommendations.
12. If the socket fusion type method of joining the pipe should be used, disassembly of pipe shall be provided for at changes of direction of pipe and at valves by use of companion flanges or threaded couplings or other means as recommended by the manufacturer.
13. All pipe, fittings and valves shall be manufactured from molding compounds meeting the requirements of ASTM D3222, latest revision, as specified hereinabove so as to ensure compatibility of materials, and all materials (including joining materials) shall be suitable for service associated with the production of potable water.
14. Magnetic locator tape shall be provided for all plastic piping installed underground.
15. High Density Polyethylene (HDPE) pipe, 6 inch to 8 inch diameter shall be pressure rating DR 9.

B. Gravity Sewer Service

1. PVC gravity sewer pipe shall conform in all respects to Standard Specifications for Type PSM Polyvinylchloride (PVC) Sewer Pipe and Fittings ASTM D 3034, latest revision, (sizes 4" - 15"); ASTM F679, latest revision, (sizes 18" - 27"); covering requirements and test methods for materials, dimensions, workmanship, flattening resistance, impact resistance, pipe stiffness, extrusion quality, joining systems and a form of marking.
2. Pipe conforming to ASTM D3034, latest revision, shall have a minimum wall thickness of SDR 35.
3. Pipe conforming to ASTM F679, latest revision, shall have a minimum pipe stiffness (PS) of 46 psi and minimum T-1 wall.
4. Pipe shall be furnished in sections not less than ten (10) feet in length and not greater than thirteen (13) feet in length.
5. Pipe and fittings shall be inspected and tested in accordance with ASTM D 3034 or ASTM F679, latest revisions, by a testing laboratory acceptable to the Owner and certified copies of the test reports and test results shall be furnished to the Owner.
6. Pipe and fittings shall be clearly marked in accordance with Section 12 of ASTM D 3034, or Section 11 of ASTM F679.
7. Pipe shall be furnished with bell and spigot end with elastomeric seals.
8. Spigot (plain) ends shall be marked to indicate when a "full-home" position of spigot

in bell has been attained.
9. Seal rings or gaskets shall be continuous elastomeric rings meeting the requirements of ASTM D 3212, latest revision.
10. Material for seal ring shall be specifically formulated for wastewater service.
11. The joints shall meet all test requirements of ASTM D 3212, latest revision, and certificates of compliance shall be furnished to the Owner.

C. Water Line Service

1. Polyvinylchloride (PVC) water pipe, 4 inch to 12 inch diameter, shall be AWWA C-900 Class 150 (DR-18) and shall bear the seal NSF. Joints shall conform to ASTM D3139 or ASTM D3212.
2. PVC pipe less than 4-inches in diameter shall be Schedule 80 with a pressure rating of 200 psi solvent welded, including blow-off assemblies.
3. PVC pipe shall meet the requirements of AWWA C900, Class 200 (SDR 14, minimum) with the same outside diameters for corresponding nominal sizes of ductile iron pipe meeting the requirements of AWWA C151.
4. PVC pipe shall be capable of making connection with cast iron fittings meeting the requirements of AWWA C111 without the use of adaptors.
5. Pipe shall be fabricated in nominal 20 foot lengths.
6. PVC pipe shall be equipped with bell and spigot joints.
7. Bell shall consist of integral wall section with pipe.
8. Bell section shall have same hydrostatic strength as pipe wall and meet the requirements of AWWA C900.
9. Joints shall have elastomeric gaskets manufactured in conformance with ASTM F477.
10. Gaskets shall be formulated for water service and be supplied separately from the pipe bell with lubricant recommended by the pipe manufacturer.

D. Natural Gas Service

1. Polyethylene (PE) natural gas pipe and fittings shall be PE 2406 medium density polyethylene (MDPE) meeting cell classification 234363E per ASTM D3350. All pipe and fittings materials shall be opaque yellow in color. Materials shall be stabilized against ultraviolet deterioration and shall be suitable for unprotected outdoor storage for at least four (4) years.
2. Fittings shall be of the same diameter, type, and wall thickness of the pipeline being constructed. Fittings shall be manufactured and tested in accordance with ASTM D 2513 and applicable Federal Department of Transportation (DOT) regulations.

2.3 FIBERGLASS PIPE AND FITTINGS

A. RTRP (Fiberglass Pipe) shall conform to the following requirements:

1. AWWA C950.
2. Shall be [Class 150] [Class 200] [and] [Class 250].
3. Shall be Type I[or II].
4. Shall be [Grade 1, epoxy] [or] [Grade 2, polyester].
5. Shall have bell-and-spigot ends [for bonded] [with gasket or seal for gasketed]

joints.

6. Liner is optional unless indicated.[Include FM approval if used for fire-service mains.]

B. RTRF (Fiberglass Fittings) shall conform to the following requirements:
   1. AWWA C950
   2. Shall be similar to pipe in material, pressure class, and joining method.

C. Fiberglass pipe (UL RTRP) shall conform to the following requirements:

   1. UL 1713.
   2. Shall be [Class 150] [and] [Class 200] [and] [Class 250].
   3. Shall have bell-and-spigot ends with gasket or seal for gasketed joints
   4. Liner is optional unless indicated.

D. Fittings shall be similar to pipe in material, pressure class, and joining method.

2.4 CLEANOUTS

A. PVC Cleanouts shall conform to the following requirements:

   1. Shall have a PVC body with PVC threaded plug.
   2. Shall include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping or proper adapters.

PART 3 - EXECUTION

3.1 JOINING OF PIPE

A. Pipe joining procedure shall be in accordance with these Specifications and in accordance with the recommendations of the manufacturer of the particular type of joint.

B. Push-On Joint Pipe

   1. The joining of Push-On Joint pipe shall be performed in accordance with the AWWA Standard for Underground Installation of PVC Pressure Pipe and Fittings for Water, C606 and in accordance with the manufacturer's instructions and/or recommendations for the particular joint furnished.
   2. The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter.
   3. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the socket.
   4. A thin coat of gasket lubricant shall be applied to either the inside surface of the gasket or outside surface of the spigot, or both.
   5. Gasket lubricant shall be as supplied by the particular manufacturer and reviewed by the Engineer.
   6. The spigot end of the pipe shall be carefully inserted in the socket so that the joining surfaces will not come in contact with the ground, trench bed or trench sides.

7. The joint shall then be completed by forcing the spigot end to the bottom of socket by methods as recommended by the particular manufacturer and concurred with by the Engineer.
8. All pipe shall be furnished with a depth mark to indicate a 'full-home' assembly.
9. The Contractor shall provide special transition sleeves or transition pieces of pipe for connecting pipe of different classes; and those special pieces shall be clearly identified with suitable marking.
10. If the Contractor desires to cut lengths in the field to make closures, he shall have on hand an adequate number of lengths of pipe of the various classes having the exterior of the barrel gauged to fit the socket of pipe.

C. Polyethylene Pipe

1. Heat Fusion Joining

   a. Butt, socket, and saddle fusion joints in polyethylene gas pipe shall be made using procedures that have been qualified and approved by the Federal Department of Transportation (DOT) in accordance with CFR, Title 49, Part 192.283.
   b. The Contractor shall ensure that all persons making heat fusion joints have been qualified to make joints in accordance the above referenced CFR code.
   c. The contractor shall maintain records of qualified personnel and shall certify that qualified training was received not more than twelve (12) months prior to commencing work.

2. Butt Fusion of Unlike Wall Thicknesses

   a. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one (1) standard DR (i.e. SDR 9 to SDR 11).
   b. Transitions between unlike wall thicknesses greater than one (1) DR shall be made with a transition nipple or by mechanical means.

3. Mechanical Compression Couplings

   a. Polyethylene gas pipe and fittings may be joined together to other materials by transition fittings or fully restrained mechanical couplings. These devices shall be designed for joining polyethylene gas piping to another material and shall be approved by the DOT.
   b. When mechanical couplings are used for joining, polyethylene gas piping shall be reinforced with a stiffener in the pipe bore. Stiffeners shall be properly sized for the diameter and wall thickness of the polyethylene gas piping being joined.
   c. For service connections, the stiffener length shall match the pipe end penetration depth into the coupling.

3.2 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. PVC Sewer Pipe and Fittings shall be as follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Install according to ASTM D 2321.

3.3 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade.

1. Use PVC sewer pipe fittings in sewer pipes at branches for cleanouts and PVC sewer pipe for riser extensions to cleanouts.
2. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers located in unpaved areas in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding finished grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

END OF SECTION 33 11 18

SECTION 44 42 13.16 – DIFFUSER EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes the design, manufacture, installation and start-up of a flexible membrane, fine pore aeration system including in-basin aeration components as shown on the Drawings and as specified herein.

B. The aeration system manufacturer shall provide single source responsibility for the complete aeration system including in-basin piping, diffuser assemblies and support components.

C. Under this section of the specification, the contractor shall provide and install the aeration equipment in the digester as shown in the contract drawings and as described herein.

1.3 SUBMITTALS

A. The Contractor shall provide system submittals as follows:

1. Basic design, layout, including drop pipe, piping for full tank aeration, and support structures.
2. Full scale clean water oxygen transfer efficiency test report
3. Membrane endurance test data
4. Design calculations showing oxygen transfer based on guaranteed performance.
5. Include complete air headloss calculations for the aeration equipment from the top of the dropleg to the farthest diffuser bubble release point.
6. Design calculations showing uniform air distribution (+10% maximum variation) through lateral piping and diffuser element orifice system.
7. Design calculations for piping and support components.
8. A statement of the terms of the warranties.
9. List of spare parts which should be purchased and kept on hand.
10. All ancillary equipment to be provided by the manufacturer shall be listed.
11. Complete shop drawings of all equipment furnished including cut-sheets describing sub-components with the specific components highlighted.
12. Operation & Maintenance Manuals
13. Additional submittal requirements in accordance with Specification Section 01 33 00.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be delivered in unopened, undamaged crates designed for handling and storage.

B. Equipment shall be stored and protected in accordance with the Manufacturer's recommendations.

1.5 DEFINITIONS

A. Tank: Vertical walled reactor within which aeration occurs.

B. Diffuser Unit: Fabricated unit including diffuser support frame and flexible membrane which releases air to the water.

C. Diffuser Assembly: Fabricated assembly including diffuser units and assembly mounting components.

D. Air Drop Pipe: Vertical piping section from out-of-basin header stub to in-basin aeration system.

E. Air Subheader Piping: Air distribution piping from drop pipe to air distribution laterals.

F. Air Lateral Distribution Piping: Air distribution piping from air subheader and diffuser assemblies.

G. Air Header Piping: Out-of-basin air distribution piping from the blower building to the header stubs.

H. Blower Manifold Piping: Air distribution piping between the blower discharge and air header piping.

I. Aeration Grid: Associated piping and diffuser components connected to a single drop pipe.

J. Standard Cubic Feet per Minute (scfm): Air at 68°F, 14.7 psia and 36% relative humidity.

K. Maximum Pressure: Pressure in blower manifold piping at the specified airflow rate.

L. Oxygen Transfer Efficiency: Percent of oxygen in the air stream that is dissolved to the wastewater under specified conditions of temperature, barometric pressure, airflow rate, and dissolved oxygen concentration.

M. Standard Oxygen Transfer Efficiency: Percent of oxygen in the air stream that is dissolved to clean water under conditions of 68°F, 14.7 psia, and zero dissolved oxygen.

N. Air Distribution Uniformity: Variation in air distribution between diffuser assemblies.

PART 2 - PROCESS DESCRIPTION

2.1 SYSTEM DESCRIPTION

A. Design in-basin air piping and diffusers to diffuse air throughout the digester in

accordance with the specifications.

B. Design each diffuser assembly to provide uniform air release over the specified airflow range.

C. Design the aeration system to provide the minimum specified oxygen transfer efficiency at the specified airflow and operating pressure.

PART 3 - SYSTEM EQUIPMENT

3.1 MANUFACTURERS

A. The aeration system shall be manufactured by:
   1. Environmental Dynamics International
   2. Sanitaire

B. To assure system integrity and responsibility, all items of equipment described in this section shall be manufactured by a single manufacturer regularly engaged in the production of this equipment.

3.2 FINE BUBBLE AERATION

A. Furnish all materials, equipment, services, and testing for the fine bubble aeration system. Provide the components listed below at a minimum:

   1. Stainless steel drop legs, supports, and anchors.
   2. PVC manifolds, air distributors, diffuser holders, and retainer rings
   3. Bolts, nuts and gaskets for aeration system flange connections.
   4. Air distributor purge systems.
   5. Membrane disc diffusers with integral O-ring gaskets.

B. System Design and Performance

   1. Design aeration oxygen transfer shall be at 14.7 PSI, 20°C and zero dissolved oxygen at the specified submergence, air rate and pressure.

   2. The aeration-mixing system shall be designed to meet the following:
      a. Airflow = 830 scfm average
      b. Airflow = 1,400 scfm maximum
      c. Diffuser Submergence = 16.0 feet maximum
      d. Pressure at Top of Dropleg= 8.0 psig
      e. Diffuser Unit DWP = 17 inches H20 maximum
      f. Design Diffuser Submergence = 13 feet average
      g. Percent Oxygen Transfer, SOTE= 25%

   3. The diffusers shall not exceed the following:
      a. Air Fluxrate = 5.6 scfm/ft2 of active diffuser surface area at the design airflow.

b. Active Surface Area = 0.41 ft2 minimum *per diffuser* (249 ft2 minimum *total*)

1) Active surface area shall be defined as the net perforated area of the media or membrane and shall reflect only that portion of the membrane which can be demonstrated to produce uniform air discharge under the full operating range proposed for the diffuser.

C. Materials Fabrication and Finishing

1. Stainless Steel – Pipe, Fittings and Supports

a. Fabricate all welded parts and assemblies from sheets and plates of 304L stainless steel with a 2D finish conforming to ASTM A240, 554, 774, 778.
b. Fabricate non-welded parts and flanges from sheets, plates or bars of 304 stainless steel conforming to ASTM A240 or ASTM A276.
c. Welds & Welding Procedure

1) Weld in the factory using latest standards according to AWS. Continuously weld both sides of face rings and flanges to eliminate potential for crevice corrosion.
2) Corrosion Protection and Finishing: Clean all welded stainless steel surfaces and welds after fabrication. Preclean outside and finish clean all interior and exterior welds and piping by full immersion pickling and rinse with water to remove all carbon deposits and contaminants to regenerate a uniform corrosion resistant chromium oxide film per ASTM A380 Section 6.2.11, Table A2.1 Annex A2 and Section 8.3.

2. Natural Rubber – Furnish all fixed and expansion joint O-ring gaskets of natural rubber/SBR with a Shore A durometer of 45 ± 5.

3. Polyvinyl Chloride (PVC) – Pipe and Fittings

a. Produce all PVC pipe and fittings from PVC compound with a minimum tensile strength of 7000 psi.
b. Provide lower drop pipe, manifold and air distributors as follows:

Diameter	Wall Thickness	ASTM
4 inch	SDR 33.5	D3915, 3034
5 inch & larger	Schedule 40	D1784, 1785, 2466

c. Factory solvent weld all PVC joints. Field solvent welding will NOT be permitted.

4. EPDM - Membrane Diffusers and Gaskets

a. Manufacture circular membrane diffuser discs with integral O-ring of EPDM synthetic rubber compound with precision die formed slits. Thermoplastic materials (i.e. plasticized PVC or polyurethane) are not acceptable.

b. Add carbon black to the material for resistance to ultraviolet light.
c. Design diffuser as one piece injection molded part with a minimum thickness of 9-inch diameter unit. Compression molded diffuser elements are not acceptable.
d. Limit the maximum tensile strength of the diffuser to 10 psi when operating at 2.4 SCFM/ft² of material. Furnish proportionately thicker material for larger diameter disc diffusers to limit the maximum tensile stress and to resist stretching.
e. Produce diffusers free of tears, voids, bubbles, creases or other structural defects.
f. Furnish diffuser material to meet the following:

Item	**Value/Units**	**ASTM**
Base Polymer	EPDM	D573
UV Resistance	Carbon Black	
Specific Gravity	1.25 or less	
Durometer – Minimum	58% ± 5%	D2240
Modulus of Elasticity	500 psi	D412
Ozone Resistance (72 hrs: 40°C pphm)	No cracks @ 2X magnification	D1171 Test A
Tensile Strength	1200 psi	D412
Elongation - % - Retained 70 hrs @ 100°C - minimum at break	 75% Max 350%	 D573 D412

g. Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.
h. Membrane Longevity
i. Longevity of the proposed membrane diffusers shall have been demonstrated in at least three (3) full-scale municipal installations operating continuously for a period of three (3) years.
j. Test reports, prepared by an independent testing agency, shall confirm membrane longevity through compliance with the following maximum allowed percent (+/-) change in each membrane property. Tests conducted in-house by the Manufacturer shall not be acceptable.
k. Data for a minimum of three diffusers from each installation shall be provided.

Property	Maximum Change
Durometer	5%
Weight	5%
Permanent Set	0.5%

l. Test reports shall be submitted with the equipment submittals.

D. Fine Bubble Aeration System Components: Each grid will consist of the following components:

1. Dropleg - Provide a stainless steel dropleg from the air main connection to the dropleg connection above the manifold.

a. Provide a Van Stone style flange with a 150 pound bolt pattern for the top connection.
b. Provide a band clamp coupling with gasket for the lower dropleg to manifold
c. Provide a Van Stone style flange with a 150 pound bolt pattern for the top connection.
d. Provide a band clamp coupling with gasket for the lower dropleg to manifold.

2. Manifold – Provide a PVC manifold for connection to the air distribution headers.

a. Provide a band clamp coupling with gasket for the lower dropleg to manifold.
b. Outlets shall be provided along the bottom centerline of the manifold.
c. Fabricate manifolds with 4 inch diameter fixed threaded union or flanged joints for connection to the air distributors.
d. Design manifold, distributor connections and supports to resist thrust generated by expansion/contraction of the air distributors over a temperature range of 125° F
e. Support manifold with a minimum of two supports.
f. Connect manifolds with fixed threaded union or flanged joints to prevent rotation or blow apart.

3. Air Distributors and Diffuser Holders - Provide 4 inch diameter air distributors perpendicular to the air manifold.

a. Fabricate distributors with single diffuser holders solvent welded to the crown of the air distributor for complete air seal and strength.
b. Provide minimum solvent weld area of 15 square inches.
c. Design distributors and holders to resist a dead load of 200 lbs applied vertically to the outer edge of the diffuser holder.
d. Provide 4 inch diameter threaded removable end caps complete with gasket, threaded coupling and end plate for clean out at the end of each distributor.

4. Air Distributor and Manifold Connection Joints

a. Join air distributor sections with positive locking fixed threaded union or flange type joints for all submerged header joints to prevent blow apart and rotation.
b. Bell and spigot, slip on or expansion type joints are not acceptable for submerged joints.
c. Design threaded union joints with spigot section connected to one end of the distribution header, an O-ring gasket and a threaded screw on retainer ring. Solvent welding shall be done in the factory.

5. Supports - Provide each section of manifold and air distributor with a minimum of two (2) supports.

a. Limit maximum support spacing to 8 feet.
b. Design all supports to allow for thermal expansion and contraction forces over a temperature range of 125° F and to minimize stress build up in the piping system.
c. Design supports to be adjustable without removing the air distributor from the support.
d. Manifold Support – 6 inch diameter and larger.

    1) Design supports to include hold down guide straps, support structure and anchor bolts.
    2) Design guide straps with a 2 inch minimum width to eliminate point load on manifold and minimize binding.
    3) Design support for 2 inches plus or minus vertical adjustment for leveling of manifold.
    4) Air Distributor and Manifold Supports – 4 inch diameter.
    5) Design supports with hold down straps, support structure and anchor bolt.
    6) Design support for 1 1/2 inch(plus or minus) vertical adjustment for leveling air distributor to plus or minus 1/4 inch.

e. Guide support

    1) Guide straps to have 1 1/2 inch wide top and bottom contoured bearing surface with chamfered edges to minimize binding and resistance to movement of air distributor under full buoyant uplift load.
    2) Design strap with 1/8 inch clearance around distributor so strap is self-limiting and cannot be over tightened.

f. Fixed supports

    1) Fixed straps to have 1 1/2 inch wide top and bottom contoured bearing surface with punched burrs to positively grip the air distributor when tightened.
    2) Design strap to be self-limiting to prevent stressing the distributor if the clamp is over tightened.
    3) Attach supports to tank floor with one stainless steel anchor bolt.

6. Diffuser Assemblies Furnish diffuser assemblies including diffuser, diffuser gasket, holder, retaining ring and air flow control orifice.

a. Membrane Diffuser

    1) Incorporate an integral check valve into the membrane diffuser.
    2) Design and test aeration diffusers for a dynamic wet pressure (DWP) of 12 inches ± 20% water column @ 1.0 SCFM/diffuser and 2 inches submergence in the Aeration Tanks.
    3) Visual Uniformity – Observe diffusers for uniform air distribution across the active surface of the diffuser at 1.0 SCFM- 1.5

SCFM/diffuser and 2 inches submergence. Active surface is defined as the perforated horizontal projected area of the diffuser.

4) Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.
5) Diffuser Support Plate – Provide a PVC support plate to form an air plenum under the diffuser and support for the membrane when the air is off.

b. Diffuser Holders and Retainer Rings

1) Design holder to provide peripheral support for the diffuser.
2) Design holder with air flow control orifice below the diffuser.
3) Design retainer ring to seal the diffuser and o-ring in the holder to prevent air leakage around gasket.
4) Design retainer ring threads with minimum cross-section of 1/8 inch and allow for one complete turn to engage threads.

7. Anchor Bolts

a. Provide a mechanical 304 SS expansion anchor bolts for embedment in 4,000 psi concrete with a pullout safety factor of 4.

8. Liquid Purge System

a. Provide a continuous purge assembly for each air distribution header.

3.3 SHOP OXYGEN TRANSFER TEST

A. Conduct a performance test to demonstrate capability of the aeration equipment to meet the specified oxygen transfer requirements.

B. Base all tests on the following criteria:

1. A minimum of 3 tests for each specified condition in complete accordance with ASCE Clean Water Test Procedure (1992 or latest edition).
2. Manufacturer to conduct tests in a full-scale aeration test tank (minimum of 300 sq. ft.) at the specified submergence and water depth with a diffuser density equivalent to the specified tank configuration. Diffuser density is defined as the ratio of the total tank surface area to the total active diffuser surface area.
3. Conduct shop test with air rate and mass rate of oxygen transfer directly proportional to the ratio of the shop test tank volume and the design tank volume.
4. Plot of pounds of oxygen per day per 1,000 cubic feet of tank volume versus air per 1,000 cubic feet of tank volume in tap water at 14.7 Asia, 20°C and zero dissolved oxygen at the specified submergence.

C. Certify and stamp all tests by a registered Professional Engineer.

D. Include all costs for testing (exclusive of witnesses expenses) in the equipment price. All tests may be witnessed at Owner/Engineer option. Cost of travel and living expenses for Owner/Engineer to be paid by the Owner.

E. Submit all test data from oxygen transfer tests for approval by the Engineer prior to manufacturing equipment.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Contractor shall furnish, inspect, store, and install aeration system and blower components in accordance with Manufacturer's written instructions and approved submittals.

B. Diffuser assemblies on a common grid shall be installed within an elevation tolerance of ±1/2 inches.

C. Contractor shall provide all valves, air header piping, wall sleeves with seals, wall pipes, and concrete pedestals as necessary to complete the system as shown on the plans.

D. Air piping including blower manifold, header, and in-basin piping must be clean prior to delivering air up the diffusers.

E. Contractor shall be responsible for cleanliness of piping and may be required to manually clean pipe, or air or water flush piping as required.

4.2 START-UP

A. After installation is completed, the Contractor shall perform the following field tests in the presence of the Engineer and the Owner.
   1. Fill the reactor to the bottom of the diffuser assemblies.
   2. Adjust the pipe supports and diffuser assemblies such that all diffuser units are installed within ±1/2 inches of the design diffuser elevation.
   3. Fill the reactor to a level of 2 feet above the top of the diffusers with potable water.
   4. Release air to the system and inspect the system for air leaks at all piping or diffuser connections.
   5. Check all membrane for cuts or tears that may have occurred during the installation.
   6. Adjust any piping or diffusers that show leaks or disproportionate amount of airflow.
   7. Operate the blowers at the design air rate and observe air release and air distribution patterns.
   8. All water, air, power and labor associated with testing and adjustment of diffuser assemblies are to be supplied by Contractor.

4.3 QUALITY ASSURANCE

A. The Manufacturer shall have experience in the design, manufacture, supply, and commissioning of fine pore, flexible membrane aeration equipment of the type specified for this project.

B. Manufacturer shall have available skilled supervision and startup services as specified.

C. The Contractor shall provide the services of the Manufacturer service/startup technician to supervise and inspect and certify the equipment is operating as designed. The Manufacturer will provide classroom and field training on the operation and maintenance required at each installation. The Manufacturer shall provide a factory trained service/startup technician for the following at a minimum: for two (2) trips including a total of eight (8) workdays to inspect the installation, observe/assist in startup and supervise the performance testing and Owner's training. The Manufacturer's service/startup technician days on site shall be 8 hours per day not including travel time. The Manufacturers service/startup technician shall provide additional time on site at no cost to the Owner if required to resolve startup issues associated with the system equipment, programming or other issues due to system design or performance. Any additional days on site, if requested by the Owner, shall be negotiated between the Owner and the Manufacturer.

D. The equipment manufacturer shall furnish the services of a factory trained representative for the following at a minimum:

1. Aerobic Digester No. 1 & 2 - two (2) trips to the job site for eight-hour days on-site.
   a. One (1) trip is for a pre-installation meeting with the Contractor, Owner, and Engineer.
   b. One (1) trip is to inspect the installation, the initial wet operation of the equipment, observe/assist in startup, supervise the performance testing, and complete Owner's training of the plant operating personnel in proper operation and maintenance.

E. All site visits shall be coordinated with the Owner and Engineer at least seven (7) days prior to site visit.

F. The Owner will NOT provide written acceptance of the system until training is complete.

4.4 OWNER ACCEPTANCE

A. In addition to the documentation associated with the completion of the Acceptance Testing, the Manufacturer shall provide the Owner with documentation that states the installation of the system has been inspected, meets the Manufacturer's guaranteed requirements, and is free from faults and defects. Once this documentation is received and training is complete, the Owner will issue a written letter of acceptance.

4.5 GUARANTIES

A. The Manufacturer shall furnish a three (3) year performance bond covering satisfactory performance of the diffusers provided for the Aerobic Digesters No. 1 and No. 2; FOB to Shenandoah WWTP and shall include parts only (not labor). The performance bond shall be in an amount to cover complete replacement of all diffusers in the digesters in addition to 50 spare diffusers, all of which will comply with the performance requirements set forth in these Specifications. Obligees of the Bond shall be the Owner and the Contractor. Bonds shall be furnished with the Manufacturer as principal and

with corporate surety satisfactory to the owner and authorized to do business in the State of Georgia and countersigned by an agent whose office is located in the State of Georgia.

B. Manufacturer shall provide a 1 year warranty for all system components from the date of substantial completion and Owner acceptance.

END OF SECTION 44 46 13

3SECTION 44 42 56 – SUBMERSIBLE WASTEWATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Submersible Pumps

1.3 GENERAL REQUIREMENTS

A. All castings for pumps and motor frames shall be free of pits, blisters, burrs, or other defects.

B. Pumps shall be furnished with ½" NPT gauge taps on suction and discharge flanges and ¾" NPT drain taps on the volute.

C. Review of the equipment data by the Engineer shall not relieve the Contractor or the manufacturer of responsibility for all detailed dimensions and correct fitting of all parts, or for the satisfactory operation and service of the equipment as specified.

D. When mechanical seals are called for, the Contractor shall furnish the following packaged spare parts for each grouping of identical pumps:

1. Two (2) sets of mechanical seals
2. One (1) shaft sleeve
3. One (1) shaft key

E. Except on close-coupled pumps, pumps shall be connected to motors by flexible couplings of a type suitable for the service conditions.

F. All anti-friction bearings supporting direct-driven shafting shall have a B-10 life rating of not less than 17,000 hours

G. All bearings supporting pinion shafting, worm shafting, or other gear shafting shall have a life of not less than 100,000 hours.

H. All components requiring lubrication, except sealed bearings, shall be provided either with pressure grease connections of Alemite or buttonhead type or with oil cups or oil reservoirs as required.

I. Four (4) pressure grease guns shall be furnished for this project. Guns shall be stainless steel, have 1-quart capacity, and shall be furnished with a flexible extension.

J. Motors:

1. Motors shall be squirrel cage, induction type, of current Characteristics as specified, and shall have horsepower ratings adequate for driving the connected units under all conditions of loading.
2. Motors shall be guaranteed to continuously carry 115% of the rated loads without injurious heating.
3. All motors shall be furnished with not less than Class B insulation unless otherwise noted.
4. All motors shall have cast iron frames, shall be copper-wound, and shall be rated as "premium energy efficient" or "high energy efficient".
5. Motors greater than 40 HP shall be protected with phase protection.
6. Motors to be connected to VFDs shall be manufactured with an inverter grade insulation system capable of withstanding the waveform stresses produced by the VFD.
7. Premium efficiency components shall also be used to offset the increased losses of sinusoidal input with harmonic input.
8. All motors shall have nominal efficiency ratings as follows when tested per requirements of NEMA Mg 1-12.53a, and rating (nameplating) shall be per requirements of NEMA Mg 1-12.53b:

HORSEPOWER	NOMINAL FULL-LOAD EFFICIENCY. %**
¾	81.5
1	84.0
1½	85.5
2	86.5
3	88.5
5	88.5
7½	90.2
10	90.2
15	91.7
20	92.4
25	93.0
30	93.0
40	93.6
50	93.6
60	94.5
75 and greater	96.0

** Efficiencies may vary slightly with RPM selected.

9. The design and manufacture of all motors shall comply with the General Specifications of the A.I.E.E.
10. All motors shall have windings impregnated with moisture-proof compound, and shall be open drip-proof, splash proof, weatherproof, or totally enclosed.

1.4 SUBMITTALS

A. Product Data: Include performance curves, furnished specialties, and accessories for each type and size of pump indicated.

B. Shop Drawings: Show layout and connections for pumps. Include setting drawings with templates, conduit locations, directions for installing foundation and anchor bolts, and other anchorages.

C. Maintenance Data: For each type and size of pump specified to include any maintenance manuals specified in Division 1.

D. The Contractor, equipment manufacturer(s) and/or supplier(s), and representative(s) shall be responsible for reviewing the specified equipment during the bid period, and confirming that the specified equipment and appurtenances are suitable for use in this application, and, for notifying the Engineer immediately upon discovery of any issues with the use of the equipment in this application.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with the pump manufacturer’s rigging instructions for handling.

D. Each pump shall be performance tested at the manufacturer's plant before shipment.

1. Testing will include checking the unit at its rated speed, head, capacity, efficiency, and brake horsepower, and at such other conditions of head and capacity to properly establish the performance curve.
2. Certified copies of test curves will be submitted to the Engineer for review and approval before the shipment of any equipment to the job site.
3. The Standard of the Hydraulic Institute shall govern the procedures and calculations for all performance testing.

E. Submersible pumps shall be tested as follows before shipment from the factory:

1. Impeller, motor rating, and electrical connections shall first be checked for compliance with the customer's purchase order.
2. A motor and cable insulation test for moisture content or insulation defects shall be made.
3. Before submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

4. The pump shall be run for 30 minutes submerged, a minimum of six (6) feet underwater.
5. After operational test No. 4, the insulation test (No. 2) is to be performed again.
6. A written report stating the foregoing steps have been done shall be supplied with each pump at the time of shipment upon request. The pump cable end will be sealed with a high-quality protective covering, to make it impervious to moisture or water seepage before electrical installation.

1.6 WARRANTY

A. Warranty Period: 5-year prorated manufacturer's warranty.

1. The warranty shall be for unlimited usage of the equipment for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 PUMP MANUFACTURERS

A. Manufacturers

1. Flygt
2. KSB
3. Grundfos

2.2 SUBMERSIBLE PUMPS

A. Provide three (3) submersible pumps designed to pump raw, unscreened wastewater influent. The pumps shall meet the following performance criteria:

INFLUENT PUMPS No. 1, 2, & 3	
Pump Information	Operating Point
Capacity (GPM) – 1 Pump Operating:	4,170
TDH (ft.) – 1 Pump Operating:	60
Capacity (GPM) – 2 Pumps Operating in Parallel:	8335
TDH (ft.) – 2 Pumps Operating in Parallel:	73
Motor (HP):	127
RPM	1778
Voltage(V)/Frequency(Hz)	460/60
Motor shall be inverter duty	

B. Provide two (2) submersible pumps designed to pump return activated (RAS) sludge. The pumps shall replace the existing pumps in the Influent Pump Station and meet the following performance criteria:

RAS PUMPS No. 1 & 2	
Pump Information	Operating Point
Capacity (GPM):	4,200
TDH (ft.):	25
Motor Size (HP):	40
RPM	887
Voltage(V)/Frequency(Hz)	460/60
Motor shall be inverter duty	

C. Provide two (2) submersible pumps designed to pump waste activated (WAS) sludge. The pumps shall located in the new RAS/WAS/Drain Pump Station and meet the following performance criteria:

WAS PUMPS No. 1 & 2	
Pump Information	Operating
Capacity (GPM):	350
TDH (ft.):	6
Motor Size (HP):	3
RPM	1179
Voltage(V)/Frequency(Hz)	460/60
Motor shall be inverter duty	

D. Provide two (2) submersible pumps designed to pump process water drainage from treatment basins. The pumps shall located in the new RAS/WAS/Drain Pump Station and meet the following performance criteria:

DRAIN PUMPS No. 1 & 2	
Pump Information	Operating Point
Capacity (GPM):	1760
TDH (ft.):	45
Motor Size (HP):	30
RPM	1176
Voltage(V)/Frequency(Hz)	460/60

E. Provide one (1) submersible pump designed to pump scum and floatables from the final clarifiers. The pumps shall located in the new Scum Pump Station and meet the following performance criteria:

SCUM PUMP No. 1	
Pump Information	Operating Point
Capacity (GPM):	263
TDH (ft.):	15.4
Motor Size (HP):	2.1
RPM	1755
Voltage(V)/Frequency(Hz)	460/60

F. Pumps shall be designed to operate with variable frequency drives (VFDs). The contractor shall provide VFDs per the Electrical drawings and specifications.

G. Pump shall be constructed of the following materials:

1. Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes and other irregularities.
2. Where watertight sealing is required, o-rings made of nitrile rubber shall be used.
3. All exposed nuts and bolts shall be stainless steel 304 construction.

H. Motor:

1. The pumps motors shall be suitable for use with variable frequency drives (VFDs). See electrical plans and specifications for all motor starter requirements.
2. The submersible pump motor shall be a squirrel-cage induction shell type design, housed in an air-filled watertight chamber.
3. The use of oil-filled motors shall not be considered an acceptable equal to the specified air-filled motor.
4. The stator winding and stator leads shall be insulated with moisture resistant Class

F insulation which will resist a temperature of 180 degrees C (356 degrees F). Class A, B, or F insulation shall not be acceptable.

5. The stator shall be insulated by the trickle impregnation method using Class H monomer-free resin resulting in a winding fill factor of at least 95%.
6. The use of pins, bolts, or other fastening devices requiring penetration of the stator housing shall not be considered acceptable.
7. The motor shall be designed for continuous duty and shall be capable of sustaining a minimum of fifteen (15) starts per hour, with written documentation provided to verify this.
8. Rotor bars and short circuit rings shall be made of aluminum.
9. The motor shall not draw more than the specified input KW at nominal voltage at utility supply quality.
10. The junction chamber containing the terminal board shall be sealed from the motor by an elastomer compression seal (o-ring).
11. The connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board and thus perfectly leakproof.
12. Three (3) thermal sensors shall be embedded in the stator winding end coils (one per phase). These sensors shall be wired to the control panel for additional motor overload protection and shall shut down the pumps if a high temperature condition is sensed in the stator. Pump leakage sensing devices shall be provided within each pump as recommended by the pump supplier. A separate pump overtemp/leakage monitoring relay shall be provided by the pump supplier to the associated starter supplier (for mounting within the separate starter by the starter supplier). Each pump monitoring relay shall include separate dry contacts for “leakage” and “overtemp” alarms as indicated on wiring diagrams on contract documents.

I. Pump shaft shall be AISI type 420 stainless steel.

J. Pump finishes:

1. All surfaces in direct contact with sewage, other than stainless steel, shall be protected by an approved sewage resistant coating.
2. Impeller shall be coated with Rilsan.
3. Pump exterior shall be sprayed with PVC epoxy primer, with chloric rubber paint finish.

K. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber o-rings.

L. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machine surfaces.

M. No secondary sealing compounds, rectangular gaskets, elliptical o-rings, grease or other devices shall be used.

N. Pumps shall be equipped with a cable entry water seal design.

1. Cable entry water seal is to be completely replaceable in the field without the need for new pump components or the use of potting compounds.

2. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter.
3. The gland shall be compressed by the entry body to provide a strain relief function, separate from the function of sealing the cable.
4. The assembly shall bear against a shoulder in the pump top.
5. The junction chamber and terminal board shall be separated from the motor by an o-ring seal, which shall isolate the motor interior from foreign material gaining access through the pump top.

O. Each pump shall be provided with a tandem mechanical rotating shaft seal system.

1. Seals shall run in an oil reservoir, and lapped seal faces must be hydrodynamically lubricated at a constant rate.
2. The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven tungsten carbide ring.
3. The upper seal unit between the oil sump and motor housing shall contain one stationary tungsten carbide ring and one positively driven rotating carbon ring.
4. Each interface shall be held in contact by its own spring system.
5. The seals shall not require maintenance or adjustment and shall be easily inspected and replaceable.
6. The following seal types shall not be considered acceptable nor equal to the dual independent seal as specified herein:

    a. Shaft seals without positively driven rotating members
    b. Conventional double mechanical seals containing either a common single or double spring acting between the upper and lower units.

P. Each pump shall be provided with an oil chamber for the shaft sealing system.

1. The oil chamber shall not require a pressure equalizer ring for oil pressure compensation.
2. Seal lubrication shall require an oil chamber capacity no greater than 11.5 pints.
3. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.

Q. The pump shaft shall rotate on two permanently lubricated bearings.

1. The upper bearing shall be a single row roller bearing and the lower bearing shall be a two-row angular contact bearing.
2. A minimum B-10 bearing life of 17,500 hours shall be required when the pump is operating at or near the best efficiency point.

R. The impeller shall consist of the following:

1. The impeller shall be of ASTM A-48, Class 35B grey cast iron, dynamically balanced, semi-open, multi-vane, backswept, screw-shaped, non-clog design.
2. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located in the pump volute.
3. The leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge, and other matter normally

found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater.
4. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw.
5. The impeller shall be locked to the shaft, held by an impeller bolt.
6. The volute shall have a replaceable insert ring in which are cast spiral-shaped, sharp-edged grooves. The spiral grooves shall provide trash release pathways and sharp edges across which each impeller vane leading edge shall cross during rotation to remain unobstructed. The insert ring shall be of cast ASTM A-48, Class 35B, and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

S. The volute shall consist of the following:

1. The Volute shall be of single piece design and shall have smooth fluid passages large enough at all points to pass any size solids which can pass through the impeller.
2. A wear ring system shall be installed to provide efficient sealing between the volute and impeller. The wear ring shall consist of a stationary ring made of nitrile rubber molded with a steel ring insert which is drive fitted to the volute inlet.

T. Each pump shall be provided with an adequately designed cooling system consisting of the following:

1. A stainless steel motor cooling jacket shall encircle the motor housing, providing for dissipation of motor heat regardless of the type of pump installation.
2. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed-loop system in turbulent flow providing for superior heat transfer.
3. The cooling system shall have one fill port and one drain port integral to the cooling jacket.
4. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers, or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

2.3 CONTROLS

A. General: Refer to electrical plans and specifications for controls, instrumentation and control panel requirements.
B. Scum Pump Station: Refer to electrical plans and specifications for controls, instrumentation and control panel requirements.
1. One (1) Control Panel shall be furnished by the scum pump shall be provided for control of the scum pump station
2. Refer to Specification Section 26 29 00 “Manufactured Control Panels” for additional requirements
3. The equipment manufacturer shall be responsible for the proper sizing and operation of the control equipment to adequately protect and control the scum pump system equipment.
4. The single control enclosure shall be of:

a. NEMA 4X stainless steel construction
b. Sufficient size to contain all controls for the scum pump equipment.

5. Rated for 480V-3phase input
6. Include the starter and all controls for the scum pump,
7. Furnished with NC solenoid valve
8. Furnished with three teflon-coated stainless steel float switch along with all controls
9. SCADA I/O per the SCADA point lists on electrical plans

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine areas and conditions, with the installer present, for compliance with requirements for installation tolerances and other conditions affecting the performance of pumps and equipment.

2.2 INSTALLATION AND OPERATION

A. Comply with the manufacturer's detailed written instructions for installing pump equipment.

B. Installation and operation shall be per instructions and recommendations provided by the manufacturer.

C. Install pumps and arrange to provide access for maintenance, including removal of motors, impellers, couplings, and accessories.

D. Support piping so the weight of piping is not supported by pumps.

E. Check installation, alignment, and provide supervision of initial startup and operation.

F. Verify that all units are in condition suitable for installation; are properly fitted, assembled, and installed; are accurately leveled and aligned, and are ready for satisfactory operation.

G. Set and check pump controls for automatic start, stop, and alarm operation as required for system application.

H. Final Checks before Starting: Perform the following preventive maintenance operations:

1. Lubricate bearings.
2. Disconnect couplings and check motors for proper direction of rotation.
3. Verify that each pump is free to rotate by hand. Do not operate the pump if it is bound or drags until the cause of the trouble is determined and corrected.
4. Verify that pump controls are correct for the required application.

2.3 CLEANING AND PROTECTING

A. Restore marred, abraded surfaces to their original condition or replace them with new ones.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure equipment is without damage or deterioration at the time of Substantial Completion.

2.4 START-UP ASSISTANCE AND TRAINING

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train the Owner's maintenance personnel as specified below:

1. Factory authorized service representatives of each pump and/or pump manufacturer shall perform all necessary on-site assistance for installation supervision.
2. Once the pumps have been installed correctly and are operating as intended, the service representatives shall perform eight (8) hours of on-site start-up assistance and operator training for each type of pump.
3. Train the Owner's maintenance personnel on procedures and schedules related to troubleshooting, servicing, and preventive maintenance.
4. Schedule training with the Owner with at least seven days advance notice.

END OF SECTION 44 42 56

GENERAL NOTES:

1. CONTRACTOR SHALL COORDINATE BETWEEN ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING, AND OTHER DRAWINGS:
   A. ANY DISCREPANCIES OR CONFLICTS BETWEEN DRAWINGS OF DIFFERENT DISCIPLINES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT. CONTRACTOR SHALL NOT PROCEED WITH SHOP DRAWING PREPARATION OR ANY CONSTRUCTION UNTIL THE ARCHITECT HAS GIVEN DIRECTION OF RESOLUTION FOR THE DISCREPANCY OR CONFLICT.
   B. NOT ALL OPENINGS AND OTHER COMPONENTS THAT ARE REQUIRED HAVE BEEN SHOWN ON THE STRUCTURAL DRAWINGS. COORDINATE AND VERIFY THE LOCATIONS AND SIZES OF CHASES, INSERTS, OPENINGS, SLEEVES, FINISHES, DEPRESSIONS AND OTHER PROJECT REQUIREMENTS AT FLOORS, WALLS, AND ROOFS BETWEEN DRAWINGS OF DIFFERENT DISCIPLINES.
2. IN THE CASE OF INCONSISTENCIES BETWEEN DRAWINGS AND SPECIFICATIONS OR WITHIN EITHER DOCUMENT, A BIDDER WILL BE DEEMED TO HAVE INCLUDED IN ITS BID THE BETTER QUALITY OR GREATER QUANTITY OF THE WORK INVOLVED UNLESS THE BIDDER ASKED FOR AND OBTAINED THE ARCHITECT'S WRITTEN CLARIFICATION OF THE REQUIREMENTS BEFORE SUBMISSION OF BID.
3. ALL DIMENSIONS SHOWN TAKE PRECEDENCE OVER SCALE SHOWN ON PLANS, SECTIONS, AND DETAILS. DO NOT SCALE THE DRAWINGS.
4. THE DETAILS PROVIDED ON SHEETS LABELED AS "TYPICAL DETAILS" APPLY GENERALLY TO THE DRAWINGS IN AREAS WHERE CONDITIONS ARE SIMILAR TO THOSE DESCRIBED IN THE DETAILS, UNLESS NOTED OTHERWISE.
5. ALL OF THE CONTRACTOR'S PROPOSED SUBSTITUTIONS ARE CONSIDERED CHANGE ORDERS AND SHALL BE SUBMITTED TO THE ARCHITECT/ENGINEER FOR REVIEW AND/OR APPROVAL PRIOR TO ANY PERTINENT WORK OR FABRICATION.
6. CONSTRUCTION METHODS, PROCEDURES AND SEQUENCES ARE THE CONTRACTOR'S RESPONSIBILITY. THE CONTRACTOR SHALL TAKE ALL THE NECESSARY MEANS TO MAINTAIN AND PROTECT THE STRUCTURAL INTEGRITY OF ALL CONSTRUCTION, NEW AND EXISTING, AT ALL STAGES INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:
   A. BRACE ALL BASEMENT-TYPE WALLS RETAINING EARTH UNTIL RESTRAINING SLABS/FLOORS HAVE BEEN INSTALLED AND REACHED REQUIRED DESIGN STRENGTH.
   B. BRACE/SHORE ALL WALLS AS REQUIRED TO MAINTAIN STABILITY DURING CONSTRUCTION.
   C. SHORE EXISTING FLOORS, WALLS, AND/OR ROOFS AS REQUIRED DURING DEMOLITION OF ANY PORTION OF EXISTING STRUCTURE UNTIL NEW SUPPORT FRAMING HAS BEEN INSTALLED.
7. ALL STRUCTURAL MEMBERS, AS SHOWN, HAVE BEEN DESIGNED TO CARRY IN PLACE DESIGN LOADS ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUPPORT OF ANY LOADS AND FORCES IMPOSED DURING CONSTRUCTION, TRANSPORTATION, ERECTION, AND HANDLING. THE CONTRACTOR SHALL INSURE THAT CONSTRUCTION LOADS DO NOT EXCEED THE DESIGN LIVE LOADS INDICATED ON THE STRUCTURAL DRAWINGS AND THAT THESE LOADS ARE NOT IMPOSED ON THE STRUCTURAL MEMBERS PRIOR TO THE TIME THAT CONCRETE REACHES THE FULL SPECIFIED DESIGN STRENGTH, STEEL MEMBERS AND THEIR CONNECTIONS ARE FULLY BOLTED AND / OR WELDED AND ALL OTHER FRAMING MEMBERS AND THEIR CONNECTIONS ARE IN PLACE.
8. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO ANY PERTINENT WORK OR FABRICATION. ALL EXISTING CONDITIONS AND DIMENSIONS SHALL BE NOTED ON THE SHOP DRAWINGS.
9. ALL CONSTRUCTION JOINTS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE INCORPORATED INTO THE STRUCTURE. ADDITIONAL CONSTRUCTION JOINTS TO FACILITATE CONSTRUCTION SHALL BE LOCATED AND DETAILED ON THE SHOP DRAWINGS FOR REVIEW.
10. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED.

SHOP DRAWINGS/SUBMITTALS:

1. SHOP DRAWING SUBMITTAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE PROJECT CONTRACT DOCUMENTS (DRAWINGS AND SPECIFICATIONS) AND SHALL FOLLOW INDUSTRY GUIDELINES AND STANDARDS.
2. ALL QUESTIONS, CLARIFICATIONS, OR MODIFICATIONS OF THE CONTRACT DOCUMENTS SHALL BE CLEARLY DOCUMENTED AND INDICATED ON THE SHOP DRAWING TRANSMITTAL OR COVER SHEET. ITEMS SHALL NOT BE CONSIDERED APPROVED UNLESS SPECIFICALLY ADDRESSED BY MBA IN THE REVIEW COMMENTS.
3. ALL SHOP DRAWINGS ARE TO BE NEWLY PREPARED. REPRODUCTIONS OF CONTRACT STRUCTURAL DRAWINGS FOR USE AS ERECTION DRAWINGS WILL NOT BE PERMITTED. SHOULD SHOP DRAWING SUBMITTALS CONTAIN ANY REPRODUCTIONS OF CONTRACT STRUCTURAL DRAWINGS, THEY WILL BE REJECTED AND RETURNED WITHOUT ENGINEER REVIEW.
   A. MBA MAY CONSIDER TRANSFERRING COMPUTER FILES, IN THE FORMAT CREATED, OF THE PLAN SHEETS TO PROJECT SUBCONTRACTORS TO ASSIST IN DEVELOPING SHOP DRAWINGS ON A CASE BY CASE BASIS. A SIGNED FILE TRANSFER AGREEMENT WILL BE REQUIRE PRIOR TO RELEASE OF MBA FILES.
4. CONTRACTOR TO REVIEW ALL SHOP DRAWING SUBMITTALS AND STAMP WITH APPROVAL PRIOR TO SUBMISSION TO ARCHITECT/ ENGINEER. ***SHOP DRAWINGS RECEIVED BY ARCHITECT/ENGINEER THAT HAVE NOT BEEN REVIEWED AND COORDINATED BY THE CONTRACTOR WILL BE RETURNED WITHOUT ARCHITECT/ENGINEER'S REVIEW***. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRECTING DIMENSIONS WHICH PERTAIN TO FABRICATION PROCESSES OR CONSTRUCTION TECHNIQUES PRIOR TO SUBMITTAL AND FOR COORDINATION OF WORK OF ALL TRADES.
5. CONTRACTOR MAY PROVIDE REVIEWED AND APPROVED SUBMITTALS IN AN ELECTRONIC .PDF FORMAT FOR ENGINEER REVIEW AND APPROVAL. IN LIEU OF ELECTRONIC SUBMITTALS, CONTRACTOR MAY PROVIDE NO MORE THAN FOUR PAPER COPIES OF EACH STRUCTURAL SHOP DRAWING SUBMITTAL TO THE ENGINEER. THE STRUCTURAL ENGINEER WILL REVIEW AND RETURN TWO OF THE COPIES TO THE ARCHITECT. ADDITIONAL COPIES REQUIRED BY THE CONTRACTOR SHALL BE MADE BY THE CONTRACTOR AFTER THE REVIEW PROCESS.
6. MBA REVIEW OF SHOP DRAWING SUBMITTALS IS FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS. REVIEW AND/OR APPROVAL OF SHOP DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY FOR DEVIATIONS FROM THE REQUIREMENTS OF THE CONTRACT DOCUMENTS OR FOR ERRORS/ OMISSIONS IN THE SHOP DRAWINGS.
7. RESUBMITTED SHOP DRAWINGS SHALL HAVE CHANGES AND/OR ADDITIONS CLEARLY INDICATED. REVIEW OF RESUBMITTED SHOP DRAWINGS IS LIMITED TO THE ITEMS REQUIRING CORRECTION ON THE PREVIOUS SUBMITTAL.

EQUIPMENT NOTES:

1. CONTRACTOR SHALL COORDINATE BETWEEN DRAWINGS TO VERIFY ALL EQUIPMENT WEIGHTS, LOCATIONS, AND/OR PENETRATIONS. THIS INFORMATION SHALL BE PROVIDED TO SUBCONTRACTORS PERFORMING DELEGATED DESIGN AND SHALL BE IDENTIFIED ON THE CORRESPONDING SUBMITTAL.
2. EQUIPMENT LOADS CONSIDERED IN THIS DESIGN ARE SHOWN ON PLANS THUSLY (1400#). THE STRUCTURAL ENGINEER SHALL BE NOTIFIED AND ALLOWED TO MODIFY THE DESIGN AS REQUIRED IF FINAL EQUIPMENT WEIGHTS ARE HEAVIER OR THE EQUIPMENT LAYOUT DIFFERS FROM THE APPROXIMATE LAYOUT SHOWN ON THE PLAN.
3. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S CERTIFIED DRAWINGS, SPECIFICATIONS AND/OR OTHER REQUIREMENTS FOR ATTACHING THE EQUIPMENT TO THE STRUCTURE. IF STRUCTURAL MEMBERS CONFLICT WITH ATTACHMENT, THE STRUCTURAL ENGINEER SHALL BE NOTIFIED AND ALLOWED TO MODIFY THE DESIGN AS REQUIRED TO ACCOMMODATE THE MANUFACTURER'S REQUIREMENTS.

INTERFACE WITH EXISTING BUILDING:

1. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING AND MAINTAINING THE STRUCTURAL INTEGRITY OF THE EXISTING BUILDING AT THE INTERFACE CONNECTIONS TO THE NEW STRUCTURE.
2. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF ALL SHORING REQUIRED TO PROTECT THE EXISTING STRUCTURE.
3. AFTER DEMOLITION AND GENERAL SURVEY WORK HAS BEEN COMPLETED, AND PRIOR TO FABRICATION OF STRUCTURAL ELEMENTS, THE CONTRACTOR WILL VERIFY ALL EXISTING DIMENSIONS, ELEVATIONS, AND CONDITIONS. THE ARCHITECT AND STRUCTURAL ENGINEER SHALL BE NOTIFIED AND ALLOWED TO EXAMINE THE AS-BUILT CONDITIONS OF THE EXISTING STRUCTURE TO DETERMINE IF ASSUMPTIONS REGARDING THE INTERFACE AT THE EXISTING STRUCTURE WERE CORRECT. MODIFICATIONS, IF REQUIRED, WILL BE MADE AT THAT TIME.
4. DESIGN OF CONNECTIONS AND ADDITIONS TO THE EXISTING BUILDING ARE BASED ON ORIGINAL STRUCTURAL DRAWINGS. DESIGN OF CONNECTIONS AND ADDITIONS TO THE EXISTING STRUCTURE ARE BASED UPON AVAILABLE PROVIDED INFORMATION AND/OR ASSUMPTIONS MADE BY THE STRUCTURAL ENGINEER.
5. THE CONTRACTOR SHALL INCLUDE ALLOWANCES FOR FABRICATED AND ERECTED STRUCTURAL STEEL AND FOR FABRICATED AND ERECTED MISCELLANEOUS STEEL ON A UNIT PRICE BASIS PER TON STATED ON THE BID FORM. THIS IS IN ADDITION TO ALL OTHER STEEL SHOWN ON THE DRAWINGS. THIS EXTRA STEEL SHALL BE INSTALLED IN THE BUILDING IN SUCH SIZES AND FORMS AS DIRECTED BY THE ARCHITECT. ANY UNUSED PORTION SHALL BE A CREDIT TO THE OWNER. SEE THE ALLOWANCE SECTION OF THE SPECIFICATION FOR SPECIFIC QUANTITIES.

CONCRETE:

1. CONCRETE CONSTRUCTION AND QUALITY ASSURANCE SHALL BE IN ACCORDANCE WITH CURRENT ACI STANDARDS.
2. CONCRETE SCHEDULES

	ITEM	28 DAY COMPRESSIVE STRENGTH
A.	WATER CONTAINMENT STRUCTURES	4000 PSI NORMAL WEIGHT (MAX. W/C RATIO = 0.45)
B.	AERATION BASIN	5000 PSI NORMAL WEIGHT
C.	ALL OTHER CONCRETE	3000 PSI NORMAL WEIGHT

3. CONCRETE COVER OVER REINFORCING (UNO)

A.	UNFORMED SURFACE IN CONTACT WITH EARTH:	3 IN.
B.	UNFORMED SURFACE OVER VAPOR BARRIER:	2 IN.
C.	FORMED SURFACES EXPOSED TO EARTH OR WEATHER	
	#6 AND LARGER	2 IN.
	#5 AND SMALLER	2 IN.

4. CONCRETE AT SLABS ON GRADE SHALL HAVE A NOMINAL MAXIMUM COARSE AGGREGATE SIZE OF 3/4 INCH. ADJUST PORTIONS OF COMBINED COARSE, INTERMEDIATE AND FINE AGGREGATES TO PROVIDE A COARSENESS FACTOR OF 60 TO 75%.
5. ALL REINFORCING SHALL CONFORM TO THE LATEST REVISION OF ASTM SPECIFICATION A615, GRADE 60 AND BE DETAILED IN ACCORDANCE WITH THE LATEST REVISION OF ACI STANDARD 315.
6. NO REINFORCING BAR SHALL BE WELDED IN ANY MANNER, UNLESS SPECIFICALLY SHOWN OR NOTED ON THE DRAWINGS.
7. CONTINUOUS FOOTING REINFORCING BARS SHALL BE LAPPED 30 BAR DIAMETERS, BUT NOT LESS THAN 1'-0".
8. GRADE BEAM, ELEVATED BEAM, AND ELEVATED SLAB REINFORCING BARS SHALL BE SPLICED ONLY AS SHOWN ON THE DRAWINGS, EXCEPT THE REINFORCING DESIGNATED AS "CONTINUOUS" SHALL HAVE A CLASS "B" LAP SPLICE (PER ACI 318). LAP SPLICES OF CONTINUOUS REINFORCING SHALL BE MADE OVER SUPPORTS FOR BOTTOM BARS AND FOR INTERMEDIATE BARS AND AT MID-SPAN FOR TOP BARS. AT EXTERIOR SUPPORTS, TOP AND BOTTOM BARS SHALL BE HOOKED AND INTERMEDIATE BARS SHALL EXTEND TO WITHIN 2" OF EXTERIOR FACE.
9. COLUMN AND WALL VERTICAL REINFORCING BARS SHALL BE LAPPED WITH A CLASS "B" SPLICE. WALL HORIZONTAL REINFORCING BARS SHALL BE LAPPED WITH A CLASS "B" TOP SPLICE AT SPLICE POINTS. PROVIDE CORNER BARS FOR WALLS.
10. PROVIDE FULL EMBEDMENT FOR ALL DOWELS. IF NOT OTHERWISE SPECIFIED, DOWEL SIZE AND SPACING SHALL BE THE SAME AS MAIN REINFORCING.
11. CONSTRUCTION JOINTS IN CONCRETE BEAMS AND SLABS SHALL BE AT OR NEAR MIDSPAN. ALL CONSTRUCTION JOINTS TO BE KEYED.
12. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE PERMITTED IN WALLS AND BEAMS, UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.
13. CONDUIT, PIPES, AND SLEEVES SHALL NOT BE SPACED CLOSER THAN 3 DIAMETERS ON CENTER, NOT HAVE AN OUTSIDE DIAMETER GREATER THAN 1/3 THE OVERALL THICKNESS OF THE SLAB, WALL OR BEAM IN WHICH THEY ARE EMBEDDED, AND SHALL HAVE A MINIMUM COVER OF 1 1/2 INCH FOR CONCRETE EXPOSED TO EARTH OR WEATHER AND 3/4 INCH FOR CONCRETE NOT EXPOSED TO EARTH OR WEATHER.
14. PIPING AND CONDUIT SHALL BE SO FABRICATED AND INSTALLED THAT CUTTING, BENDING, OR DISPLACEMENT OF REINFORCEMENT FROM ITS PROPER LOCATION WILL NOT BE REQUIRED.
15. THE CONTRACTOR SHALL SUBMIT, FOR REVIEW, SHOP DRAWINGS FOR ALL REINFORCING BARS INCLUDING DETAILS AT ALL OPENINGS AND ASSOCIATED ADDED REINFORCEMENT AS SHOWN ON TYPICAL DETAILS.

TENSION LAP SPLICE LENGTH

BAR SIZE	f'c = 3000 PSI				f'c = 4000 PSI				f'c = 5000 PSI			
	TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS	
	A	B	A	B	A	B	A	B	A	B	A	B
#3	22"	28"	17"	22"	19"	24"	15"	19"	17"	22"	13"	17"
#4	29"	37"	22"	29"	25"	32"	19"	25"	22"	29"	17"	22"
#5	36"	47"	28"	36"	31"	40"	24"	31"	28"	36"	22"	28"
#6	43"	56"	33"	43"	37"	48"	29"	37"	33"	43"	26"	33"
#7	63"	81"	48"	63"	54"	70"	42"	54"	49"	63"	37"	49"
#8	72"	93"	55"	72"	62"	80"	48"	62"	55"	72"	43"	55"
#9	81"	105"	62"	81"	70"	91"	54"	70"	63"	81"	48"	63"
#10	91"	118"	70"	91"	79"	102"	61"	79"	70"	91"	54"	70"
#11	101"	131"	78"	101"	87"	113"	67"	87"	78"	101"	60"	78"

SITE AND FOUNDATION:

1. THE DESIGN OF FOUNDATIONS AND RELATED COMPONENTS IS BASED ON THE GEOTECHNICAL ENGINEERING REPORT PREPARED BY CONTOUR ENGINEERING, PROJECT NO. G22WSA01, DATED 04/12/22. THE GENERAL CONTRACTOR SHALL ADHERE TO ALL REQUIREMENTS AND RECOMMENDATIONS IN THE REPORT.
2. ALLOWABLE SOIL BEARING PRESSURES (PSF):

HEADWORKS & FILTER/UV	1500
CLAIRIFIER & POST AERATION	2000
ALL OTHER STRUCTURES	2500

3. EXCAVATE, WHERE REQUIRED, TO BUILDING AND STRUCTURE SUBGRADE.
4. PROOF-ROLL THE AREA UNDER THE BUILDING, PLUS 5'-0" ON ALL SIDES, WITH A LOADED DUMP TRUCK TO LOCATE ANY SOFT AREAS. A GEOTECHNICAL ENGINEER IS TO BE PRESENT DURING THIS OPERATION. ANY SOFT AREAS DETECTED ARE TO BE UNDERCUT AND REPLACED WITH ENGINEERED FILL.
5. ACCEPTABLE FILL MATERIAL SHALL BE FREE OF ORGANICS, AND HAVE A P.I. OF LESS THAN 20, L.L. OF LESS THAN 40 AND A MAXIMUM DRY DENSITY OF GREATER THAN 100 PCF. CRUSHED STONE BACKFILL TO MEET REQUIREMENTS OF A.H.D. No. 57 STONE. DRAINAGE FILL SUPPORTING SLABS SHALL MEET THE REQUIREMENTS OF THE GEOTECHNICAL ENGINEER.
6. FILL, WHERE REQUIRED, IS TO BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 98% STANDARD PROCTOR (ASTM D-698), WITHIN ±2% OF OPTIMUM MOISTURE CONTENT.
7. THE GEOTECHNICAL ENGINEER SHALL REVIEW THE FINAL FOUNDATION DESIGN TO VERIFY THAT ALL FOUNDATION SYSTEMS, INCLUDING SLAB ON GRADE DESIGN AND DETAILING, COMPLIES WITH THE GEOTECHNICAL PARAMETERS INCLUDED IN THE GEOTECHNICAL REPORT. WRITTEN VERIFICATION OF THIS REVIEW SHALL BE SUBMITTED TO THE ARCHITECT TWO WEEKS BEFORE FINAL PRICING/BID DATE.
8. PROVIDE 6" MINIMUM OF COMPACTED CRUSHED STONE FILL BENEATH BASE SLABS AND SLABS ON GRADE AT ALL STRUCTURES. GEOTECHNICAL ENGINEER SHALL VERIFY IF ADDITIONAL STONE IS REQUIRED DUE TO SITE CONDITIONS.

1

CONCRETE MASONRY:

1. MASONRY CONSTRUCTION SHALL CONFORM TO ACI 530.1 SPECIFICATION OR TMS 402/602.
2. MASONRY COMPRESSIVE STRENGTH (f'm) SHALL BE 1900 PSI BASED ON THE UNIT STRENGTH METHOD OR VERIFIED BY PRISM TESTS IN ACCORDANCE WITH ASTM C 1314.
3. MORTAR SHALL BE TYPE S OR M.
4. ALL REINFORCING BARS SHALL CONFORM TO ASTM A615, GRADE 60.
5. NO REINFORCING BAR SHALL BE WELDED IN ANY MANNER, UNLESS SPECIFICALLY SHOWN OR NOTED ON THE DRAWINGS.
6. BLOCK FILL SHALL BE GROUT WITH AN 8" TO 11" SLUMP, PROPORTIONED PER ASTM C 476 OR ATTAINING 3000 PSI AT 28 DAYS PER ASTM C 1019. DO NOT USE MORTAR AS BLOCK FILL.
7. ALL GROUT SHALL BE CONSOLIDATED AT TIME OF PLACEMENT USING A LOW-VELOCITY MECHANICAL VIBRATOR WITH A 3/4-INCH HEAD. RE-CONSOLIDATE GROUT AFTER INITIAL WATER LOSS AND SETTLEMENT HAS OCCURRED. DO NOT PLACE NEXT LIFT OF GROUT UNTIL LOWER LIFT HAS BEEN RE-CONSOLIDATED.
8. ALL BLOCK CELLS AND CAVITIES BELOW GRADE SHALL BE GROUTED SOLID. ALL LINTELS & BOND BEAMS SHALL BE GROUTED SOLID.
9. ALL BLOCK CELLS WHICH HAVE VERTICAL REINFORCING SHALL BE GROUTED FULL-HEIGHT IN 5'-0" LIFTS (MAXIMUM HEIGHT). PROVIDE 1 1/2" (MINIMUM) GROUT KEY BELOW MORTAR JOINT AT TOP OF EACH LIFT.
10. VERTICAL REINFORCING SHALL BE DOWELED TO FOOTING WITH HOOKED BARS AT THE BASE AND EXTEND FULL-HEIGHT INTO BOND BEAM AT THE TOP. WHERE SPLICES ARE NECESSARY, PROVIDE LAP LENGTH = 48 BAR DIAMETERS.
11. VERTICAL REINFORCING SHALL BE LOCATED IN THE CENTER OF THE BLOCK CELLS, UNLESS NOTED, AND SHALL BE HELD IN PLACE WITH BAR POSITIONERS (HECKMANN #376 OR HOHMANN & BARNARD #RB) PRIOR TO GROUTING. "WET-STICKING" OF REINFORCING SHALL NOT BE ALLOWED.
12. MINIMUM VERTICAL WALL REINFORCING IN ALL WALLS SHALL CONSIST OF ONE VERTICAL (MATCHING WALL REINF. BUT NOT LESS THAN #5) IN EACH CORNER, AT EACH DOOR & WINDOW JAMB & AT EACH SIDE OF CONTROL AND/OR EXPANSION JOINTS. PROVIDE ADDITIONAL VERTICAL REINFORCING AS SHOWN IN SECTIONS AND AS NOTED ON PLANS.
13. AT CORNERS AND INTERSECTIONS OF BOND BEAMS IN WALLS, PROVIDE CORNER BARS (48 DIAMETERS LONG EA. LEG) TO TIE WALLS TOGETHER. BAR DIAMETER SHALL MATCH BOND BEAM REINFORCING.
14. AT TOP OF ALL MASONRY WALLS (BEARING OR NON-BEARING), PROVIDE 8" DEEP CONTINUOUS BOND BEAM REINFORCED WITH 2#5 CONTINUOUS, UNLESS NOTED OTHERWISE.
15. WHERE CMU IS PLACED IN A STACK BOND PATTERN, HORIZONTAL WALL REINFORCING SHALL CONSIST OF A MINIMUM STANDARD (9 GAGE) LADDER-TYPE JOINT REINFORCING AT EVERY COURSE (8" O.C.) FOR 12" CMU OR AT EVERY OTHER COURSE (16" O.C.) FOR 8" CMU. COORDINATE W/ ARCHITECTURAL DRAWINGS. WHERE CMU IS PLACED IN A RUNNING BOND PATTERN, HORIZONTAL WALL REINFORCING SHALL CONSIST OF A MINIMUM STANDARD (9 GAGE) LADDER-TYPE REINFORCING AT EVERY OTHER COURSE (16" O.C.).
16. COORDINATE WITH ARCHITECTURAL DRAWINGS FOR DETAILS AND LOCATIONS OF MASONRY CONTROL JOINTS. IF NOT OTHERWISE SHOWN, DO NOT EXCEED 30'-0" BETWEEN BLOCK WALL CONTROL JOINTS AND 20'-0" BETWEEN BRICK VENEER CONTROL JOINTS.
17. ANCHOR WALLS TO SUPPORTING STRUCTURES AS SHOWN ON THE STRUCTURAL AND ARCHITECTURAL DRAWINGS. CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY BRACING OF ALL MASONRY WALLS DURING CONSTRUCTION.
18. THE CONTRACTOR SHALL SUBMIT, FOR REVIEW, SHOP DRAWINGS FOR ALL REINFORCING BARS INCLUDING DETAILS AT ALL OPENINGS AND ASSOCIATED ADDED REINFORCEMENT AS SHOWN ON TYPICAL DETAILS.

STRUCTURAL STEEL:

1. DESIGN, CONSTRUCTION, QUALITY ASSURANCE, AND ERECTION OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CURRENT AISC STANDARDS.
2. ALL STRUCTURAL STEEL WIDE FLANGE SHAPES SHALL CONFORM TO ASTM A992
3. ALL STRUCTURAL STEEL PLATES, ANGLES AND CHANNELS SHALL CONFORM TO ASTM A36.
4. ALL STRUCTURAL STEEL SQUARE, RECTANGULAR AND ROUND HSS SECTIONS SHALL CONFORM TO ASTM A500, GRADE B.
5. ALL STRUCTURAL STEEL PIPE SHALL CONFORM TO ASTM A53, TYPE E OR S, GRADE B
6. FABRICATION AND ERECTION SHALL CONFORM TO AISC CODE OF STANDARD PRACTICE.
7. ALL WELDING SHALL CONFORM TO AWS STANDARDS. THICKNESS OF WELDS ARE AS SHOWN, SPECIFIED OR REQUIRED.
8. ALL BOLTED CONNECTIONS SHALL BE MINIMUM 3/4" DIAMETER, A325 HIGH STRENGTH BOLTS, UNLESS NOTED OTHERWISE.
9. THE STRUCTURAL STEEL FABRICATOR SHALL PROVIDE CERTIFICATIONS BY A PROFESSIONAL STRUCTURAL ENGINEER (P.E.) REGISTERED IN THE STATE OF GEORGIA THAT THE CONNECTION DESIGN IS IN ACCORDANCE WITH ALL APPLICABLE CODES AND SPECIFICATIONS. CONNECTION DESIGN CALCULATIONS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER OF RECORD FOR REVIEW.
10. ALL BEAM CONNECTIONS SHALL BE "SIMPLE SHEAR CONNECTIONS" UNLESS NOTED OTHERWISE. WHERE BEAM REACTIONS AND/OR DESIGN FORCES ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS, THE CONNECTIONS SHALL BE DESIGNED TO SUPPORT A REACTION EQUAL TO ONE-HALF THE TOTAL UNIFORM LOAD CAPACITY FROM THE MAXIMUM UNIFORM LOAD TABLE (LATEST AISC MANUAL OF STEEL PRACTICE) MULTIPLIED BY A FACTOR OF 1.2 (NON-COMPOSITE BEAMS) OR 1.45 (COMPOSITE BEAMS) FOR GIVEN SHAPE, SPAN, AND GRADE OF STEEL.

STEEL JOIST:

1. STEEL JOIST DESIGN, MANUFACTURE, AND QUALITY CONTROL SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF SPECIFICATIONS BY THE STEEL JOIST INSTITUTE.
2. STEEL JOIST ERECTION, INSTALLATION, BRIDGING, ETC. SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF SPECIFICATIONS BY THE STEEL JOIST INSTITUTE.
3. A STEEL JOIST DESIGN PACKAGE SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER OF RECORD FOR REVIEW PRIOR TO FABRICATION AND ERECTION. THIS PACKAGE SHALL INCLUDE A PLACEMENT PLAN AND DESIGN CALCULATIONS BEARING THE SEAL AND SIGNATURE OF THE JOIST DESIGNER WHO SHALL BE REGISTERED IN THE STATE OF GEORGIA.
4. ALL JOISTS SHALL BE WELDED TO SUPPORTING MEMBER AT EACH END PER ENGINEERS AND/OR MANUFACTURER'S REQUIREMENTS.
5. JOISTS DESIGNATED AS "SP" ON THE DRAWINGS ARE TO BE DESIGNED FOR A SUPERIMPOSED DEAD LOAD OF 30 PSF AND A SUPERIMPOSED LIVE LOAD OF 20 PSF IN ADDITION TO THE CONCENTRATED LOADS SHOWN ON THE PLANS.
6. JOISTS SHALL BE DESIGNED FOR COMPONENT AND CLADDING WIND LOADS BASED ON THE PROVIDED DESIGN CRITERIA AND COMPONENT AND CLADDING WIND LOAD TABLES. DESIGN ENGINEER SHALL ASSUME 15 PSF MAXIMUM DEAD LOAD IN UPLIFT CALCULATIONS.
7. JOIST DESIGNER SHALL COORDINATE ALL EQUIPMENT WEIGHTS, CONCENTRATED LOADS AND LOCATIONS WITH THE GENERAL CONTRACTOR. GENERAL CONTRACTOR SHALL PROVIDE THIS INFORMATION TO THE JOIST DESIGNER. THE LOADS AND CORRESPONDING LOCATIONS SHALL BE IDENTIFIED IN THE STEEL JOIST DESIGN PACKAGE.

STEEL DECK:

1. STEEL DECK CONSTRUCTION SHALL BE IN ACCORDANCE WITHTHE LATEST EDITION OF SDI STANDARDS.
2. ATTACH ROOF DECK TO SUPPORTS AT 12" OC. W/ 5/8" PUDDLE WELDS. ATTACH TO PERIMETER SUPPORTS AT 6" OC. PROVIDE #10 TEK SCREW SIDELAP FASTENERS AT 12" OC. (MIN. 4 PER SPAN).

PRE-FABRICATED COLD-FORMED STEEL TRUSSES:

1. THE DESIGN, MANUFACTURE, QUALITY ASSURANCE AND ERECTION OF COLD-FORMED STEEL TRUSSES SHALL BE IN ACCORDANCE WITH THE CURRENT AISI NORTH AMERICAN STANDARDS FOR COLD-FORMED STEEL FRAMING.
2. A TRUSS DESIGN PACKAGE SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER OF RECORD FOR REVIEW PRIOR TO FABRICATION AND ERECTION. THIS PACKAGE SHALL INCLUDE, AT A MINIMUM, EACH INDIVIDUAL TRUSS DESIGN DRAWING AND CALCULATION, THE TRUSS PLACEMENT DIAGRAM, THE PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT/BRACING METHOD AND DETAILS, AND ANY OTHER STRUCTURAL DETAILS GERMANE TO THE TRUSSES. THE TRUSS DESIGN DRAWINGS SHALL BEAR THE SEAL AND SIGNATURE OF THE TRUSS DESIGNER WHO SHALL BE REGISTERED IN THE STATE OF GEORGIA.
3. TRUSS TO TRUSS CONNECTIONS SHALL BE DESIGNED AND SPECIFIED BY THE TRUSS MANUFACTURER FOR THE DESIGN LOADS.
4. TRUSS MANUFACTURER SHALL DESIGN AND PROVIDE COLD-FORMED STEEL FRAMING FOR ALL RIDGE, HIP RIDGE AND VALLEY MEMBERS.
5. ALL TEMPORARY AND PERMANENT BRACING MEMBERS AND CONNECTIONS REQUIRED FOR TRUSSES SHALL BE DESIGNED AND DETAILED BY THE TRUSS DESIGNER. AT A MINIMUM, TRUSS INSTALLER SHALL COMPLY WITH THE “GUIDE TO GOOD PRACTICE FOR HANDLING, INSTALLING, RESTRAINING, AND BRACING OF COLD-FORMED STEEL TRUSSES” BY THE COLD-FORMED STEEL COUNCIL.
6. TRUSSES SHALL BE DESIGNED FOR THE FOLLOWING SUPERIMPOSED LOADS:
   ROOF TOP CHORD DEAD LOAD---------------------------------20 PSF
   ROOF BOTTOM CHORD DEAD LOAD--------------------------10 PSF
   ROOF TOP CHORD LIVE LOAD-----------------------------------20 PSF
7. TRUSSES SHALL BE DESIGNED FOR COMPONENT AND CLADDING WIND LOADS BASED ON THE PROVIDED DESIGN CRITERIA AND COMPONENT AND CLADDING WIND LOAD TABLES.
8. TRUSS DESIGNER SHALL VERIFY THAT ALL EQUIPMENT WEIGHTS, CONCENTRATED LOADS, AND LOCATIONS ARE PROVIDED BY THE GENERAL CONTRACTOR. GENERAL CONTRACTOR SHALL PROVIDE THIS INFORMATION TO THE TRUSS DESIGNER. THE LOADS AND CORRESPONDING LOCATIONS SHALL BE IDENTIFIED ON THE TRUSS PLACEMENT DIAGRAM.
9. MECHANICAL DUCT OPENINGS IN TRUSSES SHALL BE COORDINATED WITH THE MECHANICAL DRAWINGS TO ACCOMMODATE THE DUCT LOCATION AND SIZE WITH INSULATION.

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

KREBS ENGINEERING

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 33120 12/07/22 HOKE S. LINDSEY

COWETA COUNTY
WATER & SEWERAGE AUTHORITY
SHENANDOAH WASTEWATER TREATMENT
FACILITY IMPROVEMENTS
COWETA COUNTY, GEORGIA

COWETA COUNTY
WATER & SEWERAGE
AUTHORITY

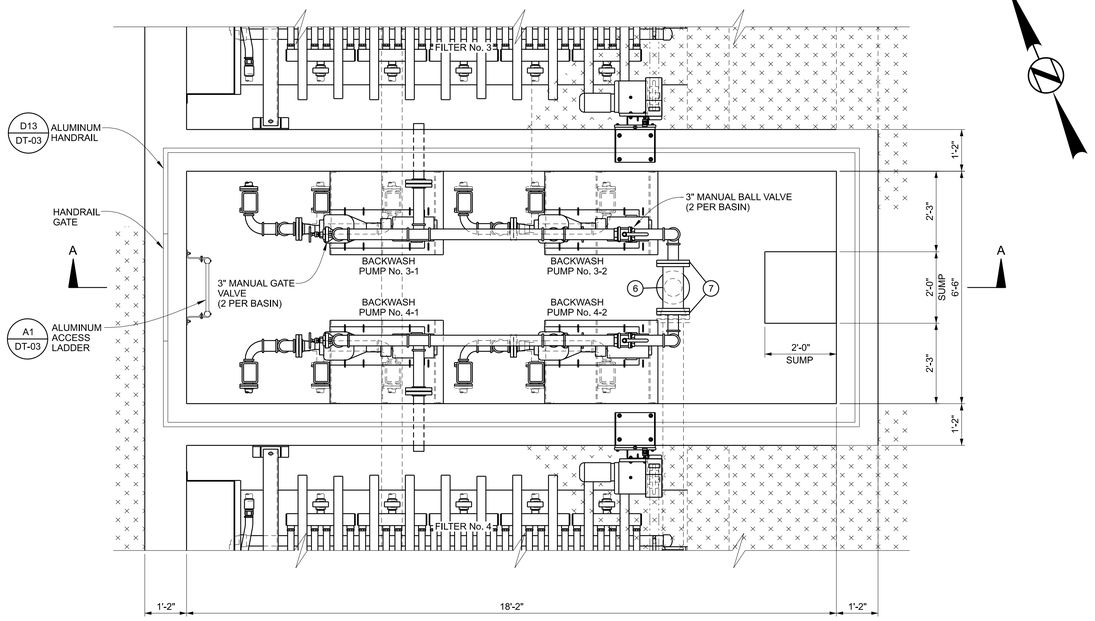
Designed	HSL	Project No.	20518
Drawn	HSL		
Checked	HSL		

Revisions

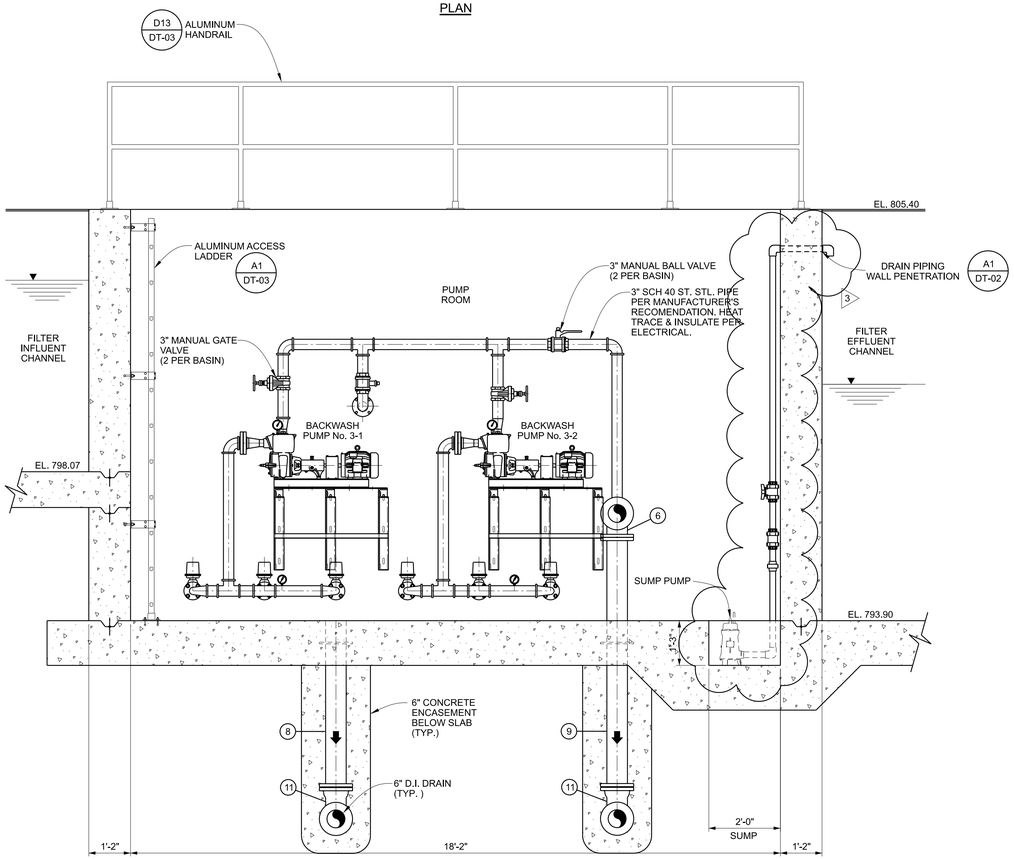
No.	Date	Description
1	1-20-23	ADDENDUM #3

Sheet Title
GENERAL STRUCTURAL NOTES

Issue Date DEC., 2022
Sequence of
Sheet No. S0-01



PLAN

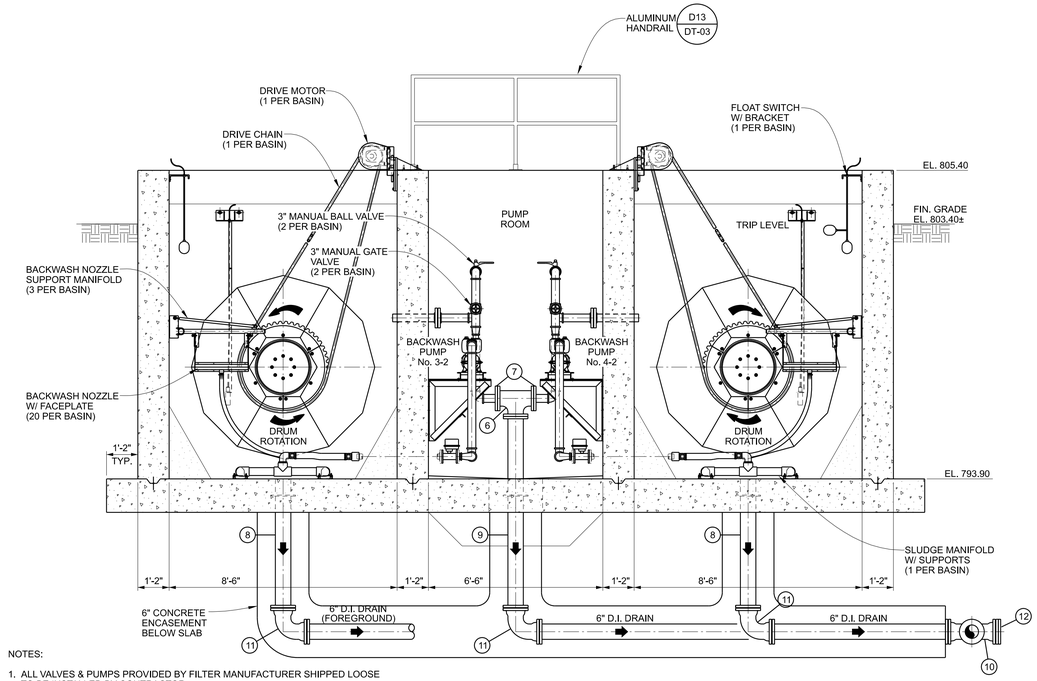


SECTION A-A

NOTES:

1. ALL VALVES & PUMPS PROVIDED BY FILTER MANUFACTURER SHIPPED LOOSE TO BE INSTALLED BY CONTRACTOR.
2. PIPING, WIRING, HEAT TRACING & INSULATION BY CONTACTOR.

A1 | BACKWASH PUMP AREA DETAIL 1/2" = 1'-0"



NOTES:

1. ALL VALVES & PUMPS PROVIDED BY FILTER MANUFACTURER SHIPPED LOOSE TO BE INSTALLED BY CONTRACTOR.
2. PIPING, WIRING, HEAT TRACING & INSULATION BY CONTACTOR.

G9 | SECTION 3/8" = 1'-0"

FITTINGS LIST

1. 36" D.I. WALL PIPE, MJ-WS-PE
2. 30" D.I. WALL PIPE, PE-WS-MJ
3. 12" D.I. WALL PIPE, PE-WS-MJ
4. 6"x6" D.I. TEE, ALL MJ
5. 6" D.I. PLUG VALVE, MJ-MJ
6. 6" x 6" D.I. TEE, ALL FLG
7. 6" D.I. BLIND FLANGE, TAPPED
8. 6" D.I. PIPE, PE-WS-PE
9. 6" D.I. PIPE, FLG-WS-PE
10. 6" x 6" D.I. CROSS, ALL MJ
11. 6" D.I. 90° BEND, RJ-RJ
12. 6" D.I. PLUG, RJ

KREBS ENGINEERING

GEORGIA REGISTERED No. 41549 PROFESSIONAL ENGINEER 12/07/22 JARRED M. JACKSON

COWETA COUNTY WATER & SEWERAGE AUTHORITY

SHENANDOAH WASTEWATER TREATMENT FACILITY IMPROVEMENTS

COWETA COUNTY, GEORGIA

COWETA COUNTY WATER & SEWERAGE AUTHORITY

Designed	JMJ
Drawn	CLM
Checked	MAS
Project No.	20518

Revisions

No.	Date	Description
3	01/20/23	ADDENDUM 3

Sheet Title

FILTERS SECTIONS & DETAILS

Issue Date	Sheet No.
DEC., 2022	C11-05
Sequence -- of --	

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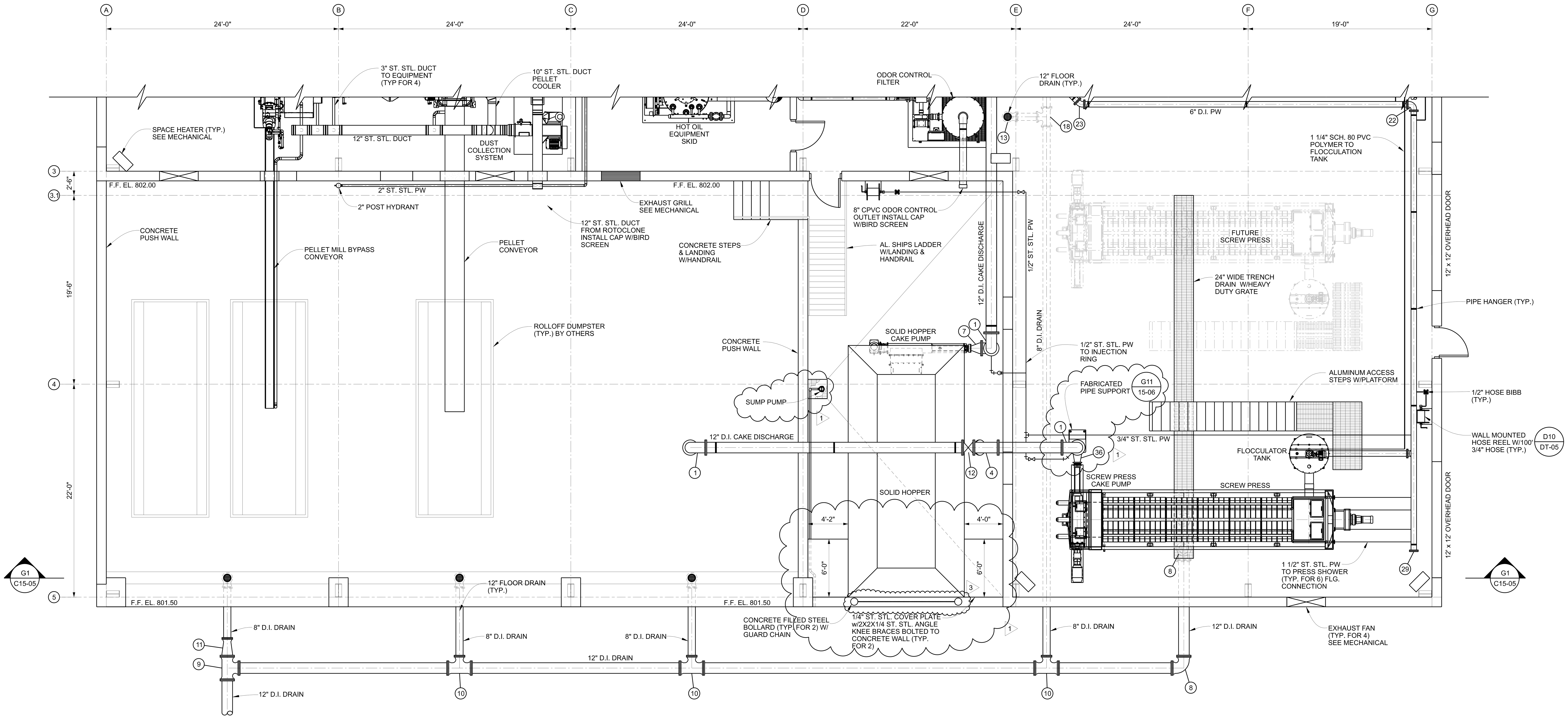

FITTINGS LIST

1. 12" D.I. 90° BEND LR, FLG-FLG
2. 12" D.I. 90° BEND, FLG-FLG
3. 12" D.I. 45° BEND, FLG-FLG
4. 12" D.I. WYE, FLG-FLG
5. 12"x 8" D.I. CONC. REDUCER, FLG-FLG
6. RESERVED
7. 12"x 6" D.I. ECC. REDUCER, FLG-FLG
8. 12" D.I. 90° BEND, RJ-RJ
9. 12" x 12" D.I. TEE, RJ-RJ
10. 12" x 8" D.I. TEE, RJ-RJ
11. 12" x 8" D.I. CONC. REDUCER, RJ-RJ
12. 12" D.I. PLUG VALVE, FLG-FLG
13. 8" D.I. 90° BEND, FLG-FLG
14. 8" D.I. 45° BEND, FLG-FLG
15. 8" D.I. GATE VALVE, FLG-FLG
16. 8" x 6" D.I. CONC. REDUCER, FLG-FLG
17. 8" D.I. GATE VALVE, FLG-FLG
18. 8" D.I. TEE, RJ-RJ
19. 8" D.I. 90° BEND, RJ-RJ
20. 8" CPVC. 90° BEND
21. RESERVED
22. 6" D.I. 90° BEND, FLG-FLG
23. 6" D.I. 45° BEND, FLG-FLG
24. 6" x 6" D.I. TEE, FLG-FLG
25. 6" D.I. DRESSER COUPLING, FLG-FLG
26. 6" D.I. CHECK VALVE, FLG-FLG
27. 6" x 4" D.I. TEE, FLG-FLG
28. 6" x 4" CONC. REDUCER, FLG-FLG
29. 6" D.I. BLIND FLANGE
30. 4" CPVC. 90° BEND
31. 4" C.S. 90° BEND, THERMAL OIL LINE
32. 6" D.I. GATE VALVE, FLG-FLG
33. 6" D.I. PLUG VALVE, FLG-FLG
34. 6" D.I. 90° BEND, RJ-RJ
35. ~~4" D.I. GATE VALVE, FLG-FLG~~ (1)
36. 12" x 6" D.I. 90° BEND LR, FLG-FLG
37. 4" PVC BUTTERFLY VALVE
38. 8" x 4" PVC CONC. REDUCER
39. 4" x 3" PVC CONC. REDUCER
40. 4" PVC FLANGE
41. 6" CPVC FLANGE
42. 6" x 4" CPVC SOCKET REDUCER

NOTES:

1. FLOOR DRAINS SHALL HAVE 8" DIA. OUTLET & 12" GRATE RATED FOR HEAVY TRAFFIC JOSAM 32200 OR EQUAL.
2. THERMAL FLUID PIPING SHALL BE WELDED SCH. 40 CARBON STEEL.
3. ISOLATION VALVES FOR THERMAL FLUID PIPING SHALL BE TEMPERATURE RATED & HAVE FLANGED CONNECTIONS.
4. NITROGEN PIPING SHALL BE STAINLESS STEEL TUBING WITH SWAGELOK FITTINGS & VALVES.
5. DUST COLLECTION PIPE & FITTINGS SHALL BE 16 GAUGE 304 STAINLESS STEEL W/ CLAMPED CONNECTIONS. PIPE AND FITTINGS SHALL BE NORFAB OR EQUIVALENT.
6. DUST COLLECTION DUCT SHALL BE HARD PIPED TO WITHIN 3 FT. OF THE EQUIPMENT CONNECTION.
7. DUST COLLECTION EQUIPMENT CONNECTIONS SHALL BE MADE W/ STATIC DISSIPATIVE URETHANE HOSE AND STAINLESS STEEL HOSE CLAMPS. HOSE ADAPTERS SHALL BE USED TO TRANSITION FROM RIGID DUCT TO HOSE CONNECTIONS.
8. URETHANE HOSE SHALL BE RATED FOR TEMPERATURES UP TO 225° F.
9. REFERENCE APPENDIX D FOR DRYER SYSTEM P&ID AND TIE IN POINT SCHEDULE.
10. SLUDGE CAKE PIPING SHALL BE NON-LINED, DUCTILE IRON PIPE.
11. 1-1/2" DIAMETER AND SMALLER PLANT WATER PIPING SHALL BE CONNECTED TO THE 6" D.I. MAIN CORPORATION STOP & FULL PORT BALL VALVE.
12. HEAT TRACE & INSULATE ALL EXTERIOR PLANT WATER PIPING.

A1 PLAN 3/16" = 1'-0"

KREBS ENGINEERING

GEORGIA REGISTERED No. 41549 PROFESSIONAL ENGINEER JARRED M. JACKSON 12/07/22

COWETA COUNTY WATER & SEWERAGE AUTHORITY
SHENANDOAH WASTEWATER TREATMENT FACILITY IMPROVEMENTS
COWETA COUNTY, GEORGIA

COWETA COUNTY WATER & SEWERAGE AUTHORITY

Designed	JMJ	Project No. 20518
Drawn	CLM	
Checked	MAS	

Revisions

No.	Date	Description
1	01/13/23	ADDENDUM 1
3	01/20/23	ADDENDUM 3

Sheet Title: SOLIDS HANDLING BUILDING ENLARGED PLAN

Issue Date: DEC., 2022 | Sheet No.: C15-03 | Sequence: -- of --

Appendix F –
SCADA Integrator Proposal
Addendum No.3

Customer: Coweta County WSA
Project: Shenandoah WWTF Improvements
MR Quote #: Q22-10715, Rev. 2

January 20, 2023

Quote Expiration
March 21, 2023

Bill of Materials and Labor

Qty	Tag/Loop	Description

MR Systems is pleased to offer this proposal to provide instrumentation, control panels, and associated services for the Shenandoah WWTF Improvements project for the Coweta County Water & Sewerage Authority

Our proposal complies with the I/O point list, instrument schedule, control panel schedule, SCADA specifications, and SCADA instrumentation as outlined in the contract documents.

SECTION 27 60 00 - SCADA SYSTEM

MR Systems understands the requirements of this section and will comply as required and outlined in this scope of work, unless otherwise noted.

1.2.F - Operation and Maintenance Manuals

1 One (1) Copy Of PLC Programming Software

1.3 - Warranty

One (1) Year Included After Substantial Completion

1.5 - Submittals

SCADA Network Diagram
Shop Test Plan and Results
Propagation Study Results - NOT REQUIRED
Control Panel Hardware and Drawings Submittal
Instrumentation/Field Device Submittal
Computer System Submittal
Calculation Submittal

2.2 - SCADA Computer Systems

SCADA Server - Existing Will be Reused
SCADA Desktop Workstation(s) - Existing Will be Reused
1 Interconnecting Cables
Server Rack Ethernet Switch - Existing Will be Reused
VPN/Security Router - Existing Will be Reused/Maintained by Owner

2.3 - SCADA Software

Currently the Owner Maintains Annual Support with AVEVA
2 MR Systems Has Included Two (2) Additional Years of Support
MR Systems will update AVEVA software on existing computers at both WWTP and WTP
Both WWTP and WTP applications have to updated to the same versions for connectivity.

2.4 - SCADA PLC Panels

MR Systems will provide the following SCADA PLC Panels as outlined below. Other PLC Panels shall be provided by the various Equipment Vendors for MR Systems to interface with.

Bill of Materials and Labor

Qty	Tag/Loop	Description
1	**PLC-AWBLR**	**Aeration Blower Building SCADA PLC Panel (90-PLC-101)** Enclosure: NEMA 12, Painted Carbon Stainless Steel Expected Enclosure Size: 72" H x 36" W x 24" D PLC Manufacturer & Model: Allen-Bradley CompactLogix Available I/O: 32 DI, 16 DO, 24 AI, 8 AO Wired I/O: 32 DI, 16 DO, 24 AI, 8 AO Operator Interface Terminal: Not Included Communications Type: Fiber Optics Fiber Optics Termination Panels: Included Primary Power: 120VAC Power Backup Power: AC UPS AC Power Protection: Included Digital I/O Surge Protection: Interposing Relays Included Analog I/O Surge Protection: MR Systems' Kamikaze II Included Utility Light(s): LED Fixture Included AC Utility Power Outlet: GFI Outlet Included Panel Door Intrusion Switch: Included
1	**PLC-UV**	**Filter/UV Building SCADA PLC Panel (90-PLC-201)** Enclosure: NEMA 12, Painted Carbon Stainless Steel Expected Enclosure Size: 72" H x 36" W x 24" D PLC Manufacturer & Model: Allen-Bradley CompactLogix Available I/O: 160 DI, 32 DO, 40 AI, 16 AO Wired I/O: 160 DI, 32 DO, 40 AI, 16 AO Operator Interface Terminal: Advantech PPC, 19" with InTouch Runtime Communications Type: Fiber Optics Fiber Optics Termination Panels: Included Primary Power: 120VAC Power Backup Power: AC UPS AC Power Protection: Included Digital I/O Surge Protection: Interposing Relays Included Analog I/O Surge Protection: MR Systems' Kamikaze II Included Utility Light(s): LED Fixture Included AC Utility Power Outlet: GFI Outlet Included Panel Door Intrusion Switch: Included
1	**PLC-DWTR**	**Solids Dewatering Building SCADA PLC Panel (90-PLC-401)** Enclosure: NEMA 12, Painted Carbon Stainless Steel Expected Enclosure Size: 48" H x 36" W x 12" D PLC Manufacturer & Model: Allen-Bradley CompactLogix Available I/O: 16 DI, 16 DO, 8 AI, 8 AO Wired I/O: 16 DI, 16 DO, 8 AI, 8 AO Operator Interface Terminal: Not Included Communications Type: Fiber Optics Fiber Optics Termination Panels: Included Primary Power: 120VAC Power Backup Power: AC UPS AC Power Protection: Included Digital I/O Surge Protection: Interposing Relays Included

Bill of Materials and Labor

Qty	Tag/Loop	Description
		Analog I/O Surge Protection: MR Systems' Kamikaze II Included Utility Light(s): LED Fixture Included AC Utility Power Outlet: GFI Outlet Included Panel Door Intrusion Switch: Included
1	**PLC-DBLWR**	**Digester Blower Building SCADA PLC Panel (90-PLC-301) - New Subpanel** Enclosure: NEMA 12, Painted Carbon Stainless Steel - REUSE EXISTING Existing Enclosure Size: 72" H x 36" W x 24" D PLC Manufacturer & Model: Allen-Bradley CompactLogix Available I/O: 96 DI, 16 DO, 40 AI, 24 AO, 4 RTD Wired I/O: 96 DI, 16 DO, 40 AI, 24 AO, 4 RTD Operator Interface Terminal: Not Included Communications Type: Fiber Optics Fiber Optics Termination Panels: Included Primary Power: 120VAC Power Backup Power: AC UPS AC Power Protection: Included Digital I/O Surge Protection: Interposing Relays Included Analog I/O Surge Protection: MR Systems' Kamikaze II Included Utility Light(s): LED Fixture Included AC Utility Power Outlet: GFI Outlet Included Panel Door Intrusion Switch: Included
		3.1 - General
1		Modify the Existing HMI Application Per Specification Existing WWTP Screens Redeveloped and New WWTP Screens Processes Added to Match Sample Process Flow Screens Existing WTP, Distribution, and Collections Screens Will Remain As Is 2-D Graphical Plant Layout Overview Screen 2-D Graphical Plant Process-Flow Overview Screen Win911 Alarm Notification Software
		Coordinate with IT Personnel for Secure Network Access Modifications One (1) Day Meeting with IT Personnel for Review of Cybersecurity Requirements
		3.2 - Testing
		Unwitnessed Factory Test (UFT) Factory Demonstration Test (FDT) Operational Readiness Test (ORT) Functional Acceptance Test (FAT)
		3.3 - Training
		One (1) x Eight (8) Hour Day

Bill of Materials and Labor

Qty	Tag/Loop	Description
		SECTION 27 60 05 - SCADA INSTRUMENTATION
		MR Systems understands the requirements of this section and will comply as required and outlined in this scope of work, unless otherwise noted.
		MR Systems will provide field instruments as listed below which is based on Contract Drawing E0-26 where it is noted as "Furnished By SCADA Integrator".
		1.2.C - Operation and Maintenance Manuals
		1.5 - Submittals
		Reference SECTION 27 60 00 for List of Submittals
		2.2 - Universal Controllers/Single or Multi-Parameter Transmitters
		MR Systems will provide single and multi-parameter transmitters as required per analyzer. Below is a list of multi-parameter analyzers with applicable sensors that we are supplying.
1	20-AIT-134	TSS Immersion Sensor, Phosphorus Analyzer, and Ammonia Analyzer with Multi-Parameter Transmitter and Filtrax Filtered Water Sample System
		Manufacturer & Model: Hach TSS, Phosphax sc, Amtax sc with sc4500
		Service: Aeration Bason No.1 Zone No.3
		Accessories:
4		Instrument Tags: #316 SST, Engraved with Tag and Range
3		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
2		Stainless Steel Pole Mounting Hardware
2		Rail Mounting Kit
2		Transmitter UV Protection Screen with Sunroof
1		Misc (Power Cables, Tubing, Fittings, etc…)
1	20-AIT-234	TSS Immersion Sensor, Phosphorus Analyzer, and Ammonia Analyzer with Multi-Parameter Transmitter and Filtrax Filtered Water Sample System
		Manufacturer & Model: Hach TSS, Phosphax sc, Amtax sc with sc4500
		Service: Aeration Bason No.2 Zone No.3
		Accessories:
4		Instrument Tags: #316 SST, Engraved with Tag and Range
3		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
2		Stainless Steel Pole Mounting Hardware
2		Rail Mounting Kit
2		Transmitter UV Protection Screen with Sunroof
1		Misc (Power Cables, Tubing, Fittings, etc…)
1	42-AIT-301	TSS Immersion Sensor, Phosphorus Analyzer with Multi-Parameter Transmitter and Filtrax Filtered Water Sample System
		Manufacturer & Model: Hach TSS, Phosphax sc, Amtax sc with sc4500
		Service: UV Effluent Chanel
		Accessories:
4		Instrument Tags: #316 SST, Engraved with Tag and Range
2		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Stainless Steel Pole Mounting Hardware

Bill of Materials and Labor

Qty	Tag/Loop	Description
1		Rail Mounting Kit
1		Transmitter UV Protection Screen with Sunroof
1		Misc (Power Cables, Tubing, Fittings, etc…)
1		MR Systems has included Hach WarrantyPlus Startup, Maintenance, and Training Services
		2.3 - LEVEL (OR OPEN CHANNEL FLOW) TRANSMITTERS & ULTRASONIC TRANSDUCERS
1	10-FIT-301	Ultrasonic Level/Flow Transducer with Remote Transmitter
		Manufacturer & Model: Siemens or E+H
		Service: Influent Flow
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Aluminum Solar Hood
1		Mounting Hardware
1	44-FIT-101	Ultrasonic Level/Flow Transducer with Remote Transmitter
		Manufacturer & Model: Siemens or E+H
		Service: Post Aeration Flow
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Aluminum Solar Hood
1		Mounting Hardware
1		Spare Ultrasonic Transducer
		2.4 - SUBMERSIBLE PRESSURE (HYDROSTATIC)TRANSDUCERS
1	05-LT-101	Submersible Pressure (Hydrostatic) Transducer
		Manufacturer & Model: KPSI 750 Level Transducer
		Service: Influent Pump Station Primary Level (Pressure)
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Stainless Steel Cable Hanger
1	30-LT-301	Submersible Pressure (Hydrostatic) Transducer
		Manufacturer & Model: KPSI 750 Level Transducer
		Service: RAS/WAS Wetwell Level
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Stainless Steel Cable Hanger
1	30-LT-501	Submersible Pressure (Hydrostatic) Transducer
		Manufacturer & Model: KPSI 750 Level Transducer
		Service: Drain Wetwell Level
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Stainless Steel Cable Hanger

Bill of Materials and Labor

Qty	Tag/Loop	Description
1	50-LT-301	Submersible Pressure (Hydrostatic) Transducer
		Manufacturer & Model: KPSI 750 Level Transducer
		Service: WAS Transfer Pump Station Primary Level (Pressure)
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Stainless Steel Cable Hanger
		2.5 - TEFLON-COATED STAINLESS STELL FLOAT SWITCHES
1	05-FS-001	N.O. Teflon-Coated Stainless Steel Float Switch
		Manufacturer & Model: Siemens 9G-EF
		Service: Overflow Structure High Level
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	05-FS-103	N.O. Teflon-Coated Stainless Steel Float Switch
		Manufacturer & Model: Siemens 9G-EF
		Service: Influent Pump Station Off Float
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	05-FS-104	N.O. Teflon-Coated Stainless Steel Float Switch
		Manufacturer & Model: Siemens 9G-EF
		Service: Influent Pump Station Lead Pump Float
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	05-FS-105	N.O. Teflon-Coated Stainless Steel Float Switch
		Manufacturer & Model: Siemens 9G-EF
		Service: Influent Pump Station Lag Pump Float
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	05-FS-106	N.O. Teflon-Coated Stainless Steel Float Switch
		Manufacturer & Model: Siemens 9G-EF
		Service: Influent Pump Station Lag-Lag Pump Float
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	30-FS-302	N.O. Teflon-Coated Stainless Steel Float Switch
		Manufacturer & Model: Siemens 9G-EF
		Service: RAS/WAS Wetwell Low Level Cutoff Float

Bill of Materials and Labor

Qty	Tag/Loop	Description
		Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	30-FS-502-LAL	N.O. Teflon-Coated Stainless Steel Float Switch Manufacturer & Model: Siemens 9G-EF Service: Drain Wetwell Low Level Float Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	30-FS-502-LAH	N.O. Teflon-Coated Stainless Steel Float Switch Manufacturer & Model: Siemens 9G-EF Service: Drain Wetwell High-High Level Float Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	50-FS-303	N.O. Teflon-Coated Stainless Steel Float Switch Manufacturer & Model: Siemens 9G-EF Service: WAS Transfer Pump Station Off Float Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	50-FS-304	N.O. Teflon-Coated Stainless Steel Float Switch Manufacturer & Model: Siemens 9G-EF Service: WAS Transfer Pump Station Lead Pump Float Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
1	50-FS-305	N.O. Teflon-Coated Stainless Steel Float Switch Manufacturer & Model: Siemens 9G-EF Service: WAS Transfer Pump Station Lag Pump Float Accessories:
1		Instrument Tags: #316 SST, Engraved with Tag and Range
1		Anchor Kit and Wall Bracket
		2.6 - ELECTROMAGNETIC FLOW METER ELEMENT & TRANSMITTER
1	30-FIT-305	Electromagnetic Flow Meter Element with Remote Transmitter Manufacturer & Model: Rosemount 8750W Service: WAS Flow Line Size: 8" Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Aluminum Solar Hood

Bill of Materials and Labor

Qty	Tag/Loop	Description
1	30-FIT-308	Electromagnetic Flow Meter Element with Remote Transmitter
		Manufacturer & Model: Rosemount 8750W
		Service: RAS Flow
		Line Size: 20"
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Aluminum Solar Hood
		2.7 - INSERTION TYPE THERMAL DISPERSION AIR FLOW ELEMENT WITH REMOTE TRANSMITTER
1	50-FIT-112	Insertion Type Thermal Dispersion Flow Element with Remote Transmitter
		Manufacturer & Model: FCI ST50 with VORTAB Flow Conditioner
		Service: Aerobic Digester No.1 Air Flow
		Line Size: 8"
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
2		AC Power and Analog Surge Protector; Phoenix Contact Pipetrab
1		Aluminum Solar Hood
1	50-FIT-122	Insertion Type Thermal Dispersion Flow Element with Remote Transmitter
		Manufacturer & Model: FCI ST50 with VORTAB Flow Conditioner
		Service: Aerobic Digester No.2 Air Flow
		Line Size: 8"
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
2		AC Power and Analog Surge Protector; Phoenix Contact Pipetrab
1		Aluminum Solar Hood
1	50-FIT-132	Insertion Type Thermal Dispersion Flow Element with Remote Transmitter
		Manufacturer & Model: FCI ST50 with VORTAB Flow Conditioner
		Service: Aerobic Digester No.3 Air Flow
		Line Size: 13"
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
2		AC Power and Analog Surge Protector; Phoenix Contact Pipetrab
1		Aluminum Solar Hood
1	50-FIT-142	Insertion Type Thermal Dispersion Flow Element with Remote Transmitter
		Manufacturer & Model: FCI ST50 with VORTAB Flow Conditioner
		Service: Aerobic Digester No.4 Air Flow
		Line Size: 13"
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
2		AC Power and Analog Surge Protector; Phoenix Contact Pipetrab
1		Aluminum Solar Hood

Bill of Materials and Labor

Qty	Tag/Loop	Description
		2.8 - GAUGE PRESSURE TRANSMITTERS
		Gauge Pressure Transmitters are NOT REQUIRED to be supplied by the SCADA Integrator per Drawing E0-26.
		2.9 - AMMONIA ANALYZERS AND REMOTE TRANSMITTERS
		MR Systems has included Ammonia Analyzers as part of the Multi-Parameter Transmitters listed above in SECTION 27 60 05-2.2.
		2.10 - AMMONIA IMMERSION/SUBMERSION SENSORS AND REMOTE ANALYZERS / TRANSMITTERS
1	20-AIT-124	Ammonia Immersion Sensor with Single-Parameter Transmitter
		Manufacturer & Model: Hach ISE with sc4500
		Service: Aeration Basin No.1 Anaerobic Zone Ammonia
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		PVC Rail Mount Kit
1		Transmitter UV Protection Screen with Sunroof
1	20-AIT-254	Ammonia Immersion Sensor with Single-Parameter Transmitter
		Manufacturer & Model: Hach ISE with sc4500
		Service: Aeration Basin No.2 Anaerobic Zone Ammonia
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		PVC Rail Mount Kit
1		Transmitter UV Protection Screen with Sunroof
		2.11 - D.O. (DISSOLVED OXYGEN) IMMERSION/SUBMERSION SENSORS AND REMOTE ANALYZERS / TRANSMITTERS
1	44-AIT-102	Dissolved Oxygen Immersion Sensor with Single-Parameter Analyzer/Transmitter
		Manufacturer & Model: Hach LDO with sc4500
		Service: Post Aeration Dissolved Oxygen
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Pole Mount Assembly
1		Transmitter UV Protection Screen with Sunroof
1	50-AIT-110	Dissolved Oxygen Immersion Sensor with Single-Parameter Analyzer/Transmitter
		Manufacturer & Model: Hach LDO with sc4500
		Service: Aerobic Digester No.1 Dissolved Oxygen
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Pole Mount Assembly
1		Transmitter UV Protection Screen with Sunroof

Bill of Materials and Labor

Qty	Tag/Loop	Description
1	50-AIT-120	Dissolved Oxygen Immersion Sensor with Single-Parameter Analyzer/Transmitter
		Manufacturer & Model: Hach LDO with sc4500
		Service: Aerobic Digester No.2 Dissolved Oxygen
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Pole Mount Assembly
1		Transmitter UV Protection Screen with Sunroof
1	50-AIT-130	Dissolved Oxygen Immersion Sensor with Single-Parameter Analyzer/Transmitter
		Manufacturer & Model: Hach LDO with sc4500
		Service: Aerobic Digester No.3 Dissolved Oxygen
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Pole Mount Assembly
1		Transmitter UV Protection Screen with Sunroof
1	50-AIT-140	Dissolved Oxygen Immersion Sensor with Single-Parameter Analyzer/Transmitter
		Manufacturer & Model: Hach LDO with sc4500
		Service: Aerobic Digester No.4 Dissolved Oxygen
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Pole Mount Assembly
1		Transmitter UV Protection Screen with Sunroof
		2.12 - NITRATE IMMERSION/SUBMERSION SENSORS
1	20-AIT-114	Nitrate Immersion Sensor with Single-Parameter Transmitter
		Manufacturer & Model: Hach NT3100sc with sc4500
		Service: Aeration Bason No.1 Zone No.1
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Stainless Steel Pole Mounting Hardware
1		Transmitter UV Protection Screen with Sunroof
1	20-AIT-214	Nitrate Immersion Sensor with Single-Parameter Transmitter
		Manufacturer & Model: Hach NT3100sc with sc4500
		Service: Aeration Bason No.2 Zone No.1
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Stainless Steel Pole Mounting Hardware
1		Transmitter UV Protection Screen with Sunroof

Bill of Materials and Labor

Qty	Tag/Loop	Description
		2.13 - O.R.P. (OXIDATION REDUCTION POTENTIAL) IMMERSION/SUBMERSION SENSORS
		O.R.P. Immersion/Submersion Sensors are NOT REQUIRED to be supplied by the SCADA Integrator per Drawing E0-26.
		2.14 - pH IMMERSION/SUBMERSION SENSORS AND REMOTE TRANSMITTERS
1	10-AIT-302	pH Immersion Sensor with Single-Parameter Transmitter
		Manufacturer & Model: Hach pHD sc Model 2 with sc4500
		Service: Influent pH
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		CPVC Rail Mount Kit
1		Transmitter UV Protection Screen with Sunroof
1		Buffer Solution Kit
		2.15 - PHOSPHOROUS ANALYZERS AND REMOTE TRANSMITTERS
		MR Systems has included Phosphorous Analyzers as part of the Multi-Parameter Transmitters listed above in SECTION 27 60 05-2.2.
		2.16 - T.S.S. (TOTAL SUSPENDED SOLIDS) SENSORS AND REMOTE ANALYZERS / TRANSMITTERS
		MR Systems has included other T.S.S Analyzers as part of the Multi-Parameter Transmitters listed above in SECTION 27 60 05-2.2.
1	30-AIT-309	Insertion Type T.S.S. with Wiper and Single-Parameter Transmitter
		Manufacturer & Model: Hach TSS W sc with sc4500
		Service: RAS T.S.S.
		Accessories:
2		Instrument Tags: #316 SST, Engraved with Tag and Range
1		AC Power and Analog Surge Protector; Phoenix Contact Boxtrab
1		Stainless Steel Ball Valve and TriClamp
1		Transmitter UV Protection Screen with Sunroof
		2.17 - AMBIENT AIR TEMPERATURE TRANSMITTERS
		MR Systems has included Ambient Air Temperature Transmitters in the control panels listed above that we are supplying.
		2.18 - PORTABLE DOCUMENTING HART PROCESS CALIBRATOR
1		Fluke 754 Documenting Process Calibrator - HART
1		CXT1000 Carrying Case
1		750P Pressure Module
3		TP220 Test Probes
2		AC280 Hook Clips
2		TL224 Industrial Test Leads
		DPC/TRACK Sample Software - NOT INCLUDED, OBSOLETE BY FLUKE

Bill of Materials and Labor

Qty	Tag/Loop	Description
1		NIST-traceable Calibration Report and Data
1		Instruction Manual
1		Battery Pack with Charger
		2.19 - SUN/RAIN SHIELDS
		MR Systems has included sun/rain shields as listed above with each instrument that it is required for. Instrument sun/rain shields as will meet the requirements on Detail "E-SRS" on Contract Drawing DTE-07.
		2.20 - ELECTRICAL SURGE AND TRANSIENT PROTECTION
		MR Systems has included surge protectors as listed above with each instrument that it is required for and within control panels that we are supplying.
		3.5 - TESTING
		Operational Readiness Test (ORT) Functional Acceptance Test (FAT)
		3.6 - TRAINING
		One (1) x Eight (8) Hour Day
		3.7 - SPARES
1		Surge Protection Devices
		3.8 - SYSTEM DOCUMENTATION
		Calibration Sheets
		3.10 - WARRANTY/SERVICE AGREEMENTS
		One (1) Year Warranty Included After Substantial Completion One (1) On-Site Calibration During Warranty

Project Labor

One Lot	**Project Engineering, Electrical Design, Mechanical Design, Drafting & Administrative Labor (including Travel & Living expenses)** to perform final system design and to prepare Submittals and Record Drawings as required by the Contract Documents.
One Lot	**HMI Software Applications Development & Graphics Design Labor** (including Travel & Living expenses) as required by the Contract Documents.

Customer: Coweta County WSA
Project: Shenandoah WWTF Improvements
MR Quote #: Q22-10715, Rev. 2

January 20, 2023

Quote Expiration
March 21, 2023

Bill of Materials and Labor

Qty	Tag/Loop	Description
One Lot		**PLC Control Strategy Design & Programming Labor** (including Travel & Living expenses) to be performed as required by the Contract Documents.
One Lot		**Field Service** (including Travel & Living expenses) to provide installation supervision calibrations, startup, training, etc. as required by the Contract Documents.
One Lot		**Electrical Installation or Terminations** (including Travel & Living expenses) to provide installation of conduit, wire, etc. as required by the Contract Documents.
1 Year		**Onsite Comprehensive Warranty** (including Travel & Living expenses)
One Lot		**Freight**

Control Panels, Fiber, Instruments, Associated Field/Design Labor & Submittals: $1,268,605

SCADA PLC/HMI Programming: $215,071

Total Project Cost (including 7% sales tax): $1,483,676

General Notes:

A *** Sales Representation ***
Mr. Scott Cockrell of Eco-Tech, Inc. in Canton, GA, is our local Sales Representative and will contact you prior to the bid with pricing. Scott may be reached at 678-880-1203 (Office) or 678-251-6178 (Cell).

B *** Technical Questions ***
For technical or scope of supply questions contact Sothorn Khel, P.E., of MR Systems. Sothorn may be reached at 678-325-2824 (Office) or 770-519-0597 (Cell).

C *** Installation of Conduit and Wire ***
This quotation **DOES NOT INCLUDE** the supply or physical installation of conduit or wire unless specifically noted above.

D *** Equipment Installation ***
This quotation **DOES NOT INCLUDE** physical installation of field instruments, pipe, tubing, fittings, isolation valves, instrument stands, instrument mounts, control panels, antennas, masts, wooden poles, or other devices or other equipment unless specifically noted above.

E *** Wiring Terminations ***
This quotation **DOES NOT INCLUDE** field or panel terminations of signal or power wires

F *** Fiber Optics Cable ***
This quotation **DOES NOT INCLUDE** the supply or physical installation of Fiber Optic Cable.

Bill of Materials and Labor

Qty	Tag/Loop	Description
	G	*** Fiber Optic Cable Termination *** This quotation **DOES NOT INCLUDE** termination or testing of fiber optics cable.
	H	*** Coaxial Cable Installation *** This quotation **DOES NOT INCLUDE** the physical installation of coaxial cable or other related components.
	I	*** Installation of Communications Towers or Poles *** This quotation **DOES NOT INCLUDE** the supply or physical installation of Communication Towers or Poles.
	J	*** Contractor License Information *** MR Systems' Georgia Electrical Contractors License Numbers are EN214384 and EN214554 (Non-Restricted). MR Systems' Georgia General Low Voltage License Number is LVG104769 and Non Restricted Low Voltage License Number is LVU406402.
	K	*** This Line Is Intentionally Left Blank ***
	L	*** Terms and Conditions *** MR Systems General Terms & Conditions of Sale apply to any order resulting from this quotation. Please refer to the link provided below for a copy of our General Terms and Conditions of Sale. https://www.mrsystems.com/sellersterms/
	M.	*** Performance & Payment Bonds *** If you desire MR Systems to provide Performance and Payment Bonds for this project, please let our local sales representative know and we will provide you with an adder for the cost of these bonds.

Revision Notes:

Rev. 0	First Issue - 2023-01-10 - SK
Rev. 1	Priced Proposal - 2023-01-11 - SK
Rev. 2	Addendum No.1 Changes and Rev.1 Engineer Comments - 2023-01-20 - SK

THIS IS THE LAST PAGE

Attachments to Addendum No. 3 preceding this page:

1.	PROPOSAL FORM		
2.	SPECIFICATION	012200	UNIT PRICES
3.	SPECIFICATION	055000	METAL FABRICATIONS
4.	SPECIFICATION	055300	GRATINGS AND STAIRS
5.	SPECIFICATION	075400	PVC MEMBRANE ROOFING
6.	SPECIFICATION	331118	PLASTIC PIPE AND FITTINGS
7.	SPECIFICATION	444213.16	DIGESTER EQUIPMENT
8.	SPECIFICATION	444256	SUBMERSIBLE WASTEWATER PUMPS
9.	PLAN SHEET	S0-01	GENERAL STRUCTURAL NOTES
10.	PLAN SHEET	C11-04	FILTERS PLAN & SECTIONS
11.	PLAN SHEET	C15-03	SOLIDS HANDLING BUILDING ENLARGED PLAN
12.	APPENDIX	F	SCADA INTEGRATOR PROPOSAL

A total of 93 pages or sheets of drawings (including this page) have been included in Addendum No. 3.General Contractors are requested to return this page as an acknowledgement that you have received this Addendum by e-mail. This will NOT be mailed. A copy of this Addendum may be picked up at the office of the Engineer.

Return acknowledgement to Krebs Engineering, Inc. by email to Shelly Fritz – Shelly.Fritz@krebseng.com

Received By_____

Contractor_____

Date_____