

**2" SUPER T SERIES® EQUIPPED WITH ERADICATOR™ SOLIDS MANAGEMENT SYSTEM  
HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMP  
TYPICAL PERFORMANCE SPECIFICATIONS**

**PART 1 - GENERAL**

**1.01 PERFORMANCE CRITERIA**

- A. The pumps manufacturer must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. The pump manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.
- C. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 2" suction connection, and 2" discharge connection. Each pump shall be selected to perform under following operating conditions:

- 1. Capacity (GPM) \_\_\_\_\_
- 2. Total Dynamic Head (FT) \_\_\_\_\_
- 3. Total Dynamic Suction Lift (FT) \_\_\_\_\_
- 4. Maximum Repriming Lift (FT) \_\_\_\_\_
- 5. Minimum TDH (FT) \_\_\_\_\_
- 6. Maximum TDH (FT) \_\_\_\_\_
- 7. Maximum Static Suction Lift (FT) \_\_\_\_\_
- 8. Total Discharge Static Head (FT) \_\_\_\_\_
- 9. Minimum Submergence Depth (FT) \_\_\_\_\_

**D. Pump Performance Certifications**

- 1. ERADICATOR™ – Solids Management System designed for management of sanitary wipes, plastic bags, feathers, hair, sludge, and all other types of stringy solids.
- 2. Solids Handling Capability
  - a. All internal passages, impeller vanes, and recirculation ports shall pass a 1½" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer's certified drawings showing size and location of the recirculation port shall be submitted for approval.

**E. Reprime Performance**

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

2. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.
3. Pump must reprime \_\_\_ vertical ft. at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within five minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:
  - a. A check valve to be installed down stream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.
  - b. A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.
  - c. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90° elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.
  - d. Impeller clearances shall be set as recommended in the pump service manual.
  - e. Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.
  - f. Liquid to be used for reprime test shall be water.
  - g. Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

*\*(Optional **Certified Pump Performance Test**)*

F. Certified Pump Performance Test

1. Tests shall be conducted in accordance with Hydraulic Institute Standards 14.6.3.4 Acceptance Grade 2B at the specified head, capacity, rated speed and horsepower. The performance tests will validate the correct performance of the equipment at the design head, capacity and speed.
2. For pumps utilizing up to (13 HP) motors; but larger than (1.3 HP), tests shall be conducted in accordance with Hydraulic Institute Standards 14.6.3.4.1, as the specified head, capacity, rated speed and horsepower.

G. Manufacturer's Warranty

1. The pump manufacturer shall warrant the pump equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.
2. All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the pump equipment and all components.
3. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.
4. It is not intended that the pump manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.
5. The warranty shall become effective upon the acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment, whichever occurs first.

## **PART 2 - PRODUCT**

### **2.01 UNITARY RESPONSIBILITY**

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

### **2.02 MANUFACTURER**

- A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. "Reverse-engineered" products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.
- C. The term "pump manufacturer" shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a "pump manufacturer and is not an acceptable

supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

- D. After execution of the contract, the contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.
- E. In event the contractor obtains engineer's approval for equipment substitution, the contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the engineer prior to acceptance.
- F. It will be assumed that if the cost to the contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.

## 2.03 PUMP DESIGN

- A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.
- B. The pumps manufacturer must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- C. Materials and Construction Features
  - 1. Pump casing: Casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:
    - a. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.
    - b. A 2" NPT fill port shall be supplied for ease of filling the pump casing.
    - c. Casing drain plug shall be at least 3/4" NPT to insure complete and rapid draining.
    - d. Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.
  - 2. Coverplate assembly shall be cast iron Class 30. Design must incorporate following maintenance features:
    - a. A lightweight inspection coverplate, retained by acorn nuts, for access to pump interior for removal of stoppages. Designs that require removal of complete coverplate assembly for access to the impeller will not be accepted.
    - b. Retained by acorn nuts for complete access to pump interior. Back coverplate removal must allow service to the impeller, seal, wear plate or check valve without removing suction or discharge piping.

- c. Aggressive Self-Cleaning Wear Plate
  - 1) A replaceable wear plate secured to the back cover plate by studs and nuts. Wear plate shall be self-cleaning design ensuring that debris is cleared away and does not collect on the impeller vanes.
  - 2) The nature of the conveyed medium poses significant challenges to the continuous operation of the pump. Of particular concern is the clogging of the impeller by debris in the pumped medium including but not limited to long rags, fibers, and like debris which are able to wrap around the impeller vanes, stick to the center of the vanes or hub, or lodge within the spaces between the impeller and the housing.
  - 3) The aggressive self-cleaning wear plate shall have integral laser cut notches and grooves designed to disturb and dislodge any solids which might otherwise remain on the impeller in dynamic operation. Wear plate is designed to constantly and effectively clear the eye of the impeller without the use of blades or cutters.
- d. In consideration for safety, a pressure relief valve shall be supplied in the cover plate. Relief valve shall open at 75-200 PSI.
- e. Two O-rings of Buna-N material shall seal cover plate to pump casing.
- f. Pusher bolt capability to assist in removal of cover plate. Pusher bolt threaded holes shall be sized to accept same retaining capscrews as used in rotating assembly.
- g. Easy-grip handle shall be mounted to face of cover plate.
- 3. Rotating Assembly: A rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, sealplate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:
  - a. Sealplate and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.
    - 1) The bearing cavity shall have an oil level sight gauge and fill/vent plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill/vent plug check valve. The air vent check valve shall vent the cavity but prevent introduction of moist air to the bearings.
    - 2) The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.
  - b. Impeller shall be ductile iron, 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.

- c. Shaft shall be AISI 4140 alloy steel unless otherwise specified by the engineer, in which case AISI 17-4 pH stainless steel shall be supplied.
  - d. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.
  - e. Shaft seal shall be oil lubricated mechanical type. The stationary and rotating seal faces shall be (tungsten titanium carbide) (silicon carbide) alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the sealplate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton. Cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.
  - f. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same capscrews as used for retaining rotating assembly.
4. Adjustment of the impeller face clearance (distance between impeller and wearplate) shall be accomplished by external means.
- a. Clearances shall be maintained by a four point external shimless coverplate adjustment system, utilizing a four collar and four adjusting screw design allowing for incremental adjustment of clearances by hand as required. Each of the four points shall be lockable to prevent inadvertent clearance increases or decreases due to equipment vibration or accidental operator contact. The four point system also allows for equal clearance gaps at all points between the impeller and wear plate. Requirement of realignment of belts, couplings, etc., shall not be acceptable. Coverplate shall be capable of being removed without disturbing clearance settings. Clearance adjustment systems that utilize less than four points will not be considered.
  - b. There shall be provisions for additional clearance adjustment in the event that adjustment tolerances have been depleted from the coverplate side of the pump. The removal of stainless steel tabbed spacers from the rotating assembly side of the pump shall allow for further adjustment as described above.
  - c. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.
5. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished from the top of pump, without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

6. Spool flanges shall be one-piece cast iron, class 30 fitted to 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.

***\*(Insert following paragraph for optional VOLUTE CASING HEATER accessory)***

7. Pump shall be provided with a thermostat mounted to the exterior of the volute casing, and a \_\_\_ watt 115 volt electric heater inserted into the interior of the volute. The heater shall be energized at 43+/-3 degrees F to provide heat to the casing and eliminate the possibility of freezing.

D. Serviceability

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs by incorporating features that require no special tools for replacement of any components within the pump.

**PART 3 - EXECUTION**

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install, level, align, and lubricate pump(s) as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.
- C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to control panel.
- D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.
- E. After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

3.03 FIELD QUALITY CONTROL

## A. Operational Test

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