

**ADDENDUM NO. 1  
TO  
CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS  
FOR  
CIBOLO CREEK MUNICIPAL AUTHORITY**

**SELF-PRIMING CENTRIFUGAL PUMP SYSTEMS FOR  
ODO J. RIEDEL REGIONAL WATER RECLAMATION PLANT**

TO: PROSPECTIVE OFFERORS

The Contract Documents and Technical Specifications shall be modified as required by the following items:

**I. Contract Documents**

1. Invitation for Bid: Bid Date and Time extended to June 29, 2017, at 2:00 p.m. CDT.
2. Sale of Equipment Agreement: Section 1. Modified to delete reference to a belt filter press and insert reference to "three (3) self-priming centrifugal pump systems." In addition the IFB no. was corrected.

**II. Technical Specifications**

1. Section 11070 : Pump, Self-Priming Centrifugal
  - A. Add Paragraph 2.3.C.5:  
Power supply to the motors shall be 460 volts, three phase.
  - B. Modify Paragraph 2.8.E.5  
Controls shall be variable torque performance.
  - C. Add Paragraph 2.8.F:  
Process PID Control
  - D. Modify Paragraph 2.8.G.1:  
Add Toshiba drives to the list of available manufacturers.
  - E. Modify Paragraph 2.8.H.1.b:  
VFD enclosure shall be unpainted stainless steel, type NEMA 4X.
  - F. Modify Pump Data Sheet (End of Section)  
The specified pump speed listed shall be the maximum.  
The minimum NPSH available for PMP-190-01 shall be 9.0 ft.

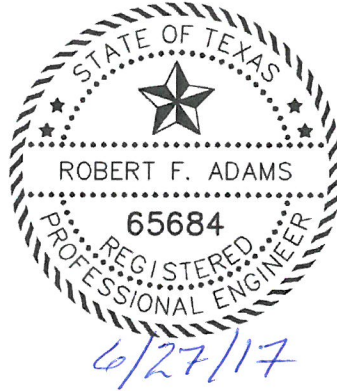
All items in conflict with this addendum are hereby deleted.

THIS ADDENDUM IS MADE PART OF THE SPECIFICATIONS AND IFB DOCUMENTS, AND SHALL BE ACKNOWLEDGED ON THE BID FORM AND ON THE BID ENVELOPE.

ALAN PLUMMER ASSOCIATES, INC.  
TBPE Firm No. 13



Robert F. Adams, P.E.  
June 27, 2017



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**INVITATION FOR BIDS**

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Issued By: Cibolo Creek Municipal Authority

Date Issued: June 7, 2017

Invitation For Bid No. 2017-002

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**INVITATION FOR BIDS FOR THE PURCHASE OF  
THREE (3) SELF-PRIMING CENTRIFUGAL PUMP SYSTEMS  
FOR  
ODO J. RIEDEL REGIONAL WATER RECLAMATION PLANT  
12423 AUTHORITY LANE, SCHERTZ, TEXAS**

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Sealed bids addressed to Cibolo Creek Municipal Authority, (“CCMA”) 100 Dietz Road, Schertz TX 78154 will be received until **2:00 PM CDT, June 29, 2017.** It is Bidder’s responsibility to ensure its bid is delivered to CCMA timely. CCMA shall reject any bid received after **2:00 PM CDT, June 29, 2017** at such time the bids shall be publicly opened and read aloud for furnishing equipment as described herein below: 1

To receive an Adobe portable document format (pdf) of the Invitation for Bids (“IFB”) documents, please email CCMA representative, Brandon Bradley ([bbradley@ccmatx.org](mailto:bbradley@ccmatx.org)) or call (210) 658-6241 or the document may be obtained through CCMA’s website: <http://www.ccmatrix.org> All communications relating to this IFB shall cite the above IFB number and be directed to Mr. Bradley.

QUESTIONS REGARDING THIS IFB MUST BE PRESENTED TO CCMA IN WRITING and shall be submitted electronically to the above email address by June 21, 2017 in order for answers to be obtained and disseminated in a timely manner, since CCMA does not expect to extend the bid submission date. Oral communications are not acceptable in response to this Solicitation.

Questions shall not be directed to CCMA’s technical personnel or consultants. CCMA will transmit to all prospective Bidders written response to all written questions received. Questions received after June 21, 2017 will not be answered. Oral statements by CCMA may not be relied upon and will not be binding or legally effective.

This IFB includes the following documents:

- |  |   |
|--|---|
| Invitation for Bids                      | Required Forms and Specifications*          |
| Invitation for Bid Form*                 | Bid Form*                                   |
| Mailing Instructions                     | Terms and Conditions of Invitation for Bids |
| Specifications for Items to be Purchased | Form of Sale of Equipment Agreement         |
| Exhibit A – Project Location             |   |

\* *Items that may be submitted in response to this IFB.*

**MAILING INSTRUCTIONS**

**MAIL TO:** CIBOLO CREEK MUNICIPAL AUTHORITY  
100 DIETZ ROAD  
SCHERTZ, TX 78154

**MARK ENVELOPE:**

IFB No. 2017-002

FIRM NAME: \_\_\_\_\_

FIRM ADDRESS: \_\_\_\_\_

\_\_\_\_\_  
FIRM CITY, STATE, ZIP CODE: \_\_\_\_\_

PURCHASE OF THREE (3) SELF-PRIMING CENTRIFUGAL PUMP SYSTEMS  
FOR ODO J. RIEDEL REGIONAL WATER RECLAMATION PLANT  
12423 AUTHORITY LANE, SCHERTZ, TEXAS


BID OPENING TIME & DATE: \_\_\_\_\_ **2:00 PM, JUNE 29, 2017** \_\_\_\_\_



## SALE OF EQUIPMENT AGREEMENT

This Sale of Equipment Agreement (“Agreement”), is entered into as of the Effective Date of \_\_\_\_\_, 2017, by and between **Cibolo Creek Municipal Authority**, located at 100 Dietz Road, Schertz, Texas 78154 (“Buyer” or “CCMA”), and (insert name of company selling the equipment), a (insert State of organization and type of entity), located at \_\_\_\_\_ (“Seller”) (collectively, the “Parties” and individually, a “Party”).

### TERMS

1. Description of Equipment. Buyer agrees to purchase from Seller the following equipment: three (3) self-priming centrifugal pump packages (“Equipment”), which shall comply with the specifications of CCMA IFB # IFB 2017-002 (“Specifications”), and as further described in Seller’s attached proposal. The Seller acknowledges and agrees if there is any conflict between the Specifications and Seller’s proposal, the Plans and Specifications shall control. 
2. Purchase Price. The total price for the Equipment is \$\_\_\_\_\_ (“Purchase Price”). Payment shall be made by Buyer within net forty-five (45) days of issued date of an invoice properly submitted unless Buyer has rejected the Equipment. Payment by Buyer shall not constitute any acceptance by Buyer of the delivery, quantity, fitness for the intended purpose or the invoiced amount or the performance by Seller of its obligations and shall not waive any of Buyer’s options for recourse under this Agreement. Upon notice to Seller, Buyer shall have the right to deduct or offset payments owed to Seller for costs, including, but not limited to, additional inspection costs and costs to replace non-conforming Equipment, including transportation costs. Disputed invoices shall be paid only after resolution of the dispute.
3. Tax Exempt. The Parties recognize that CCMA is exempt from payment of State of Texas limited sales excise and use taxes. Seller shall not include such taxes in the Purchase Price. An exemption certificate will be signed by CCMA where applicable upon request by bidder after contract award.
4. Delivery. Time is of the essence under this Agreement. Seller will deliver the Equipment to Buyer at the **Odo J. Riedel Regional Water Reclamation Plant**, located at 12423 Authority Lane, Schertz, Texas 78108, no later than \_\_\_\_\_, 2017 (“Delivery Date”). If Seller fails to meet the Delivery Date, Seller agrees to pay all costs for expedited shipment of the Equipment to permit Buyer to receive the Equipment as soon as possible.
5. Risk of Loss. The risk of loss from any damage to the Equipment, regardless of the cause, shall be on Seller until Buyer has accepted the Equipment.
6. Warranty of Workmanship. Seller warrants to Buyer that the Equipment is free from substantial defects in workmanship and materials and shall meet the specifications required by Buyer (“Warranty”). The Warranty shall remain valid for twenty-four (24) months from the Delivery Date.

**SECTION 11070**  
**PUMP, SELF-PRIMING CENTRIFUGAL PUMP PACKAGE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. None

1.2 SUMMARY

A. Section Includes:

1. Framework and skid
2. Skid mounted self-priming centrifugal pump with chopping impeller
3. Control panel (variable frequency drives)
4. Installation, startup, testing, placing in service assistance, training of the OWNER's personnel

B. Scope of work:

1. Furnish, install, test and place in operation three separate pump skids each with a self-priming centrifugal pump with chopping impeller. Two units to be located at the existing intermediate lift station and one unit to be located at the existing headworks.
2. Equipment Manufacturer shall be responsible to coordinate the testing and installation of the pumping units and for the adequacy and compatibility of the pump and motor.

C. Related Sections:

1. None

1.3 REFERENCES (NOT USED)

1.4 SYSTEM DESCRIPTION

A. Design Requirements:

1. All equipment including controls and drives specified herein shall be specifically designed for this service and the environment encountered in this installation.
2. Equipment shall be designed and capable of either continuous or intermittent operation.
3. All equipment, supports, anchors and fasteners shall be of adequate strength to withstand loads associated with starting, turbulence, thrusts from liquid movement, thermal expansion and contraction and other loads encountered under normal operating conditions.
4. Pump must have the necessary characteristics and be properly selected to perform under the stated operating conditions.
5. Consideration shall be given to the service anticipated, in which occasionally debris will lodge between the pump suction check valve and seat, resulting not only in the loss of liquid in the suction leg, but also in the siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal with proper installation of air release line free to atmosphere.
6. In consideration of such occurrence and of the unattended operation intended, each pump shall be so designed as to retain adequate liquid in the pump casing to insure unattended automatic re-priming while operating at its rated speed in a completely open system without suction check valves and with a dry suction leg.
7. Summary:
  - a. One skid; mounted with self-priming centrifugal pump (with chopping impeller) to be installed at the existing headworks to pump sewage from the elevated headworks structure to the 'old' headworks structure near existing primary clarifiers A & B.
  - b. Two skids; each mounted with a self-priming centrifugal pump (with chopping impeller) to be installed at the existing intermediate lift station A and the

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existing intermediate lift station C to pump sewage from the existing intermediate lift station boxes to the existing aeration basin.

B. Service Conditions:

1. Liquid Pumped: Slurries of sewage, rags, debris, floatable solids, and other organic solids.
2. Refer to Pump Data Sheet at the end of this section for additional requirements.

1.5 PERFORMANCE REQUIREMENTS:

- A. Guaranteed Performance: Transfer the product at the operating conditions as listed in the Pump Data Sheet.
- B. Pumping Unit System: Comply with performance requirements specified, as determined by testing assemblies representing those indicated for this Project.

1.6 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating ranges of the pump, from shutoff to maximum capacity.
    - a. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
  3. Wiring Diagrams: If applicable, for power, signal, and control wiring diagrams, including terminals and numbers.
  4. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and include any motor specifications.
  5. Documentation demonstrating factory finish is equivalent to finish system specified in this Section.
- C. Information Submittals:
  1. Factory functional and performance test reports and logs.
  2. Manufacturer's Certification of Compliance.
  3. Special shipping, storage and protection, and handling instructions.
  4. Manufacturer's instructions for installation.
  5. Manufacturer's Certificate of Proper Installation.
  6. Qualification Data: For manufacturer and manufacturer's representative.
  7. Suggested spare parts list to maintain the equipment in service for a period of two years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current pricing information.
  8. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
  9. Warranties and service agreements.
- D. Operation and Maintenance Data: For each pumping system, include the operation and maintenance manuals in accordance with Paragraph 3.4 "Operation and Maintenance Data."

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  1. Pumping units shall be the product of a manufacturer having at least ten (10) installations of identically sized equipment in the United States of the type proposed, each with a minimum of five (5) years of satisfactory service.
  2. A list of similar installations shall be furnished with the shop drawing submittal, including names and telephone numbers of contacts.

- B. Manufacturer's Representative Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- C. Source Limitations: Equipment units of each type specified in this section shall be supplied by a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store pumping system components in accordance with manufacturer's written instructions.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the pumping unit skid that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five (5) years from date of Substantial Completion.
  - 2. Cost for the removal, shipment, repair or replacement, and installation of components by SUPPLIER shall be included in warranty, as well as replacement of defective work.

## 1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. One (1) set of the following spare parts shall be furnished for each skid unit provided under this specification:
    - a. Two (2) Cover plate O-rings.
    - b. One (1) Mechanical seal complete with shaft sleeve.
    - c. One (1) Set impeller clearance adjustment shims.
    - d. Bearings, each size and type.
    - e. Spare belt set.
  - 2. Special tools required for maintenance or adjustment.
  - 3. Other items as recommended by manufacturer.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Gorman-Rupp Pumps
  - 2. Pioneer Pump
  - 3. All Prime Pumps
  - 4. Godwin Pumps (Xylem)
  - 5. WEMCO Pumps

### 2.2 PUMPING UNIT CONSTRUCTION

- A. Pump Type: Horizontal, non-clogging, self-priming centrifugal type, designed specifically for the application.
- B. Pump Casing: Cast iron, ASTM A48, Class 30, 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, with a Teflon gasket, shall be opened after loosening a hand nut/clamp bar assembly.
  - 3. Casing Drain Plug: 1-1/4" NPT.



- C. Cover Plate: Cast iron, Class 30, incorporating the following features:
1. Retained by hand nuts for complete access to pump interior. Removal shall 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.
  2. Wear Plate, Self-Cleaning:
    - a. Carbon steel, ANSI No. 1015, replaceable, secured to the cover plate by weld studs and nuts.
    - b. Impeller Clogging Prevention:
      - 1) Prevent impeller clogging from 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.
      - 2) Provide one or more notches and/or recesses along a common diameter of the wearplate to disturb and dislodge any debris which might otherwise remain on the impeller in dynamic operation.
  3. Pressure Relief Valve: Provide, mounted in cover plate, set to open at 75-200 PSI.
  4. O-rings: Buna-N material; seal cover plate to pump casing.
- D. Rotating Assembly: A rotating assembly, consisting of impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, shall be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:
1. Seal Plate and Bearing Housing: Cast iron, Class 30; with separate oil filled cavities, vented to atmosphere, provided for shaft seal and bearings; cavities cooled by the liquid pumped. Three lip seals to prevent leakage of oil.
    - a. Bearing Cavity: Provide an oil level sight gauge and fill plug check valve.
    - b. Seal Cavity: Provide an oil level sight gauge and fill/vent plug.
    - c. Double Lip Seal: Provide an atmospheric path for positive protection of bearings, with capability for external drainage monitoring.
  2. Impeller:
    - a. Ductile iron, hardened to Brinell 400.
    - b. Chopping impeller to handle raw sewage, which may contain rags and other debris.
    - c. Two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lockscrew and conical washer.
  3. Shaft: AISI 4140 alloy steel.
  4. Bearings: Anti-friction ball; oil lubricated from a dedicated reservoir.
  5. Shaft Seal: Cartridge type, mechanical, oil-lubricated, double floating, self-aligning, with tungsten titanium carbide rotating and stationary faces, Type 316 stainless steel stationary face, fluorocarbon elastomer. Cage and spring to be Type 316 stainless steel. Seal shall be oil lubricated from a dedicated reservoir.
  6. Pusher bolt capability to assist in removal of rotating assembly.
- E. Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means. Clearances shall be maintained by external shimless cover plate adjustment, utilizing collar and adjusting screw design for incremental adjustment of clearances by hand.
- F. Suction Check Valve: Molded Neoprene with integral steel and nylon reinforcement with blow-out center for protecting pump casing from hydraulic shock or excessive pressure. Removal or installation of suction check valve must be accomplished through the cover plate opening, without disturbing the suction piping.
- G. Spool flanges: Cast iron, ASTM A48, Class 30, mounted on suction and/or 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.
- H. Drain Kit: Provide each pump with a drain kit consisting of 10-foot length of reinforced plastic hose; female quick connect fitting at one end, and factory installed drain fittings in each pump. Fittings include a stainless steel pipe nipple, stainless steel bushing, stainless steel gate valve and aluminum male quick connect fitting.
- I. Baseplate, Pumping Unit Assembly:

1. Provide a common baseplate of cast iron or fabricated steel.
  2. Constructed to support the full weight of pump, motor, and drive assembly. Baseplate and shall be provided with grout fill and venting holes. Base shall have anchor bolt holes drilled.
  3. Provide a V-belt drive to run pump at a speed to meet the specified range of operating conditions. Drive assembly shall utilize at least two V-belts providing a combined safety factor of 1.5.
  4. Provide an enclosed OSHA belt guard of fabricated steel or reinforced fiberglass to cover the rotating belt and sheave assembly. 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.
  5. Furnish connection for a casing drain.
- J. Re-prime Lift:
1. Each pump must be capable of a re-prime lift as stated above. Re-prime lift is defined as the static height of pump suction centerline above liquid that the pump will prime; and delivery within five minutes on liquid remaining in the pump casing after a delivering pump is shut down with the suction check valve removed.
    - a. No restrictions shall be present in pump or suction piping, which could serve to restrict the rate of siphon drop of the suction leg. The pump shall be designed to re-prime with a suction pipe configuration that incorporates a minimum horizontal run of 4½ feet and one 90-degree elbow.
    - b. Impeller shall be set at the clearances recommended by the manufacturer in the pump service manual.
    - c. Re-prime lift repeatability shall be demonstrated by five sequential re-prime cycles.
    - d. Re-prime lift stated above shall be based on the use of wastewater.

## 2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified herein:
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven loads will not require motor to operate in service factor range above 1.0.
  2. Controllers, Electrical Devices, and Wiring:
    - a. All electrical work shall be performed by workers skilled in the electrical trade and licensed for the work by the local authority.
    - b. A licensed Master Electrician will be required for constructing, installing, altering, maintaining, repairing or replacing any electrical wiring, apparatus, or equipment on any voltage level. A licensed Master Electrician or a licensed Journeyman Electrician is required to be on the job site during the performance of any electrical work.
  3. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
  4. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  5. Conduit Box - Provide each motor not supplied with a cord and plug with a conduit box amply dimensioned for the motor lead terminations. Include a grounding lug on motors 1/6 horsepower and larger. Supply a gasket suitable for the motor enclosure type and application.
- B. If a motor horsepower rating larger than specified is offered as a substitute and accepted, provided required changes in conductors, motor controllers, overload relays, fuses, switches and other related items with no change in the Contract price.
- C. Motor Description:
1. Horizontal solid shaft, 1800 RPM, TEFC, premium efficiency type.
  2. Class B design, Class F insulation, and 1.15 service factor. It shall be of the normal starting torque and low starting current type suitable for continuous operation.

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3. Non-overloading over entire pump curve.
4. Provide heavy lifting eyes capable of supporting entire weight of pump and motor.
5. Rating: Three phase – 460 volts



D. Enclosure Material

1. Motors to be installed outdoors, use enclosure type as follows: Outdoors - Totally enclosed, fan cooled (TEFC), weatherproof.
2. TEFC motors shall have a steel or cast iron frame, cast iron end brackets, cast iron conduit box, tapped drain holes (erosion resistant plug for frames 286T and smaller and automatic breaker/drain devices for frame 324T and larger), and upgraded insulation by additional dips and baked to increase moisture resistance.

## 2.4 ACCESSORY EQUIPMENT

Provide the items listed in the following paragraphs:

A. Air Release Valves:

1. Each pump shall be equipped with an automatic air release valve, designed to vent air to atmosphere during initial priming, or unattended repriming cycles. Upon completion of the priming or repriming cycle, the valve shall automatically close to prevent recirculation. A visible indication of valve closure shall be evident, and shall operate solely on discharge pressure. Valves which connect to the suction line, or rely on vacuum pumps are not acceptable.
2. Valve parts exposed to sewage shall be cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms shall be fabric-reinforced neoprene, or similar inert material. Valve design shall incorporate following maintenance features:
  - a. A clean-out port, at least 3 inches in diameter, shall allow easy inspection, clean-out, and service.
  - b. Valves shall be field adjustable for varying discharge heads.
  - c. Connection of the air release valves to the station piping shall include stainless steel fittings.

B. Pump Gauges: Provide the following gauges to monitor suction and discharge pressures:

1. Suction Pressure monitored by a glycerin-filled compound gauge, graduated -34 to +34 feet water column minimum.
2. Discharge Pressure monitored by a glycerin-filled pressure gauge, graduated 0 to 140 feet water column minimum.
3. Gauge Size: Minimum 4-inches in diameter, graduated in feet water column, rated accuracy shall be 1% of full scale reading.
4. Gauges to be factory mounted on a resilient panel with frame assembly secured to pumps or piping.
5. 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.

## 2.5 FINISH COATING

- A. Factory Finish: Provide polyurethane, pigmented (over epoxy zinc rich primer and high build epoxy). Pump, piping, valves, and all other ferrous metal surfaces shall receive surface preparation, prime coat and finish coat in factory.
- B. Field Finish: Provide cleaning and primer touch-up of the factory coating and then apply a field finish of polyurethane, pigmented in the color chosen by the owner.

## 2.6 SOURCE QUALITY CONTROL

- A. Factory Tests and Adjustments: Test all pumping units to be furnished.
  1. Include test data sheets, curve test results, performance test logs, certified by a factory test engineer.
- B. Functional Test: Perform motor test on equipment. Include a vibration test, as follows:
  1. Dynamically balance rotating parts of each pump and its driving unit before final assembly.

2. Limits:  
Complete rotating assembly, including drive unit and motor, shall be less than 90 percent of limits established in the Hydraulic Institute Standards.
- C. Performance Test:
  1. Perform on each pump in accordance with Hydraulic Institute Standards.
  2. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test.
  3. At least one point shall be obtained as near as possible to each specified condition.
  4. Results of the performance test shall be certified by a Registered Professional Engineer and submitted for approval prior to shipment.
- D. Hydrostatic Test: Pump casing tested at 150 percent of shutoff head. Test pressure maintained for not less than five minutes.

## 2.7 OTHER PUMP REQUIREMENTS

- A. Noise Level:
  1. When the equipment is in operation, no single piece of equipment shall exceed the OSHA noise level requirements for a one hour exposure, and the regulatory agency having jurisdiction where the Project is located.
- B. Guards: Exposed moving parts shall be provided with guards which meet the requirements of OSHA. Guards shall be fabricated of minimum 14-gage galvanized steel or fiberglass; designed to be readily removable to facilitate maintenance of moving parts.
- C. Initial Supply of Lubricants: Manufacturer shall indicate types, brands, and quantities of initial lubricants, oil, grease, etc. necessary to startup equipment. SUPPLIER shall provide and install the recommended lubricants and shall comply with all manufacturer recommended procedures.

## 2.8 CONTROL PANEL – VARIABLE FREQUENCY DRIVE

### A. PERFORMANCE REQUIREMENTS

1. VFD shall meet or exceed the following harmonic limits at the point of common coupling (pcc) for any combination of the pumps and equipment operated from 10% to 100% speeds under actual operating conditions:
  - a. Point of Common Coupling (pcc) Location: Motor Control Center bus, which feeds the VFD.
  - b. Voltage: 5% total harmonic distortion (THD) per IEEE 519-1992
  - c. Current: limits for  $20 < I_{sc}/I_L < 5$  per IEEE 519-1992
- B. VFD system shall maintain a 0.95 minimum power factor from 10 % to 100 % speed. VFD system, including power factor correction and/or harmonic filter, shall never have a leading power factor under operation or at any other time. VFD manufacturer is to supply a power factor correction system, if required, to meet this requirement. The power factor correction capacitors shall be mounted on the input side of the VFD.
- C. VFD shall be capable of accommodating future 4-20 mA input signal from future flow-depth measurement device.
- D. The VFD drive shall be capable of operating between 460 volts and 504 volts at temperatures of up to 104 deg F.

### E. CONTROLS

The following standard basic control features shall be provided on the variable frequency controller:

1. Remote Start, Stop, and speed control via remote input 4-20 DC signal.
2. Linear independent time acceleration and deceleration adjustable setting.
3. Isolated process signal follower for 4-20 mA DC control of output frequency.
4. Process output of 4-20 mA DC for remote speed indication.
5. Variable torque performance from 4 to 60 Hertz.



6. Frequency stability of 0.5 percent for 24 hours with voltage regulation of plus or minus two percent of maximum rated output voltage.
7. Individual door mounted LED type pilot lights for indication of run, power on, and interruption due to over current, over voltage, over frequency, undervoltage, over temperature, and phase loss.
8. 115 VAC isolated control power for operator devices. Low voltage DC control power is not acceptable. VFD manufacturer to size control power transformer to power motor heaters.
9. Motor slip dependent speed regulation.
10. Five-cycle logic power carry-over during utility loss of power.
11. Insensitive to input line rotation.
12. Fixed dwell time at start to increase motor starting torque.
13. Auto restart to automatically restart on phase loss, overvoltage, and undervoltage trips only.
14. Hand-Off Auto selector that allows speed control to change from unit mounted potentiometer in hand position to input process follow in auto mode.
15. Provide percent speed meter in face of unit.
16. Provide all necessary control relays, timers, indicating lights, etc.. All of these devices shall be installed in the VFD enclosure.



#### F. Process PID control:

1. The VFD's PID regulator shall allow a pressure, level, or flow signal to be connected for closed loop control.
2. The PID set point shall be adjustable from the terminal or by analog input.

#### G. MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton Corporation; Cutler-Hammer Products
  - b. General Electric Company; GE Industrial Systems
  - c. Rockwell Automation; Allen-Bradley Co.; Industrial Control Group
  - d. Siemens Energy and Automation; Industrial Products Division
  - e. Square D
  - f. Toshiba Drives
  - g. Danfoss
  - h. WEG Automation



#### H. ENCLOSURES

1. Description:
  - a. Stand alone units shall be mounted in individual full height, freestanding NEMA 250, Type 4X stainless steel enclosure.
  - b. Constructed of not be less than 16-gauge steel ~~with surfaces to be painted.~~ Provide cooling fans, thermostat, and air filters.
  - c. Doors shall include plastic device holders for mounting up to six operator devices. Factory mounted operator devices shall be factory wired.
  - d. Disconnect operating handle shall remain connected to the breaker and not be mounted on the door.
2. Handle position indicate ON, OFF, or TRIPPED condition of the circuit breaker.
3. Provide provisions for padlocking in the OFF position with at least three padlocks. Interlock provisions shall prevent unauthorized opening of closing of the controller door with the disconnect handle in the ON position.



#### I. ACCESSORIES

1. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
2. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
3. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
4. Control Relays: Auxiliary and adjustable time-delay relays as designated.

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5. Standard Displays:
  - a. Output frequency (Hz).
  - b. Set-point frequency (Hz).
  - c. Motor current (amperes).
  - d. DC-link voltage (VDC).
  - e. Motor torque (percent).
  - f. Motor speed (rpm).
  - g. Motor output voltage (V).
6. Historical Logging Information and Displays:
  - a. Real-time clock with current time and date.
  - b. Running log of total power versus time.
  - c. Total run time.
  - d. Fault log, maintaining last four faults with time and date stamp for each.

#### J. FACTORY FINISHES

1. Finish: Manufacturer's standard gray coating system applied to VFD before shipping.

#### K. ADJUSTMENT

1. Make all VFD internal adjustments and all adjustments necessary for manual and automatic operation of the entire system of driven equipment.

### 2.9 GENERAL SKID MOUNT REQUIREMENTS

#### A. SKID BASE

1. Package Pumping Units: Provide a common structural steel base for mounting equipment including, but not limited to, horizontal split case centrifugal pumps, piping, and valves, providing a complete operating pumping system.
2. Skid Base Design: Each skid base shall be of sufficient rigidity to support the equipment and withstand the operating forces. Structural members shall be constructed from heavy weight structural tubing with deck plate attached to the skid and structural steel plate mounted under the pumping units and pipe and equipment supports. Deck and structural plate shall be 100% seal welded to peripheral structural members, and skip welded on the bottom to internal structural members.

#### B. MOBILITY

1. Each package skid should be able to be relocated by any of the OWNER's existing equipment.
2. The SUPPLIER shall coordinate load and skid configuration with the OWNER to insure capabilities of the existing lifting equipment.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Install and adjust equipment in accordance with the approved shop drawings and the manufacturer's instructions. Do not operate the equipment until the installation is approved by the manufacturer's representative.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions and as described herein.
- B. Level skid framework by means of steel wedges (steel plates and steel shims). Wedge taper not greater the ¼-inch per foot. Use double wedges to provide a level bearing surface. Accomplish wedging so that there is no change of level or springing of the base elbow when anchor bolts are tightened.
- C. Adjust pump assemblies such that the driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings.
- D. Complete equipment installation with controls, safety devices and auxiliary support systems necessary to start the equipment and verify that the equipment functions correctly under no load conditions. Turn rotating equipment by hand to check. Complete cleaning and testing

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of piping systems. Inspect and clean equipment, devices, piping, and structures of debris and foreign material.

- E. Remove temporary bracing supports and other construction debris that may damage equipment.
- F. Remove protective coatings and oils used for protection during shipment and installation.
- G. Flush, fill, and lubricated systems in accordance with Manufacturer's instructions.
- H. Install temporary connections and devices required to fill, operate, checkout and drain the system. Provide temporary valves, gauges, piping, test equipment, and other materials and equipment necessary to conduct testing and startup.
- I. Equipment
  - 1. Check equipment for correct direction of rotation and freedom of moving parts.
  - 2. Align equipment to Manufacturer's tolerances. Adjust clearances and torques.
  - 3. Check installation prior to start-up for conformance to Manufacturer's instructions.
  - 4. Adjust or modify equipment to ensure proper operation.
- J. Correct any deficiencies or problems noted in Manufacturer's representative's installation reports.

### 3.3 FIELD QUALITY CONTROL

- A. Functional Tests: Conduct on each pump as described below:
  - 1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
  - 2. Vibration Test:
    - a. Test units installed and in normal operation, and discharging to the connected piping systems at rates between the low discharge head and high discharge head conditions specified, and with the actual facility structures and foundations provided, shall not develop at any frequency or in any plane, peak-to-peak vibration amplitudes exceeding the limits specified previously.
    - b. If units exhibit vibration in excess of the limits specified adjust, or modify as necessary. Units which cannot be adjusted or modified to conform as specified shall be replaced.
    - c. Flow Output: Measured by plant instrumentation and storage volumes.
- B. Performance Test: In accordance with Hydraulic Institute Standards.
  - 1. Place each piece of equipment in the system in operation until the entire system is functioning. All components shall continue to operate without alarms or shut downs, except as intended, for eight consecutive hours to be considered started up.
  - 2. Operate the equipment through the design performance range consistent with available flows. Adjust, balance, and calibrate and verify that the equipment, safety devices, controls, and process system operate within the design conditions. Each safety device shall be tested for proper setting and signal. Response shall be checked for each equipment item and alarm. Simulation signals may be used to check equipment and alarm responses.
- C. A copy of all information from functional tests, including data, worksheets, and other materials shall be turned over to the OWNER at the completion of the testing program.

### 3.4 OPERATIONS AND MAINTENANCE DATA

- A. Final Submittal: Submit one (1) hard copy of each Manual in final form at least 30 days before initial equipment startup. ENGINEER will return comments in electronic form within 15 days of receipt or notify SUPPLIER of its acceptance. If the manual needs to be returned it will be at the SUPPLIER's expense.
  - 1. Correct or modify each manual to comply with ENGINEER'S comments. Submit four (4) hard copies of each corrected manual within 15 days of receipt of ENGINEER'S comments. Provide three (3) electronic copies of the final manual in PDF format as described below.
    - a. Portable Document Format (PDF)

- 1) Submit all electronic copies of operational and maintenance data in PDF format on CD-ROM each labeled with project name, owner, engineer, equipment information, etc.
  - 2) Sections within each PDF file shall be bookmarked to allow the user to easily navigate the document by clicking on the section label.
  - 3) Files to be exact duplicates of accepted preliminary data. Arrange by specification Section number. Bookmark specifications.
2. Files to be fully functional and viewable in most recent version of Adobe Acrobat.

#### B. Operations Manual

1. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria.
  - c. Operating standards.
  - d. Operating procedures.
  - e. Operating logs.
  - f. Wiring diagrams.
  - g. Control diagrams.
  - h. Piped system diagrams.
  - i. Precautions against improper use.
  - j. License requirements including inspection and renewal dates.
2. Descriptions: Include the following:
  - a. Product name and model number.
  - b. Manufacturer's name.
  - c. Equipment identification with serial number of each component.
  - d. Equipment function.
  - e. Operating characteristics and limits.
  - f. Limiting conditions.
  - g. Performance curves.
  - h. Engineering data and tests.
  - i. Complete nomenclature and number of replacement parts.
3. Operating Procedures: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Instructions on stopping.
  - f. Normal and emergency shutdown instructions.
  - g. Seasonal and weekend operating instructions.
  - h. Required sequences for electric or electronic systems.
  - i. Special operating instructions and procedures.
4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

#### C. Product Maintenance Manual

1. Content: Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
2. Source Information: For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent.
3. Product Information: Include the following, as applicable:
  - a. Product name and model number.
  - b. Manufacturer's name.
  - c. Color, pattern, and texture.
  - d. Material and chemical composition.
  - e. Reordering information for specially manufactured products.
4. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.

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- d. Schedule for routine cleaning and maintenance.
- e. Repair instructions.
- 5. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- 6. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - a. Include procedures to follow and required notifications for warranty claims.

### 3.5 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at Project site or classroom designated by OWNER, for minimum person-days listed below, travel time excluded:

No. Person Days	Work Description
1	Installation assistance and inspection.
1	Functional and performance testing.
1/4	Pre-startup classroom or site training.
1/2	Facility startup.
1/4	Post-startup training of OWNER'S personnel.

- B. Services Provided:
1. Furnish test forms and procedures for field-testing.
  2. Furnish startup services.
  3. Furnish training of OWNER'S personnel at such times requested by OWNER
- C. Manufacturers Services
1. Furnish minimum manufacturers' services to comply with the requirements of this Section.
  2. Where time is necessary in excess of that stated in the Section for manufacturers' services the time required to perform the specified services shall be considered incidental.
  3. Schedule manufacturers' services to avoid conflict with other onsite testing or other manufacturers' onsite services.
  4. Determine, before scheduling manufacturers' services that all conditions necessary to allow successful completion of the services have been complied with.
  5. Only those days of service approved by ENGINEER will be credited to fulfill the specified minimum service.
  6. Manufacturer's onsite services shall include:
    - a. Assistance during product installation to include observation, guidance, and instruction of SUPPLIER's personnel during the assembly, erection, and installation.
    - b. Inspection, checking, and adjustments as required for product to function as warranted by manufacturer and required to provide Manufacturer's Certificate of Installation.
    - c. Provide on a daily basis copies of manufacturer's representative field notes and data to ENGINEER.
    - d. Visiting site as required to correct problems and until installation and operation are acceptable to ENGINEER.
    - e. Resolution of assemble or installation problems attributable to, or associated with, respective manufacturer's products and systems.
    - f. Assistance during functional and performance testing, start-up, evaluation, and commissioning.
    - g. Training of OWNER'S personnel in the operation and maintenance of the product as required.
- D. Demonstration and Training
1. Program Structure: Develop an instruction program that includes individual training modules for the equipment.
  2. Training Sections:

- a. Basis of System Design, Operational Requirements, and Criteria: Include equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
- b. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
- c. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
- d. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
- e. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
- f. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
- g. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
- h. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

### 3.6 FACILITY STARTUP

- A. After initial startup under the supervision of a qualified representative of the pump manufacturer, a preliminary "running-in" period will be provided for the CONTRACTOR, per the Contract Documents, to make field tests and necessary adjustments. At the end of the specified period of operation, the pumps will be accepted if, in the opinion of the ENGINEER, the pumps has operated satisfactorily without excessive power input, wear, lubrication, or undue attention required for this operation, and if all rotating parts operate without excessive vibration or noise at any operating speed and head, including shutoff.

### 3.7 SUPPLEMENT

- A. The Pump Data Sheet included after "END OF SECTION" shall be part of this Section.

## **END OF SECTION**


**PUMP DATA SHEET**

Description	Criteria	Criteria	Criteria
Tag Numbers:	PMP-190-01	PMP-511-11	PMP-511-31
Quantity:	1	1	1
Location:	Headworks	Intermediate LS A	Intermediate LS C
Liquid Pumped:	Sewage w/ Rags	Sewage w/ Rags	Sewage w/ Rags
Capacity, GPM:	2200	1800	1800
Total Discharge Head, FT:	4	14	14
Total Suction Lift, FT:	4	7	7
Maximum Re-priming Lift, FT:	25	25	25
Minimum Submergence Depth, FT:	2.1	2.1	2.1
Minimum NPSH available, FT absolute:	9.0	25	25
Minimum NPSH required, FT:	9.0	25	25
Hydraulic Efficiency (minimum):	70%	70%	70%
Pump Speed, RPM (maximum):	1800	1800	1800
Motor, HP (maximum):	60	60	60
Impeller Diameter (inches):	14.75	14.75	14.75
Suction Size, Inches	10	10	10
Discharge Size, Inches	12	10	10
Solids Handling Capacity, Diameter of Sphere, inches:	3	3	3