



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

June 14, 2012

SUBJECT: FAP Route 338 (IL 59)
Project ACNHF-0338 (044)
Section 2011-035 I
DuPage County
Contract No. 60P41
Item No. 009, June 15, 2012 Letting
Addendum C

NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised pages 203, 204, 207, 208, 212, 215, 387, 397, 406-408, 423, 426, 429, 431, 434, 436-442, 446, 475-478, 486, 488, 496 & 509 of the Special Provisions.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

John D. Baranzelli, P. E.
Acting Engineer of Design and Environment

A handwritten signature in cursive script, appearing to read 'Ted B. Walschleger', followed by the initials 'P.E.'.

By: Ted B. Walschleger, P. E.
Engineer of Project Management

cc: John Fortmann, Region 1, District 1; Mike Renner; D.Carl Puzey;
Estimates

TBW/MS/III

1.4 BASIS OF PAYMENT

- A. Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, HEATING AND VENTILATION WORK.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90 (Z275).
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 CONTROL DAMPERS

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

- ~~1. American Warming and Ventilating; a division of Mestek, Inc.~~
- ~~2. Arrow United Industries; a division of Mestek, Inc.~~
- ~~3. Cesco Products; a division of Mestek, Inc.~~
- ~~4. Greenheck Fan Corporation.~~
- ~~5. Metal Form Manufacturing, Inc.~~
- ~~6. Nailor Industries Inc.~~
- 7. Potterff.

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- ~~8. Ruskin Company.~~
- ~~9. Vent Products Company, Inc.~~

B. Frames:

- 1. Hat U Angle shaped.
- 2. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel 0.05-inch- (1.3-mm-) thick stainless steel.

C. Blades:

- 1. Multiple blade with maximum blade width of 6 inches (152 mm).
- 2. Parallel- and opposed-blade design.
- 3. Galvanized-steel and Stainless steel.
- 4. 0.064 inch (1.62 mm) thick single skin or 0.0747-inch- (1.9-mm-) thick dual skin.
- 5. Blade Edging: Closed-cell neoprene or PVC.
- 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch- (13-mm-) diameter; galvanized steel or stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

- 1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

E. Actuators: Actuators and assembly located in the wet well and dry well shall be suitable for Class 1, Group D, Division 2 Hazardous locations.

2.4 FLEXIBLE CONNECTORS

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

- ~~1. Ductmate Industries, Inc.~~
- ~~2. Duro-Dyne Inc.~~
- ~~3. Elgon Manufacturing.~~
- ~~4. Ventfabrics, Inc.~~
- ~~5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.~~

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

- 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

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- D. Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, HEATING AND VENTILATION WORK.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acme Engineering & Manufacturing Corporation.
 2. Carnes Company.
 3. Greenheck Fan Corporation.
 4. JencoFan.
 5. Loren Cook Company.
 6. PennBarry.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- E. Accessories:
1. Companion Flanges: For inlet and outlet duct connections.
 2. Fan Guards: Inlet safety guard.
 3. Motor and Drive Cover (Belt Guard).
 4. Explosion proof disconnect.
 5. Explosion proof motor.
 6. Flex duct connectors
 7. Lorenized- special color to be determined by Architect.
 8. Vibration Isolators:
 - a. Static Deflection: 1 inch (25 mm).

2.2 PROPELLER FANS

- ~~A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:~~
- ~~1. Acme Engineering & Manufacturing Corporation.~~
 - ~~2. Carnes Company.~~
 - ~~3. Greenheck Fan Corporation~~
 - ~~4. Loren Cook Company.~~
 - ~~5. PennBarry.~~

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- B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- C. Fan Wheel: Replaceable, cast or extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- D. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- E. Fan Drive:
 - 1. Resiliently mounted to housing.
 - 2. Statically and dynamically balanced.
 - 3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
 - 4. Extend grease fitting to accessible location outside of unit.
 - 5. Service Factor Based on Fan Motor Size: 1.4.
 - 6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
- F. Accessories:
 - 1. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
 - 2. Wall Sleeve: Galvanized steel to match fan and accessory size.
 - 3. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

2.3 CENTRIFUGAL WALL VENTILATORS

- ~~A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acme Engineering & Manufacturing Corporation.
 - 2. Carnes Company.
 - 3. Greenheck Fan Corporation.
 - 4. Loren Cook Company.
 - 5. PennBarry.~~
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.
- C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

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2.1 REGISTERS AND GRILLES

~~A. Adjustable Bar Register Drum Louver:~~

- ~~1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - ~~a. A-J Manufacturing Co., Inc.~~
 - ~~b. Anemostat Products; a Mestek company.~~
 - ~~c. Carnes.~~
 - ~~d. Krueger.~~
 - ~~e. Nailor Industries Inc.~~
 - ~~f. Price Industries.~~
 - ~~g. Titus.~~
 - ~~h. Tuttle & Bailey.~~~~
2. Material: Stainless steel.
3. Finish: Satin Polish.
4. Face Blade Arrangement: Vertical spaced.
5. Damper Type: Stainless steel adjustable opposed blade.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- C. Install stainless steel registers and grilles with stainless steel fasteners.

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- C. In addition to the requirements of this section, submittals shall also meet the requirements of Division 1, Section 1.6, Submittals; including certifications that the equipment and materials to be provided will meet the requirements of this project.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For propeller unit heaters to include in emergency, operation, and maintenance manuals.

1.6 BASIS OF PAYMENT

- A. Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, HEATING AND VENTILATION WORK.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- ~~A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ~~Airtherm; a Mestek company.~~
 - 2. ~~Berko.~~
 - 3. ~~McQuay International.~~
 - 4. ~~Modine.~~
 - 5. ~~Trane Inc.~~~~

2.2 DESCRIPTION

- A. Assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 2021.
- D. Comply with UL 823.
- E. Heater shall be suitable for Class I, Group D, Division 2 hazardous locations.

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2.3 PVC PIPE AND FITTINGS

A. Pipe

1. PVC pipe and fittings for non-buried use, unless otherwise specified, shall be Schedule 40, 80 or 120 PVC pipe meeting the requirements of ASTM D1784 and ASTM D1785. Fittings shall be of the solvent welded socket type meeting the requirements of ASTM D2464, ASTM D2466, and ASTM D2467. Use compounds qualifying for a rating of 4000 psi for water at 73.4 degrees F.

2.4 DUCTILE IRON PIPE AND FITTINGS

A. Pipe

1. All ductile iron pipe shall be designed and manufactured in accordance with AWWA C150/ANSI A21.50 and AWWA C151/ANSI A21.51.
2. In addition to external load, all pipe and fittings shall be designed for collapse vacuum pressure of -14.7 psi with a factor of safety of 2.0.
3. Ductile iron pipe shall have flanged, grooved, push-on, or mechanical joints of the sizes and classes as shown on the Drawings or as specified herein. Unless otherwise shown on the Drawings, flanged and grooved joint ductile iron pipe and fittings shall be used for non-buried service, while push-on and mechanical joint ductile iron pipe and fittings shall be used for buried service.
4. Unless otherwise shown on the Drawings, flanged and grooved joint ductile iron pipe shall be minimum thickness class 53 to enable threaded flanges or grooves for couplings/adapters.
5. Manufacturer's Statement: The manufacturer shall furnish a sworn statement that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of this standard.
- ~~6. Ductile iron pipe shall be as manufactured by Clow Water Systems Company, American Cast Iron Pipe Company, U.S. Pipe and Foundry Co., or approved equal.~~

B. Lining, Coating and Marking

1. General

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- H. Saddle stands shall be the adjustable type. Each stand shall consist of a length of steel pipe fitted at the base with a standard threaded ductile iron flange and at the top with an adjustable saddle or roll. The base flanges shall be bolted to the floor foundation or concrete wall.
- I. Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.
- J. Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on ductile iron, malleable iron or steel hooks, hook plates, rings or ring plates.
- K. Provide Type 316L stainless steel for pipe supports, hangers, guides, inserts, restraints, anchors, and appurtenant support items that are located in the wet well area and discharge chamber.
- L. Contact between piping and dissimilar metals such as hangers, building structural work or equipment subject to galvanic action is not acceptable.

~~M. Manufacturers (or approved equal):~~

- ~~1. Anvil~~
- ~~2. Cooper (B-Line)~~
- ~~3. Approved equal~~

2.2 PIPE HANGERS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Carbon or stainless steel, adjustable swivel, split ring.
- B. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and over: Carbon steel or stainless steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 Inches (76 mm): Cast iron hook.
- E. Wall Support for Pipe Sizes 4 Inches (100 mm) and over: Welded steel bracket and wrought steel clamp.
- F. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded. ASTM A283 or ASTM A36 unless noted otherwise.

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- C. Slip type expansion joints, having suitable packing shall be provided for the PVC piping in the manner and at the intervals recommended by the pipe manufacturer.
- D. Expansion joints shall be provided with adequate tie rods to limit the axial movement at the specified test pressures.
- E. ~~Mechanical expansion joints shall be Style 63 as manufactured by Dresser Industries, or approved equal.~~

2.2 WALL SLEEVES AND CASTINGS

- A. Wall castings and make-up pieces shall meet the requirements of AWWA C100 and shall be a minimum of Class B. Special fittings, where required, shall be of an approved design, and laying lengths and other functional dimensions shall be determined by their positions in the pipelines and by the particular piping materials to which they connect.
- B. All wall castings and sleeves below grade and at other required locations shall be watertight. Where water-tightness is essential and at other locations where indicated, wall castings or sleeves shall be provided with an intermediate flange located approximately at the center of the wall.
- C. The Contractor shall install suitable sleeves at all points where pipes pass through walls or floors of structures where wall castings are not provided. Sleeves inside buildings and between floors shall be of steel with a minimum thickness of Schedule 40 and the space between the pipe and the sleeve shall be caulked with lead and oakum. Sleeves through walls of structures shall be cast iron solid sleeves, meeting the requirements of AWWA C100 with caulked bell and spigot or mechanical joint ends or link seal.
- D. Where indicated, the space between the pipe and sleeve shall be sealed using a mechanical link-type closure ~~as manufactured by Thunderline Corporation or approved equal~~. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe wall opening. Sleeves shall be cast iron of size recommended by the manufacturer of the link-type closure.
- E. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by the Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run.

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Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

F. Sleeves for installation in core drilled exterior walls shall be as follows:

1. Schedule 40 black steel pipe with ends cut square and reamed of sufficient length to carry 1/8-inch thick square steel base plates at both ends of the sleeve. Base plates to be 2 inches greater than sleeve diameter. The sleeves shall be of sufficient size to permit the full specified thickness of insulation or piping to pass through sleeve. Base plates shall be screwed into wall.
2. Spaces between pipe and wall sleeves shall be caulked with ~~Minnesota Mining & Mfg. Co. Scotch Seal Brand #612~~ or approved equal sealant. Where space exceeds 1/2 inch, tightly pack first with 1.58 lb. density fiberglass and then caulk both ends with sealant specified.

2.3 DIELECTRIC COUPLINGS

- A. Where connections between pipelines or equipment of corrosion causing dissimilar metals are required, the junction of the two dissimilar metals shall be made through a dielectric insulating coupling, union, or other approved dielectric insulating device.

2.4 SLEEVE TYPE COUPLINGS

- A. For sleeve type couplings, diametrically opposite bolts shall be equally tightened on the connection so that the gaskets will be brought up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.
- B. Sleeve-type couplings for exposed ductile iron pipe shall be of steel and shall be ~~Style 38 or 253 couplings as made by Dresser Industries, Inc., or approved equal.~~ The coupling shall be provided with steel bolts and nuts.
- C. ~~Flanged coupling adaptors shall be Style 128 as made by Dresser Industries, or approved equal.~~
- D. ~~Sleeve type couplings shall be shop coated with Dresser Red "D" Shop Coat, Smith-Blair Standard Blue Shop Coat, or approved equal nontoxic material. Finish Coat shall be as indication in Section 09-91-00, Painting.~~

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- E. Couplings shall have a minimum pressure rating equal to the test pressure of the pipeline.
- F. All couplings shall be furnished with the pipe stop removed.
- G. Couplings shall be provided with gaskets of a composition suitable for exposure to the liquid or gas within the pipe.

2.5 FILLING RINGS

- A. The Contractor shall provide suitable filling rings where the layout of the flanged piping is such as to necessitate their use. In materials, workmanship, facing, and drilling, such rings shall conform to the AWWA C111/ANSI A21.11 or C115/ANSI A21.15 Standards. Filling rings shall be of suitable length with nonparallel faces and corresponding drilling, if necessary, to ensure correct assembly of the adjoining pipe or equipment.

2.6 CORPORATION CONNECTIONS

- A. Valves, materials, and installations shall conform to AWWA C800 and ASTM B62. All taps shall be direct and shall not require saddles unless indicated otherwise on the Drawings. Corporation connections shall be installed at the sizes and locations indicated on the Drawings.
- B. Corporation valves shall be ball type rated for a working pressure of 300 psig.
- C. ~~Corporation connection materials shall be manufactured by Mueller, Ford Meter Box, or approved equal.~~

PART 3 - EXECUTION

3.1 GENERAL

- A. Couplings will be permitted only to joint standard lengths of pipe and as required to complete a straight run of pipe. Joining by couplings, of random lengths of pipe and cutting from standard lengths to form a required run, will not be permitted.
- B. Reducing fittings shall be used for all changes in pipe size. Brushing will not be permitted.

3.2 HANGERS AND SUPPORTS

- A. All miscellaneous pipelines shall be permanently erected and supporting devices shall be furnished and installed as specified in Section 33 40 20, Pipe Hangers and Supports.

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- B. The GIP shall provide the following screens as a minimum. This is a general listing. Additional “drilldown” screens may be required in order to present the graphical details in manner that is conducive to viewing by the operator. The final list of required screens shall be developed during the GIP Graphical Screen Development Phase.
- a. Main menu and navigation screens for the GIP screens presented in a general to specific hierarchy.
 - b. GIP Help screen(s) that summarize operator interface formats, use of function keys, navigational standards, etc.
 - c. System alarm screen that presents a list of critical system wide alarms. Operator acknowledgment of all system alarms shall be possible at the GIP panel or the Alarm Acknowledge pushbutton located on the Control Panel CP47. Refer to the Plans for additional details.
 - d. Local alarm screen that presents a list of local process alarms. Operator acknowledgment of all system alarms shall be possible at the GIP panel or the Alarm Acknowledge pushbutton located on the Control Panel CP47.
 - e. System status screens that summarize the present operational status of the major pump station equipment such as pumps, sluice gates, motorized valves, meters, floats, transducers, etc.
 - f. Electrical Distribution system one-line showing the status of the (2) Electrical Services, ATS, (2) main circuit breakers, circuit breakers feeding (4) pump motors mounted in the MCC, etc.
 - g. Customer Metering Screen detailing information gathered via the MCC digital metering equipment and ammeter information for the individual motors.
 - h. Building Status Screen that provides details on the status of room temperatures, Trash Rack Differential Level, Combustible Gas Alarm Panel, Intrusion Alarm Panel, Fire Alarm Panel, Pavement Flooded Status, Sump Pump Panel, UPS status, PLC Status, etc.
 - i. GIP Interface Screens shall match to the greatest extent possible IDOT’s standard formats used at other pump station installations. Details regarding IDOT’s standard formats shall be provided during the GIP Graphical Screen Development Phase.

2.8 ETHERNET DATA SWITCHES

- A. Manufacturers:
- a. Allen Bradley Stratix 6000 Fixed Managed Switch.
 - b. ~~Or equal.~~

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- R. A maintenance bypass switch shall be provided which shall allow for manual transfer of connected load to utility power permitting scheduled maintenance or UPS replacement without discontinuing power to the control panels. The electrical rating and capacity of the bypass switch shall match that of the UPS. Refer to the Plans for additional details regarding the wiring configuration between the UPS and Control Panels.
- S. The UPS system shall ***include*** ~~be as manufactured by Liebert, Oneac, MGE or approved Engineer's equal with~~ output relay card, and extra battery module, if required.
- ~~T. The maintenance bypass switch shall be the Liebert MicroPOD or approved Engineer's equal.~~

2.10 DIRECT ACTING FLOAT SWITCHES

~~A. Manufacturers:~~

- ~~a. The float switches shall be Model 9G-EF floats as manufactured by Siemens Water Technologies, Control Systems Products~~
- ~~b. Engineer approved equal.~~

B. Features:

- a. Provide required mounting accessories as detailed on the Plans. The floats shall sense water levels as shown on the Plans. The float shall contain a switch which closes or opens its contacts when floating in a horizontal position. Float switch shall not contain Mercury. Float switches shall be suitable for Class 1 Division 2 locations. Provide intrinsically safe barriers as required.
- b. Float switch body shall be constructed of Teflon-coated, 20 gauge, 316 stainless steel housing measuring not less than 5 1/2" (14 cm) in diameter. A long life, high reliability, potted SPST magnetic reed switch rated for not less than 100 VA at up to 250 Volts shall be mounted inside the float and connected to a multi-stranded, 2 conductor plus ground, 16 gauge, CPE jacketed cable. The cord shall have fine strand conductors (not more than 34 gauge) made especially for heavy flexing service. The cable connection point shall be potted in epoxy providing a strong bond to the float and reed switch forming a water/moisture tight connection. A flexible Neoprene sleeve, not less than 1/8" (3.2 mm) thick, shall be provided over the CPE jacketed cable extending not less than 5" (12.7 cm) from the top of the mounting bracket extending down through the cable mounting bracket hinge point to the top of the float switch body, providing cable stress point relief and extended operational life. Heavier gauge cable shall be provided as required to account for voltage drop considerations.

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- c. A timed purge cycle.
 - d. Immediately after the system is powered up after loss of power.
10. The system shall have a replaceable air filter/desiccator to limit moisture into the compressor intake air.
11. Orifice lines shall be polyethylene type sized per the manufacturer's requirements.
12. ~~Bubbler type level sensing systems shall be provided by WaterLOG (YSI Incorporated), Digital Control Company, or approved equal.~~

2.14 TRASH RACK DIFFERENTIAL LEVEL SENSING SYSTEM

- A. Two (2) hydrostatic level sensors (LIT-007A and LIT-007B) shall be used to measure water level. Refer to the HYDROSTATIC TYPE LEVELS SENSING SYSTEM Section of this Specification for details regarding the level sensors. LIT-007A shall be mounted upstream of the Trash Rack and LIT-007B shall be mounted downstream of the Trash Rack. Refer to the Plans for additional details regarding the location and mounting requirements for the sensors. A 4-20mA signal proportional to water level shall be produced by each transmitter and those signals shall be fed to Programmable Logic Controller PLC-SP47-03 located in the SCAD Panel. The PLC shall calculate the differential level between the two signals. The PLC shall provide a 4-20mA output proportional to the differential level which shall be fed to a meter mounted on the Control Panel. The PLC shall be programmed to take into account the level offset in the difference in the mounting height of the transducers. The PLC shall provide an alarm when the differential level becomes too great indicating that the trash rack has become clogged. The differential level for this alarm shall be programmable by the operator via the GIP panel mounted on the Control Panel.

2.15 HYDROSTATIC TYPE LEVEL SENSING SYSTEM

- A. The hydrostatic type level transmitter shall include an upper and a lower assembly. The lower assembly shall include housing and gauge pressure diaphragm type transducer as specified herein.
- B. The hydrostatic type level transmitter upper assembly shall be installed in the Electrical Room and shall house the system signal conditioning and transient protective electronics and connections terminal block. A desiccant type or expansion bag type breathing system shall be installed. A labyrinth seal vent shall be provided on the side to allow atmospheric pressure access to the breathing system. The Upper assembly shall be housed in a NEMA 4 enclosure. A meter assembly shall be provided on the front of the panel for system readout and programming. A 4-20 mA scalable isolated analog output signal proportional to Wet Well water level shall be provided for integration into the SCADA system. The input voltage to the assembly shall be 120 VAC, 60 Hz, 1 Phase.

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~~K. The level transmitter shall be manufactured by Ametek, Druck, Endress Hauser, or approved equal.~~

2.16 ULTRASONIC CLAMP-ON TYPE FLOW METER

- A. The Recirculation Pipe Flow Meter (FT-010), Main Flow Pump No. 1 Flow Meter (FT-001), Main Flow Pump No. 2 (FT-002), Flow Meter, Main Flow Pump No. 3 Flow Meter (FT-003), and the Low Flow Pump Flow Meter (FT-004) must be a clamp-on design precluding the requirement of penetrating into the pipe. The flow meter shall be completely microprocessor based utilizing a compression mode propagation measurement technique. The meters shall be of the size and mounted as indicated on the Plans.
- B. The meter shall have remote mounted transducers that permit separation of up to 300 meters using a coaxial or twin axial cable. The transducers shall be rated NEMA 6 (IP 67). Contractor shall be responsible for determining the proper cable length required to connect the transducer mounted on the recirculation pipe and the flow meter mounted on Control Panel CP47 located in the Electrical room. Refer to the Plans for additional details regarding the location of equipment.
- C. The flow meter electronics shall be housed in a NEMA Type 4 (IP65) enclosure and powered by 95-264VAC, 50-60Hz. The front panel shall consist of a two line backlit LCD display. The flow meter shall be suitable for panel mounting and shall have the following features as a minimum:
- a. Integral Front Panel Keypad for Programming
 - b. Flow Rate Display
 - c. Flow Totalizer Display
 - d. 4-20 mA Output
 - e. 0 to 1,000Hz Rate Pulse and Dual Alarm Outputs
 - f. USB Programming Port
 - g. RS485 Modbus Network Connection
 - h. Remote Totalizer Reset Capability
- D. The flow meter electronic assembly shall be intrinsically safe or an intrinsically safe barrier shall be provided.
- E. The flow meter shall have an accuracy of $\pm 1\%$ for flows from 4 to 40fps flow range. Repeatability shall be 0.5% of reading and a flow sensitivity of 0.001 fps.
- ~~F. The furnished flow meter shall be Spirax Sarco UTM10 or Engineer's Approved equal.~~

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~~b. Square D Class 9001, Type K.~~

~~c. Cutler Hammer 10250T.~~

B. Construction:

- a. Heavy duty.
- b. Watertight.
- c. Oil-tight.
- d. Flush panel mounting
- e. Size to mount in 30.5-mm diameter.
- f. Match NEMA rating of associated Control Station (see below)

C. Pushbuttons:

- a. Flush head unless specified elsewhere.
- b. Contact Blocks:
 - i. Double break silver contacts.
 - ii. Ac Ratings: 7,200 va make, 720 via break.
 - iii. Single pole, double throw or double pole, single throw.
 - iv. Up to six tandem blocks.
- c. Momentary contact unless specified elsewhere.
- d. Non-illuminated.
- e. Legend plates, as required, for type of operation or as specified elsewhere.

D. Pushbuttons – Emergency Stop (ESTOP)

- a. Jumbo red mushroom head.
- b. Contact Blocks:
 - i. Double break silver contacts.
 - ii. Ac Ratings: 7,200 va make, 720 via break.

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- d. Interchangeable lenses.
- e. Transformer rated for 120 v, 60 Hz.
- f. Push to test.
- g. Legend plates as specified elsewhere.

G. Control Stations:

- a. Describes enclosures used to house field pilot devices.
- b. NEMA ratings:
 - i. NEMA 7 in Class 1, Division 1 or 2 Hazardous (Classified) Locations.
 - ii. NEMA 4X 316 stainless steel in indoor wet/corrosive locations or outdoors.
 - iii. NEMA 12 in other areas.
- c. Nameplates:
 - i. Engraved laminated plastic.
 - ii. Letters 3/165 in. high.
 - iii. Black letters on white background.
 - iv. Identify per equipment controlled, using names found on Plans.

2.27 PROCESS INDICATORS, ELECTRONIC

~~A. Manufacturers:~~

- ~~a. Precision Digital.~~
- ~~b. Red Lion, IMP.~~
- ~~c. Moore Industries.~~

B. Features:

- a. 4-20mA dc Input.
- b. ½ digit LED indicator.

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- c. Loop powered.

C. Enclosures:

- a. Panel mounted as indicated on Plans.
- b. For below grade or outdoor installations: NEMA 4X: Impact-resistant polycarbonate body, clear gasketed polycarbonate cover 1/2" conduit hole in bottom of case.
- c. For Explosion Proof installations: NEMA 7 XP: FM approved cast aluminum body, screw-type cast aluminum cover with view port. Two 3/4" conduit holes.
- d. Provide 2" pipe mounting kit as detailed.

D. Model: PD675-N, NEMA 4X; PD677-N, NEMA 7 XP.

2.28 TEMPERATURE SWITCHES – BUILDING STATUS

A. Manufacturers:

- a. Honeywell.

B. Features:

- a. Integral temperature indicator.
- b. Suitable for wall or ceiling mount.
- c. Adjustable high and low temperature setpoints.
- d. Dry contacts suitable for connection to PLC Reed Relay input.

2.29 TEMPERATURE SENSORS/TRANSMITTERS

~~A. Manufacturers:~~

- ~~a. Minco~~
- ~~b. Siemens~~
- ~~c. Honeywell~~
- ~~d. Engineer's approved equal~~

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B. Features:

- a. Temperature Sensor/transmitter shall be suitable for temperature ranges between -20 to 125 Degree F.
- b. Transmitter shall have 4-20 mA output proportional to ambient temperature and shall be integrated into the SCADA system.
- c. Temperature Sensor/transmitter for Electrical Room shall be wall mounted and housed in a NEMA 1 Enclosure.
- d. Temperature Sensor/transmitter for Electrical Room shall be wall mounted and housed in an Explosion Proof Enclosure.
- e. Units shall be UL Listed.

2.30 CONTROL RELAYS

~~A. Manufacturers:~~

- ~~a. Potter and Brumfield~~
- ~~b. Struthers Dunn.~~

B. Operating Data:

- a. Pickup Time: 13 ms maximum.
- b. Dropout Time: 10 ms maximum.
- c. Operating Temperature: - 45°F to 150°F.

C. AC Coil:

- a. 120 or 2409 vac.
- b. Continuous rated.
- c. VA inrush maximum.
- d. VA sealed, maximum.
- e. 50 to 60 Hz.
- f. Light to indicate energization
- g. Minimum Dropout Voltage: 10% of coil rated voltage.

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D. DC Coil:

- a. 24 or 120 Vdc.
- b. Continuous rated.
- c. Light to indicate energization.
- d. Minimum Coil Resistance:
- e. 24 Vdc: 450 Ω .
- f. 120 Vdc: 9,000 Ω .

E. Contacts:

- a. Gold flashed fine silver, gold diffused for 1 amp or less resistive load.
- b. Silver cadmium oxide.
- c. form C.
- d. 120 vac.
- e. 10 amp make, 1.5 amp break (inductive).
- f. Rated at 10 million operations.
- g. 11 pin, square socket.
- h. DIN rail mountable.
- i. Enclosed and protected by polycarbonate cover
- j. Provide relay-retaining clips.

2.31 TIMERS

A. Interval/Duration Timer (Rear of Panel):

- ~~a. Manufacturers:~~
 - ~~i. Potter and Brumfield, CN series.~~
 - ~~ii. Eagle Signal DM 100 series.~~
 - ~~iii. Or equal.~~

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- b. Mounting: Plug-in with dust tight cover.
- c. Type: Integrated circuit.
- d. Range: 0.5 sec to 99 min. Field selectable.
- e. Contacts: 2 DPDT contacts rated 10 amp. 120 vac.
- f. Power: 120 vac, 60 Hz.

B. Interval/Duration Timer (Front of Panel):

~~a. Manufacturers:~~

~~i. Eagle Signal, CX300 series.~~

~~ii. Or equal.~~

- b. Type: Microprocessor.
- c. Timing Range: Five ranges from 200 sec to 200-hr field selectable.
- d. Contacts: 10 amp, 120 vac.
- e. Controls: Membrane switches for operator input.

2.32 TERMINAL BLOCKS

~~A. Manufacturers:~~

~~a. Phoenix Contact.~~

~~b. Weidmuller.~~

~~c. Or equal.~~

- B. 300 v rating for 120 v circuits and below, 600 v rating for 480 v circuits.
- C. Clamping screw type.
- D. Isolating end caps for each terminal.
- E. Identification on both terminals.
- F. Clip-mounted on DIN rail.
- G. Accept AWG 12 to 22.

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H. Feed-Through Terminals:

- a. 20 Amp rating.

I. Switched Terminals:

- a. Knife disconnect with test sockets.
- b. 10 Amp rating.

J. Fused Terminals:

- a. Hinged fuse removal/disconnect.
- b. 10 Amp rating.
- c. Include blown fuse indication.

2.33 ELECTRONIC CURRENT ISOLATOR

~~A. Manufacturers:~~

- ~~a. Phoenix Contact Model MCR Series.~~
- ~~b. Approved Engineer's equal.~~

B. Features

- a. Solid state instrument to electrically isolate one instrument loop from another instrument loop. Converter to accept 4-20mA dc input signal and provide equal but isolated and power-booster output.
- b. Mounting: DIN Rail.
- c. Temperature compensated, calibration-free.
- d. Signals: Input: 4-20mA dc into 50 ohms. Output: 4-20mA dc into output for up to 500 ohms.
- e. Isolation: Common mode up to 700 vac between input and output.
- f. Accuracy: 0.5% of span.
- g. Provide power supply specific to isolator.

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2.34 INTRINSICALLY SAFE BARRIERS AND RELAYS

A. ~~Manufacturers:~~

a. ~~Gems Safe Pak or Engineer's approved equal~~

- B. Provide intrinsically single channel safe barriers, dual channel safe barriers and relays as indicated on the Plans and as required to meet NEC requirements for explosion proof applications. All wiring between those rooms identified as Hazardous Locations and Non-Hazardous locations shall be provided with intrinsically safe barrier or relay as the installation calls for.
- C. Provide relays with 4NO/4NO auxiliary contacts or as indicated on the Plans. Provide additional contacts as required to meet installation requirements.

2.35 CONTROL PANEL FABRICATION

A. General

- a. Refer to Plans for additional details.
- b. The panels shall match the general construction of the motor control center and shall be of the same height.
- c. The panels shall conform to all application standards of NEMA and ANSI and shall consist of formed steel panels containing equipment and devices as indicated.
- d. The panels shall be equipped with space heater(s) as specified for motor control centers.

B. Enclosure

- a. The SCADA and Control panels shall be NEMA 12 floor mounted, front accessible only, metal enclosed type, arranged for cable and/or conduit entry from the top, bottom or sides, as required. Panel design shall allow easy access to all internal wiring and appurtenances. Ventilation fan, air filter, thermostatically controlled space heater, light kit and 120V receptacle shall be provided.
- b. The enclosure shall be of a height and depth to match the motor control center and of a width sufficient for the equipment to be housed.
- c. The panel shall have a full piano hinge door and a 3-point latch with a locking handle. The handle shall have a cylinder type lock keyed to match the IDOT's system. The doors shall have a hinged gasketed door.
- d. The enclosure shall be finished inside and out. Exterior color shall match that for the motor control center, and the interior color shall be white or as otherwise approved by the Engineer.

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- O. Blank alarm module units shall be fully equipped for alarms, complete with relays and logic.
- P. After power failure all alarm output contacts shall remain in the original positions just before the power failure.
- Q. ~~For uniformity among stations, alarm annunciator shall be Ronan Model X3-1000, Panalarm Series 10, DeLine Model 11, or approved equal.~~

3.1 INSPECTION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 INSTALLATION

- A. The modification, demolition and installation of the SCADA equipment shall be scheduled to minimize interruption of automatic operation and monitoring of the pumping system. The contractor shall submit a detailed schedule for IDOT's approval
- B. The Contractor shall install the equipment in strict accordance with the approved Shop Drawings and the equipment manufacturer's recommendations
- C. Unload, unpack and transport equipment to prevent damage or loss.
- D. Protect from dust and other harmful materials
- E. The Contractor shall adjust the location of equipment to accommodate the work in accordance with field conditions encountered.
- F. The equipment shall be installed with workspace clearances required by the Code.
- G. The equipment shall be installed to permit maintenance and replacement of parts, and shall be clear of all openings with swinging or moving doors, partitions or access panels.
- H. Mounting Bases for Floor Mounted Control Panel
 - 1. The Contractor shall install each floor mounted control panel on a concrete housekeeping pad of sufficient with an apron as indicated on the Plans. Control Panel CP47 and SCADA Panel SP47 shall be mounted flush with the MCC mounted in the Electrical Room. Housekeeping pad shall be consistent for all equipment mounted adjacent to one another. The equipment shall be of such construction that when it is installed on the concrete pad there are no openings between the top of the pad and the bottom of the equipment.
 - 2. Each foundation shall be level, stable, and compacted to 95 percent Standard Proctor.
 - 3. Entryways or conduit locations shall be in accordance with manufacturer's approved Shop Drawings.

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- C. The valve bodies shall be cast iron meeting the requirements of ASTM A126 (Class B) or ductile iron meeting the requirements of ASTM A536, mounted with non-corrosive metals. All wearing surfaces shall be bronze or other approved non-corrosive material and there shall be no moving bearing or contact surfaces of iron in contact with iron.
- D. Wedge shall be cast iron or ductile iron totally encapsulated within molded rubber.
- E. Valves 14" and larger installed with the stem horizontal shall be equipped with bronze rollers, tracks, and scrapers if recommended by the manufacturer.
- F. Each valve shall have the manufacturer's name, pressure rating, and year in which manufactured cast on body. Prior to shipment from the factory, each valve shall be hydrostatically shell tested at a pressure of 400 psi in sizes 12" and smaller, and 300 psi in sizes 14" and larger. In addition, each valve shall be hydrostatically seat tested at a pressure of 200 psi in sizes 12" and smaller, and 150 psi in sizes 14" and larger.
- ~~G. Gate valves shall be manufactured by the Clow Valve Company, Mueller, or approved equal.~~

2.4 KNIFE GATE VALVES

- A. Knife gate valves shall be rising-stem, bonnetless, wafer type made with a cast iron body.
- B. Flanges shall be drilled and tapped in accordance to ANSI B16.5, Class 150 and MSS SP-81.
- C. All wetted parts and the valve stem shall be 304 or 316 stainless steel. Stainless steel liner shall extend through the valve chest to the top of the packing gland.
- D. The valve gate shall be suitable for a 0 psi to 150 psi pressure differential.
- E. Valve shall have a round port with a replaceable EPDM resilient seat interlocked by a stainless steel retaining ring. The retaining ring shall act as a wiper blade to clean the gate before it passes over the seat. The resilient seat shall be captured and locked into place on three sides only exposing one surface for sealing. The seat shall be raised with a relieved area around the seat to prevent jamming.
- F. Valve port shall be full diameter port with no guides or wedges obstructing the port flow area.
- G. All ductile iron surfaces (interior & exterior) shall be coated with an epoxy coating per Section 09 91 00.

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H. Operators shall be handwheel or chainwheel type as indicated on the Project Drawings. Handwheels shall have a diameter of 16" (maximum).

~~I. Knife gate valves shall be manufactured by Red Valve, or approved equal.~~

2.5 SWING CHECK VALVES

A. Check valves shall be of swing type and shall meet the material, design, and testing requirements of AWWA C508. The valves shall have ductile or cast iron bodies and be rated for a working pressure of 200 psi for valves 12" and smaller, and 150 psi for valves 14" and larger.

B. Swing check valves shall be installed at the pump discharge lines, opening to allow flow when the pump starts and providing a tight seal in the shut-off position.

C. The valve shall be so constructed that by simply unbolting and lifting off the cover, the internal working parts may easily be removed and replaced without removing the valve from the line. The valve shall be furnished with outside lever and weight.

D. Check valves shall be suitable for mounting in horizontal lines or vertical lines when flow is up.

E. Check valves shall have stainless steel hinge pins conforming to ASTM A276 CR304, which operate in a bronze support bearing.

F. Disc material shall be ductile iron conforming to ASTM A536 with a Buna-N disc seat.

G. Valve seat material shall be bronze conforming to ASTM B62 or B148.

~~H. Swing check valves shall have an air cushion system to minimize the slamming shut of the valve. The air cushion cylinder shall be constructed of bronze or stainless steel components, with the piston totally enclosed within the cylinder and not open at one end. The cushion cylinder assembly shall be externally mounted on the side of the valve body and be adjustable to cushion the closure of the valve. Cushioning shall be by air trapped in the cushion cylinder which shall be fitted with a one way adjustable control check valve to cushion disc contact to the seat at the shut-off point. Swing check valves shall be manufactured by the Milliken Valve Company, APCO Valve, or approved equal.~~

2.6 ELECTRIC VALVE ACTUATORS

A. Where indicated on the Drawings, electric valve operators shall be furnished and installed for open-close service.

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1. Actuators shall contain electric motor, gearing, manual over-ride, limit switches or sensors, torque switches or sensors, drive coupling, gear case, and automatic declutchable handwheel; as a self-contained unit. All calibration shall be possible without removing any covers and without the use of any special tools.
2. The motor shall be specifically designed for the actuator service and be 120 volts, single phase, 60 hertz. The motor shall be totally enclosed with class F insulation and protected by means of thermal sensors imbedded in the motor windings. Motor enclosure will be totally enclosed, non-ventilated.
3. Motor speed reduction shall be by means of a gear train consisting of hardened steel spur gears and self-locking worm and worm gear set. The worm shall be heat-treated alloy steel and have worm thread surface rolled or ground. The worm gear shall be bronze. Non-metallic gears in the power train are not acceptable.
4. Actuator enclosure shall be NEMA 7X. All external fasteners on the electric actuator will be stainless steel. Fasteners on limit switch and terminal compartments shall be captured to prevent loss while covers are removed.
5. All gearing shall be grease lubricated and designed to withstand the full stall torque of the motor.
6. The actuator shall include an adjustable torque feature to interrupt the motor power circuit if an obstruction is encountered in either direction of travel or when torque seating of valves is required for tight shut-off. The torque limit shall be calibrated to ensure maximum actuator rating is not exceeded.
7. Manual over-ride shall be by handwheel. Manual operation shall facilitate easy change-over from motor to manual operation when actuator is under load. Return from manual to electric mode of operation will be automatic upon motor operation. A seized or inoperable motor shall not prevent manual operation.
8. Position limits shall be mechanically geared and in step with the valve position at all times. Limit adjustment shall not be altered by manual operation. Position indication shall be in step with valve position at all times whether operation is electrically or manually operated.
10. The actuator shall be furnished with integral motor controls with a LCD graphic display or LED lights for displaying mode of operation, position, torque, alarm conditions, and any other appurtenant functions.
- ~~11. Electric valve actuators shall be manufactured by EIM Controls, or approved equal.~~

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2.7 AIR/VACUUM RELEASE VALVES

- A. Contractor shall provide air/vacuum valves at pump discharge elbows, as indicated on the Plans, to remove air pockets upon pump start-up as well as allow air into the system when draining.
The air/vacuum valves shall be float operated and capable of automatically releasing air.
- B. Air/vacuum valves shall be manufactured and tested in accordance with AWWA C512.
- C. The diameter of the inlet and outlet shall be as indicated on the Plans, for use within an operating pressure range of 1-150 psig.
- D. Air/vacuum valves shall be installed in a vertical position. A full ported shut-off valve shall be installed below each valve in the event servicing is required.
- E. Aside from inlet and outlet ports, the air/vacuum valves shall have three additional ports for cleaning and backwash.
- F. Air/vacuum valve components shall be of the following materials:
 - 1. Body and Cover – Cast Iron per ASTM A126, Class B
 - 2. Float – Type 316 Stainless Steel
 - 3. Internal Parts – Type 316 Stainless Steel
 - 4. Seal – Buna-N
 - 5. Shut-Off Valves – Full port, bronze bodied as recommended by the manufacturer
- ~~G. Air/vacuum valves shall be specifically designed for wastewater service applications and shall be manufactured by Cla-Val, Val-Matic, or approved equal.~~

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General
 - 1. All valves shall be furnished and installed complete with operators, fittings, and piping as required.

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6. Stem design force shall be no less than 1.25 times the output thrust of the electric valve motor operator.

G. Wall Thimbles

1. The wall thimbles shall be cast iron and supplied by the gate manufacturer, with precautions made to prevent contact between dissimilar metals. Material thickness should be according to the manufacturer's recommendations and be of sufficient resistance to handle the operating forces. The wall thimble depth shall be sized for installation within the concrete wall in which the thimble is to be mounted.
2. A water stop shall be welded around the periphery of the thimble. Wall thimbles shall be designed to allow thorough and uniform concrete placement during installation. A suitable gasket or mastic material shall be provided to seal between the gate frame and the wall thimble.

H. Operating Mechanism

1. The gate manufacturer shall select the proper gear ratio to ensure that the gate can be operated with no more than a 40 lb effort when the gate is in the closed position and experiencing the maximum operating head. Operating mechanism shall be operated with an 18" diameter handwheel.

~~I. Slide Gates shall be manufactured by Whipps, or approved equal.~~

2.3 ELECTRIC MOTOR OPERATORS FOR SLIDE GATES

- A. General: The electric actuator shall include a motor, operator unit gearing, limit switch or sensors, torque switches or sensors, stem nut, automatic declutchable handwheel, and reversing motor starter; as a self-contained unit. The actuator shall meet AWWA C540 specifications. A 3-pole disconnect switch shall be built in the motor starter or furnished with the actuator for field mounting. All calibration shall be possible without removing any covers and without the use of any special tools.
- B. Enclosures: Provide actuator motor and all electrical enclosures NEMA 4X for the outdoor slide gate.
- C. Motor: The motor shall be 460 volts, 3 phase, 60 hertz specifically designed for slide gate operator service and shall be of high starting torque, totally enclosed, non-ventilated construction, with Class F insulation and protected by means of thermal sensors imbedded in the motor windings. The motor shall be easily removed through the use of a plug-in connector and shaft coupling.

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- J. Controls: The actuator shall be furnished with integral motor controls with a LCD graphic display or LED lights for displaying mode of operation, position, torque, alarm conditions, and any other appurtenant functions.
- K. Temperature: The electric motor operators shall be capable of operating at a minimum ambient temperature of -40° F without the need of an additional heating source.
- ~~L. Electric motor operators for slide gates shall be manufactured by Limitorque, or approved equal.~~

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All gates shall be furnished and installed complete with operators, fittings, and appurtenances as required and in accordance to the manufacturer's requirements.
- B. Gates shall be installed in the positions and configurations as indicated on the Project Drawings. All material shall be carefully inspected for defects in workmanship and material, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Gates and other equipment which do not operate as designated or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
- D. The Contractor shall fill the void in between the gate frame and the wall with non-shrink grout in accordance with the manufacturer's recommendations.
- E. Wall thimbles and anchor bolts to be embedded in concrete shall be placed before the concrete is placed and supported and braced so they will remain in perfect alignment during placing of concrete and thereafter. An improperly placed wall thimble shall be removed and replaced at the Contractor's expense.

3.2 TESTING

- A. After installation, all gates shall be field tested in the presence of the Owner's representative to ensure that all items of equipment are in full compliance with this Section. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting. The effort to open and close manual operators shall be measured, and shall not exceed the maximum operating effort specified above. Electric motor actuators shall function smoothly and without interruption.

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- D. The equipment shall be suitable for continuous operation in a high humidity environment and at full nameplate load while the motor is completely submerged, partially submerged, or totally non-submerged.
- E. All components shall be current production models.
- F. ~~Pumps shall be manufactured by ITT Flygt; or approved equal.~~

2.2 PUMP CHARACTERISTICS

- A. The pumps shall be designed for operation as follows:
 - 1. Pump performance requirements of Main Flow Pump-1, Main Flow Pump-2, and Main Flow Pump-3:

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DIVISION 43 – LIQUID HANDLING EQUIPMENT

SECTION 43 21 43 – SUMP PUMP

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Work under this Section includes furnishing and installation of the sump pump, controls, associated discharge piping, and appurtenances, complete and operational, as specified herein and on the Project Drawings.

1.2 RELATED WORK

- A. Work under this Section is also subject to the requirements specified under Division 1 of these Special Provisions.
- B. Section 09 91 10: Painting
- C. Section 33 40 10: Interior Piping and Appurtenances
- D. Section 33 40 20: Pipe Hangers and Supports
- E. Section 33 40 30: Pipe Specialties
- F. Section 43 01 50: General Mechanical Provisions
- G. Section 43 20 10: Valves and Appurtenances
- H. Division 26: Electrical
- I. Division 40: SCADA

1.3 QUALITY CONTROL

- ~~A. Pump and appurtenances shall be Barnes Series 2SEV-L, or approved equal.~~
- B. All equipment shall be new and of first class materials and construction, guaranteed to perform the service required.
- C. Provide standard sump pump equipment manufactured by a company with no less than five (5) years of experience in the manufacture of such equipment. Manufacturer shall have installed a minimum of five (5) installations of comparable sized sumps.

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