



ADDENDUM NO. 2

DATE: JULY 29th, 2020

TO: ALL PLAN HOLDERS AND PERSPECTIVE BIDDERS

FROM: CLIFF KNAUER P.E., DEWBERRY

CC: ALEX ROUCHALEAU, P.E., DEWBERRY
CHRIS LIGHTFOOT, SENIOR INSPECTOR, DEWBERRY
JERRY CONNOLLY, GOVERNMENT SERVICES GROUP

PROJECT NAME: SR 79 WASTE WATER AND WATERMAIN IMPROVEMENTS

PROJECT NUMBER: 50113689

Please note the following clarifications, corrections or supplemental information regarding the above-referenced project:

- 1.) Lift station pumps shall be grinders. Please see revised section 15700 – submersible duplex lift station. Documentation from the pump suppliers does not need to be submitted prior to the bid date.
System curve points are as follows:

North Lift Station LS-2

Flow (gpm)	TDH (ft)
0	59.5 (static head)
25	70
50 (design point 1)	92
62	109
75 (design point 2)	129
100	177

South Lift Station LS-1

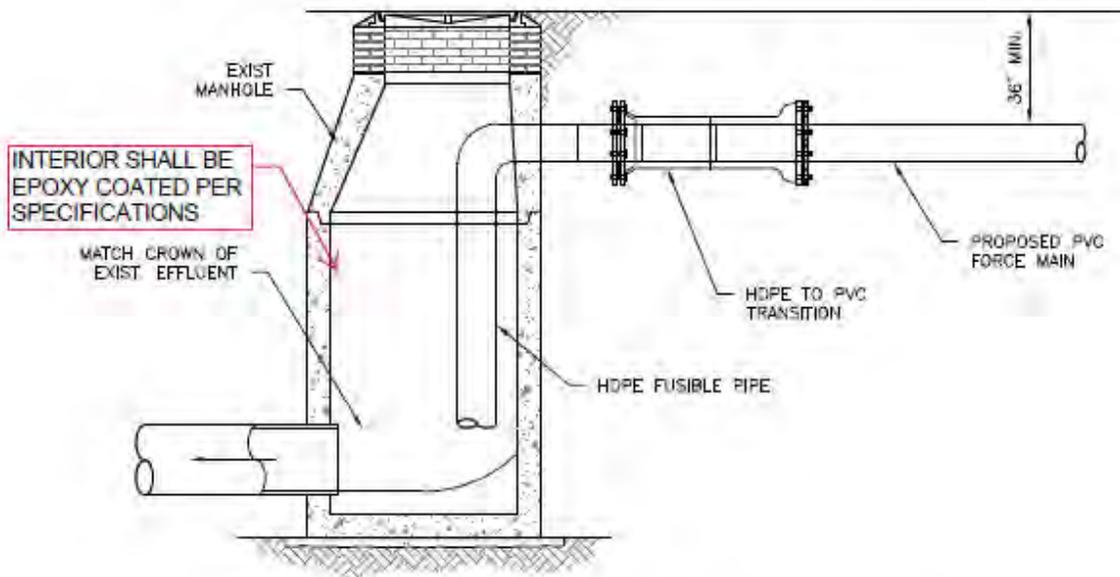
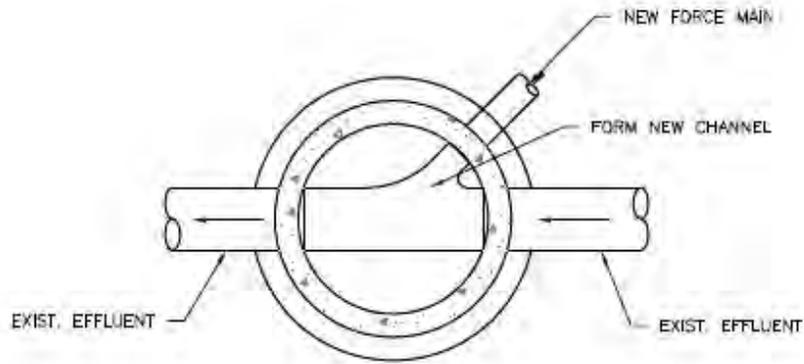
Flow (gpm)	TDH (ft)
0	34 (static head)
25	43
50 (design point 1)	65
66	87
75 (design point 2)	100
100	146





1. An electric generator is to replace the bypass pump. Generator size to be 50kW with a 100A ATS. Final electrical plans to be provided in an addendum.
2. VFDs at lift stations to be replaced with soft-starters
3. Flush / mix valve can be substituted for mixer.
4. Proposed lift stations have been staked out in the field.
5. Please see attached mandatory pre-bid sign in sheet. General Contractor / Utility Contractors listed on this sheet are approved to bid on this project.
6. Project construction budget is \$2.0 million.
7. There is no anticipated phasing of the proposed utilities with the roadway construction of SR-79.
8. Dewberry Engineering will not perform survey / as-built survey for the construction activities.
9. Plans and specifications can be downloaded at the following link:
<https://govmserv.sharefile.com/share/view/s358b353bd614659b>
10. Please see attached sewer forcemain tie into gravity sewer manhole detail previously excluded from plans
11. Please see attached specification section 16200 – automatic transfer switch
12. Please see attached revised specification section 15700 – submersible duplex lift station





DETAIL - FORCE MAIN CONNECTION TO MANHOLE
SCALE: N.T.S.



Note: Please fax or email a notice of receipt back to Jerry Connolly at jconnolly@govmserv.com. Please also include a copy of the signed addendum in the Bid Package. Any bidders that fail to submit a signed copy of this addendum may have their bids rejected by the Highway 79 Corridor Authority.

RECEIPT OF ADDENDUM 2

ACCEPTED BY:

Signature of Bidder

Date

TYPE OR PRINT NAME OF BIDDER



SECTION 16200
AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SCOPE:

- A. Furnish all mechanically held Automatic Transfer Switches as shown on the drawings and specified herein. The Automatic Transfer Switches shall be housed in a NEMA 4X stainless steel enclosure.

1.02 CODES & STANDARDS:

- A. The automatic transfer switches and controls shall conform to the requirements of:
 - 1. UL 1008 - Standard for Transfer Switch Equipment
 - 2. NFPA 70 - National Electrical Code
 - 3. NFPA 110 - Emergency and Standby Power Systems
- B. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

1.03 ACCEPTABLE MANUFACTURERS:

- A. Automatic transfer switches shall be ASCO, Zenith, or approved equal. Alternate bids must list any deviations from this specification.

PART 2 - PRODUCTS

2.01 MECHANICALLY HELD TRANSFER SWITCH:

- A. The transfer switch shall be electrically operated and mechanically held. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency.
- B. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.

- D. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
- E. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

2.02 ENCLOSURE:

- A. The ATS shall be furnished in a NEMA 4X stainless steel enclosure, unless otherwise shown on the plans.

PART 3 - OPERATION

3.01 CONTROLLER DISPLAY & KEYPAD:

- A. An LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port.
 - 1. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.02 VOLTAGE, FREQUENCY, & PHASE ROTATION SENSING:

- A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Sources	Dropout / Trip	Pickup / Reset
Under voltage	N&E,3φ	70 to 98%	85 to 100%
Over voltage	N&E,3φ	102 to 115%	2% below trip
Under frequency	N&E	85 to 98%	90 to 100%
Over frequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

- B. Voltage and frequency settings shall be field adjustable locally with the display and keypad.
- C. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).
- D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases, frequency, and phase rotation.

3.03 TIME DELAYS:

- A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.
- B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
- C. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
- D. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
- E. All time delays shall be adjustable by using the LCD display and keypad.

3.04 ADDITIONAL FEATURES:

- A. A three position momentary-type test switch shall be provided for the test / automatic / reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal.
- B. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed, when the ATS is connected to the emergency source.

- D. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
- E. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.
- F. Engine Exerciser:
 - 1. The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program exercise routines. For each routine, the user shall be able to:
 - a Enable or disable the routine.
 - b Enable or disable transfer of the load during routine.
 - c Set the start time:
 - 1) Time of day
 - 2) Day of week
 - 3) Week of month (1st, 2nd, 3rd, 4th, alternate or every)
 - d Set the duration of the run.
 - 2. At the end of the specified duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. A 10-year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information.

PART 4 - ADDITIONAL REQUIREMENTS

4.01 WITHSTAND & CLOSING RATINGS:

- A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans.
- B. The ATS shall be UL listed in accordance with UL 1008.

4.02 TEST & CERTIFICATION:

- A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

4.03 SERVICE REPRESENTATION:

- A. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

END OF SECTION

SECTION 15700
SUBMERSIBLE DUPLEX LIFT STATION
(Revised per Addendum)

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work described under this section of the specifications consists of the contractor furnishing and installing a grinder submersible wastewater pumping stations in the locations shown on the drawings. All metal components in the wet wells, including anchor bolts, washers and nuts, with the exception of the frame and cover, pumps, motors, and station piping, shall be stainless steel. The pump supplier shall coordinate the pump motor requirements with the control system supplier to insure proper operation of the pumps.
- B. The wastewater pumping stations covered under this section are shown individually on the plans.
- C. Omission of a specific item or component obviously necessary for the proper functioning of the system shall not relieve the Contractor from the responsibility of supplying that specific item or component at no additional expense to the Owner.

1.2 QUALITY ASSURANCE

- A. Components shall be as manufactured by:
 - 1. Sewage Pumps: Flygt Corp., Davis EMU, Sulzer, ABS, Fairbanks-Morse / Pentair, KSB or equal.
 - 2. Hatch and Valve Pit Cover: Bilco, Neenah Foundry Co., U.S. Foundry Co., or equal.
- B. Reference to industry standard specifications herein shall be construed to be in reference to the latest revision or edition.

1.3 SUBMITTALS

- A. Submit shop drawings and manufacturers literature including the following:
 - 1. Pump Shop Drawings.
 - a. Pump manufacturer, type, model, size, weight, dimensions, speed, size of discharge nozzle, and type of bearings.
 - b. Motor manufacturer data shall include type, model, type of bearings and lubrication, weight, rating size of motor, temperature rating, service factor, efficiency at full load and pump design points, full load current, and locked rotor current.
 - c. Certified pump performance curve showing the shutoff head, minimum safe operating capacity, head, capacity, maximum pump

capacity, efficiency, and brake horsepower for the specified speed. The design total dynamic head at the specified capacity shall clearly be indicated on the curve. The pump curve shall include a minimum of five operating points including shutoff head, run out condition, design operating point and two additional points in order to clearly define the pump curve.

- d. Written certification that the motors and pumps are explosion proof suitable for a Class 1, Division 1 atmosphere.
 - e. Wet well design with proposed guiderail support locations, hatch, all pipe penetrations, pumps, and slide rail system
 - f. Performance Affidavits.
 - g. Shop test results.
 - h. Manufacturer's Installation Certificate.
 - i. Certificate of Equipment Compliance.
 - j. Field testing results.
 - k. Equipment Warranty.
2. Electric Motors.
- a. Electric characteristics.
 - b. Design characteristics.
 - c. Mechanical construction.
 - d. Manufacturer's name.
 - e. Manufacturer's type.
 - f. Pertinent specifications for the use intended.
 - g. Name of the equipment to be driven.
 - h. Manufacturer's storage requirements.
 - i. Tabulate the following information in one location on each electric motor shop drawing submittal:

Motor manufacturer	Nameplate horsepower
Model	Motor rpm, full load nameplate
Frame number	Insulation class
Type of enclosure	Service factor

Volts	Maximum ambient temperature
Hertz	Maximum temperature rise
Phase	Shop painting
NEMA design	Nominal efficiency
Code letter	Guaranteed minimum efficiency at 50, 75 and 100 percent full load
Locked rotor amps	Minimum power factor at 50, 75 and 100 percent load
Locked rotor torque	Resistance temperature device information (if applicable)

3. Wet Well.

- a. Submit evidence that shows precast supplier has a current PCI, NPCA, and/or State DOT certification.
- b. Submit shop drawings of wall section(s), slab top, and base proposed for each precast structure. Include joint design detail(s) and other related details for field assembly. Indicate conformance with Contract Documents and ASTM C858 or C913, as applicable.
- c. Submit catalog cuts for aluminum access hatches (with fall-through protection system) and ladders with telescoping safety posts.
- d. Submit catalog cuts and installation instructions for waterproofing systems and concrete sealers.
- e. Submit catalog cut for HDPE (coating) system (approved under Section 15750).
- f. Under a separate submittal, provide two file copies of calculations with a sealed design summary page for each precast structure design. (Other than the design summary page, prepared calculations will not be reviewed by the Engineer.) Calculations will not be returned to the Contractor.
- g. Proof of compliance with AIS requirements.

B. A conveniently mounted Maintenance and Operation Instruction Chart and Daily Maintenance and Inspection Record Chart, with ample room for recording daily inspections of the pump station shall be provided for the station.

C. In addition to the Maintenance and Operation Chart, the manufacturer shall further provide four (4) copies to be returned to Owner exclusive of those required by Contractor complete and detailed Operation and Maintenance Manuals. The manuals shall cover, in addition to general operating procedures, the operation, maintenance and servicing procedures of the major individual components provided with the pump station. They shall also include serial

numbers, pump and motor model, and local representative contact information. Manuals shall be shipped with the pump station.

1.4 FACTORY TESTS

- A. Each pump shall be fully tested on water at the manufacturer's plant. Tests shall be at rated speeds, capacities, heads, efficiencies and brake horsepower and at such other conditions of head and capacity to establish performance curves, and comply with shut in and a minimum of 2 other points on the curve as defined at the end of this section. Pump tests shall be in accordance with the applicable Hydraulic Institute test code. The pump motors shall not be overloaded (in excess of their horsepower and a 1.00 service factor nameplate rating) within the limits of operation of the impeller performance curve. Five certified copies of the test results shall be submitted to and approved by the Engineer before pumps are shipped. Tests shall include:
1. Test the pump motor for insulation breaks or moisture.
 2. Prior to submergence, the pump shall be run dry and be checked for correct rotation.
 3. Pumps shall be run for 30-minutes in a submerged condition.
 4. Pumps shall be removed from test tank, test insulation immediately for moisture; oil plug removed, check upper seal and possible water intrusion in stator housing.
- B. All pump cable ends shall be fitted with a rubber shrink fit boot to protect cable prior to electrical installation.

1.5 EQUIPMENT WARRANTY

- A. Each pump manufacturer shall warrant the pumps being supplied to the Owner against defects in workmanship and materials for a period of five years under normal sewage pumping use, operation and service. In addition, the manufacturer shall replace certain parts which shall become defective through normal use and wear on a progressive schedule of cost for a period of 5-years; parts included are the mechanical seal, impeller, pump housing, wear ring, and ball bearings. The warranty shall be in published form and apply to all similar units.
- B. All pumps and motors shall carry a 5-year non-prorated warranty against defects in workmanship and materials under normal sewage pumping use, operation, and service. Warranty shall include both 100% parts and labor.

PART 2 - PRODUCTS

2.1 LIFT STATION STRUCTURES

- A. The structures for the underground lift station will be precast reinforced concrete as shown on the drawings. If precast reinforced concrete pipe is used for the wet well it shall conform to ASTM Designation C478. Wall thickness shall be as shown on the drawing. The base shall be constructed of reinforced concrete as shown on the drawing. The base may be constructed by the tremie seal method,

or the base and first section of pipe shall be constructed monolithically and watertight. Joints for pipe sections shall be tongue and groove. The lift stations shall come with a precast HDPE liner. The HDPE liner shall be an integral part of the lift station and shall be installed at the wetwell manufacturer prior to the delivery of the lift station.

- B. Joint material shall consist of a flexible, plastic gasket. The gasket shall meet or exceed requirements of Federal Specification SS-S-00210, Type I, Rope Form. The gasket shall be applied to a clean joint after priming and in accordance with the manufacturer's recommendations. Excess material shall be smoothed flat with a roller. Voids remaining in the joint shall be caulked with anhydrous cement grout on the inside and outside to make a smooth watertight seal. The interior of the pump station wet well structure shall be coated with at least two coats and the exterior with at least one coat of a coal tar epoxy coating. The minimum thickness of each coat when dry shall be 8 mils.

2.2 ACCESS COVERS

- A. The covers shall be mounted over the lift station wet well structure. The hatches shall be rectangular heavy-duty aluminum with an H-20 rating / 150-lb/sf load rating for vehicular traffic and shall be sized according to the drawings and / or the manufacturer's requirements to allow for pump / motor and all necessary accessories to be removed and accessed for maintenance and replacement. The frame shall have recessed hinges with stainless steel hinge pin or butt type stainless steel hinge. Each hatch shall have double lids as required to provide a clear opening for the pumps.
- B. Lids shall be gasket sealed and equipped with a flushlocking device operated with a T-wrench. Bolts in the locking device shall be stainless steel.

2.3 VALVE PIT

- A. A valve pit for the gate and check valves shall be constructed adjacent to the pump station as shown on the drawings. The valve pit shall have an aluminum double-leaf cover sized as per drawings in the non-traffic areas. In vehicular traffic areas, the covers shall be aluminum with load rating of H-20 for heavy vehicular traffic.

2.4 SUBMERSIBLE GRINDER PUMPS

- A. As shown on the drawings, furnish and install totally submersible grinder sewage pumps, equipped with impellers and electric motors.
- C. Capacities and Operation Conditions: The pumps and motors shall have capacities and operation conditions as tabulated on the Drawings. System curve points are shown below:

North Lift Station LS-2

Flow (gpm)	TDH (ft)
0	59.5 (static head)
25	70
50 (design point 1)	92
62	109
75 (design point 2)	129
100	177

South Lift Station LS-1

Flow (gpm)	TDH (ft)
0	34 (static head)
25	43
50 (design point 1)	65
66	87
75 (design point 2)	100
100	146

- C. **Pump Design:** The pumps shall be capable of handling raw, unscreened sewage and reducing domestic, commercial institutional and light industrial sewage into a finely ground slurry. The design shall be such that the pumps will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be removed for this purpose, nor need personnel to enter the pump well. The pumps shall be equipped with a lifting ring and stainless steel chain of adequate strength to permit raising the pump for inspection and removal.
- D. A single or double rail guide system shall be furnished and installed for each pump to permit raising and lowering the pump. Guide bars shall be of Type 304 stainless steel pipe or rails of adequate length to extend from the lower guide holders on the pump discharge connection to the upper holders mounted on the access frame.
- E. All accessory hardware shall be stainless steel.
- F. **Pump / Grinder Construction:** The stator casing, oil casing and impeller shall be of gray iron construction, with all parts coming into contact with sewage protected by a coat of rubber-asphalt paint. All external bolts and nuts shall be of stainless steel. The wear ring designed for abrasion resistance shall be installed at the inlet of the pump to provide protection against wear to the impeller. The impeller shall be of the recessed vortex design, capable of passing the size solids as directed by the Engineer, fibrous material, and heavy sludge, constructed with long throughways with no acute turns and securely mounted on a stainless steel shaft. The grinder mechanism shall consist of a radial cutter threaded and locked on the motor shaft by a washer in conjunction with a countersunk flat head cap screw, and a shredding ring containing a minimum of fifteen flow passages with cutting edges. The shredding ring shall be reversible to provide twice the cutting edge life. Both the shredding ring and radial cutter shall be of

440C stainless steel hardened to a minimum of Rockwell C55 and shall be finish ground for a fine cutting edge. A sliding bracket shall be an integral part of the unit and the pump casing shall have a machined connecting flange to connect with a cast iron discharge connection. There shall be provided a cast iron discharge connection, which shall be bolted to the floor of the sump and so designed as to receive the pump connection without the need of any bolts or nuts. The pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of two separate lapped face seals, the lower consisting of one stationary and one rotating tungsten-carbide ring, the upper consisting of one stationary tungsten-carbide ring and one rotating carbon ring, with each being held in contact by a separate spring. The seals shall require neither maintenance nor adjustment and shall be easily replaced.

- E. All pumps shall be Class I Div. 1 rated.

2.5 MOTORS

- A. Pump motor shall be housed in an air-filled or oil-filled watertight casing and shall have Class F insulated copper windings which shall be moisture resistant. The motor shall be NEMA Design B. Pump motors shall have cooling characteristics suitable to permit continuous operation in a totally, partially, or nonsubmerged condition. The pump shall be capable of pumping dry. Before final acceptance, a field running test demonstrating this ability, with 24-hours of continuous operation under the above conditions shall be performed for all pumps being supplied, if required at the Owner's option. Cable junction box and motor shall be separated by a stator-lead sealing gland or terminal board which shall isolate motor from any water or solids gaining access through pump top. Motors shall be sized to be non-overloading.
- B. Pump motor cable shall be suitable for submersible pump applications and the type shall be permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. Pump motor shall be explosion proof rated.
- D. All motors shall be Class I Div. 1 rated.
- E. All motors shall be inverter duty rates and non-overloading.
- F. All motors shall carry a 5-year non-prorated warranty against defects in workmanship and materials under normal sewage pumping use, operation, and service. Warranty shall include both 100% parts and labor.

2.6 CONTROLS

One automatic control center shall be furnished and installed for each station as specified in the electrical specifications.

2.9 CONTROL FUNCTIONS

- A. The control function shall provide for the operation of the lead pump under normal operations with automatic alterations between cycles. If the incoming flow exceeds the capacity of the lead pump the lag and second lag pump shall be automatically started to handle the increased flow.
- B. High level and low level alarm liquid level switches shall also be provided. In addition to the alarm requirements, the low level switch shall also function as an emergency all pumps off control.

2.10 PIPING

- A. All internal piping shall be Class 53 (150 pressure rating, minimum), flanged ductile iron pipe. The pump suction and discharge lines shall be of the sizes shown on the drawings. Gate and check valves in the discharge line shall conform to specifications. All valves in the discharge vault shall be flanged.
- B. A screened vent for the underground lift station shall be located as shown on the drawings. Piping for the vent shall be ductile iron pipe.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Pump Stations, as described in this section of the specifications, shall be given an inspection and operational test of all equipment to check for excessive vibration, for leaks in all piping or seals and for correct operation of the automatic control system and all auxiliary equipment. Field tests shall be conducted at the Contractor's expense. Manufacturers of the lift station equipment shall furnish the services of a field engineer to check installation and supervise start-up for whatever length of time may be required to make the system operable and acceptable to the Engineer.

3.2 INSTALLATION AND OPERATING INSTRUCTIONS

- A. Installation of the pump chamber and related appurtenances shall be accomplished in accordance with written instructions provided by the manufacturer. These instructions shall be delivered with the stations. See plans for individual pump design conditions.

3.3 QUALITY ASSURANCE

A. LEAK TESTING OF WET WELLS

1. Prior to application of the lining system, and prior to backfilling, the wet wells shall be leak tested.

2. Contractor shall temporarily plug all openings of the precast structure and fill the entire structure with water. The Contractor shall be responsible to obtain the water and dispose of it properly after the leak test is complete.
3. The leak test is considered complete when all visible leaks are sealed in an approved manner.

B. FIELD TESTING OF MOTORS

1. All three phase electric motors 1/2 HP and larger and all single phase electric motors 1 HP and larger shall be field tested by the Contractor at as near operating conditions as possible. Complete and submit all of the information required by the attached "Motor Test Record" for all motors to be tested per the above. Submit record prior to the issuance of the Substantial Completion Certificate. Contractor, for the purposes of this item, is the one furnishing and/or installing the final motor-driven unit.
2. All testing shall be witnessed by the Engineer.
3. Submit completed forms in quadruplicate (one set to be submitted at the time when substantial completion is requested, and one set to be placed in each of the submitted O&M manuals).

C. FIELD TESTING OF PUMPING EQUIPMENT

1. All testing shall be done in the presence of the Engineer and the equipment manufacturer or their approved representative.
2. During Functional Testing, demonstrate the each pump has been properly installed and is in proper alignment, and can be removed and reinstalled in the wet well through the wet well hatch.
3. Demonstrate that there are no mechanical defects in any of the parts. Adjust, repair, modify, or replace any components of the system, which fail to meet all specified requirements.
4. Confirm that the units operate without overheating or overloading of any parts and without objectionable vibration.
5. Confirm that the pumps can deliver the specified pressure and quantity at the rated speed. All field tests shall be conducted with clean water provided by the Contractor. The Contractor shall provide all temporary flow measurement devices as necessary to achieve accurate measurement of the pumped flow during the field tests.
6. Confirm that the pumps can pass the size of solids specified and the type of liquid for which the pumps are to be used.

END OF SECTION