



B R O W N S V I L L E
PUBLIC UTILITIES BOARD

Date: January 29, 2024
To: All Vendors
Subject: Addendum #1

REFERENCE: B024-24 Purchase of a Vertical Mixer Flow Waste Pump and Motor

This Addendum forms part of the contract and clarifies, corrects or modifies original bid document.

NEW SUBMISSION DATE & TIME: February 14, 2024 by 5:00 PM
NEW OPENING DATE & TIME: February 15, 2024 at 10:30 AM

See attached updated technical specifications.

The signature of the company agent, for the acknowledgement of this addendum, shall be required. **Complete information below and return via e-mail to: dsolitaire@brownsville-pub.com.**

I hereby acknowledge receipt of this addendum.

Company: _____

Agent Name: _____

Agent Signature: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone Number: _____ **E-mail address:** _____

If you have any further questions about the Bid, call 956-983-6366.

Diane Solitaire

BY: Diane Solitaire
Purchasing



**SPECIFICATION FOR
VERTICAL MIXED FLOW PUMP(S)**

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the furnishing and testing of ANSI/NSF 61 certified vertical mixed flow, enclosed line-shaft, oil lubricated pump(s) as specified herein. The pump and motor assembly is referred in this Section as the Pump Unit.

1.02 RELATED REQUIREMENTS

- A. Attachment "A" to this Specification Section gives performance and design requirements.
- B. Attachment "B" to this Specification Section provides pump curve performance requirements and general dimensions of existing pump to be replaced by equipment under this Section. Equipment under this Section will be a replacement and shall not require any electrical or mechanical modifications to the existing pumps station and controls.

1.03 REFERENCES

The latest version of the publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A49	Standard Specification for Heat-Treated Carbon Steel Joint Bars, Micro-alloyed Joint Bars, and Forged Carbon Steel Compromise Joint Bars
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A108	Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality
ASTM A181	Standard Specification for Carbon Steel, Forgings for General Purpose Piping
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes

ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A564	Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless-Steel Bars and Shapes
ASTM A582	Standard Specification for Free-Machining Stainless Steel Bars
ASTM A743	Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
ASTM B148	Standard Specification for Aluminum-Bronze Sand Castings
ASTM B505	Standard Specification for Copper Alloy Continuous Castings
ASTM B584	Standard Specification for Copper Alloy Sand Castings for General Application

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.5-2009	Pipe Flanges and Flanged Fittings
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AMERICAN NATIONAL STANDARD INSTITUTE/HYDRAULIC INSTITUTE (ANSI/HI)

ANSI/HI 2.1–2.2	Rotodynamic (Vertical) Pumps for Nomenclature and Definitions
ANSI/HI 2.4	Rotodynamic (Vertical) Pumps for Manuals Describing Installation, Operation and Maintenance
ANSI/HI 14.6	Rotodynamic Pumps for Hydraulic Performance Acceptance Tests
ANSI/HI 9.6.4	Rotodynamic Pumps for Vibration Measurements and Allowable Values
ANSI/HI 9.8	Rotodynamic Pumps for Pump Intake Design

AMERICAN NATIONAL STANDARD INSTITUTE/AMERICAN PETROLEUM INSTITUTE (ANSI/API)

ANSI/API 610-2004	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
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AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA E103	Vertical and Horizontal Line-Shaft Pumps
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1.04 NOT USED

1.05 DESIGN AND PERFORMANCE CRITERIA

- A. The design requirements for the pumps shall be as follows:
 - 1. Design requirements for the pumps shall be as specified in Attachment A at the end of this Specification Section.
 - 2. Critical speed analysis: The VENDOR shall require that the pump manufacturer perform both lateral and torsional critical speed analyses to identify and ensure that:
 - a. The first lateral critical speed shall be at least 25 percent above the maximum pump speed;
 - b. No torsional natural frequencies occur within a range extending from 25 percent below to 25 percent above the specified operating speed range;
 - c. Any blade excited resonant frequency shall be no closer than plus or

minus 25 percent of the natural frequency of any part of the installed assembled pumping unit.

3. Allowable Operating Range: The VENDOR shall require that pump manufacturer identify the allowable operating region of the pump curves submitted. When the allowable operating region is limited by a factor other than vibration, that factor shall be submitted to the OWNER as part of the Shop Drawings.

B. Seismic Load:

1. The Contractor shall conform to the requirements of Seismic Design Data shown on Drawings when applicable.

1.06 SUBMITTALS

Submit the following:

A. Shop Drawings

1. Equipment specifications and data sheets, with identification of all materials used and methods of fabrication. Designate materials by ASTM standards.
2. Complete assembly, layout, cross section, installation and shop drawings, with clearly marked dimensions submitted in electronic format. Electronic files to be AutoCAD latest version, drawn to scale. Submit electronic files on CD or DVD.
3. Manufacturer's product data and specifications for painting.
4. Show shaft diameter and bearing spacing. Submit calculations showing shaft critical frequency and determination of bearing spacing. Show calculated bearing life certified by the pump manufacturer.
5. Submit calculation and estimate of shaft elongation or shaft stretch including any accumulation of shaft joint clearances, versus the maximum required clearances between the impeller and the casing before pump operation, during operation, and steady state operation.
6. Provide a scaled drawing showing the pump, motor, including equipment weights, and lifting attachments.
7. Pretest pump curves on which the specified operating points are marked. Include losses for entrance, bowl, column, and discharge head. Show efficiency and brake horsepower for the selected pump curve. Include moment of inertia of the completed pumping unit including driver, impeller, and liquid pumped. Include maximum combined hydraulic and static thrust and momentary upthrust. Show required submergence and NPSH_R.
8. Tabulated Data: Rated head, capacity and brake horsepower. Rated operated speed. Maximum combined hydraulic and static thrust.
9. Submit certified and witness shop test procedures, the equipment to be used, plan and section drawings of the testing arrangements and manufacturer's sample form for reporting performance test results at least two weeks before the tests. The test shall conform with ANSI/HI 14.6.
10. Certified performance curves showing pumping head, capacity, horsepower and efficiency from shut-off to beyond minimum operating head at operating speeds. Include losses for entrance, bowl, column, and discharge head. In addition, include NPSH_R, thrust curves and momentary upthrust. The NPSH_R curve shall extend from the Allowable Operating Range limits as defined by Hydraulic Institute Standards.
11. Submit certified performance curves at least two weeks prior to shipping the units from the factory. Provide copies of the data recorded during the test and methods of data reduction for determining certified tests results.
12. Motor bearing temperature operating range for the service conditions specified.
13. Field test procedure.
14. Manufacturer's delivery, storage, and handling requirements.
15. Manufacturer's installation instructions and recommendations.
16. Certified setting plans, with tolerances, for anchor bolts.
17. Schematic diagrams showing the wiring for each electrical or electro-mechanical equipment item, as well as interconnecting and point-to-point field wiring diagrams for wiring between all components provided under this specification.

18. Documentation for instrumentation and control equipment provided under this Specification.
 19. Motor data per applicable motor specification.
 20. Spare parts list indicating sizes, quantities, and part numbers of the items to be furnished.
 21. Speed-torque characteristic of pump operation against fully closed discharge valve and speed-torque characteristic of pump for pump operation against fully open discharge valve.
- B. Operation and Maintenance Manuals shall be included with all manufacturer recommended operation and maintenance information, in hard copy and in electronic (PDF) format.
- C. Certificates:
1. Metallurgical certificate from foundry for castings of pump components, including but not limited to: impeller, bowl, shafts, shaft sleeves, and columns.
 2. Stress-relief certificate from furnace vendor for column and head fabrications.
 3. Machining accuracy certificate showing that column, shaft and head fabrications were machined within OEM drawing tolerances.
 4. Material Certification:
 - a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated. If materials others than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to OWNER.
 - b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.
 5. Certification of welders in accordance with American Welding Society (AWS).
- D. Reports:
1. **Certified report of Lateral and Torsional Analysis:** Submit calculations of lateral vibration analysis for the discharge head/motor assembly, and for the column/pump assembly. Submit calculations of torsional analysis for the complete rotating assembly. The analysis report shall include the specific items of API Standard 610, Part 5.9, Dynamics. Pump manufacturer shall provide whatever devices or supports necessary to meet the requirements of the analysis, at no additional cost to the OWNER.
 2. **Factory Tests:** Furnish reports of witnessed and certified factory tests. No equipment shall be shipped from its place of manufacture before the witnessed and certified factory test reports have been approved by the OWNER.
 3. **Field Tests:** Furnish reports of field tests. Prior notification of field tests shall be submitted for all equipment at least two weeks before the tests.
 4. **Installation Report:** Furnish to OWNER copies of certified report prepared by manufacturer's technical representative certifying satisfactory installation, operation, and in service placement of units. **Pump and motor manufacturer's representative shall be onsite and shall perform pump installation testing as per the Hydraulic Institute, including vibration. Tests shall be passing in order for the pump and motor equipment to be considered acceptable and ready for payment.**

1.07 QUALITY ASSURANCE

- A. System Coordination:
1. VENDOR retains overall responsibility to ensure pump and motor are properly installed by the OWNER, adjust, test, and place in operation the Pump Unit(s).
 2. When bid requires more than one pump, all pumps for each service provided

under this Specification shall be the products of a single manufacturer. All motors for each service provided under this specification shall be the product of a single manufacturer. The pump manufacturer/supplier shall furnish the pumps and motors, as a complete and integral package to insure proper coordination, compatibility, and operation of the system.

3. Coordinate start-up with pump manufacturer, motor manufacturer, pump control valve manufacturer and air vacuum valve manufacturer.

B. Manufacturer's Qualifications

The VENDOR shall provide evidence to the OWNERR that the manufacturer has a minimum of five (5) years of experience, within the last ten (10) years, in the design, manufacture, and supervision of installation of equipment of the type and size specified (or larger) under this Specification.

1. The VENDOR shall provide evidence to the OWNER that equipment which was designed and manufactured by the manufacturer, and which is similar to the equipment required under this Specification, has been in continuous and successful operation in at least five (5) separate facilities for the past five (5) years.

C. Manufacturer's representative

1. Furnish services and training to OWNER's maintenance and operations personnel covering pump and motor installation, operation, and maintenance topics, including all required testing, preventative, and predictive maintenance.
2. The VENDOR shall provide the services of a qualified manufacturer's service technician to:
 - a. Witness, test (including vibration, temperature, amp, etc.), and certify the installation of the equipment;
 - b. Check the installation before the equipment is placed into operation;
 - c. Perform field tests as per the Hydraulic Institute for commissioning new pumps.;
 - d. Assist in start-up of equipment; and
 - e. Train the plant operations and maintenance staff in the care, operation and maintenance of equipment. Including predictive maintenance.
3. The VENDOR shall provide the services of the manufacturer's service technician at such times and for such duration of time as are needed to perform the tasks required of the representative as specified in Article 1.07.C.2 above. At a minimum, the services of the manufacturer's technician shall be provided as indicated herein below and any additional time required shall be provided at no additional cost to the OWNER. The number of visits and person-days per visit indicated below shall be understood as referring to the total required services for the lot of equipment provided under this Specification. However, the CONTRACTOR is advised that the number of visits and person-days per visit indicated below do not include (and are to be understood as being in addition to) the motor manufacturer's technician services.

a.	Installation:	1	visits of	1	person-days per visit
b.	Field testing:	1	visits of	1	person-days per visit
c.	Start-up:	1	visits of	1	person-days per visit
d.	Training:	1	visits of	1	person-days per visit
4. The CONTRACTOR shall coordinate the manufacturer's representative services such that technicians from the pump, motor and discharge valve manufacturer (when valves are part of the purchase) are present simultaneously at the project site during field testing and startup of the pumps.
5. The OWNER reserves the right to require that any unused person-days from any visit be applied to any other specific visit.
6. Person-days shall be understood only as days spent on-site (not in transit).
7. Unless otherwise authorized by the OWNER, the **manufacturer's technician shall be a direct employee of the equipment manufacturer or a factory trained technician, with at least five (5) years of experience in the installation, testing and start-up of equipment of the type provided under**

this Specification. Provide resume of the proposed manufacturer's technician for OWNER approval as part of the submittal process, before commencing fabrication of equipment. The manufacturer's sales and marketing personnel will not be accepted as manufacturer's technicians.

8. Reports: The VENDOR shall submit a report from the manufacturer for each visit to the Site of the manufacturer's technician. The report shall provide complete information regarding the visit, including, but not limited to, dates, times, subject equipment, tasks performed, persons contacted, problems corrected, test results, training provided, and other pertinent information.

In addition to the above, **the VENDOR shall provide the services of person(s) authorized by the manufacturer to witness the unloading at the Site and, if stored, placing into storage the equipment provided under this Specification, and to ascertain the condition of said equipment.**

Manufacturers' sales and marketing personnel may be accepted as authorized person(s) to perform these specific tasks. The VENDOR shall submit to the OWNER a report, completed by the authorized person(s) and certified by the equipment manufacturer, documenting the findings of the authorized person(s).

- D. Painting: The equipment provided under this Specification shall be shop cleaned, primed, and finish painted, and field painted in accordance with the manufacturer's recommendations.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Manufacturer shall carefully prepare the pump for shipment to minimize the likelihood of damage during shipment. Cavities shall be drained of water. Equipment shall be properly supported and securely attached to skids. Openings shall be covered in a manner to protect both the opening and interior.
- B. Deliver, unload, and store products on site in a manner that prevents damage. Use special care to prevent damage from temperature and condensation.

1.09 PROJECT CONDITIONS (NOT USED)

1.10 SPARE PARTS

- A. Provide spare parts that are identical to an interchangeable with similar parts installed for each type of pumps.
1. One set of all special bolts, nuts and impeller shaft thrust rings and keys.
 2. One set of all pump shaft bearings.
 3. One set of intermediate lineshaft bearings.
 4. One set of all special tools required.
 5. One complete set of gaskets.
 6. One complete sets of wearing rings with fasteners.
 7. One complete set of mechanical seals.
- B. All spare parts shall be plainly tagged, marked for identification and reordering and shall be delivered properly boxed.

PART 2 PRODUCTS

2.01 PUMP MANUFACTURER(S)

- A. Fairbanks-Nijhuis
- B. Flowserve
- C. Peerless
- D. Sulzer

E. Or, Approved Equal.

2.02 MOTOR MANUFACTURER(S)

A. General Electric Model No. 5KS449FT8G03A

2.03 MATERIALS AND/OR EQUIPMENT

A. General

1. This is a replacement pump(s) for an existing pump station. Pump(s) shall be **Fairbanks Pump Model 8312AE or Approved Equal** (See Attachment B for pump curve performance requirements and dimensions, **VENDOR** to confirm field dimensions). Replacement pump shall not require any mechanical or electrical modifications to the existing pump station. Vendor shall field-verify dimensions of existing pump installation to ensure new pump will fit without the need of additional couplings or modifications. Pump(s) shall be vertical mixed flow type, enclosed line-shaft, oil lubricated, provided with vertical hollow shaft motors. Pump(s) shall conform to AWWA Standard E103 for Horizontal and Vertical Line-Shaft Pumps of latest edition, except as otherwise specified in this Specification.
2. **Pumping unit to yield performance stable and free from noise or vibration** throughout operating range. From run-out head to shut-off head, the Head vs. Capacity curve shall be constantly rising without a 0 or reverse slope.
3. Pumps shall be manufactured in accordance with the latest Hydraulic Institute Standards.
4. Pumping assemblies, including pump and motor, shall operate within vibration and bearing temperature limits specified over the full operable range of the pump performance. Motors shall be non-overloading under any condition of operation specified and indicated without operating in the motor service factor.
5. Equip pumping units with all specified and required accessories, including lifting attachments, pressure gages, drain connections, and motor temperature and vibration sensors.
6. Apply a never seize compound to all bolts.
7. **Provide isolation sleeves and washers when stainless steel hardware is used on dissimilar materials. VENDOR to supply OWNER with all anchorage and flange bolting stainless steel 316 hardware of the type and size recommended by the manufacturer.**
8. The pumps shall be capable of temporary operation at or near shut off head for 3 minutes to allow for opening and closing of the pump discharge control valve as the pump starts or stops.

B. Discharge Head:

1. Type: Aboveground, with three-section mitered elbow.
2. Material: Fabricated steel ASTM A53, or A283 grade D steel, smooth and free of all imperfections. Stress relieve fabrication in an oven prior to machining. Furnish a stress relief certificate from the oven vendor. Machine and drill fabrication in one machining set-up so that flange surfaces are parallel to one another and perpendicular to the stuffing box mounting bore, and so aligning registers are concentric to one another within the tolerances specified by the OEM. Inspect and report machined dimensions and machining accuracy on each fabrication.
3. Provide integral flange for bolting to column flange.
4. Provide a foundation (sole) plate, of fabricated steel ASTM A36 for support of the pump assembly, including thrust and dynamic loads. The top of the foundation plate shall be machined faced, drilled and tapped for the pump baseplate. Pump manufacturer shall design the soleplate to allow air escape during grouting.
5. Connection: Flanged, ASME B16.1, 125-lb, standard, flat faced.
6. Provide discharge head and baseplate design to support the weight of the pump's motor and withstand all thrust conditions imposed by the pump and driver

during operation at the specified conditions. It shall have sufficient bearing surface on the pump foundation to provide a rigid setting so as to attenuate any self-generated vibrations to within the limits specified and provide protection for the type of enclosure employed.

- ~~7.~~ Provide top shaft of Type 416 stainless steel or ASTM A564 Type 630 17-4, and adjustable flanged spacer coupling with motor shaft thrust ring for connection to drive motor.
8. Provide O-ring gasket between top column flange and discharge head.
9. Provide top flange of discharge head with machined registers fit to match motor mounting.
- ~~10.~~ Provide sealing box, with plugged 1/2-inch NPT water flush connection, designed for use with conventional packing or mechanical seal without requiring re-machining. Provide split mechanical seal with 1/2-inch NPT seal flushing water inlet port.
11. Provide 1/2-inch NPT tapped connection for pressure gage on the horizontal centerline of discharge piping. Provide one (1) 1-inch discharge head drain. Install drain line to the drain trench.
12. Discharge head shall have service openings which allow ready access to the pumping unit's coupling and mechanical seal. **One service opening shall be large enough (without affecting the stability of the pump) to allow a service person to insert their hands and maneuver with enough space to remove/install a split mechanical seal.** Service openings shall be guarded by hinged and latchable wire mesh guards bent and shaped to conform to the exterior configuration of the mounting stand. Wire mesh guards shall prevent physical contact with rotating elements interior to the mounting stand. Wire mesh guards shall be constructed from heavy gauge Type 316 stainless steel and Type 316 stainless steel hardware. Guards shall have 1/4-inch clear sieve openings.
13. The base of the discharge head shall be machined to match the drilling of the top column flange as selected by the pump manufacturer. The discharge head shall have a top flange surface with machined register fit to mate with the drive motor and facilitate rigid mounting to the motor. The discharge head shall be bolted to the sole plate which is to be permanently grouted to the concrete supporting foundation.
14. Sealing box leakage shall be collected in leakage containment and piped to drain. A 1-inch NPT sealing box drain tap shall be provided.
15. Integral lifting lugs shall be provided on the sides of the discharge head.

C. Bowl Assembly

1. Pump bowls: Ductile iron ASTM A536 Gr. 60-40-18. Free from blow-holes, sand holes and other defects and faults. Bowls shall be flanged and fastened to adjacent bowls or pump parts with Type 316 stainless steel cap screws and hardware. Fit bowls with hardened stainless steel wear rings, ASTM A743 CA-15 hardened to 435-500 Brinell minimum.
2. Impeller shaft: ASTM A564, Type 630, 17-4 PH stainless steel, turned and ground. The shaft diameter shall be sized for the total axial thrust, the horsepower transmitted and the weight of all rotating parts supported by it. The maximum combined shear stress shall not exceed 30 percent of the elastic limit in tension, or be more than 18 percent of the ultimate tensile strength of the material used, per AWWA E103. For shaft couplings the maximum combined shear stress shall not exceed 20 percent of the elastic limit in tension, or be more than 12 percent of the ultimate tensile strength of the coupling material used. The shaft shall be supported by bronze intermediate bearings located above and below each impeller.
3. Impellers:
 - a. Type: totally enclosed or semi-open (mixed flow)
 - b. Material: cast nickel-aluminum bronze ASTM B148 C95800 or stainless steel ASTM 743 GR CF8M, sandblasted before machining, hand filed, polished, statically and dynamically balanced.
 - c. Fit impeller with stainless steel wear rings, ASTM A743 CA-15 hardened to 435-500 Brinell minimum.

- d. Secure impeller to shaft with stainless steel axial and radial keys.
 - e. Provide a means of impeller adjustment through the pump to motor shaft coupling.
 - f. Provide statically and dynamically balanced impellers to balance quality grade G6.3 in accordance with ISO 1940-1973, "Balance of Rotating Rigid Bodies".
 - g. Provide certificate of dynamic balancing.
4. Vortex Suppressor: Provide suction bell with fabricated Type 316 stainless steel vortex suppressor /basket strainer assembly, in accordance with ANSI/HI Standard 9.8. Structural design of suppressor assembly shall be responsibility of pump manufacturer/supplier. Submit vortex suppressor design to OWNER for approval before fabrication. Attach suppressor with Type 316 stainless steel hardware.
5. Suction Bowl / Bell Bearing:
- a. Bronze ASTM B505 C93200.
 - b. Provide a sand collar of ASTM B505 C93200 bronze, attached to shaft with a set of screw arrangement.
 - c. Provide a suction bowl plug or cap of cast iron, ASTM A48 class 30.
 - d. The bearing supports shall be streamlined to act as guide vanes and to present minimum resistance to flow. Bearing to be integral to the bell and grease-packed,
6. Intermediate Bowl Bearings:
- a. Bronze ASTM B505 Alloy C93200 or ASTM B148 Alloy C95800.
 - b. Bearings shall be located above and below each impeller.
7. Top Bowl and Connector Bearings:
- a. Bronze ASTM B505 Alloy C93200 or ASTM B148 Alloy C95800.
8. Suction Bell
- a. Ductile iron ASTM A536 Gr. 60-40-18.
 - b. Suction bell contoured for gradual change in velocity. Provide tail bearing with ridged vanes to direct the flow to the impeller. Bolted or welded shrouds are unacceptable.
 - c. Bell diameter shall be as specified in Attachment A, Process Pump Schedule.
- D. Column and lineshafting
1. Discharge Column
- a. Column Type: Registered fit flanged column sized to limit velocity to 12 ft/sec at any flow in the operating head range.
 - b. Column material: Seamless steel pipe, ASTM A53 Grade B in maximum section length of 10 feet for constant speed units and 5 feet for variable speed units.
 - c. Provide 5-feet long tapered column transition piece at discharge from pump bowls.
 - d. Column Connections: Flanged with Type 316 stainless steel hardware.
2. Lineshaft:
- a. Sized to limit design stress safety margin such that the maximum combined shear stress doesn't exceed 20% of the material yield strength nor be more than 12% of the ultimate strength per AWWA E103.
 - b. ASTM A582, Type 416 stainless steel without sleeves. Surface finish not to exceed 40 RMS.
 - c. Lineshaft to be furnished in interchangeable lengths, not greater than 10-feet.
 - d. Lineshaft diameter shall be as per AWWA Standard E103.
3. Lineshaft Bearings and Couplings:
- a. Bearing spacing: shall be 10 feet maximum on constant speed units and 5 feet maximum on variable speed units, and determined via detailed critical speed analysis as required to prevent resonant vibrations of the lineshaft over the speed range of the pump. Design bearing span such that shaft critical frequency is at least 25% away from the shaft rotating speed range.

- b. Bearing Material: Neoprene in ASTM B505 C93200 bronze guides located at column flanges.
- c. Lineshaft Couplings: 416 stainless steel split ring and key mounted without threads or pins.

E. Mechanical Seals:

- 1. ~~Split mechanical seal (including all standard equipment, unless otherwise specified) shall be as manufactured by A.W. Chesterton Co. or approved equal. All seals provided in this section shall be from the same manufacturer.~~
 - a. ~~Metal parts: Type 316L stainless steel.~~
 - b. ~~Springs: type 17-7 pH stainless steel; Elgiloy; or Hastelloy.~~
 - c. ~~O-rings: Viton~~
 - d. ~~Stationary Faces: Carbon (sintered graphite)~~
 - e. ~~Rotating Faces: Silicon Carbide~~
 - f. ~~Mechanical Seal Gland: Type 316L stainless steel~~
 - g. ~~Gland Bolts and Nuts: Type 316L stainless steel~~
- 2. ~~Split mechanical seals shall be rated for service from full vacuum up to 150% of pump shut off head.~~
- 3. ~~Split mechanical seals shall be capable of handling +/- 1/16 inch axial movement minimum.~~
- 4. ~~All cleaners, solvents, glues, or adhesives used in conjunction with the mechanical seals shall be NSF 61 approved.~~
- 5. ~~Mechanical seal gland shall be split, with two ports 180 degrees apart; one for external flush/lubricating water and one for venting.~~
- 6. ~~Restriction bushing: Provide Chesterton 14K restriction bushing or equal in stuffing box.~~
- 7. ~~**Mechanical seal shall be installed by the seal manufacturer's installation technician at the job site prior to pump start-up and preliminary field testing.** The seal technician shall be a direct employee of the seal manufacturer and have a minimum of 3 years of experience installing split mechanical seals.~~

F. Equipment Identification

- 1. Provide corrosion-resistant nameplates SS316, securely affixed in a conspicuous place, on each item of equipment. Nameplates shall conform to the requirements of ANSI/HI 2.4 and Specification Section 15075-6C "Mechanical Identification".

G. Anchor Bolts:

- 1. Type 316 stainless steel anchor bolts (and relative hardware, including but not limited to, nuts and washers) shall be sized by the pump manufacturer, and supplied by the VENDOR in accordance with the equipment manufacturer's instructions.
- 2. Size and quantity of anchor bolts shall be designed to withstand all momentary and continuous thrusts, vibration, seismic events, and other physical forces to be encountered by the pump, motor, and associated equipment.

H. Vibration and Temperature Monitoring System:

- 1. ~~Provide vibration monitoring system and temperature monitoring system for each motor to monitor the vibration and temperature. per requirements of:~~
 - a. ~~Specification "Electric Motor, Vertical Induction" for High Service Pumps. Motor shall be inverter duty.~~

I. The structural natural frequency of the assembled pump shall be at least 25 percent higher than the pump operating speed.

J. Motors

- 1. The pumps shall be provided with electric induction motors per requirements of:
 - a. This Specification. Motor shall be inverter duty.
- 2. Provide motor thrust bearing with a minimum B-10 life of 100,000 hours.
- 3. The thrust bearing in the motor shall be arranged to withstand any momentary pump up thrust at start-up and shall limit the total movement of the pump shaft

- under these conditions to less than 0.02-inch.
4. Overall sound-pressure level of each motor shall not exceed 85 decibels when measured on flat network using octave-band frequency analyzer conforming to ANSI S1.11. Determine overall sound-pressure level as average of four or more readings at evenly spaced points, 3 feet from motor.
 5. Provide ball or pin type non-reverse ratchet to provide immediate protection against reversing due to phase reversal or from backspin at shutdown. Sprag type non-reverse devices are not acceptable.
- K. Drain, Vent and Seal/Lubricating Water Piping
1. Provide drains from stuffing box, mechanical seal, and gauge assemblies and drain piping and valves to discharge into floor trench or sumps as indicated or, as directed by the OWNER.
 2. Drain, vent and seal water piping: Schedule 5 Type 316L stainless steel with Pressfit connections or Schedule 40 Type 316L stainless steel with socket welded or threaded connections. Provide a sufficient number of unions to permit removal of each valve and in-line device. All components of piping system shall be NSF61 approved.
- L. Painting: Per Pump Manufacturer Recommendations as follows:
1. Shop painting: Factory applied Primer and Finish Paint
 - a. Bowls (exterior), Columns (exterior and interior), and Discharge Head (exterior and interior): Per Manufacturer's Recommendations.
 - b. The interior of the bowls shall have Scotchkote 134 or equal epoxy lining.
 2. Provide additional shop paint coating for touch-up to all surfaces after shop testing is completed and equipment accepted.
 3. All coatings and linings in contact with the pumped fluid shall be suitable for use with potable water and shall be NSF61 approved.

2.04 SOURCE QUALITY CONTROL

- A. Shop Tests:
- ~~1. All of the shop tests required under this Specification shall, in addition to being certified by the manufacturer, be witnessed by the OWNER's representatives. Provide a minimum of 30 days written notice to the OWNER prior to shop testing.~~
 2. Certified shop tests shall be performed for all equipment provided under this Specification. Standard performance test will be conducted as specified in the latest edition of ANSI/HI 14.6: Rotodynamic Pumps for Hydraulic Performance Acceptance Tests and all test data shall be submitted for approval by the OWNER prior to shipment. Test and record speed, flow, head, and horsepower. Certified copies of the calculated anticipated pump field performance curves shall be submitted, including head, capacity, efficiency, total brake horsepower, NPSH and required submergence. NPSHR data can be based on previous factory performance test.
 - ~~3. Generally, the entire pump, including the entire column shall be used in the pump tests. Where the tests facility cannot accommodate the entire column length, the manufacturer shall use as much column as possible to accommodate the test facility and shall adjust test data to compensate for the portions of the column not used in the tests. Manufacturer shall use the upper and lower transfer column sections and the pump strainer in the pump tests.~~
 4. Hydrostatic Testing: Each bowl assembly and discharge head shall be hydrostatically tested at not less than the greater of the following, and in full compliance with the latest edition of ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests:
 - a. 150% of the pressure which would occur when the pump is operating at the rated condition of the pump or,
 - b. 125% of the pressure which occur when the pump is operating at rated speed against a closed discharge valve.
 5. Run pump at full speed rating point for 60 minutes prior to start of any testing.

6. Performance of the pumping units shall be within the tolerances acceptance grade of 1U, as specified in ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests, when operated at design speed and capacity (Rating Point in Pump Schedule attached as Appendix A).
7. In the event that specified tests indicate that pump or motor will not meet specifications, OWNER has the right to require additional complete witnessed tests for all pumps and motors at no additional cost to the OWNER.
8. Repeat tests until specified results are obtained. If impellers are trimmed or modifications made to the pumps, pump assemblies must be retested.
9. Correct or replace promptly all defects or defective equipment revealed by or noted during tests at no additional cost to the OWNER.
10. Submit certified copies of all the test result to the OWNER for review prior to the shipment of the motors from their place of manufacture.
11. All test measurements shall be taken with calibrated instruments and all procedures shall conform to the test code of the Hydraulic Institute unless modified herein.

PART 3 EXECUTION

3.01 - 3.02 (NOT USED)

3.03 INSTALLATION (BY OWNER)

- A. Installation of equipment and materials provided under this Specification Section shall be in accordance with the manufacturer's recommendations and the approved shop drawings. VENDOR representative shall provide onsite guidance to OWNER in achieving this standard.
- B. Additional instructions for the installation of equipment and materials provided under this Specification are as follows:
 1. Pumping units shall be installed on a concrete pad and aligned.
 2. Level the sole plate to within 0.002" per foot of sole plate diameter.
 3. After alignment is correct, space between pump base and concrete pad shall be grouted using high strength (minimum 10,000 PSI compressive strength) non-shrink grout. Do not imbed leveling nuts in grout.
 4. After grouting has set, loose the leveling nuts so the soleplate bears on the grout. Recheck the soleplate for levelness.
- C. After installation of pump equipment, bring piping into direct axial alignment with pump discharge. Flange faces shall fit closely and squarely. The pump discharge shall have no strain imposed upon it by piping misalignment.
- D. Test piping connections, to prove the pump nozzles are installed with the pipe in a free supported state without need to apply vertical or horizontal pressure to align piping with pump nozzles, by removing all flange bolts and checking flange to flange alignment.
- E. Before start-up adjust the clearance between the impeller and the bowl per manufacturer recommendation.
- F. Install the mechanical seal after finishing the adjustment between the impeller and the bowl. A split mechanical seal vendor shall be onsite instructing OWNER personnel on performing this work.

- G. Special Precautions: Before starting the pumps the VENDOR to check the following:
 1. Check setting of impellers and make sure rotating elements are free
 2. Check rotation of motor with pump drive disconnected.
 3. Check settings of the pumps control valve and air vacuum valve.
- H. After start-up and testing as specified below, shut down pump and recheck alignment of coupling. Check in all directions and follow manufacturer's instructions.
- I. After unit has been operated within the allowable operating range for one week, OWNER shall check couplings for misalignment and correct as necessary.
- J. After completion of all procedures specified above, the OWNER shall clean and touch up any damaged coating system as required.

3.04 REPAIR/RESTORATION (NOT USED)

3.05 FIELD QUALITY CONTROL

- A. Provide a minimum of 30 days written notice to the OWNER prior to field testing.
- B. After installation of pumping equipment by the OWNER, and after inspection, operation, testing and adjustment have been completed by the VENDOR, and supervised/inspected by the manufacturer's technical representative, conduct running test for each individual pump system in the presence of OWNER to determine the ability of the pumps, motors, pump control valves and instrumentation to operate like a coordinated system. OWNER shall check each individual pump system's ability to operate within vibration and temperature limits specified, and to deliver its rated capacity under specified conditions. Vibration tests to prove that there are no field installed resonant conditions due to misalignment, the foundation, or the connecting piping and its supports, when operating at any speed within the specified operating range. During tests, VENDOR shall observe and record head, capacity, motor inputs, noise and vibration. Promptly correct or replace all defects or defective equipment revealed by or noted during tests, at no additional cost to the OWNER, and repeat tests until specified results that are acceptable to the OWNER are obtained. Up to a 5% flow measurement accuracy will be accepted. OWNER shall provide labor, material, equipment, piping, and flowmeters for conducting tests. VENDOR shall provide technical personnel and portable testing instrumentation.
- C. VENDOR shall provide vibration signature testing in accordance with ANSI/HI 9.6.4-2009, Centrifugal and Vertical Pump for Vibration Measurements and Allowable Values, except as modified herein:
 1. Vibration readings, taken near the lower motor bearing, shall not exceed 0.16-in./sec. RMS, unfiltered
 2. Test Duration: Determined by OWNER, but not less than four hours of continuous operation.
 3. Submit written report with analysis conclusion, exhibits of where measurements were made, etc. Report shall contain complete analysis of findings, problems encountered, if any, and probable cause and specific recommendations for any corrective action.
- D. VENDOR to provide all equipment, flow meters and test gauges for conducting tests.
 1. VENDOR shall provide calibrated test gauges for all permanently installed gauges and portable calibrated flow meters for all pumping systems.
 2. All calibrations must be within 30 days of the field testing.
 3. The testing will not be started and will not be accepted until the calibrated testing equipment stated above is operational and all certifications have been submitted.
- E. Water for testing can be from the clearwells.

- F. If required, take corrective action and have the Pump Units retested to ensure full compliance with the specified requirements. Remove and replace equipment at no additional cost to the OWNER with equipment that will meet all requirements specified and indicated if unable to demonstrate to the OWNER that units will perform the service specified and indicated. All costs associated with the field tests or any required corrective action shall be borne by the VENDOR.
- G. The vibration analysis indicated above shall be repeated 6 months after signature testing, in the presence of OWNER. A report shall be prepared comparing the results of the 6-month tests with the results of the signature tests. Significant worsening of the vibration, to be determined by the OWNER, during the 6-month tests shall require corrective action and retesting.

3.06 ADJUSTING

- A. Manufacturer's technical representative to inspect, check, assist in making adjustments if necessary, and approve for placing in operation.

3.07 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

~~**NO PAYMENT FOR ANY EQUIPMENT WILL BE MADE UNTIL EQUIPMENT IS FULLY INSTALLED AND HAS PASSED ALL REQUIRED TESTING TO THE SATISFACTION OF THE OWNER.**~~

95% PAYMENT FOR EQUIPMENT DELIVERED, PAYMENT WILL BE MADE WITHIN 30 DAYS OF EQUIPMENT DELIVERY. THE REMAINING 5% RETAINAGE WILL BE PAID ONCE EQUIPMENT IS FULLY INSTALLED AND HAS PASSED ALL REQUIRED TESTING TO THE SATISFACTION OF THE OWNER.

ATTACHMENT "A"

PROCESS PUMP SCHEDULE

A. PUMP PERFORMANCE REQUIREMENTS

Parameter	Pump Requirements
Pump Identification	WTP1 Waste Pump
Number of Unit(s):	1
Pumping Unit(s) Designation:	WTP1 Waste Pump No.1
Type of Service	Chlorinated Filter Backwash Waste Water
Pump Shaft	Enclosed, Oil Lubricated
Overall Length from Bottom of Sole Plate to Suction Bell	18'-6"
Pump Features	Bronze Bowl Liner, Dynamic Balance, Certified Performance Test, Oiler, Hot Dipped Galvanized Soleplate 48"x48", 3D electronic file drawing of pump and motor showing each component
Pumping Unit Drivers:	Hollow Shaft Electric Motor
Location (Note 3)	Water Treatment Plant No. 1
Water Temperature	35°F-85°F
Minimum Column Size (inch)	24
Discharge Size (inch)	24
First Rating Point at Full Speed: Pumping Capacity (gpm) Pumping Head (FT) (Note 1)	12,000 35
Minimum Bowl Efficiency at First Rating Point	83%
Secondary Rating Point at Full Speed: Pumping Capacity (GPM) Pumping Head (FT) (Note 1)	14,000 29
Minimum Bowl Efficiency at Secondary Rating Point	80%
Maximum Number of Pump Stages	1
Pump Full Speed (RPM) not to exceed	885
Brake Horsepower (HP) (Note 2)	125
Net Positive Suction Head Required (NPSHr) at All Points and Head Capacity Curve not to exceed (ft)	32
Head at MCSF (Minimum Constant Flow) to exceed (ft)	39
Capacity at MCSF (Minimum Constant Flow) to exceed (gpm)	10,000
Shutoff Head not to exceed (ft)	40
Run-out point Pump Head to be less than (ft)	18

Note 1: Pump supplier to add strainer, bowl, column and pump head losses to the specified pump head.

Note 2: Listed brake horsepower is not to be exceeded at the motor coupling at any point of the head-capacity curve including line, bearing, seal, coupling, etc. losses.

Note 3: Vendor is required to verify existing baseplate(s) and discharge piping dimensions to ensure new equipment will fit without additional modifications or couplings.

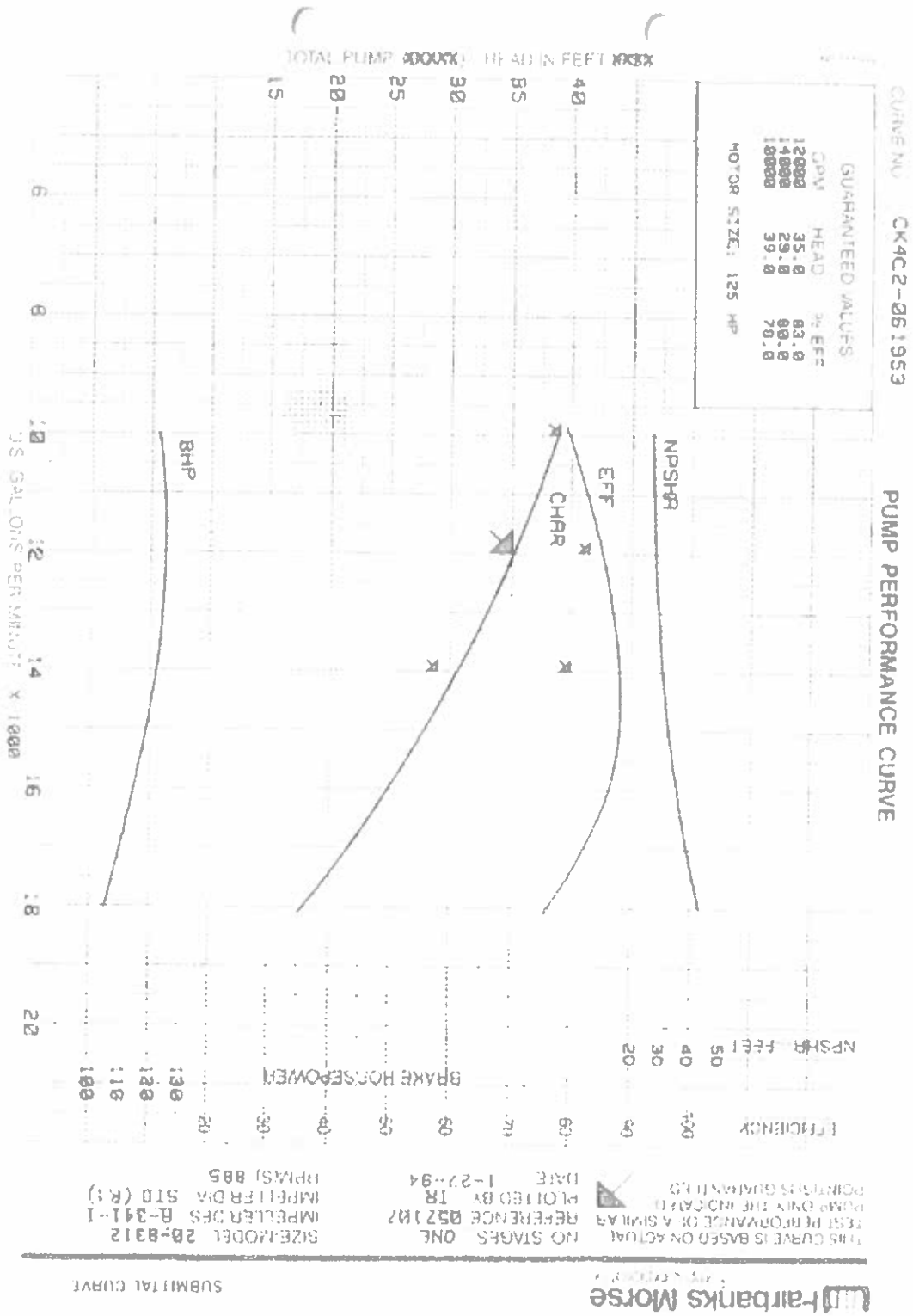
B. ELECTRIC MOTOR REQUIREMENTS

Parameter	Pump Requirements
Pump Identification	WTP1 Waste Pump
Motor Manufacturer and Model No.	GE Model No. 5KS449FT8G03A
Horsepower Rating (HP)	125
Pump Speed	Constant speed
Service Factor	1.15
Nominal Speed (RPM)	885
Voltage	460 Volts, 3-phase, 60 Hz
Enclosure	TEFC
Shaft	Hollow

Note 1: The motor shall be capable of starting the pump against a closed discharge valve using a full voltage starter under all conditions which the pumping unit could be subjected.

ATTACHMENT "B"

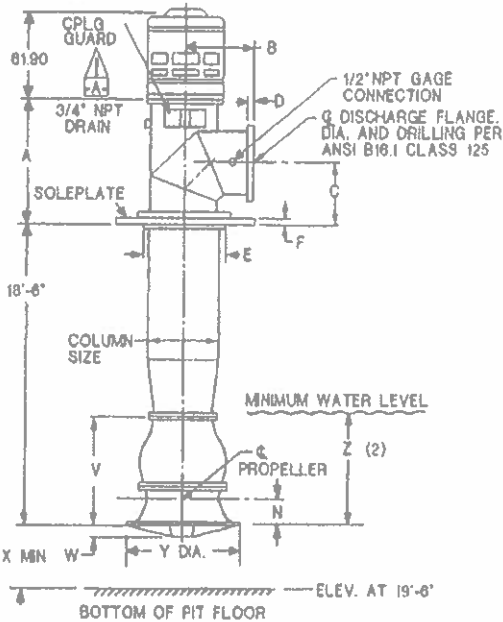
EXISTING PUMP MODEL 8312AE - PUMP CURVE AND DIMENSIONS



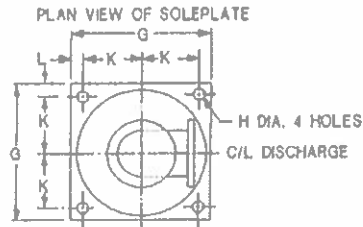
DISCH SIZE	COL SIZE	A						B	C	D	E	F	G	H	K	L
		MOTOR BASE DIAMETER														
24	24	12	18-1/2	20	24 1/2	30-1/2	29	29 7/8	1-7/8	28	1	48	1	22	2	
		47-7/8	58 7/8	64 7/8	82 7/8											

FLANGE DIMENSIONS				
150 LB ANSI STANDARD				
SIZE	DIAMETER	NO. BOLTS	SIZE BOLTS	BOLT CIRCLE
24	32	20	1-1/4	29 1/2

DRIVER IS SHIPPED SEPARATELY FOR FIELD INSTALLATION



WARNING
 DO NOT OPERATE THIS MACHINE WITHOUT PROTECTIVE GUARDS IN PLACE. ANY OPERATION OF THIS MACHINE WITHOUT PROTECTIVE GUARDS CAN RESULT IN SEVERE BODILY INJURY.
 -A- SUPPLIED BY FMPC



SOLEPLATE IS DESIGNED TO BE IN FULL CONTACT WITH GROUTED SURFACE

PUMP SIZE	MODEL	N	V		W	X	Y	Z
			1 STG	2 STG				
20	8312	18	38 1/2	60	6	12	35	60

● SEE PERFORMANCE CURVE

1. DIMENSIONS SHOWN ARE TYPICAL AND MAY VARY DUE TO TOLERANCES. TO ACHIEVE EXACT DIMENSIONS, FIELD ADJUSTMENTS MAY BE REQUIRED
2. MINIMUM REQUIRED AT MAXIMUM FLOW
3. NOT FOR CONSTRUCTION, INSTALLATION, OR APPLICATION PURPOSES UNLESS CERTIFIED
4. BASEPLATE MUST BE SUPPORTED ON ALL 4 SIDES.

CUSTOMER		CRAIG, SHEFFIELD & AUSTIN, INC.			P.O.	NO UNITS	Fairbanks Morse Pump Corporation
JOB NAME		CITY OF BROWNSVILLE, TX			TAG NAME	2	
PUMP SIZE & MODEL		STGS	GPM	EDM	PPM	SETTING PLAN FOR	
20" 8312AE		1				MODEL 8312 PUMPS	
2	10/3/94	MOTOR	HP	FRAME	BLEC. CHA	ENCL	TEFC
1	10/21/94	GENERAL ELEC.	125	L449TP	3/60/480 VOLT		
REV	DATE	CERTIFIED FOR		CERTIFIED BY	DATE	SIZE	DWG NO
		K4C2-061953		J. FINE	1/94	C	SK4C2-061953

D:\8312-FL\SPF.PIC

END OF SECTION