ADDENDUM NO. 4
FOR
BRUNSWICK COUNTY PUBLIC UTILITIES
Northeast Brunswick Regional Water Reclamation Facility
2.5 MGD Facility Expansion

DATE: August 29, 2019

TO: Prospective Bidders and Others Concerned

The Contract Documents for the subject project shall be supplemented and/or amended as follows:

Addendum No. 4

1. Remove and replace Section 46 53 61 – Oxidation Ditch Equipment with attached revised Section 46 53 61.

2. Remove and replace Section 09 06 00 – Schedule of Finishes with attached revised Section 09 06 00.

3. Remove and replace Section 09 90 00 – Protective Coatings with attached revised Section 09 90 00.

4. Remove and replace Section 01 10 00 – Summary with attached revised Section 01 10 00.

5. Add and incorporate Section 10 44 16 – Fire Extinguishers into the contract documents.

6. Add and incorporate Section 08 12 16 – Aluminum Doors and Frames into the contract documents.

7. Add and incorporate Section 08 70 00 – Door Finish Hardware into the contract documents.

8. Add and incorporate Section 10 14 25 – Signs into the contract documents.

9. Add and incorporate Section 07 41 16 – Standing-Seam Metal Roof Panels into the contract documents.
10. Add and incorporate Section 07 42 00 – Metal Wall Panels into the contract documents.

11. Add and incorporate Section 05 52 00 – Handrails and Guardrails into the contract documents.

12. Remove and replace Section 08 33 10 – Overhead Coiling Doors with the attached revised Section 08 33 10 specification.

13. Replace Section 41 22 00 – Hoists and Trolleys Paragraph 2.2.A as follows:
   A. Hoist/trolley shall have nominal 1.0 ton capacity. Mark the hoist capacity in tons on both sides of the hoist or load block. Hoist shall have a minimum lifting height of 32 feet.

14. Add Paragraph 3.1.A.3 to Specification Section 40 12 23 – Air Service Piping as follows:
   3. All stainless-steel welded joints shall be field passivated utilizing a pickling paste applied immediately after welding is completed in compliance with the requirements of ASTM A380.

15. Replace Section 46 51 17.02 – Existing Eq Tank Jet Aeration System Modifications Paragraph 2.2.B.6 as follows:
   6. ACFM ±4%: 600

16. Spec Section 08 11 13 - Hollow Metal Doors: DELETE Paragraph 2.5. A.4 “Post Installed Expansion Anchors.....”

17. Remove and replace Specification Section 40 61 93A - Control System Input/Output Schedule Note 4 as follows:
   PLC-1 shall be provided by CSI and programmed by SSP.
   PLC-2 shall be provided by Kruger, Inc. and programmed by SSP.
   PLC-3 shall be provided and programmed by Trojan.
   Existing RTU-5 shall be modified by CSI and programmed by SSP.

18. Replace Specification Section 40 05 59 – Slide Gates and Weir Gates Paragraph 2.1.B as follows:
   B. Manufacturer:
   1. Golden Harvest, Inc.
   2. Waterman Industries, Inc.
   3. Whipps, Inc.
   4. Rodney Hunt
   5. Or Engineer Approved Equal
Questions/Clarifications

1. The Odor Control Systems as produced by ECS Environmental Solutions (Belton, TX) utilizing the Sulfadsorb-HC Carbon with a minimum H₂S treatment capacity of 0.30 g H₂S/cm³ of media followed by the CC-PP8 potassium Permanganate impregnated polishing media has been determined by the Engineer to be an “or Equal” odor control solution for the Headworks Odor Control System (44 30 00.01). Systems quoted by ECS shall meet all requirements indicated within the Contract Specifications and installation requirements as indicated on the Contract Drawings. For systems with significantly different layouts and installation requirements than those indicated on the Contract Drawings, the Contractor shall be responsible for coordinating adjustment of installation at no additional cost to the Owner.

2. All mag meters shown on the plans shall be supported by their flanges or surrounding pipe. They shall not be supported directly under the flow tube.

3. Table 2.1 in Section 09 90 00 shows a coating system for aluminum. Please confirm that aluminum is supposed to be coated.

   Section 09 90 00 has been updated. Aluminum will not be coated unless otherwise noted in specifications. An exception will be that bitumastic will be required on areas where concrete and aluminum are in direct contact.

4. M-30.0, the V-Notch weir is stainless. If it is, is that in the Contractor’s scope or will it be covered by the clarifier manufacturer?

   Weirs are to be constructed of Fiberglass Reinforced Plastic (FRP) as indicated in Section 46 43 21 – Secondary Clarifier Paragraph 2.4J.1. Weirs are to be provided by Kruger as part of their equipment package included in the Appendix of the Project Specifications.

5. The Work Sequence listed in Part 1.5 of Section 01 10 00 references temporary bypass pumping in several areas (D.5, F.3, F.4). Is there a bypass pumping specification available?

   There will be bypass pumping required for the testing of the tertiary treatment system as discharge from the effluent PS to the River will not be allowed until full system acceptance has occurred, and the treatment system reliably meets effluent discharge requirements. The bypass pumping system operation will need to be coordinated by the Contractor with the equipment startup plan as outlined in the Contract Documents and proposed by the Contractor’s Sequence of Construction.
6. Section 46 53 61 Part 3.3 B & C indicates that the Contractor shall bear all costs for sampling and analysis during performance testing. Part 3.5 E. of the Veolia proposal (Appendix E) indicates that the Owner is responsible for collecting samples and laboratory testing during performance testing. Please confirm that the Owner bears the responsibility/costs of sampling and laboratory testing.

_The Contractor shall be responsible for the costs associated with collection and testing of all samples during equipment startup. As a clarification, for any conflicts between the Contractor’s requirements as outlined in the Contract Documents and Veolia’s terms of service, the Contract Documents shall govern._

7. Part 3.5 C. of the Veolia proposal (Appendix E) indicates that performance testing will be demonstrated via one thirty-day test period during the first twelve months of operation. Please confirm that the Contractor is not expected to be present during Veolia’s performance testing period should testing be conducted outside of final completion.

_Final Completion will not be issued until the system has been fully started up and placed into operation with performance verified. Equipment startup and testing shall be coordinated by the Contractor as outlined in Section 01 10 00 – SUMMARY and as detailed in the related equipment specifications. The Contractor will be expected to be present and to assist the Owner/vendors in completing equipment startup and performance testing._

8. Plan sheet S65.0, in the design load table, the monorail is listed with an equipment load of 1 ton, while specification 41 22 00, section 2.2 mentions a 0.5 ton capacity. Can you clarify what the correct capacity of the monorail is?

_Hoist should be rated for 1.0 tons. Specifications have been updated._

9. Section 46 53 61 requires a 24-month warranty on the Kaeser blowers (furnished by Veolia). The Veolia scope in Appendix E appears to include a 12-month warranty on everything. Can you confirm that Veolia includes a 24-month warranty on the blowers?

_The blower manufacturer will provide a 24 month warranty on the bare blowers supplied in the package. Kruger will warrant the blower for the 12 month terms stated in their proposal._

10. Galvanized steel will not be an acceptable alternative to aluminum grating supports at the Headworks.
11. Specifications 08 11 13-2.2 and 2.3 refer to a ‘Door and Frame Schedule’. Specification 08 11 13-2.7.D refers to a ‘Door Hardware Schedule’. We could not locate either of these schedules in the documents. Please review and advise.

*Door & Frame Schedule and Door Hardware Schedule is provided on attached drawing S00.7.*

12. Please provide foundation surcharge directions for the ATAD Holding tanks as was provided for the EQ tank. Please provide bearing capacity and anticipated settlements for the ATAD Holding Tanks.

*See note 5 on attached sheet S75.0.*

13. We cannot find any door, window, louver, finish schedules, etc. - are there plans to issue architectural drawings?

*No, architectural drawings will not be issued. See attached drawings and drawings from previous Addenda that address the requested schedules.*

14. Plan sheet S00.5, Revision A, issued in Addendum #1, detail 4 specifies 8” Split Face CMU for the wall construction, with a 12” CMU bond beam. Can you confirm the 8” note should be 12”?*

*See sheet S00.5 included with this Addenda. Detail 4 has been revised to show 12” Splitface CMU wall.*

15. Notes 1 and 3 on drawings C1 and C2 says, “Provide and install petroleum resistant gaskets in all buried ductile iron pipe joints from STA 10+77 to STA 27+45”. Do you expect the Contractor to encounter contaminated soils during excavation/installation of the Effluent Force Main?

*Yes, contaminated soils are expected to be encountered during excavation/installation of the Effluent Force Main.*

16. Google Maps shows what appears to be an aerial pipe crossing in the vicinity of the rolling gate shown on drawing C2. Please confirm.

*Yes, there is an aerial pipe crossing in the area mentioned. Please see attached revised Sheet C2 for the location.*

17. On the ATAD Holding Basins, Sheet M75.1 refers us to the structural drawings for the concrete slabs outside of the structure. Please provide structural details (thickness & reinforcing) for these concrete slabs (blower and odor control).

*Drawing S75.1 has been provided in Addendum No. 4. Drawing directs contractors to construct pads similar to Section 2 on drawing S15.0.*
18. Please clarify if Roll-Up Doors shown on sheets S55.3, S55.4, S60.1, and S60.3 are manual or motor operated? Spec section 08 33 23 references both methods but does not specify what the doors require.

*Electrical drawings have not provided any work directing contractors to install electrical systems to power motor assemblies, therefore contractor shall supply manual operated doors.*

19. Specification 08 33 23 – Overhead Coiling Doors Paragraph 2.2 H calls for between jamb mounting but drawings show face of wall mounting. Which is required?

*Drawing S00.5 has been revised in Addenda. Detail 6 on this drawing directs contractors to install face of wall mounting.*

20. Plan sheets M15.0 and M75.1 detail the slabs for the EQ Tank and ATAD Holding Tanks to be a 4” membrane slab. Specification section 331630 page 4 requires a 6” membrane slab. Please confirm which is preferred. The 4” thickness is our standard but no problem to go 6”.

*6” membrane slab shall be required for the EQ Tank and the ATAD Holding Tanks.*

21. In Appendix A, the geotechnical report from ECS page 10 last sentence alludes to a soft clay in the vicinity of Boring S-3 to be undercut in the oxidation ditches, The S-3 bore went less than 1’ and hit refusal, Can you give some guidance as to the extent of the 2’ undercut to be performed in the area around this boring.

*Contractor shall be required to undercut 2’ under the slab at this location per geotechnical report included in the contract documents.*

22. Regarding the gas line crossing shown on drawing C2, are there any special fees or permits required?

*Contractor shall be required to obtain permits and any associated fees for the gas line crossing on sheet C2 if required by the owner of the easement.*

23. Does the gas company require any specific method of excavation and installation when crossing through their easement?

*See attached “Piedmont Natural Gas Encroachment Permit Standard Conditions”. Contractor shall be required to adhere to the conditions shown in this document for any work within their easement.*
24. Specification 33 16 30-8, Section 3.8A, requires all exposed concrete shall be given a three-coat finish consisting of one coat of a cementitious waterproofing product, Thoroseal or equal, and two coats of acrylic masonry paint, Port 520 or equal. Crom typically provides two coats Tnemec Series 156 on all exterior tank surfaces. Please confirm that this is acceptable alternate in lieu of the three-coat system provided.

This is an acceptable alternative to the specified three-coat system.

25. M-70-1, stainless steel support angles and alm. grating with frame at Aeration/Foam openings. Will that need to be included in the Contractor’s scope?

Yes, these would need to be included in the Contractor’s scope.

26. ITB-2 and NB-3 reference a 10% minority business participation goal. The Brunswick County Minority Enterprise Policy on I-8 lists a 5% goal. Please clarify whether the goal is 5% or 10%.

The minority business participation goal is required to be 10% for this project.

27. Does the Contractor need special permission from any property owner(s) to install the 24” Effluent FM shown on drawings C1 and C2?

No, the force main installation is within existing easements owned by the County and will not require permission from private property owners.

28. The Geotech report says to anticipate a preload period of 1 to 3 months. So that all bidders are on the same page, what duration should the Contractor assume in their bid for preloading?

The Contractor should assume a preload period of 3 months in their bid.

29. The soils report indicates that the Contractor is to surcharge the location for the new equalization tank to 10’ above existing grade and 10’ outside the structure’s footprint. The distance between the existing and proposed equalization tanks appears to be about 16’. Is there a need for shoring to prevent the surcharge from encroaching on the existing equalization tank?

Contractor shall protect the existing tank at all times during construction. Shoring may be required and shall be included in the cost if the Contractor deems it necessary to protect the tank.

30. How close can surcharge material be placed to the existing equalization tank?

Contractor shall protect the existing tank at all times during construction. Surcharge material shall not bear against the wall of the existing tank.
31. Drawing E03.0 shows the existing transformer being relocated to the north and east of its location on the drawing. See the attached photo from my visit to the site yesterday. The actual location of the transformer appears to be closer to the proposed location on E03.0. Please confirm whether the transformer needs to be relocated.

Contractor shall include the cost of relocating the transformer in their base bid.

32. The new duct bank (Keynote 1E) appears to be routed on top of the existing 16” Influent FM. Please clarify whether the 16” Influent FM will be removed once flow is established to the new headworks, EQ PS, etc.

Refer to sheet C03.3 for location of the proposed duct bank in reference to the 16” influent FM. Force main shall remain active until such time that the proposed plant expansion is active and the force main has been redirected to the proposed headworks.

33. In reference to the low-voltage duct bank re-route shown on drawing E03.0 and the As-Built drawings, it appears power and control will be disconnected to the following existing structures: EQ Tank, EQ Pump Station, Headworks, Lab/Admin Building, Post-ATAD, etc. There appears to be no Sequencing or Shut-down schedule/requirements. Please provide information on restrictions regarding shut-downs, tie-ins, and temporary measures regarding this re-route.

Contractor shall submit construction phasing plans for review and approval by the Owner and Engineer in accordance with the MOPO specification.

34. Can you provide details for the temporary pump arounds shown on drawing C02.1 (flows, pump types, restrictions, etc.)?

Refer to note 2 on sheet C02.1. Contractor shall include a temporary pump around plan in the detailed erosion control phasing plan.

35. Sheet M60.0 references FRP grating to be used in the trench drain, while plan sheet S60.1 calls for aluminum grating. Can you clarify which type of grating is to be used?

Aluminum grating shall be used in this location as shown on sheet S60.1.

36. Please confirm there is no thermal break required between the aluminum purlins and the standing seam metal roof on the UV Canopy and Cascade Aerator Canopy?

A thermal break is not required on these structures.
Plan Sheets

1. DELETE the following drawing sheets:
   a. I01.2
   b. S00.5
   c. S20.0
   d. S20.1
   e. S20.2
   f. S55.1
   g. S60.0
   h. S60.1
   i. S60.2
   j. S60.3
   k. S60.4
   l. S65.0
   m. S65.1
   n. S65.2
   o. S65.3
   p. S70.0
   q. S70.1
   r. S90.0
   s. C1
   t. C2

2. ADD the following drawing sheets:
   a. I01.2, Revision D
   b. S00.5, Revision B
   c. S00.6, Revision A
   d. S00.7, Revision A
   e. S00.8, Revision A
   f. S00.9, Revision A
   g. S20.0, Revision F
   h. S20.1, Revision F
   i. S20.2, Revision B
   j. S20.3, Revision A
   k. S55.1, Revision E
   l. S60.0, Revision D
   m. S60.1, Revision D
   n. S60.2, Revision E
   o. S60.3, Revision D
   p. S60.4, Revision B
   q. S60.5, Revision A
   r. S65.0, Revision D
s. S65.1, Revision D  
t. S65.2, Revision D  
u. S65.3, Revision B  
v. S65.4, Revision A  
w. S70.0, Revision D  
x. S70.1, Revision D  
y. S70.2, Revision A  
z. S75.0, Revision A  
aa. S90.0, Revision F  
bb. C1, Revision D  
cc. C2, Revision D

Attachments
1. Specification Section 46 53 61 – Oxidation Ditch Equipment  
2. Specification Section 09 06 00 – Schedule of Finishes  
3. Specification Section 09 90 00 – Protective Coatings  
4. Specification Section 01 10 00 – Summary  
5. Specification Section 10 44 16 – Fire Extinguishers and Accessories  
6. Specification Section 08 12 16 – Aluminum Doors  
7. Specification Section 08 70 00 – Finish Hardware  
8. Specification Section 10 14 25 – Signs  
9. Specification Section 05 52 00 – Handrails and Guardrails  
10. Specification Section 08 33 10 – Overhead Coiling Doors  
11. Specification Section 07 42 00 – Metal Wall Panels  
12. Specification Section 07 41 13 – Standing-Seam Metal Roof Panels  
13. Piedmont Natural Gas Encroachment Permit Standard Conditions  
14. Plan Sheets:
  b. I01.2, Revision D  
c. S00.5, Revision B  
d. S00.6, Revision A  
e. S00.7, Revision A  
f. S00.8, Revision A  
g. S00.9, Revision A  
h. S20.0, Revision F  
i. S20.1, Revision F  
j. S20.2, Revision B  
k. S20.3, Revision A  
l. S55.1, Revision E  
m. S60.0, Revision D  
n. S60.1, Revision D  
o. S60.2, Revision E  
p. S60.3, Revision D  
q. S60.4, Revision B
All Bidders shall acknowledge receipt and acceptance of this Addendum in the Bid Form where so indicated. Proposals submitted without acknowledgment of all Addenda will be considered incomplete.

**END OF ADDENDUM No. 4**

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SECTION 46 53 61 – OXIDATION DITCH PACKAGE EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials and equipment for a fully operating oxidation ditch secondary wastewater treatment system, as shown on the Contract Drawings and specified herein. The biological treatment system shall consist of an oxidation ditch system that includes two oxidation ditches, submersible mixers, adjustable influent and effluent weirs, jet aeration system, blowers, controls, instrumentation, SCADA, technology licenses and patent infringement indemnification.

B. Mechanical process equipment to be furnished under this section includes, but is not limited to, the following:

1. 3 4.4 HP 400 rpm submersible mixers.
2. 2 5.0 meter automatic influent weirs.
3. 2 5.0 meter automatic effluent weirs.
4. 4 Jet aeration headers.
5. 4 30 HP Jet aeration Dry-pit Liquid Motive Pumps.
6. 3 100 HP Screw blowers.
7. 4 6-inch Modulating control valve for air flow control.
8. 1 14-inch Modulating control plug valve for RAS flow control.
9. 1 6-inch Open/Close control plug valve for WAS flow control.

C. Instrumentation and Controls to be furnished under this section includes, but is not limited to, the following:

1. 1 Common PLC panel for Oxidation Ditch, ATAD and Discfilter processes
2. 4 Thermal Mass Flow meters
3. 4 Dissolved oxygen (D.O.) sensors
4. 2 Level Switches
5. 2 Magnetic Flow Meters (RAS & WAS meters)

D. Related Work specified elsewhere:

1. Division 01 – GENERAL PROVISIONS
2. Division 03 – CONCRETE
3. Division 05 – MISCELLANEOUS METALS
4. Section 09 90 00 – PROTECTIVE COATINGS
5. Division 26 – ELECTRICAL
6. Division 40 – PROCESS INTERCONNECTIONS

1.2 DESCRIPTION OF SYSTEM

A. The oxidation ditch system is a biological treatment process designed to reduce carbon, nitrogen and phosphorus contaminant levels in domestic wastewater.

B. The system will utilize a multi-stage anaerobic selector followed by a pair of oxidation ditches operating in the Phased Isolation Ditch mode of treatment. The anaerobic selector shall consist of a minimum of 3 stages.

C. The oxidation ditch system shall utilize fully automated, time-based variable control of the complete volume of the oxidation ditches between aerobic and anoxic conditions. Systems that incorporate a mixed liquor recycle, whether pumped or by gravity, to a dedicated anoxic zone as a means of achieving denitrification will not be allowed.

D. The oxidation ditch system shall utilize a fully automated, time-based control of influent distribution to each ditch via the influent weirs, and fully automated, time-based control of effluent discharge from each ditch via the effluent weirs. The PLC control system shall fully coordinate these flow control functions with the varying anoxic and aerobic conditions within each ditch to facilitate biological treatment to the extent required to produce an effluent in compliance with the requirements of this specification.

E. Performance is based upon the supplied oxidation ditch system equipment designed to process influent wastewater at the influent flow rates, conditions and characteristics as listed within this specification.

1.3 QUALITY ASSURANCE

A. Qualification Requirements: The equipment outlined within this Section is the product of Veolia Water Technologies, Inc. (dba Kruger) (Cary, NC). This equipment has been pre-approved for sole sourcing by the Owner as part of the County’s existing procurement requirements. No alternate manufacturer shall be accepted for equipment packaged under this Section. Equipment as outlined within this Section has been pre-negotiated by the Owner with pricing for equipment scope outlined within the Contract Documents and represented in the Bid Form.

1.4 PROCESS GUARANTEE

A. Basis of Design
1. All systems shall be accompanied with a performance guarantee on the equipment provided and for the complete operation and functionality of the completed system provided by the Manufacturer.

2. Design Criteria:

<table>
<thead>
<tr>
<th>BIOLOGICAL TREATMENT SYSTEM DESIGN FLOW CONDITIONS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Flow, MGD</td>
</tr>
<tr>
<td>Peak Hour Flow, MGD</td>
</tr>
</tbody>
</table>

*Note: Influent flow shall be equalized as indicated within these Contract Documents. Flows represent a two ditch system to be installed now. An additional identical third ditch will be added in the future to increase flow rates to an ADF = 3.75 MGD and PHF = 7.5 MGD

<table>
<thead>
<tr>
<th>BIOLOGICAL TREATMENT SYSTEM DESIGN POLLUTANT LOAD CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD$_5$</td>
</tr>
<tr>
<td>Design, mg/L (lb/day)</td>
</tr>
<tr>
<td>TSS</td>
</tr>
<tr>
<td>Design, mg/L (lb/day)</td>
</tr>
<tr>
<td>NH$_3$-N</td>
</tr>
<tr>
<td>Design, mg/L (lb/day)</td>
</tr>
<tr>
<td>TKN</td>
</tr>
<tr>
<td>Design, mg/L (lb/day)</td>
</tr>
<tr>
<td>TP</td>
</tr>
<tr>
<td>Design, mg/L (lb/day)</td>
</tr>
</tbody>
</table>

Wastewater Temperature

Minimum Month, C | 16
Maximum Month, C | 22

B. Process Guarantee Requirements
1. Process guarantee testing shall be coordinated and completed in accordance with the requirements of Section 01 10 00 – SUMMARY.

2. The Process Guarantee shall be defined by the table(s) in this Section.

3. The Process Guarantee shall be predicated on all conditions specified herein, in the entirety of the Process Guarantee and Performance Test document.

4. The Process Guarantee shall be conclusively demonstrated through the successful completion of the Performance Test, as described herein.

5. Process Guarantee Table(s): The Biological Treatment System design shall be based on meeting the target 30 day average effluent limitations after the tertiary treatment summarized in the table below at the design loading conditions and governing design operating conditions summarized above.

<table>
<thead>
<tr>
<th>TARGET EFFLUENT QUALITY REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effluent Soluble BOD, mg/L</td>
</tr>
<tr>
<td>Effluent TSS, mg/L</td>
</tr>
<tr>
<td>Effluent NH3-N, mg/L</td>
</tr>
</tbody>
</table>

1.5 SUBMITTALS

A. Complete submittal drawings and information shall be submitted in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

B. Submittal package shall include a complete copy of this Specification section. Contractor shall review submittal and indicate all items within the submittal as compliant with the specifications by indicating a check mark by each paragraph of this Specification. For any items which do not meet the requirements of this Specification, the Contractor shall indicate by marking the corresponding paragraph with an “X”. For each item which is not in compliance with this Specification, a written clarification shall be provided by the Contractor detailing how the submitted equipment differs from the requirements outlined in this Specification section and detail why it is not possible to meet the requirements of this Specification. All exceptions shall be listed on a separate document which is included at the front of the submittal provided for review. Any submittal package received without a marked up Specification section, description of exceptions or a Contractor’s review stamp shall be rejected and returned by the Engineer without further review.

C. Submittal shall contain the following at a minimum

1. Equipment drawings showing all important details of construction and dimensions.
2. Equipment wiring diagrams.

3. Descriptive literature, bulletins, and/or catalogs of the equipment.

4. Data on the characteristics, features, and performance of the equipment.

5. The total dry weight and operating weight of the equipment including the weight of the single largest item.

6. Motor drive data.

D. TOOLS AND SPARE PARTS

1. The Manufacturer shall furnish a list of recommended spare parts. The list shall, as a minimum, include detailed information for the following spare parts:
   a. Bearing Sets, as applicable for mixers and/or pumps
   b. Mechanical Seal Set, as applicable for mixers and/or pumps
   c. O-ring set, as applicable for mixers and/or pumps
   d. Belts, as applicable to blowers
   e. Inlet air filters, as applicable to blowers

1.6 LAYOUT COORDINATION AND REVIEW

A. The Contractor shall review design and layout drawings to ensure that installation arrangements are suitable for the specified equipment. Any potential conflicts or recommended modifications shall be coordinated with the Engineer and noted on the shop drawings or by a pre-submittal request for information, if appropriate.

1.7 OPERATING INSTRUCTIONS

A. The Manufacturer shall furnish operation and maintenance manuals consistent with the requirements of Section 01 78 23 – OPERATION AND MAINTENANCE DATA. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions and other information that is required to instruct operation and maintenance personnel unfamiliar with such equipment.

1.8 PRODUCT STORAGE AND PROTECTION

A. The Contractor shall be responsible for protection and storage in accordance with the Manufacturer’s recommendations of all items shipped to the site from the time of delivery until installation is completed and the units and equipment are ready for operation.
1.9 WARRANTY

A. The Contractor shall warrant the system installation, equipment, and all materials to be free of construction and installation defect for a period of one (1) year. The warranty period shall include the 12 – month period beginning upon the date of issuance of Substantial Completion by the Owner. Substantial completion is defined as operational and functional use of all facilities by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The physical layout of the system shown on the Contract Drawings and the equipment specified herein are based upon the BIO-DENIPHO Oxidation Ditch System, as manufactured by Veolia Water Technologies, Inc. (dba Kruger) of Cary, NC.

2.2 JET AERATION AND MIXING SYSTEM

A. General

1. Provide, as shown on the plans, one complete jet aeration system within each oxidation ditch. The system shall consist of all in-basin liquid and air distribution piping, including pre-fabricated liquid and air jet headers and nozzles, backflush system and all necessary supports and hardware to provide for a complete system.

2. The oxidation ditch process system shall comprise a two (2) basin system. The reactor basin is 20.5 feet deep; with an operating SWD of 18 feet.

3. The equipment shall be manufactured by ClearStream Environmental, of Sandy, Utah, and provided by the Oxidation Ditch Manufacturer as a complete package.

B. Construction

1. The jet aeration system shall be designed to transfer oxygen into each oxidation ditch as follows:

   a. Average Standard Oxygen Transfer Rate (SOR): 375 lb/hr per ditch, with an air input of 1,245 SCFM.

   b. Peak Standard Oxygen Transfer Rate (SOR): 500 lb/hr per ditch, with an air input of 2,219 SCFM.

2. Four (4) identical aeration headers shall be provided, two (2) for each ditch. Each jet aeration header shall be comprised of integrally fabricated air and liquid ducts, and a minimum of seventeen (17) air / liquid jet nozzles. The jet nozzles shall be mounted on one side of the liquid duct in each oxidation ditch channel to facilitate horizontal flow and shall be equally spaced along the length of the duct as shown on the Contract Drawings. Recirculated
mixed liquor shall enter the liquid header through a flanged connection of size as indicated on the Contract Drawings. Low pressure air shall enter the air header through a flanged connection of size as indicated on the Contract Drawings.

3. The jet header shall be designed to provide uniform distribution of the motive liquid and low pressure air to each jet nozzle. The motive liquid and low pressure air shall be combined in the jet nozzle, and the resulting air/liquid stream shall be discharged horizontally as a high energy jet in the lower portion of the reactor basin.

4. The liquid duct shall be a cylindrical member, internally smooth and free of protrusions which might collect stringy material. The jet nozzles shall be longitudinally spaced along the perimeter of the liquid duct, and aligned on a common horizontal plane.

5. The air duct shall also be a cylindrical member located above, and parallel to, the liquid duct. The air duct shall be attached to, and supported by the air feed manifolds located at each jet location. The provision of individual air feed manifolds for each jet shall ensure uniform air distribution.

6. The air and liquid ducts shall be fabricated Schedule 10 304 stainless steel as specified in Section 40 12 23 – AIR SERVICE PIPING.

7. Each jet nozzle assembly shall consist of an inner liquid nozzle, and an outer air/liquid discharge nozzle fabricated from 304 stainless steel. The jet nozzles shall be assembled to be concentric with the inner and outer nozzles in axial alignment. The outer nozzles shall be of constantly reducing cross-sectional area in the direction of flow; with an included angle of at least 20º for at least six inches along the horizontal flow path to increase the velocity of the air/liquid stream. Both inner and outer nozzles shall be of a non-clog design, free from all protrusions which might collect stringy material, and shall be capable of passing a 1.50 inch spherical solid. The diameter of the outlet of the outer nozzle shall be 1.7 to 1.9 times that of the inner nozzle.

8. Air feed manifolds shall be enclosed conduits which carry the low pressure air from the air duct to the air/liquid discharge nozzle. Air feed manifolds shall be fabricated from Schedule 10 304 stainless steel.

9. The aeration equipment shall be capable of producing fine bubbles to increase the oxygen transfer efficiency. All materials must be resistant to a complete range of operating temperature, salinity, hardness, corrosiveness, and abrasives experienced in domestic wastewater treatment. The equipment must further be capable of continuous operation over extended periods with compressed air temperatures up to 100°C. The aeration system shall be designed to accomplish the design oxygen transfer and to provide rapid dispersion of oxygen throughout the liquid mass.
10. The aeration system shall be designed to provide mixing such that when operated under design conditions, it shall suspend all biological floc and mixed liquor suspended solids throughout the liquid mass. The aeration system shall be able to suspend all biological floc and mixed liquor suspended solids with the air flow off.

C. Hydro- Pneumatic Backflush System

1. A positive hydro-pneumatic flush out system shall be provided for each jet header. Minimum size of the flush out line shall be 4 inches. The system shall be of the air lift type, activated by turning off the motive liquid pump, allowing the manifold to fill with air, and opening the flush out valve. The initial surge of liquid through the liquid nozzle shall be sufficient to dislodge any partially formed plugs. The air lift shall then carry all foreign material out of the aeration header. The aeration system supplier shall provide all necessary piping, valves, and supports for the flush out system.

D. Distribution Piping

1. All air and liquid distribution piping that is integral to the jet aeration header assembly shall be provided as a part of the aeration system to the limits as shown on the Contract Drawings. All piping shall be fabricated of Schedule 10 304 stainless steel as specified in Section 40 12 23 – AIR SERVICE PIPING. Flanged connections shall be provided for connection of the jet aeration manifold, and the out-of-basin piping.

E. Supports

1. All necessary supports for the aeration header, air and liquid piping, and the flushout system shall be provided as a part of the aeration system. All supports shall be constructed of Type 304 stainless steel.

2. Header and pipe supports shall consist of dual leg angle welded to a supporting base. The support base shall be leveled and anchored with anchor bolts and grouted in place as necessary. A cross brace shall be provided and field welded for additional support. The support angle shall be field welded directly to the jet manifold by the installing contractor.

2.3 MOTIVE LIQUID PUMPS

A. DESCRIPTION

1. Related Work Specified Elsewhere:
   a. Division 01 – GENERAL REQUIREMENTS
   b. Section 09 90 00 – PROTECTIVE COATINGS
   c. Division 26 - ELECTRICAL
   d. Division 40 – PROCESS INTERCONNECTIONS
2. Scope of Work
   a. The Contractor shall furnish, install, test and place in satisfactory
      operation, as shown and described in the Contract Documents. Four (4)
      vertical dry pit motive pumps will be supplied. The vertical dry motive
      shall be provided by one approved vertical dry pit pump manufacturer.

B. SUBMITTALS
   1. Data to be submitted:
      a. The Contractor shall submit detailed installation drawings for the
         units which he proposes to supply, showing: Brake Horsepower,
         Power Input to Electric Drive Motor and primary flow circulation
         capacity for the design condition, together with descriptive data and
         specifications describing in detail the construction of the complete
         units.
      b. The manufacturer shall furnish evidence that they have equipment
         of a similar type in satisfactory operating condition for not less than
         5 years. A list giving locations and date of installation shall be
         furnished to the Engineer.
      c. The Contractor shall submit a certification executed by the pump
         manufacturer stating that the Pumps, complete with motor,
         intermediate shafting, necessary guards and all other specified
         accessories and appurtenances shall be furnished by the pump
         manufacturer to insure compatibility and integrity of the individual
         components, and provide the specified warranty for all components.
      d. Operation and maintenance manuals in accordance with Division
         01 of these specifications shall be provided.
   2. Dimensional Data:
      a. The successful bidder shall submit to the Engineer for approval,
         within 45 days after the award of the Contract, shop drawings
         certified as correct, showing all weights and dimensions necessary
         for the installation of foundations, anchor bolts, brackets and
         support system.
      b. Submit anchor bolt sizes, setting depth and other details for
         approval.

C. QUALITY ASSURANCE
   1. Each pump shall be supplied as follows:
      a. All pumping equipment furnished under this Section shall be of a
         design and manufacture that has been used in similar applications,
and it shall be demonstrated to the satisfaction of the Owner that the quality is equal to equipment made by that manufacturer specifically named herein.

b. Unit responsibility. Pumps, complete with motor, intermediate shafting, necessary guards and all other specified accessories and appurtenances shall be furnished by the pump manufacturer to insure compatibility and integrity of the individual components, and provide the specified warranty for all components.

c. The vertical dry-pit solids-handling pump(s) specified in this section shall be furnished by and be the product of one manufacturer.

d. Pumps are to be engineered and manufactured under a written Quality Assurance program. The Quality Assurance program is to be in effect for at least ten years, to include a written record of periodic internal and external audits to confirm compliance with such program.

e. Pump(s) are to be engineered and manufactured under the certification of ISO-9001:2000.

D. FABRICATION AND MANUFACTURE

1. Performance

a. The pump(s) shall be designed for continuous operation and will be operated continuously under normal service.

b. OPERATION CRITERIA

<table>
<thead>
<tr>
<th></th>
<th>Flow (GPM)</th>
<th>TDH (ft.)</th>
<th>Max. Pump Speed (RPM)</th>
<th>Max. Solids Passage (in.)</th>
<th>Max. Shutoff Head (ft.)</th>
<th>NPSHR @ Rated Condition (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Condition</td>
<td>3,995</td>
<td>21.0</td>
<td>890</td>
<td>4.5</td>
<td>39</td>
<td>16</td>
</tr>
</tbody>
</table>

c. Net positive suction head available at the centerline of the pump impeller is 28 feet at 3,995 GPM.

2. Manufacturer

a. Vertical dry pit pumps shall be manufactured by FAIRBANKS NIJHUIS or Approved Equal.

3. Design

a. Rotation
1) The pump will be clockwise rotation when viewed from the driver end looking at the pump.

b. Impeller

1) The impeller shall of close-grained cast iron conforming to ASTM A48 CL30 and be of the two-vane, enclosed mixed-flow design, single suction, solids-handling type designed to pass a minimum sphere size of 3.5" diameter.

2) The impeller is to be dynamically balanced and secured to the shaft by means of a key, and impeller capscrew, and matched to the volute/casing. The arrangement shall be such that the impeller cannot be loosened from torque in either forward or reverse rotation.

3) Wiper vanes on the back impeller shroud are not allowed.

c. Volute/Casing

1) The volute shall be matched to the impeller and made of close-grained cast iron conforming to ASTM A48 CL30. The volute is to be of one-piece design with smooth fluid passages large enough to pass any size solid that can pass through the impeller.

2) The volute shall be side flanged tangential discharge and capable of rotation in 45 degree increments to accommodate piping orientation. The volute shall be designed to permit front or back impeller removal. Diffusion vanes are not permitted.

3) The volute shall be furnished with a large contoured inspection and cleanout opening located at the cutwater, to allow access to the impeller. Discharge flange 125 lb. ANSI drilling.

4) The volute shall be designed to permit front or back impeller removal and to permit the removal of the rotating assembly without disturbing the suction or discharge piping. The casing shall be hydrostatically tested to 1.5 times the design head or 1.25 times the shutoff head whichever is greater.

d. Wear Rings

1) Axial type removable wear rings are to be provided on both the impeller and suction head for reduction of recirculation.

2) Wear rings shall be stainless steel. The impeller wear ring shall be approximately 50 Brinell softer than the fronthead wear ring.
e. Fronthead

1) The fronthead shall be made of close-grained cast iron conforming to ASTM A48 CL30 and have the base integrally cast. It shall be cast separately of the volute. Fronthead suction flange shall be 125 lb. ANSI drilling.

2) Fronthead shall incorporate a hand hole for inspection.

f. Backhead

1) A separately cast close-grained cast iron backhead with large access openings and integral sealing box conforming to ASTM A48 CL30 shall be provided. The sealing box shall be cast integrally with the backhead and be designed to accommodate either packing or mechanical seal without remachining. The sealing box shall be drilled and tapped for external flushing with seal cage.

2) A ¾" minimum backhead drain tap shall be provided. Sealing box leakage will be collected by the backhead drain trough and piped directly to drain, eliminating any drippage to the floor.

3) Pump shafts shall be protected by mechanical seals with associated process water assembly via John Crane SAFEUNIT, or equal.

g. Bearing Frame Assembly

1) The bearing housing shall be close-grained cast iron conforming to ASTM A48 CL30 and of heavy, rugged design for carrying the bearings and machined for accurate and permanent bearing alignment completely enclosing the shaft between the bearings. Bearing supports are to be of heavy-duty construction providing for self-centering fit with the casing for proper alignment. The bearing housing shall be of dust-proof design, incorporating lip-type grease seals in contact with the shaft to prevent the entrance of contaminants. Jacking bolts for external impeller adjustments are required. Zerk-type grease fittings for bearing lubrication shall be supplied at the bearing housing.

2) The pump shaft shall be made from type 4140 alloy steel, of sufficient diameter to carry the maximum loads imposed and to prevent vibration and fatigue. The shaft shall be accurately machined along its entire length. Keyways shall be provided at both ends.

3) A renewable shaft sleeve, positive adhesive sealed to prevent leakage between the shaft and the sleeve, shall
protect the shaft through the sealing box area. The shaft sleeve shall be stainless steel with Brinell hardness of 300-350.

4) Radial (inboard) bearings shall be grease-lubricated single-row deep-grooved ball type, self-aligning, designed to carry the hydraulic radial loads encountered in the service conditions. Thrust (outboard) bearings shall be angular contact, duplex mounted, designed to carry the pump hydraulic axial and dead load thrust.

5) Bearings shall be designed for an L10 life of 100,000 hours per AFBMA at best efficiency point. Grease relief ports with plugs shall be provided.

h. Fits and Hardware

1) The volute/casing, fronthead, backhead, and frame shall be manufactured with concentric shoulder fits to assure accurate alignment. All machined bolts, nuts, and capscrews shall be of the hex-head type and will not require the use of any special tools.

i. High Ring Base

1) The motor high ring base shall be cast iron or fabricated steel of adequate height to permit access to the coupling and furnished with a shaft guard.

j. Vibration Limitations (Field)

1) The limits of vibration as set forth in the standards of the Hydraulic Institute shall govern.

k. Testing

1) A certified factory hydrostatic and performance test shall be performed on each pumping unit in accordance with Hydraulic Institute Standards, latest edition. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition.

2) Results of the performance tests shall be certified by a Registered Professional Engineer and submitted for approval before final shipment.
I. Pumps shall be manufactured by companies whose management system is registered to ISO-9001:2000

2.4 SUBMERSIBLE PROPELLER MIXER –ANAEROBIC SELECTOR TANKS

A. DESCRIPTION

1. Related Work Specified Elsewhere:
   a. Division 01 – GENERAL REQUIREMENTS
   b. Division 26 – ELECTRICAL
   c. Division 40 – PROCESS INTERCONNECTIONS

2. Scope of Work

Furnish, install, test and place in satisfactory operation, as described in the Contract Documents submersible mixers complete with guide rails and support, lifting crane and all necessary appurtenances required for proper mixer operation. The submersible mixer and controls shall be provided by a single submersible mixer manufacturer.

B. SUBMITTALS

1. Data to be submitted:
   a. The Contractor shall submit detailed installation drawings for the mixers showing: Brake Horsepower, Power Input to Electric Drive Motor and primary flow circulation capacity for the design condition, together with descriptive data and specifications describing in detail the construction of the complete units. Also included in the submittal will be the mixer flow velocity and site installation diagrams for approval.
   b. Furnish evidence that the Manufacturer has equipment of a similar type in satisfactory operating condition for not less than 5 years. A list giving locations and date of installation shall be furnished to the Engineer.
   c. Submit a certification executed by the submersible mixer manufacturer stating that the mixers, and assured submergence control system are totally compatible.
   d. Operation and maintenance manuals in accordance with 01 78 23 – OPERATION AND MAINTENANCE DATA of these specifications shall be provided.

2. Dimensional Data:
   a. Submit to the Engineer for approval, within 45 days after the award of the Contract, shop drawings certified as correct, showing all
weights and dimensions necessary for the installation of foundations, anchor bolts, brackets and mast support system.

b. Submit anchor bolt sizes, setting depth and other details for approval.

C. QUALITY ASSURANCE

1. Each mixer shall be tested as follows:
   a. Mechanical and electrical integrity shall be established by physical inspection and by use of a megger.
   b. Power leads shall be applied and motor started to verify proper rotation.
   c. Mixer shall be run in the submerged condition to verify amp draw, starting capability, mechanical, and electrical integrity.
   d. The unit shall be removed and checked by megger and by physical inspection to determine electrical and mechanical integrity.

D. FABRICATION AND MANUFACTURE

1. Performance

The submersible mixer installation shall consist of identical mixers. Mixers shall be constant speed driven by squirrel cage induction motors that are certified for use with variable speed drives. Each mixer shall be mounted in the basin using a mast or rail retrieval system that does not require anyone entering the basin to install or remove the mixer. Each mixer shall be submersible provided with a non-clogging propeller, designed for mixing raw or processed sewage.

2. Manufacturer

Submersible mixers shall be manufactured by WILO-EMU USA LLC of Thomasville, Georgia, or Approved Equal.

3. The submersible mixers shall be equal to:

   Furnish three (3) submersible mixers for the anaerobic basin(s). The basin(s) shall contain wastewater mixed liquor of a solids concentration of not more than 1% by weight. Each mixer shall be capable of the following performance:

<table>
<thead>
<tr>
<th>Mixing Location</th>
<th>Model No.</th>
<th>Prop. Material</th>
<th>Propeller Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaerobic Selector</td>
<td>TR 50-2.40-4/8</td>
<td>PUR</td>
<td>3 Blade Curved</td>
</tr>
</tbody>
</table>
4. General mixing unit requirements

a. The submersible mixing units shall be the standard product of the manufacturer for this application in accordance to the specifications contained below. The submersible mixers shall be non-clogging, with backward curved propeller blades of a cross section which reduces drag while eliminating fibrous build up. A planetary gear section connected to an integral squirrel cage, electric induction motor, shall drive the mixer’s propeller. Each mixer shall include a motor, gear reduction section, bearings, two (2) independent sets of silicon carbide mechanical seals, stainless steel shafts, A48 class 35 or 40 Cast Iron housing, ceramic coating on the housing and machined fits for circular cross section O-rings.

1) Motor shall meet the requirements of Division 26 – ELECTRICAL.

b. The mixers shall be the submersible type and shall be installed in location as shown in the Contract Drawings. The manufacturer shall design the mixer motors for full load continuous operation.

c. All major components of the mixing unit (i.e., stator housing, seal housing, and cable entry) shall be manufactured from close-grained ASTM A48 class 35 or 40 cast iron. All surfaces, exception of stainless steel shall be coated with a two-component ceramic based coating material. The material shall be a solvent-free epoxy polymer with solvent-free polyamine hardener and various extenders. The ceramic coating shall provide a high gloss surface when hardened, and shall provide a long-lasting ceramic veneer with mechanical and chemical resistance and resistance to abrasion. Epoxy and enamel coatings will not be considered as equal to the specified coating system and will not be accepted. The coating shall be Ceram C0 or approved equal.

d. All nuts, bolts, washers, and other fastening devices supplied with the mixers shall be AISI Type 316 stainless steel.

e. All mating surfaces of the major castings requiring a watertight seal shall be machined and fitted with FPM (Viton) O-rings. Sealing shall be done via smooth surface (surface finish 250 or higher) while the O-rings are used as back up sealing system for each joint.

<table>
<thead>
<tr>
<th>Number of Mixers</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Nominal Motor Horsepower</td>
<td>4.40 HP</td>
</tr>
<tr>
<td>Electrical Voltage and Characteristics</td>
<td>460/3/60</td>
</tr>
<tr>
<td>Max. Number of Starts per Hour</td>
<td>15 (or unlimited on VFD)</td>
</tr>
<tr>
<td>Nominal Cable Length (ft)</td>
<td>40</td>
</tr>
<tr>
<td>Rail and Lifting Crane</td>
<td>316 Stainless Steel</td>
</tr>
</tbody>
</table>
f. Mixers shall be furnished with polyurethane propellers as detailed in the equipment listing above.

g. Mixer support frame shall be manufactured from AISI Type 316Ti Stainless Steel as detailed in the submersible equipment tabulated data above.

5. Mixer stator, gear chamber and seal casings

a. Casings shall be manufactured from ASTM A48 Class 35 or 40 close-grained cast iron.

b. The outside contours of the mixer(s) shall be shaped to reduce hydraulic losses and to aid in mixing efficiency.

c. Each casting shall be free from porosity, voids, mold part line marks and raised surfaces (otherwise known as Finns on a casting), and other casting quality defects. The surface shall be smooth to the touch and free from all sharp edges.

d. Corners shall have smooth radius contours to avoid sharp edged corners and surfaces.

6. Propellers

a. Propellers shall be manufactured from closed cell polyurethane (PUR). No welded steel or stainless steel propeller shall be accepted.

b. The propeller shall have a swept-back profile and at least 3 blades. The propeller blades shall be thicker on the leading edge than the trailing edge and thicker towards the hub than at the tip to allow the propeller to free itself from rags as it turns. The blades shall be smooth, finished throughout, and shall be free from sharp edges.

c. Propellers shall be statically and dynamically balanced.

d. Propellers shall be slip fit and securely held to the shaft by a stainless steel washer and bolt assembly that is enclosed in a separate hub chamber. The hub chamber is fitted with an O-Ringed cap that seals the entrance of the propeller hub chamber device. The output shaft shall be splined to mate with the matching spline insert of stainless steel that forms the hub of the propeller.

7. Bearings

a. Each mixer shall be furnished with a minimum of four (4) sets of bearings spaced to minimize shaft deflection to offer maximum bearing life. At a minimum, at least two sets of the bearings shall be of double row design. Designs with fewer than four (4) sets of bearings shall not be allowed.
b. A minimum of two sets of bearings shall support the propeller shaft (shaft from gear box to the propeller). Designs where the propeller shaft is supported solely by the gearbox shall not be acceptable.

c. Mixer shaft overhang and bearing design shall provide a minimum B10 life of 100,000 minimum at design point.

d. Bearings shall be sealed, grease lubricated and maintenance-free

8. Shafts

a. The shaft connecting the propeller to the gear reducer shall be constructed of AISI 329 (1.4462) stainless steel.

b. Minimum propeller shaft diameter (D), measured at the outermost bearing shall be: 1.77 inches (45 mm).

b. The propeller shaft shall be supported such that the length (L) from the outermost bearing to the hub of the propeller shall not exceed 3.88 inches (98.5 mm). The shaft overhang ratio of the distance from the bearing to the hub of the propeller (L) divided by diameter of the shaft at the bearing shall not exceed 2.2

9. Sealing devices

a. Each submersible mixer shall be provided with two separate seal chambers. The inner chamber shall be located between the dry stator chamber and the gear reduction chamber. The outboard seal chamber shall be located between the gear reduction chamber and the outside of the mixer at the hub of the propeller.

b. Each seal chamber shall be provided with an independent set of mechanical seals and a lip seal running in an oil bath. The inboard set of seals shall be mounted in the chamber between the motor and gearbox. The outboard set of seals shall be mounted between the gearbox and the propeller.

c. Each mechanical seal set shall be provided with solid sintered silicon carbide seal face material on both the stationary and rotating components. Both the inboard mechanical seal set and the outboard mechanical seal set shall be silicon carbide.

d. The metal components of the mechanical seal case shall be constructed of AISI 316 stainless steel.

e. A moisture sensor probe shall be furnished in the seal oil chamber of each mixer. Each sensor shall be wired to the control panel and shall activate an alarm light upon seal failure.
f. The seal sensor probe shall be externally located and accessible for maintenance without the need to disassemble the mixer for service or replacement.

10. Power and control cables
   a. Shall meet the requirements of Division 26 – ELECTRICAL
   b. Shall meet the requirements of Division 40 – PROCESS INTERCONNECTIONS
   c. Power and control cables shall be furnished in lengths to run un-spliced from the mixer to the control panel or disconnect as shown on the Contract Drawings and as specified herein. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to confirm that all strands of each conductor is terminated properly.
   d. Cables shall be of the “NSSHOU” type and shall be approved by the MSHA for use in hazardous locations and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the mixer motor through a heavy duty galvanized cast iron entry assembly which shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.
   e. The cables for each mixer motor shall pass through the galvanized cast iron strain relief component and then through a series of stainless steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. The cable entry design shall be of the type recommended in the Factory Mutual Research Corporation specifications for Explosion Proof Certification. The entry shall be comprised of the cast iron fitting that will include the Buna-N strain relief grommet coupled with a poured conductor section. In the poured section, only Factory Mutual approved sealant shall be used to wick into each conductor strand that has the insulation removed in this area to provide a positively leak proof seal for the power and sensor cords.

11. Motors
   a. Shall meet the requirements of Division 26 – ELECTRICAL
   b. Each mixer shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with the variable frequency drive system.
   c. The motors shall be air-filled and constructed with moisture resistant NEMA Class F insulation and Class F slot liners and
constructed to NEMA B design standards. The copper wound stator shall be dipped in epoxy enamel and hardened to withstand a temperature of 180 degrees Centigrade as defined in NEMA Standard MG-1. Each winding phase or layer shall be laced with Class H glass lined paper. The use of cable ties to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum amortisseur bars and short circuit rings. The constructed motor shall be certified for continuous duty with a service factor of 1.10.

d. Motors shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.

e. Motors shall be capable of uninterrupted operation with a voltage drop of 10%.

f. The motor shall bear the FM (Factory Mutual) explosion-proof label certifying its use in a Class 1, Division 1, Groups C & D hazardous location.

g. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with two (2) thermal switches, embedded in the end coils of the stator winding.

h. Thermal switches shall automatically de-energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.

i. The mixer manufacturer's nameplates shall be engraved or stamped on stainless steel and fastened to the motor casing.

12. Gear reduction drive system

a. The submersible mixer propeller shall be driven by the motor through a two-stage planetary gear reduction drive system that locates the motor shaft in line with the propeller shaft.

b. The motor shaft shall be fitted with a keyed sun gear that uses high efficiency straight cut teeth to engage the planetary gear section.

c. The sun gear system shall be custom matched to the planetary gear system to allow for propeller speed changes in the field by a simple exchange of the sun gear and the planetary gear plate.

d. The planetary gear section shall consist of three identical gears mounted on a stainless steel backing plate designed to withstand 100 % lock stress from the propeller without gear or bearing damage.
e. Each planetary gear shall be supplied with precision needle bearings that are lubricated by the gear lubricant in the gear chamber.

f. There shall be a minimum of three planetary gears spaced 120 degrees around the central sun gear.

g. The planetary gear section shall be easily removed and shall be interchangeable with other ratios and for simplified spare parts inventory.

h. The planetary gear section shall also engage a ring gear mounted in the outer surface of the gear chamber which shall cause the motor rotation to also rotate the planetary gear plate which shall be fitted to the output propeller shafting by the use of a straight spline connection.

i. The planetary gear plate shall be retained on the output propeller shaft by the use of a snap ring and snap ring groove in the output shaft.

j. The planetary design shall be designed such that with regular oil changes, no further maintenance should be required during the life of the submersible mixer in the installation. The gears shall have a minimum L-10 life of not less than 100,000 hours at the rated duty.

k. Gear oil changes shall be easily made using external stainless steel pipe plugs that are sealed via nylon washers.

l. Standard 80 to 90-weight gear oil either normal or synthetic shall lubricate the gear section.

13. Guide Rail (Mast) System

a. An AISI 316SS guide rail system shall be used to mount each mixer during operation and to guide the units during installation and removal for service. The system shall consist of a bottom assembly, mixer support assembly, 4-inch by 4-inch (100 mm by 100 mm) guide pipe, upper support and positioning device. The system shall be fixed at the bottom of the tank to allow horizontal rotation of the mast through not less than 120 degrees. All brackets shall be constructed of AISI 316 stainless steel. The mast bearings shall be constructed of Hostaform (POM). Power/control cable holders shall be provided every five feet.

b. The bottom assembly shall be bolted to the floor of the tank, and provide support for the guide pipe. It shall also include a hole to accept the guide pipe bottom plug. The bottom console and guide pipe shall be constructed of AISI 316Ti stainless steel.
c. The assembly shall be strong enough to support the weight of the mixer, the guide pipe and the mixer preload force. The assembly shall be positioned in such a manner so as to prevent the mixer blade tips from hitting the basin floor. The mixer shall rest upon a support foot.

d. The upper guide holder assembly shall secure the system to the tank edge or platform. It shall also provide the lateral support for the guide pipe. The assembly shall contain a location to secure the electrical motor cable holder.

e. Mixer support frame (including angular adjustment brackets) shall be manufactured from: AISI 316Ti Stainless Steel.

14. Hoist (Crane) Assembly

a. A hoist system shall be used for lifting and lowering of the mixer on the guide rail during installation and maintenance. The system shall be capable of 360 degree-rotation. Each hoist assembly shall be rated at a minimum of 550 pounds. All crane and bases shall be constructed of AISI 316 stainless steel. The inserts in the base shall be constructed of Nylon (PA).

15. Shop Painting

a. Primer and Finish Paint-Shop apply to all exterior ferrous surfaces of the mixer and motor.

1) Solids by volume: 97%
2) Type: Solvent-free ceramic coating, impregnated with aluminum oxides
3) Total Dry Film Thickness: 400 microns (15 mils) minimum
4) Minimum Adhesion: 15 Newtons per square millimeter (2,030 psi) per ISO 4624.
5) Minimum Hardness: 110 on Buchholz Indentation scale
6) Resistance: Level 1 (continuous duty) for sewage with pH of 6-11, Level 1 for saltwater, Level 3 (not recommended) for 10% hydrochloric acid.

b. Surface Preparation-Prepare all surfaces to receive coating system.

1) Method: Blasting per ISO 12944-4
2) Standard Cleanliness Grade: 2.5
3) Minimum Peak to Valley Height: 70 microns (2.75 mils)
16. Controls  
   a. Mixer Controls shall be as outlined in Division 26 – ELECTRICAL and Division 40 – PROCESS INTERCONNECTIONS

2.5 5.0 METER ADJUSTABLE INFLUENT WEIR

A. General  
   1. Furnish and install adjustable influent control weirs as described within the Contract Documents. The weirs shall be 16’-5” in length. The weirs shall be continuously adjustable between their maximum and minimum elevations.
   2. The adjustable weirs shall be so designed to ensure that all flows leaving the oxidation ditch shall exit by passing over the adjustable weir with negligible leakage around or below the weir assembly.

B. Construction  
   1. Inlet Weir: The unit shall consist of a tiltable weir plate, which by means of hinges at the lower edge shall be fastened to an anchor iron. An actuator shall raise and lower the weir. The complete unit shall be installed in a concrete chamber placed in the outside wall of the oxidation ditch.
   2. Weir Assembly:
      a. Anchor Iron: The main support for the weir plate consists of a hot dip galvanized angle iron 4” x 3” x 5/16” the full length of the weir with anchor bolts embedded in concrete and a retainer bar 1¼” x ¼” for holding the EPDM rubber in place.
      b. Slide Plates: The slide plates shall prevent excessive wear of the EPDM rubber seal. The slide plates consist of two 23 5/8” x 28 3/8” x 5/16” thick 304 stainless steel plates.
      c. Weir Plate: The weir plate placed between the slide plates and hinged to the angle iron at the bottom of the weir shall be made of a hot dip galvanized steel plate 16’-3 ¾” x 18 5/16” x 3/16” thick. At the top of the weir a 5½” tube x 3/16” wall shall be welded on.
      d. Weir Bracing: There shall at the bottom be welded on, cross ribs 1 3/16” x 3/8” over the full length, and vertical support ribs 5” x 3/8” x 3’-1½” centers.
      e. Seals: For sealing between the weir and slide plates, 2 layers of EPDM rubber strips 3/16” thick shall be bolted to the weir. For sealing between the weir and angle iron 2 layers of EPDM rubber strips 3/16” thick shall be bolted to the weir as well as to the angle iron.
3. Drive Assembly:
   a. The drive consists of an actuator, spindle, pull rod and bracket for support of the actuator.
   b. The motor shall be \( \frac{1}{2} \) hp nominal, 3600 rpm, 3 phase, 60 Hz, 460 volt.
      1) Motor shall meet the requirements of Div 26 – ELECTRICAL.
   c. The actuator shall have an output RPM of 26. It shall include a bronze spindle nut with acme thread, dia. 1½", 4 threads per inch.
   d. The upper edge of the weir plate shall be connected to the actuator through a welded on eyelet and a pull rod 1" x 1½".
   e. By means of the actuator, the upper edge of the weir shall be moved up and down to adjust the water level in the aeration tank. The range of movement shall be 0-14".
   f. The actuator shall be installed on a bracket, which shall be mounted on the concrete beam spanning the weir chamber opening.
   g. The bracket shall contain guide rails for the threaded spindle, which shall be furnished with guide rollers. These shall be mounted on a cross member on the lower end of the spindle and guide the spindle as well as take up the transverse forces deriving from the connection rod when the weir plate approaches the extreme upper and lower positions.
   h. In case the actuator upper or lower limit switch is defective, the open/close torque switches shall protect the actuator.

4. Spindle Shield:
   a. For protection of the spindle, a spindle shield tube shall be attached to the top of the actuator.

5. Bolting:
   a. All anchor bolts shall be furnished by the manufacturer and set with proper projection by the Contractor in accordance with approved, certified drawings furnished by the manufacturer. Anchor bolts shall be 304 Stainless Steel.

6. Steel:
   a. All parts mentioned in the specifications shall be made of A36 steel unless otherwise specified above.

7. Hot Dip Galvanizing:
a. Hot dip galvanizing shall be in accordance to the latest industry standards. Cadmium plating of bolts shall not be accepted.

2.6 5.0 METER ADJUSTABLE EFFLUENT WEIR

A. General

1. Furnish and install adjustable effluent control weirs as shown and specified in the Contract Documents. The weir(s) shall be 16'-5" in length. The weir(s) shall be continuously adjustable between their maximum and minimum elevations.

2. The adjustable weir(s) shall be so designed to ensure that all flows leaving the oxidation ditch shall exit by passing over the adjustable weir with negligible leakage around or below the weir assembly.

B. Construction

1. Outlet Weir: The unit shall consist of a tiltable weir plate, which by means of hinges at the lower edge shall be fastened to an anchor iron. An actuator shall raise and lower the weir. The complete unit shall be installed in a concrete chamber placed in the outside wall of the oxidation ditch.

2. Weir Assembly:

a. Anchor Iron: The main support for the weir plate consists of a hot dip galvanized angle iron 4" x 3" x 5/16" the full length of the weir with anchor bolts embedded in concrete and a retainer bar 1¼" x ¼" for holding the EPDM rubber in place.


c. Weir Plate: The weir plate placed between the slide plates and hinged to the angle iron at the bottom of the weir shall be made of a hot dip galvanized steel plate 16'-3 3/4" x 18 5/16" x 3/16" thick. At the top of the weir a 5½" tube x 3/16" wall shall be welded on.

d. Weir Bracing: There shall at the bottom be welded on, cross ribs 1 3/16" x 3/8" over the full length, and vertical support ribs 5" x 3/8" x 3'-1½" centers.

e. Seals: For sealing between the weir and slide plates, 2 layers of EPDM rubber strips 3/16" thick shall be bolted to the weir. For sealing between the weir and angle iron 2 layers of EPDM rubber strips 3/16" thick shall be bolted to the weir as well as to the angle iron.

f. Scum Board: The scum board shall prevent scum from escaping from the oxidation ditch. The scum board consists of a U-formed...
channel plate 5½” x 2 3/8” x 8 ga. bolted to the side brackets. On the channel is bolted on an EPDM rubber strip 8 5/8” x 3/8” thick retained at the back by a flat bar 1¼” wide x ¼” thick.

3. Drive Assembly:
   a. The drive consists of an actuator, spindle, pull rod and bracket for support of the actuator.
   b. The motor shall be ½ hp nominal, 3600 rpm, 3 phase, 60 Hz, 460 volt.
      1) Motor shall meet the requirements of Division 26 – ELECTRICAL.
   c. The actuator shall have an output RPM of 26. It shall include a bronze spindle nut with acme thread, dia. 1½”, 4 threads per inch.
   d. The upper edge of the weir plate shall be connected to the actuator through a welded on eyelet and a pull rod 1” x 1½”.
   e. By means of the actuator, the upper edge of the weir shall be moved up and down to adjust the water level in the aeration tank. The range of movement shall be 0-14”.
   f. The actuator shall be installed on a bracket, which shall be mounted on the concrete trough back wall
   g. The bracket shall contain guide rails for the threaded spindle, which shall be furnished with guide rollers. These shall be mounted on a cross member on the lower end of the spindle and guide the spindle as well as take up the transverse forces deriving from the connection rod when the weir plate approaches the extreme upper and lower positions.
   h. In case the actuator upper or lower limit switch is defective, the open/close torque switches shall protect the actuator.

4. Spindle Shield:
   a. For protection of the spindle, a spindle shield tube shall be attached to the top of the actuator.

5. Bolting:
   a. All anchor bolts and hardware shall be furnished by the manufacturer and set with proper projection by the Contractor in accordance with approved, certified drawings furnished by the manufacturer. Anchor bolts shall be 304 Stainless Steel.

6. Steel:
a. All parts mentioned in the specifications shall be made of A36 steel unless otherwise specified above.

7. Hot Dip Galvanizing:

a. Hot dip galvanizing shall be in accordance to the latest industry standards. Cadmium plating of bolts shall not be accepted.

2.7 SCREW BLOWER

A. GENERAL

1. Screw blower package with integrated controls including accessories as specified herein.


   b. All equipment specified in this section shall be designed and furnished by a single blower manufacturer, who shall be responsible for the suitability and compatibility of all included equipment per this section.

2. Furnish and install screw blower equipment with accessories necessary to provide a complete operational system as described within the Contract Documents.

B. Quality Assurance

1. Manufacturers’ Qualifications:

   a. All equipment furnished under this section shall be manufactured in a plant whose quality management system is certified / registered as being in conformity with ISO 9001 and who shall assume complete responsibility for the design and performance of the blower package.

   b. All equipment furnished under this section shall be new, unused, and shall be the standard product of the manufacturer, who shall have a minimum of 10 years’ experience in producing blower packages.

2. Factory Tests:

   a. All cast parts to be manufactured in a plant whose quality management system is certified / registered as being in conformity with ISO 9001.

   b. All critical dimensions of the blower components provided by the manufacturer shall be verified and documented prior to assembly.

   c. Each blower provided by the manufacturer shall be tested per ISO 1217, Annex B.
d. Each blower provided by the manufacturer shall be operated and tested at different pressures for a total of one (1) hour.

e. On completion of final assembly of the packaged blower and prior to shipment, each packaged blower shall be mechanically run for a minimum of one (1) hour.

f. Each Screw SFC-VFD blower package provided by the manufacturer shall be guaranteed to provide performance to ISO 1217, Annex E.

g. Each Screw STC blower package provided by the manufacturer shall be guaranteed to provide performance to ISO 1217, Annex C.

3. Reference Standard:

a. American Society of Testing and Materials (ASTM)

b. National Electrical Manufacturers Association (NEMA)

c. Occupational Safety and Health Act (OSHA)

d. National Electrical Code (NEC)

e. American Gear Manufacturers Association (AGMA)

f. Anti-Friction Bearing Manufacturers Association (AFBMA)

g. International Organization of Standardization (ISO)

h. International Electrotechnical Commission (IEC)

i. German Institute for Standardization (DIN)

C. Submittals

1. Manufacturer’s standard submittal for establishing compliance to this Section shall include the following items; following submittal procedures in accordance with Section 01 30 00 – SUBMITTAL PROCEDURES.

   a. Table of contents

   b. A complete and detailed list of any and all variations to the specification

   c. Descriptive literature, bulletins, and/or catalog cut sheets of the equipment.

   d. Scope of supply

   e. Blower package performance data sheets showing at least the following:
1) Package model name
2) Bare blower model name
3) Design conditions as listed in this section
4) Air flow in ICFM and SCFM for design conditions listed
5) Discharge pressure
6) Motor size
7) Package input power and Specific performance per ISO 1217 Annex C/E.
8) Bare blower speed with percentage of its maximum speed
9) Process air connection size.
10) Operating Voltage required for the blower package
11) Sound pressure and power levels
12) Dimensions
13) Package weight
14) Discharge temperature
15) Accessories being supplied
f. Installation data sheets
g. Manufacturer’s standard performance curve showing pressure differential, capacity in ICFM, blower shaft horsepower at standard conditions.
h. Blower package drawing showing all important details required for installation including dimensions, anchor bolt locations, size and location of connections to other works and weight of equipment.
i. Motor manufacturer’s data sheet showing at least the following:
   1) Motor manufacturer’s name and model number
   2) Efficiency class and %
   3) Efficiency at ½, ¾, and full load
   4) Amp draw
   5) Motor RPM
6) Code letter
7) Motor frame

j. Wiring schematic of blower package.
k. Inlet filter documentation
l. Data sheets for supplied components and accessories
m. Spare parts overview drawing
n. Recommend spare parts list
o. Paint specification for blower package
p. Maintenance overview
q. Blower startup check list
r. Lubrication requirements
s. MSDS sheet (oil)
t. Warranty information
u. Manufacturer’s standard for equipment standards
v. Compliance with Machinery Standards for sound and performance certificate

2. Manufacturer’s standard Operation and Maintenance Manual shall include the following sections; following submittal procedures in accordance with Section 01 78 23 – OPERATION AND MAINTENANCE DATA.

a. Regarding this Document
b. Technical Data for the blower package
c. Safety and Responsibility
d. Design and Function
e. Installation and Operating Conditions
f. Installation
g. Initial Start-up
h. Operation
i. Fault Recognition and Rectification
j. Maintenance
k. Spare parts, Operating Materials, Service
l. Decommissioning, Storage and Transport
m. Annex with Drawings and Diagrams

D. Product Delivery, Handling and Storage.

1. Delivery and Handling of Equipment:
   a. All equipment and materials shall be handled and stored in strict accordance with the Manufacturer’s requirements.
   b. The contractor shall be responsible for proper storage of the equipment so as to remain in “as shipped” condition. If the equipment remains in storage at the job site for longer than six (6) months before installation, the contractor shall provide factory service personnel for a complete inspection of the equipment. Any work necessary to restore the equipment to “as shipped” condition shall be the responsibility of the contractor.
   c. Manufacturer and Contractor shall coordinate the delivery schedule for just in time delivery to minimize the period the Blower package is on site before installation.
   d. Contractor shall unload and inspect all equipment and materials against reviewed shop drawings at the time of delivery. Any damage shall be reported to the freight company immediately upon receipt.
   e. Equipment and materials damaged or not meeting the requirements of the reviewed shop drawings shall be immediately returned for replacement or repair.
   f. Each box or shipping crate shall be properly marked to show its net weight and its contents

2. Storage:
   a. Contractor shall prepare for storage and label all equipment and materials after they have been inspected. The Contractor shall be responsible for the equipment and materials while in storage.
   b. Store materials to permit easy access for inspection and identification. Support all material off of the ground while protecting steel members and packaged material from corrosion and deterioration as per manufacturers’ instructions.

E. Spare Parts
1. Furnish the following manufacturer’s recommended routine maintenance spare parts for each blower package provided:
   a. Two (2) filter elements for integral inlet silencer
   b. Lubrication for first year of operation
   c. One (1) belt set
   d. Two (2) filter mats for blower control cabinet (Screw SFC-VFD blower package)
   e. One (1) tube of motor grease (50HP or larger)

2. All parts shall be furnished in clearly identified packaging.

F. Warranty

1. The manufacturer shall warrant the bare blower being supplied against all defects in workmanship and materials for a period of twenty-four (24) months from date of startup, not to exceed thirty (30) months from date of shipment from the manufacturer of the blowers. All other package components shall be warranted for a period of twelve (12) months from date of startup, not to exceed eighteen (18) months from the date of shipment.

G. Manufacturer

1. The equipment specified herein is intended to be standard equipment for use in low pressure air systems and be supplied by a single manufacturer or authorized sales representative to assure uniform quality, ease of maintenance, and minimal parts storage.

2. Manufacturer List:
   a. Kaeser Compressors, Inc.
      1) Model – FB660SL-SFC
   b. or Approved equal

H. Design Criteria

1. Standard Conditions for SCFM:
   a. Elevation: 14.7 PSIA (0’ elevation)
   b. Temperature: 68 deg F.
   c. Relative Humidity: 36%

2. Design (site) Conditions for ICFM:
a. Elevation: 14.6 PSIA (50’ elevation)

b. Maximum Blower Inlet Temperature: 100 deg F.

c. Relative Humidity*: 50%

   *Relative humidity at maximum blower inlet temperature.

3. Performance Data:

   a. Application: Ditch Jet Aeration System

   b. Quantity: 3

   c. Blower Packaged Controlled by a VFD: Yes

   d. Flow required: 2,130 SCFM

   e. Blower Package Discharge Pressure: 22.7 PSIA

   f. Motor Horsepower: 100 HP

      1) Motor shaft power shall account for belt losses in addition to internal package losses.

      2) The motor shall not operate in its service factor at design conditions.

   g. Power supply voltage:

      1) Blower Package: 460v/ 3ph/ 60hz

      2) Incoming supply configuration: center grounded WYE

   h. % of Maximum Blower Speed at 60hz: <= 99%

   i. Blower Package Sound Pressure Level: 74 dB(A) at 3 feet*

      * In accordance with ISO 2151, +/- 3 dB(A) at 1m, free field conditions, with insulated piping.

4. Plant System Communication:

   a. Interface: (PLC)

I. Blower Package Configuration:

   1. Installation Location: inside

   2. Inlet Configuration: ambient
3. All components and instrumentation are to be mounted and pre-piped; no field installation shall be required by the contractor. The manufacturer shall be responsible for all aspects of the engineering, from the blower package's air inlet to its discharge connection.

J. Bare Blower Construction

1. Blower type:
   a. The bare blower shall be mounted for vertical air flow, be of the oil-free, positive displacement, rotary screw type, designed for air or other inert gas service, and belt driven via electric motor.
   b. The bare blower assembly must operate at the effective value for vibration velocity in frequency range A and B, according to VDI 3836.

2. Material:
   a. AISI, ASTM, GJL, GLS, DIN, etc…, numbers, types, and grades specified are typical of material composition and quality, equivalent materials will be considered.

3. Housing:
   a. The casing shall be made of high strength, close grained, cast iron, and shall be adequately ribbed to prevent casing deflection and facilitate cooling. Casing shall be of EN GJL-200 material.
   b. The casing shall be precision machined to allow for minimum clearances.
   c. The casing shall allow for the thermal decoupling of the gearbox section allowing for low oil temperature. No additional oil cooler, oil pump or oil filter in the oil circuit is acceptable.
   d. The casing shall include threaded atmospheric vent ports between its air-side and oil-side labyrinth seals for safe separation of the conveying and oil chamber.
   e. Bearing fits shall be precision machined to ensure accurate positioning of the rotors in the casing.

4. Rotors:
   a. The main rotor shall be machined out of a one piece casting made of EN GJL-250 material.
   b. The secondary rotor shall be machined out of a one piece casting made of EN GJL-500 material.
c. The shaft of the rotor shall be press fit and machined out of C45 shaft material.

d. The rotors shall be machined with precision tolerance to ensure consistent rotor clearance and stable volumetric efficiency.

e. The rotor assemblies shall be statically and dynamically balanced to ISO standard 1940/1- Q2.5 (turbine rotor). Modifications to the face of the rotors for balancing purposes are not acceptable.

f. The rotors shall have the energy-efficient Sigma Profile for the maximum degree of delivery.

g. The rotor must be solid or closed-end to prevent build-up of contaminants inside the rotor causing imbalance.

h. The rotors shall operate without rubbing, liquid seals or lubrication in the air chamber. No wear-prone surface coating shall be allowed.

5. Cover Plates:

a. The drive and gear-end cover plates shall be high strength, close grained, cast iron material. Aluminum end plates shall not be allowed.

b. The cover plates shall have a precision machined sealing face.

c. The drive end plate shall include at least two precision machined holes to allow for the use of fitting bolts to accurately align the opening for the input shaft seal.

6. Timing Gears:

a. The rotor timing gears shall be precision machined and ground from alloy steel made from case hardened 16 MnCr5 material.

b. Each timing gear shall be straight cut and beveled to quality standard 5f 21, which will eliminate axial bearing loads and ensure long life as well as quiet operation. Helical gears, which cause axial loading, shall not be allowed.

c. Each timing gear shall be manufactured in accordance with:

   1) DIN 3960, Specifications for Spur Gear Sets
   2) DIN 3961 & DIN 3962, Tolerances for Spur Gear Mesh
   3) DIN 3964, Specifications for Shaft Centering
   4) The timing gear set shall be taper-mounted on the rotors. Keyed, hub mounted, taper-pinned, or splined shaft timing gear mounting designs are not acceptable.
7. Bearings:
   a. All four rotor shaft support locations shall incorporate large, heavy-duty, full complement, cylindrical roller bearings with PEEK cages to absorb the radial gas forces which affect the rotors and change continuously. An additional gear side ball bearings on the driven rotor shall be used for axial load forces.
   
   b. The bearings minimum acceptable L10 design life shall be as follows:
      
      1) At least 40,000 hours at blower’s maximum rated speed and maximum rated differential pressure.
      
      2) At least 100,000 hours at design conditions.

8. Lubrication:
   a. Both the gear end and the drive end of the blowers shall be oil splash lubricated via a disc slinger for minimal maintenance and long service life. Grease lubricated bearings in the blower are not acceptable.
   
   b. The lubrication design shall ensure adequate lubrication of the timing gears and bearings.
   
   c. The drive-end and gear-end oil chambers shall not be interconnected. Each oil chamber shall have x1 drive-end and x2 gear-end domed designed sight glasses which will allow visual inspection of oil level and oil condition, viewable from the front of the blower.
   
   d. Blower to be factory filled with a synthetic lubricating fluid that is rated for the design conditions specified.

9. Rotor Seal Assembly:
   a. Each rotor shall include one seal assembly on each end, four assemblies in total per blower. Each seal assemble shall consists of the following:
      
      1) Oil splash guard ring.
      
      2) Shaft guide wear sleeve with vent holes located between the air and oil seals. Wear sleeve to protect the blower casing.
      
      3) Two piston ring type labyrinth seals made from heat treated GG/42CrMo4 material shall be located on the air side and two spiral sealing seals shall be located on the oil side of the rotor sleeve. The use of rubber lip seals shall not be allowed.
4) Seal assemblies shall not require an additional vacuum pump or electric oil mist separator for a sealing effect.

10. Input Shaft Seal Assembly:
   a. The input drive shaft seal shall be a sliding ring type mechanical seal that will prevent oil leakage from where the input shaft goes thru the drive end cover plate.
   b. The mechanical seal assembly shall consist of the following:
      1) Replaceable wear sleeve on the input drive shaft
      2) Cover plate with a machined sealing surface
   c. Mechanical sliding ring seal
   d. The input shaft seal design must allow for the mechanical seal assembly to be replaced without removing the drive end cover plate.

K. Motors:

1. Drive Motor:
   a. Motor shall meet the requirements of Division 26 – ELECTRICAL
   b. Motor shall be designed, manufactured, and tested in accordance with the latest revised editions of NEMA MG-1, IEC, DIN, ISO, IEEE, ANSI, and AFBMMA standards as applicable and shall be capable of continuous operation.
   c. Motor must meet or exceed Energy Independence and Security Act (EISA 2007) standards for NEMA Premium efficiency. It shall also be marked with a Department of Energy Certification Compliance Number to assure compliance.
   d. Motor shall comply with Low Voltage Directive 2006/95/EC or equivalent and be UL listed.
   e. Motor must be inverter rated with impulse peak resistance in accordance with IEC 60034-1:2010 or equivalent for operation with an IGBT frequency converter or equivalent.
   f. Motor horsepower nameplate rating shall not be exceeded at the design discharge pressure when operating at 60hz.
   g. The temperature rise of the motor windings shall not exceed IEC and NEMA standards when the motor is operated continuously at the rated horsepower, rated voltage, and frequency in ambient conditions at 104°F / 40°C.
h. Motor shall be suitable for Full Load/Direct On-line starting, Solid State Ramp starting, VFD, and/or Wye-Delta reduced current starting.

i. Motor to be supplied, mounted and aligned by the blower package manufacturer.

j. VFD controlled motor (≥100HP) shall have an isolated non drive end “B-side” bearing. Methods of shaft insulation by means of brushes and/or grounding rings are not acceptable.

k. Motor shall confirm to the following:

1) Motor voltage: 460v/ 3ph/ 60hz
2) Type: Squirrel cage induction
3) Speed: Single
4) Torque: Constant
5) Service factor: 1.15
6) Enclosure: TEFC
7) Mounting: Horizontal
8) Speed: 3,600 rpm @ 60 hz (maximum)
9) Design: A
10) Duty cycle: continuous (24 hours a day)
11) Winding insulation: F
12) Temperature rise: B
13) Thermal motor protection: Positive Temperature Coefficient (PTC) thermistors (one per winding) wired in series. The use of thermostats is not allowed
14) Conduit box location: Top
15) Wiring Connection: Terminal strip inside conduit box. Use of wire nuts for connection of motor wiring to power source shall not be allowed.
16) Bearing L10 life: >40,000 hours
17) Bearing lubrication: Grease
18) Bearing type: Regreaseable,
a) Lubrication fittings must be located towards the front of the blower package so that both bearings can be safely lubricated while the blower package is running.

b) Grease drain holes to be closed for protection of the environment. A spent grease cavity in the bearing cover should be large enough to hold spent grease required for 40,000 operating hours.

19) Bearing design: Cantilever forces (belt drive)

20) Condensation winding 110v heater: No

21) Motor shall be as manufactured by Siemens.

2. Sound enclosure ventilation fan motor:
   a. Motor shall be UL listed
   b. Motor starter/overload protection shall be provided and wired.
   c. Motor shall turn ON when the main motor starts and turn OFF after a predetermined time after the main motor stops. Controlling the fan motor via a thermostat or remote ON/OFF switch shall not be allowed.

L. Blower Package

1. Drive:
   a. The blower shall be driven by the drive motor through a V-belt drive assembly designed to meet the blower conditions specified with a 1.2 or larger service factor.

   1) V-belts shall have a XPZ/XPB profile with embedded low-stretch polyester tension cords. The v-belts shall be designed for high rotational speeds and be heat and oil resistance. Ribbed, banded, or multi groove belts shall not be allowed.

   2) Sheaves shall have a SPZ/SPB profile and be balanced to G6.3 for sheaves.

   b. The blower drive must have a fully enclosed guard which protects the operator when the blower package enclosure is open while in operation.

   1) Belt guard shall be OSHA approved.

   2) The belt guard made from the manufacturer’s standard sheet metal, shall be designed to duct the cooling air flow
from the drive motor fan across the front of the blower to supplement blower input shaft seal cooling.

3) The mounting fasteners for the belt guard shall be retained on the housing to prevent loss during maintenance.

c. Belt tension shall be accomplished by the use of a motor swing base and automatic tensioning assembly.

1) The drive motor shall be mounted on a pivoting swing base with an axial adjustment for proper alignment of the v-belts. The weight of the drive motor shall provide the primary belt tension. The use of a sliding motor mount shall not be allowed.

2) A tensioning assembly consisting of a threaded rod with spring shall be used to adjust the v-belt tension to prevent belt slippage and efficiently transmit power to the blower. It shall include a visual indication showing whether or not the v-belt tension is within the correct belt tension range.

3) Adjustment of the tensioning assembly shall be accomplished without removal of the guard or loosening of the motor mounting bolts.

4) The design of the swing base with tensioning assembly shall prevent the swing base from falling and creating a personnel hazard in the event of a belt failure. The tensioning assembly adjusting nut shall raise the motor swing base facilitating v-belt changes without the use of pry bars or jacks.

2. Inlet Silencer:

a. An inlet silencer designed for the frequency range of the blower, shall be provided to reduce the noise of the blower package as specified.

1) The inlet silencer shall be of carbon steel construction and be of the wear-free absorptive type, directly connected to the inlet port of the blower, and shall be mounted horizontally.

2) The inlet silencer shall be lined with replaceable polyether absorptive material.

3) The inlet silencer shall have an integral filter designed to protect the blower from particulates. It shall be located between the absorptive material and the blower inlet.
a) The filter element shall be a washable and reusable polyester element for minimal pressure drop.

b) The filter efficiency shall meet ASHRAE 52.2 MERV 7 50-70% @ 3-10 microns corresponding to EN779 G4.

c) The filter element integral to the silencer shall be supplied no matter if the inlet configuration of the silencer is ambient or piped.

d) Filter element shall be removable without disconnecting the inlet duct.

4) The filter maintenance cover and element must be removable by hand (without the use of tools).

5) The pressure loss thru the inlet silencer assembly shall be accounted for in the motor horsepower selection of the blower package.

3. Base frame with integrated discharge silencer:

   a. The blower base frame with integrated discharge silencer shall be designed for the frequency range of the blower, shall be provided to reduce the noise of the blower package as specified.

      1) The blower base frame shall be of formed steel construction and designed for horizontal mounting of blower with vertical air flow. Flange-mounting only of the bare blower to the blower base frame shall not be allowed, additional support by use of the base frame shall be required; preventing the loading of the blower casing and discharge silencer shell.

      2) The blower base shall incorporate the pivoting motor swing base and tensioning assembly to insure proper alignment of the drive assembly.

      3) The discharge silencer shall be an integral part of the base frame.

      4) The discharge silencer type shall be a combination of absorption, reflection and diffusion.

         a) The design of the discharge silencer shall incorporate a solid outer and perforated inner cylinder with absorptive material in between the cylinders.

         b) Absorptive material shall be long, flexible, knotted polyester fibers to allow for lowering the noise and
heat emissions inside the sound enclosure. The use of mineral wool shall not be allowed.

c) The discharge silencer shall have connections ports for pressure relief, discharge pressure, and discharge temperature. Unused ports shall be capped or plugged.

d) The pressure loss thru the discharge silencer assembly shall be accounted for in the motor horsepower selection of the blower package.

4. Blower Sound Enclosure:
   a. A sound enclosure shall be provided which fully covers the blower, motor, drive assembly, inlet silencer, blower base frame with integrated discharge silencer, and be shipped fully assembled.

   1) The sound enclosure shall be the product of the blower manufacturer to insure proper integration of blower package components.

   2) The sound enclosure shall meet the sound level specified.

   3) The sound enclosure acoustic material shall comply to FMVSS 302 with a burning rate B or lower than 100 mm/min.

   4) The sound enclosure assembly shall be of self-supporting bolted steel panel construction on a fabricated steel skid.

      a) All maintenance removable panels or doors shall be located in the front of the sound enclosure and must have a slotted key lock. A door key shall be provided. All maintenance panels shall meet OSHA weight requirements.

      b) The enclosure base shall be designed to enclose the full bottom of the sound enclosure and include fork lift guides for easy transportation and installation.

   5) The sound enclosure ventilation cooling air circuit shall be separate from the process air circuit. Mixing of the two air circuits within the enclosure shall not be allowed.

   6) The sound enclosure shall have a set of inlet louvers positioned on the blower-side of the enclosure to allow for the flow of ambient cooling air across the blower oil sumps.
7) A screened inlet louver shall be located on the back of the enclosure and designed to provide a laminar flow of ambient cooling air across the blower drive motor.

8) The sound enclosure ventilation air exhaust and the ventilation fan shall be located at the top of the sound enclosure.
   a) The ventilation fan shall be sized to provide adequate cooling of the blower package at all blower speeds.

5. Control Cabinet
   a. Shall meet the requirements of Division 40 – PROCESS INTERCONNECTIONS.
   b. A control cabinet located on the side of the sound enclosure shall be preinstalled and wired on the sound enclosure skid.
   c. The control cabinet shall be UL-508A approved and shall meet or exceed IP54 standards for environmental protection.
   d. The back of the control cabinet shall have predrilled holes with grommets for easy pass thru of electrical wiring.
   e. The control cabinet’s back plate shall be galvanized for improved grounding.
   f. The Screw SFC-VFD blower package’s control cabinet shall have a lockable hinged door which allows access to the factory installed variable frequency drive, enclosure vent fan starter, terminals, relays, operator control panel, cabinet cooling fan and all interconnecting wiring.
      1) The control cabinet shall utilize a high cooling fan to remove heat from the cabinet and maintain proper operating temperatures.
   g. The Screw STC blower package’s control cabinet shall have a lockable hinged door which allows access to the factory installed main motor starter, enclosure vent fan starter, terminals, relays, operator control panel and all interconnecting wiring.
      1) The main motor starter shall be a magnetic, wye-delta, reduced-voltage starter, to ensure low starting current and soft start.

6. Operator Control Panel
a. Shall meet the requirements of Division 40 – PROCESS INTERCONNECTIONS

b. The operator control panel shall consist of a Sigma Control 2™ controller. The controller shall be suitable for use in an ambient temperature range of -4°F to +140°F.

c. The controller shall be suited for the specified conditions as previous listed and include an industrial PC with powerful processing software that will allow for the control, regulation, and monitoring of the blower package, along with allowing the display and modification of machine settings and external communication.

1) The controller shall include a stabilized 24VDC power supply and a real time clock with a scheduling timer.

2) A buffer battery with a ten year lifetime shall be included for protection of system memory and internal clock.

3) The controller shall include digital and analog inputs/outputs for controlling and/or monitoring the following.

   a) Main motor, sound enclosure ventilation fan motor and electrical cabinet ventilation fan motor (Screw SFC-VFD blower package).

   b) Emergency stop button

   c) Voltage monitoring

   d) Blower inlet and discharge temperature

   e) Blower inlet and discharge pressure

   f) Filter differential pressure

   g) Sound enclosure temperature

   h) Oil temperature and oil level

4) The controller shall have the ability to be externally wire for the following digital input/output signals.

   a) Remote on/off (DI)

   b) Remote reset of fault message (DI)

   c) Remote no external failure (DI)

   d) Blower running signal (DO)

   e) Blower on signal (DO)
f) Group alarm signal (DO)

g) Group warning signal (DO)

h) Remote 4-20mA blower speed signal (Screw SFC-VFD blower packages) (AI)

i) 0-20mA speed output from inverter (Screw SFC-VFD blower packages) (AO)

5) The controller shall include touch key controls with LED indications on important functions.

6) The controller display shall be LED backlit with a plain text and graphical display capable of displaying the blower packages status in various languages.

7) The controller shall utilize “Unique Radio Frequency Identification (RFID) Technology, which ensures secure log-in for users and service personnel so service work and system changes can be performed only by authorized and qualified personnel.

8) The controller shall include integrated web server.

9) The controller shall include a SD card slot for the manual loading of updates and recording/recording of controller specific process data.

10) The controller shall include an expansion slot for communicating with various industrial protocols/plant monitoring systems.

11) The controller sensor connections shall be via a central I/O module with labelled connections.

12) The controller shall include displayable operating and maintenance hour counters for major components.

13) The controller shall have the ability to be timed controlled via up to 10 programmable timers.

14) The controller shall shut down the blower package in the event of a motor overload, high blower differential temperature, high blower differential pressure, high sound enclosure temperature, in-correct rotation, loss of drive or external failure signal.

15) The controller shall have a programmable and selectable auto re-start after loss of power.
d. The controller shall have the ability to communicate the status of the blower package in the following ways to the operator.

1) Local control status at the controller display
2) Remote machine status via the supplied Ethernet connection
3) Emailing of operational, warning or alarm conditions to the operator via Ethernet port/connection.
4) Operator’s systems plant communication via Profibus DP, Modbus RTU, Modbus TCP, DeviceNet, or Profinet

e. The controller shall enable the blower package to be controlled by the following ways.

1) ON and OFF directly at the blower package
2) ON and OFF remotely away from the blower package
3) ON and OFF from selectable timers in the controller

f. The Screw SFC-VFD blower package’s controller shall enable the blower package to be controlled by the following control modes.

1) Pressure regulation with a PID loop
   a) The controller automatically regulates the deviations between the setpoint and actual pressure by changing the speed of the drive motor.
   b) The setpoint pressure is specified by setting a parameter in the controller. This is the default control mode when blower package ships.
2) Speed setting with an external 4-20mA signal
   a) The motor speed is controlled via an external analog signal within the programmed speed minimum and maximum speed range.
3) Manual speed setting
   a) The motor speed is controlled manually by the operator changing the speed via the controller display.

7. The Screw SFC-VFD blower package’s drive system shall be Variable Frequency Drive as follows
a. The blower drive system shall use a 6-pulse, constant torque, AC variable frequency drive using pulse width modulation technology (PWM), integrally mounted and wired into the blower package control cabinet.

b. The blower drive shall consists of the power module (frequency converter), control unit and BOP-2 User interface. It shall be of Siemens SINAMICS converter family or equal.

c. The blower drive shall “soft start” to allow for unlimited motor starts per hour.

d. The blower drive shall monitor the motor PTC thermistors.

e. The blower drive control and data input shall be via bus system from the blower controller as sole and central operating unit and communication interface.

f. The blower drive shall come completely programmed and parametrized. A SD card slot shall be provided for updates.

g. The blower drive shall have a line reactor preinstalled and wired. The line reactor shall smooth voltage peaks, bridge commutation gaps and reduce the effects of harmonics on the inverter and line supply.

h. The blower drive shall include a class A noise suppression line (RFI) filter either integrated to the power module or preinstalled and wired between the line reactor and power module.

i. The blower drive shall be protected from Electro Magnetic Interference by utilizing shielded motor connection cables.

8. Blower Package Accessories:

a. Pressure Relief Valve

1) The relief valve(s) shall be factory installed within sound enclosure. Relief valve may not be shipped loose for field installation in the discharge piping.

2) The relief valve(s) shall be spring type and must be sized for 100% of the design flow specified. Weighted relief valves shall not be used.

3) The relief valve(s) shall be set to protect the blower from excessive differential pressure based on the design conditions specified. A seal shall be affixed that must be broken if set point is changed.
4) The relief valve(s) exhaust shall be vented out of the sound enclosure. Exhaust vented into the sound enclosure shall not be allowed.

5) The relief valve shall be ASME Section IIIV, UV, CE, and PED certified.

6) The relief valve shall be manufactured by Kunkle or equal.

b. Check Valve

1) A check valve to prevent back flow through the blower shall be factory installed and not shipped loose for field installation in the discharge piping.

2) The check valve flapper shall be swing type made from a steel disc embedded in a high temperature silicone elastomer. The valve shall be designed so that, in the event of failure, the valve element is retained in the valve housing. Split disc or center hinged designs shall not be used.

3) The check valve capacity shall exceed the blower package’s maximum discharge pressure and temperature.

c. Flexible Connector

1) An elastomeric compensator/flex connector shall be provided to isolate the connection of the blower package to the self-supporting system piping. Restraining rods shall not be used. Flex connectors located between the bare blower and silencers shall not be allowed.

2) The flexible connector capacity shall exceed the blower package’s maximum discharge pressure and temperature.

a) Maximum temperature shall be assumed at minimum operating speed of the blower unit. This temperature shall correspond to the maximum temperature rate of the blower compressor to allow for maximum blower turndown during normal operations.

3) The Discharge connection shall be an ANSI/DIN flanged arch-type EPDM web reinforced connector.

4) Piped Inlet connection –When required reference Blower Package Configuration section, shall be provided with a web reinforced silicone rubber sleeve with corrosion resistant clamps shall be provided

d. Oil Drains
1) An oil drain from the blower drive-end and gear-end lubricating oil sumps shall be separately piped to the front of the blower base with flexible tubing. Common fill and drain shall not be allowed.

2) Each oil drain shall include a drain valve installed for ease of maintenance. The drain valves shall be 90° stainless steel ball valves and include a fully retained gasketed threaded cap to prevent accidental discharge of the blower lubricant.

e. Vibration Isolators

1) Vibration isolators shall be provided between the base frame with integrated discharge silencer and sound enclosure skid to prevent transmission of vibration to the foundation.

2) A ground wire shall be installed between the blower base and the sound enclosure base to allow for grounding of the complete blower package.

f. Inlet and Discharge Pressure Transducer

1) Pressure transducers shall be installed on the inlet and discharge of the blower and shall be monitored by the Sigma Control 2 operator panel.

2) The transducers shall have the following range

   a) 0 to -17.4 PSIG (inlet)
   b) 0 to 17.4 PSIG (discharge)

3) The transducers shall have a sensor made of Ceramic aluminum oxide

4) The transducers shall have a output signal of 4-20mA

g. Inlet and Discharge Temperature Sensor

1) Temperature sensors shall be installed on the inlet and discharge of the blower and shall be monitored by the Sigma Control 2 operator panel.

2) The sensors shall have a temperature range of -58°F to 392°F.

3) The sensors shall have a thermowell made of brass.

4) The sensors shall have a measure element of Pt100.

h. Enclosure Temperature Sensor
1) The blower package shall include an installed temperature sensor that measure the temperature inside of the blower package’s enclosure and shall be monitored by the Sigma Control 2 operator panel.

2) The sensor shall monitor that the enclosure of the blower package operates within a temperature range of 5°F to 149°F.

3) The sensor shall have a thermowell made of stainless steel.

4) The sensor shall have a measure element of Pt100.

i. Oil temperature sensor

1) The blower shall include an installed oil temperature sensor in the gear side oil sump that shall measure the oil temperature.

2) The oil temperature sensor shall have a temperature range of -58°F to 482°F.

3) The sensors shall have a thermowell made of brass.

4) The sensors shall have a measure element of Pt100.

j. Oil level switch

1) The blower shall include and installed oil level switch, one for each oil sump that shall measure the oil level in each oil sump of the blower.

2) The oil level switch shall be preset for low oil condition.

3) The oil level switch shall be a SPST switch, Voltage rating up to 250v, .5 A.

k. Gear Chamber Aeration Demister System:

1) Each air chamber shall be vented to atmosphere through an aeration demister system.

2) The demister system will discharge into cabinet 99.98% oil free air.

3) Any oil collected by demister system shall be automatically drained back into gear side blower oil sump.

9. Nameplates:

a. The blower package shall have at least two weather proof corrosion resistant type nameplates which includes the manufacturer name,
phone number, model number, year, capacity, max end pressure, max pressure difference, blower speed, equipment number, part number, serial number, voltage, phase, HP, motor Hz/ rpm, and FLA attached on the outside and inside of the blower package.

10. Anchor bolts and hardware:
   a. Anchor bolts, washers, hex nuts, and all other fastening hardware shall be 316 stainless steel and be supplied by the Contractor.
   b. Equipment manufacturer shall provide anchor bolt sizing.

11. Paint Specification:
   a. The blower manufacturer is responsible for surface preparation, priming and finish coating of the blower package and components requiring paint in accordance with the manufacture’s standard procedures. Field painting of blower equipment or supplying components that are only prime painted is not acceptable.
      1) Cast parts are to be painted with a two part gray epoxy primer and two part top coat.
      2) Fabricated parts are to be painted with a two part gray epoxy primer and two part top coat.
      3) Sound enclosure parts are to be powder coated.
         a) Panels and base paint finish shall be pretreated by de-greasing and phosphate cleaning, then powder coated to a thickness of 70 µm -100 µm on both sides.
         b) The blower package to be painted the blower manufacturer’s standard colors.

2.8 PROCESS VALVES
   A. Butterfly Valves
      1. Butterfly valves and accessories shall be in accordance with the applicable ASTM and/or ANSI/AWWA Specifications, as amended to date, and shall be manufactured by DeZurik, or equal. Valves shall be bubble tight at rated pressures and shall be satisfactory for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90° from full open position to the tight shut position. A certification attesting to operation and leak test shall be furnished with the valves upon shipment. Wafer type valves are not acceptable.
2. **Bearings:** Valve bearings shall be of the self-lubricated bronze with shaft seals to prevent leakage and to protect bearings from internal or external corrosion.

3. **Seats:** Seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall also act as a body liner to prevent flow from contacting the body casting. Seats shall have flange sealing to provide a positive seal without the use of flange gaskets. Seats shall be EPDM suitable for high temperature air.

4. **Shafts:** Shafts shall be one piece and shall be of 416 stainless steel. Shaft diameter shall meet the 75B standard from AWWA specification C504-87 for butterfly valves. Shafts shall be finished ground to minimize bearing and shaft seal wear. Shafts of 12" and larger shall have a non-adjustable thrust collar.

5. **Disc:** Disc shall be cast iron with welded nickel edge. The disc-to-shaft connections shall be type 316 stainless steel. Pins, shaft and disc of all valves shall be individually machined and completely interchangeable.

6. **Actuators:** Per Section 40 05 57 – VALVE OPERATORS AND ELECTRIC VALVE ACTUATORS.

7. **Valve schedule:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Size</th>
<th>Type</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four (4)</td>
<td>6&quot;</td>
<td>Modulated</td>
<td>Air drops</td>
</tr>
</tbody>
</table>

B. **ECCENTRIC PLUG VALVES**

1. All eccentric, permanently lubricated plug valves shall be of the tight-closing, rubber seat type. Valves shall be suitable for sewage and wastewater applications. Valves shall be bubble-tight at the full rated pressure in either direction. Valves shall be suitable for throttling service and/or operation after long periods of inactivity. Valve manufacturers shall have a minimum of five (5) years’ experience.

2. Valve bodies shall be constituted of cast iron ASTM A-126 Class B. Flanges shall fully conform the drilling and thickness requirements of ANSI B16.1, Class 125. Body wall thickness shall conform to AWWA C504-80.

3. Plug shall be of the balanced type, cast iron, ASTM A-126, Class B or ASTM A-436 (Ni-Resist) or Ductile Iron ASTM a-536.

4. Port passage size shall be at least 80% of the full port area for valves 20 inches and smaller, and 70% of the full port area for valves 24 inches and larger, for minimum pressure drop. Valve must be capable of passing the same solids requirements as the pump specifications.

5. Seating surfaces shall meet the requirements of AWWA C509-80.
6. Upper and lower bearings shall be stainless steel, permanently lubricated.

7. U-cup or V-type, self-adjusting, wear compensating packing. Packing shall be replaceable without removing the valve bonnet or plug.

8. Valves shall be rated 150 lb. WOG or 400 lb. WOG as required.

9. Interior epoxy coated, 8 mil minimum per AWWA 550-81.

10. All valves shall be leak tested to their full rating prior to shipment. Actuator mechanism must be fully isolated from line media.

11. Actuator: Per Section 40 05 57 – VALVE OPERATORS AND ELECTRIC VALVE ACTUATORS.

12. Valve schedule:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Size</th>
<th>Type</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>One (1)</td>
<td>14”</td>
<td>Modulated</td>
<td>RAS Flow Control</td>
</tr>
<tr>
<td>One (1)</td>
<td>6”</td>
<td>OPEN/CLOSE</td>
<td>WAS Flow Control</td>
</tr>
</tbody>
</table>

2.9 OXIDATION DITCH CONTROL PANEL – GENERAL

A. Shall meet the requirements of Division 40 – PROCESS INTERCONNECTIONS.

B. Shall meet the requirements of Division 26 – ELECTRICAL.

C. The Oxidation Ditch Supplier shall provide a common PLC-based control panel to monitor and control the Oxidation Ditch, ATAD and Discfilter processes. The PLC-based control panel shall include the PLC, operator display, control relays, push buttons and selector switches, indicating lights, power supplies, incoming power surge protector, analog isolators, signal conditioners, circuit breakers, and terminal strips.

D. The Contractor shall furnish and install all required equipment, including signal wiring, piping, terminations, incidental conduits, and necessary mounting and accessory equipment to provide a complete and operational system.

2.10 CLOUD-BASED PROCESS MONITORING AND SUPPORT SYSTEM

A. General

1. Include hardware and software programming necessary to provide a cloud-based Portal for monitoring and system support as part of the Oxidation Ditch control system. All required hardware shall be preinstalled in the system control panel to facilitate the extraction of PLC data, as well as data from other PLCs on a common network, if required.

2. Installed hardware shall transmit data to the cloud via internet connection, and the cloud shall be capable of transmitting data to the installed
hardware. If a broadband internet connection is not available, provide necessary hardware to allow for cellular communication between the plant and the cloud.

3. All data transferred shall be fully encrypted via the most recent TLS encryption and shall use SSL certificates at both ends of the data communication chain.

4. The Portal shall be accessible from any desktop or laptop computer, as well as from any smartphone or tablet or any other device with a web browser and an active internet connection. A password shall be required to access the Portal, and the Owner shall have the ability to define Monitoring and support solutions that rely on dial-in or VPN type connections, or require software other than a conventional web browser such as Google Chrome or Firefox to use the Portal, will not be acceptable.

B. Portal Functions

1. The Portal shall contain the following baseline functions:
   a. A user-configurable Dashboard with multiple widgets to allow the easy viewing and navigation with the Portal.
   b. Access to all electronic O&M manuals, product data sheets, operational and training presentations and videos, and other resource documents for the equipment specified in this section and for other processes and equipment as provided by the Owner.
   c. Real-time graphical representation of all input data with user adjustable ranges and the ability to compare any parameters.
   d. A number of Key Performance Indicators (KPIs) specific to the Oxidation Ditch technology shall be calculated and displayed in real time to aid in quick assessment of system performance and areas of optimization.
   e. The Portal shall feature phone call and text messaging functions to notify designated representatives of the Owner and/or Manufacturer of important notifications regarding the current status of the Oxidation Ditch system.
   f. The Portal shall include a Customer Service module that includes access to all contracts between Manufacturer and Owner. Viewing and downloading of all current and past contracts for service, spare parts, or other purchases shall be available through the Portal.
   g. The Portal shall include a data import function to allow lab-derived or other useful data recorded within a spreadsheet or other .csv file format to be quickly imported and automatically populated in graphical displays and the generation of applicable KPIs.
2. The cloud-based service shall be easily expandable to provide additional functions and incorporate unit operations from other locations in the facility, as well as unit operations at other facility locations.

3. The cloud-based service will be fully accessible by the Manufacturer to aid in system optimization and troubleshooting. There will be no charge to the Owner for use of the service through the performance testing period.

2.11 FIELD INSTRUMENTATION

A. Dissolved Oxygen Probes

1. The interface unit shall convert the sensed dissolved oxygen concentration to an analog electrical signal.

2. The wetted probe shall sense the dissolved oxygen concentration via a luminescent sensor. The signal from the sensor shall be tied to the interface unit that will convert the sensor signal to a 4 to 20 mA signal that will interface with the PLC. The dissolved oxygen transmitter shall be utilized for monitoring the dissolved oxygen concentration in the tank.

3. The measuring principle shall be based on luminescent material that is sensitive to oxygen.

4. Sensor replacement shall not require factory service personnel to be present. Calibration shall be accomplished in free air and will not require special chemical baths.

5. The interface unit shall be housed in a NEMA 4X/IP66 metal enclosure with a corrosion-resistant finish. The panel must be complete with terminal strips and wire ducts (if needed).

6. Operation characteristics

a. The dissolved oxygen probe shall be a continuous-reading probe that utilizes luminescent sensor technology.

b. The probe will not require calibration more frequently than once every six months.

c. The probe material shall be formed Noryl® and 316 Stainless Steel. All parts of the probe shall be corrosion resistant and fully immersible.

d. The sensor material shall be polybutyl methacrylate.

e. The measurement range shall be 0.00 to 20.00 mg/L dissolved oxygen.

f. The operation of the analyzers shall not be affected by H2S, pH, K⁺¹, Na⁺¹, Mg⁺², Ca²⁺, NH₄⁺¹, Al³⁺, Pb⁺², Cd²⁺, Zn²⁺, Cr (total), Fe⁺²,
Fe$^{3+}$, Mn$^{2+}$, Cu$^{2+}$, Ni$^{2+}$, Co$^{2+}$, CN$^{-}$, NO$_3^{-}$, SO$_4^{2-}$, S$^{2-}$, PO$_4^{3-}$, Cl$^{-}$, anion active tensides, crude oils, or Cl$_2$.

g. The probe shall provide electrolyte-free operation without the requirements of sample conditioning.

h. The probe shall be furnished with a mounting kit.

7. The analyzer shall be HACH LDO® Probe and sc200 Controller interface unit

B. Thermal mass flow meter

1. The Process Equipment/Technology Supplier shall provide airflow meters for monitoring the airflow to each treatment train.

2. The Thermal Mass Flowmeter shall use thermal dispersion technology to provide direct mass flow measurement.

3. The unit shall be installed in line sizes ranging from 2 inches to 24 inches with a ½” or ¾” NPT connection.

4. The sensor/transmitter shall generate a 4-20mA analog output that will directly correlate to the measured flow. The transmitter can be configured in two standard configurations, integral transmitter with local display or remote transmitter with display.

5. The Thermal Mass Flowmeter shall be capable of measuring air, compressed air and nitrogen, with a range of 0.75 SFPS to 400 SFPS, with an accuracy of +/- 2% of reading, +/- 0.5% of full scale.

6. The Flow Element shall be insertion type, thermal dispersion method, 316 stainless steel body with Hastelloy C thermowell sensors, 316 stainless steel compression fitting with Teflon or stainless steel ferrule. Maximum operating pressure for stainless steel ferule 500 psig, Teflon ferrule 150 psig. Maximum operating temperature: stainless steel ferrule 0°F to 250°F, Teflon ferrule 0°F to 200°F. The insertion length shall be field adjustable lengths: 1” to 6”, 1” to 12” or 1” to 18”.

7. The Thermal Mass Flowmeter Transmitter shall be NEMA 4X [IP67], aluminum, and dual conduit ports.

8. The Transmitter will have two (2) 4-20mA outputs user assignable to flow rate and/or temperature.

9. The Transmitter shall operate with input power of 18~36VDC (6 Watt Maximum) or 85~265VAC (12 Watt Maximum), and operating temperature of 0°F to 140°F.

10. The Transmitter digital display +/- 9999 counts LCD, 0.45” H characters, user scalable to flow rate units or as 0-100%.
11. The unit shall be rated non-incentive for use in Class 1, Division 2, Groups A, B, C, and D where indicated on the Contract Drawings.

12. The Thermal Mass Flowmeter shall be FCI ST50 or approved equal.

2.12 Anchor Bolts

A. Manufacturer shall provide calculations to justify the size of anchor bolts for installed equipment. Calculations shall be signed and sealed by a Professional Engineer licensed in the State of North Carolina.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prior to assembly, all stainless steel bolts and nut threads shall be coated with a non–seizing compound.

B. The mounting points shall be level and parallel and of proper size.

C. Align all equipment and motors in accordance with the manufacturer's written instructions. Lubricate equipment and motors in accordance with the manufacturer's written instructions.

D. Provide all oil and grease of initial equipment startup.

E. The equipment shall be handled and installed in strict accordance with the manufacturer's instruction and recommendations and in the locations shown on the Drawings.

F. The Contractor shall touch–up all shipping damage to the paint and stainless steel as soon as the equipment arrives on the job site.

G. All surfaces (including shop primed) shall be cleaned and painted as specified in Section 09 90 00 – PROTECTIVE COATINGS of these Specifications or as indicated above.

H. Equipment and all accessories shall be supplied complete with supports suitable for mounting as shown on the Contract Drawings.

I. Prior to acceptance of the work of this Section, thoroughly clean all installed materials, equipment and related areas as required in Section 01 77 00 – CLOSEOUT PROCEDURES.

J. All equipment, components, piping and appurtenances shall be installed true to alignment and rigidly supported. Piping and appurtenances shall not be supported off of any equipment.

K. Contractor to provide oil and grease in sufficient quantities to service the first year of operation of all equipment. Oil and grease shall be provided in clearly marked containers for storage.
3.2 FIELD TESTS, ADJUSTMENT AND STARTUP

A. In addition to specific startup and testing requirements specified herein, equipment shall be started up and tested in accordance with the requirements outlined in Section 01 10 00 – SUMMARY.

B. Provide the services of qualified representatives for check-out of all major oxidation ditch equipment following installation. Sufficient checks shall be conducted to demonstrate that all system components are fully operational, that controls and instrumentation components have been calibrated and properly adjusted and that the entire oxidation ditch system is ready for continuous safe operation. The purpose of the checkout shall be to ensure that each individual system component has been correctly installed, shall operate fully in the manner intended, and is ready to perform its function as part of an integrated system when placed in continuous operation.

C. Provide the services of qualified representatives to assist in the start-up of the completed oxidation ditch system.

D. Furnish the services of qualified representatives for a minimum of twenty (20) days, over multiple trips as required to complete the specified system check-out, start-up, testing and training.

3.3 PERFORMANCE TEST

A. Timing of Performance Test
   1. Start of the Performance Test
      a. The Contractor shall start the Performance Test in compliance with the schedule indicated in Section 01 10 00 – SUMMARY.
   2. Duration of the Performance Test
      a. The Performance Test shall occur for the duration as indicated in Section 01 10 00 – SUMMARY.

B. Sampling and Analytical Parameters
   1. A Performance Test Protocol shall be prepared by Manufacturer and approved by Owner prior to commencement of the Performance Test.
      a. Test shall provide sufficient sampling and sampling frequency to accurately capture diurnal variability in treatment performance through a combination of composite and grab samples.
   2. Contractor shall take and analyze samples for the purposes of determining system compliance with the Process Guarantee. Contractor shall bear all costs for sampling and analysis. The following are the minimum parameters for sampling and analysis:
### Sampling and Analytical Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Flow, Influent/Effluent</td>
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<tr>
<td>TSS, Influent/Effluent</td>
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<tr>
<td>cBOD₅, Influent/Effluent</td>
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<tr>
<td>NH₄-N, Influent/Effluent</td>
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<tr>
<td>NO₃-N, Influent/Effluent</td>
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</tr>
<tr>
<td>Total Phosphorus (TP), Influent/Effluent</td>
<td>mg/L</td>
</tr>
<tr>
<td>Dissolved Oxygen (DO), In Reactor(s)</td>
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<td>pH, Influent/Effluent</td>
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<tr>
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</tr>
<tr>
<td>Temperature, Influent/Effluent</td>
<td>°C</td>
</tr>
</tbody>
</table>

C. Sampling, Laboratory and Analytical Standards

1. All analyses, data reduction or tests shall be carried out by the Contractor using procedures furnished or approved by Manufacturer.

2. Contractor shall have all laboratory analyses performed at a state-certified laboratory where the project is located.

D. Determination of Performance Test Result

1. Performance Test shall be deemed acceptable once system performance has maintained treatment requirements outlined in the above tables for a period of time as indicated in Section 01 10 00 – SUMMARY.

E. Certificate of Performance Test Acceptance

1. The Contractor shall submit to the Engineer for review a Final Report prepared by the Manufacturer detailing system performance and sampling results indicating that the system has met Performance Guarantee requirements.

3.4 OPERATOR TRAINING

A. Provide operator training for Owner’s personnel by approved Manufacturer’s representatives after system is operational. Training will take place while manufacturer’s representatives are at the job site for inspection and shall include at least one (1) additional trip of at least four (4) 8 – hour days or whatever time is necessary to make the operator’s staff thoroughly familiar with the system operation and maintenance of all major components.

END OF SECTION 46 53 61
SECTION 09 06 00 – SCHEDULE OF FINISHES

PART 1 - GENERAL

1.1 SCOPE:

A. The work under this section consists of all labor, materials, methods, and applications for finishes to concrete, concrete masonry, wood, and metal surfaces, both interior and exterior, as described in the specifications and listed in the finish schedule included herein.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Cast-In-Place Concrete Section 03 30 00
B. Precast Concrete Structures Section 03 40 00
C. Unit Masonry Section 04 20 00
D. Metal Fabrications Section 05 50 00
E. Protective Coatings Section 09 90 00
F. Site Piping Division 33
G. Process Interconnections/Valves Division 40
H. Process Blowers and Pumps Division 43
I. Odor Control Equipment Division 44
J. Process Equipment Division 46

PART 2 - PRODUCTS

A. Products shall be as specified in other sections of the specifications, except as follows:

B. "Cementitious" coating shall consist of a light gray, heavy cementitious matrix (with or without perlite matrix), which shall be applied to clean concrete surfaces for sealing, water proofing, and for decorative purposes. Coating shall be brush or squeegee applied in accordance with manufacturer's instructions. Surface preparation prior to application shall consist of smooth form finish, plus stone rubbing of form marks, joints, and blemishes. Color shall be gray to closely match other concrete work. Coating shall be Onatex as manufactured by the Old North Manufacturing Company, Thoroseal as manufactured by Thoro System Products, or equal.

C. Abrasive coating shall be a skid resistant wearing surface suitable for application on exterior above grade and on grade slabs. Coating system shall be a skid resistant broadcast system as manufactured by Sika Chemical Corporation or
equal. Binder shall be applied at a minimum coverage of 1 gallon per 30 square feet with a minimum of 2 pounds of flintshop #20 aggregate per square feet. Application shall be in strict accordance with manufacturer's written instructions.

D. Concrete sealer shall be non-yellowing, low luster, acrylic polymer type. It shall be sprayed or brushed on in accordance with the manufacturer’s recommendations. It shall be manufactured by Okon, Inc., CDS, Inc., Anti Hydro, Inc., or approved equal.

PART 3 - EXECUTION

A. All metals shall be coated as outlined in Section 09 90 00 – PROTECTIVE COATINGS and as referenced in the remaining sections of the Specifications.

B. All buildings shall have rooms finished as indicated on the drawings in accordance with the finishing schedules.

C. All other structures shall be finished as follows:

1. Concrete Floor Slabs
   Troweled with sealer hardener

2. Concrete Exterior Walls
   Smooth rubbed finish with cementitious coating 2’ below finish grade; remainder of wall to have honeycombs reworked

3. Interior Concrete Walls Exposed
   Smooth rubbed finish with cementitious coating entire wall

4. Interior Concrete Walls Submerged
   Smooth rubbed finish with cementitious coating within operating water levels; remainder of wall to have form marks removed and honeycombs reworked

5. Concrete Walkways
   Not Used

6. Concrete Sidewalls
   Broom finish

7. Precast Structures and Vault
   All honeycomb and lift holes reworked and all exposed exterior surfaces shall be grouted with cementitious coating

8. Masonry Walls, Ceilings, Structural Members, Wood Trim, Metal Doors and Frame, Piping (including pump piping submerged and in vault), Equipment, Electrical, and Misc. Metals
   Paint
D. Concrete Chemical Resistant coating shall be installed in following areas:

<table>
<thead>
<tr>
<th>Area/Structure</th>
<th>Extent of Coating Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headworks (High H₂S Area)</td>
<td>All interior concrete/grout surfaces</td>
</tr>
<tr>
<td>EQ Pump Station (High H₂S Area)</td>
<td>All interior concrete/grout surfaces</td>
</tr>
<tr>
<td>New EQ Basin (Low H₂S Area)</td>
<td>All interior concrete/grout surfaces</td>
</tr>
<tr>
<td>Anaerobic Selector (Low H₂S Area)</td>
<td>All interior concrete/grout surfaces to 2 ft below the normal water level</td>
</tr>
<tr>
<td>Oxidation Ditches (Low H₂S Area)</td>
<td>All interior concrete/grout surfaces to 2 ft below the normal water level</td>
</tr>
<tr>
<td>MLSS Splitter Box (Low H₂S Area)</td>
<td>All interior concrete/grout surfaces in the effluent channels and all interior concrete surfaces in the influent channel to 1 ft below the concrete weir invert</td>
</tr>
<tr>
<td>Secondary Clarifiers (Low H₂S Area)</td>
<td>No concrete coating</td>
</tr>
<tr>
<td>UV Structure (Low H₂S Area)</td>
<td>No concrete coating</td>
</tr>
<tr>
<td>Cascade Aerator (Low H₂S Area)</td>
<td>No concrete coating</td>
</tr>
<tr>
<td>Effluent Pump Station (Low H₂S Area)</td>
<td>No concrete coating</td>
</tr>
<tr>
<td>Scum Pump Station (High H₂S Area)</td>
<td>All interior concrete/grout surfaces in the wetwell</td>
</tr>
<tr>
<td>Thickened WAS Tank (High H₂S Area)</td>
<td>All interior concrete/grout surfaces in vault</td>
</tr>
<tr>
<td>ATAD Reactors (High H₂S Area)</td>
<td>All interior concrete surfaces in tank</td>
</tr>
<tr>
<td>Post ATAD Holding Tank (High H₂S Area)</td>
<td>All interior concrete surfaces in tank</td>
</tr>
<tr>
<td>Precast Manholes (High H₂S Area)</td>
<td>All drain and gravity sewer manholes to be coated.</td>
</tr>
<tr>
<td>Vaults</td>
<td>No concrete Coating</td>
</tr>
</tbody>
</table>

Notes: Areas to be coated with coating noted above superseded coatings specified elsewhere for the same areas.

END OF SECTION 09 06 00
PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work required under this section consists of all painting and finishing work and related items necessary to complete the Work indicated on Contract Drawings, described in the Specifications and listed in the Painting Schedule.

1.2 WORK TO BE PERFORMED UNDER THIS SECTION

A. Painting of all exposed woodwork, interior and exterior.

B. Painting of all exposed surfaces of all ferrous metal work (including galvanized) of the building exterior and interior, in whatever location found, not covered by other sections of the specifications. This specifically includes miscellaneous metal, ornamental metal, metal doors and frames, metal windows, mechanical trade work and electrical trade work.

C. Painting of exposed surfaces of masonry on the interior and exterior as indicated in the Finish Schedule.

D. Painting of all bare and covered pipes (excluding stainless steel), anchors and hangers; exposed steel and iron work; and copper metal surfaces and equipment installed under Divisions 33, 40, 41, 43, 44 and 46 and under the electrical work Division 26.

E. Painting of all bare and primed only valves and mechanical equipment installed under Divisions 33, 40, 41, 43, 44 and 46 and under the electrical work Division 26.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

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

B. Shop priming and shop coat on machinery and equipment. Refer to the sections under which various items of manufactured equipment with factory applied shop prime coat are furnished as referenced in paragraphs 1.2.D and E. All items of equipment furnished with prime coat finish shall be finish painted under this section.

1.4 MANUFACTURER

A. A single manufacturer to the greatest extent possible will supply paint materials. Proprietary designations of colors and materials are not intended to exclude equivalent products of other manufacturers. Manufacturer's numbers specified refer to products manufactured by the Tnemec Company, Inc. to establish quality standards to be equaled or surpassed as equals subject to compliance with
specifications. Painting materials and colors may be selected from the following or equal:

1. Sherwin Williams
2. Pittsburgh Paint Division of PPG Industries, Inc.
3. Tnemec Company, Inc.
4. Or Equal

1.5 SUBMITTALS
A. In addition to manufacturer's data, application instructions and label analysis for each coating material, submit samples for Engineer's review of color and texture only. Resubmit samples if requested until required sheen, color and texture are achieved.

B. For all paint finishes in occupied spaces supply manufacturers VOC content information.

1.6 STORAGE OF MATERIALS
A. Store all materials used on the job in a single place designated by the Contractor and Approved by the Owner. Such storage place shall be kept neat and clean and all damage thereto or its surroundings shall be restored. Soiled or used rags, waste and trash must be removed from the facilities every night and every precaution taken to avoid the danger of fire.

1.7 INSPECTION OF SURFACES
A. Before starting any work, surfaces to receive paint finishes shall be examined carefully for defects, which cannot be corrected by the procedures, specified herein under "PREPARATION OF SURFACES" and which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected. The commencing of work in a specific area shall be construed as acceptance of the surfaces, and thereafter the Contractor shall be fully responsible for satisfactory work as required herein.

B. High-Voltage Holiday (Spark) Testing: Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE SP0188 and the Manufacturer's printed application guide to verify a pinhole-free surface. Areas which do not pass the spark detection test shall be corrected at no cost to the Owner. For coating systems less than 20 mils, a low-voltage holiday testing equipment shall be used.
1.8 JOB, WEATHER AND TEMPERATURE CONDITIONS

A. Maintain temperature in facilities at constant 65 °F or above during drying masonry and providing adequate ventilation for escape of moisture from building in order to prevent mildew, damage to other work and improper drying of paint. Once painting has commenced, provide constant temperature of 65 °F or above. Maintain surface temperatures at 5 °F above the dew point temperature while preparing the surface and painting and prevent variations in temperature which might result in condensation on freshly painted surfaces.

B. Before painting is started in any area, broom clean and remove excessive dust.

C. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.

1.9 COOPERATION WITH OTHER TRADES

A. This work shall be scheduled and coordinated with other work and/or job conditions as required to achieve satisfactory results.

B. The Contractor shall examine the specifications for the various trades and shall thoroughly familiarize himself with all their provisions regarding painting.

1.10 COLOR SELECTION

A. The Owner shall select colors from the manufacturer’s standard color range.

PART 2 - PRODUCTS

2.1 Provide the following painting systems for the various substrates, as indicated:

<table>
<thead>
<tr>
<th>EXTERIOR MATERIAL</th>
<th>Material</th>
<th>System</th>
<th>Finish</th>
<th>Prime Coat</th>
<th>No. Of Coats</th>
<th>Finish Coat</th>
<th>No. Of Coats</th>
<th>Total Dry Thickness</th>
<th>Mil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Non-submerged)</td>
<td>Flexible and Breathable Acrylate</td>
<td>Smooth Texture</td>
<td>151-Color Elasto-Grip FC</td>
<td>1</td>
<td>156-Color Enviro-Crete</td>
<td>2</td>
<td>14.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Masonry</td>
<td>Flexible and Breathable Acrylate</td>
<td>Smooth Texture</td>
<td>151-Color Elasto-Grip FC</td>
<td>1</td>
<td>156-Color Enviro-Crete</td>
<td>2</td>
<td>14.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galvanized Metal</td>
<td>Aliphatic Polyurethane</td>
<td>Gloss</td>
<td>66-Color Hi-Build Epoxoline</td>
<td>1</td>
<td>1095-Color Endura Shield</td>
<td>1</td>
<td>7.0</td>
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<td></td>
</tr>
<tr>
<td>Material Description</td>
<td>Primer/Coating</td>
<td>Gloss Level</td>
<td>Texture</td>
<td>Aftershot</td>
<td>Primer Color</td>
<td>Aftershot</td>
<td>Post-Aftershot</td>
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<tr>
<td>Ferrous Metals (Non-submerged)</td>
<td>HDP Acrylic Polymer</td>
<td>Gloss</td>
<td>37H-77 Chem-Prime</td>
<td>1</td>
<td>1028-Color Enduratone</td>
<td>2</td>
<td>7.0</td>
<td></td>
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</tr>
<tr>
<td>Ferrous Metals (Submerged, intermittently submerged or within 5’ of water surface)</td>
<td>Epoxy-Cycloaliphatic Amine</td>
<td>Semi-Gloss</td>
<td>66-1211 Epoxoline Primer</td>
<td>1</td>
<td>104-Color H.S. Epoxy</td>
<td>2</td>
<td>12.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood</td>
<td>HDP Acrylic Polymer</td>
<td>Gloss</td>
<td>V10-99W Tnemec Primers</td>
<td>1</td>
<td>1028-Color Enduratone</td>
<td>2</td>
<td>7.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Chemical Resistant Coating (Wastewater – Non-Enclosed Space with Low H2S gases)</td>
<td>Polyamidoamine Epoxy</td>
<td>Gloss</td>
<td>N140 Porta-Pox Plus</td>
<td>1</td>
<td>22-Color Epoxoline</td>
<td>1</td>
<td>16.0 – 20.0</td>
<td></td>
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<tr>
<td>Concrete Chemical Resistant Coating (Severe Wastewater – Enclosed Space with H2S gases)</td>
<td>Aggregate Reinforced Amine Epoxy Mortar</td>
<td>Gloss</td>
<td>434-5022 Perma-Shield H2S Or 436-5020 Perma-Shield FR</td>
<td>1</td>
<td>435-Color Perma-Glaze</td>
<td>1</td>
<td>125.0</td>
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</table>

**INTERIOR MATERIALS**

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Primer/Coating</th>
<th>Gloss Level</th>
<th>Texture</th>
<th>Aftershot</th>
<th>Primer Color</th>
<th>Aftershot</th>
<th>Post-Aftershot</th>
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<tbody>
<tr>
<td>Concrete (Non-Submerged)</td>
<td>Acrylic Latex</td>
<td>Low Sheen</td>
<td>1029-Color Enduratone</td>
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<td>1029-Color Enduratone</td>
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<td>5.0</td>
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<tr>
<td>Concrete Masonry</td>
<td>Epoxy Polyamide</td>
<td>Semi Gloss</td>
<td>130-6602 Envirofill (fill all voids)</td>
<td>1</td>
<td>66-Color Hi-Build Epoxoline</td>
<td>2</td>
<td>20.0</td>
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<tr>
<td>Material Description</td>
<td>Finish</td>
<td>Color</td>
<td>Finish Description</td>
<td>Quantity</td>
<td>Coverage</td>
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<td>Gypsum Drywall</td>
<td>Acrylic LatexSemi Gloss</td>
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<td>Galvanized Metal</td>
<td>Aliphatic Polyurethane Gloss</td>
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<td>1095-Color EnduraShield</td>
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<tr>
<td>Ferrous Metals (Submerged, intermittently submerged, or within 5’ of water surface)</td>
<td>Epoxy-Cycloaliphatic Amine Semi-Gloss</td>
<td>66-1211 Epoxoline Primer</td>
<td>1</td>
<td>104-Color H.S. Epoxy</td>
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<tr>
<td>Ferrous Metals (Non-submerged)</td>
<td>HDP Acrylic Polymer Gloss</td>
<td>37H-77 Chem-Primer</td>
<td>1</td>
<td>1028-Color Enduratone</td>
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<tr>
<td>Concrete Chemical Resistant Coating</td>
<td>Polyamidoamine Epoxy Gloss</td>
<td>N140 Porta-Pox Plus</td>
<td>1</td>
<td>22-Color Epoxoline</td>
<td>1</td>
<td>16.0 – 20.0</td>
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<tr>
<td>Concrete Chemical Resistant Coating</td>
<td>Aggregate Reinforced Amine Epoxy Mortar Gloss</td>
<td>434-5022 Perma-Shield H2S Or 436-5020 Perma-Shield FR</td>
<td>1</td>
<td>435-Color Perma-Glaze</td>
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<td>Wastewater Piping:</td>
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<td>Aeration Effluent</td>
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<td>Process Air</td>
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<tr>
<td>Non-Potable Water</td>
<td>True Blue/Safety-11SF with Black-35GR Bands</td>
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<td>Reclaimed Water</td>
<td>Rec Water Purple-16SF</td>
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<td>Sludge Piping</td>
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<td>Filter Surface wash</td>
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<td>Gasoline</td>
<td>Lemon Yellow/Safety-02SF</td>
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<td>Fuel Oil</td>
<td>Lemon Yellow/Safety-02SF</td>
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<td>Chemical Piping</td>
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<td>Chlorine, liquid</td>
<td>Lemon Yellow/Safety-02SF</td>
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2.2 PAINT MATERIALS

A. All paint, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact, with the manufacturer's instructions printed thereon.

B. All painting materials shall be of the best quality and shall be approved by the Engineer. They shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

C. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

D. Paint shall arrive on the job color-mixed except for tinting of undercoats and possible thinning.

E. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

F. It shall be the responsibility of the applicator to see that all mixed colors match the Color selection made by the Engineer prior to application of the coating.

PART 3 - EXECUTION

3.1 GENERAL

A. Only skilled mechanics shall be employed. Application may be brush, roller or spray, upon approval from the Engineer and only in accordance with the coating manufacturer's recommended practices.

B. The Contractor shall protect his work at all times and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.

C. Remove and protect hardware, accessories, device plates, lighting fixtures, factory finished work and similar items, provide ample in-place protection. Upon completion of each space, carefully replace all removed items.
D. Remove electrical panel box covers and doors before painting walls. Paint separately and reinstall after all paint is dry.

E. All materials shall be applied under adequate illumination, evenly spread and flowed-on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

F. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.

G. All coats shall be dry to manufacturer’s recommendations before applying succeeding coats.

H. Where spray paint is specified, the Contractor shall finish 100 square feet by spraying a sample of the finish upon the request of the Engineer. This shall be finished with materials specified or approved.

I. Surfaces to be stained shall appear uniform in shading with color variations caused only by the natural wood grain.

3.2 PREPARATION OF SURFACES

A. General:
   1. Surfaces shall be clean, dry and adequately protected from dampness.
   2. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.
   3. Mildew shall be removed and the surface neutralized per the coating manufacturer’s recommendations.
   4. Efflorescence on any area will be corrected before painting.

B. Ferrous Metal Surfaces:
   1. Remove dirt and grease with mineral spirits and wipe dry with clean cloths.
   2. Remove rust, mill scale and defective paint down to sound surfaces or bare metal using scraper, sandpaper, wire brush or, if necessary, sandblasting. Grind, disc sand, sand blast, etc., if necessary to remove shoulders at edge of sound paint to prevent them from photographing through finish coats. Preparation shall meet or exceed an SSPC-SP 6 specification for non-submerged surfaces and an SSPC-SP10 specification for submerged surfaces or surface subject to high humidity.
   3. Touch up all bare metal and damaged shop coats with specified shop coat primer.
4. For ferrous surfaces with shop coats touched up, as above required, the first coat as listed in the following schedule will be applied to the dry mil film thickness specified.

C. Galvanized Metal Surfaces:

1. All Galvanized Surfaces shall be cleaned in accord with SSPC-SP 16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized, Steel.

D. Concrete

1. Patch large openings and holes and finish flush with Tnemec Series 218 MortarClad. After priming, fill any remaining small holes with prepared patching material.

2. Check pH; if not neutral, then correct by using a 3% solution of T.S.P. or ammonium hydroxide. The etched surface should appear uniform in sheen and feel like 100 grit abrasive paper.

3. Remove form oil from poured-in-place concrete by washing concrete with xylol or exempt-type form oil solvent, or as required for complete removal.

4. All surfaces shall be dry. No painting shall be done until surfaces have cured for 28 days and are dry.

5. All concrete in immersion shall be cleaned in accordance with SSPC-SP13/NACE6 Surface Preparation of Concrete, ICRI CSP 5.

3.3 WORKMANSHIP FOR PAINTING

A. Exterior painting shall not be done when the surface temperature is below 50 °F, while the surface is damp, or during cold, rainy or frosty weather. The substrate temperature must be 5 °F or more above the dew point temperature while painting and during the coating cure. Avoid painting surfaces while they are exposed to hot sun.

B. Exterior doors shall have tops; bottoms and side edges finished the same as the exterior faces of these doors.

END OF SECTION 09 90 00
SECTION 01 10 00 – SUMMARY

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes:
      1. Project information
      2. Work covered by Contract Documents
      3. Access to site
      4. Coordination with occupants
      5. Work restrictions
      6. Specification and Drawing conventions
   B. Division 01 Section “Temporary Facilities and Controls” for limitations and procedures governing temporary use of Owner’s facilities.

1.3 PROJECT INFORMATION
   A. Project Identification: Northeast Brunswick Regional Water Reclamation Facility 2.5 MGD Facility Expansion
      1. Project Location: Brunswick County, NC
   B. Owner: Brunswick County
   C. Consultant: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
      1. McKim & Creed, Inc. 243 N. Front Street, Wilmington, NC 28401

1.4 WORK COVERED BY CONTRACT DOCUMENTS
   A. The Work of the Project is defined by the Contract Documents and consists of the following:
      1. The project consists of the construction of a 2.5 MGD expansion of the existing Northeast Brunswick Water Reclamation Facility.
      2. Constructed facilities include the following:
BASE BID

a. Site grading and access improvements.

b. Site process piping and electrical improvements.

c. One (1) headworks structure to include three (3) rotary drum screens, one (1) screenings conveyor, one (1) headcell grit removal system, one (1) grit washing system, one (1) grit pump and one (1) influent flow meter.

d. One (1) EQ pump station equipped with three (3) submersible solids handling pumps and force main

e. One (1) headworks/EQ Pump Station odor control system and ducting.

f. One (1) EQ storage tank equipped with a jet aeration/mixing system (two (2) blowers, two (2) jet motive pumps, jet header) and all associated valving, piping, instrumentation and controls.

g. Installation and commissioning of one (1) additional blower package and one (1) additional jet motive pump including all piping, valves and appurtenances at the existing EQ storage tank.

h. Decommissioning of existing headworks and EQ pump station.

i. Two (2) oxidation ditches equipped with an anaerobic selector, influent and effluent control weirs, submersible mixers, jet aeration system (jet headers, all piping and valves, blowers, and jet motive pumps), instrumentation and controls.

j. One (1) MLSS flow splitter box structure

k. Two (2) 65’ diameter secondary clarifiers equipped with solids scrapping mechanism, scum box, suction header, and drive assembly and flow distribution box.

l. Three (3) RAS/WAS pumps with associated controls for flow control and splitting.

m. One (1) NaOH duplex chemical feed pump skid and controls.

n. One (1) duplex scum pump station and controls.

o. Two (2) tertiary disk filters and filter structure.

p. UV disinfection system consisting of UV structure and four (4) banks of UV lamps, fixed level control weirs, instrumentation and controls.

q. One (1) step cascade post – aeration structure.
r. One (1) effluent pump station equipped with three (3) submersible solids handling pumps and controls and two (2) vertical turbine NPW booster pumps, two (2) hydropneumatics tanks and controls.

s. Pre – ATAD sludge thickening facility including Two (2) rotary drum thickener, two (2) flocculator tanks, two (2) spray wash booster pumps, polymer feed system and thickened WAS storage facility.

t. One (1) Pre-ATAD pump station including two (2) ATAD Feed pumps and two (2) ATAD Discharge Pumps.

u. ATAD system including two (2) ATAD Reactors with two (2) ATAD Transfer Pumps and eight (8) submersible mixer/aerators and two (2) center mixers.

v. Two (2) Post – ATAD holding tanks each including a jet aeration header, one (1) PD blower, one (1) jet motive pump and one (1) truck loading solids handling pump.

w. One (1) ATAD/Post – ADAD Holding Tank odor control system and ducting.

x. One (1) truck loading station with all controls.

y. One (1) blower/mechanical building.

z. One (1) electrical and controls building.

aa. PLC based instrumentations and controls package for monitoring and operating treatment facilities.

bb. One (1) system transformer and generator.

cc. Site HVAC equipment.

B. Type of Contract

1. Project will be constructed under a single prime contract.

1.5 WORK SEQUENCE

A. General: All Work shall be conducted in an orderly manner by the Contractor. The Contractor shall employ sufficient number of construction crews such that each area of construction as outlined above and within the Contract Documents shall be completed within the allocated Construction Timeline.

B. In general, the majority of Work under this Contract includes construction, testing and startup of a new parallel treatment works at the NE Brunswick Regional WWTP. The Contractor shall be responsible for coordinating construction of the parallel treatment works consisting of the following components with all pre-startup testing and performance checks/testing performed prior to final acceptance.
1. Headworks
2. EQ Pump Station
3. Odor Control System
4. EQ Tank
5. Anaerobic tank
6. Oxidation ditches
7. RAS/WAS Pump Station
8. MLSS splitter box
9. Secondary clarifiers
10. Scum Pump Station
11. Tertiary filters
12. UV system
13. Cascade aeration
14. Effluent pump station
15. NPW Pumps and controls
16. Rotary Drum Thickeners
17. ATAD Transfer Pumps
18. ATAD Reactors
19. Post ATAD Transfer Pumps
20. Post ATAD Storage Tank
21. ATAD/Post – ATAD Odor Control System
22. Truck Loading Pumps
23. Chemical Feed Pumps

C. The Contractor shall prepare and submit for review and approval a Startup Plan which incorporates the requirements outlined below for the sequence of construction and startup requirements outlined within the Contract Documents and as required by the equipment manufacturers. The Startup Plan at a minimum shall include a detailed startup schedule, descriptions of preliminary requirements to be completed prior to startup of each system, functional testing descriptions,
operational testing descriptions, performance testing descriptions, coordination with adjacent treatment units and operator training.

D. Headworks, EQ Pump Station, EQ Basin Tie-In and Startup

1. Critical path for construction shall consist of construction and startup of the new electrical building and MCCs in addition to running all the necessary duct banks/conduits/conductors to provide power to the additional equipment to be installed as part of the new headworks, EQ PS and EQ tank improvements.

2. Construction of the new headworks, EQ PS, EQ tank and EQ tank drain line should proceed in parallel to construction of the electrical building to coordinate tie-in of the influent force main to the new treatment system to keep the existing treatment plant in full operation through construction and final acceptance of the new treatment train.

3. Contractor shall commission and test all Headworks, EQ PS, EQ Tank equipment and EQ drain line with NPW prior to introducing wastewater flow through the system. Testing shall include confirming water tightness of all piping, isolation valves and gates; satisfactory operation of all equipment and pumps; and satisfactory operation of all control systems.

4. Currently all flow enters the existing treatment facility through a 16" FM tying into the existing headworks structure. This existing 16" FM shall be tied into the new FM going to the new headworks structure utilizing a tapping sleeve as indicated on the Contract Drawings. Once tie-in has been completed and the headworks equipment and EQ pump station have passed functional tests using NPW to the satisfaction of the Engineer, the Contractor shall coordinate with the Owner to begin diverting flow from the influent FM to the new headworks structure and downstream EQ pump station. At this point, forward flow will be introduced to the new EQ tank.

5. After the new 24" drain line from the EQ tank farm to the existing anaerobic selector has passed testing requirements and final tie-in is required, the Contractor shall coordinate with the Owner to bring down level within the existing EQ tank as far as possible to maximize available storage within the tank and provide bypass pumping to drain down the volume within the anaerobic selector to allow for dewatering the incoming line for tie in. All RAS and other return flows shall be coordinated with the Operator to be stopped during the time of dewatering the anaerobic selector and final tie in. During low flow, it is estimated that the available storage within each EQ tank will provide approximately 6 hours of storage. The Contractor shall be responsible to provide a standby bypass pumping system if required as part of a detailed tie in plan to pump flow from the EQ pump station wetwell to the existing oxidation ditch system, as a backup system, in the event the existing FM cannot be placed back into service or the available storage is not adequate to reliably perform tie in. Once an acceptable Work plan has been approved by the Engineer, and during a low flow period and after confirmation rainfall is not forecasted within the next 48 hours, flow out of the existing EQ tank shall be stopped utilizing the effluent isolation valves.
shown on the Contract Drawings. The valves shall be sufficiently exercised and checked for functionality prior to beginning with Work. The Contractor shall coordinate tie in of the new 24” line leaving the new EQ tank to the existing 16” line at the existing EQ tank and the new 24” line from the EQ tank farm connected at the existing oxidation ditch influent line. Once connections are completed, flow from the new EQ tank will flow to the existing oxidation ditch and controlled by the new 20” flow meter and 14” motor operated valve controls as indicated in the Contract Documents. Once tie-in is completed and tested, flow may be released from the EQ tank by opening the 16” yard valve isolating the tank drain line and RAS flows reintroduced to the anaerobic selector. Tie-ins shall only be performed under the supervision of the Owner’s representative. It should be noted that the existing drain line coming off the existing EQ tank was hydraulically designed to only pass peak flows which are shaved at the existing headworks and drain by gravity back to the anaerobic selector through the existing 16” drain line. Prior to fully commissioning the new Headworks, it will be necessary that the 24” line coming from the tank farm to the existing anaerobic selector at the oxidation ditch will need to be fully operational.

6. Once the new EQ tank is online, the existing EQ tank will be drawn down, and the new influent tied to the sidewall of the existing EQ tank. Once tie in has been tested for water tightness, the tank can be placed back into service. At this point both EQ tanks will be online.

7. Acceptance testing of the new headworks and EQ pump station shall be performed and monitored for a minimum of 14 days to allow for system burn in and confirm equipment reliability/stable performance under an operating load prior to any Work to proceed at the existing headworks structure to allow placing the existing Headworks back into service if needed. If something should happen, flow to the new headworks can be redirected to the old headworks using the valve at the connection of the 16” to 24” at the point of tie in at the existing oxidation ditch and the wye-fitting and valves at the EQ existing EQ tank as shown on the Contract Drawings. In the event issues arise during acceptance testing with any of the installed equipment or systems, the Contractor shall make all necessary improvements to the system to correct issues. Once issues are corrected and accepted by the Engineer, the Acceptance test shall be restarted and shall run for 14 days. Once system has successfully operated for a complete 14-day test period, the Engineer will issue acceptance of the testing results. Work on the existing headworks structure shall only proceed after commissioning and Acceptance of the new Headworks, EQ PS and tie-in of the new EQ Tank drain line has occurred to ensure adequate hydraulic capacity between the existing EQ tank and existing anaerobic selector.

E. Oxidation Ditch System Startup

1. Startup of the Oxidation Ditch System shall include the following operations:
a. Functional Testing: Once dry testing of the various equipment of the Oxidation Ditch (OD) System has ended up in a satisfactory manner, Functional Testing of the OD System, to confirm equipment operation and basic performance as detailed within each specific equipment specification, shall be performed. Functional testing shall be performed utilizing NPW over a period of a minimum of one (1) week to start up all equipment and to check all control systems, prior to introducing any wastewater flows and seeding with RAS/WAS. The Equipment Manufacturer’s representative shall perform testing and issue a written report detailing testing performed and equipment functionality.

b. Operational Testing: Upon successful completion of the Functional Testing, the Contractor shall remove all NPW from the OD System and coordinate with the Owner to seed the Oxidation ditch system with RAS or WAS from the existing treatment facility and low flow influent wastewater from the EQ tank farm to start acclimating the biological system. Operational testing shall be performed so long as it will take the biological system to treat the incoming wastewater flow to meet the plant effluent permit requirements. Adjustment shall be made to controls systems and equipment to meet design requirements as outlined within the Contract Documents and the equipment manufacturers’ recommendations.

c. Performance Testing: Upon successful completion of Operational Testing, Performance testing shall occur for a minimum of 30 days to allow the biological treatment process to reach steady state operation. In the event system upset or equipment malfunctions occur requiring interruption of the treatment process, all adjustment/repairs shall be made by the Contractor and the performance test shall be restarted. The performance testing shall only be accepted once the secondary treatment process has operated for a minimum of 30 days without interruption due to equipment and/or control malfunction, and acceptable effluent quality has been achieved.

d. Performance testing of the Secondary Treatment process shall be performed as a whole, with the anaerobic selector, oxidation ditches, secondary clarifiers, RAS/WAS pumps and scum pump station. However, it is recommended that the Contractor coordinate startup of the tertiary disc filters and UV system to coincide with the testing of the secondary treatment process to expedite startup time of the facility. However, in the event the tertiary treatment equipment is not ready for functional testing, the Contractor may direct secondary clarifier effluent to the bypass at the tertiary disk filters to drain back via the plant gravity sewer system and into the EQ pump station for disposal. The Contractor shall provide inflatable plugs for the inlet of the disc filter header to minimize solids accumulation in the disc assemblies during bypass operation. Effluent shall not leave the secondary treatment process.
to the post clarifier’s unit processes until a few days prior to the beginning of the Performance Testing.

e. The Contractor shall be responsible for collecting required samples and providing lab services to document system loading and treatment performance as outlined within the final startup plan. If the samples analysis data collected during the Performance Testing meet the plant’s designed operation data and effluent permit requirements, final acceptance by the Engineer shall occur.

F. Tertiary Filter System, UV Disinfection and Effluent Pump Station Equipment

1. The Contractor shall be responsible for coordinating with equipment suppliers to perform initial functional testing as outlined within the respective equipment Specification sections of this manual and as required by the equipment manufacturers. All mechanical and electrical equipment and controls systems shall be tested in dry conditions to confirm systems function as intended for reliable operation and as outlined within the Contract Documents. In the event equipment does not function as intended, the Contractor shall make all necessary effort to bring equipment into compliance.

2. Functional testing of equipment shall be performed utilizing NPW to verify equipment and controls operations under hydraulic loading to verify control systems performed as intended by design and as anticipated during normal operation under effluent flow conditions. In the event the system does not function as required, the Contractor shall make all necessary improvements to ensure the equipment performs adequately prior to introducing secondary effluent.

3. Prior to introducing clarified secondary effluent to the tertiary filter system, the secondary clarified effluent shall have achieved acceptable performance (TSS < 20 mg/L) for the secondary treatment process as outlined above and meet the design loading conditions required for the tertiary filtration system. In addition to TSS, UV transmittance of the clarified effluent shall be measured to ensure the system effluent meets UV transmittance requirements prior to introducing to the UV system. The Contractor shall provide bypass pumping capable of pumping up to 2.5 MGD from the effluent pump station utilizing a bypass pumping system equipped with fused HDPE piping to the new Headworks structure or EQ Pump Station until acceptance of all plant performance testing. Bypass pumping shall be performed for a minimum of 14 days to allow for evaluation of the performance of tertiary filters and UV disinfection equipment.

4. Once all preliminary operational testing has been completed and approved by the Engineer, clarified effluent may be introduced to the tertiary filters, UV system and effluent pump station to evaluate performance of the equipment. During initial operational startup of the tertiary treatment equipment, performance of equipment shall be regularly monitored with sampling collected and analyzed by the Contractor as outlined within the
approved startup plan. All tertiary effluent shall be bypass pumped back to the new Headworks structure or EQ pump station until stable performance meeting discharge requirements of the tertiary filters and UV disinfection system have been achieved over a continuous 14-day period. The bypass pumping system shall be as outlined in the previous paragraph. Once acceptable performance has been achieved, the Contractor shall coordinate with the Owner to begin discharge of treated effluent via the effluent pump station.

G. ATAD System

1. The Contractor shall be responsible for coordinating with equipment suppliers to perform initial functional testing as outlined within the respective equipment Specification sections of this manual and as required by the equipment manufacturers. All mechanical and electrical equipment and controls systems shall be tested in dry conditions to confirm systems function as intended for reliable operation and as outlined within the Contract Documents. In the event equipment does not function as intended, the Contractor shall make all necessary effort to bring equipment into compliance.

2. Functional testing of equipment shall be performed utilizing NPW to verify equipment and controls operations under hydraulic loading to verify control systems performed as intended by design and as anticipated during normal operation under normal flow conditions. In the event the system does not function as required, the Contractor shall make all necessary improvements to ensure the equipment performs adequately prior to introducing any WAS or other solids to the solids handling system.

1.6 WORK BY OWNER

A. General: Cooperate fully with Owner so Work may be carried out smoothly, without interfering with or delaying Work under this Contract or any work by Owner. Coordinate the Work of this Contract with any work performed by Owner.

1.7 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of the Project.

B. Use of Site: Limit use of Project site to construction limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to within construction limits unless approved by the Engineer.

2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Any damage by the Contractor to the paved WWTP access road must be repaired and/or replaced by Contractor to original grade and condition.

1.8 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy adjacent sites during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner’s day-to-day operations.

1. Maintain access to existing facilities. Do not close or obstruct occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

2. Notify the Owner not less than 48 hours in advance of activities that will affect Owner’s operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.

3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
2. Comply with conditions and restrictions of NCDOT encroachment agreements, traffic control, and other permits obtained by the Owner including but not limited to erosion and sediment control, stormwater control, wetlands protection, and CAMA permits.

B. On-Site Work Hours: Limit work to normal business working hours Monday through Friday or as approved by the Owner. Contractor shall be responsible for construction observation fees if outside normal approved 40-hour work week.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

   1. Notify Owner not less than two (2) days in advance of proposed utility interruptions.

   2. Obtain Owner’s written permission before proceeding with utility interruptions.

D. Existing Treatment Facilities: Do not interrupt or perform activities in a manner which will result in the detrimental impact on the performance of the existing treatment facility.

   1. Notify Owner not less than one (1) week in advance of proposed activities which may impact the existing treatment facility’s operational performance.

   2. All activities which may impact the existing treatment facility’s performance shall be coordinated with the Owner in writing prior to proceeding.

E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

   1. Notify Owner not less than two (2) days in advance of proposed disruptive operations.

   2. Obtain Owner’s written permission before proceeding with disruptive operations.

F. Controlled Substances: Smoking is prohibited indoors in existing or temporary structures on site or other habitable structures on site.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where used within a sentence or phrase.
a. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

1. Drawing Coordination: Requirements for materials and products identified on the Drawings and not further specified in the specifications are intended to describe a performance standard for function or materials of construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRECEDENCE

A. In resolving inconsistencies precedence shall be given in the following order; Agreement, Supplementary Conditions, General Conditions, Specifications – Division 01, Specifications – Divisions 02 – 46, and the construction drawings.

END OF SECTION 01 10 00
SECTION 10 44 16 – FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.
B. Accessories.

1.2 RELATED SECTIONS

A. Section 09900, PAINTING

1.3 REFERENCES

A. NFPA 10 - Portable Fire Extinguishers.
B. UL 299 - Dry Chemical Fire Extinguishers.

1.4 DESCRIPTION OF WORK

A. Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.

B. Provide and install a fire extinguisher complying with the specifications at the locations below:

- Qty- 4 at Building 55.0
- Qty- 3 at Building 60.0
- Qty- 2 at Building 65.0
- Qty- 2 at Building 90.0

C. Definition: “Fire Extinguishers” as used in this section refers to units which can be hand carried as opposed to those which are equipped with wheels and fixed fire extinguishing systems.

D. Type of products required include:
   1. Fire Extinguishers

1.5 SUBMITTALS FOR REVIEW

A. Section 01300, SUBMITTALS
B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01300, SUBMITTALS
B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

C. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Two (2) copies Operation and Maintenance Data.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.8 QUALITY ASSURANCE

A. Provide units conforming with UL 711.

B. Single Source Responsibility: Obtain products in this section from one (1) manufacturer.

1.9 REGULATORY REQUIREMENTS

A. Conform to NFPA 10 for requirements for extinguishers.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Base Bid Manufacturer:

   1. The Williams Bros., Model: Apex, WB-SR95246-FG

B. Subject to compliance with Base Bid, available manufacturers.

   1. Larsen

   2. J. L. Industries

2.2 EXTINGUISHERS

A. Dry Chemical Type: UL 299, Cast steel tank, with pressure gage; Class A, B, C; 10 pound with wall bracket.

B. Extinguisher Finish: Stainless steel enamel red color.
2.3 WALL BRACKERS

A. Shall be designed to fit extinguishers and shall hold extinguishers firmly and securely in place but shall provide for easy removal. Brackets shall be J. L. Industries “MARK” type or Engineer approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Secure rigidly in place.

3.2 IDENTIFICATION

A. Identify existence of fire extinguisher in cabinet with lettering spelling “FIRE EXTINGUISHER” applied to door. Provide lettering selected by Engineer from manufacturer’s standard arrangements. Signs shall meet local fire department and OSHA requirements.

END OF SECTION 10 44 16
SECTION 08 12 16 – ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aluminum doors and frames.
B. Perimeter sealant.
C. Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products.

1.2 RELATED SECTIONS

A. Section 07 80 00- Door Finish Hardware

1.3 REFERENCES

A. AA (Aluminum Association) - Designation System for Aluminum Finishes.
C. AA (Aluminum Association) - AA 6061-T6 – Heavy Duty Structures.
E. AA (Aluminum Association) - AA DAF-45 – Designation System for Aluminum Finishes
F. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications
Manual.

G. AAMA - Curtain Wall Manual #10 - Care and Handling of Architectural Aluminum from Shop to Site.

H. AAMA 501.2 - Methods of Test for Metal Curtain Walls.

I. AAMA 603.8 - Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.


M. AAMA FC-1 - Field Check of Metal Curtain Walls for Water Leakage.

N. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.


P. ASCE 788 - Calculation of Wind Loads.

Q. ASTM A36/A36M - Structural Steel.


S. ASTM A446/A446M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

T. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

U. ASTM B209M - Aluminum and Aluminum-Alloy Sheet and Plate.

V. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

W. ASTM B221M - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.


Y. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

AA. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

BB. ASTM E1105 - Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.

CC. SSPC (Steel Structures Painting Council) - Paint 20 Zinc Rich Coating.

DD. SSPC (Steel Structures Painting Council) - Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

1.4 SYSTEM DESCRIPTION

A. Insulated Aluminum doors and frames; includes tubular aluminum sections, shop fabricated, factory finished, vision glass, infill, related flashings, anchorage and attachment devices.

B. System Assembly: Shop unitized assembly.

1.5 PERFORMANCE REQUIREMENTS

A. System Design: Where required, Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall:

1. As calculated in accordance with North Carolina Building code, refer to Structural documents for design requirements. Structural Test Unit: Minimum size of 3-feet (91.44 cm) by 7-feet (213.36 cm) shall be evaluated compliant with ASTM E 330 testing method.

B. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

C. Expansion / Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F degrees C over a 12-hour period without causing detrimental effect to system components and anchorage.

1.6 SUBMITTALS FOR REVIEW

A. See Specifications for procedures regarding submittals.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and
tolerances, affected related Work and expansion and contraction joint location and
details Indicate the following:

1. Elevations and details of each door and frame type.
2. Schedule of doors and frames.
3. Conditions at openings with various wall thicknesses and materials.
4. Location and installation requirements for hardware.
5. Thicknesses of materials, joints.
6. Connections and trim.

D. Color selection from Manufacturers Standard offering.
E. Hardware Templates: Provide finish hardware mounting details.
F. Manufacturer’s Installation Instructions: Printed installation instructions for each
product, including product storage requirements.
G. Operations and Maintenance Data: Printed instructions for each product.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing aluminum door
and frame systems of the type required for this project, with minimum ten continuous
years documented experience.
B. Product Qualifications: Wind-load test certification conforming to ASTM E 330 on
samples of previous products shall be provided for the type of door to be used.
C. Installer’s Qualifications: Workmen skilled in handling aluminum door and frame
systems of the type required for this project.
D. Instruction: The manufacturer or his representative will be available for consultation to
all parties engaged in the project, including instruction to installation personnel.
E. Conform to requirements of ANSI A117.1.
F. Design structural support framing components under direct supervision of a
Professional Structural Engineer experienced in design of this Work and licensed in
the State of North Carolina.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Handle Products of this section in accordance with AAMA - Curtain Wall Manual #10.
B. Protect finished aluminum surfaces with wrapping or strippable coating. Do not use
adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

C. Deliver doors and frames palleted, wrapped or individually crated. Doors shall be side protected with surrounding grooved 2-inch (50.8 mm) by 4-inch (101.6 mm) wood frame and covered with 275-pound (124.74 kg) test corrugated cardboard.

D. Inspect delivered doors and frames for damage; unload and store with minimum handling. Repair minor damage if refinished items are equal in all respects to new work; otherwise, remove damaged items and replace with new.

E. Store products of this section under cover in manufacturer's unopened packaging until installation.

1. Place units on minimum 4-inch (101.6 mm) wood blocking.
2. Avoid non-vented plastic or canvas covers.
3. Remove packaging immediately if packaging becomes wet.
4. Provide 0.25-inch (6.35 mm) air spaces between stacked doors.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.10 PROJECT CONDITIONS

A. Field Measurements: Take field measurements of areas to receive aluminum frames; note discrepancies on submitted shop drawings.

1.11 WARRANTY

A. Correct defective Work within a five-year period after Substantial Completion.

B. Warranty: Include coverage for complete system for failure to meet specified requirements.

C. Manufacturer: Ten-year warranty against defects in workmanship and materials, including warping, rotting, decaying or bowing.

D. Installer: Warrant installation procedures and performance for five years against defects due to workmanship and materials handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Obtain though one source from single manufacturer.
B. Acceptable Manufacturer: Model: Series 100BE: Cline Aluminum Doors, Inc. or approved equal.

2.2 MATERIALS

B. Sheet Aluminum: ASTM B209.
C. Steel Sections: ASTM A36/A36M; shaped to suit mullion sections.
D. Fasteners: Stainless steel.

2.3 COMPONENTS

A. The Contractor is responsible for coordinating the door submittal information with the Owner.
B. Aluminum Door Components: Minimum 5-ply composite laminated construction to include:
   1. Facing: One-piece 0.040-inch (1.02 mm) smooth 5005-H14 stretcher-leveled aluminum alloy.
   2. Substrate: One-piece oil-tempered hardboard backer.
   3. Core: Organic materials shall be used to form a marine grade honeycomb core with high compression strength of 94.8 psi (ASTM C365), and internal aluminum hardware backup tube.
   4. Hardware Backup: The hardware backup tube shall be a minimum of 4-inches (107.95 mm) in width, 1.375-inches (34.93 mm) in depth with a wall thickness of 0.0125-inches (3.18 mm). Contiguous for the full perimeter of the door to allow for all specified and non-specified hardware reinforcement.
   5. Hardware Prep: Basic to include mortise lock edge prep or cylindrical lock prep; and pairs prepped for flush bolts, if required.
   6. Bonding Agent: Environmentally friendly adhesive with strength buildup of 350 pounds per square inch (24.6 kg/cm2).
   7. Perimeter Door Trim: Wall thickness of 0.050-inch (1.25 mm) minimum in 6063-T5 extruded aluminum alloy with special beveled edge cap design and integral weather stripping on lock stile.
   8. Replaceable Door Trim: Mechanically fastened to the hardware backup tube, allowing for replacement in the field, if damaged.
9. Trim Finish: To have minimum of a Class I anodized finish.


11. Materials: Only nonferrous, non-rusting members shall be acceptable, including tie rods, screws and reinforcement plates.

12. Regulations: All components and agents to meet EPA standards.

C. Aluminum Frames:

1. Frame Components: Extruded channel 6063-T5 aluminum alloy, minimum wall thickness 0.125-inch (3.18 mm); cut corners square and joinery shall be mechanical with no exposed fasteners.

2. Profile: Open Back with Applied Stop (OBS), 1.75-inch by 5-inch (44 x 127 mm).

3. Profile: Open Back with Applied Stop (OBS), 1.75-inch by 6-inch (44 x 152.39 mm).

4. Hinge and Strike Mounting Plates: Extruded aluminum alloy bar stock, 0.1875-inch (4.75 mm) thick mounted in a concealed integral channel with no exposed fasteners.


6. Door Stop: No screw-on stops acceptable.

D. ACCESSORY SEALANT MATERIALS

1. Sealant and Backing Materials:
   a. Perimeter Sealant: Type specified in Section 07920.
   b. Sealant Used Within System (Not Used for Glazing): as recommended by manufacturer.

E. Accessories

1. Fasteners: Aluminum, nonmagnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.

2. Do not use exposed fasteners.

3. Brackets and Reinforcements: Manufacturer’s high-strength aluminum units
where feasible, otherwise, nonferrous stainless steel.

4. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil (0.76 mm) thickness per coat.

F. HARDWARE

1. Refer to Project Drawings for Door Hardware Schedule. Coordinate Hardware Submittal with Owner.

2. Installed per ANSI 117.1, North Carolina Building Code, and ADA requirements for Handicapped Accessibility on all doors.

G. FABRICATION

1. Fabricate components with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.

2. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.


4. Prepare components with internal reinforcement for door hardware.

5. Reinforce framing members for imposed loads.

6. Aluminum Flush Door Construction: Of type, size and design indicated:
   a. Minimum Thickness: 1.75-inches (44 mm), 5-ply composite laminate system.
   b. Door Size: Sizes shown are nominal; provide standard clearances as follows:
      c. Hinge and Lock Stiles: 0.125-inch (3.18 mm).
      d. Between Meeting Stiles: 0.25-inch (6.35 mm).
      e. At Top Rails: 0.125-inch (3.18 mm).
      f. Between Door Bottom and Threshold: 0.125-inch (3.18 mm).

H. FINISHES

1. Finish Coatings (Door and Frame): (Conforming to) AAMA 605.2-92 Organic Coating: High Performance Organic Coating: Kynar/Polyvinylidene Fluoride (PVDF) (AAMA 605.2). Color to be selected from manufacturers full range of standard offering.
2. Concealed Steel Items: Galvanized in accordance with ASTM A123 to 2.0 oz/sq ft.

3. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

4. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

5. Extent of Finish:

6. Apply factory coating to all surfaces exposed at completed assemblies.

7. Apply finish to surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

8. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

C. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer’s instructions.

3.2 INSTALLATION

A. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

B. Install doors and frames in accordance with manufacturer’s instructions and approved shop drawings; set frames plumb, square, level, and aligned to receive doors.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Separate dissimilar metals to prevent electrolytic action between metals.
G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Set thresholds in bed of mastic and secure.

I. Install hardware using templates provided.

J. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria.

K. Install perimeter sealant to method required to achieve performance criteria.

3.3 ERECTION TOLERANCES

A. Section 01400 - Quality Control: Tolerances.

B. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

C. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.5 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work from damage.

END OF SECTION 08 12 16
SECTION 08 70 00 – DOOR FINISH HARDWARE

PART 1 - GENERAL

1.1 Scope of Work

A. Work Included: The Contractor shall furnish all necessary labor, materials, services and equipment to provide all finish hardware as shown on the drawings and as required by the Hardware Schedule included herein. The hardware supplier shall visit the jobsite prior to preparation of the final finish hardware schedule to insure compliance with this requirement.

1.2 Applicable Codes and Standards: All work specified under this section shall comply with the following codes:

A. North Carolina State Building Code
B. National Fire Codes published by the National Fire Protection Association
C. Pender County Codes
D. All hardware shall meet the requirements of the American with Disabilities Act as it applies to this project.

1.4 Quality Assurance

A. The hardware supplier shall have in his employ a member of the American Society of Architectural Hardware Consultants (AHC) to properly handle, detail and service the hardware on this project in a manner acceptable to the Engineer. This AHC member shall visit the jobsite during construction to give advice and supplementary instructions regarding the proper installation of hardware. Upon completion of the project, the AHC member shall inspect the hardware installation with a representative of the hardware manufacturer. The final Finish Hardware Schedule shall be prepared by a member of the American Society of Architectural Hardware Consultants (AHC).

1.5 Submittals

A. SAMPLES: If requested by the Engineer, samples of each item of hardware proposed for use shall be furnished. After inspection by the Engineer, samples will be returned to the hardware supplier.

B. MANUFACTURER’S DATA: Manufacturer's descriptive data and catalog cuts for each item of hardware shall be submitted in accordance with Section 0130.
C. TEMPLATES: The hardware supplier shall promptly furnish templates and schedules to other trades requiring their use to enable them to make proper provision in their work to receive the finish hardware.

D. SCHEDULES: A complete and final Finish Hardware Schedule shall be prepared by the hardware supplier and submitted to the Engineer. Such submission shall not relieve the supplier of the responsibility of furnishing hardware of the correct weight and quality to that specified for the project whether included in this Finish Hardware Schedule or not.

E. Keying System Submission: Before lock are delivered to job site, submit complete keying system to and have approved by Owner. Provide locks specified to be master keyed biting charts, which shall be submitted to and approved by Owner.

F. CERTIFICATE OF COMPLIANCE: A letter of compliance signed by an AHC member shall be submitted to the Engineer stating that all hardware has been properly installed and is functioning properly.

1.6 Delivery, Storage, and Handling

A. Protection
   1. All necessary means shall be used to protect materials specified under this Section from damage before, during and after installation.
   2. The work of other trades shall be adequately protected from damage resulting from work specified under this Section.
   3. Leave manufacturer’s protective coverings on hardware until just prior to final inspection.

B. Storage and Handling of Materials
   1. All finish hardware shall be stored in a weathertight field, warehouse, or the equivalent.
   2. Finish hardware shall be delivered and stored in bins in a locked area.
   3. Finish hardware shall be kept in manufacturer’s shipping cartons or containers until time of installation.

C. Replacements
   1. In the event of damage to materials or work in place, all necessary repairs and replacements shall be immediately made to the satisfaction of the Engineer at no additional cost to the Owner.
   2. Defective hardware shall be removed and new hardware of same type shall be reinstalled without any additional cost to the Owner.

D. Packaging and Marking - Each hardware set shall be individually packaged complete with all fasteners and accessories necessary for proper installation.
Each item shall be wrapped in paper and enclosed in a cardboard box or the equivalent. Each package shall be legibly labeled and marked for that portion of the work for which it is intended. Containers shall have manufacturer's standard identification and markings.

E. Keying: Keying shall be coordinated with Owner.

1.7 Coordination: Installation of hardware shall be coordinated with painting and finishing work to the extent that painting and finishing operations be completed prior to hardware installation.

1.8 Acceptance and Tolerances: Hardware installation will not be accepted until all hardware is properly adjusted and working smoothly.

1.9 Certification: The hardware supplier shall prepare a letter of compliance signed by an AHC member stating that all hardware has been properly installed and is functioning properly.

PART 2  PRODUCTS

2.1 Materials

A. Hinges: Unless otherwise specified, hinges shall be butt type 1 ½ inch template hinges. Ball bearing hinges shall be provided at all closer operated doors. Exterior and interior doors shall have stainless steel hinges and fasteners. Outswinging exterior door hinges shall have non-removable pins. All hinges shall be 4-1/2 inches by 4-1/2 inches unless otherwise noted. Minimum 3 hinges per door. Hinges shall be as manufactured by Hager Hinge Company, St. Louis, Missouri or approved equal.

B. Screw and Fasteners:
   1. Provide concealed fasteners where possible. Exposed fasteners will be finished to match hardware fastened.
   2. Provide Philips flat head screws except as otherwise noted
   3. Provide through bolts for closers, overhead closers, and surface leaves of hinges.

C. Mortise LockSets
   1. ANSI 156.13-1987, Series 1000, Grade 1 in functions scheduled.
      a. Corbin 9500 NF Series with 779L2 lever design or equal

D. Closer: Closers shall be heavy duty type and parallel arm type. All closers shall be provided with heavy duty hold open device. All closers shall have sex nuts and bolts required. Closers shall be as manufactured by Sargent, New Britain, Connecticut or approved equal. Threaded rod type closers are unacceptable.

E. Wall Bumpers and Floor Stops: Wall bumpers shall be used at all locations except where conditions will not permit wall bumpers. Wall bumpers and floor stops shall be as manufactured by Ives, New Haven, Connecticut or approved equal.

F. Thresholds: Thresholds shall be furnished at all exterior doors and elsewhere as required by the drawings or Finish Hardware Schedule. Thresholds shall be as
manufactured by Pemko Manufacturing Company, Emeryville, California or approved equal.

G. Exit Devices: Exit devices shall be provided at all locations required by code and as required by the Finish Hardware Schedule. Exit devices shall be as manufactured by Sargent, New Britain, Connecticut or approved equal.

H. Weatherstripping: Provide weatherstripping of door heads and jambs at locations required by the Finish Hardware Schedule. Weatherstripping shall be as manufactured by Pemko Manufacturing Company, Emeryville, California or approved equal. Supply weather stripping for all exterior doors.

I. Silencers: Silencers shall be provided at all doors. Furnish three per single door and two each per pair of double doors. Silencers shall be as manufactured by Glynn Johnson Corporation, Chicago, Illinois or approved equal.

J. Miscellaneous Hardware: Miscellaneous hardware items shall be provided as required by the drawings, the specifications and the Finish Hardware Schedule. Materials shall be of manufacture noted or approved equal.

K. Tools: All hardware shall be furnished with such adjusting tools and instructions as supplied by the hardware manufacturer as standard practice. Upon completion of the work, the Contractor shall turn these tools and instructions over to the Owner for his use.

L. Astragals:
   1. Exterior
      a. 2"x 1/8" clear anodized aluminum with integral, weather stripping
      b. National Guard Products Inc. 139A or equal

M. Drip Cap: Anodized alum to match door

2.2 Shop Finish

A. Unless otherwise noted on the drawings or in the Finish Hardware Schedule, hardware finishes shall be as follows:
   1. Door closers – stainless steel
   2. Interior Butts – stainless steel
   3. Exterior butts – stainless steel
   4. All other hardware – stainless steel

2.3 Design Criteria

A. All finish hardware shall be suitable for use at locations indicated on the drawings and under service conditions that might be reasonably ascertained from a thorough review of the drawings. The hardware supplier shall have his AHC member thoroughly review the drawings and the Finish Hardware Schedule. Hardware finishes shall be as listed in Paragraph 2.02A. The hardware supplier shall coordinate the finish hardware schedule with the design criteria furnishing the required hardware at no additional cost to the Owner. Any deficiencies or misuse of hardware shall be called to the attention of the Engineer in writing prior to submitting a proposal.
PART 3 EXECUTION

3.1 Examination and Preparation of Surfaces

A. Doors and frames shall be examined for proper preparation to receive finish hardware. Errors in fabrication shall be corrected prior to installation of hardware.

3.2 Installation and Workmanship

A. Manufacturer’s Instructions: All hardware shall be accurately and securely installed in accordance with templates and installation instructions provided by the hardware manufacturer.

B. Workmanship: Workmanship and finish shall be free from all blemishes and defects. All defective hardware will be rejected even though it may be installed before such defect is discovered. Screw heads shall not be fouled and finishes shall not be scratched or marred.

C. Sequencing and Scheduling: Finish hardware shall not be installed until after completion of painting and finishing of items receiving hardware application.

D. Adjustments: All hardware shall be adjusted for proper operation under all operating conditions just prior to final inspection. All hardware shall be left in perfect working order at the completion of the project.

E. Closers: Closers shall be mounted in standard configuration except at exterior doors and other locations where parallel arm configuration is required.

3.3 Cleaning

A. Temporary protective coverings and wrappings provided by the hardware manufacturer shall remain on finish hardware until just prior to final inspection. At such time, all temporary protective coverings and wrappings shall be removed.

B. All hardware shall be thoroughly cleaned of foreign matter, finger prints and smudges just prior to final inspection.

C. Cleaning procedures must not damage hardware finish or adjacent surfaces in any manner.

3.4 Hardware Schedule

HW-1

Entry Lockset Function w/lever type heavy duty ANSI Grade 1
Threshold and Weather Stripping
Continuous Header Drip Cap
Bottom Rain Diverter Sweep
Closer Hold Open Device

HW-2

Entry Lockset Function w/lever type heavy duty ANSI Grade 1
Astragal
Threshold and Weather Stripping
Continuous Header Drip Cap
Headbolt/Footbolt at inactive leaf
Dummy Trim Pull
Bottom Rain Diverter Sweep
(2) Closer Hold Open Device
Latchguard Escutcheon

HW-3

Entry Lockset Function w/lever type heavy duty ANSI Grade 1
Headbolt/Footbolt at inactive leaf
Dummy Trim Pull
(1) Closer Hold Open Device on active leaf

END OF SECTION 08 70 00
SECTION 10 14 25 – SIGNS

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. Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.

B. This Section includes the following types of signs:

   1. Panel signs.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles and finishes.

C. Shop drawings showing fabrication and erection of signs. Include elevations, and large-scale sections of typical members and other components. Show fasteners, accessories and installation details.

   1. Provide message list for each sign required, including large-scale details of wording and lettering layout.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

   1. Samples for initial selection of color, pattern and texture:

      a. Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service
performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Manufacturers of Panel Signs:
   b. Leeds Architectural Letters, Inc.
   c. Mohawk Sign Systems.
   d. Southwell Company

2.2 MATERIALS

A. Plastic Laminate: Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standards.

B. Fasteners: Use concealed fasteners fabricated from metals (stainless steel) that are not corrosive to the sign material and mounting surface.

2.3 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

2. Signage shall comply with the requirements of the Accessibility Guidelines of the American Disabilities Act.

B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished, to conform to the following requirements:

1. Edge Condition: Square cut.

2. Edge Color for Plastic Laminate: Edge color same as background.
3. Corner Condition: Square corners.

4. Size: 1-1/2 inch high x length required by text, except where indicated otherwise.
   a. Where “MEN” and “WOMEN” signs with international handicap logo and male/ female caricatures are indicated, provide panel sign 6” wide x 9” high.

C. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes and colors of letters, numbers and other graphic devices.

D. Engraved Copy: Machine-engrave background to produce raised letters, numbers, symbols and other graphic devices on the face of sign panel to produce precisely formed copy, incised to uniform background depth and raised letter height. Use engraving process linked to master templates in a process capable of producing characters of the style indicated with sharply formed edges.
   1. Raised Copy Engraved Plastic Laminate: Engrave through the exposed face ply of the plastic laminate sheet to expose the contrasting core ply background.
      a. Engrave the copy to produce a minimum raised copy thickness of 1/32 inch.
      b. Letter Style: Helvetica Medium, Upper Case
      c. Letter Height: 1 inch, unless indicated otherwise.
      d. Letter Spacing: Normal.
      e. Type Position: Centered, except bottom centered where “MEN” and “WOMEN” signs with international handicap logo and male/ female caricatures are indicated.
      f. Male/Female Caricature Size: 2” wide x 5” high nominal.
      g. Accessibility Symbol Size: 2-1/2” wide x 3” high nominal.
      h. All text shall be accompanied with Grade 2 Braille.

2.4 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color as selected by the Engineer from the manufacturer's standards.
PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer’s instructions.

1. Install signs level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

2. Mount signs on wall and door, with horizontal centerline of sign 60 inches above finish floor.

B. Mounted Panel Signs: Attach panel signs to door surfaces using the methods indicated below:

1. Interior Doors: Vinyl-Tape Mounting - Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

2. Interior Walls: Silicone-Adhesive Mounting - Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.3 SIGNAGE SCHEDULE

A. Contactor shall provide a minimum of 18 – 16" X 16" Signs throughout project. Graphic content will be determined by Owner after Contract Award. Contractor shall include cost for signs in base bid.

END OF SECTION 10 44 25
SECTION 05 52 00 – HANDRAILS AND GUARDRAILS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes providing handrails and guard rails as shown on the Drawings and includes miscellaneous handrails and guard rails not included in other metal systems in other sections of these specifications.

B. Height for stair rails, handrails, and guard rails shall conform to all applicable codes and as noted on the drawings.

C. Handrails and guard rails used to extend existing facilities shall match the existing as closely as possible unless noted otherwise.

D. Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.

1.2 QUALITY ASSURANCE

A. Codes and Standards:
   2. ANSI A117.1
   3. OSHA Part 1920.23 and 1910.24
   4. Life Safety Code 101
   5. AWS "Structural Welding Code"

B. Qualification for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure”.

C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job process; allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

D. Shop Assembly: Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinate installation.
1.3 SUBMITTALS

A. Submit Certificates of Compliance with specified requirements. Obtain shop drawings for fabrication and erection. After verifying details and dimensions provide three sets of final drawings and installation instructions to Owner's Construction Representative for use in observing installation and for Record Drawings.

B. All submittals for this Specification shall be in accordance with Section 01340 – Submittals.

1.4 WARRANTY

A. Per General Condition Article 9, the Contractor shall provide a 3 year warranty from substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221; alloy 6061-T6, T6510; except alloy 6063-T52 for seamless pipe meeting ASTM B241; unless otherwise indicated.

B. Aluminum Castings: ASTM B108; alloy 214 unless otherwise indicated.

C. Aluminum Sheet or Plate: ASTM B209; alloy 6061-T6, unless otherwise indicated.

D. Finish: Clear anodized finish AA C22A41R1X, medium matte, nondirectional, minimum 0.7 mil clear anodized, clear lacquer coating, unless otherwise indicated.

E. Nonshrink, Nonferrous Grout: CE CRD C588.

2.2 FABRICATION

A. The Contractor shall provide a "manufacturer's system."

B. Exposed work shall be formed true to line and level with accurate angles and surfaces and straight sharp edges.

C. Ease exposed edges to a radius of approximately 1/32-inch, unless otherwise shown.

D. Use bent-metal corners formed to the smallest radius possible without causing grain separation or otherwise impairing the work.

E. Welded Connections: Cope intersections of rails and posts, weld joints and grind smooth. Butt weld end-to-end joints of railings or use welding connectors, at fabricator's option.
F. Weld corners and seams continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces. Discoloration of finished surfaces will not be acceptable.

G. Form exposed connections with flush, smooth, hairline joints, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flathead (countersunk) screws or bolts. Provide splices with lock mechanism but allow for expansion and contraction.

H. Provide anchorage of the type shown, coordinated with the supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support.

I. Toe Boards: Fabricate toe boards with a bent/form profile for increased plate stiffness to the dimensions and details shown. Use 1/4-inch thick x 4-inch plate secured to each post of railing.

J. Brackets, Flanges and Anchors: Provide brackets, flanges, and anchors for railing posts and for handrail supports. Furnish inserts and sleeves as required for anchorage masonry work.

K. Furnish cast metal brackets, flanges, and exposed anchors of the same material and finish as rail supports, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which handrails and guard rails are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors which are to be embedded in concrete or masonry construction. Coordinate the delivery of such items to the project site.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and guard rail items to in-place construction; including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts and other connectors as required.
B. Use railing manufacturer’s standard methods of installation when acceptable to the Engineer.

C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

D. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surface of units which have been coated or finished after fabrication, and are intended for field connections. Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 6-feet on centers, unless otherwise shown. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

E. Anchor posts in concrete where noted on the drawings, by means of pipe sleeves set and anchored into the concrete. Provide sleeves of galvanized, steel pipe, not less than 6-inches long and having an inside diameter not less than 1/2-inch greater than the outside diameter of the inserted pipe post. Provide steel plate closure secured to the bottom of the sleeve and of width and length not less than 1-inch greater than the outside diameter of the sleeve. After the posts have been inserted into the sleeves, fill the annular space between post and sleeve solid with nonshrink, nonferrous grout. Cover anchorage joint with a round metal flange finished to match post.

F. Anchor rail ends into concrete with round flanges welded to rail ends and anchored into the wall construction with lead expansion shields and bolts.

G. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting the work.

H. Dissimilar Materials: Where dissimilar metals contact each other or there is a condition such as aluminum against concrete, they shall be protected from each other with a pressure sensitive tape, bitumastic coating or other protective method.

I. Toe Boards: Provide toe boards where shown and as required by code.

J. Toe boards shall be provided wherever people can pass or work beneath the open sides or wherever falling material could create a hazard to moving machinery or equipment.

END OF SECTION 05 52 00
SECTION 08 33 10 – OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes overhead coiling metal doors.

B. Type of overhead coiling doors include the following:
   1. Overhead service doors.

C. Operation of overhead coiling doors include the following:
   1. Chain operation.

D. Provide complete operating door assemblies including door curtains, guides, counterbalance mechanism, hardware, operators and installation accessories.

E. Provide complete operating door assembly that meets the wind loading requirements of the North Carolina State Building Code.

F. Field painting is specified in Division 9.

G. Electrical connections for powered operators and accessories are specified in Division 16.

H. Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.

1.2 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data, roughing-in diagrams and installation instructions for each type and size of overhead coiling door.
   1. Provide operating instructions and maintenance information.

C. Shop drawings for special components and installations that are not dimensioned or detailed in manufacturer's data sheets.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Furnish each overhead coiling door as a complete unit produced by one (1) manufacturer, including hardware, accessories, mounting and installation components.
1. Furnish overhead coiling door units by one (1) manufacturer for entire Project.

B. Insert and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry to install units. Provide setting drawings, templates, instructions and directions to install anchorage devices. Coordinate delivery with other work to avoid delay.

1. See concrete and masonry Sections of these specifications regarding installation of inserts and anchorage devices.

C. Wind Loading: Design and reinforce overhead coiling doors to withstand a wind-loading pressure in accordance with the North Carolina State Building Code.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one (1) of the following:

1. Atlas Roll-Lite Overhead Doors/Division of MASCO.
2. Ceco/Windsor Door--Division of the Ceco Corp.
3. Overhead Door Corp.
4. Raynor Garage Door.
5. Wayne-Dalton Corp.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand required wind loading, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material gage recommended by door manufacturer for size and type of door required, and as follows:

1. Aluminum Door Curtain Slats: ASTM B209, alloy and temper recommended by aluminum producer and finisher for the type of use and finish indicated.
2. Slat type: Flat.

B. Endlocks: Malleable iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Windlocks: Malleable iron castings secured to curtain slats with galvanized rivets. Unless otherwise recommended by door manufacturer, provide windlocks to meet or exceed the wind requirements of the North Carolina Building Code.

D. Bottom Bar: Consisting of two (2) angles, each not less than 1-1/2 x 1-1/2 x 1/8 inch thick; stainless steel to suit type of curtain slats. Coordinate with automatic reversing control.

E. Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles with sufficient depth and strength to retain curtain loading. Build up
units with minimum 3/16 inch thick steel sections, galvanized after fabrication. Slot bolt holes for track adjustment.

F. Secure continuous wall angle to wall framing with a minimum of 3/8 inch bolts at not more than 30 inches o.c., unless closer spacing recommended by door manufacturer. Extend wall angles above door opening head to support coil brackets, unless otherwise indicated. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position. Provide removable stops on guides to prevent over-travel of curtain and a continuous bar for holding windlocks.

G. Weather Seals: Provide vinyl or neoprene weather-stripping for exterior exposed doors, except where otherwise indicated. At door heads, use 1/8 inch thick continuous sheet secured to inside of curtain coil hood. At door jambs, use 1/8 inch thick continuous strip secured to exterior side of jamb guide.

2.3 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and in a spring barrel, and connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural-quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and to limit barrel deflection to not more than 0.03 inch per foot of span under full load.

C. Provide spring balance of one (1) or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel in size required to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.

F. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weather seal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

1. Fabricate aluminum hoods for doors of not less than 0.032-inch thick that matches slat aluminum.

2.4 PRIME PAINTING
A. General: Shop-clean and -prime ferrous metal surfaces, exposed and unexposed, except tightly joined and lubricated surfaces and galvanized metal, with door manufacturer's standard rust-inhibitive primer. Use primer that is compatible with finish painting.

B. Finish: Field painted. Refer to Section 09900 and Section 09999.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers and equipment supports according to final shop drawings, manufacturer's instructions and as specified.

B. After completing installation, including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion.

C. Train Owner's maintenance personnel on procedures and schedules related to door operation, servicing, preventive maintenance and procedures for resetting closing devices after activation.

END OF SECTION 08 33 10
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. All engineering, manufacturing and installation of the items listed by a single manufacturer and wall systems contractor trained, tested and, certified by the manufacturer for proficiency in erecting the specified products.

1. Aluminum profile panels with integral reveals and profiled panels with compatible joinery. Panels shall be designed to permit installation in both vertical and horizontal orientations.

2. Extruded aluminum trim related to the wall and window system and its intersection with adjacent materials.

3. Sealants and gasketing between panels, windows and their intersections.

4. Adjustable secondary supports for the panel and window system specified in 1.04, B or final inspection and alignment of adjustable secondary supports by others for conformance to tolerances specified in 1.04, B, 1.

1.2 QUALITY ASSURANCE

A. ATAS International products and services shall establish the minimum level of quality, performance, dimension and appearance required.

1. Manufacturer and wall systems contractor shall demonstrate a minimum of ten years of experience in the successful completion of projects employing similar materials, applications and performance requirements.

B. Manufacturer and wall systems contractor shall provide a list of five similar completed projects with addresses of the location, architect and owner.

1.3 PERFORMANCE REQUIREMENTS

A. Panels shall be designed for component and cladding wind loads determined in accordance with the more stringent of the local building code or ASCE 7 for the parameters specified.

1. Building Classification: III (per ASCE 7)

2. Importance Factor: 1.25 (seismic), 1.10 (snow)

3. Exposure Category: C

4. Basic Wind Speed: 160 mph, 3 sec gust
B. Performance of the wall panels shall be verifiable with tests witnessed or conducted by independent agencies.

1. Structural performance of the wall panels shall be derived from ASTM E72 Chamber Method with a deflection limit of l/180 applied to positive load. Ultimate structural values shall be achieved without the use of backside mechanical attachments to the structure.

2. Air infiltration of the wall panels shall not exceed .06 CFM/ft² at a static pressure of 6.24 PSF (equivalent to 49 mph wind) when tested in accordance with ASTM E283. Mock-up test size should be approx. 10’-0 X 10’-0 in size to simulate actual field conditions.

3. There shall be no uncontrolled water penetration through the panel joints at 12 PSF (equivalent to 68.5 mph wind) when tested in accordance with ASTM E331. Mock-up test size should be approx. 10’-0 X 10’-0 in size to simulate actual field conditions.

4. The standard horizontal panel joint shall demonstrate effective rain screen and pressure equalization principles with interior seal broken at least 1” in 10 lf of panel and any exterior seal removed when tested at a static pressure of 12 PSF (equivalent to 68.5 mph wind) in accordance with ASTM E331. Effective performance shall mean no water rising within the equalization chamber and no uncontrolled leakage to the interior.

1.4 WARRANTY

A. The manufacturer shall warrant for a period of one year that the panel system materials will be free from defects. The wall systems contractor shall warrant for a period of one year that the installation workmanship will be free from defects.

B. Painted finish warranties shall be the paint manufacturer’s standard for wall panels and finished extrusions.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

A. Profiled panels

1. BWG390 profiled panel.

2. .032 aluminum

3. Texture smooth

4. Panel coverage 39 inches

B. Joinery: Manufacturer’s standard lap
2.2 TRIM
A. The wall panel manufacturer shall furnish aluminum trim matching wall panel. Installation shall be by the certified wall systems contractor.

2.3 MATERIALS AND FINISHES
A. Panels
   1. Provide 70% PVDF
B. Formed Trim
   a. Gauges as required
   b. Finish to match Panel.
C. Fasteners: Stainless Steel

PART 3 – EXECUTION

3.1 SUBMITTALS
A. Submit test reports and certifications to demonstrate compliance with performance requirements and building code acceptance specified.
B. Shop and erection drawings shall clearly illustrate the details required to comply with the performance requirements specified including interface of the panel system with adjoining construction.
   1. Materials and finish for each component shall be defined.
   2. Erection procedures will be included where required to clearly explain proper installation of fasteners, trim, gaskets and sealants.
   3. Samples shall be submitted to illustrate the panel design, texture, color and other features specified.

3.2 INSPECTION
A. The wall systems contractor in accordance with section 1.4, B, 1, shall check final alignment of the secondary steel supports for the panel system.
B. All materials shall be inspected for damage and conformance to the specifications and shop drawings prior to installation.

3.3 FABRICATION
A. The panel components shall be prefabricated for field assembly in accordance with the procedures and details shown on the shop drawings.
B. The wall panels shall be fabricated in accordance with the quality procedures established for the specified UL classifications, FM and building code approvals.

3.4 INSTALLATION

A. Manufacturer shall provide detailed instructions covering the tools, fasteners, sealants, gaskets, and procedures required to assure performance of the wall assembly as specified.

B. Installers of panels and other components shall be trained, tested and certified by the manufacturer to erect the specified products.

C. Install the panel system, fasteners, trim and related items in accordance with dimensions and procedures shown on the approved shop and erection drawings.

D. Paint, bituminous coating, or sealant as recommended by the manufacturer shall separate dissimilar metals.

E. Work shall be coordinated with other trades as required to insure proper flashing and seals to adjoining construction.

3.5 DAMAGED MATERIAL

A. Damage caused by the manufacturer or wall systems contractor shall be replaced or repaired to as new condition.

B. The construction manager for the project shall inspect and approve each completed wall area and be responsible for protection of completed work from damage by other trades.

3.6 CLEANING

A. The wall systems contractor shall remove all protective materials and labels from the wall system as the system is erected.

B. The general contractor shall be responsible for final cleaning of the wall system due to conditions that occur after wall systems contractor has completed an area. Cleaning is to be done in accordance with the manufacturers instructions.

END OF SECTION 07 42 00
SECTION 07 41 13 - STANDING-SEAM METAL ROOF PANELS

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 standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Existing WWTP.

1. Preinstallation Conference: Conduct conference at Existing WWTP.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.

4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.

6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

7. Review temporary protection requirements for metal panel systems during and after installation.


9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

   1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

   1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical roof area and eave, rake, seams, penetrations, including fascia, and soffit as shown on Drawings; approximately 48 inches by 12 feet square by full thickness, including attachments, underlayment, and accessories.

2. Build mockups for typical roof area only, including accessories.
   a. Size: 12 feet long by 6 feet

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS
A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers’ written instructions and warranty requirements.

1.10 COORDINATION
A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY
A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: 5 years from date of Substantial Completion.

   B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

   2. Finish Warranty Period: 20 years from date of Substantial Completion.

   C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

   1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

   B. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980.

   C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.

   D. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

      1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

E. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

F. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 at the following test-pressure difference:
   1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa)

G. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
   1. Test-Pressure Difference: 2.86 lbf/sq. ft.

H. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.

J. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
   1. Fire/Windstorm Classification: Class 1A-120.
   2. Hail Resistance: SH.

K. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C)

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type
indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

B. Standing-Seam Metal Roof Panels Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Nominal Thickness: 0.022 inch

   b. Exterior Finish: Two-coat fluoropolymer

   c. Color: Match existing roofs

3. Clips: One-piece fixed to accommodate thermal movement.

   a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

   b. Material: 0.062-inch- (1.59-mm-) thick, stainless-steel sheet.

4. Panel Coverage: 12 inches (Contractor to confirm panel matches existing)

5. Panel Height: 1.5 inches (Contractor to confirm panel matches existing)

6. Joint Type: As standard with manufacturer

2.3 MISCELLEANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 designation unless otherwise indicated. Provide manufacturer’s standard sections as required for support and alignment of metal panel system.
B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.

2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Roof Curbs: Fabricated from same material as roof panels with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

E. Panel Fasteners: Self-tapping screws designed to withstand design loads.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.


2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill
indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.


   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

   4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

   6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.

2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer’s written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistant barriers and flashings that will be concealed by metal panels are installed.

3. Install screw fasteners in predrilled holes.

4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Install flashing and trim as metal panel work proceeds.

6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use stainless steel for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer’s approved stainless steel fasteners according to manufacturers’ written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners. Fasteners shall be stainless steel.

2. Install pressure plates at locations indicated in manufacturer’s written installation instructions.

3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

5. Watertight Installation:
   a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
   b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
   c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Clipless Metal Panel Installation: Fasten metal panels to supports with screw fasteners at each lapped joint at location and spacing recommended by manufacturer.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer’s written installation instructions, and SMACNA’s "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

I. Roof Curbs: Install flashing around bases where they meet metal roof panels.

J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13
PIEDMONT NATURAL GAS ENCROACHMENT PERMIT STANDARD CONDITIONS

Part I. GOVERNANCE FOR ALL LAND USES

1. If PROJECT OWNER has already retained a contractor to install or construct the facilities constituting the encroachment, then such contractor shall also be required to execute this Permit as a condition of Piedmont granting the Permit. PROJECT OWNER further acknowledges and understands that it must ensure that any current or future contractors, subcontractors, vendors, agents, and representatives comply with all terms and conditions of this Permit and that the execution of this Permit by a contractor shall not reduce, eliminate, or otherwise alter any of the terms, obligations, or requirements assigned to PROJECT OWNER herein.

2. PROJECT OWNER, or its agent, will give the following PIEDMONT Resource Center representatives a three working day notice of the day on which the encroachment(s) will be made, in order that arrangements can be made for necessary representatives of PIEDMONT to be present at PIEDMONT’s election. PROJECT OWNER shall ensure construction plans reference the PIEDMONT contact requirement.

<table>
<thead>
<tr>
<th>RC REP</th>
<th>Josh Reaves</th>
<th>RC:</th>
<th>24-Wilmington</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONE:</td>
<td>910-251-2802</td>
<td>E-MAIL:</td>
<td><a href="mailto:Joshua.Reaves@duke-energy.com">Joshua.Reaves@duke-energy.com</a></td>
</tr>
</tbody>
</table>

3. To the extent allowed by law, PROJECT OWNER shall indemnify, defend, and hold harmless PIEDMONT, its affiliates, partners, successors, assigns, and the respective officers, directors, employees, agents, and representatives of each such entity from and against any and all actions, suits, claims, damages, loss, liability, attorney fees, cost and expense, including death, personal injury, and property damage occurring to PROJECT OWNER, its contractor, subcontractors, or PIEDMONT, and their respective officers, directors, employees, agents, and representatives, or to any third parties, which arise out of or in connection with, or by reason of, performance of the work herein contemplated, the existence of said installations and facilities, failure to comply with any applicable local, state or federal law or regulation and/or release of contaminants or other hazardous substances, or the acts, errors or omissions of the PROJECT OWNER or anyone for whom PROJECT OWNER is legally responsible (excluding those claims which have been solely caused by the intentional or negligent acts or omissions of PIEDMONT, its contractors, agents, and/or representatives).

4. As long as PROJECT OWNER continues to operate installations or facilities under this Permit, PROJECT OWNER shall maintain adequate comprehensive general liability insurance coverage, either through a policy or policies of insurance or an approved program of self-insurance, and any other insurance required by law. PROJECT OWNER further agrees to comply with the specific insurance requirements required by PIEDMONT in its sole discretion, if any, pursuant to Section 15 of this Permit, and PROJECT OWNER agrees to provide copies of the certificates of insurance to PIEDMONT if requested in PIEDMONT’s sole discretion.

5. It is further understood and agreed between PROJECT OWNER and PIEDMONT:

   a. That PIEDMONT does not, by consenting to the proposed encroachment upon PIEDMONT’s right of way and easement, assume any responsibility for the protection, maintenance, or operation of PROJECT OWNER’s facilities. Furthermore, all work performed in connection with any of the encroaching facilities and installations will be without any expense, risk, or liability to PIEDMONT or any of its directors, officers, agents, representatives, or employees except as otherwise expressly provided herein.

   b. That all work shall be conducted in a prudent, workmanlike manner and in conformity with any applicable statutes, orders, rules, or regulations and specifications of any governmental or regulatory authority having jurisdiction over the installations or facilities, and the work shall be in accordance with any applicable design, plans, drawings and specifications approved by Piedmont.

   c. That PIEDMONT reserves the right to maintain and repair the existing natural gas facilities and pipelines, to construct additional pipelines, and to fully exercise its easement rights which exist now or in the future without liability for restoring the installation or for the interruption of service in the use of such installations to the extent allowed by law, at any time and from time to time in such manner as PIEDMONT determines in its reasonable discretion to be necessary for the proper operation of its pipeline system or natural gas facilities.
d. That except to the extent made necessary by the construction and maintenance of such permitted encroachments, and the reasonable use thereof, the exercise of any rights permitted to PROJECT OWNER shall not interfere with or supersede the rights of PIEDMONT under its easements. Furthermore, nothing herein shall be construed as expanding, creating, or granting PROJECT OWNER any authority greater than the express terms of this Permit or as required by applicable law.

e. That except for approved permanent surface crossings or grade changes, any disturbance to the easement area or right of way resulting from any construction activities permitted hereunder shall be restored to its preconstruction condition and to the reasonable satisfaction of PIEDMONT.

6. This Permit shall not be assigned by PROJECT OWNER except as approved by PIEDMONT in writing in its reasonable discretion.

7. Execution below by PROJECT OWNER acknowledges agreement and acceptance of the conditions expressed herein for PROJECT OWNER's particular encroachment, and PROJECT OWNER agrees to adhere to the general requirements for permitting encroachments contained in Piedmont’s GUIDELINES FOR PROPOSED LAND USES, as amended from time to time. PROJECT OWNER further agrees not to begin any work within the confines of the easement or right of way until this Permit has been executed by the Parties.

8. That this Permit may only be terminated by mutual consent or for PROJECT OWNER’s failure to cure a material breach of the terms of this Permit within 30 days (or such additional time as PIEDMONT may approve in its sole discretion after written notice by PIEDMONT to PROJECT OWNER of the default, including a description of the default).

9. That if PIEDMONT, in its sole discretion, determines that the encroachment interferes with the exercise of its easement rights, then upon written notice to PROJECT OWNER, PROJECT OWNER shall, at its expense and within 30 days of such notice, modify or relocate its installations and facilities in such manner as to facilitate PIEDMONT’s continuing exercise of its easement rights; provided that PIEDMONT shall provide reasonable alternatives to accommodate the relocation of the installations or facilities within PIEDMONT’s easement or right of way. In such an event, when feasible, PIEDMONT agrees to use good faith efforts to minimize the adverse impact on PROJECT OWNER, including providing longer notice of any necessary relocation.

10. In the event of an emergency, in order to protect or safeguard its property, operations, equipment and/or employees from damage or injury, PIEDMONT may reasonably request immediate repair or renewal of the installations and facilities, and if the same is not performed within such period of time as Piedmont reasonably requires under the circumstances, PIEDMONT may make or contract to make such repairs or renewals, at the sole risk and actual cost and expense of PROJECT OWNER.

11. This Permit is based on PIEDMONT’s representation to PROJECT OWNER, and acceptance by PROJECT OWNER, that PIEDMONT’s easement is exclusive and that the PROJECT OWNER cannot cross PIEDMONT’s easement without PIEDMONT’s Permit as expressed herein.

12. Crossings are to be scheduled during PIEDMONT’s normal working hours. If PROJECT OWNER, or its agent, requests crossing to be done outside of PIEDMONT’s normal working hours, PROJECT OWNER shall reimburse PIEDMONT at PIEDMONT’s overtime rate for all hours required for crossing and travel time.

13. PROJECT OWNER will contact the applicable 811 OneCall in the state in which the work is performed to have all underground pipelines, installations and facilities located prior to any construction activity within PIEDMONT’S easement. All underground pipelines, installations and facilities are to be clearly marked during the construction process.

14. Proposed encroachments that are not installed within (1) year from the approval date need to be re-reviewed and reapproved by PIEDMONT Engineering before construction may begin.

15. SPECIAL PROVISIONS:

   a. PROJECT OWNER will contact the OneCall Locating Service to have the pipeline(s) located prior to any construction activity within PIEDMONT’S easement.

   b. Pipeline(s) are to be clearly marked during the construction process.
c. Installation(s) shall be in accordance with attached plans.

d. Installations shall maintain a minimum of 2’ of separation from PEIDMONT’s high pressure gas main, within the easement.

e. During backfilling operations, PROJECT OWNER shall provide and install color coded warning ditch tape 8'–12’ above their installation.

f. All installations shall be excavated and no mechanical excavation permitted within five (5) feet of pipeline without express authorization of PIEDMONT representative on-site, which authorization will be given after visual inspection of the pipeline.

g. Before drilling begins within the easement, PROJECT OWNER shall excavate a ‘window’ on the drill side, extending at least 2’ below PIEDMONT’s pipeline for PIEDMONT’s representative to monitor during drilling operations.

h. Neither sheeps foot rollers nor vibratory feature on roller type compaction equipment is permitted within 5 feet of PIEDMONT’s marked gas line.

i. For Ductile Iron Pipe (DIP) installations, PROJECT OWNER shall install (2) #6 stranded wires to their DIP and excavate enough of the crossing to allow for PIEDMONT to install test wires on the gas facility.

j. Within one (1) week following installation, the Contractor shall submit to the engineer drawings showing actual locations of the instrument and installation and baseline monitoring records. The installation and monitoring records shall include appropriate items from the following list, but not be limited to:
   a. Project name and number.
   b. Instrument type and number.
   c. Planned and as-built location in horizontal position and elevation.
   d. Personnel responsible for installation and/or monitoring.
   e. Date and time installation and/or monitoring.
   f. Space for initial readings to be taken to ensure the instruments are working properly or any necessary measurements as required to ensure proper installation.
   g. A space on the record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on the instrument behavior.
### Door Schedule

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
<th>Revision</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum Door</td>
<td>28 AUG 2019</td>
<td>A004</td>
<td>Drawn</td>
</tr>
<tr>
<td>Coiling Overhead Door</td>
<td>28 AUG 2019</td>
<td>A004</td>
<td>Drawn</td>
</tr>
<tr>
<td>Aluminum DBL Door</td>
<td>28 AUG 2019</td>
<td>A004</td>
<td>Drawn</td>
</tr>
</tbody>
</table>

### Door Details

1. **Type 1**
   - cmu: 3-1/2" x 6-1/2" x 8-1/2"

2. **Type 2**
   - cmu: 3-1/2" x 6-1/2" x 8-1/2"

3. **Type 3**
   - cmu: 3-1/2" x 6-1/2" x 8-1/2"

4. **Type 4**
   - cmu: 3-1/2" x 6-1/2" x 8-1/2"

### General Notes
- Do not use for construction.
- Aluminum doors.
- All materials and components stainless steel.
- Extra temporary weather seal.
- Exterior drain cap.
- Exterior door handle.
- Material: stainless steel (304-316)

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**Notice:**
- Violation of this schedule may result in construction delays.
- Always consult with project manager before making any changes.

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**Contact Information:**
- Venture IV Building, Suite 500
- Raleigh, North Carolina 27606
- Phone: (919) 233-8091, Fax: (919) 233-8031
- www.mckimcreed.com
- NC License# F-1222
1. DETAIL - AL I12 EXTR. COL / CS12 CNNS

2. DETAIL - TYP. AL I12 EXTR. COL / I9 BM CNNS

3. DETAIL - AL I12 EXTR. COL. BASE PLATE

4. DETAIL - AL I12 COL / SLAB-ON-GRADE CNNS

5. DETAIL - AL I12 INTR. COL. BASE PLATE

6. DETAIL - TYP. AL I12 COL. / I6 BM. CNNS

7. DETAIL - RIDGE CNNS

NOTES:

1 - DETAIL - AL I12 EXTR. COL / CS12 CNNS

2 - DETAIL - TYP. AL I12 EXTR. COL / I9 BM CNNS

3 - DETAIL - AL I12 COL / SLAB-ON-GRADE CNNS

4 - DETAIL - AL I12 COL / SLAB-ON-GRADE CNNS

5 - DETAIL - AL I12 INTR. COL. BASE PLATE

6 - DETAIL - TYP. AL I12 COL. / I6 BM. CNNS

7 - DETAIL - RIDGE CNNS
PRE-ATAD THICKENING FACILITY - BOTTOM PLAN

BOTTOM PLAN NOTES:

1. This is a Preliminary Plan for the Pre-Atad Thickening Facility in the Pre-Atad Phase.
2. Design and Engineering Services Provided by McKim & Creed.
3. This Plan is for Preliminary Review and Discussion.
4. Final Drawings and Specifications will be provided for construction.

DESIGN LOADS:

- Construction Loads: See Plan.

NORTHEAST BRUNSWICK REGIONAL
WATER RECLAMATION FACILITY
2.5 MGD FACILITY EXPANSION

Brunswick County
North Carolina

NORTH CAROLINA

McKIM & CREED

1700 Victory Drive
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www.mckimcreed.com

NC License# F-1222
Venture IV Building, Suite 500
Raleigh, North Carolina 27606

1730 Varsity Drive

ADDENDUM NO. 4
NOT FOR CONSTRUCTION
NORTHEAST BRUNSWICK REGIONAL WATER RECLAMATION FACILITY
2.5 MGD FACILITY EXPANSION
PRE-ATAD THICKENING FACILITY ROOF FRAMING PLAN

PRE-ATAD THICKENING FACILITY - ROOF FRAMING PLAN

1 - PLAN - PRE-ATAD THICKENING FACILITY - ROOF FRAMING PLAN

NORTH ROOF FRAMING PLAN NOTES:

- Structural:
  - DAR / WFB
  - WFB
  - AWB
  - AS NOTED

- S60.2

- ARDMORE DRIVE UNITED STATES
  - 1700 Rainier Drive
  - Raleigh, NC 27606
  - Phone: (919) 233-8091, Fax: (919) 233-8031
  - www.mckimcreed.com

- NC License # F-1222
  - Venture IV Building, Suite 500
  - Raleigh, North Carolina 27606
  - 1730 Varsity Drive

- BRUNSWICK COUNTY
  - NORTH CAROLINA

- A 90% DESIGN SUBMITTAL - NOT FOR CONSTRUCTION
  - 05 JUN 2019

- B FINAL DESIGN - NOT FOR CONSTRUCTION
  - 14 JUN 2019

- C ISSUED FOR BID - NOT FOR CONSTRUCTION
  - 19 JUL 2019

- D ADDENDUM NO. 2 - NOT FOR CONSTRUCTION
  - 21 AUG 2019

- E ADDENDUM NO. 4 - NOT FOR CONSTRUCTION
  - 28 AUG 2019
ROOF FRAMING PLAN NOTES:

A. The roof joist spacing shall be as noted on the plan. Joists shall be spaced at 18" o.c. in the Y direction and 24" o.c. in the X direction.

B. The roof sheathing shall be as noted on the plan. Sheathing shall be installed with the sheathing edges parallel to the roof framing member.

C. The roof framing members shall be as noted on the plan. Framing members shall be constructed of materials specified on the plan.

D. The roof framing members shall be anchored to the walls as noted on the plan. Anchorage shall be provided to resist wind loads.

E. The roof framing members shall be connected to the roof sheathing as noted on the plan. Connection shall be provided to resist wind loads.

F. The roof framing members shall be connected to the roof framing members as noted on the plan. Connection shall be provided to resist wind loads.

G. The roof framing members shall be connected to the roof framing members as noted on the plan. Connection shall be provided to resist wind loads.

H. The roof framing members shall be connected to the roof framing members as noted on the plan. Connection shall be provided to resist wind loads.

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X. The roof framing members shall be connected to the roof framing members as noted on the plan. Connection shall be provided to resist wind loads.

Y. The roof framing members shall be connected to the roof framing members as noted on the plan. Connection shall be provided to resist wind loads.

Z. The roof framing members shall be connected to the roof framing members as noted on the plan. Connection shall be provided to resist wind loads.
1. SECTION - THRU PRE-ATAD PUMP STATION

2. SECTION - THRU PRE-ATAD PUMP STATION

3. DETAIL - BTM. SLAB / WALL CONN.

4. DETAIL - CONC. WALL / CMU WALL CONN.

5. DETAIL - TRENCH REINF. REQ.'s

NOTES:

- SD117
- NORTHEAST BRUNSWICK REGIONAL
- WATER RECLAMATION FACILITY
- 2.5 MGD FACILITY EXPANSION
- BRUNSWICK COUNTY
- NORTH CAROLINA

PRE-ATAD PUMP STATION
SECTIONS AND DETAILS

ISSUED FOR BID - NOT FOR CONSTRUCTION
**BOTTOM PLAN NOTES:**

1. The layout shown represents the ATAD Reactor Bottom Plan as of the specified date. Additional plans may be required for specific applications.

2. Failure to follow these instructions may result in incorrect installation or operation of the equipment.

3. Design and installation should be performed by qualified personnel.

4. All equipment and systems listed are subject to change without notice.

5. McKim & Creed reserves the right to make changes to the plans and specifications at any time.

**DESIGN LOADS:**

- **A.** 90% SUBMITTAL - NOT FOR CONSTRUCTION
- **B.** FINAL DESIGN - NOT FOR CONSTRUCTION
- **C.** ISSUED FOR BID - NOT FOR CONSTRUCTION
- **D.** ADDENDUM NO. 4 - NOT FOR CONSTRUCTION

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**NORTHEAST BRUNSWICK REGIONAL WATER RECLAMATION FACILITY**

2.5 MGD FACILITY EXPANSION

**MCKIM & CREED**

1700 Longview Drive, Raleigh, NC 27606

Phone: (919) 233-3566, Fax: (919) 233-8031

www.mckimcreed.com

**BRUNSWICK COUNTY NORTH CAROLINA**

**NORTH CAROLINA**

**ADDENDUM NO. 4 NOT FOR CONSTRUCTION**

**SCALE:**

**HORIZONTAL: 1" = 10' 0"**

**VERTICAL: 1" = 0' 0"**

**M&C FILE NUMBER:**

**DRAWING NUMBER:** 00069-0047

**PROJ. START DATE:**

**MCE PROJ. #**
VX-15
16.76

VX-14
17.25

VX-16
15.88

VX-18
16.90

VX-19
16.16

VX-17
15.80

30'
15'
0

PLAN VIEW

PROFILE VIEW

1"=30' (VERT)

DESCRIPTION

DATE

REVISIONS

SCALE

HORIZONTAL:

VERTICAL:

M&C FILE NUMBER

DRAWING NUMBER

STATUS:

DRAWN

PROJ. MGR.

DESIGNED

CHECKED

PROJ. START DATE:

MCE PROJ. #

REV.NO.

Revision

AUG 2018

00069-0047

NORTHEAST BRUNSWICK REGIONAL WATER RECLAMATION FACILITY

2.5 MGD FACILITY EXPANSION

www.mckimcreed.com

NC License# F-1222

Venture IV Building, Suite 500

Phone: (919) 233-8091, Fax: (919) 233-8031

Raleigh, North Carolina 27606

1730 Varsity Drive

BRUNSWICK COUNTY

NORTH CAROLINA

A

90% DESIGN SUBMITTAL - NOT FOR CONSTRUCTION

05 JUN 2019

B

FINAL DESIGN - NOT FOR CONSTRUCTION

14 JUN 2019

C

ISSUED FOR BID - NOT FOR CONSTRUCTION

19 JUL 2019

D

ADDENDUM NO. 4 - NOT FOR CONSTRUCTION

28 AUG 2019

Civil

N/A

As Noted

C1

C1

C1

ISSUED FOR BID

NOT FOR CONSTRUCTION

D