



CITY OF SAN JUAN
LIFT STATION No. 6 RELOCATION PROJECT
RFB NO. 25-005-04-09
ADDENDUM NO. 4

Addendum Date: April 8, 2025

Notice to Bidders:

The Request for Bid (RFB) is modified as set forth in this Addendum. The Original RFB documents and any previously issued Addenda remain in effect. This addendum will be part of the contract documents and shall be included with Bid submittal. Non-receipt of addendum by bidder under no circumstances relieves bidder of obligation of compliance with the terms and conditions stated in the addendum.

Bid Opening Receipt Date:

The bid opening date has been changed from April 9, 2025, to **April 16, 2025**. The time and location remain unchanged. Correction from Addendum No. 3.

Revision To The Specifications:

1. Section 33211 Self-Priming Pumps: Remove and Replace Entire Section. See attached revised section.
2. Section 00300 Bid Proposal Form: Remove and Replace Entire Section. Contractor to submit complete bid as shown on addendum No. 4.

Acknowledgement by Respondent:

Respondents shall acknowledge receipt of this Addendum No. 4. Submit Completed Addendum with Statement of Bid. Failure to acknowledge receipt of this addendum may render your bid "Incomplete".



Trimad Consultants, L.L.C.
Texas Firm No. 18526

Signature of Respondent

Date

END OF ADDENDUM

**SECTION 00300
BID PROPOSAL FORM**

**CITY OF SAN JUAN
LIFT STATION NO.6 RELOCATION PROJECT
PROJECT NO. 25-005-04-09**

BID OPENING: APRIL 16, 2025 AT 3:00, P.M.

TO: OWNER (CITY OF SAN JUAN)

The undersigned, as bidders, declares that the only person or parties interested in this proposal as principals are those named herein, that this proposal is made without collusion with any other person, firm or corporation; that he has carefully examined the form of contract, Notice of Contractors, specifications and plans thereon referred to, and has carefully examined the plans, specifications, locations, and conditions and classes of materials of the proposed work; and agrees that he will provide all the necessary labor, machinery, tools, and apparatus, and other incidental to construction, and will do all the work and furnish all the materials called for in the contract and specifications in the manner prescribed therein and according to the requirements of the Engineer/Architect as therein set forth.

It is further agreed that quantities of work to be done at unit prices and materials to be furnished may be increased or diminished as may be considered necessary, in the opinion of the Engineer, to complete the contemplated, and that quantities of work, whether increased or decreased are to be performed at the unit price set forth below or as provided in the Specifications.

It is further agreed that the lump sum prices may be increased to cover additional work ordered by the Engineer and approved by the Owner, but not shown on the Plans or required by the Specifications, in accordance with the provisions of the General Conditions. Similarly, they may be decreased to cover deletion of work so ordered.

It is understood that the Owner reserves the right to reject any and all bids.

Bidders are advised that Formal Sealed Bids are to be submitted at the Purchasing Department of San Juan City Hall. As previously instructed via Invitation, Notice to Bidders, Instructions to Bidders, and at the Pre-Bid Conference, Bidders can go online to the City of San Juan web site address: www.sjtx.us to download any and all related project documents, or may contain copies of same by contacting the office of Lori A. Maldonado, Purchasing Agent. Located at 709 S. Nebraska Avenue., San Juan, Texas 78589 or by calling (956) 223-2204 or by emailing your request to lmaldonado@sjtx.us. Kindly submit your **Bid** Submittal to the Purchasing Department of San Juan City Hall on or before the Bid Opening date and time.

Accompanying this proposal is a five (5) percent (%) of the bid price by certified check, or cashier's check or bid bond payable to the City of San Juan.

BID PROPOSAL

The bid security accompanying shall be returned to the bidder, unless in case of the acceptance of the proposal, the bidder shall fail to execute a Contract and file a performance and payment bond within ten (10) days after its acceptance, in which case the bid security shall become the property of the City of San Juan and shall be considered as payment for damages due to delay and other inconveniences suffered by the OWNER on account of such failure of the bidder.

ENGINEER'S/ARCHITECT ESTIMATE OF QUANTITIES – APPROXIMATELY ONLY

Bidder agrees to perform all work described in the specifications and shown on the plans, for the following prices:

TABLE 1 BID ITEMS:

ITEM NO.	SECTION NO.	ITEM DESCRIPTION	UNIT	UNIT QTY	UNIT PRICE	TOTAL
1	02233	Clearing and Grubbing	LS	1		
2	01745	Site Restoration	LS	1		
3	01574, 01577	Erosion and Sedimentation Control	LS	1		
4	01578	Ground and Surface Water Control	LS	1		
5	01561	Trench Excavation Safety Protection (4' to 8')	LF	102		
6	01561	Trench Excavation Safety Protection (12' to 16')	LF	1162		
7	01561	Trench Excavation Safety Protection (20' to 24')	LF	1509		
8	02509	24-Inch PVC (SDR 26) Gravity Sanitary Sewer Line (12' to 14'), complete in place	LF	862		
9	02509	24-Inch PVC (SDR 26) Gravity Sanitary Sewer Line (14' to 16'), complete in place	LF	300		
10	02509	24-Inch PVC (SDR 26) Gravity Sanitary Sewer Line (20' to 22'), complete in place	LF	1509		
11	02082	48-Inch Dia. Sanitary Sewer Manholes (8' to 12'), complete in place	EA	1		
12	02082	48-Inch Dia. Sanitary Sewer Manholes (12' to 16'), complete in place	EA	2		
13	02082	48-Inch Dia. Sanitary Sewer Manholes (20' to 22'), complete in place	EA	3		

14	02082	60-Inch Dia. Drop Sanitary Sewer Manholes (18' to 22'), complete in place	EA	2		
15	02082	Tie to Existing Manhole, complete in place	EA	1		
16		24-Inch Cap, complete in place	EA	1		
17		12-Inch Cap, complete in place	EA	1		
18		Installation of a new lift station. Lift Station to a depth of as per Plans and Specifications, power pole and electrical service, yellowmine discharge pipe and certalok plastic fittings to install yellowmine discharge pipe in wetwell, control panels, generator plug; 8' fencing and two (2) 12' wide galvanized gates per plans and specifications, fiberglass 19'-9" diameter wetwell with all penetrations made during manufacturing; with approved analog telemetry and service for 3 years transferable to the City of San Juan, electrical power (3-Phase) 480V and all panels (stainless) and racks; generator plug; safety hatches per pump manufacturer and per plans and specifications, steel pipe manifold with protective coatings and paint and air release valves, gate valves, ductile iron force main and fittings, gauges, as per plans and specifications; by pass pumping and dewatering included; any and all startup requirements for power, water, disposal, trucking to be included in pricing, complete in place	LS	1		
19		Self Priming Pumps (4) four, with discharge pipe and supports; complete in place.	EA	4		
20		VFD's installation for Self Priming Pump	EA	3		
21		Provide and install Biotrickling Odor Control System and all necessary components as per plans and specifications; including all labor,	LS	1		

		materials, and incidentals in order to construction and install fully operational odor control system; and items not on plans or specifications for fully operational system; complete in place.				
22		Bypass pumping Lift Station, Receiving Manhole; and Sewer Line; Complete in Place. Owner has the option to delete this item if the Engineer determines this item is not needed; by submitting this bid the Contractor agrees to the deduction.	LS	1		
23		Dewatering for Project utilizing Pumps and Temporary Wellpoints; obtaining of all permits; all use of water, et. al.	LS	1		
24		Installation of Pump Vault; constructed of concrete and steel rebar as per plans and specifications; complete in place.	LS	1		
25	02509	12-Inch PVC (C-900) Force Main, complete in place	LF	102		
26		Bore & 24-Inch Steel Casing, complete in place	LF	30		
27	02509	12-Inch 45 Degree Elbow, complete in place	EA	2		
28	05105	2-Inch Air Release Valve, complete in place	EA	1		
29	02745	Hot Mix Asphalt (2-Inch), complete in place	SY	70		
30	02717	8-Inch Flex Base, complete in place	SY	70		
31		8-Inch Subgrade Lime Stabilized, complete in place	SY	70		
32	01555	Traffic Control, complete in place	LS	1		
33	01020	Mobilization and Demobilization	LS	1		

ITEM NO.	SECTION NO.	ITEM DESCRIPTION	UNIT	UNIT QTY	UNIT PRICE	TOTAL
ALLOWANCES						
34		Betterment	ALW	1	\$250,000	\$250,000

BID ITEMS (1-34) – BASE BID: \$ _____ (IN FIGURES)

SUMMARY BID TABULATION

TABLE 1 – BID ITEMS 1-34

TOTAL AMOUNT OF BID (ITEMS 1-34) \$ _____

TOTAL AMOUNT OF BID (ITEMS 1-34 WRITTEN): _____

TABLE 2 ALTERNATIVE BID ITEMS:

ITEM NO.	SECTION NO.	ITEM DESCRIPTION	UNIT	UNIT QTY	UNIT PRICE	TOTAL
1		Installation of Atlas Copco PAC F66 Diesel Self Priming Backup Pump with all fittings, full tank of diesel; startup; manuals, 3 year warranty, complete in place.	LS	1		
2		Provide and install Overhead Bridge Crane; 2-Ton Capacity; utilizing steel construction with paint for corrosive use as per manufacturer; including 2 trolleys; electric lift with cables (SS); cable controls; panels, electrical components, footings, anchors, all labor for installation; fully functional for 4 pumps; including items not mentioned for fully functional system; complete in place.	LS	1		

ALTERNATIVE BID ITEMS (1-2) – BASE BID: \$ _____ (IN FIGURES)

SUMMARY BID TABULATION

TABLE 2 – ALTERNATIVE BID ITEMS 1-2

TOTAL AMOUNT OF BID (ITEMS 1-2) \$ _____

TOTAL AMOUNT OF BID (ITEMS 1-2 WRITTEN): _____

In the event of the award of a Contract to the undersigned, the undersigned will furnish a performance and payment bond for the full amount of the Contract, to secure proper compliance with the terms and provisions of the Contract, to insure and guarantee payment of all lawful claims for performed labor performed and materials furnished in the fulfillment of this Contract. The proposed work to be done shall be accepted when

fully completed and finished in accordance with the Plan and Specifications to the satisfaction of the Engineer.

The undersigned certifies that the bid prices contained in this Proposal have been carefully checked and are submitted as correct and final.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) days after the scheduled closing for receiving bids.

Unit and lump sum prices must be shown in figures for each item listed in the Bid Proposal form. Should bid prices on any item be omitted, the right is reserved to apply to the lowest prices submitted by and other bidders for the omitted items in payment for work done under this Proposal. In the event of discrepancies, the Owner reserves the right to accept or reject formalities.

The undersigned agrees, unless hereinafter stated otherwise to furnish all materials as shown on the Specification and Detail sheets.

Bidder hereby agrees to commence work under this contract within **ten (10) days** after the Notice to Proceed is issued and complete work within **five hundred and forty-eight (548) Calendar Days**.

Receipt is hereby acknowledged of the following agenda to the Contract Document.

Addendum No. 1 dated: _____ Received: _____

Addendum No. 2 dated: _____ Received: _____

Addendum No. 3 dated: _____ Received: _____

Addendum No. 4 dated: _____ Received: _____

Addendum No. 5 dated: _____ Received: _____

Bidder agrees that the Owner has the right to accept or reject any or all bids to waive any or all formalities.

Date: _____

Respectfully submitted:

Authorized Signor:

Type/Print Name (Authorized Signor):

Title:

Legal Company Name:

Address:

City, State and Zip Code:

Business Phone:

Cell Number:

Email Address:

(Seal – If bidder is a corporation)

SECTION 33211 SELF-PRIMING PUMPS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work under this section includes, but is not limited to, furnishing, and installing a factory built __ 4-plex ____ pump station as indicated on the project drawings, herein specified, as necessary for proper and complete performance.

1.02 REFERENCES

- A. 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.
1. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)
 - a. ANSI B16.1 Cast iron pipe flanges and flanged fittings.
 - b. ANSI/AWWA C115/A21.51 Cast/ductile iron pipe with threaded flanges.
 - c. ANSI 253.1 Safety Color Code for Marking Physical Hazards.
 - d. ANSI B40.1 Gages, Pressure and Vacuum.
 - e. AWWA C508 Single Swing Check Valves.
 2. American Society for Testing and Materials (ASTM)
 - a. ASTM A48 Gray Iron Castings.
 - b. ASTM A126 Valves, Flanges, and Pipe Fittings.
 - c. ASTM A307 Carbon Steel Bolts and Studs.
 - d. ASTM A36 Structural Steel.
 3. Institute of Electrical and Electronics Engineers (IEEE)
 - a. ANSI/IEEE Std 100 Standard Dictionary of Electrical Terms.
 - b. ANSI/IEEE Std 112 Test Procedure for Polyphase Induction Motors.
 - c. IEEE Std 242 Protection of Industrial and Control Power Systems.
 4. National Electric Code (NEC) / National Electrical Manufacturers Assoc. (NEMA)
 - a. NEC National Electric Code.
 - b. NEC 701 National Electric Code article 701.
 - c. NEMA Std MG1 Motors and Generators.
 5. Miscellaneous References
 - a. Ten-State Standards Recommended Standards for Sewage Works.
 - b. Hydraulic Institute Std for Centrifugal, Rotary and Reciprocating Pumps.
 - c. NMTBA and JIC Std. National Machine Tool Builders Association and Joint Industrial Council Standards
 - d. ISO 9001 International Organization for Standardization.

1.03 SYSTEM DESCRIPTION

- A. The contractor shall furnish and install one factory built, automatic pump station. The station shall be complete with all equipment specified herein; factory assembled on a common steel baseplate.
- B. The principal items of equipment shall include 4ea self-priming, horizontal, centrifugal, v belt motor driven sewage pumps, valves, piping, and integral station base. A pump motor control panel with thermal magnetic circuit breakers, VFD's, automatic liquid level control systems for normal and standby operation, and internal wiring.
- C. Factory built pump station design, including materials of construction, pump features, valves and piping, and motor controls shall be in accordance with requirements listed under PART 2 - PRODUCTS of this section.

1.04 PERFORMANCE CRITERIA

- A. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Each pump shall be selected to perform under following operating conditions:

1. Type of Pump	Self-Priming Centrifugal
2. Suction Size	8"
3. Discharge Size	6"
4. Pumps Required	4ea
5. Liquid Temperature	Ambient
6. Solid Size, Maximum	3"
7. Design Capacity (GPM)	800
8. Design Total Dynamic Head (FT)	80' / 128'
9. Maximum Repriming Lift (FT)	20'
10. Minimum Submergence Depth (FT)	1.5'
11. Minimum Pump Efficiency	62.5%
12. Maximum Motor Horsepower	60
13. Nominal Motor Speed	1750

- B. Station Power Requirements

- 1. Site power furnished to pump station shall be [3] phase, [60] hertz, [] volts, [4] wire, maintained within industry standards. 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.

1.05 SUBMITTALS

- A. Product Data

- 1. Prior to fabrication, pump station manufacturer shall submit submittal data in portable document format (.pdf) form for review and approval.
- 2. Prior to fabrication, pump station manufacturer shall submit electronic copies of submittal data for review and approval.

- B. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for equipment baseplate. 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.

- C. Operations Maintenance Manuals

- 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 with the 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 the 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 NFPA70. 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, engine, 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.

1.06 QUALITY ASSURANCE

- A. The pumps and pump station manufacturer must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. The pumps and pump station manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.
- C. 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.
- D. 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.
- E. The term "pump manufacturer" or "pump station manufacturer" shall be defined as the entity which designs, machines, assembles, hydraulically tests, and warrants 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.
- F. Pump Performance Certifications
 1. All internal passages, impeller vanes, and recirculation ports shall pass a 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance

shall not be permitted. Upon request from the engineer, manufacturer's certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

- a. 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 an occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.
- b. 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.
- c. The pump must reprime [20] vertical feet 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:
 - 1) A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal to (or greater than) the pump discharge diameter.
 - 2) 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.
 - 3) 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 90o elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.
 - 4) Impeller clearances shall be set as recommended in the pump service manual.
 - 5) 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.
 - 6) Liquid to be used for the reprime test shall be water.
- d. 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.

G. Factory System Test

1. All components including the pumps, motors, engine, 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 and capacity per acceptance grade 2B. The factory operational test shall duplicate actual performance anticipated for the complete station.
2. Upon request from the engineer, the operational test may be witnessed by the engineer, and/or representatives of his choice, at the manufacturer's facility.

H. 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.

1.07 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 be 100% for 5 years and include specific details described below. Pro-rated or 3rd party warranties shall not be acceptable.
 1. In addition to defects in material and workmanship, fiberglass reinforced polyester station enclosures (where applicable) are warranted 100% 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 100% 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 the 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 maintenance is performed in accordance with manufacturer recommendations. A start-up report completed 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.

PART 2 – PRODUCT

2.01 UNITARY RESPONSIBILITY

- A. The pump station system integrator must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. 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.

2.02 MANUFACTURER

- A. The specifications and project drawings depict equipment and materials manufactured are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The contractor shall prepare his bid based on the specified equipment for the purpose of determining the low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

2.03 UNIT BASE

- A. The unit base shall be comprised of structural steel with a perimeter flange and reinforcements. Perimeter flange and reinforcements shall be designed to prevent flexing or warping under operating conditions. The perimeter flange shall be drilled for hardware used to secure unit base to concrete pad as shown on the contract drawings. Unit base shall contain provisions for lifting the complete pump station unit during shipping and installation.

2.05 PUMP DESIGN

- A. 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.
- B. The pump manufacturer must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- C. Materials and Construction Features
 - 1. Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:
 - a. Fill port cover plate, 3 1/2" diameter, shall be opened after loosening a positive lock clamp bar assembly. In consideration for safety, cap screw threads must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A non-metallic gasket shall prevent adhesion of the fill port cover to the casing while assuring a reliable seal.
 - b. Casing drain plug shall be at least 1 1/2" NPT to ensure complete and rapid draining.
 - c. Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.
 - 2. Cover plate shall be cast iron Class 30. Design must incorporate the following maintenance features
 - a. Retained by acorn 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.
 - b. 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.
 - c. In consideration for safety, a pressure relief valve shall be supplied in the cover plate. Relief valve shall open at 75-200 PSI.
 - d. Two O-rings of Buna-N material shall seal cover plate to pump casing.
 - e. Pusher bolt capability to assist in removal of cover plate. Pusher bolt threaded holes shall be sized to accept same retaining caps crews as used in rotating assembly.
 - f. Easy-grip handle shall be mounted to face of cover plate.
 - 3. 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 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 lock screw 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 cap screws as used for retaining rotating assembly.
4. Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means.
 - a. Clearances shall be maintained by a four-point external shimless cover plate 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. Cover plate 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 cover plate side of the pump. The removal of stainless-steel shims 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.
 5. An externally removable suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished from the top of pump without disturbing the suction piping or completely draining the casing. 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.
 6. Pump shall include flange kit consisting of two female 125# NPT cast iron class 30 flanges suitable for attachment to suction and discharge ports.

D. Serviceability

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

2.06 VALVES AND PIPING

A. Check Valve

1. Each pump shall be equipped with a full flow type 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 rings 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.

B. Plug Valve

1. The discharge header shall include a 2- way plug valve to permit either or both pumps to be isolated from the common discharge header. Valves shall have ports designed to pass spherical solids equal to the pump's capability. The plug valve shall be non-lubricated, tapered type. Valve body shall be semi steel with flanged end connections drilled to 125-pound standard. Valve shall be furnished with a drip tight shutoff plug mounted in stainless steel bearings and shall have a resilient facing bonded to the sealing surface. Valve shall be operated with a single lever actuator providing lift, turn, and reseal action. The lever shall be equipped with a locking device to hold the plug in the desired position.

C. Automatic Air Release Valves

1. 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.
2. 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.
3. A cleanout port, three inches in diameter, shall be provided for ease of inspection, cleanout, and service.
4. Valves shall be field adjustable for varying discharge heads.
5. Connection of the air release valves to the station piping shall include stainless steel fittings.

D. Gauge Kit

1. Each pump shall be equipped with a glycerin filled compound gauge to monitor suction pressures, and a glycerin filled pressure gauge to monitor discharge pressures. Gauges shall be a minimum of 4 inches in diameter and shall be graduated in feet water column. Rated accuracy shall be 1 percent of full-scale reading. Compound gauges shall be graduated 34 feet to +34 feet water column minimum. Pressure gauges shall be graduated from 0 to 460 feet water column minimum.
2. Gauges shall be mounted on a resilient panel and frame assembly which shall be firmly secured to pumps or piping. Gauge installations shall be complete with all hoses and stainless-steel fittings and shall include a shutoff valve installed in each gauge inlet at the point of connection to suction and discharge pipes.

E. Piping

1. Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA A21.51/C115 and class 53 thickness.
2. Flanges shall be cast iron class 125 and comply with ANSI B16.1.
3. Pipe and flanges shall be threaded, and suitable thread sealant applied before assembling flange to pipe.
4. Bolt holes shall be in angular alignment within 1/20 between flanges. Flanges shall be faced with a gasket finish.

- F. Contractor must ensure 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.

2.07 DRIVE UNIT

A. Motors

1. Pump motors shall be 60 HP, 3 phase, 60 hertz, 480 VAC, horizontal TEFC 1800 RPM, NEMA design B with cast iron frame with copper windings, induction type, with class F insulation and 1.15 SF for 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.
2. Motors shall be tested in accordance with provisions of ANSI/IEEE Std 112.
3. Motor with engine shall be of a double shaft configuration.

2.08 FINISH

- A. 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.

2.09 ELECTRICAL COMPONENTS

- A. The pump station control panel will be tested as an integral unit by the pump station manufacturer. The control panel shall also be tested with the pump station as a complete working system at the pump station manufacturer's facility.
- B. The electrical control components shall be provided by the pump station supplier and shall be provided with the following features.
- C. Panel enclosure
 1. Enclosure shall be constructed in conformance with applicable section of National Electrical Manufacturers Association (NEMA) standards for type 4X Stainless Steel electrical enclosures. Enclosure shall be fabricated of Stainless steel having a minimum thickness of not less than 0.075 Inch (14 gauge). All seams shall be continuously welded and shall be free of burrs and voids. Interior and exterior surfaces shall be coated with a paint finish suitable for the NEMA classification of the enclosure. There shall be no holes through the external walls of the enclosure for mounting the enclosure or any components contained within the enclosure. Panel enclosure up to 60" x 36" x 12" shall be mounted on floor stands and secured to pump base.
 2. Enclosure shall be equipped with a door mounted on a continuous steel hinge and sealed around its perimeter. Door shall be held closed with clamps that are quick and easy to operate. The door shall accommodate the mounting of switches and indicators.
 3. 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.

4. 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. All control devices and instruments shall be secured to the sub-plate with machine screws and lock washers. Mounting holes shall be drilled and tapped; Self tapping screws shall not be used to mount any components. All connections from the back panel to door mounted or remote devices shall be made through terminal blocks. All control devices shall be clearly labeled to indicate function.

D. UL Label Requirement

1. Pump station controls shall conform to third party safety certification. The panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". The enclosure, and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.

E. 750 VA Control Power Transformer

1. The lift station shall be equipped with a 750 VA step-down transformer to supply 115-volt, AC, single phase for the control equipment.

F. 5 kVA Auxiliary Power Transformer

1. The lift station shall be equipped with a 5 KVA step-down transformer to supply 115-volt, AC, single phase for the control and auxiliary equipment. The primary and secondary side of the transformer to be protected by a thermal magnetic circuit breaker, sized to meet the power requirements of the transformer. An operating mechanism shall penetrate the control panel door and a padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

G. Motor Branch Circuit Components

1. Main Connections

- a. A main terminal block and ground lug shall be furnished for field connection of the electrical supply. The connections shall be designed to accept copper conductors of sufficient size to serve the pump station loads. The main terminal block 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 terminal block. Ten percent of the control terminals shall be furnished as spares.
- b. All motor branch and power circuit components shall be of highest industrial quality. The short circuit current rating of all power circuit devices shall be a tested combination or evaluated per the National Electrical Code Article 409. The lowest rated power circuit component shall be the overall control panel short circuit rating and shall not be less than the fault current available. The minimum control panel rating shall not be less than 10 kA, rms symmetrical. Control assemblies operating at 120 volts nominal or less may be provided with transformers which limit the fault current and may be rated less than the minimum required short circuit rating.

2. Circuit Breakers and Operating Mechanisms

- a. A properly sized heavy duty air circuit breaker shall be furnished for each pump motor. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.
- b. 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. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

3. Motor Starters

4. The variable frequency drive shall be capable of operation under any combination of the following conditions without mechanical or electrical damage. Ambient Temperature: 0 to + 40 degrees C

- a. Relative Humidity: Less than 95% non-condensing
 - b. Altitude: Less than 1,000M (3300 ft) above sea level
 - c. Vibration: .006 inches displacement, 1G peak
 - d. Shock: 15G peak for 11mS (+/- 1.0mS)
 - e. Control Specification
 - f. Control System: Sinusoidal pulse width modulated voltage waveform
 - g. Frequency Accuracy: +/- 0.4% of max. frequency
 - h. Volts/Hertz Ratio: V/Hz user programmable
 - i. Operation Frequency: 0 to 400 Hz
 - j. Overload Capacity: 110% Overload capability for up to 1 minute, 150% Overload capability for up to 3 seconds
5. Digital Readout and Monitor
- a. Interface to the drive is provided via a module with integral LCD display. Unit is a 7 line by 21-character backlit LCD display with graphics capability. It is used to display drive operating conditions, fault / alarm indications and programming information with full text support in multiple languages, including but not limited to English, German, French, Italian, Spanish, Portuguese, and Dutch. The unit will display standby status (power on, not running), output frequency (drive run), set-up parameters and fault. With keypad, user can monitor current, voltage, frequency, acceleration and deceleration time, minimum frequency, and maximum frequency. Readout also provides inverter status and protective circuit status.
6. Protection
- a. The variable speed drive system shall include a diode or fully gated 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.
7. The system protection will provide the following:
- a. Intermittent overload - 50 to 150%
 - b. Current limit - 50 to 115%
 - c. Overcurrent - 220-300% of rated output current
 - d. Inverse time overload - 50 to 100%
 - e. Short circuit - Phase to phase or phase to ground
 - f. Overvoltage - 10% above input line or DC bus voltage
 - g. Undervoltage - 10% below line voltage
 - h. Power loss ride-through - 500mS
8. 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:
- a. Overcurrent
 - b. Short circuit
 - c. Overload
 - d. Overvoltage
 - e. Undervoltage
 - f. Overheat
 - g. Ground fault
 - h. Motor stalled

- i. Power supply fault
9. Auto restart shall occur when the inverter faults. Auto restart shall be adjustable up to 9 attempts with a 0.5 to 30 second interval. Auto restart will not be attempted for ground fault, output shorted, transistor shorted or internal microprocessor fault but will trip out immediately, activate the fault relay and make the appropriate indication on the display.
 10. In the event of a fault trip, the microprocessor shall save the status of the inverter at the time of the fault and make that information available on the digital display. Information regarding the last 4 faults is maintained in event of a power loss.
 11. Operational Functions:
 - a. Acceleration and deceleration time independently adjustable from 0.1 to 3600.0 seconds (selectable ranges).
 - b. Volts/Hertz patterns user selectable.
 - c. Maximum and minimum frequency limit adjustments.
 12. The Control System shall include pump priming protection as part of the PLC Programming. The pumps will start at higher speed to ensure proper reprime and then slow the pump down to hit the most efficient speed/ operating point.
- H. Three Phase Voltage Monitor
1. The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, high voltage, low voltage, and voltage unbalance. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart, following an adjustable time delay, when power conditions return to normal.
- I. Transient Voltage Surge Suppressor
1. All Control Panels shall have Surge Protective Devices installed immediately after the main overcurrent device or immediately after the supply conductors to the panel have been terminated. The Surge Protective Device(s) shall follow IEEE C62.41 recommendation for cascading to protect all voltage levels to and including 24 volts AC/DC and shall be as follows:
 2. Be UL 1449 3rd Edition Recognized for UL Type 2 applications except at 48 volts AC/DC and below may be UL 1449 3rd Edition for Type 3 applications.
 3. Provide suppression for both normal mode (L-N [Wye]) and common mode (L+N-G [Wye] or L-G [Delta]).
 4. Have a Surge Current Capacity (Imax) of at least 40kA.
 5. Have a Nominal Surge Current Rating (In) of 20kA.
 6. Have SCCRs of 200kA, except that 347Y/600V, 240/480V High leg Delta and 347V single-phase SPDs shall have a minimum SCCR of 125kA.
 7. Use MOV technology with thermal disconnect.
 8. Be RoHS compliant.
 9. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.
 10. Hardwired Listed Type 1 or Type 2 Surge Protective Devices Shall:
 - a. All Type 1 or Type 2 surge protective devices shall be manufactured by a single ISO-9001 registered company normally engaged in the design, development, and manufacture of such devices for electrical distribution system/ equipment protection. Surge protective devices shall be UL Listed with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (In) of 20kA, and Surge Current Capacity (Imax) of 120kA, 200kA, 300kA or 400kA. These SPDs shall be installed in

accordance with the NEC® and/or local code requirements. The said manufacturer shall offer a minimum five (5) year warranty for its Type 1 and Type 2 surge protective devices.

- b. The hardwired surge protective device shall have specifications as shown below:
 - 1) The Maximum Continuous Operating Voltage (MCOV) shall not exceed 25% on Wye and 40% on Delta systems of the nominal voltage (system voltage) in the configuration being used
 - 2) Prewired NEMA 1 or NEMA 4X factory sealed enclosure suitable for the intended installation location
 - 3) Shall have a two-color LED status indicator per phase
 - 4) Have an operating temperature range of at least -40°C to +50°C
 - 5) Only use thermally protected MOV technology, such as Bussmann SurgePOD™.
- c. Surge Protective Device Agency Information: SPDs shall be "Listed" by Underwriters Laboratories, Inc. to UL 1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA2 for Canada; and must have CSA certification.
- d. Manufacturers must provide verification of performance data for UL and CSA standards.
- e. All SPDs must be RoHS compliant.
- f. Surge protective devices shall be installed and located in accordance with all applicable gency, NEC® and local code requirements. The SPDs must be suitable for the particular installation, be it on the upstream side (Type 1) or downstream side (Type 1 or Type 2) of service entrance Overcurrent Protective Device (OCPD).
- g. All SPDs shall match voltage and system specific requirements as provided by the manufacturer.
- h. All SPDs shall provide surge protection for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye] or L-G [Delta]).
- i. Surge protective device shall be clearly marked with specifications as required by UL 1449 3rd Edition along with UL holographic label on the SPD.
- j. Each surge protective device should be serial numbered along with barcode for easy identification and traceability.

J. Other Components

- 1. The PLC shall be an Allen-Bradley CompactLogix 5370 L2 Control System. The PLC shall be equipped with a CPU with 750KB [1769-L16ER] or 1MB [1769-L18ERM] of user memory, and two EtherNet/IP communication ports supporting ring topologies and 1 USB port for firmware download and programming. The Controller shall utilize the small applications 1769 I/O modules. The Controller shall be designed to implement consumed tag, event instruction, embedded inputs, remote I/O, axis, and motion event triggers. The controller shall be equipped to handle up to 32 Controller Tasks and 100 programs/task.
- 2. The PLC shall operate on 24VDC power and be equipped with a 24VDC embedded power supply. A 1784-SD1 (1GB) Memory Module shall be shipped with the controller. The controller will contain, at least but not limited to, embedded digital I/O [16DC Inputs, 16DC Outputs]. The controller shall accept all 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 on the processor as well as on a programmable, read only 1 GB SD card [shipped with controller]. 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 PLC shall communicate with the drive using an EtherNet/IP but can also support other communication protocols such as ControlNet, or DeviceNet networks. The PLC shall issue drive start/stop and speed commands. Drive status shall also be communicated to the PLC using EtherNet/IP. The drive shall be configured to operate manually without the use of the PLC.
- 5. An Allen-Bradley PanelView Plus 6 1000 electronic operator interface shall be provided for data entry and display. The Operator Interface Display size will be at least 10 inches with Color active matrix, thin film transistor (TFT), liquid crystal display (LCD). The operator interface shall have an 18-Bit color

graphic resolution with backlight CCFL of 50,000 hours minimum. The operator interface shall be mounted on the front of the control panel with other operator controls and shall be compatible with the PLC communication protocol. The operator interface shall be a backlit, touch-screen terminal. The operator interface program shall be stored externally on a Secure Digital (SD) card.

6. Electromechanical relays and timers, when used shall be equipped with 120vac coils and contacts rated NEMA A-300 minimum. Timers shall be pneumatic or synchronous motor driven.
7. 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.
8. Pump mode selector switches shall be connected to permit manual start and manual stop of each pump motor individually. Manual operation shall override shutdown systems supplied with the level control system except motor overload.
9. Pump alternation shall be integral to the PLC. Provisions for automatic alternation or manual selection shall also be integral to the PLC.
10. A push button switch shall be provided to silence one of the 115-volt AC alarm circuits while corrective actions are underway. Depressing the alarm silence pushbutton shall also cause the high-water alarm circuit (low water alarm optional) to reset when the liquid level has been lowered.
11. High Pump Temperature Shutdown Circuit
 - a. A high pump temperature protection circuit shall override the level control and shut down the pump motor(s) when required to protect the pump from excessive temperature. A thermostat shall be mounted on each pump casing and connected to the PLC. If casing temperature rises to a level sufficient to cause damage, the thermostat N.O. contact shall close indicating a high pump temperature condition to the PLC. The PLC will then interrupt power to the pump motor. The operator interface terminal will display an alarm banner indicating the motor stopped due to high pump temperature. The motor shall remain locked out until the pump has cooled and circuit has been manually reset. Automatic reset of this circuit is not acceptable.
12. Elapsed Time Meter
 - a. Six-digit elapsed time meter shall be displayed on the operator interface terminal to indicate total running time of each pump in "hours" and "tenths of hours". Pump runtime shall be adjustable, and password protected.
13. Indicating Lights
 - a. Indicating lights shall be provided on the operator Interface terminal to alert the user of the following conditions:
 - 1) Pump Run
 - 2) Pump Fault
 - 3) Wet Well Level Alarm Conditions
 - 4) Engine Run
 - 5) Engine Fail
 - b. Physical indicating lights shall be oil tight type and equipped with integral step-down transformers for long lamp life. Lamps shall be incandescent type rated 14 volts or less. Lamps shall be replaceable from the front without opening the control panel door and without the use of tools. Physical indicating lights will be provided for the following functions:
 - 1) Normal Power Available
 - 2) General Alarm
 - 3) Check Engine
14. Wiring
 - a. The pump station components, as furnished by the manufacturer, shall be completely pre-wired. (Note: If control panel is opted to be shipped loose, the pump station as furnished by the

manufacturer shall be completely pre-wired except for the power feeder lines and final connections to pump motors, engine, and remote alarm devices. The interconnecting wire, conduit, and other materials required shall be furnished and installed by the electrical contractor.)

- b. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications for industrial controls set forth by the Joint Industrial Council (JIC), National Machine Tool Builders Association (NMTBA), and the National Electric Code (NEC).
- c. All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:
 - 1) Line and load circuits, AC or DC power black
 - 2) AC control circuit less than line voltage red
 - 3) Interlock control circuit, from external source yellow
 - 4) Equipment grounding conductor green
 - 5) Current carrying ground white
 - 6) Hot with circuit breaker open orange

15. Wire Identification and Sizing

- a. Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Wiring in conduit shall be 14 gauge minimum. Motor branch wiring shall be 10 gauge minimum.
- b. Motor branch conductors and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered at each end in conformance with applicable standards. All wire connectors in the control panel shall be of the ring tongue type with nylon insulated shanks. All wires on the sub plate shall be bundled and tied. All wires extending from components mounted on door shall be terminated on a terminal block mounted on the back panel. All wiring outside the panel shall be installed in conduit

16. Control conductors connecting components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be allowed so that the door can swing to its fully open position without undue mechanical stress or abrasion on the conductors or insulation. Bundles shall be clamped and held in place with mechanical fastening devices on each side of the hinge.

K. Conduit requirements are as follows:

- 1. All conduit and fittings shall be UL listed.
- 2. Liquid tight flexible metal conduit shall be constructed of a smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover.
- 3. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code.
- 4. Conduit shall be sized according to the National Electric Code.

L. Grounding

- 1. The pump station manufacturer shall ground all electrical equipment to the enclosure back panel. The mounting surface of all ground connections shall have any paint removed before making final connections.
- 2. The contractor shall provide an earth driven ground connection to the control panel at the main ground lug in accordance with the National Electric Code (NEC).

M. Equipment Marking

- 1. Permanent corrosion resistant name plate(s) shall be attached to the control and include following information:
 - a. Equipment serial number
 - b. Control panel short circuit rating
 - c. Supply voltage, phase and frequency

- d. Current rating of the minimum main conductor
 - e. Electrical wiring diagram number
 - f. Motor horsepower and full load current
 - g. Motor overload heater element (If applicable)
 - h. Motor circuit breaker trip current rating
 - i. Name and location of equipment manufacturer
2. Control components shall be permanently marked using the same identification keys shown on the electrical diagram. Labels shall be mounted adjacent to device being identified.
 3. Switches, indicators, and instruments mounted through the control panel door shall be labeled to indicate function, position, etc. Labels shall be mounted adjacent to, or above the device.
- N. 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.
1. The O&M manual shall be provided with complete ladder logic program documentation including English names, rung comments, and coil/contact cross-references.
 2. The control shall be pre-programmed or wired to provide the following routines:
 3. Pump alternation at lead stop
 4. Excessive pump run time alternation
 5. Jump to next pump on lead failure
 6. Start/stop pumps at normal level settings
 7. Pump start delays when called simultaneously
 8. General alarm pilot light activation: Quick flashing alarm/slow flashing acknowledge/ steady on reset/off when clear
 9. Station trouble alarm (115vac and normally open dry contact)
 10. High- and low-level alarms
 11. Pump start/stop level control
 12. Drive speed/level control (If supplied with VFDs)
 13. Pump high temperature shutdown
- Drive fault alarm
- O. The operator interface shall be equipped with the following displays and functions:
1. Main Menu
 2. Wet Well Level
 3. Wet Well Level Simulation
 4. Low Water Alarm Status
 5. High Water Alarm Status
 6. Pump High Temperature Status #1, #2
 7. Drive Fault Status #1, #2 (If VFDs are supplied)
 8. Pump Fault Statue #1, #2 (If FVNR or RVSS starters are supplied)
 9. Pump Sequence Selection

10. Alarm Silence
11. Alarm Reset
12. General Alarm Lamp Test
13. Lead Level Start/Stop Setpoints
14. Lag Level Start/Stop Setpoints
15. Low Water Alarm Setpoints
16. High Water Alarm Setpoints
17. Speed/Level Setpoints 1 pump running (Speed settings if VFDs are supplied)
18. Speed/Level Setpoints 2 pumps running (Speed settings if VFDs are supplied)
19. Power-up Delay Setpoint
20. Alarm Delay Setpoint
21. Pump Start Delay Setpoint
22. Alternation Time Interval Setpoint
23. Level Transmitter Calibration

2.10 LIQUID LEVEL CONTROL SYSTEM

- A. The manufacturer of the liquid level control system must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. Sequence of Operation with Utility Power
 1. The level control system shall start and stop the pump motors in response to changes in wet well level, as set forth herein. The level control system shall utilize the PLC sequencer to select first one pump, then the second pump and third or fourth pump if required, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle or if one pump runs as the lead pump for an excessive time.
 2. Level and speed controls shall include logical comparator setpoints. Settings shall be provided to control the levels at which the pumps start and stop as well as level endpoints for minimum and maximum speed. Two sets of speed setpoints shall be provided. The first set will be enabled when a single pump is running. The second set shall be enabled when two pumps are running. Each of the settings shall be adjustable and accessible to the operator without opening the control panel. Controls shall be provided to permit the operator to read and adjust the selected levels and speeds on the operator interface. Setpoint adjustments which require hard wiring, the use of electronic test equipment or artificial level simulation are not acceptable.
 3. Upon operator selection of automatic operation, the PLC shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the PLC shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the PLC shall start the second pump when the liquid reaches the "lag pump start level" so that both pumps are operating.
 4. When a single pump is running and the wet well is equal to the "1 pump minimum level", the drive will run at the "1 pump minimum speed". As the level rises, drive speed will increase to the "1 pump maximum speed" when the wet well level is equal to the "1 pump minimum level". Likewise, when two pumps are running, the "1 pump" settings will be disabled, and the control will use the "2 pump" level and speed settings.

5. Level control range shall be 0 to 12.0 feet of water. Speed control range shall be 20.0 to 60.0 hertz. Overall repeat accuracy shall be (plus/minus) 0.1 feet of water or hertz.

C. Alarms and shutdown routines shall operate as follows:

1. Condition abnormal: The general alarm pilot light will quick flash until acknowledged, then slow flash until reset, then glow steady until condition returns to normal, then off. The operator interface will display the alarm when acknowledged. The external alarms will be active until silenced, and then off.
2. Condition abnormal then returns to normal: The general alarm pilot light will quick flash until silenced, then slow flash until reset, then off. The operator interface will display the alarm when acknowledged. The external alarms will be active until silenced, and then off.
3. Subsequent alarms will re-alarm when silenced or reset.

E. Radar Transmitter Level Sensor

1. The level control system shall utilize a VEGA radar level transmitter housed in a NEMA 4X electrical enclosure with a sensor designed to mount at the top of the wet well. The transmitter shall provide a proportional level signal for distribution to the display and electronic comparators of the electronic pressure switch, and remainder of the level control system. Transmitter full scale operating range shall be 1-31 ft. and shall provide a 4 20mA output signal. The sensor shall have a 8° beam angle, and a pressure range of -10 - +50 PSIG minimum. The transmitter shall be a microprocessor-based unit capable of easy calibration.

2.11 Alarm Light (External)

1. The station manufacturer will supply one 115-volt AC alarm light fixture with vapor-tight red globe, guard, conduit box, and mounting base. The design must prevent rainwater from collecting in the gasketed area of the fixture, between the base and globe. The alarm light will be shipped loose for installation by the contractor.

2.12 Alarm Horn (External)

1. The station manufacturer will supply one 115-volt AC weatherproof alarm horn with projector, conduit box, and mounting base. The design must prevent rainwater from collecting in any part of the horn. The alarm horn will be shipped loose for installation by the contractor.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at the time of delivery.

- B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.
- C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.
- D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnect before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.03 FIELD QUALITY CONTROL

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

3.04 Manufacturer's Start-up Services

- 1. Co-ordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. He will calibrate and adjust instrumentation, correct, or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.05 CLEANING

- A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap, and debris.

3.06 PROTECTION

- A. The pump station should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect station controls and interior equipment from cold and moisture.

END OF SECTION