

SECTION 00 91 12
ADDENDUM NUMBER 2

PARTICULARS

1.01 DATE: SEPTEMBER 24, 2015
1.02 PROJECT: WASTEWATER TREATMENT SYSTEM UPGRADE &
1.03 PROJECT LOCATION: HARBESON, DE
1.04 OWNER: ALLEN HARIM FOODS, LLC
1.05 ENGINEER: REID ENGINEERING COMPANY, INC.

TO: PROSPECTIVE BIDDERS:

2.01 THIS ADDENDUM FORMS A PART OF THE CONTRACT DOCUMENTS AND MODIFIES THE ORIGINAL PROCUREMENT DOCUMENTS DATED SEPTEMBER 2, 2015, AND ADDENDUM NUMBER 1 ISSUED SEPTEMBER 11, 2015, WITH AMENDMENTS AND ADDITIONS NOTED BELOW.

2.02 ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE SPACE PROVIDED IN THE BID FORM. FAILURE TO DO SO MAY DISQUALIFY THE BIDDER.

2.03 DRAWING REVISIONS

- A. Revision 1 - Address State Review Comments
- B. Revision 2 - Pipe Material and FEB Anoxic Effluent #1 Pump Station
 - 1. C100 - Revision 1
 - 2. C101 - Revision 1
 - 3. C102 - Revision 1
 - 4. C103 - Revision 1
 - 5. C104 - Revision 1 & 2
 - 6. C200 - Revision 1
 - 7. C201 - Revision 1
 - 8. C202 - Revision 1 & 2
 - 9. F200 - Revision 1
 - 10. M100 - Revision 1
 - 11. M101 - Revision 1 & 2
 - 12. M201 - Revision 1
 - 13. M202 - Revision 1 & 2
 - 14. M203 - Revision 1 & 2
 - 15. M300 - Revision 1 & 2
 - a. Revised Pump Station Electrical and Structural drawings will be provided
 - 16. M400 - Revision 1
 - 17. M401 - Revision 1
 - 18. M500 - Revision 1
 - 19. M501 - Revision 1
 - 20. M600 - Revision 1
 - 21. M601 - Revision 1
 - 22. M602 - Revision 1
 - 23. M603 - Revision 1 & 2
 - 24. M604 - Revision 1 & 2
 - 25. M700 - Revision 1 & 2
 - 26. M701 - Revision 1 & 2
 - 27. D100 - Revision 1
 - 28. D200 - Revision 1

ATTACHMENTS

3.01 THE FOLLOWING ATTACHMENTS SHALL BE INCLUDED AS PART OF THIS ADDENDUM.

- A. Dutchland - Site Installation Requirments Exhibit
- B. Dutchland - Subgrade and Footer Detail
- C. Dutchland - Clarifier Scope of Work Exhibit

CHANGES TO THE PROJECT MANUAL - SPECIFICATIONS:

4.01 SECTION 00 31 00 - AVAILABLE PROJECT INFORMATION

- A. Replace paragraph 1.01, B. with the following "Geotechnical Report: Entitled Report of Subsurface Exploration and Geotechnical Engineering Recommendations, dated April 30, 2015 and Supplement to Report of Subsurface Exploration and Geotechnical Engineering Recommendations dated August 28, 2015."

4.02 SECTION 00 43 73 - PROPOSED SCHEDULE OF VALUES FORM

- A. Replace this section in its entirety with the revised section attached to this Addendum.

4.03 SECTION 07 52 00 - MODIFIED BITUMINOUS MEMBRANE ROOFING

- A. Insert the this section, included in this Addendum, into the Technical Specifications

4.04 SECTION 40 91 20 - MAGNETIC FLOW METERS

- A. Replace this section in its entirety with the revised section attached to this Addendum.

4.05 SECTION 43 21 22 - SELF PRIMING CENTRIFUGAL PUMPS

- A. Replace thus section in its entirety with the revised section attached to this Addendum.
- B. Please not HP revisions to sevral pumps.
- C. Please include modifications to the electrical and structural design of the pump stations. Revised Structural and Electrical Drawings will be provided.

4.06 SECTION 46 66 53 - OPEN CHANNEL ULTRA-VIOLET DISINFECTION SYSTEM

- A. Replace paragraph 1.04, A, 5. as follows - Ultraviolet Transmittance @ 253.7 nm: 65% minimum

CLARIFICATIONS

5.01 BIDS SHALL BE SUBMITTED AS A HARD COPY TO THE OWNER BY THE SPECIFIED DATE AND TIME.

- A. Bids delivered in person on the date of the Bid will be collected in the security building.
- B. Bids delivered via US Postalk Service, UPS, FedEx or other delivery method shall be addressed as floows:
 - 1. Allen Harim Foods, LLC, Attn: Jim Quinton - WWTP BID, 18752 Harbeson Road, Harbeson DE, 19951

5.02 COMPLIANCE STATEMENTS

- A. The Compliance Statements included in Section 00 51 00 shall be included in the Bid Documents submitted by each Bidder.

REQUESTS FOR INFORMATION

6.01 RESPONSE TO RFIS

- A. Response to RFIs 1 through 4 were included in Addednum #2
- B. Response to RFIs 5 through 21 are included in the attached RFI Log.

END OF ADDENDUM NUMBER 2

RFI Log

No.	COMMENT	RESPONSE
1	M203 – Is the pump suction stainless or carbon steel?	Stainless Steel
2	M601 – Is the exposed clarifier effluent stainless or carbon steel?	Stainless Steel
3	Can the Clarifier Mechanism scope of supply be made available to the Bidders	The Evoqua proposal is attached to this Addendum
4	Is the Contractor responsible for painting the clarifier mechanism	The clarifier mechanism is factory primed. The Contractor shall field paint the finish coat with a compatible paint system.
RFIs 1 - 4 were included in Addendum #1		
5	Dwg S1.03 calls out the UV grating as FRP and Dwg M701 calls out aluminum checker plate.	The covering over the UV Channel shall be 3/8" Aluminum Checker Plate
6	0 21 13-1 2.01.C, states – Offers will be opened publicly immediately after the time of receipt. Is this an open bid?	Bids will be opened and read aloud publically.
7	Can bids be faxed in? If so do you have a fax number?	Bids must be submitted in a hard copy form in a sealed envelope.
8	Section 00 43 73 Proposed Schedule of Values Form – can this be turned in 24 hours after the bid opening? It will be very difficult for us to have this completed at the same time as the bid is due.	Section 00 43 73 - Proposed Schedule of Values Form must be completed and submitted with the Bid Documents on or before the specified Bid Time and Date.
9	Section 43 21 22-1 Self Priming Centrifugal Pumps states modify five existing self-priming centrifugal pumps. 1.04 Design Requirements states, modify 3 Existing DAF Effluent Pps, 2 RAS Pps, and 2 FEB/Anoxic Reactor #1 Pps for a total of 7 modifications. Which is correct?	The FEB/Anoxic Reactor #1 Effluent Pumps (1.04, E.) are to be new pumps; therefore there will be 6 new pumps and 5 pumps to be modified.
10	Per Addendum 1, Item 4.01.A we are instructed to include Dutchland's site access and preparation requirements. Please provide the additional information based on Dutchlands scope;	The Owner has purchased the two Pre-Cast Post Tensioned Tanks from Dutchland, Inc. The Site Access and Site Specific section of the Dutchland proposal that was incorporated to the scope of this project for all Bidders through Addendum 1 lists the responsibilities of the General Contractor (successful Bidder). These responsibilities are included in the General Contractor's Scope of Work and therefore Bids shall be prepared to include the associated work.

10a	<p>Item 1 - Access roads will these be for construction use only? Will the GC be required to remove the access roads upon completion? It states that we are to provide dry roads in all weather conditions. This project is to be constructed during the wet weather/winter season thus could this be an allowance item? This is placing undue responsibility on the GC. Dutchland is to define logistics. Please provide a detailed drawing.</p>	<p>The required access roads are primarily on the existing graveled drives of the existing facility. Please see attached access drawing provided by Dutchland.</p>
10b	<p>Item 2 – Crane, pump truck and tractor trailer pads are the required by the GC, is this 1 per each per tank or are multiple required per tank? Based on the existing structures the new DAF Tank will only be accessible on one side. Please provide a detailed drawing.</p>	<p>Please refer to the attached access drawing provided by Dutchland.</p>
10c	<p>Item 4 – The GC cannot be responsible for existing overhead conditions.</p>	<p>See Response to RFI 10. Based on existing conditions no overhead interference is anticipated; however the Bidder shall verify and price their Bids accordingly.</p>
10d	<p>Item 10 – provide exact geo-textile fabric to be installed. Provide exact stone sub-base material to be used.</p>	<p>The subgrade for the proposed tanks shall be per the requirements of the geotechnical engineer. The Tank Manufacturer requires the minimum uniform bearing capacity as outlined in the geotechnical supplement dated August 28, 2015.</p> <p>The Bidder shall include in their proposed scope of work that 12" of clean ½" stone is placed on top of the prepared subgrade for leveling and support of the reinforcing bar, forms, and pressure relief valves. The top of this stone elevation should coincide with the bottom of the tank's base concrete slab elevation and be with ½" tolerance.)</p> <p>The successful Bidder shall excavate the subgrade for the tank footers, PRVs and Clarifier center pier. Refer to attached Drawings provided by Dutchland.</p>
10e	<p>Item 11 – can the owner provide the water supply? Or provide exact amount of water the GC is to supply. GC requirement to Dutchland, Dutchland is responsible for providing the means and methods to transfer all needed water. Dutchland is responsible for properly disposing of all water. This includes testing water for tanks. Dutchland is responsible for draining of tanks after they have met the testing requirements. The GC is not responsible for providing water at any certain flow rate.</p>	<p>The Bidder shall provide all necessary equipment to pump and transfer treated effluent from the existing WWTP into each of the two new tanks for the purpose of hydrostatic testing in a timely manner (shall not exceed two days to fill). The Successful Bidder shall coordinate and drain the tanks with the WWTP Operations staff.</p>

10f	<p>Item 12 – Who is responsible for excavation of Dutchlands tank foundation? If GC is to provide any excavation and trenching for Dutchland provide detailed drawings asap so that the quantities can be figured. If this is not provided we cannot assume this responsibility. Currently the way we read the project documents and Dutchlands scope the GC will provide a flat pad foundation with 12” of gravel, (define what kind of gravel) any additional excavation will be the responsibility of Dutchland.</p>	<p>Per Section 43 41 68, paragraph 3.01 the Successful Bidder shall be responsible for preparing the subgrade for each tank. The subgrade shall be prepared per the recommendations of the geotechnical report provided in the Bid Documents.</p> <p>The successful Bidder shall excavate the subgrade for the tank footers, PRVs and Clarifier center pier. Refer to attached Drawings provided by Dutchland.</p> <p>See RFI 10d.</p>
10g	<p>GC requirements to Dutchland – Dutchland is to maintain project schedule. If Dutchland is not on site no later than November 16, 2015 and complete by and before January 15, 2016 GC can and will charge Dutchland for any additional costs incurred, including overhead and profit, this is non-negotiable.</p>	<p>The Successful Bidder (General Contractor) shall not charge, bill, penalize or fine the manufacturer of the Owner purchased Tanks. The successful Bidder will not be penalized by the Owner for delays caused by the manufacturer. The Successful Bidder will be granted one additional day to the schedule for each day beyond January 15, 2016 that the Tank Manufacturer is still completing the construction of the tanks.</p>
11	<p>Who’s responsibility is it to drain, and clean the existing CMAS Basin in order to install the jet aeration manifold?</p>	<p>The Jet Aeration manifold is to be installed “wet”. The CMAS reactor is not to be drained. The existing CMAS reactor is to remain in service with the exception of the existing jet pumps will be shut down during the placement of the new Jet Aeration Manifold.</p>
12	<p>Please see Evoqua’s Quote page 5 of 12 items excluded. It appears that Evoqua is not providing a complete package, who is supplying the items that they have excluded? If the GC is to provide please provide the needed specifications and requirements.</p>	<p>The Contractor is to provide all material, labor and equipment to install the Owner purchased Clarifier Mechanism. Please be specific concerning additional specifications as many of the excluded items are already specified elsewhere in the Bid Documents.</p>
13	<p>Sheet M202 a 14” Magnetic Flow Meter is shown it is not listed in section 40 91 20</p>	<p>See attached revised Specification Section 40 91 20.</p>

14	Who is responsible for the installation of the Clarifier Center Pier, the GC or Dutchland? If the GC is to install please provide a drawing.	<p>The Tank Manufacturer is responsible for the installation of the concrete center pier for the clarifier mechanism.</p> <p>The Successful Bidder shall be responsible for the excavation and preparation of the subgrade for the installation of the center pier. The center pier area shall be over excavated by 3' to allow the Tank Manufacturer working room to set their forms. The center pier shall be backfilled by the Successful Bidder (General Contractor) prior to the Tank Manufacturer proceeding with the slab construction for the clarifier. The Successful Bidder shall coordinate excavation and backfilling operations with the Tank Manufacturer.</p>
15	Section 46 43 21 Clarifier Mechanism Item 1.20.C states, the clarifier mechanism shall be designed for installation in an above grade stainless steel tank.	The Clarifier shall be constructed of concrete.
15a	It is my understanding that the tank will be concrete, is this correct?	The Clarifier Tank will be Pre-Cast Post Tensioned Concrete.
15b	If the tank is concrete who will be responsible for providing all the epoxy anchors?	The Successful Bidder shall be responsible for supplying all labor material and equipment required for the complete and operational installation of the equipment that is not specifically stated in the Evoqua and Dutchland proposals attached to Addendum #1.
15c	Are there any special requirements for drilling into the concrete tank, location of tendons, reinforcing, etc.?	Drilling locations shall be coordinated with the Tank Manufacturer.
15d	If the tank is concrete will the tank supplier be responsible pipe penetrations or will the GC be required to core the concrete walls?	<p>The Tank Manufacturer shall provide pipe penetrations cast into the tank walls.</p> <p>The Successful Bidder shall be provide and install the link seals.</p>
16	Where is the Metal Roof Structure shown on drawing S5.03 detail 1 located on the project?	Refer to S1.00 and S1.01
17	Who is the manufacturer of the Existing CMAS Tank No. 2 which has a new 18" Flange in tank wall. Reference Detail 8/M604 Please advise.	Aqua Store Serial # PSU-1641-002
18	Who is responsible for supplying and installing pipe supports to the walls of the concrete tanks?	<p>The Contractor shall supply and install the stainless steel pipe supports.</p> <p>Pipe support anchoring details shall be provided by the Tank Manufacturer. Pipe support and bracket details will be provided.</p>

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19	Is the Contractor responsible for disposing of the fan equipment in the Live Shed?	The Successful Bidder shall be responsible for demolition and proper offsite disposal of all material and equipment removed/demolished from the existing Live Shed.
20	Who is the manufacturer of the existing CMAS #1 tank?	The existing CMAS No. 1 tank is a Tec Tank.
21	What is the weight of the Drop In Jet Aeration System	Per one of the potential manufacturers the dry weight with concrete ballast is approximately 11,000 lbs. The wet weight is approximately 14,000 lbs.

Allen Harim Foods, LLC
Harbeson, DE
Wastewater Treatment System Upgrade and Expansion - Phase One

SECTION 00 43 73
PROPOSED SCHEDULE OF VALUES FORM

PARTICULARS

THE FOLLOWING IS A COST BREAKDOWN REFERENCED IN THE BID SUBMITTED BY:

(BIDDER) _____

TO (OWNER): ALLEN HARIM FOODS, LLC

DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ITEM DESCRIPTIONS

EARTHWORK	\$ _____
EROSION & SEDIMENT CONTROL	\$ _____
NEW DAF FEB SYSTEM	\$ _____
NEW RAW WASTEWATER PUMP STATION	\$ _____
MODIFY EX. DAF PRETREATMENT EQUIPMENT	\$ _____
MODIFY EX. DAF EFFLUENT PUMP STATION	\$ _____
NEW FINAL CLARIFIER NO. 2 SYSTEM	\$ _____
MODIFY EXISTING RAS PUMP STATION	\$ _____
NEW JET SYSTEM FOR EX. CMAS #2A	\$ _____
NEW/MODIFIED PROCESS PIPING - BELOW GRADE	\$ _____
NEW/MODIFIED PROCESS PIPING - ABOVE GRADE	\$ _____
NEW REACTOR NO. 1 EFFLUENT PUMP STATION	\$ _____
NEW UV DISINFECTION SYSTEM	\$ _____
DEMOLITION OF LIVE SHED	\$ _____
ALLOWANCE FOR STRUCTURAL MODIFICATIONS FOR TRUCK SHOP	\$ 15,000 _____
STRUCTURAL STEEL STAIRS AND WALKS	\$ _____
PIPE HEAT TRACE & INSULATION	\$ _____
MISC. STEEL	\$ _____
MISC. CONCRETE	\$ _____
PAINT	\$ _____
ELECTRICAL	\$ _____
HVAC	\$ _____
CONTINGENCY ALLOWANCE	\$ 100,000 _____
GENERAL CONDITIONS	\$ _____
MOBILIZATION	\$ _____
BID BOND	\$ _____
PERFORMANCE & PAYMENT BOND	\$ _____
INSURANCE	\$ _____
TOTAL BID AMOUNT	\$ _____

END OF SUPPLEMENT E

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SECTION 07 52 00
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Modified bituminous roofing membrane, conventional application.
- B. Insulation, flat.
- C. Deck sheathing.
- D. Base flashings.
- E. Roofing cant strips, accessories, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashings and reglets.
- C. Section 07 9006: Joint sealant for roofing systems.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2010.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2010.
- D. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011.
- E. ASTM D6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements; 2011.
- F. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- G. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation; 2007.
- H. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.
- I. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated flashings and counterflashings installed by other sections.
- B. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog data for membrane and bitumen materials, base flashing materials, insulation, vapor retarder, and surfacing.
- B. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and mechanical fastener layout.
- C. Manufacturer's qualification data.
- D. Installer's qualification data.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture; ballast materials may be stored outdoors.
- C. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.09 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide 15 year manufacturer's material and labor warranty to cover failure to prevent penetration of water.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Membrane Materials:
 - 1. GAF Materials Corporation: www.gaf.com.
 - 2. Firestone Building Products Co: www.firestonebpc.com.
 - 3. Johns Manville: www.jm.com
 - 4. Soprema, Inc.: www.soprema.us
 - 5. Or Approved Equal
- B. Cover Board:
 - 1. U. S. Gypsum Securock: www.usg.com
 - 2. Or Approved Equal
- C. Insulation:
 - 1. Atlas Roofing Corporation: www.atlasroofing.com.
 - 2. Hunter Panels: www.hpanels.com
 - 3. RMAX, Inc.: www.rmaxinc.com
 - 4. As supplied by selected membrane manufacturer.
 - 5. Or Approved Equal

2.02 ROOFING

- A. Modified Bituminous Roofing: Two-ply membrane, with insulation.
- B. Roofing Assembly Requirements:
 - 1. External Fire Exposure Classification: ASTM E108 Class B, UL listed.
 - 2. Internal Fire Spread Classification: Factory Mutual Class 1, FM-approved.
 - 3. Wind Resistance Classification: Factory Mutual I-90, in accordance with FM DS 1-28.
 - 4. Insulation Thermal Value (R) = 24.
 - 5. Surfacing: Mineral granules.

- C. Acceptable Insulation Types - Constant Thickness Application: Any type that meets requirements and is approved by membrane manufacturer for application.
 - 1. Bottom layer of Polyisocyanurate board covered with single layer of 1/2" Securock board.

2.03 MEMBRANE AND SHEET MATERIALS

- A. Cap Sheet Membrane: Polymer modified asphalt, reinforced with non-woven fabric; granule surfaced; with the following characteristics:
 - 1. Minimum Quality: ASTM D6164 Type I; styrene-butadiene-styrene (SBS) modified, polyester reinforced.
 - a. Accepted Products:
 - 1) Firestone Building Products Co.: SBS Cap
 - 2) GAF: Ruberoid SBS Mop Plus Granule
 - 3) Johns Manville: Dynalastic 180
 - 4) Soprema: Sopralene 180 Granule
 - 2. Color: White.
- B. Base Sheet Membrane: Polymer modified asphalt, reinforced with non-woven fabric; smooth surfaced; with the following characteristics:
 - 1. Minimum Quality: ASTM D6164 Type I Grade S; styrene-butadiene-styrene (SBS) modified, polyester reinforced.
 - a. Accepted Products:
 - 1) Firestone Building Products Co.: SBS Smooth
 - 2) GAF: Ruberoid SBS Mop Plus Smooth
 - 3) Johns Manville: Dynalastic 180S
 - 4) Soprema: Sopralene 180 Smooth
- C. Flexible Flashing Material: Same material as cap sheet membrane.

2.04 BITUMINOUS MATERIALS

- A. Primer: ASTM D41, asphalt type.
- B. Cold adhesive as supplied by the membrane manufacturer.
- C. Flashing cement as supplied by the membrane manufacturer.

2.05 DECK SHEATHING / INSULATION COVER BOARD

- A. Deck Sheathing: Fiber reinforced gypsum panels, 1/2" (12 mm) thick.
 - 1. Products:
 - a. US Gypsum Securock.

2.06 INSULATION

- A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 2, polymer bonded glass fiber mat both faces, and with the following characteristics:
 - 1. Compressive Strength: 16 psi (110 kPa)
 - 2. Board Size: 48 x 48 inch (1220 x 1220 mm) mechanically attached applications.
 - 3. Board Thickness: 4 inches.
 - 4. Thermal Resistance: R-value = 24.
 - 5. Manufacturers: As defined in 2.01C

2.07 ACCESSORIES

- A. Cant and Edge Strips: mineral fiber, compatible with roofing materials ; cants formed to 45 degree angle Cant RSS as supplied by ModulRTS: www.modulrts.com.
- B. Sheathing Adhesive: Urethane Foam, for adhering gypsum sheathing or insulation to metal deck and each other. As supplied or approved by membrane manufacturer.
- C. Insulation Fasteners, Plates: Appropriate for purpose intended and approved by roofing manufacturer.
 - 1. Length as required for thickness of insulation material and penetration of deck substrate, .
- D. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.

- E. Sealants: As recommended by membrane manufacturer.
- F. Sprayed In Place Foam Insulation: Froth-Pak by Dow Chemical Company:
www.dowbuildingsolutions.com

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailers are in place.

3.02 METAL DECK PREPARATION

- A. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual recommendations and roofing manufacturer's instructions.

3.03 INSULATION INSTALLATION

- A. Attachment of Insulation Over Metal Deck Without Vapor Barrier:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
 - 2. Embed subsequent layers of insulation in urethane foam adhesive ribbons in accordance with roofing and insulation manufacturers' instructions.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.
- C. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- E. Do not apply more insulation than can be covered with membrane in same day.

3.04 COVER BOARD APPLICATION

- A. Ensure insulation is clean, dry and ready for application of cover board.
- B. Embed cover board in urethane foam adhesive ribbons in accordance with roofing and cover board manufacturers' instructions.
- C. Lay cover board with joints staggered minimum 6 inch (150 mm) from joints of preceding insulation layer.
- D. Lay boards with edges in moderate contact without forcing. Cut to fit neatly to perimeter blocking and around penetrations through roof.
- E. Place mineral wool cants at all perimeter walls, parapets and curbed penetrations in a bed of flashing cement. Neatly fit all joints and mitre all corners.

3.05 MEMBRANE APPLICATION

- A. Apply membrane in accordance with manufacturer's instructions.
- B. Apply membrane in cold adhesive; heat weld all laps and seal edges and ends permanently waterproof.
- C. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears. Ensure full bond of membrane to substrate.
- D. Apply mineral granules, supplied by manufacturer in bleed out at all laps while bitumen is still hot. Gently press in to assure embedment.

- E. At end of day's operation, install waterproof cut-off. Remove cut-off before resuming roofing. Maintain stagger in insulation/cover board layers at cut-off.
- F. At roof edges, gutter edges and parapets, extend membrane to the outside face of the wall below wood blocking and terminate over butyl tape or water cut off mastic with termination bar.
- G. Install roofing expansion joints where indicated. Make joints airtight by flashing with membrane prior to sheet metal application.

3.06 SURFACING

- A. Install walkway pads by setting in cold adhesive and hot air welding the laps. Set joints 3 inches (75 mm) apart.

3.07 FIELD QUALITY CONTROL

- A. The work may be monitored on a continuous basis by the owner or an owner's representative to assure compliance with specifications. Deviations from the specifications shall be corrected by the contractor at no additional cost to the owner.
- B. Require site attendance of roofing material manufacturers 3 times during installation of the Work. Provide copy of manufacturer's inspection report.

3.08 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 40 91 20
MAGNETIC FLOW METERS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals to install and test, complete and ready for operation, seven (7) magnetic flow meter(s) as shown on the Drawings and as specified herein.
- B. The material specified herein shall comply with the American Iron and Steel provision of the Clean Water Act as it applies to the State Revolving Loan Funds and as administered by the State of Delaware. It is the Contractor's responsibility to determine if the Approved Manufacturers comply with the requirements of the provision.

1.02 RELATED SECTIONS

- A. Division 26 - Electrical

1.03 SYSTEM DESCRIPTION

- A. The process fluid to be measured will be raw wastewater from the processing plant.
- B. Fluid temperature will range from 5 degrees C to 45 degrees C

1.04 DESIGN REQUIREMENTS

- A. Raw Wastewater Pump Station Flow Meter:
 - 1. Quantity: One (1)
 - 2. Size: 14 inch
 - 3. Liner Material: Neoprene
 - 4. Process Connection: Flange ANSI Class 150
 - 5. Flange Material: Carbon Steel
 - 6. Electrode Material: AISI 316 Ti (316 SS)
 - 7. Enclosure: NEMA 6 (10 feet of water for 72 hours)
 - 8. Transmitter Electronics: Remote mounted with cable to sensor
 - 9. Flow range: 500 - 3,000 gpm
 - 10. Flow Indicators: Digital flow indicator (gpm) and totalizer (gallons).
- B. FEB Effluent/DAF Influent Pump Station Flow Meter:
 - 1. Quantity: One (1)
 - 2. Size: 10 inch
 - 3. Liner Material: Neoprene
 - 4. Process Connection: Flange ANSI Class 150
 - 5. Flange Material: Carbon Steel
 - 6. Electrode Material: AISI 316 Ti (316 SS)
 - 7. Enclosure: NEMA 6 (10 feet of water for 72 hours)
 - 8. Transmitter Electronics: Remote mounted with cable to sensor
 - 9. Flow range: 700 - 2,000 gpm
 - 10. Flow Indicators: Digital flow indicator (gpm) and totalizer (gallons).
- C. RAS Pump Station Flow Meter:
 - 1. Quantity: Two (2)
 - 2. Size: 8 inch
 - 3. Liner Material: Neoprene
 - 4. Process Connection: Flange ANSI Class 150
 - 5. Flange Material: Carbon Steel
 - 6. Electrode Material: AISI 316 Ti (316 SS)
 - 7. Enclosure: NEMA 6 (10 feet of water for 72 hours)
 - 8. Transmitter Electronics: Remote mounted with cable to sensor
 - 9. Flow range: 500 - 2800 gpm

- 10. Flow Indicators: Digital flow indicator (gpm) and totalizer (gallons).
- D. FEB/Anoxic Reactor Effluent Pump Station Flow Meter:
 - 1. Quantity: Two (2)
 - 2. Size: 14 inch
 - 3. Liner Material: Neoprene
 - 4. Process Connection: Flange ANSI Class 150
 - 5. Flange Material: Carbon Steel
 - 6. Electrode Material: AISI 316 Ti (316 SS)
 - 7. Enclosure: NEMA 6 (10 feet of water for 72 hours)
 - 8. Transmitter Electronics: Remote mounted with cable to sensor
 - 9. Flow range: 1,500 - 6,000 gpm
 - 10. Flow Indicators: Digital flow indicator (gpm) and totalizer (gallons).
- E. WAS Pump Station Flow Meter:
 - 1. Quantity: One (1)
 - 2. Size: 4 inch
 - 3. Liner Material: Neoprene
 - 4. Process Connection: Flange ANSI Class 150
 - 5. Flange Material: Carbon Steel
 - 6. Electrode Material: AISI 316 Ti (316 SS)
 - 7. Enclosure: NEMA 6 (10 feet of water for 72 hours)
 - 8. Transmitter Electronics: Remote mounted with cable to sensor
 - 9. Flow range: 1,500 - 6,000 gpm
 - 10. Flow Indicators: Digital flow indicator (gpm) and totalizer (gallons).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit product data, including Manufacturer's data, for specified products. Include the following:
 - 1. Manufacturer's outline and mounting dimensions for all flow meters.
 - 2. Manufacturer's wiring diagrams, including field connections.
 - 3. Mounting Details.
 - 4. All equipment to be furnished under this Section must be approved prior to being released for manufacturing unless otherwise noted by the Engineer.

1.06 QUALITY ASSURANCE

- A. The flow meters covered by this Section are intended to be standard equipment, as modified by this Section, of proven ability, as manufactured by a single manufacturer, having long experience in the production of such flow meters. The flow meters furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings and specified herein.
- B. In the event that equipment which differs from this Section be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no cost to the Owner and be as approved by the Engineer.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. In accordance with Section 01 60 00.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Rosemont
- B. ABB
- C. Sparling Instrument Co., Inc.
- D. Or Approved Equal
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL

- A. The magnetic flowmeter shall utilize characterized electromagnetic induction to produce a voltage linearly proportional to the average flow rate. The metering system shall consist of a sensor with field coils, transmitter and interconnecting cables to make a complete operating flow metering system. The meter shall be of the bi-polar pulsed dc type with continuous automatic zeroing.

2.03 CONSTRUCTION

- A. The sensor shall be a flanged tube with non-conductive liner. The tube shall be constructed of Type 304 stainless steel with carbon steel flanges AWWA Class D if the coils are external to the tube. If the coils are encapsulated inside the tube, the tube and flanges may be of carbon steel. Sensor rating shall be NEMA-4 and capable of withstanding accidental submergence in water. The power supply shall be 120-volt AC, 60 HZ. Power consumption shall not exceed 42 watts regardless of size. Accuracy of the flowmeter system shall be 0.5 percent of rate from 10 to 100 percent of scale. Below 1 full percentage scale [fps] it shall be 0.1 percent of full scale. Repeatability shall be 0.1 percent of rate. Liner material shall be neoprene or teflon. External surfaces shall be factory-finished with a corrosion resistant coating. The specific conductivity of the liquid shall not preclude meter operation.

2.04 COMPONENTS

- A. Output: 4-20 mA DC into 800 ohms, isolated, standard
- B. Adjustments: Calibration, Sensitivity, Damping, mA zero and span.
- C. Linearity: plus or minus 0.5% full span
- D. Repeatability: plus or minus 0.1% full span
- E. Accuracy: Within plus or minus 2.0% full span
- F. Signal Strength Meter: Analog type standard
- G. Transducer: Single twin-crystal transducer with 20 feet armored flexible cable.
- H. Standard Transducer Temperature Range: -300 degrees F to 320 degrees F.
- I. Transmitter Temperature Range: -10 degrees F to 140 degrees F.
- J. Power Requirements: 120 Volts, 60 Hz.
- K. Transmitter Housing: NEMA 4X thermoplastic standard.
- L. Flow Rate Indicator: Mounted integrally in transmitter housing. Graduations linear in gpm. Shatterproof window.
- M. Internal Frequency Standard: Calibration assured by on-board frequency reference.
- N. Grounding: Grounding rings or electrodes of the same material as the sensing electrodes shall be furnished mounted in each end of all meters one inch and larger in size. Provide grounding strap between adjacent pipe, grounding rings and flow tube, unless adjacent pipe is either non-conductive or lined with non-conductive materials, in which case provide grounding string between the rings and tube only. If grounding electrodes are provided, grounding rings shall also be provided for liner protection.
- O. Transmitter: The transmitter shall be either meter and/or remote mounted as indicated on the Drawings and as specified in paragraph 1.04 Design Requirements. If the transmitter is remote

mounted, the interconnecting cable shall be furnished by the manufacturer of the metering system. Remote transmitters shall be housed in NEMA-4X enclosures suitable for wall mounting. The transmitter shall produce a 4-20 mA dc output signal into a minimum load of 800 ohms linear to flow, and a scaled pulse when called for above for totalization.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations in the locations shown on the Drawings and as specified herein.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01400.
- B. Each flow meter shall be tested prior to shipment and the documentation of the test shall be submitted with O & M Manual for the flow meters.
- C. The services of a factory trained representative shall be provided for a total of two (2) days of testing and calibration of the flow meters.

END OF SECTION

SECTION 43 21 22
SELF-PRIMING CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals to install and test, complete and ready for operation eight (8) new self-priming centrifugal pumps and modify five (5) existing self-priming centrifugal pumps as shown on the Drawings and as specified herein.
- B. The material specified herein shall comply with the American Iron and Steel provision of the Clean Water Act as it applies to the State Revolving Loan Funds and as administered by the State of Delaware. It is the Contractor's responsibility to determine if the Approved Manufacturers comply with the requirements of the provision.

1.02 RELATED SECTIONS

- A. Division 26 - Electrical

1.03 SYSTEM DESCRIPTION

- A. The pumps shall be designed with an open impeller to be used for pumping liquids containing solid particles and abrasives.
- B. The pumps shall have an unobstructive flow into the suction and a large smooth flow channel to the casing and impeller which shall prevent clogging.
- C. The pumps shall be designed for continuous duty under severe operating conditions.
- D. Each pumping unit shall be complete with pump, baseplate and coupling guard, overhead v-belt drive, belts and sheaves, motor, and appurtenances. One manufacturer shall furnish all components.

1.04 DESIGN REQUIREMENTS

- A. Raw Wastewater Pump Station:
 - 1. Number of Pumps: Two (2)
 - 2. Configuration: Parallel
 - 3. Design Point #1: 2800 gpm at 40 ft TDH
 - 4. Design Point #2: 1667 gpm at 30 ft TDH
 - 5. Pump Speed at Design Capacity: 1050 rpm
 - 6. Maximum Solids Size: 3 inches
 - 7. Motor Horsepower: 50 HP
 - 8. Motor Type: TEFC Severe Duty
 - 9. Motor Configuration: Overhead V-Belt Drive
 - 10. Pump Influent Size: 10-inch
 - 11. Pump Effluent Size: 10-inch
 - 12. The pump shall be capable of operating on a variable speed drive for automatic control of the pump speed to maintain a set liquid level in the pump station wet well.
- B. FEB Effluent/DAF Influent Pump Station:
 - 1. Number of Pumps: Two (2)
 - 2. Configuration: Parallel
 - 3. Design Point #1: 1400 gpm at 45 ft TDH
 - 4. Design Point #2: 1100 gpm at 35 ft TDH
 - 5. Pump Speed at Design Capacity: 1050 rpm
 - 6. Maximum Solids Size: 3 inches
 - 7. Motor Horsepower: 40 HP
 - 8. Motor Type: TEFC Severe Duty
 - 9. Motor Configuration: Overhead V-Belt Drive
 - 10. Pump Influent Size: 8-inch
 - 11. Pump Effluent Size: 8-inch

12. The pump shall be capable of operating on a variable speed drive for manual control of pump speed and flow pump rate.
- C. Existing DAF Effluent Pump Station:
1. The Existing DAF Effluent Pump Station pumps shall be modified with new motors, impellers, belts and sheaves, as necessary, to be fully operational for the stated conditions:
 - a. It shall be the Contractor's responsibility to coordinate the necessary improvements for the existing pumps based on their existing condition with the pump manufacturer.
 2. Number of Pumps: Three (3)
 3. Configuration: Parallel
 4. Design Point #1: 1400 gpm at 60 ft TDH
 5. Design Point #2: 1100 gpm at 25 ft TDH
 6. Pump Speed at Design Capacity: 1150 rpm
 7. Maximum Solids Size: 3 inches
 8. Motor Horsepower: 50 HP
 9. Motor Type: TEFC Severe Duty
 10. Motor Configuration: Overhead V-Belt Drive
 11. Pump Influent Size: 8-inch
 12. Pump Effluent Size: 8-inch
 13. The pump shall be capable of operating on a variable speed drive for automatic control of the pump speed to maintain a set liquid level in the pump station wet well.
- D. Existing RAS Pump Station:
1. The Existing RAS Pump Station pumps shall be modified with new motors, impellers, belts and sheaves, as necessary, to be fully operational for the stated conditions:
 - a. It shall be the Contractor's responsibility to coordinate the necessary improvements for the existing pumps based on their existing condition with the pump manufacturer.
 2. Number of Pumps: Two (2)
 3. Configuration: Parallel
 4. Design Point #1: 1400 gpm at 47 ft TDH
 5. Design Point #2: 700 gpm at 15 ft TDH
 6. Pump Speed at Design Capacity: 1550 rpm
 7. Maximum Solids Size: 3 inches
 8. Motor Horsepower: 40 HP
 9. Motor Type: TEFC Severe Duty
 10. Motor Configuration: Overhead V-Belt Drive
 11. Pump Influent Size: 6-inch
 12. Pump Effluent Size: 6-inch
 13. The pump shall be capable of operating on a variable speed drive for manual control of pump speed and flow pump rate.
- E. FEB/Anoxic Reactor #1 Pump Station:
1. Number of Pumps: Four (4)
 2. Configuration: Parallel
 3. Design Point #1 (Phase 1): 2100 gpm (each pump) at 100 ft TDH
 4. Design Point #2 (Phase 2): 2500 gpm (each pump) at 75 ft TDH
 5. Pump Speed at Design Capacity: 1350 rpm
 6. Maximum Solids Size: 3 inches
 7. Motor Horsepower: 75 HP
 8. Motor Type: TEFC Severe Duty
 9. Motor Configuration: Overhead V-Belt Drive
 10. Pump Influent Size: 10-inch
 11. Pump Effluent Size: 10-inch
 12. The pump shall be capable of operating on a variable speed drive for manual control of pump speed and flow pump rate.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data shall include at least the following:
 - 1. Certified shop and erection drawings showing all important details of construction and dimensions.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 - 3. Data on the characteristics and performance of the pumps. Data shall include certified performance curves, based on actual shop tests of duplicate units, which show that they meet the specified requirements for head, capacity, efficiency, allowable NPSH, allowable suction lift and horsepower. Curves shall be submitted on 8-1/2 inch x 11-inch sheets.
 - 4. The total weight of the equipment including weight of the single largest item.
 - 5. A complete total bill of materials for all equipment.
 - 6. A list of manufacturer's recommended spare parts.
 - 7. Complete data on motors.
 - 8. Manufacturer's wiring diagrams for instrumentation and control system, including necessary field connections (if required).
- C. The manufacturer shall clearly identify any exception to this Section, related sections, or the Drawings. Failure to do this shall be grounds for rejection of the submittal.

1.06 QUALITY ASSURANCE

- A. The pumps covered by this Section are intended to be standard pumping equipment, as modified by this Section, of proven ability, as manufactured by a single manufacturer, having long experience in the production of such pumps. The pumps furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings and specified herein.
- B. In the event that equipment which differs from this Section be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no cost to the Owner and be as approved by the Engineer.
- C. The rated horsepower of the drive unit shall be such that the unit will not be overloaded nor the service factor reduced when the pump is operated at any point on the pump's capacity curve. If, due to the slope of the pump's performance curve, a drive unit of greater horsepower than specified is required to meet this condition, the pump will be considered for approval only if any and all changes in electrical work, etc. required by such a change will be provided at no additional cost to the Owner and be to the satisfaction of the Engineer.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. In accordance with Section 01 60 00.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gorman Rupp
- B. Or Approved Equal
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PUMP DESIGN

- A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1.04 - Design Requirements of this section.

2.03 MATERIALS AND CONSTRUCTION FEATURES

- A. Pump casing:

1. Casing shall be cast iron Class 30 with integral volute scroll.
 2. Casing shall incorporate the following features:
 - a. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.
 - b. Fill port coverplate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, hand nut threads must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.
 - c. Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.
- B. Coverplate:
1. Coverplate shall be cast iron Class 30.
 2. Design must incorporate the following maintenance features:
 - a. Retained by hand nuts for complete access to pump interior. Coverplate removal must provide ample clearance for removal of stoppages, and allow service of the impeller, seal, wear plate or check valve without removing suction or discharge piping.
 - b. A replaceable wearplate secured to the coverplate by weld studs and nuts shall be AISI 1015 HRS.
 - c. In consideration for safety, a pressure relief valve shall be supplied in the coverplate. Relief valve shall open at 75-200 PSI.
 - d. O-ring of Buna-N material shall seal coverplate to pump casing.
- C. Rotating Assembly:
1. A rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearing, seal plate and bearing housing must be removable as a single unit without disturbing the pump casing or piping.
 2. Design shall incorporate the following features:
 - a. Seal plate and bearing housing shall be stainless steel. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by liquid pumped and lip seals will prevent leakage of oil. The bearing cavity to have an oil level sight gauge and fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.
 - b. Impeller shall be ADI hardened ductile iron, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lockscrew and conical washer.
 - c. Shaft shall be stainless steel 17-4.
 - d. Adjustable wear plate shall be stainless steel with self cleaning cutting edges.
 - e. Bearings shall be anti-friction ball or tapered roller type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.
 - f. Shaft seal shall be oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light band flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton. Cage and spring to be AISI 316 stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings.
 - g. Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means. Stainless steel adjusting shims shall be used to move the entire rotating assembly as a unit when adjusting the working clearances. Clearance adjustment which requires movement of the shaft only,

thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

- h. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the coverplate opening, without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.
- i. Spool flanges shall be one-piece cast iron, class 30 fitted to suction and/or discharge ports. Each spool shall have one 1 1/4" NPT and on 1/4" NPT tapped hole with pipe plugs for mounting gauges or other equipment.

2.04 MOTORS

- A. Motors shall be squirrel cage induction type meeting as a minimum NEMA design B speed torque class. Breakdown torque shall be 200% or more of the maximum torque load placed on the motor shaft.
- B. Motors shall have ball bearings and shall have an AFBMA B-10 bearing life of 100,000 hours minimum. Bearings shall be regreaseable.
- C. All insulated windings shall have Class F non-hygroscopic insulation systems rated for temperature rise and ambient temperature in accordance with NEMA MG-1 Standards for the insulation class specified, except the motors shall be designed for Class B temperature rise.
- D. Motor shall be high efficiency type. Motor shall be wound with copper wire.
- E. Motors shall be horizontal solid shaft, 480 volts, 3 phase, 60 Hertz. Each motor shall have a minimum 1.15 service factor. Where a 1.15 service factor is required on an inverter duty motor, provide next largest size motor and a 1.0 service factor.
- F. Motors shall be rated for use with a variable frequency drive (VFD). Coordinate with VFD supplier to match drive and motor.
- G. Motors shall be TEFC and shall have cast iron frames, end bells, bearing brackets, oversized terminal box, and guards. Motors shall have a stainless steel breathers/drains. Motor shall be server duty rated for an indoor environment.

2.05 SERVICEABILITY

- A. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs by incorporating the following features.
- B. No special tools shall be required for replacement of any components within the pump.

2.06 ACCESSORIES

- A. A Standard Suction and Discharge Gauge Panel Kit shall be provided for each pump.
- B. A 1-inch x 1-inch Automatic Air Release Valve shall be provided for each pump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, contractor shall inspect complete pump and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all pump serial numbers and parts lists with shipping documentation. Notify the manufacturers representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

- A. Install, level, align, and lubricate pump(s) as required. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

- B. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.
- C. After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

3.03 MANUFACTURER'S FIELD SERVICES

- A. A factory-authorized service representative shall perform the following:
 - 1. Eight (8) labor hours, on-site time for functional and performance testing and training.
- B. Operational Test
 - 1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
 - 2. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

END OF SECTION