

CITY OF GRANITE FALLS

ORDINANCE NO. 695-04

AN ORDINANCE OF THE CITY OF GRANITE FALLS  
ADOPTING REVISIONS TO THE DEVELOPMENT  
GUIDELINES FOR PUBLIC WORKS STANDARDS.

**The City Council of the City of Granite Falls, Washington does hereby ordain as follows:**

**Section 1. Recitals and Findings.**

1.1 The City adopted "Development Guidelines for Public Works Standards" in May 2000 with revisions in May 2002 to ensure minimum standards in Public Works projects.

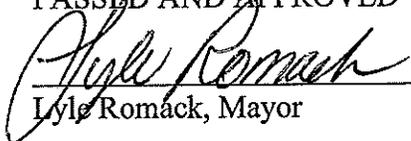
1.2 The City finds that much of the land within the City and its Urban Growth Area that may be developed in the future will require sewerage lift stations.

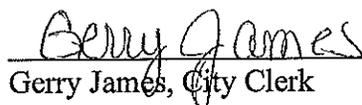
1.3 This ordinance provides for minimum standards in sewerage lift stations.

**Section 2. The DEVELOPMENT GUIDELINES FOR PUBLIC WORKS STANDARDS are hereby AMENDED to include a new Section 6.17 SEWAGE LIFT STATION STANDARDS.**

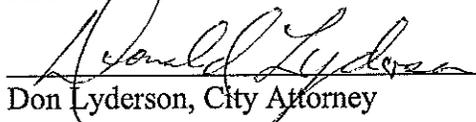
**Section 3. Effective Date.** This Ordinance shall be in force and take effect five days after publication as provide by law.

PASSED AND APPROVED THIS 26 DAY OF May 2004.

  
\_\_\_\_\_  
Lyle Romack, Mayor

  
\_\_\_\_\_  
Gerry James, City Clerk

APPROVED AS TO FORM

  
\_\_\_\_\_  
Don Lydersen, City Attorney

DATE OF READING: Final: 5-26-04  
DATE OF PUBLICATION: 6-7-04  
EFFECTIVE DATE: 6-12-04

## **6.17 SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS**

### **1. OBJECTIVE:**

This section is intended to present information and provide an outline of the minimum general standards to be accomplished in planning a sewage lift station installation within the City of Granite Falls service area. Incorporation of a sewage lift station is subject to City review and approval on a case-by-case basis. It is the City's policy to minimize the number of lift stations that must be operated by the City, as well as to minimize the use of lift stations where other means of serving an area exist or have been provided for in the City's comprehensive plan. The City, at its option, may require submittal and approval of a feasibility study, to include a design report and other materials as may be required for evaluation of the proposal, prior to granting conceptual approval for the use of a lift station.

The lift station standards contained herein are intended to apply to a typical duplex (two pump) sewage lift station within the typical size range for developer constructed stations and to express the City's general policy with regard to standardization of lift station design and operation. At the City's discretion, stations with non-typical service requirements, such as high flows, high head pressures, flow monitoring, multiple pump operation, critical service or unusual site constraints, may be subject to additional or alternative design requirements.

Due to the inherent complexity of lift station design, and the associated health and safety risks, the lift station design shall be prepared by a professional engineer with demonstrable experience in lift station design. At the request of the City, the Developer shall provide a resume for the proposed lift station designer, listing similar projects designed by that individual, with references and phone numbers. Once the lift station design has been approved by the City, the design engineer shall remain responsible for all construction-related engineering duties, including the coordination of submittals and shop drawings, and the preparation of field change requests, record drawings and O&M materials. Engineering responsibilities shall not be reassigned by the Developer to another individual without the City's approval.

### **2. DESIGN CALCULATIONS / DESIGN REPORT:**

The City will determine the service area and the associated design flows at the Developer's expense. The design service area will include the Developer's plat boundary area (or other proposed service area) as well as adjacent and potential future service areas. Documentation regarding the number and type of sewer connections proposed by the Developer shall be furnished to the City in sufficient detail to permit the City to complete the flow determination. The report shall also include a downstream analysis to ensure that downstream lift stations and gravity

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

sewer lines have sufficient capacity to handle the increased flow from the proposed lift station.

Once the service area and design flows have been established, the Developer shall then be responsible for providing design calculations and a design report to assure that the lift station installation and downstream facilities are sized to serve the overall sewage flows generated within the potential service area.

The effects of the minimum flow conditions shall be estimated to ensure that retention of the sewage in the wet well will not create a nuisance and that pumping equipment will not operate too infrequently. The wet well shall be sized to meet or exceed the pump manufacturer's recommendations for the minimum allowable time period between motor starts with the largest pump out of service, net positive suction head (wet-well mounted station), and submergence of the pump suction.

Lift station capacity shall meet the maximum rate of flow expected. The available capacity of the receiving sewer shall be adequate for the maximum lift station capacity. At least two (2) pumping units shall be provided at each lift station installation. The pump(s) shall have sufficient capacity and capability to efficiently handle the peak design flow with the largest pump out of service and to provide a minimum velocity of three (3) feet per second velocity in the force main.

The force main shall be sized for a minimum velocity of three (3) feet per second and a maximum of eight (8) feet per second. The minimum diameter of the force main shall be four (4) inches, unless otherwise approved by the City.

Three (3) copies of the Design Calculations shall be submitted to the City for review. As a minimum, the report shall include:

1. Project description
2. Projected flows
3. Connection point with downstream capacity
4. Wet well sizing
5. Run time calculations based on peak and average annual flows for start-up and ultimate design conditions.
6. Cycle time calculations to verify pump start frequency is within allowable limits
7. Pump station head calculation to establish system curve
8. Pump selection
9. Force main size, length and material
10. Force main surge pressure calculation
11. Generator and fuel supply sizing
12. Odor potential calculations
13. Wet well buoyancy calculations

The above calculations and evaluation shall be provided for City review and approval in the form of a design report prior to, or together with, the plans for the developer extension. The report shall be stamped by a professional engineer licensed in the State of Washington.

At the option of the City, a geotechnical evaluation of the proposed site shall be provided by the Developer, to be stamped by a licensed geotechnical engineer. Site or project characteristics that may necessitate a geotechnical evaluation include, but are not necessarily limited to, steep slopes, groundwater, erosion hazards, unusual drainage conditions, unstable soils, proposed construction on fill, and proposed retaining wall construction. The geotechnical evaluation may be required at any time during the design/review/construction process, as conditions become apparent. The scope of the geotechnical evaluation shall be determined by the City at such time as the time the evaluation is required.

**3. PERMITTING:**

The Developer shall furnish all required permits and variances except those specifically named by the City to be furnished by the City, together with the completed SEPA checklist when required, and shall be responsible for meeting all applicable County, State and Federal requirements, including but not limited to the following:

1. Conditional Use Permit
2. Shoreline Management Permit
3. SEPA Determination
4. Building Permit
5. Grading and Drainage Permit
6. Electrical Permit
7. Compliance with Landscaping and Noise Ordinances
8. Hydraulic Project Approval
9. Corps of Engineers 404 Permit

At the City's discretion, the Developer shall provide written determination of permit applicability from agencies with potential jurisdiction.

**4. DESIGN PLANS:**

Once the Design Calculations/Design Report has been approved by the City, the Developer shall submit to the City for review and approval complete sewage lift station plans and design. The plans and design shall include the lift station, electrical service, telemetry/SCADA, station/pump controls, and auxiliary generator/transfer switch together with all accessories for a complete, automatically operating installation. Plans shall be prepared by a professional engineer with experience in lift station design.

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

Design material and drawings shall provide all civil, mechanical and electrical details and shall be consistent with all applicable codes and regulations, and good engineering practice. Drawings shall be prepared in accordance with the City's General Drafting Standards and shall show, at a minimum:

- Locations of proposed and existing streets, right-of-ways, sewers and other utilities in the vicinity of the proposed lift station.
- All known existing structures, both above and below ground, that might interfere with the proposed construction, particularly buildings, water mains, gas mains, storm drains, overhead and underground power lines, telephones lines, and television cables.
- Site layout for the lift station installation at a minimum scale of 1" = 10', and shall be sufficient to clearly show the level of detail required in these standards. The site layout shall show the locations in plan view of all structures, piping (including utilities), equipment, easements, property boundaries, slabs, exterior lighting, fencing, access driveway(s), landscaping, drainage and surface restoration. Piping shall be labeled as to type, material and size, and with all special fittings and connections identified. Routing of buried electrical conduits shall be provided on the site layout or on a separate electrical layout and shall identify conduit size and material type, stub up locations, and the number, size, type and general termination location of all conductors. Where the site layout is too crowded to clearly indicate the information required at the minimum scale, the scale shall be enlarged and/or detail views furnished.

Relative locations of structures and equipment shall be identified and dimensioned on the site layout or associated details, based on preliminary equipment sizing if necessary, and shall specifically allow for adequate clearances for opening of doors, lids and hatches; clearance for code requirements (e.g. Labor and Industries, Uniform Building Code), and reasonable access for repairs and maintenance. Where exact equipment dimensions are not known at the time of design, or where the dimensions are subsequently revised from those assumed during design, the Developer's engineer shall provide a scaled, dimensioned drawing of the lift station layout after submittals have been approved, for City review and approval.

- Mechanical plans for the location and orientation of all mechanical equipment and all connections. Mechanical plans shall include plan and section views of the wet well and emergency bypass valve vault, scaled and dimensioned, together with appropriate details, to show: size, number, type, location, elevation, orientation, connection and bracing of the suction piping, discharge piping, bubbler tubing, float switches; pump (level)

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- control elevations; hatch type and location; ladder type and location; and grout.
- Structural plans or details for the required overhead shelter, housekeeping pads, equipment pads and any proposed retaining walls.
  - Site grading plan and a minimum of two representative cross sections through the lift station site.
  - Electrical plans and details to include: location of all control, instrument and distribution system equipment and components; electrical schematic for 3-phase power modified to show number, type and size of conduits and conductors; telemetry/SCADA block diagram showing number, type and size of conduits and conductors; electrical rack layout; telemetry/SCADA panel layout; routing in plan view of all buried electrical conduits; and all equipment and installation detail.

Any specifications created for use by the installing contractor shall be provided to the City for review and approval at the time that plans are submitted. All plan sheets shall be stamped by a professional engineer registered in Washington state. The engineer's stamp provided on the electrical and structural plan sheets shall be that of a registered electrical engineer and structural engineer, respectively.

### 5. SITE PLAN:

As part of the plan set, the Developer shall furnish a site layout for the lift station installation at a minimum scale of 1" = 10'. The scale used shall be sufficient to clearly show the level of detail required in these standards. The site layout shall show the locations and in plan view of all structures, piping (including utilities), equipment, easements, property boundaries, slabs, exterior lighting, fencing, access driveway(s), landscaping, drainage and surface restoration. Piping shall be labeled as to type, material and size, and with all special fittings and connections identified. Routing of buried electrical conduits shall be provided on the site layout or on a separate electrical layout and shall identify conduit size and material type and the number, size, type and general termination location of all conductors.

The lift station shall be located as far as practicable from existing or proposed built-up residential areas, and an asphalt concrete access road shall be provided. The site shall provide suitable access for a commercial vacuum unit, including vertical access for the vacuum pipe directly into the wet well trough. Off street parking shall be provided for a minimum of one 1-ton service vehicle. Sites for sewage lift stations shall be of sufficient size for future expansion or addition, if applicable.

The lift station site shall meet the following standards:

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

1. Level yard area, 1200 square feet minimum, exclusive of driveway, landscaping, and required buffers.
2. Driveway width 12-foot minimum and with sufficient area to allow one service vehicle to pull off the street to open the vehicle access gate.
3. Access via dedicated right-of-way or perpetual easement. Access points shall be constructed in accordance with City, or State standards, as applicable, including driveway slope and site distance.
4. Vactor access to the wet well, head-in or side-of-cab
  - Maximum longitudinal slope: 10%
  - Maximum side slope: 3%
  - Max. combined longitudinal and side slope: 10%
  - Maximum reach from truck to wet well: 10 feet

The easement for the lift station site shall be submitted to the City for review prior to construction of the lift station. Lift station sites shall be deeded to the City of Granite Falls.

As a minimum, the site layout shall provide for the following:

1. Lift station, including wet wells, influent valving and emergency bypass pump connection.
2. Auxiliary power (standby engine generator and fuel supply), including automatic transfer switch
3. Electrical service and distribution
4. Telemetry/SCADA
5. ¾ - inch water service
6. Odor control, as applicable for location and capacity.
7. Cuts and fills to provide level site for maintenance.
8. Asphalt or Portland cement concrete pavement for access and maintenance areas.
9. Six (6') foot high chain link fence enclosing the site, with pedestrian and equipment access gates.
10. Overhead weather protection for all electrical panels normally accessed by City personnel for system maintenance and operation. The overhead protection shall include cover for the City personnel during normal operation and access of the electrical panels.
11. Area lighting as required by the City.
12. Site drainage in accordance with County standards.
13. Adequate clearances between equipment items and other facilities as required by all applicable codes, and as necessary for reasonable access for maintenance and repair, including access through all doors, hatches and lids.

### 6. GENERAL REQUIREMENTS:

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

1. Prior to construction, the design report and lift station plans shall be reviewed in accordance with City standards and Department of Ecology design guidelines, and shall be approved for construction by the City Engineer.
2. Prior to construction, the Contractor shall request and attend a pre-construction meeting with the City and the City's Engineer.
3. Work shall be performed only by contractors experienced in the installation of mechanical, electrical and sewer facilities.
4. Prior to any work being performed, the Contractor shall contact the City's Engineer to set forth his proposed schedule.
5. The Contractor shall attend regular meetings with the City and the City's Engineer, on a weekly, bi-weekly or monthly basis at the City's option, to coordinate technical and administrative aspects of the project.
6. Contractor shall obtain approval of materials to be used from City of Granite Falls or designated representative prior to ordering of materials. Product submittals shall include manufacturer's literature (marked to designate included options and features and to exclude all extraneous information), shop drawings and diagrams (scaled and dimensioned where appropriate), color and material samples, design calculations (where required in addition the design report), and test reports.
7. Lift stations outside of a proposed plat shall be constructed only in easements that have been granted to the City or in property that has been deeded to the City. Sewers may be laid within a plat or property identified in the developer extension agreement, subject to dedication of appropriate rights-of-way and recording of appropriate easements at the time the plat and/or warranty bill of sale is filed with the County Auditor.
8. Sewage control valves shall be resilient seat gate valves, AWWA C 515 ductile iron body with epoxy lining, M&H Kennedy of equal.
9. All metal fabrication shall be subject to City review and approval with respect to materials, fabrication method, coating, installation and testing. Provide shop drawings for review. Structural components (other than fasteners) subject to emersion, intermittent emersion, or corrosive environments shall be 316 stainless steel or 6061-T6 aluminum alloy. Where structural steel (ferrous metal) is exposed to weather, it shall be zinc coated or galvanized by the "hot-dip" method in accordance with ASTM A123. Fasteners subject to submersion, intermittent submersion, splash or corrosive environments, or for use with aluminum items, shall be 316 stainless steel. Ferrous metal fasteners shall be zinc coated or galvanized. Concrete anchor bolts shall be stainless steel, and where

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

subject to submersion , intermittent submersion, or corrosive environments shall be adhesive type set in epoxy.

10. Unspecified Portland cement concrete for use in construction of reinforced concrete pads and foundations shall contain 6 sacks of ASTM C150 Type II cement per cubic yard of concrete, shall contain an approved air-entraining admixture, shall contain no chloride admixtures and shall have a minimum 28-day compressive strength of 3,500 psi. Reinforcing steel shall consist of deformed bars or welded wire fabric as shown on the approved plans. Curing compound shall be liquid type membrane conforming to ASTM C309, Type I, Class A and B.
11. Cement grout for ballast and wet wells shall be a sand and Portland cement mix only, and shall contain 6.5 sacks of ASTM C150 Type II cement per cubic yard of grout, and shall have a 28-day compressive strength of 2,500 psi.
12. Non-shrink grout used for pipe sleeves, equipment bases and similar applications shall be Masterflow 928 by Master Builders or equivalent product by W.R.. Grace of Darex.
13. A single roof structure shall be furnished to provide overhead weather protection for all electrical panels normally accessed by City personnel for system maintenance and operation, including the generator panel, the pump panel and the electrical equipment rack. The roof structure shall extend a minimum of 30 inches horizontally beyond the face of electrical panels, shall allow for equipment removal and replacement, shall allow for vertical vactor access to the wet well trough, and shall include overhead lighting sufficient for operation of all equipment panels and performance of typical maintenance and repair. Structural components shall be steel and shall be hot-dipped galvanized after fabrication. Roofing shall be standing seam metal roofing, 24 ga. minimum, zinc coated to G-90 standard and painted with Kynar 500 paint system or equal, color to be approved by the City. Gutters and downspouts to the drainage system shall be provided. Fasteners shall be stainless steel. Structural plans and details shall be stamped by a structural engineer licensed in the State of Washington.
14. A 6-foot high galvanized chain link fence shall be provided to enclose the site, with vertical vinyl slats in-laid for screening, three strands of barb wire, a 3-foot pedestrian access gate and a 12-foot (minimum) vehicle access gate. Fence shall be Type 1 Class 1 in accordance with WSDOT Standard Specifications 8-12 and 9-16 and Standard Drawings L-2 and L-3. Landscaping may be incorporated on site for screening in lieu of the vinyl slats, with City approval. Galvanized fencing components may be overcoated with black epoxy at the Developer's discretion, subject to review and approval of the coating specification by the City.

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

15. A  $\frac{3}{4}$  - inch water service shall be provided, with reduced pressure backflow preventor and hose bib installed in an above-grade freeze-protected enclosure on a concrete pad. Furnish 50 feet of  $\frac{3}{4}$  - inch heavy-duty rubber hose.
16. Odor control shall be provided where appropriate. An evaluation of potential H<sub>2</sub>S buildup and odor potential shall be provided in accordance with procedures outlined in ASCE Publication 69 "Sulfide in Wastewater Collection and Treatment Systems", together with a proposal for mitigation where appropriate.
17. Surge protection for the force main shall be provided where appropriate, and shall typically be provided where surge pressures are anticipated to exceed 100 psi. Surge pressures shall be evaluated for the condition where there is a sudden loss of power to the maximum number of pumps that will be permitted to operate simultaneously.
18. Wet well, vaults and similar buried structures with piped connections shall be constructed on undisturbed subgrade, unless otherwise approved by the City. Sewage piping installed between lift station structures shall be ductile iron, constructed in accordance with Section II of these standards.
19. Buried facilities shall not be backfilled until installation and bedding have been inspected by the City's Engineer.
20. All backfill placed within areas subject to vehicular traffic shall be compacted to 95% of modified Proctor maximum dry density per ASTM D1557, or in accordance with Snohomish County, City and/or State requirements, whichever is more stringent. Compaction in other areas shall be to a minimum of 90% of modified Proctor maximum dry density or as shown on the plans. Copies of the compaction results shall be provided to the City.
21. Road restoration shall be per City design and construction standards. Developer and Contractor shall become familiar with all City conditions of required permits, and shall adhere to all conditions and requirements.
22. Landscaping shall be in accordance with City requirements, where applicable.
23. Manhole/vault rim and invert elevations and pipe lengths shall be field verified after construction by the Developer's engineer(s) and the record drawings revised accordingly. The record drawings shall be signed by a Washington State licensed professional engineer, which shall attest to the fact that the information is in accordance with construction records.

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

Approval of the Lift Station shall not be granted until the record drawings have been received and approved by the City.

### 7. **FACTORY-BUILT LIFT STATION:**

#### **GENERAL**

The factory-built sewage lift station shall be Smith & Loveless, custom series buried, dry-well (wet pit/dry pit) type or wet-well mounted (suction lift, vacuum prime) as approved by the City. Submersible stations are not preferred and will only be approved if the applicant can prove that the other two types of stations are not feasible. Construction shall be in compliance with O.S.H.A., U.L., A.S.T.M., N.E.C. and other applicable codes and regulations. The station shall be constructed and anchored to comply with Seismic Zone 4 requirements.

The lift station shall have, as a minimum, two sewage pumps. The pumps shall have sufficient capacity and capability to efficiently handle the peak design flow with one pump out of service and to ensure a minimum velocity of 3 feet per second in the force main. Design calculations and pump curves indicating the same shall be provided with the submittal information. Calculations and curves shall verify that the pumps will operate satisfactorily with all pumps including the redundant pump operating (in the event that wet well levels or flows temporarily exceed the design range).

The sewage lift station supplier shall inspect the station during installation to determine if the installation is correct. Written confirmation of each visit and recommendations shall be provided to the City.

All pumps shall be tested to ensure that the vibration limits are within the standards of the current Hydraulic Institute Standards.

The sewage lift station supplier shall provide training for City personnel at the station site, as described elsewhere in this section.

The sewage lift station supplier shall provide four (4) complete copies of maintenance and operation material to the City as described elsewhere in this specification. Maintenance and operation material shall include a complete discussion of pump control strategy in narrative form, including operational troubleshooting procedures, startup and reset procedures, and calibration, setting and testing of level setpoints, gauges and alarms.

#### **CUSTOM SERIES BURIED STATION (SUBMERGED SUCTION WET PIT/DRY PIT TYPE)**

The station shall be a Smith & Loveless Custom Series station complying with the latest edition of Smith & Loveless standard specifications and with the City

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

Standards. The station shall be installed in accordance with the manufacturer's recommendations and as further described herein.

The station shall be a minimum of eight (8) feet in diameter and the pump motor assembly and piping shall be Smith & Loveless standard mint green in color.

The above-ground entrance hatch shall be forty-four inches (44") inside diameter with a steel cover, lockable to City standards. The access ladder shall include a safety climb system with extension for entering the dry well, if required. All areas, lighting and ventilation shall be included to meet the requirements for a confined space entry.

The station shall be provided with a minimum of four (4) magnesium anodes and test box mounted on the exterior of the dry well entry.

As a minimum, the station shall include the following:

- Vertical close-coupled, motor driven, non-clog pumps
- Resilient seat gate valves
- Internal piping
- Central control panel with circuit breakers, motor starters and automatic pumping level controls
- Lighting
- Sump pump with automatic discharge through dual check valves and ball valve
- Ventilating blower to provide a minimum of six air changes per hour in the dry well, continuous
- Ventilation fail detection with alarm contact
- Dehumidifier
- All internal wiring
- Protection against corrosion
- Emergency lighting
- Duplex direct air bubbler system with a compressor failure alarm for each compressor, pressure switch controls (Allen-Bradley Pressure Control No. 836NX50, settings in inches) for lead lag pump operation and high-low level alarms, and level transducer (Rosemont Model 1151 Smart) with 4-20 mA dc output proportional to wet well level and range to match level gauge.
- Low water alarm contact from a low level float switch, to also activate redundant PUMPS OFF call
- High water alarm contacts from two high level float switches, to also activate redundant PUMP No. 1 call and redundant PUMP No. 2 call
- Station flooding detection and alarm contact
- Station access limit switch to signal intrusion and operator access
- Intrusion alarm contact, with keyed deactivation/activation on time delay

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- “Pumps in hand” alarm beacon (Edwards Model 50R-N5-40WH or equal) with internal bypass toggle switch
- Operator in trouble button and alarm contact
- Check valve limit switch and alarm contact to indicate low flow with time delay, for each pump
- Smoke detector with alarm contact
- Extended warranty – 24 months from start-up or 30 months from time of shipment, whichever is first
- Document certifying the lift station is in compliance with the N.E.C. and Washington State Department of Labor and Industries requirements.
- NEMA 3R GFI duplex receptacle
- Spare parts per pump, labeled with part numbers
  - Replacement pump shaft seal assembly (1 ea)
  - Filter element for the seal filter (1 ea)
  - Pump volute gaskets (2 ea)
  - Pump base seal gaskets (1 ea)
- Touch up paint kit
- Ductile iron piping between wet well and station.
- Common reinforced concrete base slab for station and wet well.
- Sump pump piping and air bubbler line to go up dry well entry and discharge through 6” flanged opening in entry tube. Air bubbler and sump pump discharge line shall be stainless steel and shall be replaceable through the entry tube or wet well.
- Tap and plug 1/4” openings on pump discharge for pressure gauges

### **WET WELL MOUNTED STATION (SUCTION LIFT, VACUUM PRIME)**

The station shall be Smith & Loveless wet well mounted vacuum primed station complying with the latest edition of Smith & Loveless standard specifications and with the City Standards. The station shall be installed in accordance with the manufacturer’s recommendations and as further described herein.

As a minimum, the station shall include the following:

- Vertical, close-coupled, motor driven, vacuum-primed, non-clog pumps
- Resilient seat gate valves
- Internal piping
- Central control panel with circuit breakers, motor starters and automatic pump level controls
- Heater with thermostat control
- Ventilating blower with thermostat control
- Priming pumps and appurtenances
- All internal wiring

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- Discharge pipe welded to the base plate
- Bubbler piping above the base plate shall be plastic tubing, below the base plate the bubbler tubing shall be 304 Stainless Steel
- Lid to be insulated, 2 piece design, or 1 piece design with hydraulic hood assist
- Paint station with S&L standard mint green epoxy
- Shelf mounted duplex direct air bubbler system with a compressor failure alarm for each compressor, pressure switch (Allen-Bradley Pressure Control No. 836NX50, settings in inches) controls for the lead-lag pump operation and high-low level alarms, and level transducer (Rosemont Model 1151 Smart) with 4-20 mAdc output proportional to wet well level and range to match level gauge. Shelf to be mounted at the same level as the top of the station side wall.
- Shelf mounted vacuum pumps located at the same level as the top of the station side wall
- Low water alarm contact from a low level float switch, to also activate redundant PUMPS OFF
- High water alarm contacts from two high level float switches, to also activate redundant PUMP NO. 1 call and redundant PUMP NO. 2 call
- Station access limit switch to signal intrusion and operator access
- Intrusion limit switch and alarm contact, with keyed deactivation/activation on time delay
- "Pumps in hand" alarm beacon (Edwards Model 50R-N5-40WH or approved equal) with internal bypass toggle switch
- Check valve limit switch and alarm contact to indicate low flow with time delay, for each pump
- Smoke detector and alarm contact
- Extended warranty – 24 months from start-up or 30 months from time of shipment whichever is first
- Document certifying the lift station is in compliance with the N.E.C. and Washington State Department of Labor and Industries requirements
- NEMA 3R GFI duplex receptacle
- ¾" conduit connection in electric panel for connection to the telemetry sub panel
- Spare parts per pump, labeled with part numbers
  - Replacement pump shaft seal assembly (1 ea)
  - Filter element for the seal filter (1 ea)
  - Pump volute gaskets (2 ea)
  - Pump base seal gaskets (1 ea)
  - Plexiglass electrode bowl (1 ea)
  - Solenoid valve for vacuum system (1 ea)
  - Green flex tubing (10 ft)
  - Vacuum pump for priming system (1 per station)

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- Touch up paint kit
- Tap and plug ¼" openings on pump discharge

### MOTORS

The pump and motor shafts shall be the maximum diameter available for these units.

Pump motors shall be 3-phase, 60-cycle, 460-voltage. Motors larger than 25 HP shall be furnished with soft start or variable frequency drives. The developer will be responsible for providing the required power to the site.

The motors shall have 1.15 service factor and be non-overloading for the full range of the curve unless otherwise approved by the City.

### 8. WET WELL:

#### GENERAL

The wet well shall be precast concrete manhole sections and shall conform to manhole specification per Sanitary Sewer Systems – General Standards, as modified herein. Joints between precast wall sections shall be confined O-ring or as otherwise approved.

The wet well shall be provided with polypropylene manhole steps as specified for manholes, with Ladder Up Model 1 safety post.

The wet well shall be checked to ensure all joints are watertight to prevent infiltration and exfiltration of the wet well.

Bubbler piping shall be stainless steel and shall be fitted with a stainless tee (horizontal branch; vertical run) where it enters the wet well and makes a 90° bend downward. The tee and vertical bubbler tube shall have a minimum diameter of 1" in the run (vertical) direction, shall be fitted with a plug in the top of the run, and shall be located to allow vertical access for rodding out the vertical portion of the bubbler tubing. Bubbler tubing shall be braced to prevent damage during vector operations. Bubbler tubing location and method of attachment shall be detailed on the plans.

High alarm float switches (1 per pump) and low alarm float switch shall be provided in the wet well. Switches shall also serve as redundant PUMP ON and PUMPS OFF switches, respectively. Float switches shall be located so as to avoid interference by inlet flows, suction piping, bubbler tubing, bracing, steps/ladders, brackets, and other protrusions. Float switches shall be tethered to a stainless steel cable or chain that is anchored by a weight. The location and method of attachment of the float switches and cables shall be detailed on the plans.

A resilient seat gate valve shall be provided on all influent lines to the wet well, as described elsewhere in these standards.

The wet well walls and underside of the lid shall be coated to comply with the following:

**Surface Preparation:** Allow 28 days cure time for concrete. Provide SSPC SP-13 sweep blast to provide a surface profile. Surface shall be clean, dry and free of contaminants.

**Primer:** Tnemec Series 218 Mortarclad. Apply multiple coats as needed to fill bug holes and surface voids and to provide a primed surface that is monolithic, continuous and pinhole free.

**Finish:** Tnemec Series 280 Tneme-Glaze. Apply at 8.0 to 10.0 mils dry film thickness.

**Total System:** 14.0 to 18.0 mils dry film thickness.

**Application:** Comply with paint manufacturer's recommendations, including recommended recoat intervals.

#### **CUSTOM SERIES BURIED STATION**

The wet well shall be a minimum of six (6) feet in diameter. The wet well shall provide for the volute of the pumps to be fully submerged at all times. The highest float switch (PUMP 2 ON/HIGH ALARM) shall be set a minimum of six (6) inches below the invert of the lowest gravity sewer inlet pipe, or at an elevation as may be set by the City.

The wet well shall be of pre-cast concrete construction with flat slab cover and 30-inch hatch or manhole cover (at City's option) for access. The flat slab concrete cover shall be provided with a 4-inch vent that is "hooked and screened". A separate manhole cover shall be provided for vertical access to the wet well trough by a vactor unit.

#### **WET WELL MOUNTED STATION**

The wet well shall be a minimum of six (6) feet in diameter. Suction piping shall be PVC C900 and shall be braced at a point above the maximum liquid elevation to prevent damage during vactor operations, while allowing the piping to be rotated to access the check valves in the wet well mounted pumping station. Suction piping attachment and bracing shall be detailed on the plans. A cast-in-place reinforced concrete slab (12' x 16' minimum) shall be provided over the wet well as a housekeeping pad and mounting surface for the factory-built lift station. Provide a 4-inch vent that is "hooked and screened".

9. **CONTROLS:**

**FACTORY-BUILT LIFT STATION**

The control panel for the package lift station shall include:

- Main disconnect
- Lightning arrestor/surge protector
- Magnetic motor starter sized per NEMA standards
- Panel mounted running light for each pump
- Panel mounted alarm indicator light for compressor failure (each compressor)
- Panel mounted ammeter for each pump to read percentage of full load, or amperes and transmitter for 4-20mA analog signal to SCADA
- Panel mounted running time meter for each pump (Cramer or Grasslin)
- Panel mounted HOA switches for each pump
- Spare contact on HOA switches to remotely indicate when the switch is in Auto position
- Contact to allow remote start in parallel with level controls in AUTO
- HOA switches to be without spring return in hand mode
- Above listed electrical components shall be Allen-Bradley, Cutler Hammer, General Electric, or Square D Company, unless otherwise noted
- Voltage monitor relays to protect each pump motor from single-phase, phase reversal and low voltage (Diversified Electric or approved equal)
- Pump alternator, each cycle
- Panel mounted wet well level gauge. Minimum 3" dial, silicone oil filled and read for depth of wet well in inches, with snubber and block and bleed valves to check gauge zero
- Wet-well simulation valve

**GENERAL**

Control and instrument system plans shall thoroughly and completely depict system design. The plans, in conjunction with the specifications, shall define the type of control system, the type of components in the system, set points and the interface between the instrumentation and control system and the lift station system. To accomplish this, the control and instrument plan(s) shall include, as a minimum, the following:

1. Control and instrumentation system legend and general notes
2. Control, instrumentation and distribution diagram

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

3. Plans showing location of all control, instrument, and distribution system equipment and components, both electrical and pneumatic
4. All equipment and installation details

The power, control and instrumentation systems shall be designed with both operational reliability and maintainability. Use standard products wherever possible.

All components within the lift station system, including both internally and face-mounted instruments and devices, shall be clearly identified with phenolic nameplates of black background with white letters.

All wiring between cabinet, equipment and components shall be marked/numbered and multiple color coded where applicable.

All pump motors shall have an independent circuit breaker located within the lift station and the lift station shall have a main circuit breaker located outside the lift station.

The pump controls shall be air bubbler type with two compressors alternating on timer control, and shall provide for both pumps to operate at high water conditions. The bubbler system shall be equipped with pressure switch control with three switches functioning as high alarm level/lag pump on and off, lead pump on and off, and low alarm level, as well as with a pressure transducer producing a 4-20mA signal proportional to the wet well level with level indicating transmitter mounted in panel transmitting wet well level to autodialer. Provide panel mounted bubbler air gauge indicating wet well level for comparison with level indicating transmitter. Float controls shall also be provided to operate independently and in parallel with the bubbler controls. Floats shall be connected to the control panel via Intrinsically Safe Relays with each float starting a pump directly and independently of the bubbler controls and both pumps stopping in common on the low level float. The wet well control elevations shall be indicated on the plans, i.e. for duplex (wet pit/dry pit) station, HIGH WATER ALARM/PUMP 2 ON (float switch), HIGH WATER ALARM/PUMP 1 ON (float switch), HIGH WATER ALARM/LAG PUMP ON (pressure switch), LEAD PUMP ON (pressure switch), LEAD PUMP OFF (pressure switch), LAG PUMP OFF (pressure switch), LOW WATER ALARM (pressure switch), and LOW WATER ALARM/ PUMPS OFF (float switch).

The intrusion/operator access limit switch shall be connected to the control panel and used to monitor intrusion in conjunction with a key operated deactivation/activation switch located on the panel door and a time delay relay that delays the alarm signal for an adjustable interval on deactivation. Reactivation shall not occur until the limit switch is reset. The limit switch shall also be used in conjunction with the two pump HOA "AUTO" contacts to signal when either pump is left not in "AUTO" with the access closed, indicating that the

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

operator has left the station. The signal shall be displayed by a local flashing beacon light on the top of the telemetry panel, with a dry contact for future SCADA use. The beacon shall be equipped with a bypass toggle switch located in the panel interior.

The single-phase transformer for the lift station shall be as required for proper operation of the single phase side system.

The lift station electrical circuit shall be designed for generator starting and telemetry as required.

A complete set of spare fuses shall be provided for all fused equipment.

LIST OF DRY CONTACT TELEMETRY OUTPUTS, SCADA SYSTEM INPUTS, AND CONTROL SYSTEM RESET REQUIREMENTS

| Alarm/Status Outputs                                   | Reset                    |
|--|--------------------------|
| Pump 1 Run   | N/A                      |
| Pump 2 Run   | N/A                      |
| Pump 1 Pump-In-Auto                                    | N/A                      |
| Pump 2 Pump-In-Auto                                    | N/A                      |
| Pumps Not-In-Auto                                      | Auto                     |
| Pump 1 Fail  | Auto                     |
| Pump 2 Fail  | Auto                     |
| Intrusion Alarm  | Auto                     |
| Wet Well Level (analog)                                | N/A                      |
| Wet Well High Level Alarm (Float)                      | Auto                     |
| Wet Well High Level Alarm (Controller/pressure switch) | Auto                     |
| Wet Well Low Level Alarm (Controller/pressure switch)  | Auto                     |
| Wet Well Low Level Alarm (Float)                       | Auto                     |
| Low Voltage, Phase Loss, Phase Reversal                | Auto                     |
| Control Power Failure                                  | Auto w/ adjustable delay |
| Bubbler Compressor No. 1 Fail                          | Manual                   |
| Bubbler Compressor No. 2 Fail                          | Manual                   |
| Smoke Detector   | Auto                     |
| Station Flooding (buried station only)                 | Auto                     |
| Ventilation Fail (buried station)                      | Auto w/ delay            |
| Operator in Trouble (buried station only)              | Manual                   |

The following alarm contacts shall be ganged and a single pump fail alarm provided to the autodialer: motor overload, check valve limit switch fail to open (timed delay at pump start), prime fail (Wet-Well Mounted Station)

**10. ELECTRICAL SERVICE & DISTRIBUTION / TELEMETRY SYSTEM & CONTROLS:**

**GENERAL**

Codes and regulations exist at the federal, state, and local level dictating minimum acceptable requirements for electrical systems. The following standards shall be used as a basis for design and review.

- National Electric Code (NEC)
- Occupational Safety & Health Act (OSHA)
- State & Local Building Codes
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- Underwriters' Laboratory (UL)
- Insulated Power Conductor Engineering Association (IPCEA)
- American National Standards Institute (ANSI)
- Institute of Electrical & Electronic Engineers (IEEE)
- National Fire Protection Association (NFPA)

**ELECTRICAL SERVICE & DISTRIBUTION**

The local electric utility will be the primary source of electrical power. The Developer shall ascertain proper coordination between the nominal secondary delivery voltage supplied by Snohomish County P.U.D. No. 1 and the connection to the lift station equipment. The electrical service shall be 480 volt, 4-wire, 3-phase, 60 hertz, with a solid neutral terminal at the disconnect or as may otherwise be required by Snohomish County P.U.D. No. 1. This shall be confirmed with the Snohomish County P.U.D. No. 1 and confirmed by the suppliers. Underground service shall be provided unless otherwise approved by the City.

All installation shall be approved by Snohomish County P.U.D. No. 1 and shall be in conformance with the NEC (current issue) UL, OSHA and County and State electrical codes.

The City shall be furnished with a certificate of final inspection by the inspecting agency.

All wire shall be copper.

All exposed conduit shall be rigid galvanized. All underground conduits shall be PVC with rigid galvanized PVC-coated elbows and rigid galvanized PVC coated transitions to exposed conduit.

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

All underground conduits shall be marked with polyethylene tape placed 6-inches below finished grade and directly above the conduit.

All conduits shall have a minimum of 24 inches of cover.

Heating strips with thermostats shall be provided for outside electrical enclosures.

Service voltage shall be 277/480 volts, 3 phase, 4-wire, except as required by Snohomish P.U.D. #1. Single-phase services shall be 240/120 volt, 3 wire, if approved by the City, where 480 volt 3-phase is not available.

A service entrance shall be provided with a rack or pedestal on which shall be mounted, as a minimum, the following equipment:

1. Meter and meter can (as required by the P.U.D.)
2. Metering current transformers and enclosure (as required by the P.U.D.)
3. Main disconnect circuit breaker in a NEMA 3R, enclosure, with padlock to City standards
4. Automatic transfer switch in a NEMA 3R enclosure
5. An SUSE main breaker, 5 KVA single phase transformer, and 12 circuit panelboard transformer in NEMA 3R enclosures with breakers for receptacle outlet, engine generator (battery charger, block heater, control panel and other generator heaters or equipment), hot box, site or area lighting, telemetry/SCADA panel, and three spares (1-Pole 20A).
6. A 120-volt duplex receptacle outlet in NEMA 3R enclosure with padlock to City standards.
7. Ground rod(s) and connector wire in conduit to NEC standards.
8. Telemetry/SCADA panel in a NEMA 3R enclosure with door with locking 3-point latch with auto dialer installed, space/provisions for future SCADA equipment, "Pump Not-In-Auto" alarm beacon on the exterior top of the panel and "Operator-In-Trouble" mushroom head maintained contact (detented) pushbutton on exterior bottom of panel.
9. Telephone service from serving telecom utility to telemetry panel including Line Protection Unit (LPU) or Building Entrance Protector (BEP) and Network Interface Unit (NIU).
10. Mount equipment per Standard Details

11. Provide a spare 2-inch conduit from a point 6 inches above the concrete slab as noted in Standard Details, thence, underground down and horizontally to a point 24 inches out beyond the edge of the electrical rack mounting slab. Cap both ends.

Provide electrical single-line diagram as part of the design showing all components and control between pedestal, lift station and generator with wire and conduit sizes.

The City shall be provided with a complete reproducible set of as-constructed plans and details showing final location of all equipment, conduit and wire.

### **TELEMETRY & CONTROLS**

The City's telemetry system utilizes Sensaphone 2000 Dialers for telemetry/SCADA functions related to the wastewater collection systems. Provisions for a future SCADA system are to be included with each lift station.

A dialer shall be provided in a telemetry/SCADA enclosure with auxiliary equipment to facilitate connection of external signals to the Dialer, and to monitor alarm, and status signals. Communication with the City personnel is via dial-up telephone lines.

For each new lift station the Developer shall provide a dialer (Sensaphone 2000 v. 3.2) along with an enclosure, power supply, heater, surge protection devices for power and telephone lines, and other auxiliary devices as required for proper operation of the system. Terminate the following inputs and outputs for a station on a terminal strip in the telemetry/SCADA enclosure.

Typical discrete inputs include:

#### **From Transfer Switch**

- Commercial Power Fail

#### **From Generator Control Panel**

- Generator Run
- Generator Fail
- Generator Low Fuel

#### **From Pump Station Control Panel**

- Pump No. 1 Run
- Pump No. 2 Run
- Pump No. 1 HOA Status
- Pump No. 2 HOA Status
- Pumps Not-In-Auto
- Pump No. 1 Fail

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- Pump No. 2 Fail
- Intrusion Alarm
- Wet Well High Level ( 2 floats, 1 per pump)
- Wet Well High Level (controller/pressure switch)
- Wet Well Low Level (float)
- Wet Well Low Level (controller/pressure switch)
- Voltage Fail (from control panel phase monitor)
- Control Power Fail
- Bubbler Compressor No. 1 Fail
- Bubbler Compressor No. 2 Fail
- Smoke
- Station Flood (Buried Station)
- Ventilation Fail (Buried Station)
- Operator in Trouble (Buried Station)

Typical discrete outputs include:

- Start Generator (with an interposing relay driven by the future SCADA RTU/PLC)
- Start Pump 1 (with an interposing relay driven by the future SCADA RTU/PLC)
- Start Pump 2 (with an interposing relay driven by the future SCADA RTU/PLC)

Typical analog inputs include:

- Wet Well Level
- Pump No. 1 Amperes (for future SCADA RTU/PLC)
- Pump No. 2 Amperes (for future SCADA RTU/PLC)

Provisions shall also be made for additional I/O signals by providing 20% spare terminals within the telemetry/SCADA panel.

The Developer shall also be responsible for correct set-up of the dialer with respect to the system configuration. This include coordinating configuration parameters such as:

- I/O point configuration (enable/disable format)
- Debounce time
- NO/NC inputs
- High/low alarm limits
- Momentary/latched outputs
- Signal adjustments

The Developer shall coordinate with the telephone utility and the City for obtaining proper telephone service to the site. Service shall be underground unless otherwise approved by the City. The developer shall be responsible for obtaining, installing, and starting up the dialer for the new lift station. The Developer shall coordinate obtaining, installing and startup with the City to ensure that the station is properly configured and functions correctly in conjunction with the City's existing system and telephone numbers.

All major components, including relays, terminals, and power supplies shall be identified using phenolic or vlam engraved labels.

A line (surge) protector unit shall be provided for the dialer equipment. The unit shall protect the equipment from transient and electrical surges on the telephone line. Protection shall include line fuses and clamps for voltages over 25 volts, gas tubes shall be provided as an integral part of the lightning protection unit.

Typical autodialer inputs for a duplex station shall be:

- Analog wet well level signal
- Power Fail/Voltage Fail (w/ delay)
- Pump 1 Fail
- Pump 2 Fail
- High Wet Well Alarm (combine float & controller outputs in parallel)
- Low Wet Well Alarm (combine float & controller outputs in parallel)
- Generator Low Fuel
- Operator in Trouble/Smoke/Intrusion/Station Flood (combine in parallel)

Other available I/O will be used in the future SCADA system.

Transfer from utility power to standby generator power shall not be alarmed.

## 11. **AUXILIARY POWER SYSTEM:**

### **GENERAL**

Emergency power generation equipment shall be provided at the lift station site that will operate the lift station in the event of a commercial power outage.

It is essential that the emergency system be designed with capacity and rating to carry safely the entire connected lift station load, including all pumps and ancillary loads unless otherwise approved by the City.

The auxiliary power unit shall be complete in every respect and shall include, but not be limited to, the following:

1. Generator, control panel & circuit breaker.

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

2. Engine, radiator & exhaust system.
3. Fuel tank. (Capacity for 24 hours full load plus 25%.)
4. Generator set enclosure, lockable to City Standards.
5. Automatic transfer switch.
6. Block Heater
7. Battery & rack.
8. Battery charger.
9. Conduit, wire and piping.

The generator set and transfer switch shall be Cummins/Onan complying with the latest edition of Onan Corporation standard specifications and with the City Standards.

The generator set shall be spark-ignited, liquid propane, or diesel if approved by the City, 60 Hertz, 1800 RPM, 3-phase, 277/480 volt standby power.

The generator set shall include the following:

### **Engine**

- Single phase, 1500 watt coolant heater (115 VAC)

### **Generator Set**

- Mainline circuit breaker
- Weather-protective enclosure with mounted silencer (maximum noise level of 68 dBA at 23 feet)
- 5-year basic standby-power warranty

### **Accessories**

- Batteries
- Battery Charger, 2 AMP, 12 VDC, 120 VAC Input
- Vibration Isolators, Pad Type

### **Control Panel**

- Annunciator relays (12)
- Run relay package (3)
- Low coolant level shutdown
- Anti-condensation space heater, 120 VAC
- Oil temperature gauge
- Wattmeter
- Emergency stop switch

### **Fuel Systems**

- All fuel piping shall be black iron, except for flexible vibration isolation connections at pipe ends.

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

### Alternator

- Anti-condensation heater, 120 VAC

### Exhaust System

- Exhaust silencer (68 dBA at 23 feet)

### Control Features

- Run-stop-remote switch
- Remote starting, 12-volt, 2 wire
- Coolant temperature gauge
- Field circuit breaker
- DC voltmeter
- Running time meter
- Lamp test switch
- Oil pressure gauge
- Fault reset switch
- Cycle cranking
- 12-light engine monitor with individual 1/2 amp relay signals and a separate status or alarm contact for each of the following conditions:
  - Run (Green Light)
  - Pre-Warning For Low Oil Pressure (Yellow Light)
  - Pre-Warning For High Coolant Temp (Yellow Light)
  - Low Oil Pressure Shutdown (Red Light)
  - High Coolant Temperature Shutdown (Red Light)
  - Overcrank Shutdown ( Red Light)
  - Overspeed Shutdown (Red Light)
  - Switch Off (Flashing Red Light- Indicates Generator Set Not In Automatic Start Mode)
  - Low Coolant Temperature (Yellow Light)
  - Low Fuel (Yellow Light)
  - Fuel Leak (Red Light)
  - Two Customer Selected Faults (Red Light)

### AC Meter Package

Order with NFPA 110 monitor.

- AC voltmeter (dual range)
- AC ammeter (dual range)
- Voltmeter/ammeter phase selector switch with an off position
- Dual scale frequency meter/tachometer
- AC Rheostat (panel mounted) for + 5% voltage adjust

The transfer switch shall include the following:

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- Sized for full station and auxiliary equipment load plus 25%.

### **Pole Configuration**

- Poles - 3 (Solid Neutral)

### **Frequency**

- 60 Hertz

### **Application**

- Appl - Utility to Genset

### **System Options**

- Three phase, 4-wire

### **Enclosure**

- B002 Type 3R; Intended for outdoor use (dustproof and rainproof)

### **Listing**

- Listing - UL 1008

### **Programmed Transition**

- Prgrm Transition, 1-60 sec.

### **Exerciser Clock**

- 7-day solid-state exerciser clock

### **Applications Modules**

- Monitor - Phase Sequence/Balance

Suitable guards shall be provided on all electrical parts to minimize the personal shock hazard.

Generator shall be broken-in sufficiently to permit application of full load immediately upon installation.

Generator supplier shall provide all tools for the generator set as recommended and required by the manufacturer.

Generator installation shall be checked by the supplier after installation to determine that the installation is correct. Written confirmation shall be provided to the City. Generator supplier shall perform a full load test for two (2) hours after installation is complete. Provide resistive load bank for this test.

Generator supplier shall provide training for City personnel at the station site, as described elsewhere in this section.

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

Generator manufacturer shall provide four (4) copies of the maintenance and operation manual. These manuals shall be complete and shall include all information necessary to allow City personnel to operate and maintain the generator.

Generator mounting pad shall be reinforced concrete to carry the weight of the unit and shall extend a minimum of 3 inches beyond generator housing and 4 inches above the surrounding finish grade. Chamfer all edges  $\frac{3}{4}$ -inch.

Propane tank support pad shall be as above.

Diesel tank shall be a dual-wall subbase tank with leak detection.

### 12. FORCE MAIN

The force main shall be installed and tested in accordance with the Sanitary Sewer System – General Standards, and as further described herein.

The force main shall be a minimum 4-inch diameter ductile iron Class 52 with a minimum cover of 4'-0", unless it can be clearly shown that a four inch main, or larger diameter, will cause excessively low velocities in the force main and that there is no reasonable potential for additional waster water demand on the force main. Where feasible, there shall be no intermediate high point between the pump station and the force main discharge point, unless properly protected with sewage air and vacuum release assembly. Where approved by the City, butt-fused HDPE pipe may be substituted for ductile iron pipe.

Where feasible, the force main shall discharge to a new manhole prior to entering the existing system. The force main shall enter the discharge manhole at the same crown elevation as the outlet gravity pipe and shall be channeled accordingly. Walls, cone and neck of the discharge manhole shall be coated in accordance with the specification for wet well coating. Where the use of a new discharge manhole is not feasible, a drop connection to an existing manhole may be used, with City approval, and the existing manhole re-channeled and coated accordingly.

An emergency bypass pump connection equipped with a female Cam Lock fitting and plug shall be located near the wet well, in a location specified by the City, with drain back to the wet well. Valves shall be located within a valve vault per the standard detail.

### 13. LIFT STATION TEST PROGRAM

The Developer shall perform, as a minimum, the following tests and provide the City written documentation of the date performed and results obtained. Pump tests shall meet or exceed specified capacity. The City shall be informed of the testing schedule 72 hours prior to the test and shall be present during testing. All tests shall be supervised by the manufacturer's representative for the applicable

equipment, and documentation shall be provided of satisfactory installation of the factory-built lift station and associated control systems, the generator and transfer switch, and the electrical system, at the conclusion of the testing.

1. Pump capacity by drawdown test, for each pump operating alone and each combination of multiple pump operation. Record amperes and furnish pressure gauge to record total dynamic head for each condition.
2. Bubbler/control panel operation. Float switch operation.
3. Generator load test
4. Automatic transfer to and from auxiliary power
5. Telemetry control to terminal strip

Fill water for testing shall be obtained in accordance with the cross-connection policies of the local water purveyor.

Documentation of satisfactory installation shall be in the form of a notarized Manufacturer's Affidavit submitted by the Manufacturer or an authorized representative shall, certifying that:

1. the equipment has been properly installed and lubricated,
2. the equipment is in accurate alignment,
3. the manufacturer was present when the equipment was placed into operation,
4. the manufacturer has checked, inspected, and adjusted the equipment as necessary,
5. the equipment is free from any undue stress imposed by connecting piping or anchor bolts,
6. the equipment is not imposing any undue stress on any connecting members,
7. the equipment has been operated satisfactorily under full load conditions,
8. the manufacturer has inspected his equipment during the operational demonstrations and system validation tests to the extent specified, and the equipment is fully covered under the terms of the guarantee.

#### 14. TRAINING AND FOLLOW UP INSPECTION

The following training and follow-up service shall be provided at the Developer's expense, by the manufacturer's representative, and shall be in addition to any testing and inspection services required for installation and start up. Start up and training shall not occur until approved O&M materials have been provided to the City. Training and follow-up inspections shall be scheduled in advance with the City:

Lift Station:

- ½ day training at start up

## SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

- ½ day training at 6 months, to include general warranty inspection plus tightening and sealing of suction piping for the wet well mounted station

### Generator:

- ½ day training at start up
- ½ day training at first warranty inspection

### Electrical/Controls:

- ½ day training at start up

## 15. OPERATIONS AND MAINTENANCE INFORMATION:

Record (as-constructed) information for the lift station shall be incorporated into the record drawings for the developer extension. In addition, the Developer shall submit operations and maintenance information for the lift station equipment.

The following information shall be furnished for all items of equipment installed on the project requiring operational and/or maintenance procedures, and for any additional items indicated by the Engineer.

1. Lubrication Information: This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed.
2. Drawings and Diagrams: Drawings shall include record (as-constructed) version of dimensional outline drawings in either full-size (22"x34") or half-size (11"x17") format. Diagrams shall record (as-constructed) version of schematic electrical and connection diagrams, showing points of connection, numbers of circuits, size and number of conduits and conductors.
3. Start-Up Procedures: These instructions consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.
4. Operating Procedures: These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, and stopping the equipment under specified modes of operation.
5. Preventive Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.

SEWAGE LIFT STATIONS - SUPPLEMENTAL STANDARDS - Continued

6. Overhaul Instructions: These instructions consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment and any safety precautions that must be observed while performing the work.
7. Parts List: This list consists of the generic title and identification number of each component part of the equipment. Component equipment items provided by other manufacturers shall be identified with the manufacturer's name, part description, and part number.
8. Spare Parts List: This list consists of the manufacturer's recommendations of number of parts and quantities that should be stored by the Owner and any special storage precautions that may be required. Note spares provided.
9. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed callouts.
10. Maintenance Information Summaries as specified herein.

Four preliminary review copies of the manufacturer's equipment O&M manuals shall be submitted to the Engineer for review at the time of equipment delivery. All manuals except one return copy with comments will be retained by the Engineer. Allow 14 days for Engineer's review.

Four (4) copies of the final acceptable operational and maintenance materials shall be submitted to the Engineer prior to project acceptance and a minimum of 14 days prior to product training.

Maintenance Information Summaries (MIS) shall be provided for the following component equipment items, within the appropriate section of the equipment manuals, prepared according to the format specified herein:

- non-clog pumps
- sump pumps
- heating and ventilation equipment
- standby generator
- valves (larger than 1" in size)

Maintenance information summaries shall be furnished on 8-1/2" x 11" paper and on diskette in a City-approved format. The Engineer shall provide a Microsoft Excel template file on diskette. The MIS shall contain the following information compiled from manufacturer's recommendations in the order shown.

1. Description or name of item of equipment.

2. Manufacturer.
3. Name, address, and telephone number of local manufacturer's representative.
4. Serial number (where applicable).
5. Equipment nameplate data including model number.
6. Recommended maintenance procedures:
  - Description of procedures.
  - Maintenance frequency required.
  - Lubricant(s) or other materials required (where applicable), including type of lubricant, lubricant manufacturer, and specific compound.
  - Additional information as required for proper maintenance.
7. Spare parts provided (where applicable).

All operation and maintenance information shall be comprehensive and detailed, and shall contain information adequately covering all normal operation and maintenance procedures. The information shall be organized in the binders. The binders shall be provided with a table of contents and tab sheets to permit easy location of desired information.

All information shall be specifically for items of equipment installed in the Project. Material not directly applicable shall be removed or omitted from catalogs or other printed information.

Lubricants shall be described in detail, including type, recommended manufacturer, and manufacturer's specific compound to be used.

If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.