

SECTION 8

SANITARY SEWER CONSTRUCTION

SEWER LIFT STATION

1. **SCOPE OF WORK:** The Contractor shall furnish all labor, materials, tools, equipment and performance of all work necessary to furnish and install the sewer lift station(s) as herein described and noted on the detailed plans. Any deviations from the proposed design and specifications shall be pre-approved by the District 10 days prior to the bid date. Major items of construction shall include, but not limited to the following:

- 6'-0" Diameter Pre-cast Wet Well w/ Anti-Flotation Collar
- 2 - Submersible Non-Clog Sewer Pumps, Motors and Accessories (unless otherwise approved)
- Complete Stainless Steel Lift-Out and Stainless Steel Guide Rail Assembly
- Complete Flanged Discharge Piping Fittings
- 2 - Check Valves
- 2 - Gate Valves
- Aluminum Access Doors for wet well and valve vault as noted
- Duplex Central Control Panel and 5 Level Controls
(low water, pump off, lead, lag, high water)
- PVC Vent System
- A minimum 4' x 4' x 5' Pre-cast Valve Vault
- District supplied (at the developer's/contractor's expense) telemetry system
- A District approved standby generator set (see Special Provisions Section)

The above noted items are for reference only and should not be considered inclusive of all materials necessary for the construction of the lift station. The Contractor is responsible for providing all incidentals necessary to complete the station as shown on the detailed plans and further specified herein.

The Contractor shall also be responsible for submitting 3 (three) copies of all submittals of all lift station infrastructure for the proposed lift station according to the requirements of this section.

2. **PUMPS:** The Contractor shall be responsible for providing two (2) sewer submersible (unless otherwise specified) pumps capable of operating with 3 Phase power, unless approved otherwise, and meeting the following minimum design conditions capable of remaining within 4-6 pumping cycles per hour:

- Design Capacity
- Total Dynamic Head (Range)
- Maximum Speed

Minimum Design Efficiency
Discharge Size
Minimum Solids Capability
Shut Off Head
Minimum Driver Horsepower
Motor Requirements
Pump Type, Brand, and Model
Potential Acceptable Pump Manufacturers

A. Submersible Non-Clog Sewage Pumps: The pumps are to be designed and constructed to pumping sewer, heavy sludge and other fibrous materials without injurious damage during operation. The lifting cover, stator housing, volute casing, and impeller shall be constructed of ASTM 48, Class 30 gray cast iron. The volute will be fitted with ANSI 125 lb. flanges and tested to Hydraulic Institute standards at 150% of shut-off head. The interfaces between the major castings shall be machined and fitted with buna O-rings. All nuts, bolts, chains, washers and other fastening devices inside of wet well shall be constructed of 316 stainless steel. **The pump manufacturers Barnes, EMU, and Hydromatic are the only approved pump manufacturers for the District unless other manufacturers are approved by the District during the design of the station.**

The impeller shall be of the one-piece, single suction, radial flow design with well-rounded leading edges and thick hydrofoil shape with large openings to prevent the accumulation of solids and stringy material through the impeller.

Each pump shall be provided with a tandem mechanical rotation shaft seal system. The mechanical seal chamber will be oil filled and equipped with a moisture detection device wired internally to the control cable. Each seal shall be held in contact by its own spring system and require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The lower seal shall be manufactured of Tungsten Carbide and include a protective cup to prevent solids or stringy material from lodging in the seal spring.

The pump and motor shaft will be of Series 400 stainless steel with a Brinnell hardness of 200. The shaft shall be designed such that the diameter of the shaft where it passes through the lower seal is 1.97 inches with a maximum shaft deflection due to axial and radial thrust loads of .16 mm. The shaft is supported by double row lower and single row upper ball bearings with an L-10 life of 40,000 hours minimum.

The sliding bracket assembly shall be attached to the pumping unit constructed so that when lowered to the discharge base/elbow, the knifing action of the vertical metal to metal seal provides a self-cleaning, non-clogging, UL listed, non-sparking assembly.

Seal of the pump at the discharge flange will be accomplished by simple downward linear motion of the pump with the entire weight of the pump guided to and pressing against connection, no part of the pump shall bear directly on the sump floor and no rotary motion of the pump is required for sealing. The system shall include a stainless steel lift chain for raising and lowering

each pump. Each stainless steel lift cable or chain shall be connected to the bottom frame of the access hatch.

Motor shall be filled with dielectric type cooling oil (FDA approved). It shall be pumped via a shaft mounted oil impeller through a spiral shaped heat exchanger. The power cable shall be isolated by means of an O-ring terminal board. Motors shall meet the design criteria scheduled on the drawings. The motors shall have a code letter of "G" or less. Locked rotor kilovolt amperes shall not exceed 6.29 per horsepower and shall be explosion proof. Provide motor with thermal sensors, normally closed contacts, wired in series with starter overload contacts. All pump motors 40 Hp and above shall have a soft start starter for slow start processes.

Pump and control cables shall be UL listed "Water Resistant", properly sized and of proper length to suit the installation. Each cable shall be provided with a green equipment grounding conductor, sized as required, to meet code.

Cable entry system shall consist of three (3) separate seals. A rubber grommet that seals both cable jackets shall be clamped onto cord by end holding cap. An "O" ring shall seal cap to bottom half of cord cap. Both cables shall have individual conductors stripped and potted into motor if the cable jacket becomes damaged. Cords shall withstand a pull of 150 pounds without loosening or losing integrity.

B. Submersible Grinder Sewage Pumps: The pumps shall be of the submersible centrifugal type with recessed pumping impeller, integrally built-in grinder unit, and submersible motor. Grinder shall be capable of macerating materials in normal domestic sewage, including items used in maintaining normal sanitary hygiene such as: disposable diapers, sanitary napkins, rubber and the like into a fine slurry. Pump shall not be intended to handle abrasive material or sewer containing large excessive amounts of sand, grit, or other stone-like compositions. Contractor shall include all labor, materials, equipment incidentals and ancillary components to make a complete lift station system.

Pump motor shall be of the totally enclosed, submersible, squirrel cage, induction type. Single phase motors shall be of the capacitor start, capacitor run, NEMA type.

Stator windings shall be of the open type with NEMA Class B insulation good for 130° C (266° F). Windings shall operate in clean high dielectric oil that lubricates bearings and seals and transfers heat from windings to outer shell. Motor shall be heat shrunk into housing for proper alignment and superior heat transfer. Bolted-in stators which may not be properly aligned and have inferior heat transfer capabilities shall not be considered equal. Air-filled motors which do not have superior heat dissipating capabilities of oil filled motors shall not be considered equal.

Motor shall have three bearings. Upper and lower ball bearings shall support motor rotor. Upper ball bearings shall take thrust loads, lower ball bearing shall take radial loads, and lower sleeve bushing shall take all radial shock loading due to grinding action. Ball bearings shall be designed for a minimum L10 life of 50,000 hours.

A heat sensor thermostat shall be imbedded in top of windings and be connected in series with the motor starter coil control box to stop motor if temperature rises in motor to over 220° F for any reason. Thermostat is to reset automatically when temperature drops to a safe limit. Three-phase motors to have two (2) heat sensor thermostats attached to adjacent windings.

The common motor, pump and grinder shaft shall be 416 stainless steel. Pump impeller and grinding impeller shall thread onto shaft.

Motor shall be protected by two (2) mechanical shaft seals mounted in tandem with an oil-filled chamber between the seals for lubricating seal faces and providing buffer zone to protect motor in event of first seal leakage. Upper seal face shall be of carbon and ceramic lapped to a flatness tolerance of one light band. The lower seal shall be manufactured of Tungsten Carbide and include a protective cup to prevent solids or stringy material from lodging in the seal spring. Metal parts and springs for seals shall be of 18-8 stainless steel.

Pump shall be of the recessed type to provide an open unobstructed passage through the volute. Impeller shall be of 85-5-5-5 bronze and shall thread onto shaft. Enclosed or semi-open pump impellers which might become obstructed during grinding or add excessive radial loads shall not be considered as equal.

Grinder assembly shall consist of a single rotating grinder impeller and a single stationary shredding ring mounted directly below pump volute inlet. Grinder impeller shall thread onto shaft and shall be locked with a screw and washer. Shredding ring shall be held in place by a steel retaining clamp. Both shredding ring and grinder impeller shall be removable without dismantling pump. No adjustment of grinder assembly shall be necessary for proper grinder operation. Multiple grinder impeller assemblies requiring initial or periodic axial adjustment for proper operation shall not be considered equal. Grinder impeller and shredding ring shall be made of 440C stainless steel hardened to 58-60 Rockwell.

All castings shall be of high tensile strength cast iron. Castings shall be treated with phosphate and chromic rinse prior to painting. Castings shall be painted with a high quality, lead free, alkyd enamel finish.

All fasteners shall be of 300 series stainless steel. All grinder pumps shall be equipped with appropriately sized stainless steel cable for installation and removal purposes.

Motor power cord shall be 10/4 or 8/4 SOW/SOWA 4 conductor of proper length to suit installation. Motor control cords to be 18/5 SOW/SOWA 5 conductor of proper length to suit installation. Each cable shall be provided with a green ground wire to be grounded in accordance with local and national electric codes. Each pump shall have 90 rated wiring.

Cable entry system shall consist of three (3) separate seals. A rubber grommet that seals both cable jackets shall be clamped onto cord by end holding cap. An "O" ring shall seal end cap to bottom half of cord cap. Both cables shall have individual conductors stripped and potted into motor if the cable jacket become damaged. Cords shall withstand a pull of 150 pounds without

loosening or losing integrity. The end holding cap shall have female threaded tapping for 2" conduit.

Lift-Out Rail System shall consist of a combined check valve and seal fitting that mounts vertically into a stationary discharge casting. A simple downward motion shall connect pump and combination check valve and seal fitting to the stationary discharge casting. Check valve and seal fitting shall seal with two (2) "O" rings and a tapered rubber seal ring into funnel of discharge case. Check valve flapper shall be spring loaded to prevent water hammer slam. Discharge casting shall be furnished with right or left hand discharge pipe connections for duplex systems. Discharge pipe tapping shall be 3" NPT female for standard pipe. Valve casting and discharge casting shall be painted with a high quality, lead free, alkyd enamel finish.

An upper guide plate shall be provided to prevent pump and seal fitting from rising on rails. Guide rails shall be 1-1/4" stainless steel piping. Hold down pipe shall be 1/2" stainless steel pipe. Rail support shall be adjustable so that perfect vertical alignment of the rails can be obtained.

03. CONCRETE STRUCTURES: The Contractor shall provide all labor, materials, equipment and incidentals necessary to install the proposed wet well and valve vault (where specified) in accordance with the detailed drawings and following specifications.

A. Wet Well Structure: The wet well structure shall consist of one concrete monolithically cast base section with an invert and a minimum 6" long base slab extension for counter floatation. The wet well risers/top sections shall have a minimum wall thickness of 7". Both top slab and bottom slab shall have a minimum thickness of 7". Both top slab and bottom shall have a minimum thickness of 8". All openings in wet well sections shall be cast-in with the exception of the influent pipe opening which shall be cored in the wall. The latest revision of the following standards shall apply: ASTM C890-73, ASTM C891-78, and ASTM C913-79. The wet well shall have an aluminum hatch cast into the top or aluminum access ladder for access. The District, at its sole discretion, may require the wet well to have a District approved interior lining in place to protect against corrosion and deterioration caused by H₂S gases.

B. Valve Vault: The valve vault, where required, shall be made of pre-cast concrete and manufactured of the dimensions noted on the plans and specified herein. The vault shall be drained to the wet well by using a PVC drain pipe and PVC check valve assembly not glued for future replacement purposes. Access to the vault will be facilitated by use of cast-in-place step or aluminum access ladder.

C. Concrete: Cement shall be Type II, having a maximum Tricalcium Illuminatate (3CaOAL2O3) content of 8%.

Course aggregate shall be sound, crushed, angular granitic stone only. Smooth or rounded stone is not acceptable. Fine aggregate and course aggregate shall meet the requirements of ASTM C33. Calcium Chloride or admixtures containing Calcium Chloride shall not be used in the concrete mix.

D. Reinforcing: Reinforcing shall meet or exceed the minimums described in ASTM C478.

E. Joint Sealing Material: Joints between pre-cast sections shall be sealed with one inch diameter Butyl rubber sealant conforming to Federal specification number SS-S-00210-A and AASHTO-198. The material shall be compounded of 100% solids. Asphaltic or petrochemical based materials shall not be used.

F. Flexible Pipe Connectors: Watertight connections between the sewer pipe and concrete shall be achieved with flexible pipe connectors conforming to ASTM C923.

04. CENTRAL CONTROL PANEL AND LEVEL CONTROLS: The pump station control panel shall be mounted in a NEMA 4 enclosure with outside dead-front design and hasp for padlocking and shall be manufactured by EG Controls, Sun Coast Hydraulic Electric Manufacturing, or approved equal. The panel shall be designed for the electrical service as stated in Paragraph 02 above. Control and alarm circuits shall operate on 115-volt service.

The panel shall be equipped with properly sized normal and emergency main circuit breakers which shall be mechanically interlocked. Circuit breakers shall also be provided for both pumps and for controls. All circuit breakers shall be thermal magnetic type. A full voltage non-reversing magnetic starter, Square D, GE, Allen Bradley, or equal, non-adjustable quick trip ambient compensated overload relay, amber running indicator light, hand-off-automatic selector switch and run time indicators shall be provided for each pump.

The panel shall also be equipped with an alternating relay to reverse the lead pump selected on each successive start. An override circuit shall start both pumps if wet well level rises to the "Lag" start elevation or shall start the second pump if the lead pump fails to start or shuts off prematurely. A third position needs to be included on alternating relay to set one pump running if other pump is out of service. If the fourth (or TCP) float rises then a high water alarm shall turn on, which would alarm by a light and horn. Provide horn with silence push button. There shall also be a low water float for telemetry purposes and to disable pumps that may experience a low water alarm situation.

Provide a properly protected control transformer and NEMA 5-15R GRI duplex 120 volt receptacle. Seal failure relays furnished with the pumps shall be installed in the panel. Provide red pilot lights to indicate seal failure.

A terminal strip shall also be provided in the control panel and in the junction box for easy connection of cords from the pumps and float switches. To insure proper connections, a schematic wiring diagram shall be posted inside the panel door and one included in the owner's manual.

Wet well level shall be controlled by four sealed mercury tube float switches. A fifth float (low water) shall be included by the contractor for telemetry purposes and to disable pumps that may experience a low water alarm situation. All floats shall be of Type S30NO Floats by Anchor

Scientific Corp. provided with 30' of flexible cord and shall be attached to a stainless steel bracket-mounted at the top of the wet well. A 650- volt lightning arrestor shall be installed in the control panel.

Control panel shall be mounted in an approved NEMA 4 enclosure with see-through design in the door to read elapsed time meters and other controls without opening the enclosure. Enclosure shall have hasp for padlocking.

A thermostatic controlled heater needs to be installed in panel for condensation purposes. This heater shall be served on a separate breaker in the control panel.

05. PIPING, FITTINGS & VALVES: The Contractor shall provide all labor, material, equipment and incidentals to install the necessary piping for proper operation of the lift station. As required, the following specifications shall apply.

A. Station Piping: All wet well and valve vault piping and fittings larger than 3" diameter shall be ANSI B16.1 125 lb. interior coated ductile iron standard flanged fitted. All flanged gaskets shall be 1/8" thick full-face red rubber material. All piping 3" diameter and smaller shall be SCH 40 PVC unless otherwise specified. All flanged piping and fittings located in the wet well shall be installed with stainless steel bolts, nuts, and washers.

B. Pipe Fittings: All pipe fittings in the lift station and valve vault structures shall be short body flange fittings with the exception of the 90° flange. All bends shall conform to the latest revision of the ANSI A21.53 (AWWA C153) and shall be furnished faced and drilled to 125# template. All flanged pipe fittings shall be installed with stainless steel bolts, nuts, and washers.

C. Gate Valves: Gate valves 2" and larger shall be designed and manufactured in accordance with the requirements of the latest revision of AWWA C-509. All valves shall be of iron body, bronze mounted, double disc parallel seat type with non-rising stems. Valves shall be manufactured with "O" ring stem seals. Valves shall be OS & Y design provided with wheel for operation unless otherwise specified. Valves for buried use shall be NRS with 2 inch square operating nut. Mueller, American Flow Control, or approved equal will only be acceptable. Gate valves shall be resilient seat valves.

D. Check Valves: Check valves 3" and larger shall be of the weighted arm type only. The valves shall be constructed of heavy cast iron or cast steel designed to withstand the test pressure for the pipelines in which they are installed. Discs shall be of bronze or of alloy cast iron with bronze or stainless steel disc rings. Pivot pins and bushings shall be of bronze or stainless steel. Disc seats shall be replaceable. All check valves shall be Mueller, American Flow Control, or approved equal.

F. Pipe Hangers and Supports: Pipe hangers and supports shall be used in installing all above ground or interior pipelines, conduits, valves, and fittings. Hangers and supports shall be spaced no greater than 8' apart and at or near all changes in direction of the conduit. Unless otherwise specified, no pipe, conduit, or appurtenant device shall be supported from other piping,

stairways, or ladders. All non-rigid conduits requiring continuous support shall be laid in cable trays adequately ventilated and of adequate size. All pipe hangers and supports inside of the wet well are to be stainless steel with stainless steel anchors.

06. ACCESSORIES: As noted, the Contractor shall provide labor, material and equipment to install the necessary accessories as shown on the detailed plans and/or specified herein:

A. Wet Well Access: Access shall be by means of poly steps used in manholes or a channel frame aluminum ladder. Ladder rungs shall be serrated for traction and manufactured of hollow aluminum tube. The ladder shall be mounted to the inside of the wet well by 3/8" stainless steel wedge-anchors. The ladder shall be a minimum of 10" from the inside wall of the wet well to the center of the ladder rung. The top rung shall be a maximum of 12" from the outside top of the wet well. (See Section 1-5 for manhole steps)

B. Aluminum Access Doors: Aluminum access doors shall be Type K as manufactured by The Bilco Company, New Haven, Connecticut, U.S. Foundry, or approved equal. Frame shall be 1/4" extruded aluminum with built-in neoprene cushion and with strap anchors bolted to exterior. Door leaf shall be 1/4" aluminum diamond plat reinforced with aluminum stiffeners as required. Cast steel hinges shall be bolted to underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90° and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. Doors shall be built to withstand a live load of 150 pounds per square foot, and equipped with a snap lock and removable handle and locking mechanism. Aluminum shall be mil finish, with bituminous coating to be applied to exterior of frame by manufacturer. Hardware shall be zinc plated and chromate sealed. Installation shall be in accordance with manufacturer's instructions. The manufacturer shall guarantee against defects in material or workmanship for a period of one (1) years.

07. ELECTRICAL BUILDING: When required, an electrical building shall be constructed beside the wet well to house all electrical components of the lift station including but not limited to, the standby generator set, control panel, telemetry panel, and all electrical breaker boxes as needed. The building shall only be constructed from cement block (natural in color, no paint) with one-foot overhang boxing including white vinyl boxing and vented vinyl soffit. There shall also be 25 year black shingles installed with a ridge vent attached. There shall be 2 painted metal double walk in doors with the appropriate louvers installed in the doors for ventilation of the standby generator set. There shall be manual type foundation vents installed in the foundation of the cement block building (2 on each wall span). There shall be 2-8' fluorescent lights installed in the building for lighting with 2 "light packs" installed on the exterior of the building, one over the entrance doors and one centered on the building on the same side as the wet well and valve vault. The cement block building shall have a minimum 6" of cement poured and leveled for the floor of the building. All rafters of the building shall be left exposed. A District approved NEMA 4 junction box shall be installed on the exterior of the building or on 4" X 4" pressure treated wood posts beside the wet well. The junction box shall be duct sealed to prevent the entrance of gases from the wet well. All float switches and pump cables shall be installed from the wet well to the junction box and from the junction box to the building by use of approved Schedule 80

PVC conduit. Each pump electric cable shall be placed in a separate 3" Schedule 80 conduit and the float switch cables shall be placed in a separate 3" Schedule 80 conduit. All electrical panels and/or equipment in the electrical building shall be installed on pressure treated boards and/or pressure treated plywood approved by the District. The generator set and all electrical panels shall be installed to follow all county and/or state electrical codes. See and follow Section 3.8 titled "Backfilling" for soil stability procedures regarding the soil under the proposed electrical building.

08. **GENERATOR SET:** Generators covered by these specifications shall be designed, tested, rated, assembled, and installed in strict accordance with all applicable standards of ANSI, NEC, ISO, U.L., IEEE and NEMA. Failure of the normal power source shall cause the standby diesel engine generator to automatically start and come up to speed and automatically transfer. **Caterpillar and Kohler generator sets are the only approved manufacturers of generator sets that the District accepts. The District prefers to accept John Deere, Mitsubishi, Caterpillar, and Perkins engines on their diesel engines.**

Installation – The work includes supplying and installing a complete integrated generator system. The system consists of a diesel generator set with related component accessories and automatic transfer switches specified under a separate section.

Fuel System – The Contractor shall provide a full tank of off-road diesel fuel in an auxiliary fuel tank on the exterior of the building for the completion of all testing and operation.

System Test – A complete system resistive load bank test may be required by the District at the Contractor's expense after all equipment is installed.

Requirements, Codes, and Regulations – The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a manufacturer who has 15 years of experience building this type of equipment.

Submittals – Engine-generator submittals shall include the following information:

1. Factory published specification sheet indicating standard and optional accessories, ratings, etc.
2. Manufacturer's catalog cut sheets of all auxiliary components such as isolators, battery charger, silencer, exhaust flex main circuit breaker, jacket water heater, etc.
3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.
4. Weights of all equipment.
5. Interconnect wiring diagram of complete emergency system, including generator, switchgear, auxiliary fuel tank, remote pumps, battery charger, remote alarm indications.
6. Engine mechanical data at varying loads up to full load, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, noise data, fuel consumption, etc.

7. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
8. Generator resistances, reactances and time constants.
9. Generator motor starting capability.
10. Jacket water heater connection diagram.
11. Control panel schematics.
12. Automatic load transfer switch (with auxiliary contact for telemetry only).
13. Manufacturer's and dealer's written warranty.

Factory Prototype Testing – The system manufacturer must certify that engine; generator, controls, and switchgear have been tested as complete system of representative engineering models (not on equipment only).

Prototype testing shall include:

Fuel consumption at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and full load

Exhaust emissions

Mechanical and exhaust noise

Governor speed regulation at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and full load; and during transients

Motor starting kVA

Generator temperature rise in accordance with NEMA MG1-22.40

Harmonic analysis, voltage waveform deviation and telephone influence factor

Generator short circuit capability

Cooling system performance

The manufacturer shall supply equipment that is a current factory production model.

System Responsibility –

Generator Set Distributor – The complete engine generator set shall be supplied by the manufacturer's authorized distributor only.

Requirements, Codes, and Regulations – The equipment supplied and installed shall meet the requirements of NEC and all-applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory trained service personnel.

Automatic Transfer Switch – The automatic transfer switch specified in another section shall be supplied by the generator set manufacturer in order to establish and maintain a single source of system responsibility and coordination. The automatic transfer shall have a manufacturer installed auxiliary contact (normally open) for telemetry tie-in purposes only.

Warranty – The manufacturer's warranty shall in no event be for a period of less than one (1) year from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall not be a limiting factor for the system warranty by either the manufacturer or

servicing distributor. Submittals received without written warranties as specified will be rejected in their entirety.

Parts and Service Qualifications –

Service Facility – The engine-generator supplier shall have service facilities within 100 miles of the project site and maintain 24-hour parts and service capability. The distributor shall stock parts as needed to support the generator set package for this specific project.

Service Personnel – The dealer shall maintain qualified; factory trained service personnel that can respond to an emergency call within a reasonable time of notification (usually within one (1) hour).

PRODUCT SPECIFICATIONS

General Requirements – The generator set shall be Standby rated at 0 ekW, 0kVA, 1800 RPM, 0.08 power factor, 000 VAC, 3 phase, 4 wire, 60 Hertz, including radiator fan and all parasitic loads. All materials and parts comprising the unit shall be new and unused. **Under normal conditions, the generator shall be capable of producing enough power to operate 2 pumps at one time in a lead/lag system.**

Generator – The synchronous generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG1 and directly connected to the engine flywheel housing with a flex coupling.

Insulation – The insulation material shall meet NEMA standards for Class H insulation and be impregnated in a polyester varnish or vacuum impregnated with epoxy varnish to be fungus resistant. Temperature rise of the rotor and stator shall not exceed NEMA Class F (130 degrees C rise by resistance over 40 degrees C ambient). The excitation system shall be of brushless construction.

Self-Excited – The self-excited, brushless exciter shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes.

Automatic Voltage Regulator – The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be a totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, overexcitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup, and shall be environmentally sealed.

Circuit Breaker Specifications – Provide a generator mounted circuit breaker, molded case or insulated case construction, ___ amp trip, 3 pole, NEMA /IP22. Breaker shall be ABB or equal and utilize a thermal magnetic trip unit and DC shunt trip. The breaker shall be UL listed with shunt trip device connected to engine/generator safety shutdowns. Breaker shall be housed in a steel NEMA 1 enclosure mounted on a separate support stand vibration isolated from the engine/generator arrangement. Bus bars, sized for the cable type shown on drawing, shall be supplied on the load side of breaker.

Control Panel

Generator Mounted Control Panel – Provide a generator set mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation, cycle cranking, analogue AC metering (0.5% true rms accuracy) with phase selector switch, shutdown sensors and alarms with horn and reset, adjustable cool down timer and emergency stop pushbutton. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 1/IP22 enclosure with hinged door. The panel itself shall be mounted on a separate support stand isolated from the engine/generator arrangement. Panel/breaker arrangements mounted on the generator set in such a way that access to the AC Generator terminal box is restricted in any way whatsoever are not acceptable.

Readouts – Provide the following readouts:

1. Engine oil pressure
2. Coolant temperature
3. Engine RPM
4. System DC Volts
5. Engine running hours
6. Generator AC Volts
7. Generator frequency
8. Generator AC amps

Cooling System

Radiator – The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 85 degree F ambient air entering the room or enclosure (if an enclosure is specified) without de-rating the unit and 50/50 anti-freeze mixture. The generator set supplier is responsible for providing a properly sized cooling system based on the enclosure static pressure restriction.

Fuel System

All fuel piping shall be flexible fuel hose rated for 300 degrees F and 100 psi.

Exhaust System

Silencer – A critical type silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Mounting shall be provided by the contractor as shown on the drawings. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.

Exhaust System – The muffler and all indoor exhaust piping shall be “lagged” by the contractor to maintain a surface temperature not to exceed 150 degree F. The insulation shall be installed so that it does not interfere with the functioning of the flexible exhaust fitting. All exhaust

pipng shall be piped to the exterior of all cement block buildings with the exhaust piping cut off level with the vinyl boxing of the building.

Starting System

Starting Motor – A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.

Jacket Water Heater – A unit mounted thermal circulation type water heater. The heater Watt rating shall be sized by the manufacturer to maintain jacket water temperature at 90 degrees F, and shall be a (120/208/240/480) volt, single phase, 60 hertz.

Batteries – A lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 75-ampere hours. Necessary cables and clamps shall be provided.

Battery Trays – A battery tray shall be provided for the batteries and shall conform to NEC 480-7(b). It shall be treated to be resistant to deterioration by battery electrolyte. Further, construction shall be such that any spillage or boil-over battery electrolyte shall be contained within the tray to prevent a direct path to ground.

Battery Charger – A current limiting battery charger shall be furnished to automatically recharge the batteries. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, and DC volt meter. AC input voltage shall be 120 volts, single phase.

Automatic Transfer Switch

The Automatic Transfer Switch shall be true double throw mechanically held, electrically operated utilizing a reliable field proven, single-solenoid operator. Contacts shall be accessible for easy inspection and preventative maintenance. Switch shall be UL1008 listed for total system loads. Switch shall meet National Electric Code Articles 700, 701 and 702 and CSA and NFPA 110 requirements. Enclosure shall be NEMA 1 or as specified. Switch shall be 3 pole. Amperage and voltage shall be of the correct size to operate both pumps operating on a lead/lag system. There shall also be an auxiliary contact for telemetry purposes only with a ½” EMT conduit installed by the lift station electrician to the telemetry TCU.

Automatic Transfer Switch Features – The following features should come standard on the automatic transfer switch:

- Microprocessor Controls
- Optionally isolated RS-485 Serial Communication Interface
- In-phase Monitor
- Selective Load Disconnect
- Engine Exerciser
- Solid Neutral
- Switch Position Lights
- Source Availability Lights
- Test Switch
- Time Delay Bypass Switch
- 1 NO and 1 NC Contacts Rated 10 amps 250 VAC
- Load/No Load Switch

Time Delay Adjustments – The following adjustments shall be available on the automatic transfer switch:

Override Momentary Normal Outage – 1-3 seconds
Transfer to Emergency – 0-5 minutes
Override Momentary Emergency Outage – 4 seconds
Retransfer to Normal – 1 second-30 minutes
Unloaded Running Time Cool Down – 5 minutes

Voltage and Frequency Setting

Normal Source Voltage – PU 90%-95%
DO 70%-85%

Emergency Source Voltage – PU 90%
DO 75%

Emergency Source Frequency – PU 95%
DO 85%

Warranty and Service – The Automatic Transfer Switch manufacturer shall have as a standard warranty a minimum of one (1) year parts and labor. Switch distributor shall maintain a full time service center located within 100 miles of job site location for warranty and non-warranty repair.

FUEL STORAGE TANK

Fuel storage tank shall be furnished by the Contractor in accordance with the District's requirements for capacity and placement. It shall be piped for gravity fuel feed to generator.

The fuel storage tank shall be of double wall construction to provide secondary confinement of fuel in event of weld seam or other failure in the storage section of the tank. The secondary confinement section of the tank shall provide a minimum of ten percent of the storage tank capacity. All materials shall be new and rust free and shall meet ASTM A36 Standards.

Storage tank capacity shall be the size indicated on the drawings, where capacity is indicated as a function of run-time hours. Tank size shall be based on fuel consumption of 100% capacity, i.e., fully loaded.

Tank design shall incorporate structural steel channels or I-beam side rails common to both top and bottom of both the fuel tank and secondary confinement sections shall be 10 gauge minimum sheet metal. Secondary confinement section of tank shall have a minimum depth of three inches.

Pressure tests shall be at 10 PSI minimum. Any defects shall be repaired and re-tested or the tank shall be replaced.

All welds shall be continuous MIG or dual shield type.

The tank shall be equipped with the following fittings and appurtenances:

1. A 2" N.P.T. manual fill pipe with lockable cap.
2. Fuel supply and return fittings. Flexible fuel lines shall be provided between tank and engine.
3. ¾" N.P.T. vents with screened mushroom caps shall be provided for fuel storage and secondary containment sections of the tank.

4. The tank shall be placed on the exterior of the cement block building positioned in a level position on cement blocks.

EXECUTION

Installation – The Contractor shall install the equipment in accordance with the manufacturer’s recommendations, the project drawings and specifications, and all applicable codes.

Start-Up and Testing – The Contractor shall coordinate all start-up and testing activities with the Engineer and District personnel.

After installation is complete and normal power is available, the distributor’s service technician shall perform the following:

1. Verify that the equipment is installed properly.
2. Check all auxiliary devices for proper operation, including battery charger, jacket water heater, remote annunciator, etc.
3. Test all alarms and safety shutdown devices for proper operation and annunciation.
4. Check all fluid levels.
5. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
6. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
7. Connect the generator to building load and verify that the generator will start and run all designed loads in the plant.

Operation and Maintenance Manuals

Manuals Provided – Provide one (1) set of operation and maintenance manuals covering the generator, switchgear, and auxiliary components. Include final as-built wiring interconnect diagrams and recommended preventative maintenance schedules.

09. TELEMETRY SYSTEM: The District’s telemetry representative shall invoice the contractor or developer for all costs associated with the installation of the telemetry system for the proposed sewer lift station. The District requires the installation of a radio frequency system that is compatible with the existing system in operation. The system requires the contractor to install a galvanized tower section with a concrete foundation including an appropriate grounding rod installed adjacent to the concrete foundation. Unless noted otherwise, the TCU shall be coordinated by the telemetry representative to be installed in the lift station control panel.

The contractor’s electrician shall also install a ½” EMT conduit from the telemetry control panel to the lift station entry door and install an intrusion switch and arm for the intrusion alarm. Upon payment from the contractor or developer, the District’s telemetry representative shall install the remaining items to make the system operational once all other electrical components have been installed. The switch shall be a Square D Type C54B and the roller arm is a Square D model 9007 Hat.

10. OPERATION & MAINTENANCE MANUALS: The manufacturer shall prepare a complete operating and maintenance manual for the lift station. The O & M Manual shall include routine maintenance requirements and spare parts lists for each major item of equipment in the

station. The names and telephone numbers of companies where spare parts and/or trained service technicians are available shall also be included for each item of equipment.

11. DELIVERY AND HANDLING: The manufacturer shall coordinate with the contractor so that the station material is delivered to the job site on the day of, or the day before the installation. Lifting pins shall be provided by the manufacturer to insure proper handling of the lift station structures. After delivery to the job-site, the contractor shall store the control panel off the ground in a dry location until some time as it is mounted and supplied with electrical service. The Contractor shall also ensure that all pump power and control cables, as well as float cables are protected from submergence until they are properly installed and sealed.

12. GUARANTEE: The contractor shall guarantee the complete lift station to be free from defects in material and workmanship for a period of one year from the date of start-up and acceptance unless otherwise specified.

13. FIELD QUALITY CONTROL: The initial start-up of the lift station shall be performed by a qualified factor representative of the manufacturer. It shall be the responsibility of the representative to supervise the start-up and instruct the District's personnel in the proper operation and maintenance procedures for the entire lift station.