D. Complete cleanup of drilling fluid at end of each workday.

3.11 ERECTION TOLERANCES

A. Maximum Variation from Horizontal Position: 12 inches.

B. Maximum Variation from Vertical Elevation: 2 inches.

C. Minimum Horizontal and Vertical Clearance from Other Utilities: 18 inches.

D. When pipe installation deviates beyond specified tolerances, abandon bore, remove installed pipe, re-bore, and reinstall pipe in correct alignment.

E. Fill abandoned bores with grout or flowable fill material.

3.12 FIELD QUALITY CONTROL

A. Butt Fusion Joint Testing:

1. On each day joint fusions are to be made, the first fusion shall be a trial fusion. The trial fusion shall be allowed to cool completely, and test straps shall be cut out. Test straps are to be cut a minimum of 12-inches long or 30 times the wall thickness, with the fusion joint in the center. Test strap width shall be a minimum of 1- inch or 1.5 times the wall thickness.
2. The test strap shall not fail at the fusion joint when the strap is bent back until the points 6-inches on either side of the joint (or 15 times the wall thickness) touch. No fusion of pipe shall be completed or installed until trial fusions pass the bent strap test.

3.13 CLEANING

A. Upon completion of drilling and pipe installation, remove drilling spoils, debris, and unacceptable material from approach trenches and pits. Clean up excess slurry from ground.

B. In the event that the bentonite slurry used for drilling/lubricating migrates upward through fissures in the ground causing roadway pavement upheaval, the contractor shall be responsible to restore pavement to original condition.

C. Restore approach trenches and pits to original condition.

D. Remove temporary facilities for drilling operations.

SPECIAL FACTORY BUILT ABOVE GROUND PUMP STATION

PART 1 - GENERAL

1.1 Work under this section includes but is not limited to furnishing and installing a factory built duplex pump station as indicated on the project drawings and as herein specified, including all labor, excavation (including rock excavation), dewatering/pumping, bedding, backfill, compaction, testing, equipment, concrete slab, site electrical and pump station electrical, and all other appurtenances required for a complete and operational pump station shall be included in the lump sum bid for this item. The building/enclosure for the pump station is included with the “Pre-Fabricated Pump Station Building” item.

1.2 Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

A. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)

1. ANSI B16.1	Cast iron pipe flanges and flanged fittings.
2. ANSI/AWWA C115/A21.51	Cast/ductile iron pipe with threaded flanges.
3. ANSI 253.1	Safety Color Code for Marking Physical Hazards.
4. ANSI B40.1	Gages, Pressure and Vacuum.
5. AWWA C508	Single Swing Check Valves.

B. American Society for Testing and Materials (ASTM)

1. ASTM A48	Gray Iron Castings.
2. ASTM A126	Valves, Flanges, and Pipe Fittings.
3. ASTM A307	Carbon Steel Bolts and Studs.
4. ASTM A36	Structural Steel.

C. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE Std 100	Standard Dictionary of Electrical Terms.
2. IEEE Std 112	Test Procedure for Polyphase Induction Motors.
3. IEEE Std 242	Protection of Industrial and Control Power Systems.

D. National Electric Code (NEC) / National Electrical Manufacturers' Assoc. (NEMA)

1. NEC	National Electrical Code.
2. NEMA Std MG1	Motors and Generators.

E. Miscellaneous References

1. Ten-State Standards Recommended Standards for Sewage Works.
2. Hydraulic Institute Std for Centrifugal, Rotary and Reciprocating Pumps.
3. ISO 9001 International Organization for Standardization.
4. ISO 14001 International Organization for Standardization.

1.2 DESCRIPTION OF WORK

A. This section includes the furnishing and installation of the raw wastewater pump station system, as shown on the drawings and as described in this section.

B. Complete duplex pump station to pump raw unscreened wastewater.

C. All material, equipment, products, incidentals and testing required and necessary to provide a complete and operational system. Install where noted on the drawings and as specified within these specifications.

D. Coordinate all work with this equipment and any other associated equipment, installed and specified under other sections of these specifications.

E. All work performed under this section shall be in accordance with all approved trade practices and manufacturer's recommendations.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and application instructions. Prior to fabrication, pump station manufacturer shall submit one electronic document for review and approval

B. Shop drawings shall be presented to the Engineer for approval. All shop drawings shall clearly identify the specific equipment and material being supplied, the quantity being supplied, and all accessories, dimensions, descriptions, mounting and connection details, and any other information necessary to determine compliance with the plans and specifications. Shop drawings shall include plan and section layouts of the equipment, dimensions, clearances required, power requirements, and wiring diagrams.

C. Sizes shown on Contract Drawings are typical. Individual manufacturer's dimensions shall be as shown on the Contract Drawings. Any deviation from given dimensions may interfere with site characteristics. Manufacturer shall be responsible for providing Engineer with drawings showing proposed changes and/or equipment locations. Any additional engineering costs associated with these changes will be the sole responsibility of the Manufacturer with no additional cost to the Owner.

D. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor and v-belt drive data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), net positive suction head required (NPSHr), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

E. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for station. Contractor piping connections and station access clearances shall be dimensioned relative to the station centerline. The electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

F. Prior to or with the delivery of equipment, the manufacturer shall provide copies of an operation and maintenance manual including storage, installation, startup, operating and maintenance instructions, and a complete parts list and recommended spare parts list. The O&M Manuals shall be in compliance with the General Requirements.

G. O&M Manuals: Provide three (3) bound and one (1) digital electronic copy of operating and maintenance manuals containing copies of the approved shop drawings, operating and greasing instructions, and parts list.

1. Installation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.

2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:

a. Functional description of each major component, complete with operating instructions.

b. Instructions for operating pumps and pump controls in all modes of operation.

c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.

d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

e. Electrical schematic diagram of the pump station circuits shall be in accordance with NMTBA and JIC standards. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall

system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

f. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

3. Operation and maintenance instructions which rely on vendor cut sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

H. Operation Data: Provide description of system operation, adjusting and testing required.

I. Maintenance Data: Provide system maintenance requirements, servicing cycles, lubrication requirements, and local sources for spare parts.

1.4 QUALITY ASSURANCE

A. The pumps and pump station manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

B. Upon request from the engineer, the pump station manufacturer shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.

C. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. “Reverse-engineered” products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.

D. The term “pump manufacturer” or “pump station manufacturer” shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a “pump manufacturer” or “pump station manufacturer” and is not an acceptable supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

E. Reprime Performance

1. Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.

2. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.

3. Pump must reprime the net static lift as defined in the plans from the lead pump start elevation to centerline of suction, at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within five

minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:

a. A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.

b. A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.

c. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90-degree elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.

d. Impeller clearances shall be set as recommended in the pump service manual.

e. Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.

f. Liquid to be used for reprime test shall be water.

g. Utilize 6" suction piping for reprime testing.

4. Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

F. Factory System Test

1. All components including the pumps, motors, valves, piping and controls will be tested as a complete working system at the manufacturer's facility. Tests shall be conducted in accordance with Hydraulic Institute Standards at the specified head, capacity, rated speed and horsepower. Factory operational test shall duplicate actual performance anticipated for the complete station.

G. The manufacturer’s technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.5 MANUFACTURER'S WARRANTY

A. The pump station manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

1. In addition to defects in material and workmanship, fiberglass reinforced polyester station enclosures (where applicable) are warranted for sixty (60) months to be resistant to rust, corrosion, corrosive soils, effects of airborne contamination or physical failures occurring in normal service for the period of the pump station warranty.

2. All other equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump station manufacturer shall be solely responsible for warranty of the station and all components.

B. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

C. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

D. Equipment supplied by others and incorporated into a pump station or enclosure is not covered by this limited warranty. Any warranty applicable to equipment selected or supplied by others will be limited solely to the warranty, if any, provided by the manufacturer of the equipment.

E. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. A start-up report competed by an authorized manufacturer's representative must be received by manufacturer within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.

1.6 UNITARY RESPONSIBILITY

A. In order to unify responsibility for proper operation of the complete pumping station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source). The pumping station must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

1.7 MANUFACTURER

A. The pump station system integrator must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

B. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. The contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

PART 2 – PRODUCTS

2.1 PUMP STATION

A. GENERAL

1. The contractor shall furnish and install one factory-built, automatic pumping station complete with all needed equipment including precast wet well and top slab.

2. The principal items of equipment are described below. ~~shall include a raw sewage pumping system furnished with two (2) self-priming pumps. Discharge piping including primary and secondary check valves, three-way plug valve and a common header. Also includes a pump control panel with variable frequency drive and includes PLC control logic and primary/backup level control systems. Pump system installed in a pre-engineered modular station enclosure~~.

B. GENERAL OPERATING CONDITIONS

1. Each pump shall be capable of delivering 300 GPM @ 237' TDH (Single Pump – Design Flow) of raw municipal wastewater. The minimum rated horsepower of each pump motor shall be 50.

C. CONSTRUCTION

1. The station shall be constructed in one complete, factory-built assembly. It shall be sized to rest on the top of the wet well inside a building/enclosure as detailed in the specification item for "Pre-Fabricated Pump Station Building" and on the construction drawings.

2. The pump casings and discharge piping shall be mounted in relation to the station floor as detailed in the construction drawings. All pump components and station piping, including the suction pipe connections, shall be removable without having to enter the wet well. The suction and discharge connections, where they pass through the floor, shall be sealed by gaskets, rather than being welded, to allow adjustment and replacement.

3. Enclosures utilized to house the valve train and/or controls, which are defined under OSHA Article 29CFR, Parts 1910 as a Confined Space shall not be acceptable.

D. PUMPS AND MOTORS

1. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 4" suction connection, and 3" discharge connection. Each pump shall be selected to perform under following operating conditions:

Type of Pump	Self-Priming, Top Discharge
Mounting Option	Base skid with horizontal v-belt configuration
Number Required	2
Pumped Liquid	Wastewater
Liquid Temperature	35-95 degrees F
Design Capacity	300 gpm (single pump operation)
TDH	237.0 ft.
Minimum Motor Horsepower	50
Maximum Motor Speed	
Motor Enclosure	ODP
Motor Drive	VFD
Power Requirements	480-volt, 3 phase, 60 Hz
Manufacturers/Model	Gorman-Rupp Model VS3C60SC-B
Discharge Size	3 in.
Suction Size	4 in.
Lubrication	Oil
Gauges	Suction and discharge
Materials of Construction:	
Casing	Ductile Iron
Impeller	Ductile Iron
Wear Plate	Ductile Iron
Seal Plate	Ductile Iron
Gland	316 S.S.

E. Site power furnished to pump station shall be three phase, 60 hertz, 480 volts, 4 wire, maintained within industry standards. The available fault current provided at the pump station control panel is 14,000 kA rms symmetrical. Voltage tolerance shall be plus or minus 10 percent. Phase-to-phase

unbalance shall not exceed 1% average voltage as set forth in NEMA Standard MG-1. Control voltage shall not exceed 132 volts.PUMP DESIGN - LOWER CASING (FIRST STAGE)

1. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

2. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

3. Pump shall be vertically staged incorporating a lower and upper volute casing united by a ductile iron transition chamber, allowing for a direct and smooth flow path to the impeller in the upper casing.

4. Pump suction and discharge connections of the lower casing shall be vertically in-line with one another.

5. The cover plates and rotating assemblies shall be interchangeable between both casings.

6. The discharge port of the upper casing shall be capable of being rotated to allow for multiple pipe connection orientations.

7. Materials and Construction Features

    a. Pump casing shall be ductile iron with integral volute scroll. Casing shall incorporate following features:

        1) Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.

        2) Fill port cover plate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, a clamp bar screw must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.

        3) Lower casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.

        4) Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.

    b. Cover plates shall be Class 30 cast iron. Its design must incorporate following maintenance features:

    c. Retained by hand nuts for complete access to pump interior. Cover plate removal must provide ample clearance for removal of stoppages, and allow service to the impeller, seal, wear plate or check valve without removing suction or discharge piping.

    d. Pump Performance Certifications

        1) **ERADICATOR™** – Solids Management System designed for management of sanitary wipes, plastic bags, feathers, hair, sludge, and all other types of stringy solids.

        2) **ERADICATOR™** to be supplied on both the first and second stage.

e. Self-Cleaning Wear Plate

1) Replaceable wear plates secured to the cover plates by weld studs and nuts shall be AISI 1015 HRS. Wear plates shall be self-cleaning design ensuring that debris is cleared away and does not collect on the impeller vanes.

2) The nature of the conveyed medium poses significant challenges to the continuous operation of the pump. Of particular concern is the clogging of the impeller by debris in the pumped medium including but not limited to long rags, fibers, and like debris which are able to wrap around the impeller vanes, stick to the center of the vanes or hub, or lodge within the spaces between the impeller and the housing.

3) The wearplate shall have one or more notches and/or recesses provided along a common diameter of the wearplate to disturb and dislodge any solids which might otherwise remain on the impeller in dynamic operation. Clusters of notches and/or recesses may also be provided. Wear plate to include the **ERADICATOR™** tooth designed to clear debris from the eye of the impeller.

f. In consideration for safety, a pressure relief valve shall be supplied in each cover plate. Relief valve shall open at 75-200 PSI.

g. Two O-rings of Buna-N material shall seal each cover plate to pump casings.

h. Pusher bolt capability to assist in removal of cover plates. Pusher bolt threaded holes shall be sized to accept same retaining capscrews as used in rotating assemblies.

i. An easy-grip handle shall be mounted to the face of each cover plate.

8. Each rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate the following features:

a. Seal plates shall be cast iron Class 30. Anti-rotation ribs shall be cast into the seal plates to reduce internal wear and maximize component life. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.

1) Each bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.

2) Each seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.

3) Double lip seals shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

b. Impellers shall be ductile iron, two vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impellers shall be statically or dynamically balanced. Impeller shall thread onto the pump shaft and be secured with a lockscrew and conical washer.

c. Shafts shall be AISI 4140 alloy steel unless otherwise specified by the engineer, in which case AISI 17-4 pH stainless steel shall be supplied.

d. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a

dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

e. Each shaft seal shall be oil lubricated mechanical type. The stationary and rotating seal faces shall be silicon carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design. An external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be Viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seals shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

f. Pusher bolt capability to assist in removal of rotating assemblies. Pusher bolt threaded holes shall be sized to accept same capscrews as used for retaining rotating assemblies.

9. Adjustment of the impeller face clearance (distance between impeller and wearplate) shall be accomplished by external means.

a. Clearances shall be maintained by a four point external shimless coverplate adjustment system, utilizing a four collar and four adjusting screw design allowing for incremental adjustment of clearances by hand as required. Each of the four points shall be lockable to prevent inadvertent clearance increases or decreases due to equipment vibration or accidental operator contact. The four point system also allows for equal clearance gaps at all points between the impeller and wear plate. Requirement of realignment of belts, couplings, etc., shall not be acceptable. Coverplate shall be capable of being removed without disturbing clearance settings. Clearance adjustment systems that utilize less than four points will not be considered.

b. There shall be provisions for additional clearance adjustment in the event that adjustment tolerances have been depleted from the coverplate side of the pump. The removal of stainless-steel tabbed spacers from the rotating assembly side of the pump shall allow for further adjustment as described above.

c. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

10. An externally removable suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casings from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished from the top of the lower pump casing without disturbing the suction piping or completely draining both casings. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

11. Pump shall include flange kit consisting of two ASA spool flanges that shall be one piece cast iron class 30 suitable for attachment to suction and discharge ports. Each spool shall have one 1-1/4" NPT and one 1/4" NPT tapped hole with pipe plugs for mounting gauges or other equipment.

F. PUMP DESIGN - UPPER CASING (SECOND STAGE)

1. Pump shall be horizontal, self-priming centrifugal type, designed specifically for handling raw unscreened domestic sanitary sewage or industrial waste. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL

of this section.

2. The upper volute casing shall be united with the lower volute casing by a ductile iron transition chamber allowing for a direct and smooth flow path to the impeller in the upper casing.

3. The discharge port of the upper casing shall be capable of being rotated to allow for multiple pipe connection orientations.

4. Materials and Construction Features

   a. Pump casing shall be cast iron Class 30 with integral volute scroll.

   b. Cover plate shall be cast iron Class 30. The cover plate shall be interchangeable with that of the lower casing (first stage). Design must incorporate following maintenance features:

      1) Retained by hand nuts for complete access to pump interior. Cover plate removal must provide ample clearance for removal of stoppages, and allow service to the impeller, seal or wear plate without removing suction or discharge piping.

      2) A replaceable wear plate secured to the cover plate by weld studs and nuts shall be AISI 1015 HRS. Wear plate shall be self-cleaning design ensuring that debris is cleared away and does not collect on the impeller vanes.

      3) In consideration for safety, a pressure relief valve shall be supplied in the cover plate. Relief valve shall open at 75-200 PSI.

      4) Two O-rings of Buna-N material shall seal cover plate to pump casing.

      5) Pusher bolt capability to assist in removal of cover plate. Pusher bolt threaded holes shall be sized to accept same retaining capscrews as used in rotating assembly.

      6) Easy-grip handle shall be mounted to face of cover plate.

5. Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. The rotating assembly shall be interchangeable with that of the lower casing (first stage). Design shall incorporate the following features:

   a. Seal plate and bearing housing shall be cast iron Class 30. Anti-rotation ribs shall be cast into the seal plate to reduce internal wear and maximize component life. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.

      1) The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.

      2) The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.

      3) Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

   b. Impeller shall be ductile iron, two vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall be statically or dynamically balanced. Impeller shall thread onto the pump shaft and be secured with a lockscrew and conical washer.

c. Shaft shall be AISI 4140 alloy steel unless otherwise specified by the engineer, in which case AISI 17-4 pH stainless steel shall be supplied.

d. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

e. Shaft seal shall be oil lubricated mechanical type. The stationary and rotating seal faces shall be silicon carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design. An external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be Viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

f. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same capscrews as used for retaining rotating assembly.

6. Adjustment of the impeller face clearance (distance between impeller and wearplate) shall be accomplished by external means.

a. Clearances shall be maintained by a four point external shimless coverplate adjustment system, utilizing a four collar and four adjusting screw design allowing for incremental adjustment of clearances by hand as required. Each of the four points shall be lockable to prevent inadvertent clearance increases or decreases due to equipment vibration or accidental operator contact. The four point system also allows for equal clearance gaps at all points between the impeller and wear plate. Requirement of realignment of belts, couplings, etc., shall not be acceptable. Coverplate shall be capable of being removed without disturbing clearance settings. Clearance adjustment systems that utilize less than four points will not be considered.

b. There shall be provisions for additional clearance adjustment in the event that adjustment tolerances have been depleted from the coverplate side of the pump. The removal of stainless-steel tabbed spacers from the rotating assembly side of the pump shall allow for further adjustment as described above.

c. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

7. Pump shall include flange kit consisting of one ASA spool flange that shall be one piece cast iron class 30 suitable for attachment to discharge port. Spool shall have one 1-1/4" NPT and one 1/4" NPT tapped hole with pipe plugs for mounting gauge or other equipment.

8. Pump drain kit

a. The pump drain kit shall consist of a 20' length of plastic hose with a quick connect female Kamlock fitting on one end of hose and two sets of fittings for pump drains. Each set of fittings for pump drain includes a stainless-steel pipe nipple, stainless steel bushing, stainless steel ball valve and an aluminum quick connect male Kamlock fitting.

G. Serviceability

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs.

2. No special tools shall be required for replacement of any components within the pump.

H. DRIVE UNIT

1. Pump motors shall be 50 HP, horizontal, ODP, 1800 RPM, NEMA design B with cast iron frame with copper windings, induction type, with normal starting torque and low starting current characteristics, suitable for continuous service. The motors shall not overload at the design condition or at any head in the operating range as specified. Motor to be inverter duty, premium efficient, 3/60/480 volt with 1.25 service factor.

2. Drive Transmission

   a. Power to pumps transmitted V-belt drive assemblies. The sheave/belt combination shall provide the speed ratio needed to achieve the specified pump operating conditions.

   b. Each drive assembly shall utilize at least two V-belts providing minimum a combined safety factor of 1.5. Single belt drives or systems with a safety factor of less than 1.5 are not acceptable. Computation of safety factors shall be based on performance data published by the drive manufacturer.

   c. Precise alignment tolerances of the drive assemblies shall be achieved by means of a belt/sheave laser alignment system resulting in the reduction of vibration, accelerated wear, and premature failure.

   d. The pump manufacturer shall submit power transmission calculations which document the following:

      1) Ratio of pump/motor speed.
      2) Pitch diameter of driver and driven sheaves.
      3) Number of belts required per drive.
      4) Theoretical horsepower transmitted per belt, based on vendor's data.
      5) Center distance between pump and motor shafts.
      6) Arc-length correction factor applied to theoretical horsepower transmitted.
      7) Service factor applied to established design horsepower.
      8) Safety factor ratio of power transmitted/brake horsepower required.

3. Belt guards

   a. Pump drives to be enclosed on all sides by a guard constructed of fabricated steel or combination of materials including expanded, perforated, or solid sheet metal. No opening to a rotating member shall exceed 1/2 inch.

   b. Guards must be completely removal without interference from any unit component, and shall be securely fastened and braced to the unit base.

   c. Metal to be free from burrs and sharp edges. Structural joints shall be continuously welded. Rivet spacing on panels shall not exceed five inches. Tack welds shall not exceed four inch spacing.

   d. The guard shall be finished with one coat of gray W.R. non-lift primer and one coat of orange acrylic alkyd W.R. enamel in accordance with section 3, Color Definitions of ANSI 253.1; Safety Color Code for Marking Physical Hazards.

4. Pumps, piping, and exposed steel framework shall be cleaned prior to coating using an approved solvent wipe or phosphatizing cleaner. The part must thoroughly dry before paint application. Open joints shall be caulked with an approved polyurethane sealant. Exposed surfaces shall be applied with one coat of TNEMEC Series 69 Polymide Epoxy Primer and one finish coat of Series 73 Aliphatic Acrylic Polyurethane for a total dry film thickness of 4-6 mils. Finish coat shall be semi-gloss white for optimum illumination and enhancement. The coating shall be corrosion, moisture, oil, and solvent resistant when completely dry. The factory finish shall allow for over-coating and touch-up for 6 months after coating. Thereafter, it will generally require sanding to accept a topcoat or touch-up coating. See Product Data Sheet for additional information.

I. VALVES AND PIPING

1. Piping components to include the following:

   a. 6” x 4” suction elbows (90 degree standard radius) supplied.
   b. Primary discharge check valve (4"x6”) and secondary check valve (6") for each pump, with clean out ports.
   c. Three-way discharge plug valve (6") with level actuator.
   d. Common header piping (6") with center discharge arrangement.
   e. Automatic Air Release Valves, one (1) for each pump with stainless steel fittings.
   f. Isolation ball valves (1” SST) supplied for each AARV.
   g. Bypass connection (6”) with isolation valve and quick-connect fitting.

2. Each pump shall be equipped with a full flow type primary and secondary check valve, capable of passing a 3" spherical solid, with flanged ends and be fitted with an external lever and spring. 316 stainless steel body ring shall be threaded into the valve port. Valve clapper shall be cast iron, rubber face, and shall swing completely clear of waterway when valve is full open. The seating shall be by a resilient field replaceable ring on the valve disc contacting a bronze or stainless seat ring in the valve body. Hinge pin shall be of 18-8 stainless steel construction and shall be utilized with bronze bushings and packing type seal. Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. Valve shall be rated at 175 psi water working pressure, 350 psi hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3" spherical solid shall not be acceptable.

3. A 3-way plug valve shall be supplied to facilitate isolation of both pumps and the force main. Valve shall pass 3" spherical solids. The plug valve shall be non-lubricated, tapered type. Valve body shall be cast iron with flanged end connections drilled to 125 pound standard. The drip-tight shutoff plug shall be mounted in stainless steel bearings, and shall have a resilient facing bonded to the sealing surface. Valve shall be supplied with a lever operator.

4. Automatic air release valves:

   a. An automatic air release valve shall be furnished for each pump designed to permit the escape of air to the atmosphere during initial priming or unattended repriming cycles. Upon completion of the priming cycle or repriming cycle, the valve shall close to prevent recirculation. Valves shall provide visual indication of valve closure, and shall operate solely on discharge pressure. Valves which require connection to the suction line shall not be acceptable.

   b. All valve parts exposed to sewage shall be constructed of cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms, if used, shall be of fabric reinforced neoprene or similar inert material.

   c. A cleanout port, three inches in diameter, shall be provided for ease of inspection, cleanout, and service.

d. Valves shall be field adjustable for varying discharge heads.

e. Connection of the air release valves to the station piping shall include stainless steel fittings.

5. Discharge Bypass Piping

a. The station header pipe shall incorporate a 2-way plug valve to permit emergency access to the pump station force main after isolation of the pumps. The plug valve shall be non-lubricated, tapered type. Valve body shall be cast iron with flanged end connections drilled to 125 pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel or Teflon over phenolic bearings, and shall have a resilient facing bonded to the sealing surface.

b. The header pipe shall penetrate the station side wall and terminate with a 6” male OPW type quick connect fitting.

6. Gauge kit:

a. A gauge kit shall be supplied for each pump. Suction pressure must be monitored by a glycerin-filled compound gauge, and discharge pressure by a glycerin-filled pressure gauge. Gauges to be at least 4 inches in diameter, graduated in feet water column. Rated accuracy shall be 1% of full scale reading. Compound gauge shall be graduated -34 to +34 feet water column minimum. Pressure gauge to be graduated 0 to 240 feet water column minimum.

b. Gauges to be factory mounted on a resilient panel with frame assembly secured to pumps or piping. Gauge installations shall be complete with all hoses and stainless steel fittings, including a shutoff valve for each gauge line at the point of connection to suction and discharge pipes.

7. Station enclosure low temperature alarm:

a. Pump station shall be supplied with a thermostat which shall monitor interior station temperature. The control shall incorporate an unpowered dry contact wired to terminal blocks for field connection to a remote alarm device. The contact will close in the event that the temperature within the enclosure falls below approximately 35 degrees F.

8. Piping

a. Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA A21.51/C115 and class 53 thickness.

b. Flanges shall be cast iron class 125 and Comply with ANSI B16.1.

c. Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe.

d. Bolt holes shall be in angular alignment within 1/2 degrees between flanges. Flanges shall be faced with a gasket finish having concentric grooves a minimum of 0.01 inch deep by approximately 0.03 inch wide, with a minimum of three grooves on any given surface spaced a maximum of 1/4 inch apart.

9. Supports and Thrust Blocks

a. Contractor must insure all pipes connected to the pump station are supported to prevent piping loads from being transmitted to pumps or station piping. Pump station

discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

2.2 ELECTRICAL AND CONTROL EQUIPMENT

A. General - Custom control packaged system for automatic variable speed motor/liquid level control. The variable speed drives are to be supplied integral to the pump level/logic panel and shall be furnished in NEMA 1 stainless steel enclosure. The pump control panel will be approximately 60" (W) x 60" (H) x 16" (D). All necessary conduit and wiring to the pump motors, and high pump temperature shutdown sensors is included with the packaged pump station.

B. Pump Control Panel:

1. Primary Level and Logic Control System: Primary liquid level controller to be air bubbler type, operated through the color operator interface. The primary controller will sense wet well level via an analog signal and will be scaled to control the speed of the drives to maintain/match inflow to the wet well. All control logic shall be through the PLC.
2. PLC to be supplied with Ethernet/IP communication for drives and operator interface.
3. Back-up Level Control System: Float switch liquid level controller with intrinsically safe floats (2 total) with 50' cables. This controller will also provide the means to bypass the primary level controller and operate as an independent/redundant level control system, in the event of primary level control failure. The back-up control will then activate start/stop of the VFD's, at preset speeds. Transfer back from the back-up to primary level control system to require local manual reset.
4. Stainless steel weight and chain for securing float cables.
5. Stainless steel junction box with terminal strip supplied for transitioning of float cable wiring and transducer.
6. Pump automatic alternation via PLC logic.
7. Pump priming protection (sensed via KW through the PLC).
8. Adjustable time delays to eliminate simultaneous pump starts (PLC)
9. Flow limiting feature to include an operator selectable maximum flow rate through the PanelView operator interface terminal.

2.3 PUMP CONTROLS

A. Variable Frequency Pump Control System

1. The pump control system shall be factory built and furnished by the manufacturer of the originally installed self-priming pumps, The Gorman-Rupp Company of Mansfield, Ohio. This will serve to assure a completely integrated system and total system responsibility.

2. General

a. This specification covers a pump control system to work in conjunction with a duplex self-priming pump system. Major items of equipment include variable frequency drive assemblies (one for each pump), programmable logic controller and a solid state liquid level control system, furnished as part of a common pump control panel.

b. The drive assemblies shall each include a motor circuit breaker, inverter and door mounted operator controls.

c. The primary liquid level control will include an air bubbler level control, PLC based level/logic control with operator interface including level transmitter, speed set-point control, pump sequence control, alarms and pump safety shutdowns.

d. The pump control system shall be supplied by the pump manufacturer to assure a complete unit and total system responsibility. The pumps, motors, and control system shall be set-up and tested as unit at the pump manufacturer's facility.

3. UL Listing

a. The drive assemblies and liquid level control shall be manufactured by a UL panel builder and each assembly shall bear a serialized UL label for ENCLOSED INDUSTRIAL CONTROL PANELS. Listing for open style industrial control panels or an assembly of listed or recognized components shall not be acceptable.

4. Panel Enclosures

a. Pump control panel enclosure shall be constructed in conformance with applicable section of National Electrical Manufactures' Association (NEMA) standards for Type 1 electrical enclosures. Enclosure shall be fabricated of stainless steel having a minimum thickness of not less than 0.075 inch (14 gauge). Interior and exterior surfaces shall be enamel over phosphatized surfaces. Ventilated Type 1 enclosures will be permitted provided that internally powered fans and replaceable intake air filters are provided. Exhaust openings shall be near the top of the enclosure, intake openings near the bottom. Ventilation fans, louvers, and filters shall have the same NEMA rating as the enclosure so that the enclosure rating is not degraded.

5. Door

a. Enclosure shall be equipped with a hinged door held closed with clamps that are quick and easy to operate. The door shall accommodate the mounting of switches and indicators.

6. Back Panel

a. Enclosure shall be furnished with a removable back panel, fabricated of steel having a thickness of not less than 0.106 inch (12 gauge), which shall be secured to the enclosure with collar studs. Such panel shall be of adequate size to accommodate all basic components.

7. Mounting

a. All control components shall be securely fastened to a removable back panel with screws and lock washers. Switches, indicators and instruments shall be mounted through the control panel door. Self-tapping screws shall not be used to mount any components.

8. Main Connections

a. Each control assembly shall be furnished with main terminals and ground lug for field connection of the electrical supply. The connections shall be designed to accept copper conductors of sufficient size to serve the loads. The main terminals shall be mounted to allow incoming wire bending space in accordance with article 373 of the National Electric Code (NEC). A separate terminal strip shall be provided for 115 volt, single phase control power and shall be segregated from the main terminals. Ten percent of the control terminals shall be furnished as spares.

9. Indicators

   a. LED Indicating lights shall be supplied.

10. Switch Controls

   a. The manufacturer may use selector switches, pushbutton switches, or any combination thereof, to accomplish the switching tasks described herein. Switches shall be oil tight type with contacts rated NEMA A-300 minimum.

11. Control Circuit Components and Control Logic

   a. Description and function

2.4 PLC CONTROL SYSTEM

A. Programmable Logic Controller

1. The PLC shall be an Allen-Bradley Compac Logix Model L2 system. The PLC shall be equipped with a Model LRP CPU with 14K memory, and a configurable port which is reserved for future customer use.

2. The PLC shall operate on 24VDC power and be equipped with the communication devices, digital and analog I/O necessary to accomplish the specified operation. A minimum of 10% spare of the I/O used shall be supplied.

3. The program logic shall be stored in battery backed random access memory, as well as on a programmable, read only memory module. The memory module shall auto load and run when installed in the programmable control processor and is included to facilitate field repair or replacement of the programmable control hardware without the use of programming terminals or personal computers.

4. The power supply to the programmable control shall be industrial grade design with integral power factor correction, DC “OK” signal indicator, and adjustable voltage. Operating range shall be -10 degrees C to +60 degrees C. Power supply shall have infinite short circuit, overvoltage and overtemperature protection. Each motor starter or contactor shall be equipped with a surge suppressor.

5. An Allen-Bradley PanelView Plus7 1000c (10.4”) color electronic operator interface shall be provided for data entry and display. The operator interface shall be mounted on the front of the control panel with other operator controls. The operator interface shall be a TFT touch-screen terminal. A memory module shall be included.

6. Electromechanical relays and timers, when used shall be equipped with 120VAC coils and contacts rated NEMA A-300 minimum.

7. All user adjustable timer settings shall be PLC based. Time delay adjustment to be accessible via the operator interface without opening control panel door.

B. Compac Logix

1. Compac Logix shall be accomplished using programmable controllers. Electromechanical relays may be used when necessary. However, the primary control logic shall be performed by the PLC.

2. The O&M manual shall be provided with complete ladder logic program documentation including English names, rung comments, and coil/contact cross-references.

3. Control Logic

   a. Control logic shall be accomplished using programmable controllers. Electromechanical relays may be used when necessary. However, the primary control logic shall be performed by the PLC.

   b. The O&M manual shall be provided with complete ladder logic program documentation including English names, rung comments, and coil/contact cross-references.

   c. The control shall be pre-programmed or wired to provide the following routines:

      - Pump alternation at lead stop
      - Excessive pump run time alternation
      - Jump to next pump on lead failure
      - Start/stop pumps at normal level settings
      - Pump start delays when called simultaneously
      - General alarm pilot light activation: Quick flashing alarm/slow flashing acknowledge/ steady on reset/off when clear
      - Station trouble alarm(115vac and normally open dry contact)
      - High and low level alarms
      - Pump start/stop level control
      - Drive speed/level control
      - Pump high temperature shutdown
      - Drive fault alarm

d. The operator interface shall be equipped with the following displays and functions:

      - Main Menu
      - Wet Well Level
      - Wet Well Level Simulation
      - Low Water Alarm Status
      - High Water Alarm Status
      - Pump High Temp. Status #1, #2
      - Drive Fault Status #1, #2
      - Pump Sequence Selection
      - Alarm Silence
      - Alarm Reset
      - General Alarm Lamp Test
      - Lead Level Start/Stop Setpoints
      - Lag Level Start/Stop Setpoints (Locked Out)
      - Low Water Alarm Setpoints
      - High Water Alarm Setpoints
      - Speed/Level Setpoints (1 pump running)
      - Power-up Delay Setpoint
      - Alarm Delay Setpoint
      - Pump Start Delay Setpoint
      - Alternation Time Interval Setpoint
      - Level Transmitter Calibration

   e. Lag Pump Lockout Circuit for Generator Operation: The pump motor starters are to be interlocked so that both pumps are prevented from operating simultaneously during emergency standby generator power conditions. The transfer switch is to be supplied with a type “A” contact to interface with the pump control. Lag pump lockout to occur in both hand and auto modes.

4. Drive Assembly

a. All motor branch components shall be of the highest industrial quality. Operating coils of all AC control devices shall be rated for 120 volts, and shall be suitable for use in a voltage range of 108 to 132 volts, 60 hertz.

5. Drive Control

a. Each drive assembly shall be equipped with a control power transformer with primary and secondary fuses and all relays and components necessary to perform the specified functions.

b. Operator controls shall be mounted through the drive assembly enclosure door and consist of the following:

1) Mode selector switch (Hand-off-auto)
2) Manual speed potentiometer
3) Digital display
4) Drive fault reset/stop pushbutton
5) Elapsed time meter

6. Circuit Breakers and Operating Mechanisms

a. A properly sized heavy duty air circuit breaker shall be furnished for each pump motor, and shall have a symmetrical RMS interrupting rating of 14,000 amperes at 480 volts. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering. A padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the exterior of the control compartment door, with interlocks which permit the door to be opened only when circuit breakers are in the "off" position.

7. Inverter

a. The inverter shall be suitable for operation of standard NEMA Design B, 4 pole motors. The inverter will have a diode bridge rectifier on the input to minimize the generation of electrical noise back into the line and provide near unity power factor. Output devices shall be transistors.

8. Environment Conditions

The inverter shall be capable of operation under any combination of the following conditions without mechanical or electrical damage.

Ambient Temperature: -10 + 40 degrees C
Relative Humidity: Less than 90% non-condensing
Altitude: Less than 1,000M (3300 ft) above sea level

Vibration: .006 inches displacement, 1G peak

Shock: 15G peak for 11mS (+/-1.0mS)

9. Control Specification

Control System: Sinusoidal pulse width modulated voltage waveform

Frequency Accuracy: +/- 1% of max. frequency

Volts/Hertz Ratio: 1 to 14.3 V/HZ user programmable

Operation Frequency: 0 to 250 Hz

Overload Capacity: 115 for 60 seconds

10. Digital Readout and Monitor

    a. A five digit panel meter will display standby status, output frequency, set-up parameters and fault. With pushbutton, user can monitor current, voltage, frequency, acceleration and deceleration time, minimum frequency and maximum frequency. Readout also provides inverter status and protective circuit status.

11. Protection

    a. The variable speed drive system shall include a diode bridge rectifier, capacitor filter, and transistorized inverter section. Base driver signals to control firing of the power transistors will be designed with optically coupled isolators for maximum protection of the control circuits from high voltage and noise. The output will be a sinusoidal, pulse width modulated, voltage waveform for reduced harmonic heating in the motor.

    b. The system protection will provide the following:

        1) Intermittent overload - 50 to 115%
        2) Current limit - 50 to 150%
        3) Overcurrent - 180% of rated output current
        4) Inverse time overload - 50 to 100%
        5) Short circuit - Phase to phase or phase to ground
        6) Overvoltage - 10% above input line or DC bus voltage
        7) Undervoltage - 10% below line voltage
        8) Component burnout - DC bus fuse protection and/or phase input fusing
        9) Power loss ride-through - 500mS

    c. When the inverter trips out on a fault, the fault relay shall activate and the display shall indicate the reason for the trip as follows:

        1) Overcurrent
        2) Short circuit
        3) Overload
        4) Overvoltage
        5) Undervoltage
        6) Overheat
        7) Ground fault
        8) Motor stalled
        9) Power supply fault

    d. Auto restart shall occur when the inverter trips on undervoltage. Auto restart will not be attempted for any other type of fault and the inverter will trip out immediately, activate the fault relay and make the appropriate indication on the display.

    e. Save the status of the inverter at the time of the fault and make that information available on the LED display until the inverter is reset or the control power is removed.

12. Operational Functions:

    a. Acceleration and deceleration time independently adjustable from 1 to 600 seconds (selectable ranges).

b. Signal follower 0-10VDC or 4-20MA user selectable. An increasing input signal can command increasing or decreasing frequency as required by the application.

c. Volts/Hertz patterns user selectable.

d. Maximum and minimum frequency limit adjustments.

13. EMI Protection

a. Each inverter input shall be equipped with a solid state, soft clamping transient voltage protector. The protector shall be capable of dissipating 16,000 joules or greater and a response time of 6 nanoseconds.

b. All contactor coils shall be equipped with MOV or RC surge arresters.

14. 3% Input Line Reactors

a. Input Line Reactors will be provided to reduce harmonic content, which reduces the total RMS current, thereby improving the total power factor, and help balance the drive input line currents.

15. Auxiliary Power Transformer

a. The liquid level control shall be equipped with a 5 kVA stepdown transformer to supply 115 volts. The primary side of the transformer shall be protected by a thermal-magnetic air circuit breaker, specifically sized to meet the power requirements of the transformer. A mechanical operating mechanism shall be installed on the circuit breaker to provide a means of disconnecting power to the transformer. The operator handle for the operating mechanism shall be located on the exterior of the control panel with interlocks which permit the door to be opened only when the circuit breaker is in the "off" position.

16. Surge Protective Devise

a. Pump control panel will be furnished to minimize equipment damage from induced lightning/power surges and transients.

17. Three Phase Voltage Monitor

a. Voltage monitor will be wired to stop pump motors in the event of any of the following: Low voltage, voltage unbalance, phase loss, phase reversal. Power to pumps will automatically be restored upon return to normal power conditions. Includes integral pick-up and drop-out delay.

18. Operator Controls

a. Operator controls shall be mounted through the level control assembly enclosure door. These shall consist of the following:

1) Control selector switch
2) Pump sequence selector switch
3) Alarm silence/reset pushbutton
4) Air pump selector switch
5) #1 high pump temperature pilot light
6) #2 high pump temperature pilot light
7) High water alarm pilot light
8) Air flow indicator
9) PLC interface module (Panelview 600c display)

10) General alarm fault
11) #1 pump run (Integral to HIM module)
12) #2 pump run (Integral to HIM module)
13) #1 drive fault (integral to HIM module)
14) #2 drive fault (integral to HIM module)

b. The control circuit shall be fused, and shall be provided with a disconnect switch connected in such a manner as to allow control power to be disconnected from all control circuits.

c. Pump sequence selector switch shall permit selection of automatic pump alternation, or selection of any pump to run as lead pump for each cycle.

d. An alarm silence/reset pushbutton shall be provided to acknowledge and reset the alarm circuits while corrective actions are underway. Following an alarm condition, the respective alarm pilot light shall flash until acknowledged and then glow continuously until the condition has cleared. A general alarm dry contact and 115 vac powered station trouble circuit shall energize continuously until acknowledged.

e. A selector switch shall provide manual alternation of the air pumps in the bubbler system. The switch shall be connected in such a manner that either pump may be selected to operate continuously.

19. High Pump Temperature Shutdown

a. The control panel shall be equipped with circuitry to override the level control system and shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature.

b. A thermostat shall be mounted on each pump to detect its temperature. If the pump temperature should rise to a level, which could cause pump damage, the thermostat shall cause the pump motor to shut down. A pilot light shall indicate that the pump motor has been stopped because of a high temperature condition. The pump shall remain locked out until the pump has cooled and the circuit has been manually reset. Automatic reset of such a circuit shall not be acceptable.

20. Fault Monitoring Contacts

a. Dry contacts wired to terminal blocks shall be provided for each of the following monitoring conditions:

1) High Water Alarm (Primary Level Control).
2) Low Water Alarm (Primary Level Control).
3) Three Phase Voltage Monitor Fault.
4) Backup Float Control System Activated.
5) VFD Fault #1, #2.
6) High Pump Temp. Shutdown #1, #2.
7) Pump Run #1, #2.
8) Low Station Enclosure Temperature.
9) Wet Well Level Sensed by Analog Signal.
10) VFD Amperage (Analog Signal).
11) UPS Fault.

2.5 INTEGRATION WITH OHIO TURNPIKE (OTIC) SCADA SYSTEM

A. Contractor shall coordinate integration of all pump station controls with OTIC SCADA/telemetry system. Contractor to provide and install Jace 834 equipment controller and coordinate with OTIC on integration work.

2.6 BACKUP (AC) LEVEL CONTROL

A. A backup level control system shall be provided to operate the pumps, in the event of a failure of the primary solid state level control system.

B. The backup level control system shall start and stop pump motors in response to changes in wet well level. It shall be the mercury float switch type, incorporating intrinsically safe relays. Rising and falling liquid level in the wet well causes switches within the floats to open and close, providing start and stop signals to the remainder of the level control system.

C. The backup level control system shall start and stop the pumps in accordance to the wet well level. The pump start and stop float switches shall be set above and below the normal pump start and stop level settings utilized for the primary level control. Upon operator selection of automatic operation, a float switch shall start one pump motor when water rises to the "pump start level". The second pump motor will be activated off of a timer if required. When the water is lowered to the "pump stop level", the system shall stop all pumps. These actions shall constitute one pumping cycle.

D. Two float switches shall be supplied for installation by the Contractor. Each float shall contain a mercury switch sealed in a polypropylene housing, with 40 feet of power cord. Float switches shall wire direct to the control panel. A stainless steel chain with weight shall be furnished to secure the switches in the wet well.

E. Two intrinsically safe relays shall be supplied in a separate level control enclosure. Relays must be recognized and listed as intrinsically safe by a nationally recognized testing laboratory. Installing contractor shall make all connections from relays to motor controls.

2.7 FLOW METER

A. Magnetic meter flow tube, 6” diameter, included with the pump station and factory installed in the common discharge piping.

B. Flow Meter Description.

1. Toshiba Electromagnetic Flow Meter, Model LF654, to include:

a. Flow Meter Body with liner design for raw sewage application.
b. 6” 150# Flanged Body.
c. 316 Stainless Steel Electrodes.
d. 316 Stainless Steel Integral Grounding Rings.
e. Integral Transmitter with Display/Keypad.
f. 120 VAC Power
g. 4-20 mA and Scaled Pulsed Outputs.
h. Flow Meter Representative to visit site to set up the flow span and totalizer scale parameters.

2.8 PRECAST CONCRETE WET WELL AND STATION TOP SLAB

A. Precast concrete wet well delivered and set in excavation and furnished by the pump station manufacturer.

1. 8’-0” diameter X 22.16 ft. deep (includes top slab thickness).
2. 11’-6” X 1’-0” thick ant-flotation base slab.
3. 36” X 36” aluminum access hatch with safety grate cast-in.
4. 4” stainless steel vent furnished and cast in.
5. Fillet field cast in bottom.

6. Gasketed pipe openings (PSX).
7. Interior concrete surfaces only painted with Wasser Mc-Tar coating.
8. Stainless steel inlet baffle furnished and installed.

B. Cast in Place concrete top slab for control building, standby generator, and existing and proposed wet wells, complete per plan details including:

1. Required pipe openings.
2. Floor drain, strainer top, and duck bill check valve furnished and installed.
3. Required suction and discharge pipe openings.
4. Integral standby generator pad

C. Skid mounted pump assemblies installed on top slab.

D. 6" ductile iron pump suction piping furnished and installed from supplied suction elbows to wet well floor.

E. 6" ductile iron discharge piping furnished and installed from pump unit to +/- 5-foot out of wet well.

F. 6" ductile iron dedicated suction bypass piping furnished and installed from wet well floor to 2'-0" above access riser.

G. 0.375" sch. 80 PVC air bubbler piping and stainless steel support pole furnished and installed in wet well.

H. Backup float switches and junction box installed.

I. Air release piping furnished and installed from pump piping to wet well and extended to within 1-foot of the wet well floor.

2.9 FACTORY TESTS

A. All components of the pump station shall be given an operational test at the pump station manufacturer's facility to check for excessive vibration or leaks in the piping or seals, and to correct operation of the automatic control and vacuum priming systems and all auxiliary equipment. Installed pumps shall take suction from a deep wet well, simulating actual service conditions. The control panel shall undergo both a dry logic test and a full operational test with all systems operating.

B. Factory test instrumentation must include flow measuring with indicator; compound suction gauge; Bourdon tube-type discharge pressure gauge; electrical meters to measure amperes, volts, kilowatts and power factor; speed indicator; and a vibrometer capable of measuring both amplitude and frequency.

2.10 SPARE PARTS

A One complete replacement pump shaft seal assembly shall be furnished with each pump size. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare volute gasket or o-ring kit and seal gasket shall be provided. A spare suction flap valve shall also be supplied.

B. One spare pump rotating assembly to be supplied with full diameter impeller and to be interchangeable with the first or second stage of both self-priming pumps.

2.11 INSTALLATION AND OPERATING INSTRUCTIONS

A. Installation of the pump chamber shall be done in accordance with the written instructions provided by the manufacturer.

B. Operation and maintenance manuals shall be furnished which will include parts lists of components and complete service procedures and troubleshooting guide.

PART 3 – EXECUTION

3.1 MANUFACTURER'S SERVICES

A. The Manufacturer shall provide the services of a factory-trained representative for a maximum period of not less than one (1) total working day, which shall be broken down into one or two trips as necessary on-site to perform initial startup of the pump station, make final adjustments, supervise initial startup of each pump, and prepare a written test report thereof for the Owner, and to instruct the owner's operating personnel in the operation and maintenance of the equipment.

3.2 HANDLING AND STORAGE

A. During loading, unloading and storage care shall be exercised to insure that the equipment is not dropped or otherwise damaged through impacting with solid surface. The process equipment shall be stored on a smooth surface, free of sharp objects, and if laid horizontally, shall be placed in such a way to avoid structural damage to the inlet and outlet channels. Slinging will be accomplished using nylon or other fabric material. Under no circumstances shall cable or chain slings be used.

3.3 ELECTRICAL

A. All electrical components to form a complete operating electrical system will be supplied according to drawings and electrical specifications.

B. All electrical equipment, conduit and wiring not indicated on the Drawings, but necessary to provide a complete operating system shall be provided in this item at no additional cost to the Owner.

C. Electrical Wiring: The external conduit and wiring required for power supply and control to electrical equipment supplied in this Section will be furnished according to the electrical drawings and specifications.

D. Motor size: Any deviation in motor size must be approved by the Engineer. Any electrical equipment or wiring that must change to accommodate a different size motor will be at no additional cost to the Owner.

3.4 FIELD QUALITY CONTROL

A. Pumps

1. The pumps provided shall be factory tested at three points to verify the pump performs at the design points and as per Item 2.1 D.

2. Tests shall consist of checking the unit at its rated speed, head, capacity, efficiency and brake horsepower, and at such other conditions of head and capacity to properly establish the performance curve.

3. The standards of the Hydraulic Institute shall govern the procedures and calculations for these tests.

3.5 OPERATION AND MAINTENANCE MANUALS

A. Prior or with the delivery of equipment, the manufacturer shall provide copies of an operation and maintenance manual including storage, installation, start-up, operating and maintenance instructions, and a complete parts list and recommended spare parts list. The O&M Manuals shall be in compliance with the General Requirements and per Item 1.3 G.

3.6 DEMONSTRATION AND INSTRUCTIONS

A. Demonstration and Instruction: The manufacturer of each piece of equipment shall furnish the services of a qualified representative for a period of not less than one day to inspect and adjust the equipment furnished by the manufacturer. This qualified representative shall also conduct such tests as necessary to demonstrate satisfactory operation and to instruct the Owner's personnel in the care and operation of the equipment.

SPECIAL PRE-FABRICATED PUMP STATION BUILDING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The contractor shall furnish and install one (1) - factory built, factory delivered, above-ground modular building with wall mount air conditioner, electric heater, coordination with all electrical work to be installed on site, and other necessary appurtenances as shown on the plans and specified herein. The building shall be complete when delivered. Item shall include all work associated with installing a new pump station building complete as specified in the plans and in accordance with this special provision. The cost for all material, labor, and incidentals necessary as indicated on the plans shall be included in the bid price for this item.

1.02 SUBMITTALS:

A. Ohio Department of Commerce Building Permit application shall be submitted by the contractor. An approved building permit shall be obtained by the contractor prior to ordering or fabrication of building. Permit inspection will take place as required by the regulatory agency.

B. Shop Drawings:

1. Completely detailed shop drawings for prefabricated building. Indicate all dimensions, details, locations of electrical panels, lighting, HVAC, doors, and heater.

C. Drawings of modifications or changes in features or details, which are necessitated by design requirements. Make such modifications without additional compensation.

D. Do not fabricate building before shop drawings are accepted by the Chief Engineer.

1.03 QUALITY ASSURANCE

A. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per manufacturer's recommendations.

1.04 THIRD PARTY INSPECTION LISTING (STATION 600V MAX.)

A. The station manufacturer shall be required to affix to the station an UNDERWRITERS LABORATORIES (UL) LABEL attesting to the compliance of the station equipment under the PACKAGED PUMPING SYSTEMS (QCZJ) UL Listing Category and/or INTERTEK TESTING SERVICES (ETL) LABEL attesting to the compliance of the station equipment under PACKAGED PUMPING SYSTEMS. The ETL label shall state the station conforms to UL STD 778.

1.05 SHIPPING AND DELIVERY

A. The specified equipment shall be delivered by the manufacturer FOB DESTINATION and thereby the station manufacturer shall hold the full responsibility for the condition and completeness of the equipment upon its delivery.

B. The Chief Engineer or designated representative shall hold the right to inspect the equipment prior to unloading and setting to assure the quality and condition of the equipment is in no way deficient.

C. If in the view of the Chief Engineer or Chief Engineer's inspector, the equipment is deficient when delivered, delivery shall be refused.

1.06 SPECIFIED COMPONENTS

A. Within the body of this specification and on the drawings, certain components are listed by name and/or model number for at least One (1) manufacturer's specific product. As such, no "OR EQUAL" is listed or allowed where at least the one manufacturer is listed.

B. These listed components have been chosen because of the Engineer's and Owner's knowledge of and experience with these listed components.

C. No other components other than those listed are acceptable.

1.07 FACTORY START-UP AND TRAINING SERVICE

A. Without exception, the station manufacturer is directly responsible for station start-up and operator training. Third party contractors, agents or representatives are not to be allowed to start up the station nor the equipment therein. As such;

1. Start-up Factory Service Technician shall be a regular employee of the station manufacturer.

2. The manufacturer shall provide two (2) copies of the complete Operation & Maintenance Manual in electronic form.

1.08 MANUFACTURER'S WARRANTY

A. The warranty is the sole responsibility of the station manufacturer and that manufacturer's warranty shall be provided in written form, being placed in both the Submittal documents covering the specified equipment and the O&M manuals provided with that equipment.

B. It is required the station warranty provide the Owner with a single source responsibility for all components specified herein and the system. That single source shall be none other than the station manufacturer. Third party suppliers, service contractors, "Pass-through" warranties and service by the representative are not acceptable.

C. Said manufacturer's warranty shall at a minimum cover:

1. A period of one (1) year commencing upon <u>successful start-up</u>, after authorized manufacturer's start-up, not to exceed eighteen (18) months from the date of shipment.

2. The warranty period shall be inviolate regardless of any component manufacturer's warranty for equipment and components within the station.

3. The manufacturer's warranty shall cover all equipment, components and systems provided in or with the station by the manufacturer of the station, exclusive of those components supplied by and/or installed by others independent of the manufacturer of

record for this station.

4. The warranty shall provide for the station manufacturer to bear the full cost of labor and materials for replacement and/or repair of faulty or defective components so there shall be no cost incurred by the Owner for this work during the warranty period.

5. The manufacturer's warranty policy is amended only by the items considered consumable, i.e., light bulbs, pump seals, pump packing, lubricants and other maintenance items consumed by usage.

6. No assumption of contingent liabilities for any component failure during manufacturer's warranty is made.

7. The warranty pertains only where the equipment has been operated in strict accordance with the manufacturer's instructions and requirements. Evidence of misuse or modification to the equipment voids the warranty.

D. If the submitted written manufacturer's warranty does not meet the minimum requirements set forth above, that submittal will forthrightly be rejected.

PART 2 - PRODUCTS

2.01 PRE-FABRICATED PUMP STATION BUILDING:

A. Manufacturers:

1. EFI-Solutions

2. Or approved equal

2.02 BUILDING DESIGN CRITERIA

A. The station building enclosure shall be a factory assembled, modular structure of one (1) compartment attached to the station base structure and requiring no additional assembly at the job site.

B. The building design criteria shall be: (1.) To withstand snow load based on ASCE 7-10 Ground Snow Loads for the state and county of installation (2.) To withstand wind loads based on ASCE 7-10 for wind speeds; (3.) Be designed for site specific seismic requirements based on local conditions as dictated by the Available Ground Motion Parameters according to ASCE 7 and OHBC 2011 established by zip code and a live floor load of 125 PSF; (4) Be designed to IECC 2012 version of the energy code.

C. The modular building enclosing each of the stations is shown at its minimum size so that National Standards mandated clearances are maintained above, below and around equipment for proper and safe servicing, removal and reinstallation of this equipment.

D. The building specified shall be of the size shown on the drawings. Building sizes less than those shown will not be allowed.

2.03 BUILDING CONSTRUCTION

A. The materials specified are specifically chosen to be resistant to moisture degradation and infestation and to be maintainable.

B. Insulation values for the walls and roof structure shall be a minimum R-21 in the walls and the roof. Insulation within the roof and wall panels shall be foam-in-place polyurethane material

applied between the interior and exterior sheathing forming a closed cell bounded by the steel framing. The insulation shall have a minimum density of 2.2 lbs/cu. ft. nominal and shall be applied to the thickness required to provide a minimum R value of 21. The insulation shall have an ASTM E-84 flame spread index of 25 and smoke developed of 450.

C. Building framing materials shall comply with the A.I.S.I. Specification for the Design of Cold-formed Steel Structural Members and to Standards ASTM C-955, ASTM C- 1007, ASTM C-645, ASTM C-754 and ICBO 4782P and 4784P. A framing design incorporating the members covered by the listed specifications and standards shall develop a structure meeting or exceeding the building design criteria listed previously.

D. Metal-clad, foam insulated panels or SIPS will not be allowed.

E. The building structure shall be fabricated using steel C-studs as wall framing members and C-joists for roof support. The size, placement and spacing of studs and joists shall be in accordance with the design criteria and material standards. The wall C-studs shall be a minimum 2" x 3 5/8" of 16 gauge material minimum. The roof C-joists shall be a minimum 1-5/8" x 8" size of 16 gauge material minimum.

F. The exterior wall sheathing shall be 1/2" thick, exterior, CDX grade plywood.

G. The exterior roof sheathing shall be 5/8" thick, exterior, CDX grade plywood.

H. The interior wall and ceiling sheathing shall be 3/4" thick, exterior, CDX grade plywood.

I. All interior wall & ceiling surfaces shall be covered with .090" thick FRP (fiberglass reinforced plastic) sheeting of pebble grain, gloss, white finish. The individual wall faces shall be covered with one continuous sheet. The FRP sheets shall be glued to the interior sheathing requiring no fasteners. Corner moldings of like FRP material shall be installed & finished in a workmanlike manner.

J. Openings in the sidewalls and/or roof shall be as shown and be fully framed out and supported using single or multiple framing members sufficient to support and fasten those devices or equipment items requiring a framed opening, these being access hatches, HVAC equipment, pipe passages, conduit passages, door and window openings and other special purpose openings as might be shown and required. The attaching of devices or equipment to the building at a framed opening shall be done fully according to the device manufacturers mounting instructions.

K. The building shall be warranted by the station manufacturer for a period of ten (10) years from the date of delivery.

2.04 HEAVY DUTY STEEL DOORS

A. Doors, single and double leaf and of the size shown, are manufactured of 18-gauge galvanized steel. All doors shall be full flush construction and 1-3/4 inches thick. Doors shall be reinforced, stiffened, insulated, and sound deadened with a solid polystyrene foam board permanently bonded to the inside of each face skin. The lock and hinge edge of each door shall be welded with a center hairline seam the full height of the door. The lock edge shall be reinforced full height by a 14-gauge continuous one-piece channel extruded templating. The hinge edge shall be reinforced full height by a 14-gauge continuous one-piece channel, formed and tapped for hinges. Top and bottom of the door shall be closed with 16-gauge channels. Doors shall be thoroughly cleaned and receive an iron phosphate treatment prior to receiving one coat of prime paint. Door closures and rim panics are reinforced with 14-gauge channels.

B. Doors shall be fully-mounted in frames produced for pre-hanging of commercial 1- 3/4" doors. Frames are formed to 16-gauge commercial quality cold rolled steel conforming to ASTM A366 or A620 and A568. Frames are produced in two welded units, to be mechanically joined

during installation. The base side is prepared for all required hardware. Both units, base and trim, are furnished with welded mitered faces. Frame anchoring includes compression anchors and stud screws. Door hinges shall be continuous gear hinges, fabricated of extruded 6063-T6 aluminum alloy/temper with pinless assembly. The doors shall have a lockset, exterior handle, and top mounted-door closer with hold-open device.

C. Doors and frames shall be finished with a two-component, aliphatic/acrylic polyurethane coating, white in color, with a high gloss finish. The coating shall be resistant to a wide range of solvents and chemicals under splash and spill conditions. The coating system is V.O.C. compliant.

D. Door sizes and locations are as shown on the drawings.

2.05 MOUNTING AND FASTENING

A. The building shall be mounted and anchored to the concrete base slab in accordance with the building manufacturer's recommendations.

2.06 EXTERIOR FINISHES – EXTERIOR TREATMENT – SIDE LAP, RIBBED METAL SIDING

A. The exterior sheathing shall be covered with 29 gauge metal siding. The siding shall have a trapezoidal rib on 9" centers. Each panel shall be of the exposed fastener, sidelap seam type and have a rib height of 7/16 inches and be 36" wide with a smooth texture. The steel siding shall be warranted for twenty years and shall be Max-Rib as manufactured by McElroy Metal.

B. The station manufacturer shall apply a layer of housewrap to the exterior of the building. The housewrap shall reduce air infiltration and moisture penetration and damage. The housewrap shall be stapled to the exterior sheathing.

2.07 ROOF SYSTEMS – METAL ROOF SYSTEM

A. The roof sheathing shall be covered with a 26 gauge metal panel system to form a standing seam roof as shown. The panels shall have a Galvalume® substrate with a Kynar 500® finish. The panels shall meet UL Standard 2218, Class 4 impact resistant and Class A fire resistant rating. The system shall be complete with fascia and soffit. The minimum roof slope shall be 3:12.

B. The ridgeline of the roof shall be covered end to end with a broken edge panel open along the sides to create a roof vent along both sides of the entire ridge line. The top of the broken edge panel along the ridge line shall cover over the top of the standing seams to provide a finished appearance.

2.08 FACTORY INSTALLED TRUSSED ROOF SYSTEM

A. The building manufacturer shall provide wooden roof trusses, plywood sheathing, underlaying felt to be factory applied and be covered by the finished roof surface which shall be factory applied to the building to form a gabled roof system as shown.

B. When installed, the trusses shall be covered by 1/2" thick C-C Grade plywood. The selected roof material shall be called out in these specifications.

C. When required, the roof structure shall include the roof hatches being built into the roof field by the station manufacturer using the same materials as specified above.

D. Metal Facia and Soffits shall be installed on the building by the building manufacturer. These materials for the facia and soffit shall be complimentary in color and texture and approved by the Chief Engineer.

E. A ridge line, metal airvent system shall be installed as a part of the roof.

2.10 U.L. LISTING

A. All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (UL) Standard 508A "Industrial Control Equipment." The panels shall be shop inspected by UL, or constructed in a UL recognized facility. All panels shall bear a serialized UL label indicating acceptance under Standard 508A and under Enclosed Industrial Control Panel or Service Equipment Panel.

B. A photocopy of the UL labels for this specific project shall be transmitted to both the Chief Engineer and the contractor for installation within their permanent project files, prior to shipment of the equipment covered under these specifications.

2.11 ELECTRICAL

A. See electrical specifications for electrical work to be completed on site and coordinated with building installation.

2.12 COOLING/EXHAUST UNIT

A. The unit shall be one-piece, wall-mounted, factory-assembled, pre-charged, prewired, tested and ready-to-operate. The unit shall have a limited warranty of 5-years on parts and 1-year on compressor. Capacity and EER certified in accordance with ANSI/ARI Standard390-2003.One
(1) each exterior wall mounted, hard-wired as shown;

1. Enclosed weatherproof casing constructed of 20 gauge galvanized steel, finished with baked-on polyester enamel paint;

2. One (1) washable filter;

3. Remote adjustable thermostat;

4. Refrigerant: 410A (HFC);
5. Minimum EER Rating: 9.00

Cooling Capacity	BTUH	Breaker size	CFM @ 0.2" ESP, (Max/Min)	Heater	Bard Manufacturing Part Number
1 Ton	10,800	20	440/350	N/A	W12A1-A0ZBW

2.13 HEATER

A. One (1) each, wall mounted as shown.

B. Rating - 10,239 BTU/HR - 3000 watts, 240 volt.

C. Enclosed resistance wire within steel finned element.

D. Control - thermostat.

E. UL listed.

F. Fan forced.

G. Hard wired in conduit per UL 400-1.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. The contractor shall be required to provide a crane and spreader bars to set the station on the foundation designed by the engineer shown in the plan set. The foundation shall be built by the contractor and as directed by the engineer. Following setting of the station, the contractor will be required to anchor the station to the foundation. The contractor shall supply the anchor bolts.

THE FOLLOWING SECTIONS INCLUDE A COMPLETE DESCRIPTION AND SPECIFICATIONS OF AN "APPROVED ALTERNATE" PUMP STATION BUILDING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The contractor shall furnish and install one (1) - factory built, factory delivered, above-ground pump station enclosure/building from the pump manufacturer (Gorman-Rupp), integral with the complete pumps and internal piping, including all pre-wired electrical and pump control panels, as described and included with the specifications for the "Factory Built Above Ground Pump Station" for a complete packaged pump station to be delivered and set on site including wall mount air conditioner, electric heater, coordination with all electrical work to be installed on site, and other necessary appurtenances as shown on the plans and specified herein. Item shall include all work associated with installing a new pump station building complete as specified in the plans and in accordance with this special provision. The cost for all material, labor, and incidentals necessary as indicated on the plans shall be included in the bid price for this item.

1.02 SUBMITTALS:

A. Ohio Department of Commerce Building Permit application shall be submitted by the contractor (if required). An approved building permit shall be obtained by the contractor prior to ordering or fabrication of building. Permit inspection will take place as required by the regulatory agency.

B. Shop Drawings:

1. Completely detailed shop drawings for prefabricated building. Indicate all dimensions, details, locations of electrical panels, lighting, HVAC, doors, and heater.

C. Drawings of modifications or changes in features or details, which are necessitated by design requirements. Make such modifications without additional compensation.

D. Do not fabricate building before shop drawings are accepted by the Chief Engineer.

PART 2 - PRODUCTS

2.14 PRE-FABRICATED PUMP STATION BUILDING APPROVED ALTERNATE:

A. Manufacturers:

1. Gormann-Rupp

2.15 BUILDING/ENCLOSURE CONSTRUCTION AND DESIGN: The enclosure will be rectangular with outside dimensions of 18 feet long by 11' 6" feet wide and having a minimum inside wall height of 8 feet. Note these dimensions are slightly different from the dimensions shown on the plans for this building. The enclosure will be provided with four lifting eyes to ease in handling.

All exterior surfaces of the enclosure shall be Green isophthalic gel-coat molded surface and shall be provided with ultra-violet inhibitors.

All interior surfaces of the enclosure shall be finished in an isophthalic polyester laminate, sealed with a white isophthalic gel-coat.

The enclosure roof will be of same materials of construction as wall and be one piece, seamless design. The pitch of the roof will be sufficient for good moisture drainage and shall withstand a minimum load factor of 40 pounds per square foot.

The enclosure walls and roof will be fabricated of a composite, consisting of 1/8" thick laminate outside surface, 3" thick foam core, and a minimum 1/8" thick inside laminate surface. Oriented strand board (OSB) will be used in all interior walls except where wall penetrations will be made. The enclosure will have an R-20 insulation factor and will be capable of withstanding 140 MPH wind loads.

The enclosure will have an internal base flange which shall be fastened by anchors to a concrete foundation or slab (provided with Item Special - Factory Built Above Ground Pump Station). An adequate amount of sealant shall be shipped loose for use by the installing contractor to seal between the base flange and the slab.

2.16 INTAKE LOUVERS: The enclosure will be complete with one set of anodized aluminum intake louvers. Louvers will be completely self-contained and shall not require the use of motors, solenoids, or other electrically operated devices. The intake is a gravity fed louver and will open when the exhaust fan runs.

2.17 SINGLE WIDE DOOR: A 6'-8" x 3' single enclosure door will be molded of reinforced fiberglass plastic double laminate, with molded gel-coat surfaces same as described for interior and exterior surfaces. Door hardware will consist of three (3) stainless steel ball

bearing hinges, 3-point closure, and handle/lock. Door will have adjustable door positioner and holder.

2.18 DOUBLE WIDE DOOR (Qty. 2): Two additional 6'-8" x 6'-0" double enclosure doors will be molded of reinforced fiberglass plastic double laminate, with molded gel-coat surfaces same as described for interior and exterior surfaces. Door hardware will consist of three (3) stainless steel ball bearing hinges, 3-point closure, and handle/lock. Door will have adjustable door positioner and holder.

2.19 LED LIGHTING: To provide adequate illumination for all areas in the station and control panel, LED type lighting fixtures will be provided. The enclosure shall be provided with a light switch located adjacent to each door opening. Lighting circuit will be protected by a thermal magnetic circuit breaker.

2.20 QTY. (1) EXTERNAL LED SECURITY LIGHTS: Qty. (1) 120 VAC LED light(s), mounted and wired to the exterior wall of the enclosure shall be provided. Light will be protected by a 15 amp thermal magnetic circuit breaker. Placed on the south wall of the station between the discharge bypass and single man door.

2.21 LED EMERGENCY LIGHT: A 6 VDC, self-contained, battery backed, automatic emergency lighting system shall be provided. The unit shall be mounted and wired to the lighting thermal magnetic circuit breaker.

2.22 QTY. (2) INTERIOR DUPLEX RECEPTACLES: Two 120 VAC, 20 amp, GFI wall mounted receptacles shall be provided. Receptacles will be protected by a 20 amp thermal magnetic circuit breaker.

2.23 COOLING/EXHAUST UNIT

A. The unit shall be one-piece, wall-mounted, factory-assembled, pre-charged, prewired, tested and ready-to-operate. The unit shall have a limited warranty of 5-years on parts and 1-year on compressor. Capacity and EER certified in accordance with ANSI/ARI Standard390-2003.One (1) each exterior wall mounted, hard-wired as shown;

1. Enclosed weatherproof casing constructed of 20 gauge galvanized steel,finished with baked-on polyester enamel paint;

2. One (1) washable filter;

3. Remote adjustable thermostat;

4. Refrigerant: 410A (HFC);

5. Minimum EER Rating: 9.00

Cooling Capacity	BTUH	Breaker size	CFM @ 0.2" ESP, (Max/Min)	Heater	Bard Manufacturing Part Number

1 Ton	10,800	20	440/350	N/A	W12A1-A0ZBW

2.24 HEATER

A. One (1) each, wall mounted as shown.

B. Rating - 10,239 BTU/HR - 3000 watts, 240 volt.

C. Enclosed resistance wire within steel finned element.

D. Control - thermostat.

E. UL listed.

F. Fan forced.

G. Hard wired in conduit per UL 400-1.

2.25 ELECTRICAL

A. The building shall be pre-wired with electrical and pump control panels as described and included with the specifications for the "Factory Built Above Ground Pump Station" for a complete packaged pump station to be delivered and set on site. Note that lighting fixtures ,outlets, and other electrical equipment shown on electrical sheet E101 shall come installed and pre-wired in the packaged enclosure/building along with all other electrical panels, controls, and components shown on sheet E101. The electrical provided and pre-wired in the building shall be the same as what is shown on sheet E101 unless approved by the engineer. Also see electrical specifications and drawings for complete electrical work to be completed on site and coordinated with building installation.

PART 3 - EXECUTION

3.02 INSTALLATION:

A. The contractor shall be required to provide a crane and spreader bars to set the complete packaged pump station with enclosure on the foundation designed by the engineer shown in the plan set. The foundation shall be built by the contractor and as directed by the engineer. Following setting of the station, the contractor will be required to anchor the station to the foundation. The contractor shall supply the anchor bolts.

END OF SECTION