
Basin System with Centrifugal Grinder Pump and Electrical Junction Box**1. INTRODUCTION**

- 1.1. **GRINDER PUMP SYSTEMS:** Low pressure sewer systems (LPS) grinder pump shall be a **Myers® MG200 GRINDER PUMP SYSTEM** or pre-approved equal.
- 1.2. **GRINDER PUMPS** shall be of the centrifugal type. Motors shall be a minimum of two (2) hp rotating at no less than 3450 rpm pumps shall not be considered or approved equal.
- 1.3. **GRINDER PUMP SYSTEMS** shall be of the factory quick ship package type and shall carry a full factory supplied warranty. Locally fabricated packages that do not carry factory warranty shall not be considered or approved equal.

2. GENERAL**2.1. SUMMARY**

- 2.1.1. The work included in this section shall include furnishing all equipment and materials necessary for complete grinder pump units as specified herein and in compliance with the requirements as specified in the hydraulic analysis report.
Model number shall be **Myers MG200-21**.

2.2. REFERENCES

- 2.2.1. The equipment furnished shall be produced by a company experienced in the design and manufacture of grinder pumps. Manufacturer shall have a minimum of 25-years experience in the design and manufacture of grinder pump systems for use in low pressure sewer projects. A project is defined as an installation of 50 or more pumps discharging into a common force main.
- 2.2.2. The manufacturer shall submit detailed installation, user instructions and service instructions.

2.3. PACKAGE DESCRIPTION

- 2.3.1. **Pump Model: MG200-21**
- 2.3.2. **Basin Model: MG24PZ2J**
- 2.3.3. **Panel Model: 27682A000**

2.4. SYSTEM PERFORMANCE REQUIREMENT

- 2.4.1. Pumps shall be designed to meet the design head conditions based on the sewer system. Minimum flow requirements for a grinder pump, must illustrate minimum 2 fps velocity through force main.
- 2.4.2. The sewer system hydraulic analysis shall include the following:
 - 2.4.2.1. Color coded piping schematic of the entire system.

- 2.4.2.2. Complete flow, velocity and pressure requirements for each pipe segments.
- 2.4.2.3. A complete written report and design drawing must be submitted.

2.5. SUBMITTALS

- 2.5.1. The complete submittal packet shall include shop drawing information which includes, but is not limited to the following items: pump, motor, impeller, grinder assembly, lift out assembly, check valve, shut off valve, piping, level controls, basin, electrical control panel, electrical junction boxes, alarm facilities. Any deviations from the specifications shall be noted in the submittal.

2.6. PROJECT CONDITIONS

- 2.6.1. The specifications and project drawings depict equipment and materials manufactured by Myers, which are deemed 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 contract shall constitute an obligation to furnish the specified equipment and materials.
- 2.6.2. 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.
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- 2.6.4. 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 the amount equal to the savings.

3. PRODUCTS – GRINDER UNITS BASE BID

3.1. PUMP ASSEMBLY

3.1.1. Pump Model / General Construction

- 3.1.1.1. Pump shall be a centrifugal sealed grinder type, model MG200-21, as manufactured by Pentair Ltd. The pump castings shall be high quality gray cast iron, ASTM A-48, Class 30. All external-mating parts shall be machined and Buna-N Rubber O-ring seals. Fiber or paper gaskets shall not be acceptable. All fasteners exposed to the pumped liquid shall be 300 series stainless steel. The grinder unit shall be integrally built with a submersible type motor. The grinder pump shall be capable of macerating material in normal domestic and commercial sewage to a fine slurry that will pass freely through the pump and 1-1/4" discharge pipe.

3.1.2. Electrical Power/Control Cord

- 3.1.2.1. The motor power cord shall be SJOOW water resistant and CSA/UL approved.

3.1.2.2. The power cable entry into the cord cap assembly shall first be made with a rubber compression washer and compression nut. Each individual lead shall be stripped down to bare wire, at staggered intervals, and each strand shall be individually separated. A heat shrink tube filled with epoxy shall seal the outer cable jacket and the individual leads to prevent water contamination to gain entry even in the event of wicking or capillary attraction.

3.1.3. Motor

3.1.3.1. Pump motor shall be of the oil-filled type to promote superior cooling and longevity. Air-filled motors shall not be considered equal or allowed. Motor shall be at a minimum two (2) hp and shall rotate at a minimum of 3450 rpm.

3.1.3.2. The stator, rotor and bearings shall be mounted in a sealed submersible frame. The stator winding shall be of the open type with Class F insulation, (155 degrees C or 311 degrees F) and NEMA B design (3 phase), NEMA L design (single phase). Single-phase motors shall be capacitor start, capacitor run type for high start torque.

3.1.3.3. The motor shall be mounted in a three quarter motor frame attached to the bearing housing with threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit shall not be acceptable. No special tools shall be required for pump and motor disassembly.

3.1.3.4. The motor frame shall be filled with dielectric type oil for maximum heat dissipation by transferring heat from windings and rotor to outer shell. The oil shall also provide continuous lubrication of bearings and mechanical seals. Air-filled motors do not provide superior heat dissipating capabilities and continuous lubrication, therefore shall not be considered an equal. The pump and motor shall be specifically designed so that they may be operated two thirds or completely submerged in the liquid being pumped without compromise. The pump shall not require cooling water jackets. Dependence upon, or use of water jackets for supplemental cooling shall not be acceptable.

3.1.4. Bearings and Shaft

3.1.4.1. Motor shall have an upper single row ball radial bearing and a lower single row ball thrust bearing. Ball bearings shall be designed for 50,000 hours B-10 life. Bearings are to be permanently lubricated by the dielectric oil, which fills the motor housing. Grease packed ball bearings requiring periodic maintenance for lubrication shall not be acceptable.

3.1.4.2. The common motor pump and grinder shaft shall be machined from solid 400 series stainless steel and be designed for minimum shaft overhang to reduce shaft deflection and prolong bearing life.

3.1.4.3. The shaft shall be threaded to mount the pump impeller and grinder impeller.

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3.1.5.1. Motor shall be protected by one carbon ceramic type 21 mechanical seal. Seal shall permanently lubricate seal face and to transmit heat from shaft to outer shell.

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3.1.6.1. The impeller shall be designed for rough duty service and shall be of a ten vane, design with hydrodynamic pump out vanes on the rear shroud. The impeller shall be constructed of engineered thermoplastic, with a permanently molded, hexagonally locked bronze insert. The impeller shall be of a non-overloading design and be factory or field trim-able to meet specific performance conditions. Wear or field trimming shall not deter the factory balance. Impeller is to be threaded onto the pump/motor shaft.

3.1.7. Grinder Construction

3.1.7.1. Grinder assembly shall consist of grinder impeller and shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto stainless shaft and shall be locked with screw and washer. The shredding ring shall be pressed into iron holding flange for easy removal. Flange shall be provided with tapped back-off holes so that screws can be used to push the shredding ring from housing. All grinding of solids shall be from action of the 16 rotating cutter impeller against the 27 stationary shredding ring cutters, producing 24,840 cuts per seconds. All grinder cutters and shredding ring shall be of 440 F stainless steel hardened to 57-60 Rockwell C and ground to close tolerance.

3.2. PACKAGE SYSTEM

3.2.1. Fiberglass Basin

3.2.1.1. Basin – The diameters and depths shall be based on the system layout.

3.2.1.2. Basin shall be made from a fiberglass reinforced polyester resin. Resins used shall be of commercial grade polyester and shall be evaluated as a laminate test or determined by previous service to be acceptable for the intended environment. The reinforcing material shall be a commercial grade of glass fiber having a coupling agent to provide a suitable bond between the glass reinforcement and the resin. The manufacturer may supply either (continuous strand, chopped-strand, continuous mat and/or non-continuous mat) or (non-continuous glass strands having fiber lengths from 0.5 to 2.0 inches). The completed material shall be inert and acceptable to the environment. The basin shall be water tight.

- 3.2.1.3. Inner Surface** – The inner surface shall be smooth and resin rich, free of cracks, exposed fibers, porosity and crazing.
- 3.2.1.4. Exterior Surface** – The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. If a pigment is added, color should be relatively equal throughout. Foreign inclusions, dry spots, pinholes or pits, de-laminations, large dimples not meeting thickness requirements, and air bubbles are not acceptable.
- 3.2.1.5. Tank Wall** – Wall thickness shall vary with the basin height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The basin wall laminate must be designed to withstand wall collapse or buckling based on:
- A.** Wall thickness (see prior statement)
 - B.** Hydrostatic pressure (62.4 lbs per square foot)
 - C.** Saturated soil weight (120 lbs per cubic foot)
 - D.** Soil modulus (700 lbs per square foot)
 - E.** Pipe stiffness values as specified (ASTM D3753)
- Tank wall laminate must be constructed to withstand or exceed two (2) times the actual imposed loading on any depth of basin.
- 3.2.1.6. Tank Bottom** – The basin bottom shall be of sufficient thickness to withstand applicable hydrostatic uplift pressure. In saturated conditions, the center deflection of the empty basin bottom shall be less than 3/8" (elastic deflection) and shall not interfere with bottom pump mounting requirements. Any mounting studs, plates, cap screws into tank bottom should be stainless steel and resin covered except for threads. Any inserts should be stainless steel or brass and resin covered except for threads.
- 3.2.1.7. Tank Collar (Anti-Flotation)** – A means to counteract buoyancy forces shall be provided on the tank bottom in the form of a ring, and shall extend a minimum of 2" beyond the O. D. of the basin wall. Wall and collar should be blended with a radius not to exceed 1-1/2" beyond wall O.D.
- 3.2.1.8. Top Flange** – The top flange should be parallel to the tank bottom/collar and perpendicular to the tank wall. Corrosion resistant inserts shall be embedded in the top flange for securing the basin cover. The inserts shall be totally encapsulated to prevent turning (minimum turning torque should not be less than 30 foot/lbs.), pullout and corrosion.

3.2.2. Hard Piped Assembly

- 3.2.2.1.** Discharge piping shall be 1-1/4" PVC hard piped as indicated on the plans. Piping shall connect to a 1-1/4" stainless steel discharge flange, factory located on the basin at the height shown in the plans. Base elbows and guide rail systems shall not be considered equal or allowed.

3.2.2.2. Check valve shall be of the ball type with a corrosion resistant neoprene ball. The ball shall be the only moving part and shall move automatically out of the path of flow, thus providing an unobstructed smooth flow through the valve body. Upon

pump shut-off the ball shall automatically roll to the closed position to provide a positive seal against back pressure or back flow.

3.2.2.3. The ball type shutoff valve shall be furnished and installed as an integral part of the internal pipe assembly. Valve shall be of the single-union type to ease installation and removal of the pump.

3.2.2.4. Pump shall rest on basin floor mounted to a stainless steel base.

3.2.3. Inlet Flange

3.2.3.1. A one-piece, flexible basin inlet fitting for 4" SCH 40 plastic pipe shall be shipped loose for field installation. Optional fittings include:

- A.** 4" SDR35
- B.** 6" SCH40
- C.** 6" SDR35
- D.** 4" Cast iron caulking hub (bolt-on)
- E.** 6" Cast iron caulking hub (bolt-on)

Note: Optional bolt-on caulking hubs cannot be used with SDR35 pipe.

3.2.4. Junction Box

3.2.4.1. A UL listed, NEMA Type 6 submersible rated junction box shall be provided. Junction box shall be formed from corrosion resistant, flame retardant thermoplastic. The enclosure shall be of adequate thickness and properly reinforced to provide good mechanical strength. The junction box shall have a fully gasketed, hinged cover that is held in place by four (4) stainless steel screws. The hinged cover shall prevent dropping the cover into the basin during service.

3.2.4.2. An adequate number of sealing-type cord grips shall be supplied for incoming pump and level control cords. The cord grips shall be made of non-corrosive material such as PVC or nylon, and shall make an effective seal around the wire jacket.

3.2.4.3. The junction box shall have a PVC solvent weld socket with an integral 2" NPT pipe for attaching basin conduit hub. The hub shall be made of a corrosion resistant material and shall be of adequate size to accommodate the number of wires required for pump and level control operation.

3.2.4.4. The incoming wires shall be sealed by external means, (supplied by others), so that condensation from the conduit or groundwater will not enter the enclosure. The interior of the enclosure shall be of adequate size to accommodate the wires and connections for pump and level control operation.

3.3. ELECTRICAL CONTROL PANEL

3.3.1. Control Panel Model / General Construction

3.3.1.1. Control panel shall be Myers 27682A000 for simplex 230V/60HZ/1PH operation. **Panel shall be equipped for two normally open weighted float switches. Float switches mounted to the pump shall not be considered an equal and will not be allowed.** Enclosure shall be NEMA 4X and have a front mounted high intensity LED alarm light.

3.3.2. General Operation / Construction

3.3.2.1. A complete wiring diagram and installation instructions will be provided. The control panel assembly shall be completely factory tested.

3.3.2.2. A hand run button shall be provided for convenient control of the pump manual state. The push to run button shall manually run the pump while the hand run button is being pushed. The momentary operation of the hand run button will help protect the pump from damage of prolonged running due to a dry sump.

3.3.2.3. The control must provide “zero crossing” technology. This monitors the AC sine wave and only allows the relay contacts to close at zero voltage and open at zero current reducing damage caused by inrush loads.

3.3.2.4. The control panel must include an elapsed time meter and cycle counter for each pump. A counter for High Level conditions and float status indication must also be provided.

3.3.2.5. Control Panel Testing

Factory Tests – Each control panel shall receive a test to ensure proper operation prior to shipment. Factory tests shall include at a minimum:

3.3.2.5.1. All control logic functions, including: manual pump run, auto pump on, auto pump off and all alarm functions.

3.3.2.5.2 All fuses and circuit breakers.

3.3.2.5.3 All indicator lights and switches.

3.3.2.5.4 Audible and visual alarm indicators.

3.3.2.5.5 Power transfer circuit to pump motor.

3.3.2.5.6 Float switch input circuits.

3.3.3. Enclosure

3.3.3.1. The durable NEMA 4X enclosure, made from a durable polycarbonate material and intended for indoor or outdoor. The enclosure is primarily to provide a degree of protection against corrosion, windblown dust, rain, splashing water and hose directed water. The enclosure shall remain undamaged by the formation of ice on the enclosure. To maintain maximum enclosure integrity no holes shall be drilled into the enclosure for any lights, audible or silence/test circuitry. The resin system also shall include a flame retardant to obtain a flammability rating. The resin system shall be resistant to ultraviolet light.

- 3.3.3.2. The cover shall have a molded hinge allowing the door to be quickly removed to allow for better access or replacement if necessary. The cover shall be lockable by means of a high quality stainless steel latch and padlock hasps, for safe operation under indoor and outdoor use.

3.3.4. Alarms / Indicators

- 3.3.4.1. **Visual Alarm Circuitry**– A front mounted high intensity flashing red LED alarm light with various flashing modes depending on alarm condition. The lens shall be molded into the door so that the enclosure is not penetrated for the alarm light. The lens shall be made of clear polycarbonate with red LED alarm lights to allow for maximum contrast in sunlight. The same alarm light shall be capable of notifying high level, low level, float fail and power short through different flash codes. The flashing light shall reset once alarm condition ceases. The panel will have an individual alarm circuit fuse.
- 3.3.4.2. Green power (control and alarm) and pump run indicator lights shall be located on the front of the enclosure with no penetration through the door. A green pump run light, and red control and alarm power short lights shall be provided and mounted on the inside of the door.
- 3.3.4.3. The alarm circuitry must utilize touch pad technology that allows the alarm to be silenced and tested from the outside of the enclosure without penetrating the enclosure for a button or switch.

3.3.5. Circuit Breakers

- 3.3.5.1 **Motor Circuit Breaker.** The pump circuit breaker shall be thermal magnetic trip device and provide for individual motor disconnect and overcurrent and short circuit protection as required by the NEC rating for motor branch circuit protection. Breaker shall be rated 10,000 amps interrupt current (10KAIC). The voltage rating shall match that of the panel incoming service.
- 3.3.5.2 **Control Circuit Breaker.** The 120 volt control circuits shall be protected by an auxiliary single (1) pole circuit breaker. Breaker shall be rated 10,000 amps interrupt current (10KAIC).
- 3.3.5.3 **Motor Power Relay.** The motor relay shall be rated for 5 hp – 230v and 2 hp – 115v when used with “zero crossing” technology. It shall provide the electrical start/stop control for each pump and have 12 volt dc operating coil.

3.3.6. Level Controls

3.3.6.1. Float Switch Level Control Operation

- 3.3.6.1.1. The control panel shall provide terminal strip inputs for pump float and alarm float controls.
- 3.3.6.1.2. The controller shall provide a pump run indicator light. The LED indicator shall activate to indicate the pump is running.

3.3.6.2. Float Controls

- 3.3.6.2.1.** Simplex control panel operation shall be automatically controlled float switch type level controls. Float switches shall control pump and high-level alarm functions.
- 3.3.6.2.2.** Float switch shall be capable of operating at temperatures between 32 and 170 degrees F. Float switches shall activate and deactivate between 5 degrees above horizontal and 5 degrees below horizontal. Float switch shall be constructed with a polypropylene outer shell for durability and resistance to wastewater environment. Outer shell shall be filled with polyurethane foamed interior to provide best buoyancy, water tight integrity and protect the switch.
- 3.3.6.2.3.** Float switches shall be of normally open type.
- 3.3.6.2.4.** Float switch cables shall be a minimum of 18 gauge, jacketed cable. Float switch contacts shall be capable of handling 10 amps at 115 VAC or 3 amps at 240 VAC.
- 3.3.6.2.5.** Float switch shall be third party safety recognized by UL and certified by CSA.
- 3.3.6.2.6.** Float switches shall have an external zinc plated cast iron weight. Weight shall be of the split design and shall be easily adjustable for tether length. Float switch weights made of heavy metals which may contaminate the waste flow stream shall not be acceptable.

4. EXECUTION

4.1. QUALITY ASSURANCE

- 4.1.1.** The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the grinder pump shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.
- 4.1.2.** The grinder pump shall have an industry standard commercial test, which consists of a run test, Hi Pot test and hermetic leak decay test.

4.2. DELIVERY, STORAGE AND HANDLING

- 4.2.1.** The manufacturer shall furnish and deliver assembled grinder pump stations to the contractor or owner. Simplex units, containing one grinder pump and all necessary parts and equipment, shall be installed in fiberglass reinforced polyester tanks for outside installations. All equipment shall be factory installed, except for externally mounted control panel, gravity sewer inlet hubs and pump assembly, which are to be installed in the field. Each simplex grinder pump unit shall be complete, consisting of a basin, basin cover, grinder pump, check valve, junction box, start-stop level controls, motor high temperature shutoff, high water alarm, pump motor failure, alarm loss of power, all internal wiring terminating into the junction box, shutoff valve and discharge piping. In addition, an external alarm and pump control panel is to be provided for the unit.

- 4.2.2.** All packaged tank assemblies will include all the necessary equipment to make a complete turnkey system ready for installation except the grinder pump and control panel.
- 4.2.3.** Upon receipt of packaged tank assemblies, the contractor or owner will visually inspect to make certain the freight carrier has successfully transported the equipment with no damage. It is the responsibility of the contractor or owner to reject any or all damaged equipment prior to signing the delivery slip. FOB factory.
- 4.2.4.** Handling and unloading the basin assemblies shall be the responsibility of the contractor or owner. Lifting devices such as chain is prohibited.
- 4.2.5.** The basin assemblies, grinder pumps and control panels will be stored in a controlled environment to prevent weather conditions from damaging the equipment.

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7.2.1.4. Exterior Surface – The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. If a pigment is added, color should be relatively equal

throughout. Foreign inclusions, dry spots, pinholes or pits, de-laminations, large dimples not meeting thickness requirements and air bubbles are not acceptable.

7.2.1.5. Tank Wall – Wall thickness shall vary with the basin height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The basin wall laminate must be designed to withstand wall collapse or buckling based on:

- A. Wall thickness (see prior statement)
- B. Hydrostatic pressure (62.4 lbs per square foot)
- C. Saturated soil weight (120 lbs per cubic foot)
- D. Soil modulus (700 lbs per square foot)
- E. Pipe stiffness values as specified (ASTM D3753)

Tank wall laminate must be constructed to withstand or exceed two (2) times the actual imposed loading on any depth of basin.

7.2.1.6. Tank Bottom – The basin bottom shall be of sufficient thickness to withstand applicable hydrostatic uplift pressure. In saturated conditions, the center deflection of the empty basin bottom shall be less than 3/8" (elastic deflection) and shall not interfere with bottom pump mounting requirements. Any mounting studs, plates, cap screws into tank bottom should be stainless steel and resin covered except for threads. Any inserts should be stainless steel or brass and resin covered except for threads.

7.2.1.7. Tank Collar (Anti-Flotation) – A means to counteract buoyancy forces shall be provided on the tank bottom in the form of a ring, and shall extend a minimum of 2" beyond the O. D. of the basin wall. Wall and collar should be blended with a radius not to exceed 1-1/2" beyond wall O.D.

7.2.1.8. Top Flange – The top flange should be parallel to the tank bottom/collar and perpendicular to the tank wall. Corrosion resistant inserts shall be embedded in the top flange for securing the basin cover. The inserts shall be totally encapsulated to prevent turning (minimum turning torque should not be less than 30 foot/lbs.), pullout and corrosion.

7.2.2. Hard Piped Assembly

7.2.2.1. Discharge piping shall be 1-1/4" PVC hard piped as indicated on the plans. Piping shall connect to a 1-1/4" stainless steel discharge flange, factory located on the basin at the height shown in the plans. Base elbows and guide rail systems shall not be considered equal or allowed.

7.2.2.2. Check valve shall be of the ball type with a corrosion resistant neoprene ball. The ball shall be the only moving part and shall move automatically out of the path of flow, thus providing an unobstructed smooth flow through the valve body. Upon pump shut-off the ball shall automatically roll to the closed position to provide a positive seal against back pressure or back flow.

7.2.2.3. The ball type shutoff valve shall be furnished and installed as an integral part of the internal pipe assembly. Valve shall be of the single-union type to ease installation and removal of the pump.

7.2.2.4. Pump shall rest on basin floor mounted to a stainless steel base.

7.2.3. Inlet Flange

7.2.3.1. A one-piece, flexible basin inlet fitting for 4" SCH 40 plastic pipe shall be shipped loose for field installation. Optional fittings include:

- A. 4" SDR35
- B. 6" SCH40
- C. 6" SDR35
- D. 4" Cast iron caulking hub (bolt-on)
- E. 6" Cast iron caulking hub (bolt-on)

Note: Optional bolt-on caulking hubs cannot be used with SDR35 pipe.

7.2.4. Electrical Terminations

7.2.4.1. The pump power cord and level control cords shall run directly to the control panel. A one-piece flexible fitting shall be installed in the basin. The basin fitting shall secure a 2" electrical PVC conduit to accommodate all wires needed for pump and level control operation.

7.2.4.2. Pump power and level control cords shall run in non-corrosive conduit, unrestricted to the control panel. The control panel shall have an adequate number of sealing type cord grips or equivalent, and shall effectively seal around the wire jacket of the power cords.

7.3. ELECTRICAL CONTROL PANEL

7.3.1. Control Panel Model / General Construction

7.3.1.1. Control panel shall be **Myers 27682A001** for simplex 230V/60HZ/1PH operation. **Panel shall be equipped for two normally open weighted float switches. Float switches mounted to the pump shall not be considered an equal and will not be allowed.** Enclosure shall be NEMA 4X and have a front mounted high intensity LED alarm light.

7.3.2. General Operation / Construction

7.3.2.1. A complete wiring diagram and installation instructions will be provided. The control panel assembly shall be completely factory tested.

7.3.2.2. A hand run button shall be provided for convenient control of the pump manual state. The push to run button shall manually run the pump while the hand run button is being pushed. The momentary operation of the hand run button will help protect the pump from damage of prolonged running due to a dry sump.

7.3.2.3. The control must provide “zero crossing” technology. This monitors the AC sine wave and only allows the relay contacts to close at zero voltage and open at zero current reducing damage caused by inrush loads.

7.3.2.4. The control panel must include an elapsed time meter and cycle counter for each pump. A counter for high level conditions and float status indication must also be provided.

7.3.2.5. Control Panel Testing

Factory Tests – Each control panel shall receive a test to ensure proper operation prior to shipment. Factory tests shall include at a minimum:

7.3.2.5.1. All control logic functions, including: manual pump run, auto pump on, auto pump off and all alarm functions.

7.3.2.5.2 All fuses and circuit breakers.

7.3.2.5.3 All indicator lights and switches.

7.3.2.5.4 Audible and visual alarm indicators.

7.3.2.5.5 Power transfer circuit to pump motor.

7.3.2.5.6 Float switch input circuits.

7.3.3. Enclosure

7.3.3.1. The durable NEMA 4X enclosure, made from a durable polycarbonate material and intended for indoor or outdoor. The enclosure is primarily to provide a degree of protection against corrosion, windblown dust, rain, splashing water and hose directed water. The enclosure shall remain undamaged by the formation of ice on the enclosure. To maintain maximum enclosure integrity no holes shall be drilled into the enclosure for any lights, audible or silence/test circuitry. The resin system also shall include a flame retardant to obtain a flammability rating. The resin system shall be resistant to ultraviolet light.

7.3.3.2. The cover shall have a molded hinge allowing the door to be quickly removed to allow for better access or replacement if necessary. The cover shall be lockable by means of a high quality stainless steel latch and padlock hasps, for safe operation under indoor and outdoor use.

7.3.4. Alarms / Indicators

7.3.4.1. Visual Alarm Circuitry – A front mounted high intensity flashing red LED alarm light with various flashing modes depending on alarm condition. The lens shall be molded into the door so that the enclosure is not penetrated for the alarm light. The lens shall be made of clear polycarbonate with red LED alarm lights to allow for maximum contrast in sunlight. The same alarm light shall be capable of notifying high level, low level, float fail and power short through different flash codes. The flashing light shall reset once alarm condition ceases. The panel will have an individual alarm circuit fuse.

7.3.4.2. Green power (control and alarm) and pump run indicator lights shall be located on the front of the enclosure with no penetration through the door. A green pump run light, and red control and alarm power short lights shall be provided and mounted on the inside of the door.

7.3.4.3. The alarm circuitry must utilize touch pad technology that allows the alarm to be silenced and tested from the outside of the enclosure without penetrating the enclosure for a button or switch.

7.3.5. Circuit Breakers

7.3.5.1. Motor Circuit Breaker. The pump circuit breaker shall be thermal magnetic trip device and provide for individual motor disconnect and overcurrent and short circuit protection as required by the NEC rating for motor branch circuit protection. Breaker shall be rated 10,000 amps interrupt current (10KAIC). The voltage rating shall match that of the panel incoming service.

7.3.5.2. Control Circuit Breaker. The 120-volt control circuits shall be protected by an auxiliary single (1) pole circuit breaker. Breaker shall be rated 10,000 amps interrupt current (10KAIC).

7.3.5.3. Motor Power Relay. The motor relay shall be rated for 5 hp – 230v and 2 hp – 115v when used with “zero crossing” technology. It shall provide the electrical start/stop control for each pump and have 12-volt dc operating coil.

7.3.6. Level Controls

7.3.6.1. Float Switch Level Control Operation

7.3.6.1.1. The control panel shall provide terminal strip inputs for pump float and alarm float controls.

7.3.6.1.2. The controller shall provide a pump run indicator light. The LED indicator shall activate to indicate the pump is running.

7.3.6.2. Float Controls

7.3.6.2.1. Simplex control panel operation shall be automatically controlled float switch type level controls. Float switches shall control pump and high-level alarm functions.

7.3.6.2.2. Float switch shall be capable of operating at temperatures between 32 and 170 degrees F. Float switches shall activate and deactivate between 5 degrees above horizontal and 5 degrees below horizontal. Float switch shall be constructed with a polypropylene outer shell for durability and resistance to wastewater environment. Outer shell shall be filled with polyurethane foamed interior to provide best buoyancy, water tight integrity and protect the switch.

7.3.6.2.3. Float switches shall be of normally open type.

- 7.3.6.2.4.** Float switch cables shall be a minimum of 18 gauge jacketed cable. Float switch contacts and shall be capable of handling 10 amps at 115 VAC or 3 amps at 240 VAC.
- 7.3.6.2.5.** Float switch shall be third party safety recognized by UL and certified by CSA.
- 7.3.6.2.6.** Float switches shall have an external zinc plated cast iron weight. Weight shall be of the split design and shall be easily adjustable for tether length. Float switch weights made of heavy metals, which may contaminate the waste flow stream, shall not be acceptable.

8. EXECUTION

8.1. QUALITY ASSURANCE

- 8.1.1.** The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the complete grinder pump shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.
- 8.1.2.** The grinder pump shall have an industry standard commercial test, which consists of a run test, Hi Pot test and hermetic leak decay test.

8.2. DELIVERY, STORAGE AND HANDLING

- 8.2.1.** The manufacturer shall furnish and deliver assembled grinder pump stations to the contractor or owner. Simplex units, containing one grinder pump and all necessary parts and equipment, shall be installed in fiberglass reinforced polyester tanks for outside installations. All equipment shall be factory installed, except for externally mounted control panel, gravity sewer inlet hubs and pump assembly, which are to be installed in the field. Each simplex grinder pump unit shall be complete, consisting of a basin, basin cover, grinder pump, check valve, start-stop level controls, motor high temperature shutoff, high water alarm, pump motor failure, alarm loss of power, shutoff valve and discharge piping. In addition, an external alarm and pump control panel is to be provided for the unit.
- 8.2.2.** All packaged tank assemblies will include all the necessary equipment to make a complete turnkey system ready for installation except the grinder pump and control panel.
- 8.2.3.** Upon receipt of packaged tank assemblies, the contractor or owner will visually inspect to make certain the freight carrier has successfully transported the equipment with no damage. It is the responsibility of the contractor or owner to reject any or all damaged equipment prior to signing the delivery slip. FOB factory.
- 8.2.4.** Handling and unloading the basin assemblies shall be the responsibility of the contractor or owner. Lifting devices such as chain is prohibited.
- 8.2.5.** The basin assemblies, grinder pumps and control panels will be stored in a controlled environment to prevent weather conditions from damaging the equipment.

SHA Basin System with Semi-Positive Displacement Grinder Pump and Electrical Junction Box**9. INTRODUCTION**

- 9.1. GRINDER PUMP SYSTEMS:** Low pressure sewer systems (LPS) grinder pump shall be a **Myers GRINDER PUMP SYSTEM** or pre-approved equal.
- 9.2. GRINDER PUMPS** shall be of the high head semi-positive displacement. Motors shall be a minimum of two (2) hp rotating at no less than 1750 rpm pumps shall not be considered or approved equal.
- 9.3. GRINDER PUMP SYSTEMS shall be of the factory quick ship package type and shall carry a full factory supplied warranty.** Locally fabricated packages that do not carry factory warranty shall not be considered or approved equal.

10. GENERAL**10.1. SUMMARY**

- 10.1.1.** The work included in this section shall include furnishing all equipment and materials necessary for complete grinder pump units as specified herein and in compliance with the requirements as specified in the hydraulic analysis report.

Model number shall be **Myers Pump MGPD200-21**.

10.2. REFERENCES

- 10.2.1.** The equipment furnished shall be produced by a company experienced in the design and manufacture of grinder pumps. Manufacturer shall have a minimum of 25-years experience in the design and manufacture of grinder pump systems for use in low pressure sewer projects. A project is defined as an installation of 50 or more pumps discharging into a common force main.
- 10.2.2.** The manufacturer shall submit detailed installation, user instructions and service instructions.

10.3. PACKAGE DESCRIPTION

- 10.3.1. Pump Model: MGPD200-21**
- 10.3.2. Basin Model: MGPD24PZ2J**
- 10.3.3. Panel Model: 27682D001**

10.4. SYSTEM PERFORMANCE REQUIREMENT

- 10.4.1.** Pumps shall be designed to meet the design head conditions based on the sewer system. Minimum flow requirements for a grinder pump, must illustrate minimum 2 fps velocity through force main.

10.4.2. The sewer system hydraulic analysis shall include the following:

10.4.2.1. Color-coded piping schematic of the entire system.

10.4.2.2. Complete flow, velocity and pressure requirements for each pipe segments.

10.4.2.3. A complete written report and design drawing must be submitted.

10.5. SUBMITTALS

10.5.1. The complete submittal packet shall include shop drawing information which includes, but is not limited to the following items: pump, motor, impeller, grinder assembly, lift out assembly, check valve, shut off valve, piping, level controls, basin, electrical control panel, electrical junction boxes, alarm facilities. Any deviations from the specifications shall be noted in the submittal.

10.6. PROJECT CONDITIONS

10.6.1. The specifications and project drawings depict equipment and materials manufactured by **Myers** which are deemed 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 contract shall constitute an obligation to furnish the specified equipment and materials.

10.6.2. 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.

10.6.3. In the 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.

10.6.4. 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 the amount equal to the savings.

11.PRODUCTS – GRINDER UNITS BASE BID

11.1. PUMP ASSEMBLY

11.1.1. Pump Model / General Construction

11.1.1.1. Pump shall be a semi-positive displacement sealed grinder type, model MGP200-21 as manufactured by Pentair Ltd. The pump castings shall be high quality gray cast iron, ASTM A-48, Class 30. All external-mating parts shall be machined and Buna-N Rubber O-ring seals. Fiber or paper gaskets shall not be acceptable. All fasteners exposed to the pumped liquid shall be 300 series stainless steel. The grinder unit shall be integrally built with a submersible type motor. The grinder pump shall be capable of macerating material in normal domestic and commercial sewage to a fine slurry that will pass freely through the pump and 1-1/4" discharge pipe. NOTE: The following objects should not be introduced into the grinder as

damage to the pump stator boot will result; glass; metal; seafood shells; plastic objects (toys, utensils, etc.) or other like sharp objects.

11.1.2. Electrical Power/Control Cord

11.1.2.1. The motor power cord shall be SJOOW water resistant and CSA/UL approved.

11.1.2.2. The power cable entry into the cord cap assembly shall first be made with a rubber compression washer and compression nut. Each individual lead shall be stripped down to bare wire, at staggered intervals, and each strand shall be individually separated. A heat shrink tube filled with epoxy shall seal the outer cable jacket and the individual leads to prevent water contamination to gain entry even in the event of wicking or capillary attraction.

11.1.3. Motor

11.1.3.1. Pump motor shall be of the oil-filled type to promote superior cooling and longevity. Air-filled motors shall not considered equal or allowed. Motor shall be at a minimum two (2) hp and shall rotate at a minimum of 1750 rpm.

11.1.3.2. The stator, rotor and bearings shall be mounted in a sealed submersible frame. The stator winding shall be of the open type with Class F insulation, (155 degrees C or 311 degrees F) and NEMA B design (3 phase), NEMA L design (single phase). Single-phase motors shall be capacitor start, capacitor run type for high start torque.

11.1.3.3. The motor shall be mounted in a three quarter motor frame attached to the bearing housing with threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit shall not be acceptable. No special tools shall be required for pump and motor disassembly.

11.1.3.4. The motor frame shall be filled with dielectric type oil for maximum heat dissipation by transferring heat from windings and rotor to outer shell. The oil shall also provide continuous lubrication of bearings and mechanical seals. Air-filled motors do not provide superior heat dissipating capabilities and continuous lubrication, therefore shall not be considered an equal. The pump and motor shall be specifically designed so that they may be operated two thirds or completely submerged in the liquid being pumped without compromise. The pump shall not require cooling water jackets. Dependence upon, or use of water jackets for supplemental cooling shall not be acceptable.

11.1.4. Bearings and Shaft

11.1.4.1. Motor shall have an upper single row ball radial bearing and a lower single row ball thrust bearing. Ball bearings shall be designed for 50,000 hours B-10 life. Bearings are to be permanently lubricated by the dielectric oil, which fills the motor housing. Grease packed ball bearings requiring periodic maintenance for lubrication shall not be acceptable.

11.1.4.2. The common motor pump and grinder shaft shall be machined from solid 400 series stainless steel and be designed for minimum shaft overhang to reduce shaft deflection and prolong bearing life.

11.1.4.3. The shaft shall be threaded to mount the pump impeller and grinder impeller.

11.1.5. Mechanical Seals

11.1.5.1. Motor shall be protected by one type 21 carbon ceramic mechanical seal. Seal shall permanently lubricate seal face to transmit heat from shaft to outer shell. The seal housing shall be equipped with a moisture sensing probe installed between the seals, and the sensing of moisture in the seal chamber shall be automatic, continuous and not require the pump be stopped or removed from the wet well. Single seal protection will not be considered equal.

11.1.5.2. Seal face shall be carbon and ceramic and lapped to a flatness of one light band. All hardware is to 300 series stainless steel and sealing elastomers are to Buna-N Rubber.

11.1.6. Pump Impeller / Semi-Positive Displacement

11.1.6.1. The semi-positive displacement stator boot shall be designed for rough duty service and shall be of an axial double-helix positive-displacement type. The stator boot shall be constructed of Buna-N Rubber, with the progressing cavity chamber molded integral to the stator boot. Stator boot shall be retained within the volute pumping chamber by a mean of stainless steel retaining ring secured with 400 series fasteners.

11.1.6.2. The semi-positive displacement rotor shall be designed for rough duty service and shall be of a single-lobe axial helix type. The rotor shall be constructed of 300 series stainless steel designed for close slip-fit over motor shaft and retained on motor shaft by means of a lower roll pin.

11.1.7. Grinder Construction

11.1.7.1. Grinder assembly shall consist of grinder impeller and shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto stainless shaft and shall be locked with screw and washer. The shredding ring shall be pressed into iron holding flange for easy removal. Flange shall be provided with tapped back-off holes so that screws can be used to push the shredding ring from housing. All grinding of solids shall be from action of the 16 rotating cutter impeller against the 27 stationary shredding ring cutters, producing 24,840 cuts per seconds. All grinder cutters and shredding ring shall be of 440 C stainless steel hardened to 58–60 Rockwell C and ground to close tolerance.

11.1.8. Grinder Construction

11.1.8.1. Grinder assembly shall consist of grinder impeller and shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto stainless shaft and shall be locked with screw and washer. The shredding ring shall

be pressed into iron holding flange for easy removal. Flange shall be provided with tapped back-off holes so that screws can be used to push the shredding ring from housing. All grinding of solids shall be from action of the 16 rotating cutter impeller against the 27 stationary shredding ring cutters, producing 24,840 cuts per seconds. All grinder cutters and shredding ring shall be of 440 F stainless steel hardened to 57–60 Rockwell C and ground to close tolerance.

11.2. PACKAGE SYSTEM

11.2.1. Fiberglass Basin

- 11.2.1.1. Basin** – The diameters and depths shall be based on the system layout.
- 11.2.1.2.** Basin shall be made from a fiberglass reinforced polyester resin. Resins used shall be of commercial grade polyester and shall be evaluated as a laminate test or determined by previous service to be acceptable for the intended environment. The reinforcing material shall be a commercial grade of glass fiber having a coupling agent to provide a suitable bond between the glass reinforcement and the resin. The manufacturer may supply either (continuous strand, chopped-strand, continuous mat and/or non-continuous mat) or (non-continuous glass strands having fiber lengths from 0.5 to 2.0 inches). The completed material shall be inert and acceptable to the environment. The basin shall be water tight.
- 11.2.1.3. Inner Surface** – The inner surface shall be smooth and resin rich, free of cracks, exposed fibers, porosity and crazing.
- 11.2.1.4. Exterior Surface** – The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. If a pigment is added, color should be relatively equal throughout. Foreign inclusions, dry spots, pinholes or pits, de-laminations, large dimples not meeting thickness requirements, and air bubbles are not acceptable.
- 11.2.1.5. Tank Wall** – Wall thickness shall vary with the basin height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The basin wall laminate must be designed to withstand wall collapse or buckling based on:
- A.** Wall thickness (see prior statement)
 - B.** Hydrostatic pressure (62.4 lbs per square foot)
 - C.** Saturated soil weight (120 lbs per cubic foot)
 - D.** Soil modulus (700 lbs per square foot)
 - E.** Pipe stiffness values as specified (ASTM D3753)
- Tank wall laminate must be constructed to withstand or exceed two (2) times the actual imposed loading on any depth of basin.
- 11.2.1.6. Tank Bottom** – The basin bottom shall be of sufficient thickness to withstand applicable hydrostatic uplift pressure. In saturated conditions, the center deflection of the empty basin bottom shall be less than 3/8" (elastic deflection) and shall not interfere with bottom pump mounting requirements. Any mounting studs, plates,

cap screws into tank bottom should be stainless steel and resin covered except for threads. Any inserts should be stainless steel or brass and resin covered except for threads.

11.2.1.7. Tank Collar (Anti-Flotation) – A means to counteract buoyancy forces shall be provided on the tank bottom in the form of a ring, and shall extend a minimum of 2" beyond the O. D. of the basin wall. Wall and collar should be blended with a radius not to exceed 1-1/2" beyond wall O.D.

11.2.1.8. Top Flange – The top flange should be parallel to the tank bottom/collar and perpendicular to the tank wall. Corrosion resistant inserts shall be embedded in the top flange for securing the basin cover. The inserts shall be totally encapsulated to prevent turning (minimum turning torque should not be less than 30 foot/lbs.), pullout and corrosion.

11.2.2. Hard Piped Assembly

11.2.2.1. Discharge piping shall be 1-1/4" PVC hard piped as indicated on the plans. Piping shall connect to a 1-1/4" stainless steel discharge flange, factory located on the basin at the height shown in the plans. Base elbows and guide rail systems shall not be considered equal or allowed.

11.2.2.2. Check valve shall be of the ball type with a corrosion resistant neoprene ball. The ball shall be the only moving part and shall move automatically out of the path of flow, thus providing an unobstructed smooth flow through the valve body. Upon pump shut-off the ball shall automatically roll to the closed position to provide a positive seal against back pressure or back flow.

11.2.2.3. The ball type shutoff valve shall be furnished and installed as an integral part of the internal pipe assembly. Valve shall be of the single-union type to ease installation and removal of the pump.

11.2.2.4. Pump shall rest on basin floor mounted to a stainless steel base.

11.2.3. Inlet Flange

11.2.3.1. A one-piece, flexible basin inlet fitting for 4" SCH 40 plastic pipe shall be shipped loose for field installation. Optional fittings include:

- A.** 4" SDR35
- B.** 6" SCH40
- C.** 6" SDR35
- D.** 4" Cast iron caulking hub (bolt-on)
- E.** 6" Cast iron caulking hub (bolt-on)

Note: Optional bolt-on caulking hubs cannot be used with SDR35 pipe.

11.2.4. Junction Box

- 11.2.4.1.** A UL listed, NEMA Type 6 submersible rated junction box shall be provided. Junction box shall be formed from corrosion resistant, flame retardant thermoplastic. The enclosure shall be of adequate thickness and properly reinforced to provide good mechanical strength. The junction box shall have a fully gasketed, hinged cover that is held in place by four (4) stainless steel screws. The hinged cover shall prevent dropping the cover into the basin during service.
- 11.2.4.2.** An adequate number of sealing-type cord grips shall be supplied for incoming pump and level control cords. The cord grips shall be made of non-corrosive material such as PVC or nylon, and shall make an effective seal around the wire jacket.
- 11.2.4.3.** The junction box shall have a PVC solvent weld socket with an integral 2" NPT pipe for attaching basin conduit hub. The hub shall be made of a corrosion resistant material and shall be of adequate size to accommodate the number of wires required for pump and level control operation.
- 11.2.4.4.** The incoming wires shall be sealed by external means, (supplied by others), so that condensation from the conduit or groundwater will not enter the enclosure. The interior of the enclosure shall be of adequate size to accommodate the wires and connections for pump and level control operation.

11.3. ELECTRICAL CONTROL PANEL

11.3.1. Control Panel Model / General Construction

- 11.3.1.1.** Control panel shall be Myers 27682A000 for simplex 230V/60HZ/1PH operation. **Panel shall be equipped for two normally open weighted float switches. Float switches mounted to the pump shall not be considered an equal and will not be allowed.** Enclosure shall be NEMA 4X and have a front mounted high intensity LED alarm light.

11.3.2. General Operation / Construction

- 11.3.2.1.** A complete wiring diagram and installation instructions will be provided. The control panel assembly shall be completely factory tested.
- 11.3.2.2.** A hand run button shall be provided for convenient control of the pump manual state. The push to run button shall manually run the pump while the hand run button is being pushed. The momentary operation of the hand run button will help protect the pump from damage of prolonged running due to a dry sump.
- 11.3.2.3.** The control must provide "zero crossing" technology. This monitors the AC sine wave and only allows the relay contacts to close at zero voltage and open at zero current reducing damage caused by inrush loads.

11.3.2.4. The control panel must include an elapsed time meter and cycle counter for each pump. A counter for high level conditions and float status indication must also be provided.

11.3.2.5. Control Panel Testing

Factory tests – Each control panel shall receive a test to ensure proper operation prior to shipment. Factory tests shall include at a minimum:

11.3.2.5.1. All control logic functions, including: manual pump run, auto pump on, auto pump off, and all alarm functions.

11.3.2.5.2. All fuses and circuit breakers.

11.3.2.5.3. All indicator lights and switches.

11.3.2.5.4. Audible and visual alarm indicators.

11.3.2.5.5 Power transfer circuit to pump motor.

11.3.2.5.6 Float switch input circuits.

11.3.3. Enclosure

11.3.3.1. The durable NEMA 4X enclosure, made from a durable polycarbonate material and intended for indoor or outdoor. The enclosure is primarily to provide a degree of protection against corrosion, windblown dust, rain, splashing water and hose directed water. The enclosure shall remain undamaged by the formation of ice on the enclosure. To maintain maximum enclosure integrity no holes shall be drilled into the enclosure for any lights, audible or silence/test circuitry. The resin system also shall include a flame retardant to obtain a flammability rating. The resin system shall be resistant to ultraviolet light.

11.3.3.2. The cover shall have a molded hinge allowing the door to be quickly removed to allow for better access or replacement if necessary. The cover shall be lockable by means of a high quality stainless steel latch and padlock hasps, for safe operation under indoor and outdoor use.

11.3.4. Alarms / Indicators

11.3.4.1. Visual Alarm Circuitry – A front mounted high intensity flashing red LED alarm light with various flashing modes depending on alarm condition. The lens shall be molded into the door so that the enclosure is not penetrated for the alarm light. The lens shall be made of clear polycarbonate with red LED alarm lights to allow for maximum contrast in sunlight. The same alarm light shall be capable of notifying high level, low level, float fail and power short through different flash codes. The flashing light shall reset once alarm condition ceases. The panel will have an individual alarm circuit fuse.

11.3.4.2. Green power (control and alarm) and pump run indicator lights shall be located on the front of the enclosure with no penetration through the door. A green pump run light, and red control and alarm power short lights shall be provided and mounted on the inside of the door.

11.3.4.3. The alarm circuitry must utilize touch pad technology that allows the alarm to be silenced and tested from the outside of the enclosure without penetrating the enclosure for a button or switch.

11.3.5. Circuit Breakers

11.3.5.1 Motor Circuit Breaker. The pump circuit breaker shall be thermal magnetic trip device and provide for individual motor disconnect and overcurrent and short circuit protection as required by the NEC rating for motor branch circuit protection. Breaker shall be rated 10,000 amps interrupt current (10KAIC). The voltage rating shall match that of the panel incoming service.

11.3.5.2 Control Circuit Breaker. The 120-volt control circuits shall be protected by an auxiliary single (1) pole circuit breaker. Breaker shall be rated 10,000 amps interrupt current (10KAIC).

11.3.5.3 Motor Power Relay. The motor relay shall be rated for 5 hp – 230v and 2 hp – 115v when used with “zero crossing” technology. It shall provide the electrical start/stop control for each pump and have 12-volt dc operating coil.

11.3.6. Level Controls

11.3.6.1. Float Switch Level Control Operation

11.3.6.1.1. The control panel shall provide terminal strip inputs for pump float and alarm float controls.

11.3.6.1.2. The controller shall provide a pump run indicator light. The LED indicator shall activate to indicate the pump is running.

11.3.6.2. Float Controls

11.3.6.2.1. Simplex control panel operation shall be automatically controlled float switch type level controls. Float switches shall control pump and high-level alarm functions.

11.3.6.2.2. Float switch shall be capable of operating at temperatures between 32 and 170 degrees F. Float switches shall activate and deactivate between 5 degrees above horizontal and 5 degrees below horizontal. Float switch shall be constructed with a polypropylene outer shell for durability and resistance to wastewater environment. Outer shell shall be filled with polyurethane foamed interior to provide best buoyancy, water tight integrity and protect the switch.

11.3.6.2.3. Float switches shall be of normally open type.

11.3.6.2.4. Float switch cables shall be a minimum of 18 gauge jacketed cable. Float switch contacts shall be capable of handling 10 amps at 115 VAC or 3 amps at 240 VAC.

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12. EXECUTION

12.1. QUALITY ASSURANCE

12.1.1. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the grinder pump shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.

12.1.2. The grinder pump shall have an industry standard commercial test, which consists of a run test, Hi Pot test and hermetic leak decay test.

12.2. DELIVERY, STORAGE AND HANDLING

12.2.1. The manufacturer shall furnish and deliver assembled grinder pump stations to the contractor or owner. Simplex units, containing one grinder pump and all necessary parts and equipment, shall be installed in fiberglass reinforced polyester tanks for outside installations. All equipment shall be factory installed, except for externally mounted control panel, gravity sewer inlet hubs and pump assembly, which are to be installed in the field. Each simplex grinder pump unit shall be complete, consisting of a basin, basin cover, grinder pump, check valve, junction box, start-stop level controls, motor high temperature shutoff, high water alarm, pump motor failure, alarm loss of power, all internal wiring terminating into the junction box, shutoff valve and discharge piping. In addition, an external alarm and pump control panel is to be provided for the unit.

12.2.2. All packaged tank assemblies will include all the necessary equipment to make a complete turnkey system ready for installation except the grinder pump and control panel.

12.2.3. Upon receipt of packaged tank assemblies, the contractor or owner will visually inspect to make certain the freight carrier has successfully transported the equipment with no damage. It is the responsibility of the contractor or owner to reject any or all damaged equipment prior to signing the delivery slip. FOB factory.

12.2.4. Handling and unloading the basin assemblies shall be the responsibility of the contractor or owner. Lifting devices such as chain is prohibited.

12.2.5. The basin assemblies, grinder pumps and control panels will be stored in a controlled environment to prevent weather conditions from damaging the equipment.

Basin System with Semi-Positive Displacement Grinder**13. INTRODUCTION**

- 13.1. GRINDER PUMP SYSTEMS:** Low pressure sewer systems (LPS) grinder pump shall be a **Myers GRINDER PUMP SYSTEM** or pre-approved equal.
- 13.2. GRINDER PUMPS** shall be of the **high head semi-positive displacement**. Motors shall be a minimum of two (2) hp rotating at no less than 1750 rpm pumps shall not be considered or approved equal.
- 13.3. GRINDER PUMP SYSTEMS shall be of the factory quick ship package type and shall carry a full factory supplied warranty.** Locally fabricated packages that do not carry factory warranty shall not be considered or approved equal.

14. GENERAL**14.1. SUMMARY**

- 14.1.1.** The work included in this section shall include furnishing all equipment and materials necessary for complete grinder pump units as specified herein and in compliance with the requirements as specified in the hydraulic analysis report.
Model number shall be **Myers Pump MGPD200-21**.

14.2. REFERENCES

- 14.2.1.** The equipment furnished shall be produced by a company experienced in the design and manufacture of grinder pumps. Manufacturer shall have a minimum of 25-years experience in the design and manufacture of grinder pump systems for use in low pressure sewer projects. A project is defined as an installation of 50 or more pumps discharging into a common force main.
- 14.2.2.** The manufacturer shall submit detailed installation, user instructions and service instructions.

14.3. PACKAGE DESCRIPTION

- 14.3.1. Pump Model: MGPD200-21**
- 14.3.2. Basin Model: MGPD24PZ2**
- 14.3.3. Panel Model: 27682D001**

14.4. SYSTEM PERFORMANCE REQUIREMENT

- 14.4.1.** Pumps shall be designed to meet the design head conditions based on the sewer system. Minimum flow requirements for a grinder pump, must illustrate minimum 2 fps velocity through force main.
- 14.4.2.** The sewer system hydraulic analysis shall include the following:

- 14.4.2.1. Color-coded piping schematic of the entire system.
- 14.4.2.2. Complete flow, velocity and pressure requirements for each pipe segments.
- 14.4.2.3. A complete written report and design drawing must be submitted.

14.5. SUBMITTALS

- 14.5.1. The complete submittal packet shall include shop drawing information which includes, but is not limited to the following items: pump, motor, impeller, grinder assembly, lift out assembly, check valve, shut off valve, piping, level controls, basin, electrical control panel, electrical junction boxes, alarm facilities. Any deviations from the specifications shall be noted in the submittal.

14.6. PROJECT CONDITIONS

- 14.6.1. The specifications and project drawings depict equipment and materials manufactured by **Myers**, which are deemed 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 contract shall constitute an obligation to furnish the specified equipment and materials.
- 14.6.2. 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.
- 14.6.3. In the 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.
- 14.6.4. 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 the amount equal to the savings.

15. PRODUCTS – GRINDER UNITS BASE BID

15.1. PUMP ASSEMBLY

15.1.1. Pump Model / General Construction

- 15.1.1.1. Pump shall be a semi-positive displacement sealed grinder type, model MGPD200-21 as manufactured by Pentair Ltd. The pump castings shall be high quality gray cast iron, ASTM A-48, Class 30. All external-mating parts shall be machined and Buna-N Rubber O-ring seals. Fiber or paper gaskets shall not be acceptable. All fasteners exposed to the pumped liquid shall be 300 series stainless steel. The grinder unit shall be integrally built with a submersible type motor. The grinder pump shall be capable of macerating material in normal domestic and commercial sewage to a fine slurry that will pass freely through the pump and 1-1/4" discharge pipe.

NOTE: The following objects should not be introduced into the grinder as damage to the pump stator boot will result; glass; metal; seafood shells; plastic objects (toys, utensils, etc.) or other like sharp objects.

15.1.2. Electrical Power/Control Cord

- 15.1.2.1.** The motor power cord shall be SJOOW water resistant and CSA/ UL approved.
- 15.1.2.2.** The power cable entry into the cord cap assembly shall first be made with a rubber compression washer and compression nut. Each individual lead shall be stripped down to bare wire, at staggered intervals, and each strand shall be individually separated. A heat shrink tube filled with epoxy shall seal the outer cable jacket and the individual leads to prevent water contamination to gain entry even in the event of wicking or capillary attraction.

15.1.3. Motor

- 15.1.3.1. Pump motor shall be of the oil filled type to promote superior cooling and longevity. Air filled motors shall not considered equal or allowed. Motor shall be at a minimum two (2) hp and shall rotate at a minimum of 1750 rpm.**
- 15.1.3.2.** The stator, rotor and bearings shall be mounted in a sealed submersible frame. The stator winding shall be of the open type with Class F insulation, (155 degrees C or 311 degrees F) and NEMA B design (3 phase), NEMA L design (single phase). Single-phase motors shall be capacitor start, capacitor run type for high start torque.
- 15.1.3.3.** The motor shall be mounted in a three quarter motor frame attached to the bearing housing with threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit shall not be acceptable. No special tools shall be required for pump and motor disassembly.
- 15.1.3.4.** The motor frame shall be filled with dielectric type oil for maximum heat dissipation by transferring heat from windings and rotor to outer shell. The oil shall also provide continuous lubrication of bearings and mechanical seals. Air-filled motors do not provide superior heat dissipating capabilities and continuous lubrication, therefore shall not be considered an equal. The pump and motor shall be specifically designed so that they may be operated two thirds or completely submerged in the liquid being pumped without compromise. The pump shall not require cooling water jackets. Dependence upon, or use of water jackets for supplemental cooling shall not be acceptable.

15.1.4. Bearings and Shaft

- 15.1.4.1.** Motor shall have an upper single row ball radial bearing and a lower single row ball thrust bearing. Ball bearings shall be designed for 50,000 hours B-10 life. Bearings are to be permanently lubricated by the dielectric oil which fills the motor housing. Grease packed ball bearings requiring periodic maintenance for lubrication shall not be acceptable.

15.1.4.2. The common motor pump and grinder shaft shall be machined from solid #400 series stainless steel and be designed for minimum shaft overhang to reduce shaft deflection and prolong bearing life.

15.1.4.3. The shaft shall be threaded to mount the pump impeller and grinder impeller.

15.1.5. Mechanical Seals

15.1.5.1. Motor shall be protected by one type 21 carbon ceramic mechanical seal. Seal shall permanently lubricate seal face to transmit heat from shaft to outer shell.

15.1.5.2. The seal housing shall be equipped with a moisture sensing probe installed between the seals, and the sensing of moisture in the seal chamber shall be automatic, continuous, and not require the pump be stopped or removed from the wet well. Single seal protection will not be considered equal.

15.1.5.3. Seal face shall be carbon and ceramic and lapped to a flatness of one light band. All hardware is to 300 series stainless steel and sealing elastomers are to Buna-N Rubber.

15.1.6. Pump Impeller / Semi-Positive Displacement

15.1.6.1. The semi-positive displacement stator boot shall be designed for rough duty service and shall be of an axial double-helix positive-displacement type. The stator boot shall be constructed of Buna-N Rubber, with the progressing cavity chamber molded integral to the stator boot. Stator boot shall be retained within the volute pumping chamber by a mean of stainless steel retaining ring secured with 400 series fasteners.

15.1.6.2. The semi-positive displacement rotor shall be designed for rough duty service and shall be of a single-lobe axial helix type. The rotor shall be constructed of 300 series stainless steel designed for close slip-fit over motor shaft and retained on motor shaft by means of a lower roll pin.

15.1.7. Grinder Construction

15.1.7.1. Grinder assembly shall consist of grinder impeller and shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto stainless shaft and shall be locked with screw and washer. The shredding ring shall be pressed into iron holding flange for easy removal. Flange shall be provided with tapped back-off holes so that screws can be used to push the shredding ring from housing. All grinding of solids shall be from action of the 16 rotating cutter impeller against the 27 stationary shredding ring cutters, producing 24,840 cuts per seconds. All grinder cutters and shredding ring shall be of 440 F stainless steel hardened to 57–60 Rockwell C and ground to close tolerance.

15.2. PACKAGE SYSTEM

15.2.1. Fiberglass Basin

15.2.1.1. Basin – The diameters and depths shall be based on the system layout.

- 15.2.1.2.** Basin shall be made from a fiberglass reinforced polyester resin. Resins used shall be of commercial grade polyester and shall be evaluated as a laminate test or determined by previous service to be acceptable for the intended environment. The reinforcing material shall be a commercial grade of glass fiber having a coupling agent to provide a suitable bond between the glass reinforcement and the resin. The manufacturer may supply either (continuous strand, chopped-strand, continuous mat and/or non-continuous mat) or (non-continuous glass strands having fiber lengths from 0.5 to 2.0 inches). The completed material shall be inert and acceptable to the environment. The basin shall be water tight.
- 15.2.1.3. Inner Surface** – The inner surface shall be smooth and resin rich, free of cracks, exposed fibers, porosity and crazing.
- 15.2.1.4. Exterior Surface** – The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. If a pigment is added, color should be relatively equal throughout. Foreign inclusions, dry spots, pinholes or pits, de-laminations, large dimples not meeting thickness requirements and air bubbles are not acceptable.
- 15.2.1.5. Tank Wall** – Wall thickness shall vary with the basin height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements. The basin wall laminate must be designed to withstand wall collapse or buckling based on:
- A.** Wall thickness (see prior statement)
 - B.** Hydrostatic pressure (62.4 lbs per square foot)
 - C.** Saturated soil weight (120 lbs per cubic foot)
 - D.** Soil modulus (700 lbs per square foot)
 - E.** Pipe stiffness values as specified (ASTM D3753)
- Tank wall laminate must be constructed to withstand or exceed two (2) times the actual imposed loading on any depth of basin.
- 15.2.1.6. Tank Bottom** – The basin bottom shall be of sufficient thickness to withstand applicable hydrostatic uplift pressure. In saturated conditions, the center deflection of the empty basin bottom shall be less than 3/8" (elastic deflection) and shall not interfere with bottom pump mounting requirements. Any mounting studs, plates, cap screws into tank bottom should be stainless steel and resin covered except for threads. Any inserts should be stainless steel or brass and resin covered except for threads.
- 15.2.1.7. Tank Collar (Anti-Flotation)** – A means to counteract buoyancy forces shall be provided on the tank bottom in the form of a ring, and shall extend a minimum of 2" beyond the O. D. of the basin wall. Wall and collar should be blended with a radius not to exceed 1-1/2" beyond wall O.D.

15.2.1.8. Top Flange – The top flange should be parallel to the tank bottom/collar and perpendicular to the tank wall. Corrosion resistant inserts shall be embedded in the top flange for securing the basin cover. The inserts shall be totally encapsulated to prevent turning (minimum turning torque should not be less than 30 foot/lbs.), pullout and corrosion.

15.2.2. Hard Piped Assembly

15.2.2.1. Discharge piping shall be 1-1/4" PVC hard piped as indicated on the plans. Piping shall connect to a 1-1/4" stainless steel discharge flange, factory located on the basin at the height shown in the plans. Base elbows and guide rail systems shall not be considered equal or allowed.

15.2.2.2. Check valve shall be of the ball type with a corrosion resistant neoprene ball. The ball shall be the only moving part and shall move automatically out of the path of flow, thus providing an unobstructed smooth flow through the valve body. Upon pump shut-off the ball shall automatically roll to the closed position to provide a positive seal against back pressure or back flow.

15.2.2.3. The ball type shutoff valve shall be furnished and installed as an integral part of the internal pipe assembly. Valve shall be of the single-union type to ease installation and removal of the pump.

15.2.2.4. Pump shall rest on basin floor mounted to a stainless steel base.

15.2.3. Inlet Flange

15.2.3.1. A one-piece, flexible basin inlet fitting for 4" SCH 40 plastic pipe shall be shipped loose for field installation. Optional fittings include:

- A. 4" SDR35
- B. 6" SCH40
- C. 6" SDR35
- D. 4" Cast iron caulking hub (bolt-on)
- E. 6" Cast iron caulking hub (bolt-on)

Note: Optional bolt-on caulking hubs cannot be used with SDR35 pipe.

15.2.4. Electrical Terminations

15.2.4.1. The pump power cord and level control cords shall run directly to the control panel. A one-piece flexible fitting shall be installed in the basin. The basin fitting shall secure a 2" electrical PVC conduit to accommodate all wires needed for pump and level control operation.

15.2.4.2. Pump power and level control cords shall run in non-corrosive conduit, unrestricted to the control panel. The control panel shall have an adequate number of sealing type cord grips or equivalent, and shall effectively seal around the wire jacket of the power cords.

15.3. ELECTRICAL CONTROL PANEL

15.3.1. Control Panel Model / General Construction

- 15.3.1.1.** Control panel shall be Myers 27682A001 for simplex 230V/60HZ/1PH operation. **Panel shall be equipped for two normally open weighted float switches. Float switches mounted to the pump shall not be considered an equal and will not be allowed.** Enclosure shall be NEMA 4X and have a front mounted high intensity LED alarm light.

15.3.2. General Operation / Construction

- 15.3.2.1.** A complete wiring diagram and installation instructions will be provided. The control panel assembly shall be completely factory tested.
- 15.3.2.2.** A hand run button shall be provided for convenient control of the pump manual state. The push to run button shall manually run the pump while the hand run button is being pushed. The momentary operation of the hand run button will help protect the pump from damage of prolonged running due to a dry sump.
- 15.3.2.3.** The control must provide “zero crossing” technology. This monitors the AC sine wave and only allows the relay contacts to close at zero voltage and open at zero current reducing damage caused by inrush loads.
- 15.3.2.4.** The control panel must include an elapsed time meter and cycle counter for each pump. A counter for high level conditions and float status indication must also be provided.

15.3.2.5. Control Panel Testing

Factory tests – Each control panel shall receive a test to ensure proper operation prior to shipment. Factory tests shall include at a minimum:

- 15.3.2.5.1.** All control logic functions, including: manual pump run, auto pump on, auto pump off and all alarm functions.
- 15.3.2.5.2** All fuses and circuit breakers.
- 15.3.2.5.3** All indicator lights and switches.
- 15.3.2.5.4** Audible and visual alarm indicators.
- 15.3.2.5.5** Power transfer circuit to pump motor.
- 15.3.2.5.6** Float switch input circuits.

15.3.3. Enclosure

- 15.3.3.1.** The durable NEMA 4X enclosure, made from a durable polycarbonate material and intended for indoor or outdoor. The enclosure is primarily to provide a degree of protection against corrosion, windblown dust, rain, splashing water and hose directed water. The enclosure shall remain undamaged by the formation of ice on the enclosure. To maintain maximum enclosure integrity no holes shall be drilled into the enclosure for any lights, audible or silence/test circuitry. The resin system also shall include a flame retardant to obtain a flammability rating. The resin system shall be resistant to ultraviolet light.

15.3.3.2. The cover shall have a molded hinge allowing the door to be quickly removed to allow for better access or replacement if necessary. The cover shall be lockable by means of a high quality stainless steel latch and padlock hasps, for safe operation under indoor and outdoor use.

15.3.4. Alarms / Indicators

15.3.4.1. Visual Alarm Circuitry – A front mounted high intensity flashing red LED alarm light with various flashing modes depending on alarm condition. The lens shall be molded into the door so that the enclosure is not penetrated for the alarm light. The lens shall be made of clear polycarbonate with red LED alarm lights to allow for maximum contrast in sunlight. The same alarm light shall be capable of notifying high level, low level, float fail and power short through different flash codes. The flashing light shall reset once alarm condition ceases. The panel will have an individual alarm circuit fuse.

15.3.4.2. Green power (control and alarm), and pump run indicator lights shall be located on the front of the enclosure with no penetration through the door. A green pump run light, and red control and alarm power short lights shall be provided and mounted on the inside of the door.

15.3.4.3. The alarm circuitry must utilize touch pad technology that allows the alarm to be silenced and tested from the outside of the enclosure without penetrating the enclosure for a button or switch.

15.3.5. Circuit Breakers

2.3.5.1. Motor Circuit Breaker. The pump circuit breaker shall be thermal magnetic trip device and provide for individual motor disconnect and overcurrent and short circuit protection as required by the NEC rating for motor branch circuit protection. Breaker shall be rated 10,000 amps interrupt current (10KAIC). The voltage rating shall match that of the panel incoming service.

2.3.5.2. Control Circuit Breaker. The 120-volt control circuits shall be protected by an auxiliary single (1) pole circuit breaker. Breaker shall be rated 10,000 amps interrupt current (10KAIC).

2.3.5.3. Motor Power Relay. The motor relay shall be rated for 5 hp – 230v and 2 hp – 115v when used with “zero crossing” technology. It shall provide the electrical start/stop control for each pump and have 12-volt dc operating coil.

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