



ADDENDUM NO. 1

DATE: September 16, 2026
PROJECT: WWTP CSO 1 Improvements
OWNER: City of Elwood
ENGINEER: Whitaker Engineering

TO: PROSPECTIVE BIDDERS

This Addendum forms a part of the Contract Documents and modifies the original Drawings and Project Manual dated September 1, 2026. The information included in this Addendum shall become a part of the basic Drawings and Project Manual, the same as if originally incorporated therein. The original Drawings and Project Manual shall remain in their entirety, except as modified by Addendum. The items herein supersede information in the Drawings and Project Manual.

Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of three (3) pages and the following attachments:

- Elwood Street Department location map (1 page)
- Revised sheet E201 TERTIARY BUILDING SUB-MEZZANINE PLAN – ELECTRICAL (1 page)
- Revised sheet E202 TERTIARY BUILDING FIRST FLOOR PLAN – ELECTRICAL (1 page)
- Revised sheet E501 ELECTRICAL ELEVATIONS (1 page)
- Appendix G2 – Lift Station Control Panel Specifications – Grundfos (12 pages)
- Appendix V1 – Mandatory Alternate 8 – WILO Wet Pit Submersible Pump (10 pages)

GENERAL CLARIFICATIONS:

1. An updated Davis-Bacon wage decision may be issued by addendum on Friday, October 2nd. Contractors are urged to check the Eastern Engineering virtual planroom and must acknowledge all addenda on their bid form prior to the October 5th bid opening.
2. Total Drawing sheet count prior to this addendum is 78 sheets.
3. All ductile iron valves indicated on the Drawings shall be plug valves unless otherwise noted.
4. All PVC valves indicated on the Drawings shall be true union unless otherwise noted.
5. Excavation spoils shall be delivered to the Elwood Street Department (directly southeast of the WWTP). Contractor shall coordinate delivery with the Owner. See attached map for approximate stockpile location.
6. Chemical Spill Catch Basin and Grating
 - a. Catch basin structures:
 - i. Each basin (2 total) shall be Standard INDOT Type “C” precast inlet structures as indicated in the drawings.

- ii. Each basin shall be 3'-10" L x 2'-6" W x 2'-6" D interior structure with standard 6" thick walls.
- iii. No precast penetrations are required. The discharge pipe shall be core-drilled into the structures as required by the contractor.
- iv. The bottom of structure shall be grout filled (by the contractor) to provide positive drainage slope to the outlet pipe.
- v. The top of the concrete structure shall be 8" to 10" above the adjoining pavement.
- vi. The final interior of the concrete and grout shall be coated as required by the specifications to prevent deterioration from exposure to the weather and chemical spills.
- b. FRP grating:
 - i. The grating shall be made of Fiber-Reinforced Plastic (FRP) and secured to each corner of the structure via stainless steel anchor bolts, clips, fasteners, and hardware.
 - ii. The grating shall be inert to the sodium hypochlorite and sodium bisulfite chemicals.
 - iii. The grating shall be a minimum 1-1/2" thick to maximum 1-3/4" thick ($\pm 1/16$ " thickness).
 - iv. The grating shall be rated for pedestrian traffic, with not less than uniform loads of 100 Lbs. Per Sq. Ft. (PSF) or a 300 Lb. point load.
 - v. Deflection shall be less than 1/4 inch.
 - vi. Grating shall have 1-1/2" to 2" square or rectangular openings with not more than 3" O.C. from bar to bar either direction.
- 7. Contractor shall provide and mount two (2) infrared heaters within the chemical room, one above each of the chemical metering pump skids. Heaters shall be Berko model XRM4581 – 208v 1-phase, 4500 watt.
- 8. The proposed mechanical fine screen (including all mandatory alternates) shall be capable of withstanding a minimum 10-foot of head differential.
- 9. The electrical disconnect switch and control panel for the mechanical fine (bar) screen shall be installed on rack to the left of Lift Station Control Panel as shown in Sketch #2 Typical Lift Station Control Panel Elevation on sheet E903.
- 10. Instrumentation and controls subcontractor shall be the Owner's system integrator:
Toric Engineering
Nathen Burkhart
(317) 718-1800 ext. 8111
nburkhart@toriceng.com
- 11. A bid extension will not be considered due to the scheduled loan closing for project funding.
- 12. It is intended that a Mandatory Alternate #12 will be added via future addendum. This mandatory alternate will include precast lift station and screen structures in lieu of cast-in-place structures. Drawings will be issued in a future addendum.

CHANGES TO PROCUREMENT & CONTRACTING DOCUMENTS:

- 1. An updated bid form will be released via future addendum and will include the following items:
 - a. Allowance item for systems integration (Toric Engineering)
 - b. Mandatory Alternate #12 – Precast Lift Station and Screen Structures in Lieu of Cast-in-Place Structures

CHANGES TO DRAWINGS:

1. SHEET E201 TERTIARY BUILDING SUB-MEZZANINE PLAN – ELECTRICAL
 - a. See addition of sheet keynote #6 to the drawing. Revised sheet is attached.
2. SHEET E202 TERTIARY BUILDING FIRST FLOOR PLAN – ELECTRICAL
 - a. See changes to sheet plan notes #3, #9, and #11. Revised sheet is attached.
3. SHEET E501 ELECTRICAL ELEVATIONS
 - a. See changes to sheet plan note #1 and addition of sheet plan notes #2-#4. Revised sheet is attached.

CHANGES TO SPECIFICATIONS:

1. Section 03 30 00 – Cast-in-Place Concrete, 2.06.B. Delete table and insert the following in its place:

Maximum Water/ Cement or Water/ (Cement+Fly Ash)	Minimum 28 Day Strength-Pounds per Square Inch	Minimum Cementitious Content-Pounds per Cubic Yard	Maximum Cementitious Content- Pounds per Cubic Yard
0.42	5,000	580	650

2. Section 03 30 00 – Cast-in-Place Concrete, 2.06.C. Delete paragraph in its entirety and insert the following in its place:
 - C. Fly Ash and Furnace Slag Content: Minimum fly ash content shall be 40% of total cementitious material by weight. The combined total replacement of Portland cement shall not exceed 50% (fly ash and furnace slag contents).
3. Appendix G – Wet Well Submersible Pumps
 - a. Added Appendix G2 – Lift Station Control Panel Specifications – Grundfos (attached).
4. Appendix V – Mandatory Alternate 8 – Alternate Wet Weather Lift Station Pumps, Control Panel, and Associated Work (WILO Model FA 35.54T)
 - a. Added Appendix V1 – Mandatory Alternate 8 – WILO Wet Pit Submersible Pumps (attached).
 - b. Appendix V2 – Mandatory Alternate 8 – WILO Control Panel Specifications to be provided via future addendum.

END OF ADDENDUM NO. 1



Madison County, IN | Assessor Larry D. Davis

Elwood Street Department



FIELD VERIFY:
EXISTING ELECTRICAL EQUIPMENT WAS OBTAINED FROM SIMILAR BUILDING DRAWINGS AND CURSORY FIELD OBSERVATION. HOWEVER, ACTUAL "AS-BUILT" DRAWINGS WERE NOT AVAILABLE. CERTAIN INFORMATION CONCERNING THE LOCATION OF THE EXISTING ELECTRICAL WORK MUST BE VERIFIED IN THE FIELD TO DETERMINE THE EXACT LOCATIONS, DEPTH, SIZE, ETC. PRIOR TO STARTING CONSTRUCTION. ANY CONFLICT BETWEEN THESE PLANS AND THE ACTUAL CONDITIONS SHALL BE REPORTED IMMEDIATELY TO THE ARCHITECT FOR VERIFICATION AND/OR CORRECTION.

SHEET PLAN NOTES

- CONNECT NEW LIGHT FIXTURE TO EXISTING LIGHTING BRANCH CIRCUIT.
- SEE SHEET E200 FOR SECOND 'a' LEG SWITCH AND ADDITIONAL FIXTURES CONTROLLED BY SWITCH.
- FUTURE SODIUM BISULFITE TANK LEVEL SENSOR. VERIFY FINAL LOCATION IN FIELD WITH SCADA SYSTEM INSTALLER PRIOR TO ROUGH-IN.
- FUTURE SODIUM HYPOCHLORITE TANK LEVEL SENSOR. VERIFY FINAL LOCATION IN FIELD WITH SCADA SYSTEM INSTALLER PRIOR TO ROUGH-IN.
- HOME RUN WITH 1" CONDUIT, UNLESS NOTED OTHERWISE, WITH MANUFACTURER'S RECOMMENDED CONTROL CABLE TO SCADA CONTROL PANEL.
- POWER SUPPLY TO TANK HEATER. VERIFY FINAL LOCATION IN FIELD WITH TANK INSTALLER PRIOR TO ROUGH-IN.
- ELECTRICAL CONTRACTOR SHALL PROVIDE HEAT TRACE AND INSULATION ON PROCESS PIPING AS SHOWN AND DESCRIBED IN SPECIFICATIONS.

GENERAL NOTES

- SEE SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- SEE E80X SHEETS FOR ELECTRICAL SCHEDULES.
- SEE E90X SHEETS FOR ELECTRICAL DETAILS.
- WIRING SYSTEM SHALL BE CONDUIT AND CONDUCTOR UNLESS NOTED OTHERWISE. USE SOLID CONDUCTOR FOR SIZE #10 AWG AND SMALLER. USE STRANDED CONDUCTOR FOR LARGER SIZES.
- ALL WORK SHALL COMPLY WITH ALL NATIONAL, STATE, AND LOCAL CODES AND ORDINANCES PERTAINING TO THE WORK ON THIS PROJECT.
- EXPOSED CONDUIT SHALL BE RUN PARALLEL TO AND AT RIGHT ANGLES TO BUILDING LINES.
- ALL EXTERIOR EQUIPMENT AND DEVICES SHALL BE WEATHER PROOF AND RAIN TIGHT.
- COORDINATE INSTALLATION OF LIGHT FIXTURES WITH MECHANICAL EQUIPMENT, DIFFUSERS, SUPPORTS, PIPING, DUCTWORK, AND STRUCTURAL PLANS PRIOR TO ROUGH-IN OF FIXTURES.
- LOCATE CEILING MOUNTED OCCUPANCY SENSORS TO PROVIDE COMPLETE AREA OF COVERAGE OF SPACE CONTROLLED. SELECT PROPER SENSOR COVERAGE PATTERN FROM MANUFACTURER'S PRODUCT DATA. ADDITIONAL SENSORS REQUIRED DUE TO LACK OF COVERAGE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND MANUFACTURER. SENSORS SHALL INCLUDE ALL POWER SUPPLIES AND RELAYS NECESSARY FOR PROPER OPERATION.
- CONTRACT DOCUMENTS CONSIST OF BOTH THE PROJECT MANUAL AND DRAWINGS AND BOTH ARE MEANT TO BE COMPLEMENTARY - ANYTHING APPEARING ON EITHER MUST BE EXECUTED THE SAME AS IF SHOWN ON BOTH.
- CONTRACTOR SHALL THOROUGHLY EXAMINE THE WORK OF OTHER TRADES PRIOR TO SUBMITTING A BID PROPOSAL.
- CONTRACTORS SHALL PROVIDE UPDATED CIRCUIT DIRECTORIES FOR EXISTING PANEL BOARDS IDENTIFYING THE PROPER LOADS FED BY THE CIRCUITS (NEW AND EXISTING) UPON COMPLETION OF THE WORK.
- THE PROJECT IS SUBJECT TO BABA REQUIREMENTS. SEE FRONT END SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- SEE CIVIL SHEETS FOR ADDITIONAL WORK BY ELECTRICAL CONTRACTOR.
- SEE CIVIL SHEET D401 FOR CONTROL LOGIC TABLE.
- THE SYSTEM INTEGRATION WILL BE PERFORMED BY THE OWNER'S EXISTING SYSTEM INTEGRATOR (SI), TORIC ENGINEERING. THE SI'S CONTROL PANEL SCOPE FOR THIS PROJECT WILL INCLUDE THE WET WEATHER VFD CONTROL PANEL, CSO PLC CONTROL PANEL (LOCATED IN EXISTING PLC CONTROL PANEL), AND THE BASEMENT REMOTE I/O CONTROL PANEL. THE SI WILL ALSO INCLUDE THE WET WEATHER WETWELL INSTRUMENTS, CHEMICAL BULK TANK LEVEL INSTRUMENTS, EFFLUENT FLOW INSTRUMENTS, AND CHLORINE ANALYZERS. ALL APPLICATION ENGINEERING WILL BE PERFORMED BY SI. INSTALLATION OF CONDUIT, CONDUCTORS, CABLES, FIBER, AND TERMINATIONS OF SUCH WILL BE PERFORMED BY THE ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL COORDINATE BETWEEN ALL DISCIPLINES TO PROVIDE A COMPLETE AND TOTAL PACKAGE.

REVISIONS:
1 ADDENDUM #1 09/10/2026

SHEET TITLE:
**TERTIARY BUILDING
SUB-MEZZANINE PLAN - ELECTRICAL**

PROJECT TITLE:
**CITY OF ELWOOD WWTP
CSO1 IMPROVEMENTS**

**CORNERSTONE
ENGINEERING INC.**
Engineering. Team. Innovative Solutions.

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THOMAS M. REDEY, JR.
No. 11100167
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Thomas M. Redey, Jr.

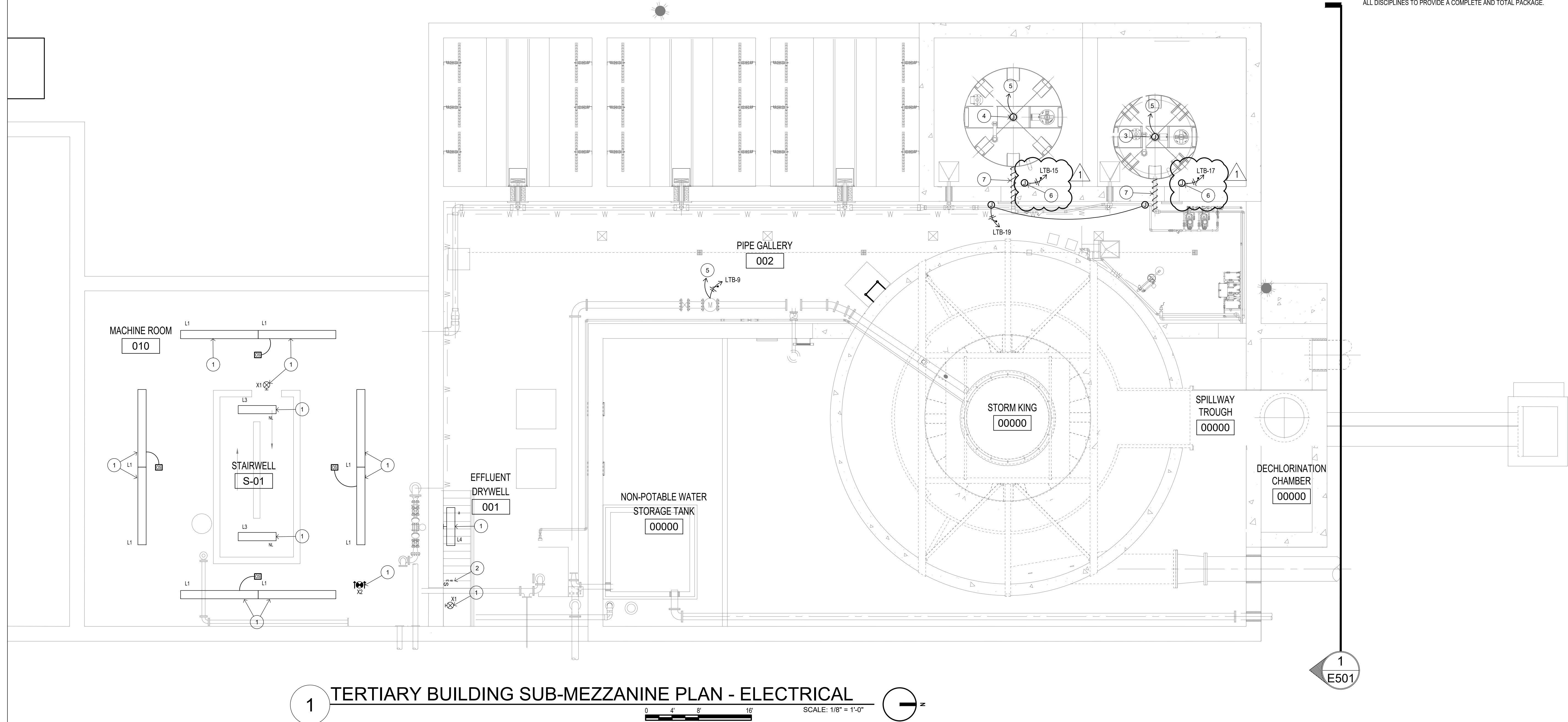
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OWNER INFORMATION:
**CITY OF ELWOOD
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1505 SOUTH B ST
ELWOOD, IN 46036**

SHEET LABEL	SHEET No. 69	OF: 78
E201	PROJECT No.: 24172	
CHECKED BY: TMR		
DRAWN BY: STAFF	DATE: 09/03/2026	



FIELD VERIFY:
EXISTING ELECTRICAL EQUIPMENT WAS OBTAINED FROM SIMILAR BUILDING DRAWINGS AND CURSORY FIELD OBSERVATION, HOWEVER, ACTUAL "AS-BUILT" DRAWINGS WERE NOT AVAILABLE. CERTAIN INFORMATION CONCERNING THE LOCATION OF THE EXISTING ELECTRICAL WORK MUST BE VERIFIED IN THE FIELD TO DETERMINE THE EXACT LOCATIONS, DEPTH, SIZE, ETC. PRIOR TO STARTING CONSTRUCTION. ANY CONFLICT BETWEEN THESE PLANS AND THE ACTUAL CONDITIONS SHALL BE REPORTED IMMEDIATELY TO THE ARCHITECT FOR VERIFICATION AND/OR CORRECTION.

SHEET PLAN NOTES

1. RECONNECT EXISTING MECHANICAL EQUIPMENT TO NEW DISCONNECT SWITCH.
2. CLOSE DAMPERS AND SEAL WITH 2" RIGID INSULATION AND 1/2" PLYWOOD. PAINT PLYWOOD WITH A MINIMUM OF TWO COATS OF LIGHT COLORED FIRE RETARDANT PAINT. SEAL PERIMETER WITH CAULK.
3. PROVIDE NEW COMBINATION MOTOR STARTER/DISCONNECT SWITCH FOR SLUICE GATE MOTOR OPERATOR. CONNECT TO EXISTING FEEDER CIRCUIT.
4. VFD FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
5. EXHAUST FAN FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR. EXTEND BRANCH CIRCUIT AS REQUIRED.
6. CONNECT NEW LIGHT FIXTURE TO EXISTING LIGHTING BRANCH CIRCUIT.
7. CONNECT NEW LIGHT FIXTURE TO EXISTING LIGHTING BRANCH CIRCUIT. RE-FEED CIRCUIT THROUGH LIGHTING CONTACTOR. SEE ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION.
8. SCADA SYSTEM CONTROL PANEL.
9. NOT USED.
10. DECHLORINATION CHAMBER/EFFLUENT CHAMBER ULTRASONIC LEVEL SENSOR.
11. NOT USED.
12. EXISTING ELECTRICAL EQUIPMENT TO REMAIN.
13. PROVIDE (2) NEW 20A-1P CIRCUIT BREAKERS FOR EXISTING KINNEY CALSS CTL PANEL BOARD #BG-105315.
14. 4" CONDUIT STUBBED 4" ABOVE FINISHED FLOOR AND CAPPED.
15. 4" CONDUIT WITH SCADA INSTALLERS RECOMMENDED CABLE.
16. ELECTRICAL CONTRACTOR SHALL PROVIDE HEAT TRACE AND INSULATION ON PIPING AS INDICATED.

GENERAL NOTES

- A. SEE SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- B. SEE E00X SHEETS FOR ELECTRICAL SCHEDULES.
- C. SEE E00X SHEETS FOR ELECTRICAL DETAILS.
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- K. CONTRACTOR SHALL THOROUGHLY EXAMINE THE WORK OF OTHER TRADES PRIOR TO SUBMITTING A BID PROPOSAL.
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- M. THE PROJECT IS SUBJECT TO BABA REQUIREMENTS. SEE FRONT END SPECIFICATIONS FOR ADDITIONAL INFORMATION.
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REVISIONS:
1. ADDENDUM #1 09/10/2026

SHEET TITLE:
**TERTIARY BUILDING
FIRST FLOOR PLAN - ELECTRICAL**

PROJECT TITLE:
**CITY OF ELWOOD WWTP
CSO1 IMPROVEMENTS**



CONSULTANT:

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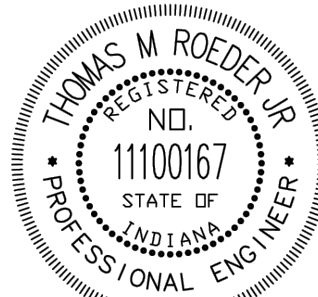


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Thomas M. Reed
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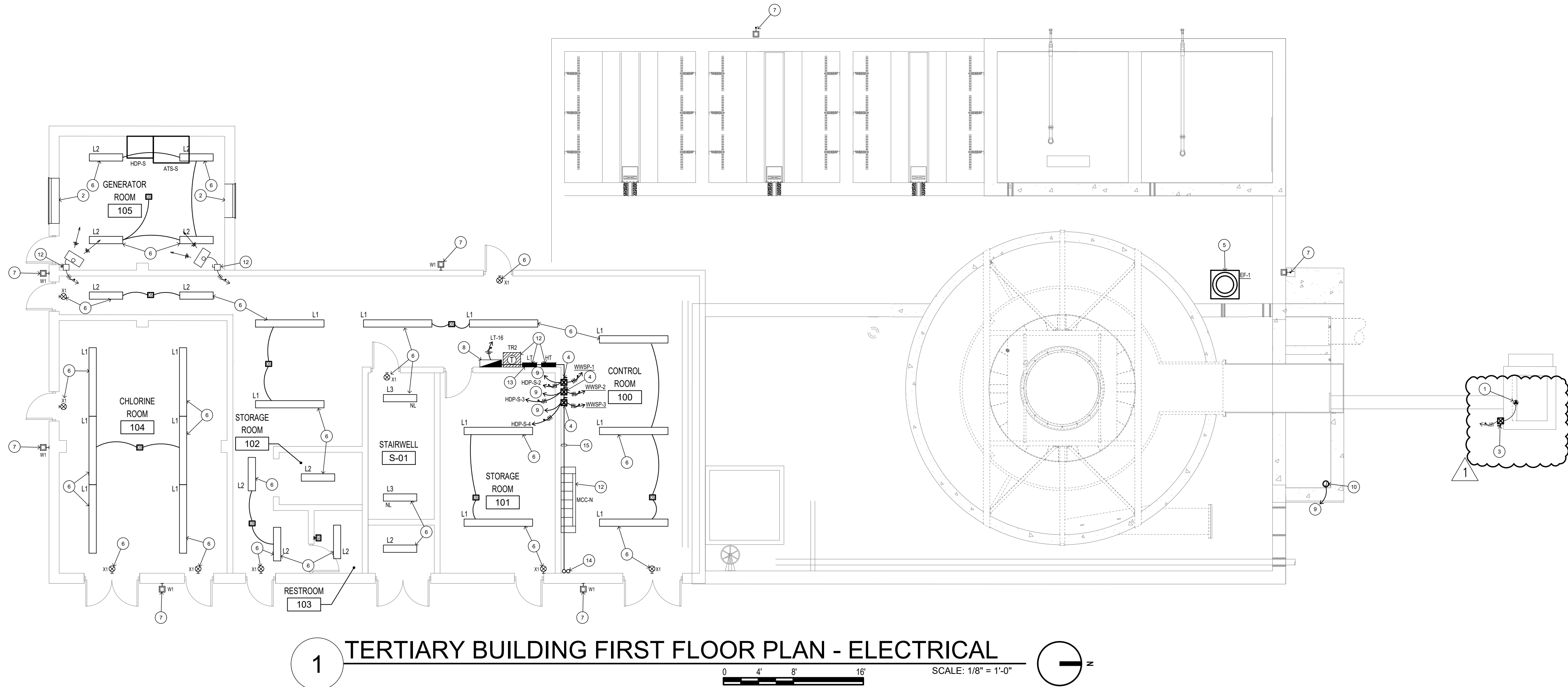
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1505 SOUTH B ST
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SHEET LABEL	SHEET No. 70	OF: 78
E202	PROJECT No.: 24172	
CHECKED BY: TMR		
DRAWN BY: STAFF	DATE: 09/03/2026	

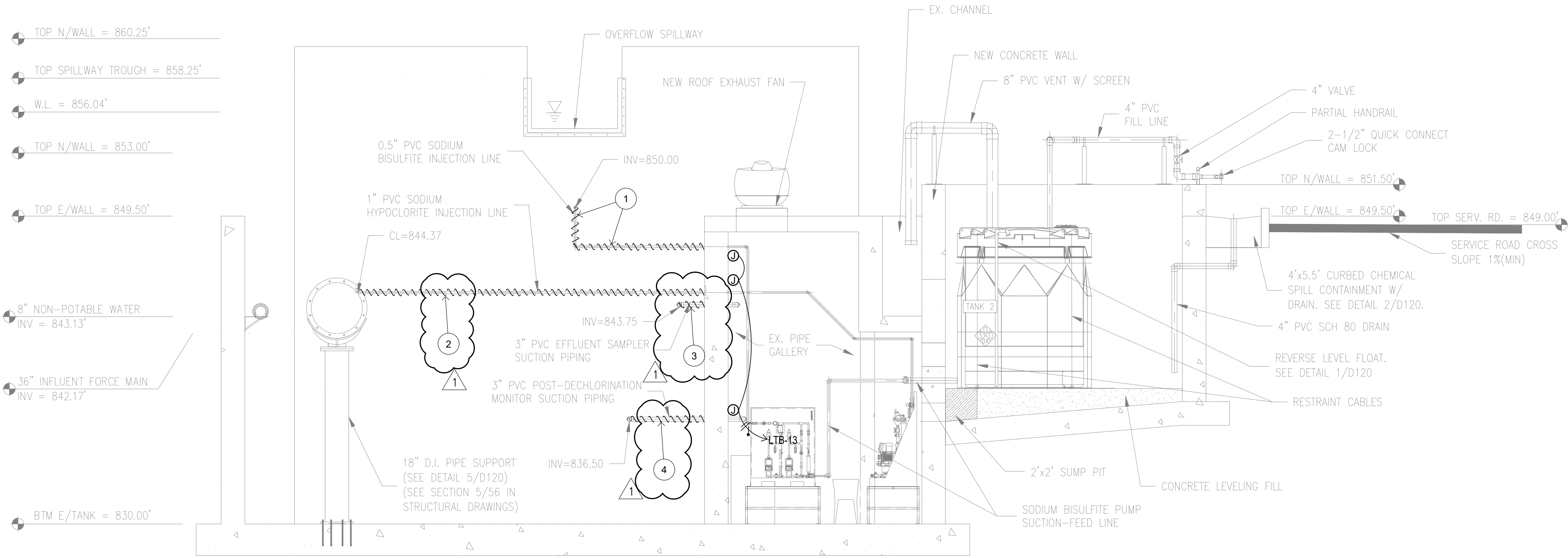


GENERAL NOTES

- A. SEE SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- B. SEE E80X SHEETS FOR ELECTRICAL SCHEDULES.
- C. SEE E90X SHEETS FOR ELECTRICAL DETAILS.
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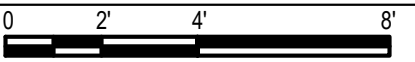
SHEET PLAN NOTES

- 1. ELECTRICAL CONTRACTOR SHALL PROVIDE HEAT TRACE AND INSULATION ON 1/2" PVC SODIUM BISULFITE INJECTION LINE. SEE CIVIL DRAWINGS FOR COMPLETE LENGTH OF LINE.
- 2. ELECTRICAL CONTRACTOR SHALL PROVIDE HEAT TRACE AND INSULATION ON 1" PVC SODIUM HYPOCHLORITE INJECTION LINE. SEE CIVIL DRAWINGS FOR COMPLETE LENGTH OF LINE.
- 3. ELECTRICAL CONTRACTOR SHALL PROVIDE HEAT TRACE AND INSULATION ON 3" PVC EFFLUENT SAMPLER SUCTION PIPE. SEE CIVIL DRAWINGS FOR COMPLETE LENGTH OF LINE.
- 4. ELECTRICAL CONTRACTOR SHALL PROVIDE HEAT TRACE AND INSULATION ON 3" PVC POST-DECHLORINATION MONITOR SUCTION PIPE. SEE CIVIL DRAWINGS FOR COMPLETE LENGTH OF LINE.



ELECTRICAL ELEVATIONS

SCALE: 1/4" = 1'-0"



REVISIONS:
1 ADDENDUM #1 09/10/2026

SHEET TITLE: ELECTRICAL ELEVATIONS
PROJECT TITLE: CITY OF ELWOOD WWTP CSO1 IMPROVEMENTS

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OWNER INFORMATION:
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1505 SOUTH B ST
ELWOOD, IN 46036

SHEET LABEL: E501
SHEET No.: 72 OF: 78
PROJECT No.: 24172
CHECKED BY: TMR
DRAWN BY: STAFF DATE: 09/03/2026

APPENDIX G2 - LIFT STATION CONTROL PANEL SPECIFICATIONS - GRUNDFOS

1. General Description And Qualifications

- 1.1. Contractor shall furnish all labor, materials, equipment and appurtenances to provide a complete lift station control panel as specified herein.
- 1.2. The pump control panel shall be manufactured and tested by a facility meeting U.L. Standard 508a for industrial controls. All components shall be the products of reputable manufacturers with at least five years of experience in the manufacture of similar equipment. Similar devices in the control panel shall be the products of the same manufacturer. All equipment shall be of modular design to facilitate interchangeability and ensure ease of service. Control panel must be UL508a or UL698a listed and include a standard 3 year warranty.
- 1.3. The pump control panel shall be Dedicated Control series as Manufactured by Grundfos Water Utilities in Aurora, IL, and provided by local representative American Pump Repair & Service, Inc. with no exception.
- 1.4. The pumps, control panel, and pump controller shall be provided by a single manufacturer for single source responsibility. Packages provided from multiple manufacturers shall not be considered equal. A single package provided from a vendor utilizing multiple manufacturers shall not be considered equal.

1.5. Related Sections

- 1.5.1. Section 26 10 00 – Variable Frequency Motor Controllers

2. Construction And Functionality

2.1. Equipment Enclosure And Accessories

2.1.1. Equipment Enclosure

The pump control panel enclosure shall be rated NEMA 4X and formed of 14 or 16 gauge steel with continuously welded seams ground smooth. Indoor enclosure shall be finished in grey powder coating. Outdoor enclosure shall be 304 stainless steel. Enclosure shall be designed to enclose electrical and electronic equipment and protect against harsh, industrial environments and sized according to the application. Enclosure shall be Saginaw, Rittal, Hoffman or approved equal.

2.1.2. Enclosure Heater

Provide enclosure heater for protection against condensation and low temperatures. Heater shall have resistive heating element with adjustable thermostat, continuously running ball bearing fan and anodized aluminum housing. Provide wattage and voltage appropriate for enclosure size and installation environment. Enclosure heater shall be Hoffman D-AH series or approved equal.

2.1.3. Enclosure Cooling Fan

If the enclosure contains a VFD or other significant heat producing component, provide a cooling fan package with self starting shaded pole axial fan motor, heat resistant plastic intake grill with fine filter, Rittal SK series or approved equal. Provide

heat resistant plastic exhaust louver and fine filter, Rittal SK series or approved equal. Size ventilation equipment to satisfy the cooling requirements of all internal components. Type rated covers shall be supplied to maintain the type rating of the enclosure and also maintain the UL listing.

2.1.4. Enclosure Convenience Outlet

Provide one duplex receptacle, 15A 120VAC, for computer or other maintenance tools. Receptacle shall be GFCI protected.

2.2. Power Distribution

2.2.1. Main Disconnect Switch

Provide non-fusible disconnect switch with through the door, pad-lockable operator. Switch shall be suitable for use as a motor disconnect on service equipment and horsepower rated. Switch shall be UL98 and UL508 listed. Switch shall be touch-safe and contacts shall be opened and closed by a driven mechanism. Switch shall be ABB Switchline or approved equal.

2.2.2. Circuit Breakers

Molded case thermal magnetic circuit breakers shall be DIN rail mounted, cable in / cable out type, UL689 Listed for the applicable voltage. Breakers shall be provided with arc chutes on each pole. Breakers shall be provided with thermal and magnetic trip mechanisms on each pole. Two and three pole breakers shall be common trip. Provide one breaker for each pump power circuit, one breaker for control power and one breaker convenience outlet. 400-600VAC Circuit Breakers shall be Schneider Electric HDL Series, ABB Isomax or approved equal. 120-240VAC Circuit Breakers shall be Cutler-Hammer Q-Line, Schneider Electric Q Series or equal.

2.2.3. Fuses

Fuses shall be of the type and amperage required for adequate protection of panel components. Fuses shall be provided to protect panel components as recommended by the component manufacturer. All fuses shall be installed in compatible fuse holders. Fuses shall be Mersen, Eaton-Bussman, Littelfuse or approved equal.

2.2.4. Fuse Holders

Fuse holders shall be of the type and amperage rating required for fuses as recommended by the fuse manufacturer. Fuse holders shall be touchsafe. Fuse holders shall be Wohner, Eaton-Bussman, Phoenix Contact, Mersen or approved equal.

2.2.5. Control Power Transformer

Control power transformer shall be panel mount, UL Listed, epoxy encapsulated core and coil type. Size control power transformer as required to provide 120-volt power for internal control circuits, as well as any lighting, heating, ventilation or convenience receptacle that may be required by this specification. Transformer shall be Schneider Electric 9070T Series, Acme AE Series, GE 9T Series or approved equal.

- 2.2.6. Surge Arrester
Provide parallel metal oxide varistor (MOV) surge arrester with molded polycarbonate housing, epoxy encapsulated to protect from moisture. Surge Arrestor shall be Schneider Electric SDSA or approved equal.
- 2.2.7. Terminal Blocks
Provide terminals for all control and pump circuit wire terminations for both field wiring and internal wiring. Terminals shall be capable of terminating #26-8 AWG stranded wires. Terminals shall be equipped with labeling devices designed specifically for use with provided terminal blocks. Terminals shall be Phoenix Contact UT6 Series terminal blocks or approved equal.
- 2.2.8. Distribution Terminal Blocks
Provide terminal blocks for all power circuit wire terminations for both field wiring and internal wiring. Provide adequate terminals for all internal secondary circuits as well as tap off points for external circuits being fed from the panel power circuit. Terminals shall accommodate one conductor per opening and shall be touch-safe. Power distribution blocks shall be Mersen model FSPDB Series or approved equal.
- 2.2.9. Wire-ways
Provide molded plastic wireways for all wiring in the panel. Wireways shall be complete with covers. Provide adequate wireway size to accommodate wires and maintain 25% unused. Wire-ways shall be manufactured by Panduit, Thomas & Betts or approved equal.

2.3. Motor Starters

- 2.3.1. Overload Relay For Three Phase Motors
Overload relay shall be solid state type with adjustable trip class setting for class 10, 20 & 30, selector for automatic or manual reset, visible trip indication, trip test, and manual reset button. The overload shall be sized appropriately for the motor full load amperage. A normally closed contact shall be wired in series with the contactor coil. A reset pushbutton shall be located on the dead front door for each overload relay. Overload relay shall be Schneider Electric 9065 Series, ABB E Series or approved equal.
- 2.3.2. Variable Frequency Drive
The variable frequency drive (VFD) shall be designed for use with standard pumps with integral AC motors, programmable for constant or variable torque. The VFD shall include an interface module with built in HOA switch function, alarm and warning lights and drive status. The VFD shall include galvanically isolated I/O and built in DC link inductors to reduce harmonics or a line reactor must be supplied.

2.4. Relays

2.4.1. General Purpose Relays

General purpose relays shall be 2-pole, slim line ice cube design with have 8A contacts and standard blade style DIN rail mounted touch-safe socket. Relays shall be Idec RJ series with SJ series sockets or approved equal.

2.4.2. Three Phase Voltage Monitor Relay

The voltage monitor relay shall continuously measure the voltage of each phase. The voltage monitor relay shall detect over and under voltage, voltage unbalance, phase loss, and phase reversal. The voltage monitor relay shall have a standard plug-in base with DIN rail mounted socket and SPDT isolated 10A contacts. The voltage monitor relay shall be SSAC PLMU series or approved equal. A normally open contact shall be wired to the programmable controller for voltage status determination. Controller programming shall automatically disable all pumps in the event of unacceptable line voltage. Pumps shall automatically be enabled once normal voltage has been restored.

2.4.3. Seal Failure Sensor Relay

The seal failure sensor relay shall be a DIN rail mounted SPDT conductivity based liquid-level control with adjustable sensitivity and an LED indicator, ABB LLC series or approved equal unless otherwise specified by the pump manufacturer. One seal failure sensor relay shall be provided for each pump. The seal failure sensor relay shall be wired to terminals facilitating field connection to the seal failure sensor probes in the pump seal cavity. In the event of water in the seal cavity the seal failure sensor relay shall change states. A normally open auxiliary contact shall be wired to the programmable controller for seal failure determination.

2.4.4. Intrinsically Safe Relay

The intrinsically safe relay shall utilize a transformer isolated barrier circuit to determine float switch status and relay that status to the controller module via an electromechanical output. The intrinsically safe relay shall be a UL698a listed device and the panel shall bear a UL698a label. The intrinsically safe relay shall include one input for each float. Intrinsically safe relays shall be Idec isolated barriers or approved equal.

2.4.5. Current Sensor

The current sensor shall convert the monitored AC current to a proportional DC voltage range of 0 to 5 volts. The current sensor shall be compact, self powered with extremely low insertion impedance. The current sensor must be UL listed and have a selectable amperage measurement range. The current sensor shall be compatible with the VFD motor control drive. The current sensor shall be Veris H904 or H934 series or approved equal, to monitor the load side current from the VFD.

2.5. Controller

2.5.1 Hardware

- a. The controller shall be microprocessor based capable of having software changes and updates via personal computer (notebook). The controller user interface shall

have a color display with a minimum screen size of 3-1/2" x 4-5/8" for easy viewing of system status parameters and for field programming. The display shall have a back light with contrast adjustment. Password protection of system settings shall be standard.

- b. The controller shall provide internal galvanic isolation to all digital and analog inputs as well as all fieldbus connections.
- c. The pump system controller shall be a standard product developed and supported by the pump manufacturer. The controller shall be manufactured by Grundfos Water Utilities with no exception.
- d. The controller shall have the ability to be connected to a battery to maintain power on controller during periods of loss of supply power.
- e. The controller shall have built in data logging capability. Logged values shall be displayed on the controller and able to be exported to computer via standard connection. A minimum of 3600 samples per logged value with the following parameters available for logging:
 - Average flow-rate (inflow and outflow)
 - Number of flow reading taken
 - Station operating hours
 - Time since service
 - Total Number of pump starts
 - Total Number of pump starts per hour
 - Pump Starts per hour
 - Individual operating hours
 - Discharge pressure (head pressure)
 - Power consumption
 - Average current consumption
 - Number of anti-blocking attempts
- f. The controller shall display the following as status readings from a single display on the controller (this display shall be the default "home" screen):
 - Current station liquid level with corresponding water graphic
 - Alarm status on the station (if any)
 - Lead pump on and off setpoints and graphically display on water graphic
 - System status with current operating mode
 - Status of each pump with current operating mode and total hours run on the pump
 - Estimated flow-rate, (not requiring flow meter connection)
 - Date and Time
 - Station Name

- g. The controller shall have as a minimum the following hardware inputs and outputs:
 - Three analog inputs (4-20mA or 0-10VDC)
 - Three digital inputs
 - Two digital outputs
 - Ethernet connection
 - Field Service connection to PC for advanced programming and data logging
 - Expandable inputs and outputs using expandable I/O modules for up to: 30 digital inputs, 23 digital relay outputs (240VAC, 2A), 9 analog inputs (4-20mA, 0-20mA, 0-10V), 9 analog outputs (0-10V), 12 PTC inputs for motor protection
- h. The controller shall be capable of receiving a redundant sensor input to function as a backup to the primary sensor.
- i. The controller shall be capable of displaying instantaneous power consumption (Watts or kilowatts) and cumulative energy consumption (kilowatt-hours).
- j. The controller shall be capable of displaying instantaneous specific energy use (kw/gpm), (optional flow meter must be connected or advanced flow calculation activated).
- k. The controller shall be capable of displaying an estimated flow-rate on the default status screen.

2.5.2 Functionality

- a. The wastewater pump station controller shall provide “out of the box” control of a typical lift (empty) station, with an intuitive color user-interface. The pump station controller shall come with pre-built configuration parameters which are selectable via the user interface, including:
 - Pump mode, for each pump, between Auto/ Manual / Off.
 - Functionality for advanced pump control of up to 6 pumps.
 - Setpoint adjustment for pump activation/deactivation and level alarms.
 - Level transducer or ball floats
 - Redundant level device handling from two 4-20mA devices
 - Functionality for grouping and alternation of up to 6 pumps
 - Station optimization including:
 - Anti-seizing function
 - Maximum pumps to run
 - Maximum starts per hour
 - Inter-pump start and stop delays
 - Maximum run time
 - Anti-blocking function
 - Pump controller shall have the ability to “flush” or “reverse” sewage pumps if the control system deems the pump to be blocked

- Triggers are selected and tolerances set by user and include low flow, current, torque, power factor, and pump over temperature
- Foam-Draining function
- Daily Emptying
- Mixer Configuration
- Pump groups with the ability to select alternation within groups or between groups

2.6 Faults and Alarm

- 2.6.1 The pump controller shall monitor and store alarm conditions
- a. The pump system controller shall store up to 50 warning and alarms in memory.
 - b. The time, date and duration of each alarm shall be recorded.
 - c. All Faults and Alarms shall be able to be disabled by user.
 - d. All Faults and Alarms shall have a user adjustable time delay of activation.
 - e. All Faults and Alarms shall have a Warning option allowing the user to set the condition with a warning threshold or change the Alarm to a Warning.
 - f. All Faults and Alarms shall be user selectable to send over SCADA
 - g. All Faults and Alarms shall be selectable by the user as Automatic reset or require Manual reset at the control system.
 - h. Control system shall have a user-defined alarm option available for any alarm of fault condition not preloaded in to control system
 - i. The controller shall display all alarm conditions:
 - Overflow
 - High Level
 - Dry Running
 - Float Switch Inconsistency
 - System Power Loss
 - Overflow
 - High Level
 - Loss of sensor signal (4-20mA)
 - Max Starts/Hour, Pump
 - VFD Trip/Failure
 - System Failure
 - Contactor feedback, Pump
 - Flow Meter Failure
 - Power Meter Failure
 - Controller Hardware Fault
 - Battery Backup Fault (UPS)
 - Communication Fault (GENIbus)
 - Communications Card Fault
 - SCADA Callback Error
 - Ethernet Fault
 - User-defined Sensor Fault
 - Discharge Pressure Sensor Fault
 - Water on Pit Floor
 - Gas Detector

- Extra Fault Failure
- Motor Protection, Tripped
- Common Phase Error
- Low Flow
- Auto/On/Off Switch Change
- Time for Service
- Pump Over Temperature
- Pump Moisture/Seal Failure
- Latest Runtime of Pump
- VFD not ready
- Torque
- Pump Blocked
- Contactor Feedback, Mixer
- Time for Service, Mixer
- Max Starts/Hour, Mixer
- Loss of Sensor signal (4-20 mA)

2.7 Flow Monitoring

2.7.1 The pump system controller shall be able to accept a physical flow meter input or calculate flow rates.

2.7.2 Simple Flow Calculation

The pump system shall be able to calculate station inflow and pump outflow rates using volumetric-over-time calculations (i.e. draw down test)

2.7.3 Advanced Flow Calculation

- The pump system shall be able to utilize the following parameters monitored within the control system to calculate flow within 1% to 2% of a physical flow meter:
 - Nominal pump power (P_{nom})
 - Nominal head pressure (H_{nom})
 - Pit Area (sqft)
 - Nominal flow rate (gpm)
- The pump system shall be able to utilize the following parameters monitored within the control system to calculate flow within 1% to 2% of a physical flow meter:

2.8 Variable Frequency Drive (VFD) Control

2.8.1 Variable Frequency Drives (VFD) shall be as defined in section 26 10 00.

2.8.2 The pump system controller shall have the ability to control up to four (4) variable frequency drives.

2.9 Communication

2.9.1 The pump system controller shall have the ability to communicate through the following common fieldbus protocols via communications card installed inside the controller:

- a. Modbus RTU

- b. Modbus TCP/IP
- c. Modbus TCP/IP via cellular using CDMA or GPRS
- d. GRM via cellular using CDMA or GPRS (3G/4G)

2.9.2 The controller shall have a built in Ethernet connection allowing controller to connected to network and access of controller via web browser and internet anywhere around the world where internet communication is available.

2.9.3 The controller shall have the ability to communicate GENIbus to down-stream components that make up the entire control system

3 Additional Control Components

3.1 Motor Protection Systems and Pump Monitoring Units shall be as Identified in Section 26 10 00 Variable Frequency Drives

4 Level Control

4.1 Ultrasonic Transducer

Liquid-level will be determined based on a 4-20mA analog input from an ultrasonic transducer. The ultrasonic transducer shall have a scalable output with minimum and maximum window limits which are independently adjustable. The ultrasonic transducer shall allow for multiple mounting configurations, shall be designed for harsh environments, rated NEMA6P and temperature compensated..

4.2 Float Switches

Alarm-level and ultrasonic transducer failure will be determined based on digital inputs from external float switches. Provide one set of terminals for connection to each float switch. Float switch terminals shall be wired to the controller to provide digital inputs for low water alarm / pump disable and high water alarm. Float switches shall be isolated by an intrinsically safe relay (see 2.4.4) and shall be signal rated for use in a class 1, div. 1 location. Floats shall be Grundfos 98365986 or equal. Floats shall also include Grundfos stainless steel float hanger 98365987 or equal.

5 Operator Interface Devices

5.1 All operator interface devices shall be located on the panel dead front unless indicated otherwise. Each device shall be labeled according to its function and the designation of any associated equipment.

5.1.1 H-O-A Switch

The H-O-A switch shall be UL Listed Type 4X, watertight type with detachable contact blocks, idec HW series or approved equal. One H-O-A switch shall be supplied for each pump. Each H-O-A switch shall be labeled according to function and designation of the associated pump. The H-O-A switch shall have auxiliary contacts wired to the controller for pump in auto status determination. Controller programming shall automatically call next pump in rotation in the event that the scheduled pump is determined to be not in auto.

5.1.2 Panel Power Pilot Light

The panel power pilot light shall be UL Listed Type 4X, watertight, 120VAC LED lamp and green lens, Idec HW series or approved equal. Incandescent bulbs will not be considered equal. The panel power light shall be labeled "MAIN POWER". The power light shall be wired to the line side of the main disconnect circuit breaker and shall be illuminated when supply power is present in the panel.

5.1.3 Pump Running Pilot Light

The pump running pilot light shall be UL Listed Type 4X, watertight type with 120VAC LED lamp and green lens, Idec HW series or approved equal. Incandescent bulbs will not be considered equal. One pump running pilot light shall be supplied for each pump. Each pump running pilot light shall be labeled according to function and designation of the associated pump. The pump running pilot light shall be illuminated when the associated pump starter or VFD is engaged.

5.1.4 Pump Failure Pilot Light

The pump failure pilot light shall be UL Listed Type 4X, watertight type with 120VAC incandescent lamp and red lens, idec HW series or approved equal. Incandescent bulbs will not be considered equal. One pump failure pilot light shall be supplied for each pump. Each pump failure pilot light shall be labeled according to function and designation of the associated pump. The pump failure pilot light shall be illuminated when the associated pump has been called to run and the associated motor starter has not engaged.

5.1.5 Elapsed Time Meter

The elapsed time meter shall be a seven-digit hour meter with 0.01-hour resolution, Redington or approved equal. One elapsed time meter shall be supplied for each pump. Each elapsed time meter shall be labeled according to function and designation of the associated pump. The elapsed time meter shall be energized when the associated pump starter is engaged.

5.1.6 Cycle Counter

The cycle counter shall be a six-digit non-resettable counter, Redington or approved equal. One cycle counter shall be supplied for each pump. Each cycle counter shall be labeled according to function and designation of the associated pump. The cycle counter shall advance one digit each time the associated pump starter is engaged.

5.1.7 Liquid Level Alarm Light

The liquid-level alarm pilot light shall be UL Listed Type 4X, watertight, push button type with 120VAC LED lamp and red lens, idec HW series or approved equal. Incandescent bulbs will not be considered equal. The liquid-level alarm pilot light shall be labeled "LIQUID-LEVEL ALARM".

5.1.8 Audible Alarm

The audible alarm shall be of molded case waterproof design with epoxy encapsulated solid state electronics, UL Listed Type 4X, mounted through the bottom of the enclosure, Floyd Bell MW series or approved equal. The audible alarm shall function during any general alarm condition.

5.1.9 Alarm Beacon Strobe

The alarm beacon strobe light shall be UL listed Type 4X, constructed of corrosion resistant materials, and have a flash energy of 7.5 joules and a flash rate of 90 flashes per minute. Provide 120-volt AC model with red lens, Ingram MS120A or approved equal. The alarm beacon strobe shall function during any general alarm condition.

5.2 Device Labeling

External or flush mounted devices shall be labeled with engraved laminated phenolic nameplates secured with permanent pressure sensitive adhesive. Internal labels shall be white polyester permanent pressure sensitive tape printed with black thermal transfer lettering.

Where operator interface devices are grouped according to associated equipment it shall be permissible to provide one label for each group of devices, i.e. an H-O-A switch, pump running pilot light, and elapsed time meter for pump #1 could be grouped together and identified with one label reading "PUMP 1".

5.3 Wire Labeling

All internal connection wires shall be numbered at each end using pre-printed heat shrink sleeve markers or wrap around tape markers with clear cover.

5.4 Schematic

A wiring diagram schematic shall be included on the inside door using adhesive paper.

END OF SECTION

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APPENDIX V1 – MANDATORY ALTERNATE 8 - WILO WET PIT SUBMERSIBLE PUMPS

PART 1: GENERAL

1.1 DESCRIPTION

- A. The General Contractor shall furnish, install, test and place in satisfactory operation, as shown on the Plans and specified, three (3) Wilo EMU model FA 35.54T+T 42-6/36GEx wet-pit submersible pumps complete with all appurtenances, accessories and spare parts as will be required to produce a complete and workable installation. To maintain system unit responsibility, the pump control system shall be furnished by the pump manufacturer as described herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to Division 01 for supplementary requirements for guarantees, shop drawings, technical manuals, startup, etc.
- B. Division 09 for Painting
- C. Division 26 for Electrical and Sewage Pump Controls
- D. Division 40 for Valves
- E. APPENDIX V2 – WILO PUMP CONTROL SYSTEM FOR SEWAGE PUMP STATION

1.3 CODES AND ABBREVIATIONS

- A. Codes, specifications and standards referred to by number of title shall form a part of this specification to the extent required by references thereto. Latest revisions shall apply, unless otherwise shown or specified.
- B. Abbreviations
 - 1. AISI – American Iron and Steel Institute
 - 2. ANSI – American National Standards Institute
 - 3. ASTM – American Society for Testing and Materials
 - 4. FM - Factory Mutual
 - 5. IEC – International Electrotechnical Commission
 - 6. NEMA – National Electric Manufacturer's Association
 - 7. NEC - National Electrical Code

1.4 SUBMITTALS

A. Data to be submitted:

1. The Contractor shall submit pump curves for the units which he proposes to supply, showing Total Dynamic Head, Pump Efficiency, Brake Horsepower, Power Input to Electric Drive Motor of Pumping Unit for the various conditions under which the units are to operate, along with descriptive data and specifications describing in detail the construction of the complete units.
2. The manufacturer shall have a minimum of five installations of similar size pump and motor combinations to those being furnished for this project. Installations must be in operation for a minimum of five years and shall list the pump/volute model and date of installation. A list of these installations shall be furnished to the Engineer with submittals.

B. Dimensional Data:

1. The successful bidder shall submit to the Engineer for approval, shop drawings, showing all weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.

1.5 QUALIFICATION REQUIREMENTS

- A. The manufacturer shall provide data on alternate equipment manufacturer's experience. Only Manufacturers with 20 or more years of experience who have furnished at least 5 similar lift stations shall be considered.
- B. After installation, a pump station start-up shall be performed by the installing contractor under the supervision of the manufacturer's authorized representative. 8 hours of field service shall be provided by an authorized, factory trained representative of the pump manufacturer. Services shall include, but not be limited to, inspection of the completed pump station installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing and activation of the Pump Manufacturer's Warranty. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor. The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer.

1.6 REFERENCES

- A. American Society for testing and material (ASTM) International
1. A 48: Standard Specification for Gray Iron Castings.

B. American National Standards Institute (ANSI)

1. B16.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings, 125 lb.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products to site under provisions of Section 01 60 00 – Product Requirements.

PART 2: MATERIALS

2.1 MANUFACTURERS

A. Manufacturer

1. Sewage pumps shall be manufactured by Wilo USA LLC of Thomasville, Georgia, or an ENGINEER pre-approved equal.
2. Any pump manufacturer, other than specified, proposing to offer the following equipment must submit sufficient information to the Engineer to determine that the equipment complies with the requirements of the Contract Documents. This information must be received by the Engineer not less than 14 days prior to the Bid Date. The Engineer will issue an addendum prior to the bid date which lists any ENGINEER pre-approved equipment. Contractors and manufacturers are advised that a manufacturer named as an approved supplier is not excused from meeting all of the technical and performance requirements of this specification. The pre-bid qualification package shall include complete pump performance data, evidence of compliance with the installation experience requirements of this Section and a letter from an officer of the company of the pump manufacturer listing all exceptions to the specifications.

B. Pump Performance

1. Each pump shall be capable of the following performance:

Duty Point Flow, gallons per minute	6,950 GPM
Duty Point Total Dynamic Head, feet	52.1 feet
Minimum Hydraulic Efficiency at Duty Point, %	72.13%
Maximum NPSH-R at Duty Point, feet	24.7 feet
Maximum Nominal Motor Power, Horsepower	162.1 HP
Maximum Motor Speed, Revolutions Per Minute	1170 RPM
Minimum Shut-off Pressure, feet	Approx. 97 feet
Secondary Rating Point Flow, gallons per minute	-
Secondary Rating Point Total Dynamic Head, feet	-
Minimum Hydraulic Efficiency at Secondary Rating Point, %	
Minimum Discharge Size, inches	14 inches (DN350)
Minimum Pump Base Suction Intake Size, inches	14 inches (DN350)

2.2 PUMP CONSTRUCTION

A. General

1. The sewage pumping units shall be vertical, non-clogging, centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be direct driven by integral squirrel cage, electric induction motors. Each pump shall include quick removal system, anchor bolts and all accessories specified herein.

B. Volute

1. The volute shall be constructed of ASTM A48 Class 35B (GG25) or higher cast iron capable of prolonged resistance to raw sewage.

2. Suction and discharge flanges shall be 125# and meet ANSI standard B16.1.
3. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel.
4. All mating surfaces requiring a watertight seal shall be machined and fitted with FPM (Viton) O-rings. Paper gaskets are not acceptable.

C. Impeller

1. Pump impellers shall be of the solids handling non-clog type. The impeller vane shall be smooth, finished throughout, and shall be free from sharp edges.
2. Pump impellers shall be manufactured from ASTM A48 Class 35B (GG25) or higher cast iron.
3. Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation. Designs based on threaded connection between pump shaft and impeller will not be considered.
4. The impeller shall be capable of passing a 5.906-inch solid non-deformable sphere. Designs which cannot pass a sphere through the impeller or rely on deforming, cutting, or chopping solid materials shall not be acceptable.

D. Wear Rings

1. The impeller shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring which is drive fitted to the suction eye of the impeller.
2. The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring which is drive fitted to the bottom suction inlet.

2.3 MOTORS

A. Submersible Motors

1. Each pump shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with all variable frequency drive systems.
2. The motor shall be air-filled and constructed with moisture resistant NEMA Class H insulation and Class H slot liners and constructed to NEMA B design standards. The copper wound stator shall be dipped in epoxy enamel and hardened to withstand a temperature of 180 °C as defined in NEMA Standard MG-1. Each winding phase or layer shall be laced with Class H glass lined paper. The use of cable ties to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum amortisseur bars and short circuit

rings. The motor shall be certified for continuous duty with a service factor of 1.10 and shall be non-overloading for the primary and secondary duty point – or- shall be non-overloading over the entire range of the impeller.

3. The motor shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.
4. The motor shall be capable of uninterrupted operation with a voltage drop of 10%.
5. The motor shall bear the Factory Mutual (FM) explosion-proof label certifying its use in a Class 1, Division 1, Groups C & D hazardous location.
6. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches. Thermal switches shall automatically de-energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.
7. The pump manufacturer's nameplates shall be engraved, laser etched, or stamped on stainless steel and fastened to the motor casing.

B. Shafts

1. All shafts shall be dynamically balanced and shall be constructed of AISI 420 (1.4021) stainless steel. Carbon steel shafts or shafts with sleeves of any type are not acceptable. The shaft shall be one-piece construction without joints or stubs attached.
2. Multiple row lower bearings for axial thrust and a single row upper bearing for radial thrust shall support the motor/pump shafts. Thrust bearings shall be restrained from thrust in both directions. Designs that do not protect the pump/motor from thrust in reverse directions shall not be acceptable.
3. Bearings shall be sealed and grease lubricated.
4. Minimum shaft diameter shall be 3.975 in. at the lowest bearing.
5. Shaft overhang ratio $L3/D4$ shall not exceed 10.

C. Mechanical Seals

1. Both upper and lower seal faces shall be silicon carbide versus silicon carbide. All springs and housings shall be stainless steel.
2. A moisture sensor shall be furnished to sense moisture intrusion for each pump. This sensor shall be wired to the Pump Control Panel (specified in Appendix V2 and Division 26) and shall activate an alarm light upon moisture intrusion.

D. Power and Control Cables

1. Power and control cables shall be furnished in lengths to run un-spliced from the pump to the pump control panel as shown on the Contract Drawings and as specified herein. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to confirm that all strands of each conductor are terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.
2. Cables shall be of the "NSSHOU" type and shall be approved by the MSHA for use in hazardous locations and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the pump through a heavy-duty galvanized cast iron entry assembly which shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.
3. The cables for each pump shall pass through the galvanized cast iron strain relief component and then through a series of stainless steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. The entry shall be comprised of the cast iron fitting that will include the Buna-N strain relief grommet coupled with a poured conductor section. In the poured section, sealant shall be used to wick into each conductor strand that has the insulation removed in this area to provide a positively leak proof seal for the power and sensor cords.

2.4 REMOVAL SYSTEM

A. General Description

1. The removal system shall consist of a discharge base elbow that mounts in the bottom of the wet pit, a replaceable pump coupling, guide pipes and supports and hardware as required for a complete and operational system. Connections to piping shall be standard ANSI flanges.

B. Discharge Base Elbow

1. The ASTM A48 Class 30B or higher cast iron discharge base elbow shall be provided to support the full weight of the submersible pump in the installation and provide a leak proof connection in which the pump coupling mates using a conformed Buna-N seal which is held in place by the combined weight of the cantilevered pump and motor. The hydraulic pressure generated while the pump is in operation also aids the sealing. The discharge base elbow shall be provided guide pipe retention lugs.

C. Pump Coupling

1. The pump coupling shall be close grained gray cast iron construction. The coupling shall be located between the pump discharge flange and the vertical face of the discharge base. The purpose of the coupling shall be to allow use of a standard ANSI drilled

pump-casing flange on the pump. The coupling acts as the intermediate part between the pump and the discharge base. The coupling vertical face is designed to seal against the vertical face of the discharge base using a replaceable Buna-N elastomeric compressible one piece seal that acts as both the discharge face seal and the gasket between the coupling and the pump flange. Wet pit installation designs which utilize the flat face of the pump flange to seal against the discharge base are not allowed.

D. Guide Rails

1. AISI 304 stainless steel guide rails supported by upper and intermediate brackets of AISI 316 stainless steel shall guide each pump. The guide rails shall consist of standard dimension schedule 40 piping with a minimum diameter of 1.25-in. The guide rails shall be supported by a AISI 316 SS upper guide rail bracket that will be mounted in the opening of the access cover to support and guide the pump/motor into and out of the wet well. Intermediate guide rail brackets will be provided for all installations deeper than 20-ft.

E. Lifting Device

1. A lifting chain of AISI 304 Stainless Steel shall be provided for each pump. Additional lifting devices, if required, shall be provided by the supplier of the hoist/crane. The responsibility to determine compatibility of the lifting chain with a hoist/crane is by others
2. A lifting chain of AISI 304 Stainless Steel shall be provided for each pump by the supplier of the hoist/crane.

2.5 SHOP PAINTING

A. Primer and Finish Paint

1. Shop apply to all exterior ferrous surfaces of the pump and motor a single coat (6 – 8 mils DFT) of two-component epoxy. Coating shall be resistant to sewage of normal pH and contain no more than 3.5 pounds per gallon of VOCs.

B. Surface Preparation

1. Prepare all surfaces to receive coating system. Surfaces must be free from dust, grease, rust, scale, and other coatings.

PART 3: EXECUTION

3.1 WARRANTY

- A. The pumps and motors will be covered by a limited five (5) year warranty that shall comprise the following terms: The initial year from start-up of the equipment shall be covered 100% for parts and labor. The following years 2 through 5 shall be covered 100% for parts. This

warranty shall not be limited by hours of running time or operation from variable speed drives.

3.2 FIELD QUALITY CONTROL

A. Field Testing

1. After the installation of the pumps, controls and all appurtenances, and when construction of other units of the pump station will permit, each complete pumping unit will be subject to field tests as specified herein under actual operating conditions.
2. The field tests shall be made by the Contractor under the direct supervision of a qualified factory-trained engineer or manufacturer's representative, and in the presence of, and as directed by the Engineer. The Contractor shall provide, calibrate and install all temporary gauges and meters, shall make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field tests.
3. The field tests shall determine the head, discharge flow and overall efficiency characteristics of each pumping unit and in addition, shall demonstrate that under all conditions of operation each unit:
 - a. Has not been damaged by transportation or installation.
 - b. Has been properly installed.
 - c. Has no mechanical defect.
 - d. Is in proper alignment.
 - e. Has been properly connected.
 - f. Is free of overheating of any parts.
 - g. Is free of all-objectionable vibration and noise.
 - h. Is free of overloading of any parts.

END OF SECTION

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