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## CHAPTER 5

### 5.000 SANITARY SEWER

#### 5A GENERAL CONSIDERATIONS

##### 5A.010 General

Sanitary sewerage refers to waste water derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted.

Any extension of Gig Harbor's sanitary sewer system shall be approved by the City Engineer and shall conform to the City of Gig Harbor's Comprehensive Wastewater Plan, Tacoma - Pierce County Health Department, Department of Ecology (DOE), and Department of Health (DOH) requirements. Specific site conditions may require variance from the comprehensive plan and require approval from the Public Works Director and DOE.

The owners of all new houses, buildings, structures, or other uses of property used for human occupancy shall be required to connect the improvements on their properties to a public sanitary sewer, except as provided in sub-section E of GHMC 13.28.100.

Anyone who wishes to extend or connect to the City's sewer system should contact the Public Works Department for a sewer extension/connection fee estimate of the costs due the City for a sewer extension or connection.

Prior to the release of any water meters, or operation of any septic tank effluent pressure (STEP) systems, all Public Works improvements must be completed and approved and all applicable fees must be paid.

See Section 1.025 for definitions of specific sewers. Maintenance of the building or side sewer shall be the responsibility of the property owner. Maintenance of the lateral shall be the responsibility of the property owner.

##### 5A.011 Grease Traps/Interceptors

See Chapter 13.30 of the Gig Harbor Municipal Code for grease interceptor requirements, rules and regulations.

A grease interceptor shall be installed in the waste line leading from sinks, drains, and other fixtures or equipment for all food service establishments such as restaurants, cafes, lunch counters, cafeterias, bars, and clubs, hotel, hospital, sanitarium, factory or school kitchens, or other establishments where grease may be introduced into the publicly owned treatment works (POTW) in quantities that can affect line stoppage or hinder sewage treatment or disposal.

The grease interceptor installation shall comply with the provisions of Chapter 10 of the Uniform Plumbing Code, and shall result in the discharge of no more than 100 mg/l fats, oils or grease

A grease interceptor is not required for individual dwelling units. Each food service establishment must be connected to an individual interceptor.

Car washing facilities and/or other businesses which handle liquid wastes containing grease, flammable wastes, sand, solids, acid or alkaline substances or other ingredients harmful to POTW, shall install industrial interceptors (clarifiers) and separators.

#### **5A.012 Grinder Pump Specifications**

Side sewer connections to the sewer main which originate from elevations lower than the sewer stub elevation shall require installation of a grinder pump, each one specific for single family units. Contact the Public Works Department for grinder pump specifications exceeding single family requirements.

#### **5A.013 Building Sewers**

Lots created by plats, re-plats, short plats, or binding site plans shall have a sewer service installed as required below. All building sewers are private and shall be installed in accordance with these standards and the Plumbing Code. Each dwelling shall require an individual connection to the sewer main.

In single family subdivisions, including mobile home and manufactured home subdivisions, a service shall be provided to each lot or pad. In cases where this is not practical, exceptions may be granted by the City in accordance with the Plumbing Code.

The City will no longer allow STEP systems unless circumstances require.

Duplexes on a gravity sewer, regardless of the number of units on a lot, may have a single or dual service provided to each building. In the case where a STEP system services a duplex, the duplex shall be served by one-3,000 gallon tank assembly. The tank servicing a duplex shall have a duplex electrical control box designed to operate if either side were to disconnect from the power source.

Services for multi-family and commercial complexes shall be as required in the Plumbing Code. Generally, this requires a minimum of one-side sewer to each separate building. See Section 5B.050 for more gravity side sewer requirements.

The location of all side sewers shall be marked on the face or top of the cement concrete curb with an "S" 1/4 in. into the concrete.

#### **5A.020 Sanitary Sewer/Water Main Crossings**

See Section 4.130 for requirements regarding sewer and water separation.

**5A.030 Staking**

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed as a professional engineer or a professional land surveyor by the State of Washington.

A pre-construction meeting shall be held with the City inspector prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of sewer lines shall be as directed by the City Engineer or as follows:

- A. Stake location of mainline pipe and laterals every 50 ft. with cut or fill to invert of pipe.
- B. Stake location of all manholes for alignment and grade with cut or fill to rim and invert of pipes.
- C. Location of valves, fixtures and septic tank shall be staked for force mains and STEP systems.

**5A.040 Trench Excavation**

See Section 4.160 for requirements regarding trench excavation.

**5A.050 Back filling**

See Section 4.170 for requirements regarding back filling. No pea gravel is to be used as bedding or backfill of sewer piping or structures.

**5A.060 Street Patching and Restoration**

See Section 2B.170 and 2B.180 for requirements regarding street patching and trench restoration.

**5A.070 Testing**

Prior to acceptance and approval of construction, the following tests shall apply to each type of construction.

- A. Gravity Sewer
  - 1. Prior to acceptance of the project, the gravity sewer pipe shall be subject to a low pressure air test per WSDOT/APWA Standards. The contractor shall furnish all equipment and personnel for conducting the test under the observation of the City inspector. The testing equipment shall be subject to the approval of the City.

The contractor shall make an air test for his own purposes prior to notifying the City to witness the test. The acceptance air test shall

be made after the trench is back filled and compacted and the roadway Section is completed to sub grade.

All wyes, tees and end of side sewer stubs shall be plugged with flexible joint caps or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

2. Testing of the sewer main shall include a television inspection by the contractor. The camera must be equipped with a rotating head to allow televising of the side sewers as mainline inspection is occurring. The camera unit shall be equipped with a measuring device that is in plain view ahead of the camera. The device shall be 1" in diameter and on a flexible shaft. Television inspection shall be done after the WSDOT Low Pressure Air Test has passed, main cleaned with eductor truck equipped with pressure jetter, and before the roadway is paved. Immediately prior to a television inspection enough water shall be run down the line so it comes out the lower manhole. A copy of the video and written report shall be submitted to the City. The written report shall include the manhole number that the inspection originates at and show the ft., age and size of the line and the ft., age of all side sewers and any defects including debris that is encountered during the inspection. Any bellies encountered that exceed 3/8 in. or greater will need to be excavated and repaired. After repair has been made, the line will need to be videoed again to confirm repair. Acceptance of the line will be made after the video has been reviewed and approved by the Inspector. Any tap to an existing system needs to be televised as well.
3. A water or a negative air pressure "vacuum" test of all manholes is also required.
4. The water test shall be made by the contractor first by filling the manhole up with water and letting it sit for 24 hours to allow the water to saturate the concrete. After 24 hours the manhole shall be filled to the top of the cone. The water cannot drop more than 0.05 gallons in 15 minutes per ft. of head above invert to pass. Upon completion of the water test, the water shall be pumped out of the manhole and not allowed to be released to the system.
5. The negative air pressure "vacuum" test may be used for testing concrete manholes. The test shall be in accordance with ASTM C 1244-93 except that the duration shall be 5 seconds per ft. as measured from the bottom of the manhole channel to the ring regardless of manhole diameter. A vacuum of 10 in. of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shall be shut off. The time shall be measured for the vacuum to drop to 9 in. of

mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 in. to 9 in. of mercury meets or exceeds the time calculated

6. A mandrel test in accordance with Section 5-17.3(4)H of the Standard Specifications shall be required on all sewers except laterals as defined in Section 1.025 of these standards.

B. Lift Station Pressure Main

1. Prior to acceptance of the project, the pressure line and service lines shall be subjected to a hydrostatic pressure test of 200 pounds for two hours and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The 200 psi pressure test shall be maintained while the entire installation is inspected. The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.
2. A water or vacuum test for all wet wells in accordance with the manhole water test for gravity sewer shall be required.
3. A mandrel test in accordance with the Standard Specifications is required.
4. Pump operation, alarms, and electrical inspection of all lift stations is required.

C. STEP/Grinder Pressure Main System

1. Prior to acceptance of the project, the pressure mainline and service lines shall be subject to a hydrostatic pressure test of 75 pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The pressure test shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. The contractor shall

perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

2. A water test of the septic, STEP or grinder tank at the factory and on site after installation is required in accordance with the criteria outlined in Section 5E.030.
3. Electrical inspection and testing of all electrical components of the system is required. All tested parts must pass before the City accepts the system. Additionally all electrical structures shall have a concrete base or floor.

#### **5A.080 Effluent Spills**

All discharges from the sewerage collection system and spills of any type that may affect human health or the environment must be immediately reported to the Tacoma - Pierce County Health Department and the Department of Ecology. As soon as the spill information is known, the persons responsible for the spill must notify the Department of Ecology of the spill, provide as much information as possible and be sure to give a detailed spill location description, including the estimated volume of discharge and the name of a person to contact for information. The Washington State Emergency Management Division 24-hour Spill telephone number is 1-800-258-5990.

A complete report on the nature, cause and extent of the spill and steps taken to clean up the spill and prevent future spills must be made to the Department of Ecology within 24 hours following the initial spill report call.

## **5B GRAVITY SEWER**

#### **5B.010 General**

All sewers shall be designed as a gravity sewer whenever physically feasible or as outlined in the Comprehensive Sanitary Sewer Plan.

#### **5B.020 Design Standards**

The design of any sewer extension/connection shall conform to City Standards, Department of Ecology's Criteria of Sewage Works Design and any applicable standards as set forth herein and in Section 1.010 and 1.040.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. See Section 1.130 for utility extension information.

New gravity sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 150 gallons per day in accordance with Chapter 3 of the Wastewater Comprehensive Plan. This figure is assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. Generally, laterals and sub main sewers should be designed to carry, when running full, not less than 400 gallons daily per capita contributions of sewage. When deviations from the foregoing per capita rates are used, a description of the

procedure used for sewer design shall be submitted to the City Engineer for review and approval.

The General Notes on the following page shall be included on any plans dealing with sanitary sewer design.

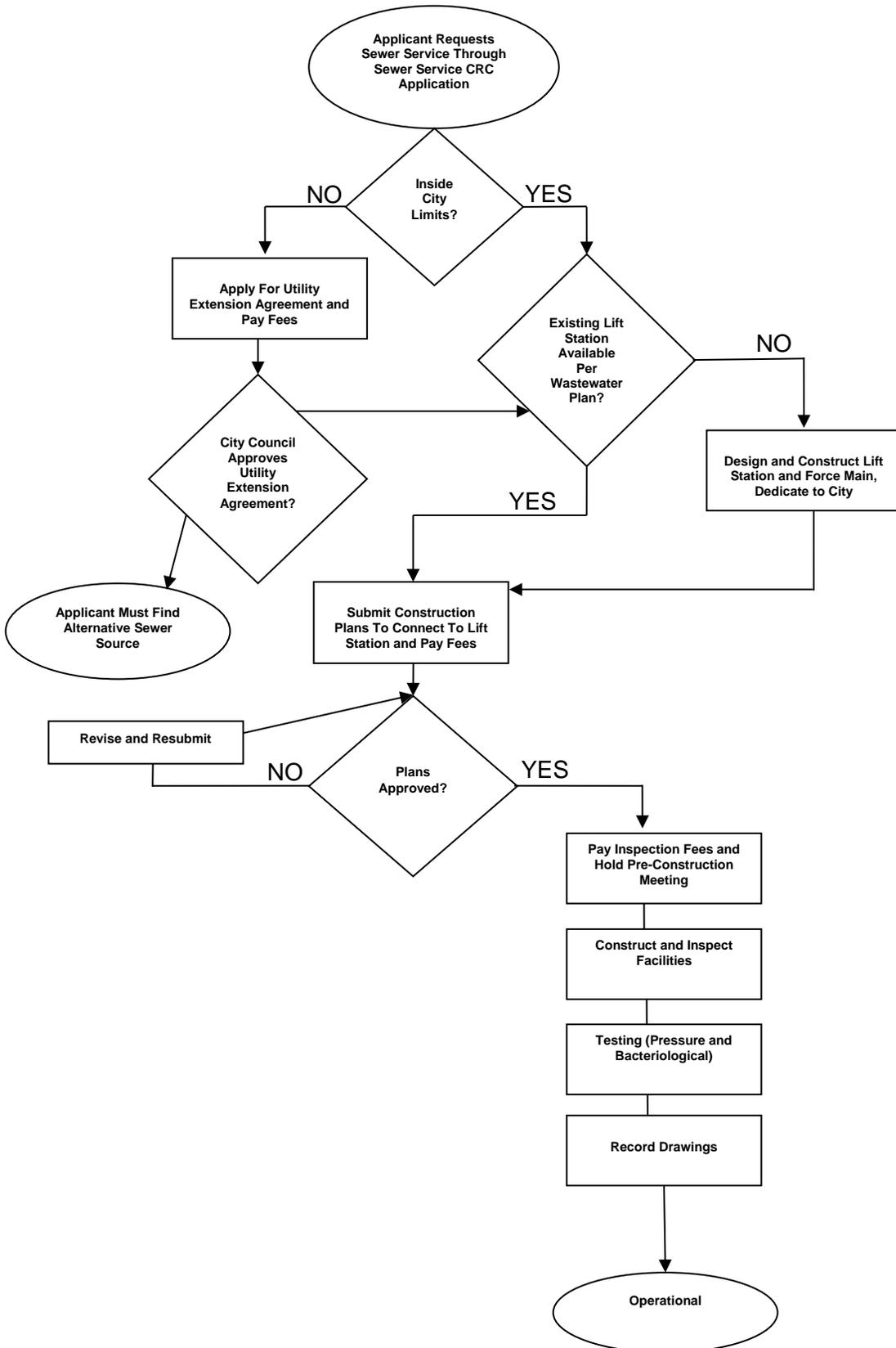
#### GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION)

1. All workmanship and materials shall be in accordance with City of Gig Harbor standards and the most current copy of the *State of Washington Standard Specifications for Road, Bridge and Municipal Construction*. In cases of conflict, the most stringent standard shall apply.
2. All safety standards and requirements shall be complied with as set forth by OSHA, WISHA and Washington State Department of Labor and Industries.
3. City of Gig Harbor datum shall be used for all vertical control. A list of benchmarks is available at the Engineering Department.
4. All approvals and permits required by the City of Gig Harbor shall be obtained by the contractor prior to the start of construction.
5. If construction is to take place in the County and/or Washington State Department of Transportation right-of-way, the contractor shall notify the City. The City will obtain the County and/or WSDOT permit(s) and provide a copy to the contractor. The contractor shall reimburse the City for associated permit fees.
6. A pre-construction meeting shall be held with the City of Gig Harbor Construction Inspector prior to the start of construction.
7. The City of Gig Harbor Construction Inspector shall be notified a minimum of 48 hours in advance of a tap connection to an existing main or lateral. The inspector shall be present at the time of the tap. Any material removed in the tap process must be given to the City Inspector **at the time of the tap**.
8. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate line at 811 a minimum of 48 hours prior to any excavation.
9. Gravity sewer main shall be PVC, ASTM D 3034 SDR 35 or ASTM F 589 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 455, and shall be green in color.
10. Pre-cast manholes shall meet the requirements of ASTM C 458. Manholes shall be Type 1-48" manhole unless otherwise specified on the plans. Joints shall be rubber gasket conforming to ASTM C 443 and shall be grouted from the inside and outside. Lift holes shall be grouted from the outside and inside of the manhole. (See Note 1.) All manholes used in a STEP system, manholes where a force main terminates into, and gravity manholes as determined by the City, must be properly coated inside to prevent hydrogen sulfide corrosion.

11. Manhole frames and covers shall have a ductile iron casting marked "sewer" and shall be capable of withstanding a test load of 120,000 lbs. and meet AASHTO M 306 standards. Covers shall be one-man operable using standard tools. Covers shall be hinged and incorporate a 90 degree blocking system to prevent accidental closure and come complete with hinge infiltration plug. Frames shall be circular and shall incorporate a sealing ring and provide a 24 in. clear opening. The frame depth shall not exceed 4 in. and the flange shall incorporate bedding slots and bolt holes. All components shall be black coated with a total weight not to exceed 200lbs. The manufacturer shall be CertainTeed, or an approved equal. Lock-type covers shall be required in all multi-family complexes, on school grounds, on manholes containing odor control devices or as determined by the City.
12. Side sewer services shall be PVC, ASTM D 3034 SDR 35 and green in color with flexible gasket joints. Side sewer connections shall be made by a tap to an existing main or a wye branch from a new main connected above the spring line of the pipe.
13. All sewer mains shall be field staked for grades and alignment by a licensed engineering or surveying firm qualified to perform such work.
14. All plastic pipe and services shall be installed with continuous tracer tape installed 12" to 18" under the proposed finished sub grade. The marker shall be plastic non-biodegradable, metal core or backing, marked "sewer" which can be detected by a standard metal detector. In addition, STEP systems and force mains shall be installed with 14 gauge coated copper wire wrapped around all plastic pipe, brought up and tied off at valve body. Tape shall be Terra Tape "D" or approved equal. The tape and wire shall be furnished by the contractor. All sewer pipe shall be green in color. If pipe used is not green in color a PVC sheathing or 'polywrap' shall be installed on pipe during construction.
15. All side sewers locations shall be marked on the face of the curb with an embossed "S" 3 in. high and ¼ in. into concrete and have the stub marked with treated 4 in. x 4 in. posts with wire.
16. Compaction of the backfill material shall be required in accordance with the above mentioned specification (See Note #1). Refer to the applicable Details 2-14 through 2-16. No pea gravel will be allowed as pipe bedding.
17. A 3-ft. square by 8 in. thick concrete pad with welded wire or #4 rebar shall be installed around all clean outs that are not in a pavement area.
18. Temporary street patching shall be allowed as approved by the City Engineer. Temporary street patching shall be provided by placement and compaction of 1 in. maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
19. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
20. The contractor shall be responsible for all traffic control in accordance with Section 2B.126 of the Gig Harbor Public Works Standards, the WSDOT Standard Plans for Road, Bridge and Municipal Construction (all applicable "K" plans) and/or the Manual on Uniform Traffic Control Devices (MUTCD). Prior to disruption of any traffic, a traffic control plan

- shall be prepared and submitted to the City for approval. No work shall commence until all approved traffic control is in place.
21. It shall be the responsibility of the contractor to have a copy of the approved plans on construction site whenever construction is in progress.
  22. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Gig Harbor.
  23. All lines shall be high velocity cleaned, pressure tested, and video inspected prior to paving in conformance with the above referenced specifications. Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main shall include videotaping of the main by the contractor. Immediately prior to videotaping, enough water shall be run down the line so it comes out the lower manhole. The contractor shall install a screen at the lower manhole to catch all debris. A copy of the video shall be submitted to the City of Gig Harbor. Acceptance of the line will be made after the video has been reviewed and approved by the inspector. Any bellies in main greater than 3/8" shall be dug up and repaired prior to acceptance. A re-inspection video will be required after repair has been made. A water or vacuum test of all manholes in accordance with Gig Harbor standards is also required. Testing shall take place after all underground utilities are installed and compaction of the roadway sub grade is completed. After the paving and raising of manholes is complete, the developer shall clean the sewer conveyance system again at the developer's expense. The method of cleaning shall be a high velocity water pressure cleaning. All rocks and debris shall be removed and be disposed of at the developer's expense.
  24. Contractors shall be responsible for cleanup of any debris in new or existing manholes and mains associated with the project after the new lines are cleaned as outlined above.
  25. All STEP mains shall be hydrostatically tested in conformance with the above-referenced specification for testing water mains. In addition, all STEP mains shall be pigged in the presence of the City Inspector prior to placing STEP main in service.
  26. Prior to backfill, all mains and appurtenances shall be inspected and approved by the City of Gig Harbor Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Gig Harbor for the required inspections.
  27. When using steel plates over the trench, "Steel Plates Ahead" and "Motorcycles Users Extreme Caution" signs shall be required.

Figure 5.1 Process to Obtain Sewer Service



**5B.030 Main Line – Gravity**

A main line is that portion of the City's sewer system to which all connections to the City system are made.

- A. **Size:** Sewer mains shall be sized for the ultimate development of the tributary area as described in the most current *City of Gig Harbor Wastewater Comprehensive Plan*. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet the requirements for future service.

The minimum size for mains shall be 8 in. inside in diameter. The minimum size for a lateral within right-of-way shall be 6". See definitions in Section 1.025.

The design is subject to all other design requirements as noted in this chapter.

- B. **Material:** Sewer main shall be PVC, ASTM D 3034, SDR 35 or ASTM F 589 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 455 and shall be green in color.
- C. **Depth:** Gravity sewer will typically have a minimum depth of 5 ft. to provide gravity service to adjoining parcels, adequate head room within manholes for maintenance personnel and vertical clearance between water and sewer lines. Actual depth will be determined by slope, flow, velocity and elevation of existing system.
- D. **Connections:** All building sewer connections to the main shall be made with a wye connection. All new mains connecting to existing mains shall require the installation of a new manhole if not made at an existing manhole.
- E. At no time shall a gravity sewer be installed with a reverse direction of flow. The maximum deflection angle through a manhole shall not exceed 90 degrees.
- F. Pipe material requirements may change due to the depth of the sewer mainline. Sewers over 20' in depth to invert shall be C900, C905 or ductile iron, green in color, or wrapped in green 'polywrap'.

**5B.040 Connection to Existing System**

- A. At connection to existing system, all new sewer connections shall be physically plugged until all tests have been completed and the City approves the removal of the plug.
- B. Connection of new pipe lines to existing manholes shall be accomplished by using provided penetrations. Where penetrations are not available, the manhole shall be core-drilled for connection, and a link-seal connection will be used. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

- C. Connection of a pipe line to a system where a manhole is not available shall be accomplished by pouring a concrete base and setting manhole Sections. The existing pipe shall not be cut into until approval is received from the City.
- D. Connections to manholes requiring a drop shall follow the criteria as outlined in Section 5B.100.
- E. All multi family, commercial and industrial sewer lateral connections shall be made at the manhole. A manhole shall be installed for lateral connections if one is not available. All new connections to existing manholes shall be channeled to meet existing flow line. If incoming slope of pipe is such that unusual turbulence is created, manhole shall be armored and coated to protect.
- F. Taps shall not be allowed to protrude more than 1 in. into the existing main. A City inspector shall be notified 48 hours prior to any tap of a City sewer. A City Inspector shall be present to witness the tap and collect all material from the tap process. The mainline, at the tap location, shall be televised from the nearest manhole, a minimum of 10 ft. beyond the tap, after tapping and prior to approval to insure compliance. Taps shall be Romac's style CB sewer saddle with Ductile plus saddle, stainless steel strap and rubber gasket meeting ASTM D-2000 3 BA515 or City approved equal. The manufactured bevel on the pipe to be inserted into the saddle shall be cut off to avoid pushing the pipe into the main.

#### **5B.050 Building Sewer (lateral)**

- A. A building or side sewer refers to the extension from a building sewer beginning two ft. outside the outer foundation wall at the structure to the sanitary sewer main. Building sewers from the lateral to the right-of-way line shall be a minimum 4 in. diameter. Maintenance of the building sewer is the responsibility of the property owner. Prior to connection of a building sewer to the public sewer a connection permit must be obtained from the City (GHMC 13.12.010). Materials and design criteria for a building sewer are covered by the Uniform Plumbing Code (IPC) as adopted by GHMC Chapter 15. Inspection of the building sewer is the responsibility of the engineering/construction inspector.
- B. Each separate building shall have its own separate side sewer connection to the system, see 5A.015 for more information. Side sewers for single family residential properties shall not be connected to the system at the manhole. Manhole sizing, where side sewers are connected, shall be the same as designated in Section 5B.060 of this manual, unless approved by the City Engineer.
- C. Location of clean out for building/plumbing sewer is governed by the plumbing code.
- D. A 6" clean out shall be installed at the edge of the right of way per Public Works Standards.

#### **5B.060 Manholes**

Precast manholes shall meet the requirements of ASTM C 478 with either a precast base or a cast-in-place base made from 3000 psi structural concrete. Manholes shall be Type 1, 48 in. diameter minimum. The minimum clear opening in the manhole frame shall be 24-in.. Joints shall be of a rubber gasket conforming to ASTM C 443 and shall be grouted from the inside and out. Lift holes shall be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the City Engineer, provided they meet the requirements of 2.318 of *Department of Ecology's Criteria for Sewage Works Design*. Material specifications need to be submitted for review before an alternate material will be considered. See drawing numbers 5-1 and 5-2 for details. All STEP system manholes and force main termination manholes must be coated for hydrogen sulfide protection with a high build modified polymer, as manufactured by Spectra Shield or approved equal.

An eccentric manhole cone shall be offset so as not to be located in the tire track of a traveled lane.

Manhole frames and covers shall be capable of withstanding test load of 120,000 lbs. Covers shall be one-man operable using standard tools. Covers shall be hinged and incorporate a 90 degree blocking system to prevent accidental closure and come complete with hinge infiltration plug. Frames shall be circular and shall incorporate a sealing ring and provide a 24-in., clear opening. The frame depth shall not exceed 4 in. and the flange shall incorporate bedding slots and bolt holes.

Manufacturer shall be CertainTeed Pam REX or approved equal.

Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted. Manhole rings and covers shall be machine-finished or ground-on seating surfaces so as to assure a non-rocking, self-seating (easily removed and replaced without the use of a sledge hammer). Manholes located in areas subject to inflow shall be equipped with a Preco sewer guard watertight manhole insert or approved equal.

Where lock-type castings are called for, the casting device shall be such that the cover may be readily released from the ring and all movable parts shall be made of stainless steel materials and otherwise arranged to avoid possible binding. Lock-type covers shall be required in all multi-family complexes, on school grounds, on manholes containing odor control devices and as determined by the City.

All covers shall be coated with a bituminous coating prior to delivery to the job site.

All manhole steps must conform to State L&I requirements and shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2 in. ASTM A-615 grade 60 steel reinforcing bar with non-slip drop-type steps, precast into the walls of the manhole. All steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced on 12-in. centers. The top two safety steps (hand holds) shall not be installed in the manhole. If an eccentric cone is used on the manhole, all steps in both the cone and manhole must align in a straight vertical line. Generally, gravity sewers shall be designed with straight alignment between manholes. Curved alignment of the sewer shall not be permitted. When possible on straight thru

alignment on new manholes, run pipe thru manhole, pour channel, then remove top of pipe to provide smooth abrasion resistant channel.

Manholes shall be provided at a maximum of 400-ft. intervals for 8- in. to 15-in. sewers, 500-ft. intervals for 18-in. to 30-in. sewers, at intersections, and at changes in direction, grade or pipe size. (See also Section 5B.080.)

Minimum slope through the manhole shall be 1/10th of one ft. from invert in to invert out.

Manhole sizing shall be determined by the following criteria:

- A. 48 in. Manhole
  - 1. 2 connecting pipes, 8 in. to 12 in. diameter.
  - 2. 3 connecting pipes, 8 in. to 10 in. diameter, perpendicular.
  - 3. 4 connecting pipes, 8 in. diameter, perpendicular.
- B. 54 in. Manhole
  - 1. 2 connecting pipes, 8 in. to 12 in. with less than 45 degree deflection
  - 2. 3 connecting pipes, 10 in. to 12 in. diameter, perpendicular
  - 3. 4 connecting pipes, 10 in. to 12 in. diameter, perpendicular
- C. 72 in. Manhole
  - 1. 2 connecting pipes, 15 in. to 18 in. diameter with less than 45 degree deflection
  - 2. 3 connecting pipes, 15 in. diameter, perpendicular
  - 3. 4 connecting pipes, 15 in. diameter, perpendicular

In the above criteria "deflection" refers to the angle between any 2 pipe channels in the manhole.

For other pipe configurations, the size of the manhole shall be approved by the City.

The above configurations will provide adequate shelves and room for maintenance and televising mains.

#### **5B.070 Slope**

All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 ft. per second based on Manning's formula using an "n" value of 0.013. Use of other practical "n" values may be permitted by the City if

deemed justifiable on the basis of research or field data submitted. The following minimum slopes, in Figure 5.2, should be provided; however, slopes greater than these are desirable.

**Figure 5.2 Slope**

<b>Sewer Size (In.)</b>	<b>Minimum % Slope % (Ft. per 100')</b>
8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.15 (0.0015 Ft/Ft)
15	0.15 (0.0015 Ft/Ft)
16	0.14 (0.0014 Ft/Ft)
18	0.12 (0.0012 Ft/Ft)
21	0.10 (0.0010 Ft/Ft)
24	0.08 (0.0008 Ft/Ft)
25	0.05 (0.0005 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Under special conditions, slopes slightly less than those required for the 2.0 ft. per second velocity may be permitted by the City Engineer. Such decreased slopes will only be considered where the depth of flow will be 30 percent of the diameter or greater for design average flow. Whenever such decreased slopes are proposed, the design engineer shall furnish the plans with his/her computations of the depths of flow in such pipes at minimum, average, and daily or hourly rates of flow. Larger pipe size shall not be allowed to achieve lesser slopes.

Sewers shall be laid with uniform slope between manholes.

#### **5B.080 Increasing Size**

Manholes shall be provided where pipe size changes occur.

Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

#### **5B.090 High Velocity Protection**

Where velocities greater than 15 ft. per second are expected, special provisions such as thrust-blocking and lining of manholes and piping materials shall be made to protect against decomposition of materials and displacement by erosion and shock.

#### **5B.100 Drops**

Straight grades between inverts are preferred over drops whenever possible when connecting to an existing manhole. Care must be taken when designing steep grades or sweeps so as not to create a situation of excessive velocity or excavation. Grade

changes associated with "sweeps" shall not be allowed unless otherwise approved by the City Engineer.

An inside drop connection shall be provided for a sewer entering a manhole at an elevation of 24-in. or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24-in., the invert shall be filleted and armored/coated to prevent solids deposition and corrosion of fillet.

If an inside drop is permitted, the corresponding manhole will need to be upgraded to at least a 60 in. manhole. See Detail 5-10 for inside drop pipe connections.

An outside drop connection will not be allowed by the City unless otherwise approved by the City Engineer or Waste Water Treatment Plant Supervisor.

#### **5B.110 Clean outs**

Clean outs are not an acceptable substitute for manholes, however, they may be used in lieu of manholes at the end of 8-in. diameter lines of not more than 150 ft. in length. This does not include a 6-in. building sewer to serve one or two single-family dwellings. Location of cleanout for building sewer is governed by the Uniform Plumbing Code as adopted by GHMC Chapter 15.

All clean outs in the City right-of-way or easements shall be extended to grade and a 3-ft. square by 8-in. thick concrete pad with welded wire or #4 rebar shall be installed around all clean outs that are not in a pavement area. See Detail 5-4.

## **5C LIFT STATIONS**

#### **5C.010 General**

The need for a sewage lift station, as identified in the Wastewater Comprehensive Plan or necessary for a development as determined by the City, shall be presented by the developer in a design report. If the City determines the area cannot be served by gravity services, the developer shall provide information and design the lift station to comply with the following minimum standards in this chapter.

#### **5C.020 Design Report Standards**

If a lift station is determined to be necessary, the developer shall perform a study prepared and stamped by a professional engineer licensed in the State of Washington to determine that the lift station installation is sized to serve the overall sewage flows generated within the designated waste water basin. The waste water basin study shall include the developer's plat boundary area and may include adjacent and future service areas as determined by the City. The final service area shall be the entire designated sewer basin as identified in the current Wastewater Comprehensive Plan which will be served by the installation of the lift station(s).

The design of any lift station shall conform to City of Gig Harbor standards, *Department of Ecology's Criteria for Sewage Works Design* and applicable standards as set forth in herein and in Sections 3.020 and 3.040.

The station's design flow capacity shall be based on an average daily per capita flow with related peaking factors and inflow/infiltration allowances.

Documentation of present and future service area flow rates for lift station size and capacity determination shall be included in the report.

The effects of the minimum flow conditions shall be estimated to be sure that retention of the sewage in the wet well will not create a nuisance and that pumping equipment operation will be optimized. The wet well shall be sized to provide full submergence on the pumps as recommended by the pump manufacturer and a minimum of six minutes between pump cycles at pump design capacity. The wet well shall be sized to provide reserve capacity as large as reasonable possible to allow adequate time for emergency responses during a failure.

The lift station shall be sized to meet the maximum rate of flow expected. The size of the receiving sewer shall also match the flow expected. At least two pumping units shall be provided at each lift station installation. 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 2-1/2 ft. per second velocity in the pressure main.

The pressure main shall be sized for a minimum velocity of 3-1/2 ft. per second and a maximum velocity of 8 ft. per second. The minimum inside diameter of the pressure main shall be 4 in.

Four copies of the design report 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 calculation and cycle time
6. Pump station head calculation and system curve
7. Pump selection and wet well details
8. Pressure main size, length and material (see Section 5D Pressure Sewer)
9. Electrical requirements and Generator sizing if auxiliary pump is not used.
10. Odor and corrosion calculations

Information prepared by an engineering firm with experience in hydrogen sulfide formation and remediation shall be provided for the following:

- A. Collection system to the lift station
- B. Lift station wet well
- C. Pressure main
- D. Downstream gravity system
- E. A statement that odors will not be detected at the lift station site or at the point of release, or the Developer will provide odor control and corrosion reduction at the appropriate locations in accordance with current City of Gig Harbor odor and corrosion control method. See also Section 5D.080 Pressure Main Termination.

11. Geotechnical analysis for wet well and lift station site
12. Backfill and compaction specifications
13. Preliminary site plan layout

#### **5C.030 Design Drawings**

The drawings shall be prepared by a professional engineer licensed in the State of Washington to an appropriate scale to show details of the site. See Section 1.040. The developer's engineer shall revise the drawings and review all dimensions to ensure accuracy for the applicable site and pump selection.

The detailed engineering drawings shall accurately depict the equipment selected by the engineer. The drawings shall include an equipment list showing manufacturer, model number and size or capacity for all structures, mechanical and electrical components, and structural/building plans to house vital mechanical equipment.

The developer shall furnish a site layout for the lift station installation.

The lift station shall be located as far as practicable from present and/or proposed residential areas. Sites shall be of sufficient size for access, maintenance and future expansion or addition, if applicable.

Lift station sites together with access to the site shall be deeded to the City.

As a minimum, the following shall be provided on the plans for construction:

1. Complete lift station, to include but not limited to, wet well structure to house all vital components and vaults
2. Auxiliary power or auxiliary pump as determined by the City
3. All electrical
4. Telemetry compatible with existing system, including complete start up and revising existing screens at the Gig Harbor Wastewater Treatment Plant.
5. 2-in. water service with RPBA assembly and wash down hydrant.
6. Odor control, as applicable for location and capacity.
7. Site soil conditions. Excavation, select backfill and compaction requirements.
8. Cuts and fills to provide level site for maintenance.
9. Asphalt, concrete pavement for access.
10. Concrete within the maintenance area.
11. Landscaping per City of Gig Harbor criteria.
12. 6 or 7-ft. high fence enclosing the site and a 12-ft. wide lockable access gate
13. Address sign
14. Site lighting

#### **5C.040 Submittals**

At the time construction plans are submitted for approval, the following information shall be provided:

- |     |                                   |   |
|-----|-----------------------------------|---|
| 1.  | Pump Data                         | Size and type<br>Pump curves<br>Head capacity<br>Velocity<br>Manufacturer/distributor   |
| 2.  | Motor Data                        | Size and type<br>Horsepower<br>Service factor<br>Motor insulation<br>Cycle length<br>Full load amps<br>Voltage<br>Frame and type of mount<br>Manufacturer/distributor   |
| 3.  | Controls                          | Type<br>Timers and relay mounting<br>Motor starter size<br>Phase monitor<br>NEMA type enclosure<br>Thermal magnetic circuit breaker<br>GFI outlet<br>Indicating lights<br>Level controller<br>Telemetry failure points<br>Elapse time meters<br>Component manufacturer/distributor<br>Hand/Off/Auto (HOA) switch  |
| 4.  | Telemetry                         | Alarm system (must be compatible with City system by mission).  |
| 5.  | Auxiliary Power/Auxiliary Pumping | All lift stations must be furnished with auxiliary-powered generators by Onan.<br>Diesel generator<br>Fuel storage tank (24-hour reserve capacity)<br>Automatic transfer switch, dry contacts for Mission telemetry<br>Or as determined by the city auxiliary diesel powered dri-prime centrifugal screw pump<br>Self contained level control<br>Exercise timer<br>Dry contacts for Mission telemetry<br>Fuel storage tank (24 hour reserve capacity minimum) |
| -6. | Maintenance                       | Warranty for two years<br>Staff training upon completion<br>Tools and equipment required  |

- |     |                      |   |
|-----|----------------------|---|
| 7.  | Electrical Service   | Specifications (service size, and voltage, motor size, enclosure type, etc.)<br>Source of power<br>Calculations<br>Single line diagram<br>Primary distribution equipment<br>Service entrance<br>Branch circuiting<br>Mechanical equipment power requirements<br>Control diagrams & schematics<br>Schedules of fixtures, panel boards & switch gear<br>Shop drawings |
| 8.  | Lighting             | Exterior/Interior lighting<br>AC and DC lighting circuits   |
| 9.  | Wet Well             | Size<br>Storage capacity<br>Access hatch<br>Locking mechanism<br>Penetration seals<br>Safety entry equipment<br>Safety net<br>Manufacturer<br>Corrosion protection, material, application, warranty.  |
| 10. | Valve Vault          | Size<br>Access ladder<br>Access hatch<br>Penetration seals<br>Manufacturer  |
| 11. | Piping and Valves    | Size and material type<br>Valves<br>Flow meter<br>Bypass pumping fittings camlock<br>Pipe supports<br>Corrosion protection, material, application, warranty   |
| 12. | Testing Plan         | Factory test<br>Operational test & start up<br>Pressure test<br>Start up & training   |
| 13. | Corrosion Protection | type of materials<br>coatings<br>linings<br>maintenance   |
| 14. | Site layout          | location of lift station on property<br>Building renditions suitable for review by the City and Design Review Board, if applicable, including building materials (type and color)   |

See Section 5D "Pressure Sewer" for additional information regarding force mains.

The design drawings may be used to provide the information required in items 1 through 14 above. Design drawings shall be reviewed and verified for completeness and compliance by the design engineer prior to submittal to the City.

The City's review does not relieve the engineer and/or developer of the responsibility for constructing a lift station that is trouble free and suitable for its purpose.

The general notes for gravity sewer and pressure sewer construction found in Section 5B and 5D of this chapter shall accompany the following lift station general notes on the plans.

### **GENERAL NOTES (LIFT STATION INSTALLATION)**

1. All workmanship, materials and testing shall be in accordance with the most current *WSDOT Standard Specifications for Road, Bridge and Municipal Construction*, National Electrical Code and City of Gig Harbor Standards unless otherwise specified below. In cases of conflict, the most stringent standard shall apply. When the most stringent standard is not clear, the City Engineer will make the determination. The electrical contractor shall be familiar with all above stated publications and guidelines as they will be strictly enforced by the City.
2. Any changes to the station design shall first be reviewed and approved by the project engineer and the City of Gig Harbor.
3. Contractors shall be responsible for cleanup of any debris in the wet well, tanks, vaults and site associated with the project prior to start up.
4. Prior to backfill, all mains, tanks, wet wells and vaults shall be inspected and approved by the City of Gig Harbor Construction Inspector and/or special inspections by approved inspection firm. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Gig Harbor for the required inspections.
5. All work shall be done per the National Electrical Code (N.E.C.) and The City of Gig Harbor Standards. The City of Gig Harbor Standards may exceed the N.E.C. The developer shall obtain all permits and arrange inspections.
6. The developer shall coordinate power service with serving utilities and make arrangements for power service connection. It shall be the developer's responsibility to maintain power service for private lift stations serving commercial properties or developments.
7. Prior to testing and start-up of the lift station, three hard copies and two electronic copies of the Operation and Maintenance Manual, together with the number of approved copies required by the developer, shall be submitted to the City for review and approval. Equipment specific manuals shall be delivered with equipment or prior to delivery, but no later than delivery.
8. The Developer, at its own expense with the design engineer and all other parties involved in the lift station construction, shall arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to check the installation, adjust and test the equipment furnished before the acceptance of the work by the City. The

factory representative shall be responsible to check and resolve any unacceptable vibration of the pump assemblies. Furthermore, the developer shall assist and instruct the City's operating staff in adjusting and operating the equipment during the initial start-up period. They shall also provide a follow up training session after 6 months of operations. Said representative shall be experienced and knowledgeable of the equipment being tested.

9. The developer, at its own expense, shall conduct an instruction program for up to five personnel designated by the City. The developer shall furnish the services of qualified instructors from the various equipment manufacturers. Program shall include instruction covering basic system operation theory, routine maintenance and repair, and hands-on operation of equipment. Training shall not proceed until all operation maintenance manuals are complete and accepted by the City.
10. All equipment shall be tested and developer shall demonstrate to City personnel that proper operation and capacity have been fully obtained. The City will not accept any facility until successful full operation of all components has been demonstrated by the developer.
11. It is the developer's responsibility to construct and start-up a complete and trouble-free system. The developer shall be responsible for correcting all design errors and/or construction defects that are discovered in the start-up or during the warranty period of the agreement with the City.
12. The developer shall give initial lubrication to all equipment as required by the part or component manufacturer.
13. Lift station and generator, site, driveway, access, concrete areas, lighting and water service shall all be completed prior to start-up request and inspection.
14. Generator/auxiliary pump and a 24-hour fuel storage tank shall be mounted on a concrete pad. The generator/auxiliary pump shall have weather proof sound dampening enclosure, block heater, battery charger, auto exerciser, radiator louvers or protection and shall comply with all requirements in Section 5C.070 of the City of Gig Harbor Standards.
15. Telemetry shall be set up completely and coordinated with the Mission including revising telemetry computer screens at Gig Harbor Wastewater Treatment Plant prior to start up request and acceptance.
16. Specific spare parts shall be provided for the station at time of startup acceptance:
  - One set mechanical seals.
  - One set of O-rings.
  - One set of pump wear rings.

Additionally, any special tools specific to the pump manufacturer shall be provided to the City of Gig Harbor at start up.

#### **5C.050 Lift Station**

The Lift Station shall be of submersible style non-clog pumps mounted in the wet well, and shall meet all of the conditions outlined in Section 5C. Two styles of pumps are referenced in this section: They are a standard non-clog centrifugal pump with either an open channel

or a vortex impeller and clog free screw centrifugal pump. The City shall designate which style of pump to be used, depending on the waste being received at the lift station.

Requirements: Non-clog open channel or vortex pumps

Furnish and install submersible non-clog wastewater pumps. Each pump shall be equipped with submersible electric motor, connected for operation on 480 volts, 3 phase, 60 hertz, with submersible cable (SUBCAB) suitable for submersible pump application of adequate length to remove pump from wet well without disconnecting. The power cable shall be sized according to NEC and ICEA standards and also meet with U.L. and C.S.A. P MSHA approval. The pump shall be supplied with discharge connection capable of delivering flow as set forth in the Engineering/Hydraulic Report, Public Works Standards, Wastewater Comprehensive Plan.

Pump Design:

The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact with O-ring.

Pump Construction:

See Appendix for pump specifications

## **5C.060 Electrical**

### General

Definition of all terms shall be according to AIA and IEEE standard definitions. Shop drawings shall be submitted during design review on all special equipment and approval obtained before manufacture. Drawings are diagrammatic; locations of all outlets to be checked and verified on project site.

Where conflict occurs with other equipment, the developer shall consult City for final decision. The developer is responsible for obtaining rough-in dimensions from supplier for equipment.

All work shall be done per National Electrical Code as amended by WAC 296-46, and City of Gig Harbor Standards. The most stringent standard shall apply. The developer shall obtain all permits and arrange inspections.

The developer shall coordinate power service with serving utilities and make arrangements for power service connection.

The pump control and electrical equipment shall be factory manufactured and field installed. It shall be fabricated and assembled by an approved U.L. 508 listed manufacturer.

Pump Station Telemetry & Controls:

Duplex Pump Control Function: The two submersible pumps shall operate in a duplex mode. Each pump shall be provided with a "Hand Off Auto" (HOA) selector switch which shall control the pump as follows:

1. Hand Position: When the HOA switch is placed in the hand position, the pump shall immediately start and run until HOA switch is placed in the off position. Pumps shall not be controlled by level sensors when the HOA switch is in the hand position.
2. Off position: When the HOA switch is placed in the off position, the pumps shall immediately stop, regardless of the water level.
3. Auto position: When the HOA switch is placed in the auto position, the pumps shall start and stop automatically in response to the water level and in the sequence determined by the controller. One pump shall start as the lead pump when the water level rises above the lead pump-on level. The pump shall run continuously until the water level decreases to the pump-off level. When both pumps are called to run, the lag pump will be set to shut off at a point 10 percent or another set point as determined by the City before the lead pump shut off.

Pump running indication: Provide indicating lights (green) that shall indicate the pump running condition. The light shall glow steadily when pump is running and shall be turned off whenever the pump is not running. In addition, provide contacts for remote monitoring of pump operation. Provide red indicating lights when pump is not running.

Alarms: Alarms shall be reported locally at the control panel and dry contacts provided for remote alarms. In the event of an alarm, individual indicating alarm lights on the pump control panel shall be lit to pinpoint the specific trouble. The alarm contact wiring shall be complete to the telemetry box as per Mission Control instructions for landing.

The schematic and line diagrams shall show the following telemetry points if applicable and a common termination point shall be provided in the lift station to interface between the lift station and the remote telemetry unit (RTU). The telemetry points shall consist of the following:

#### **Standard Lift Station**

- High wet well
- Low wet well
- Phase loss
- Pump 1 run
- Pump 2 run
- Pump 1 fail
- Pump 1 seal fail
- Pump 1 high temperature
- Pump 2 fail
- Pump 2 seal fail
- Pump 2 high temperature
- Intrusion
- Wet well level

- Station overflow
- Operator in trouble
- Generator/Dri-prime run
- Generator/Dri-prime off
- Power failure

Control Panels: Circuit breakers, motor starters, control power transformers, control relays, interlocks, selector switches, elapsed time meters, contacts for remote mounted equipment and other type devices required to meet the functional equipment specified herein. The control panel, designed by the pump manufacturer, shall be UL listed and shall have the following minimum features:

1. Enclosure (cabinet) shall be stainless steel NEMA 4x construction.
2. Intrinsic-safe barrier relays for liquid-level sensor circuits.
3. Indicating light units shall be all-tight type. Units shall include a 120-6 volt transformer and 6-8 volt lamp and shall be of the illuminated push-button type with the push-button wired for push-to-test function. Lens caps for lights indicating alarms shall be red and for lights indicating motor running status, green. Six spare lamps shall be furnished.
4. Elapsed time meters shall have a 5-digit, non-reset register with the last digit indicating tenths of an hour.
5. Control relays shall be hermetically sealed, industrial grade rated for 600 Volts AC. Contacts shall be silver alloy. Parts shall be corrosion-resistant or treated in an approved manner to resist corrosion.
6. Selector switches shall be 3-position maintained type meeting NEMA type 13 requirements. Legend plate shall be marked "hand-off-auto". Selector switches shall be provided with a padlock attachment (so that switch can be locked in the off position),
7. Provide for each starter a fused control circuit transformer with two fuses in the primary and one fuse in the secondary.
8. Panel wiring shall be stranded type XHHW or SIS rated 90 degrees Celsius with a minimum size of no. 14 AWG. Compression or ring tongue type lugs shall be used for transformers. Wires crossing hinges shall be installed in a manner to prevent chaffing. Plastic wire gutters and nylon cable wrap and wires shall be used to guide and train the wire as necessary.
9. Space shall be provided for Mission telemetry. This space shall be a minimum of 16 in. x 14 in. x 8 in. The telemetry unit shall be provided and installed per specification as required by the City. Telemetry shall be operational prior to station acceptance.
10. Main disconnect and transfer switches shall be mounted in the enclosure.

11. Cellular antenna and mounting installation shall be per Mission recommendation.

High Level Sensors: Level sensors shall be a float switch type utilizing a mercury switch mounted in a chemical resistant casing suspended on its own cable. If the sensor comes in contact with the rising-liquid level, the sensor shall tilt and cause the internal mercury switch to close its contact. The sensor shall stay tilted until the liquid level decreases below the sensor. The level sensor shall be designed for intrinsically-safe low power applications. Sensor shall be provided for high-level alarm.

The following list of approved materials shall be shown on the plans and include brand name, model and part numbers.

**APPROVED ELECTRICAL MATERIALS LIST:**

Wiring / Instrumentation / Controls:

- A. Conduit and fittings - Underground or entering wet well, vaults and cabinets shall be PVC coated rigid steel RMC with polyethylene inner coat.
- B. Supports and mounting brackets - Shall be stainless steel uni-strut, brackets and clamps with stainless steel mounting hardware.
- C. Wire - #14 copper THWN minimum.
- D. Enclosure – Hoffman, or approved equal, stainless steel NEMA 4X. Standard Burgess lock #A136. Double entry doors. Minimum cabinet size 60 in. x 60 in. Rain gutter and weather proof seal. Hoffman Lighting and D-AH8001b heater. Cabinet shall display a permanent mounted identification tag with model, serial number, make and manufacturer info.
- E. Control panel box – Hoffman or approved equal stainless steel enclosure. Orenco duplex community systems shall use standard Orenco fiberglass control panel box.
- F. Intrusion switch – Cuttler Hammer or Square D.
- G. Timers – Crouzet chronos or approved equal
- H. Relays – Idec or approved equal
- I. Phase Monitor – Diversified Electronics Model #SLA-440-ALE
- J. Thermal magnetic circuit breakers – Square D or Cuttler Hammer
- K. Indicator Lights – Cuttler Hammer or Square D
- L. Fuses & Holder– Bussman
- M. Starters – Sprecher Schuh, Cuttler Hammer or Square D

- N. Overloads - Sprecher Schuh, Cuttler Hammer or Square D
- O. Selector Switches – Square-D or Cuttler Hammer, Class 9001, Type TL3, or equal.
- P. Float switch – Rotofloat
- Q. Limit switches – GO Switch Model #11-11120-00 or approved equal
- R. Control Breakers – Square D class 9080 GCB
- S. Automatic Transfer switch – Onan
- T. Manual Transfer switch – Cutler Hammer or Square D, knife style
- U. Elapsed Time Meter – Yokogawa 240211AAAB
- V. Amp Meters – Yokogawa
- W. Receptacle – Leviton 20A – 120v GFCI with weatherproof cover.
- X. Level Controller – Siemens pressure transducer, key pad 69900005.  
(no splice allowed in cable).
- Y. UPS Back Up – Sola-/Heavy Duty
- Z. Transformers – Sola/Heavy Duty
- AA.Power Supply – Power 1 International Power
- BB.Terminal Blocks – Entrelec M 4/6 5116
- CC.Radio Telemetry – Mission Cellular

All penetrations made to panels, breaker boxes, soft starts, etc. shall be made with water tight fittings such as a Myers hub.

#### **5C.070 Auxiliary Power System/ Auxiliary Pumping System**

##### General

Onan diesel emergency power generation equipment shall be provided at the lift station site which 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.

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

1. Generator, control panel and circuit breaker.
2. Engine, radiator and exhaust system.
3. Fuel tank (capacity for 24 hours full load, plus 25 percent).
4. Generator set enclosure, lockable to City standards.
5. Automatic transfer switch.
6. Radiator protection or automatic louvers.
7. Block heater.
8. Battery and rack.
9. Battery charger.
10. 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 shall be 60 Hertz, 3-phase, 480 volt standby power.

The generator set/auxiliary pump shall include the following:

Engine:

- Single phase, 1500 watt coolant heater manufactured by KIM – hot shot 115 volt or 240 volt sized accordingly for the engine and climate conditions.

Generator set:

- Mainline circuit breaker
- Weather-protective/sound dampening enclosure with mounted silencer (maximum noise level of 68 dBA at 23 ft.).

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
- Low oil pressure shutdown

Fuel System:

- Diesel

Alternator:

- Anti-condensation heater, 120 VAC

Exhaust System:

- Exhaust silencer (68dBA AT 23 ft.)

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 common 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)
  - Over crank shutdown (red Light)
  - Over speed 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)
  - Two customer selected faults (red Light)

AC Meter Package:

- Order with NFPA 110 monitor to meet code requirements.
- 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 percent voltage adjust

The transfer switch shall include the following:

- Sized for full station and auxiliary equipment load, plus 25 percent

Pole Configuration:

- Poles - 3 (neutral)

Frequency:

- 60 hertz

Application:

- Application - Utility to Genset

System Operation:

- Three-phase, 3-wire or 4-wire

Enclosure:

- B002 type 3R; Intended for outdoor use also for interior application (dust proof and rainproof) shall have radiator grill protection or automatic louver system.

Listing:

- Listing - UL 1008

Programmed Transition:

- Program transition - 1-60 sec.

Exerciser Clock:

- 7-day Solid-State exerciser clock

Application 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 2 hours after installation is complete. Provide resistive load bank for this test.

Generator supplier shall provide a minimum of 4 hours of training for City personnel at the station site during start-up.

Generator manufacturer shall provide three hard and two electronic copies of the maintenance and operation manual. These manuals shall be complete and shall include all information necessary to all City personnel to maintain the generator. Manuals shall be delivered with or prior to delivery of equipment.

Generator and fuel tank mounting pad shall be reinforced concrete to carry the weight of the unit and shall extend a minimum of 6 in. beyond generator housing. Chamfer all edges 3/4 in.

Auxiliary Pump:

- Weather-protective/sound dampening enclosure with mounted silencer (maximum noise level of 68 dBA at 23 ft.). For interior application also.

Fuel System:

- Diesel

Accessories:

- Batteries
- Battery Charger, 2 AMP, 12 VDC, 120 VAC Input
- Vibration Isolators, pad type

Control Panel:

- Annunciator relays
- Run relay package (3)
- Low coolant level shutdown
- Oil - pressure gauge
- Emergency stop switch
- Low oil pressure shutdown

Exhaust System:

- Exhaust silencer (68dBA AT 23 ft.)

**Control Features:**

- Run-stop-remote switch
- Remote starting, 12-volt, 2-wire
- Coolant temperature gauge
- DC voltmeter
- Running time meter
- Oil pressure gauge
- 8-light engine monitor with individual 1/2 amp relay signals and a common alarm contact for each of the following conditions:
  - Run (green light)
  - Low oil pressure shutdown (red light)
  - High coolant temperature shutdown (red light)
  - Over crank shutdown (red light)
  - Over speed shutdown (red light)
  - Low coolant temperature (yellow light)
  - Low fuel (yellow light)
  - Two customer selected faults (red light)

**Exerciser Clock:**

- 7-day Solid-State exerciser clock

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

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

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

Installation shall be checked by the supplier after installation to determine that the installation is correct. Written confirmation shall be provided to the City. Supplier shall perform a full load test after installation is complete.

Supplier shall provide a minimum of 4 hours of training for City personnel at the station site during start-up.

Manufacturer shall provide 5 copies of the maintenance and operation manual. These manuals shall be complete and shall include all information necessary to all City personnel to maintain the unit.

Mounting pad shall be reinforced concrete to carry the weight of the unit and shall extend a minimum of 6 in. beyond housing. Chamfer all edges 3/4 in.

**5C.080 Odor Control**

Odor control shall be provided at the lift station and/or at the pressure main discharge manhole as determined and required by the City.

Refer to Section 5D.080 for pressure main termination and odor control requirements.

**5C.090 Lift Station Inspection Checklist**

The checklist on the following pages will be used by the City when doing a final inspection of a lift station. Additional items may be added depending on the type and style of station constructed. The list on the following page is provided to help the developer prepare for the final inspection.

LIFT STATION INSPECTION CHECKLIST

Inspectors: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

Name of Lift Station:

\_\_\_\_\_

Location:

\_\_\_\_\_

Address:

\_\_\_\_\_

Assigned Lift Station Number: \_\_\_\_\_

	OPERATION OKAY	
	Yes	No
Control Panel components:		
Ultrasonic level instrument	_____	_____
Pump Run Lights:	_____	_____
Hour Meters:	_____	_____
H.O.A.:	_____	_____
Limit Switches:	_____	_____
Panel wiring	_____	_____
Grounding	_____	_____
UPS	_____	_____
Power supplies	_____	_____
Legend Plates	_____	_____
Markings and Identifications	_____	_____

Comments:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Alarm Functions:

Power Fail:	_____	_____
High Wet Well:	_____	_____
Low Wet Well:	_____	_____
Control Override	_____	_____
Intrusion	_____	_____
Pump run	_____	_____
Pump fail	_____	_____
Seal fail	_____	_____
Overflow	_____	_____
High temperature	_____	_____
Generator failure	_____	_____
Operator in trouble	_____	_____
Intrusion	_____	_____

Pump Functions:

Pump #1 Fail:	_____	_____
Pump #2 Fail:	_____	_____
Pump #1 Run:	_____	_____
Pump #2 Run:	_____	_____
Pump control override:	_____	_____

Comments: \_\_\_\_\_

Telemetry Function at Maintenance Shop:

High Wet Well:	_____	_____
Pump #1 Fail:	_____	_____
Pump #2 Fail:	_____	_____
Intrusion:	_____	_____
Pump #1 Run:	_____	_____
Pump #2 Run:	_____	_____
Phase loss:	_____	_____
Pump control override:	_____	_____
Wet Well Level:	_____	_____

Comments: \_\_\_\_\_  
\_\_\_\_\_

Control Panel Enclosures Appropriate UL Labels: \_\_\_\_\_

Comments: \_\_\_\_\_

Wiring Schematics for Correlation: \_\_\_\_\_

Comments: \_\_\_\_\_

Wire Gauge (usually 18): \_\_\_\_\_

Comments: \_\_\_\_\_

Raceways & Electrical Conduit for Defects: \_\_\_\_\_

Comments: \_\_\_\_\_

Terminal Block: \_\_\_\_\_

Comments: \_\_\_\_\_

Proper Sized Circuit Breakers & Fuses: \_\_\_\_\_

Comments: \_\_\_\_\_

Electrical Control Devices Sized for Motors: \_\_\_\_\_

Comments: \_\_\_\_\_

Overload Devices, Trip Test & Manual Reset: \_\_\_\_\_

Comments: \_\_\_\_\_

All Wires Connected & Grounding: \_\_\_\_\_

Comments: \_\_\_\_\_

Transformers: \_\_\_\_\_

Comments: \_\_\_\_\_

Load Centers: \_\_\_\_\_  
Comments: \_\_\_\_\_

Electrical cabinet Heater Operation: \_\_\_\_\_  
Comments: \_\_\_\_\_

Disconnect Operation: \_\_\_\_\_  
Comments: \_\_\_\_\_

Auxiliary Generator Operation: \_\_\_\_\_  
Comments: \_\_\_\_\_

Transfer Switch Operation: \_\_\_\_\_  
Comments: \_\_\_\_\_

Isolation Valves Operation: \_\_\_\_\_  
Comments: \_\_\_\_\_

Check Valve Operation: \_\_\_\_\_  
Limit Switches: \_\_\_\_\_  
Comments: \_\_\_\_\_

Emergency Bypass Operation & Fittings: \_\_\_\_\_  
Comments: \_\_\_\_\_

All Nuts, Bolts and Anchors to spec., grade and in place: \_\_\_\_\_  
Comments: \_\_\_\_\_

All Mechanical Components Installed in Wet Well: \_\_\_\_\_  
Comments: \_\_\_\_\_

Wet Well Piping for Proper Size: \_\_\_\_\_  
Comments: \_\_\_\_\_

Corrosion Resistant (epoxy coating wet well pipes): \_\_\_\_\_  
Comments: \_\_\_\_\_

Calcium Aluminate Coating in Wet Well: \_\_\_\_\_  
Comments: \_\_\_\_\_

Flow Meter: \_\_\_\_\_  
Comments: \_\_\_\_\_

Note: Check that motors are not exceeding their nameplate amperage multiplied by the motor service factor, (i.e., with FLA = 10 and SF = 1.15, the amperage recorded should not exceed 11.5 amps). The motor will operate satisfactorily under the following conditions of voltage and frequency variation, but not necessarily in accordance with the standards established for operation under rated conditions.

- The voltage variation may not exceed 10% above or below rating specified on the motor nameplate.
- The frequency variation may not exceed 5% above or below motor nameplate.
- The sum of the voltage and frequency variations may not exceed 10% above or below motor nameplate rating, provided the frequency variation does not exceed 5%.

Motor Nameplate Amps: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

Motor Nameplate SF Amps: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

Voltage Taken @ Terminal Block: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_

	OPERATION OKAY	
	Yes	No

Unusual Noise #1 Pump or Motor:	_____	_____
Comments: _____		

Unusual Noise #2 Pump or Motor:	_____	_____
Comments: _____		

Unusual Noise #3 Pump or Motor:	_____	_____
Comments: _____		

Proper Pump Rotation:	_____	_____
Comments: _____		

Sealed Bearings:	_____	_____
Comments: _____		

Pump Alternator Operation:	_____	_____
Comments: _____		

AMP reading recorded at startup: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_

Motor Data: HP \_\_\_\_\_ RPM \_\_\_\_\_ Phase \_\_\_\_\_ Cycle \_\_\_\_\_ Volt \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_

Pump Design in gallons per minute: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_  
# 1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ TDH \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_



Pump performance during startup in gallons per minute: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_  
 #1, #2 and 3 \_\_\_\_\_ TDH \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Hour Meter Readings: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Pump #1 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_  
 Pump #2 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_  
 Pump #3 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_

Actual Wet Well Pump down and fill levels:

High Water: \_\_\_\_\_  
 Fill Level: \_\_\_\_\_  
 Pump Down: \_\_\_\_\_

**OPERATION OKAY**

Yes                      No

Debris in Wet Well: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Wet Well Ladder: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Infiltration Points: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Operation of Wet Well Hatch & Latch: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Wet Well Safety Net: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Wet Well & Site Cleanliness: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Operation of Valve Vault Hatch & Latch: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Valve Vault Drain Sump / Cleanliness: \_\_\_\_\_  
 Comments: \_\_\_\_\_

2" Wash Down Hydrant and DCVA: \_\_\_\_\_

Comments: \_\_\_\_\_

Locks: \_\_\_\_\_  
Comments: \_\_\_\_\_

Site Lighting: \_\_\_\_\_  
Comments: \_\_\_\_\_

Fence and Gate Area: \_\_\_\_\_  
Comments: \_\_\_\_\_

Driveway / Access: \_\_\_\_\_  
Comment: \_\_\_\_\_

O & M Manuals (3 hard, 2 electronic copies): \_\_\_\_\_  
Comments: \_\_\_\_\_

Warranty: \_\_\_\_\_  
Comments: \_\_\_\_\_

Other Comments:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Inspectors Signature of Acceptance:**

Project Inspector: \_\_\_\_\_ Date: \_\_\_\_\_

Shop Operations: \_\_\_\_\_ Date: \_\_\_\_\_

## 5D PRESSURE SEWER (PRESSURE MAIN)

### 5D.010 General

Low pressure systems, such as STEP or grinder i.e., force mains, may be considered for situations where high ground water table or topography conditions make gravity sewer impractical. Lift station pressure mains will also fall under this design criteria. STEP systems are addressed separately in Section 5E, and are only allowed with approval of the City in extreme cases.

### 5D.020 Design Standards

The design of any sewer extension/connection shall conform to City standards, *Department of Ecology's Criteria of Sewage Works Design*, and any applicable standards as set forth herein and in Sections 1.010 and 1.040.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extensions shall be extended to and through the site of the affected property fronting the main.

The system shall be designed at full depth of flow on the basis of an average daily per capita flow as shown on the table in Section 5B.020. A friction factor of 0.013 shall be used for Manning's "n" value.

New sewer systems shall be designed by methods in conjunction with the basis of per capita flow rates. Methods shall include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, and modification of per capita flow rates based on specific data. Documentation of the alternative method used shall be provided along with plans.

Privately owned pressure mains shall have a control valve installed on the main at the right of way.

Grinder and/or STEP sewers may be allowed to connect to gravity sewer mains. STEP sewers shall not be allowed to connect to lift station pressure mains.

Pressure sewer pipe shall be even sizes only (ie. 2 in., 4 in., 6 in., etc.) Minimum pressure sewer pipe size for STEP shall be 2 in.- grinder shall be - 1 ¼ in diameter. Sdr 11 polyethelene

Minimum pressure sewer (pressure main) pipe size for lift stations shall be 4 in. diameter.

The applicable General Notes in Section 5B.020 shall be included on any plans dealing with pressure sanitary sewer design.

**GENERAL NOTES (PRESSURE SEWER MAIN INSTALLATION)**

1. All workmanship and materials shall be in accordance with City of Gig Harbor standards and the most current copy of the *State of Washington Standard Specifications for Road, Bridge and Municipal Construction* (WSDOT). In cases of conflict, the most stringent standard shall apply.
2. All safety standards and requirements shall be complied with as set forth by OSHA, WISHA and Washington State Department of Labor and Industries.
3. All approvals and permits required by the City of Gig Harbor shall be obtained by the contractor prior to the start of construction.
4. If construction is to take place in the County right-of-way, the contractor shall notify the City. The City will obtain all the required approvals and permits and provide a copy to the contractor. The contractor shall reimburse the City for associated permit fees.
5. A pre-construction meeting shall be held with the City of Gig Harbor Construction Inspector prior to the start of construction.
6. The City of Gig Harbor Construction Inspector shall be notified a minimum of 48 hours in advance of a tap connection to an existing main. The inspector shall be present at the time of the tap.
7. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Gig Harbor.
8. The contractor shall be responsible for all traffic control in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD). Prior to disruption of any traffic, traffic control plans shall be prepared and submitted to the City for approval. No work shall commence until all approved traffic control is in place.
9. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate Line at 811 a minimum of 48 hours prior to any excavation.
10. All sewer mains shall be field staked for grades and alignment in accordance with Section 5A.030 of the Development Guidelines.
11. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3 in. high and ¼ in. into concrete.
12. Pipe bedding material for sewer mains shall conform to Section 9-03.9(3) of the *WSDOT Standard Specifications for Road, Bridge, and Municipal Construction*. No "pea" gravel will be allowed.
13. A 3 ft. square x 8 in. thick concrete pad with #4 rebar shall be installed around all valves that are not in a pavement area.

14. Temporary street patching shall be allowed for as approved by the City Engineer. Temporary street patching shall be provided by placement and compaction of 1 in. maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
15. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
16. All buried power for STEP/Grinder systems shall be installed with continuous tracer tape installed 12 in. above the buried power. The marker shall be plastic non-biodegradable, metal core backing marked "power". Tape shall be furnished by contractor.
17. Pressure mains 2 in. diameter shall be Schedule 80 PVC, ASTM D2241, SDR 21 with rubber gasket joints. Gaskets shall comply with ASTM D 1869 (5E.030). Pressure mains over 2 in. diameter shall be PVC C-900. Welded poly (HDPE) pipe shall be high-density ASTM D 3350, SDR 11 3408 socket welded or butt fusion welded. Fittings and valves shall comply with Section 5E.040 of the Development Guidelines.
18. STEP/Grinder service line from main connection to service ball valve shall be 1 ¼ in. or 2 in. diameter schedule 80 PVC. HDPE pipe shall be high-density ASTM D 3350, SDR 11 3408 socket or butt fusion welded.
19. All plastic pipe and services shall be installed with continuous tracer tape installed 12 in. to 18 in. under the proposed finished sub grade. The marker shall be plastic non-biodegradable, metal core or backing marked sewer which can be detected by a standard metal detector. In addition, STEP systems and pressure mains shall be installed with 14-gauge direct bury, USE green coated copper wire wrapped around all plastic pipe, brought up and tied off at valve body. Continuity testing of the wire will be done by the City. Tape shall be Terra Tape "D" or approved equal. The tape and wire shall be furnished by the contractor.
20. All pressure mains shall be hydrostatic tested in conformance with the above-referenced specification for testing water mains. (See note 1) In addition, all pressure mains shall be pigged in the presence of the City Inspector prior to placing the main in service.
21. Prior to backfill, all mains and appurtenances shall be inspected and approved by the City of Gig Harbor Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Gig Harbor for the required inspections.

#### **5D.030 STEP/Grinder/Lift Station Pressure - Main**

- A. Material: 2 in. diameter pressure mains shall be schedule 80 pipe with gasket couplings. Glued or solvent weld pipe and fittings will not be allowed. 1 ¼ in. SDR 11 PE pipe may be used for the grinder pump pressure main. Pressure main 4 in. to 12 in. shall be ductile iron AWWA C151 class 52 with ductile iron fittings, PVC C-900 or PVC C-905 with gasket joints. For 14 in. to 24 in. mains, pipe shall be ductile iron AWWA C151 Class 52 with ductile iron fittings and

gasket joints. All ductile iron pipe and fittings shall be epoxy coated on the inside of the pipe. The coating material shall be designed for use with corrosive materials. Pipe material & fittings for pressure mains larger than 24 in. shall be reviewed by the City of Gig Harbor. All pressure mains are to be green in color or wrapped with green sewer 'polywrap'.

- B. Depth: Pressure mains shall have a minimum 36 in. of cover to top of pipe. See Section 5A.020 for sanitary sewer/water main crossing requirements.
- C. Lift Station Pressure Main Velocity: The minimum velocity allowed is 2 ft. per second (fps) at average dry weather flow. 2 fps is required to maintain solids in suspension, although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.

#### **5D.035 Connections to Pressure mains.**

Connection to existing pressure main shall be done with stainless steel tapping saddle and epoxy coated resilient wedge gate valve. When connecting a STEP or grinder main or service lateral to a lift station pressure main, a check valve shall be installed up stream of the tapping valve at back of ROW. The check valve shall be made accessible for maintenance or replacement. Installation of a manhole/vault with bottom shall be required to facilitate access to the check valve.

#### **5D.045 Valves**

All valves up to 2 in. shall be red handle Philmac FIPT x FIPT ball valves with appropriate couplings. All valves 4 in. to 24 in. shall be M&H resilient seat gate valves or approved equal. Gate valves shall be ductile iron and epoxy coated on the inside and outside as specified in 5D.030. All plug valves shall have a 2 in. operating nut. Gate valves 10 in. and larger shall have gear reduction operation. Tapping valves shall be resilient wedge gate valves and be epoxy coated on the inside and outside. All pressure mains are to be green in color or wrapped with green sewer 'polywrap'.

All valve types 3" and larger used in wastewater application shall be internally coated with a Fusion Bonded Epoxy Coating. The coating shall be a one part heat curable, thermosetting epoxy coating designed for the corrosion protection of metal in a wastewater application. The epoxy is applied to preheated steel as a dry powder which melts and cures to a uniform thickness. Manufacturers: Product shall be: 3M Scotchkote 134 Fusion Bonded Epoxy Coating or approved equal.

- A. Pressure main valve spacing:  
Valves shall be installed at all locations where the size of the pipe changes. (See also 5D.065 pig port requirements for pipe line size changes and spacing). Three valves shall be installed at each cross and two valves shall be installed at every tee. In no case shall valve spacing exceed 1000 ft. for mains up to 10 ft. Valve spacing shall not exceed 500 ft. for mains over 10 in. At every lift station, a pressure main isolation valve is required within ten ft. of the station.

- B. Air/vacuum release valves:  
Air release valves shall be Crispin Model PVC US10S with ¼ in. operating orifice and operating range of 10 to 100 psi. Air release valves and air/vacuum valves shall be located at the high points of the line. This needs to stay. Air release valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance. See detail 5-5.
- C. Pressure sustaining valve assembly:  
Pressure sustaining valves are sometimes required in the design of STEP systems to keep the pipeline full during periods of low or no flow or when siphoning conditions exist. Pressure sustaining valve and assembly shall be reviewed by the City of Gig Harbor prior to approval.

#### **5D.055 Fittings**

All pipe fittings shall have a minimum working pressure rating equal to the pipe with which they are connected.

#### **5D.060 Pressure Main Low Point Drain**

Provisions to drain a pressure main to facilitate repairs or to temporarily remove pressure main from service shall be provided. This may be accomplished through the use of a valved tee connected to a drain line at the low point of the line. See detail 5-27.

#### **5D.065 STEP/Grinder Pressure Main Pigging Ports**

A pipeline pig is a projectile that is forced through the inside of a pipe to clean pressure pipelines. A pigging port is used as a point to send or retrieve the pig. Pigging ports shall be required:

1. At every change in pipeline size.
2. At the end of every dead end line.
3. At the connection point to the main when the main being constructed will be a secondary main.
4. Location and number of pigging ports required are subject to review and approval by the City of Gig Harbor. See details 5-18, 5-19.

#### **5D.070 Thrust Blocking**

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings.

See standard detail number 4-17 and 4-18 in water Section. Designed and approved restraining joint systems may be allowed in lieu of thrust blocking. Restraining joint brand, type and size shall be specified on the plans.

#### **5D.080 Pressure Main Termination**

Sewer odors and gases, hydrogen sulfide odors (H<sub>2</sub>S), and the buildup of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) occur in the operation of a pressure – main and/or STEP/grinder system. To mitigate these conditions, some type of control method(s) shall be used. This may include chemical addition at the pump station and/or the reaeration of the waste water at or near the terminus. Reaeration may include the following:

1. Construction of a vault housing and aspiration assembly.
2. The use of hydraulic fall (vertical siphon) within the terminal manhole.
3. High velocity discharge with smooth transition so as to not cause splashing of force main into the down stream gravity sewer.

These methods would all require an adequate source of fresh air at the vault or manhole. Odor and corrosion control measures shall be addressed on pressure sewer systems connecting to a gravity sewer system. All continued odor and corrosion costs shall be paid by the developer.

A determination of need for odor and corrosion prevention shall be prepared and stamped by a professional engineer licensed in the State of Washington. The report, along with said engineer's history of odor control experience and references, shall be submitted during design phase for review by the City of Gig Harbor. As a minimum, the odor control system shall be designed and installed according to current method of City of Gig Harbor odor control treatment. If required, an odor control facility shall be installed in order to inject a treatment product into the system so that both odor and corrosion issues generated by the system are addressed. The pressure main shall be sized to provide adequate contact time for treatment to be effective. All manholes within 400 ft. downstream of the outfall manhole and including the outfall manhole shall be entirely coated from the top grade ring to the channel flow line with Spectra Shield. The coating shall be applied under direction of the product representative, by a factory trained/certified applicator of the product. If new gravity manholes are to be installed at the terminus, all of the new manholes shall be coated as well. The pressure main discharge shall be made with a smooth transition of flow into the existing flow so as to not cause splashing of the effluent at the discharge.

The developer shall provide the City with a signed maintenance contract showing continued odor control treatment will be provided.

### **5E STEP ONSITE SYSTEM:**

#### **5E.010 General**

A Septic Tank Effluent Pump (STEP) system may only be installed in accordance with the existing sewer agreements outlined in Chapter 1 of the City of Gig Harbor Wastewater Comprehensive Plan.

A STEP system is a facility consisting of a tank or tanks for settling and digesting wastewater solids, and a pressure piping system for conveying the supernatant liquid into the sewer system.

STEP pump systems shall be designed and installed as a single family system.

Only sanitary wastewater shall be discharged into the tank. Roof drains and other storm water sources shall be strictly excluded.

Power for the single family system shall be provided by the customer.

All Grinder systems shall be owned and maintained by the customer.

### **5E.020 Design Standards**

The design of any STEP sewer system shall conform to City standards and any applicable standards as set forth herein and in Sections 1.010 and 1.040.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extension shall be extended to and through the side of the affected property fronting the main. Individual STEP service boxes shall be located at the corner of the lot opposite the water meter. STEP service boxes shall not be installed in driveways. The location of these boxes should be coordinated with Peninsula Light Company so the STEP services can be located on the same corner of the lot as the power drops.

Odor control measures shall be addressed on STEP/Grinder sewer systems connecting to a gravity sewer. An odor control facility shall be installed in order to inject a treatment product into the system so that both odor and corrosion issues generated by the system are addressed. Odor control system shall be designed according to current method of City of Gig Harbor odor control treatment. The STEP/Grinder system main shall be sized to provide adequate contact time for treatment to be effective. An adequately sized space shall be provided and an easement granted to the City of Gig Harbor for the installation of the odor control facility.

The standards outlined in Section 5D "Pressure Sewer" of this manual shall be used for the design and construction of STEP/Grinder pressure mains.

Pump, pipeline, and appurtenant component sizing shall conform to the criteria as set forth in the Gig Harbor "Comprehensive Sanitary Sewer Plan". The applicable General Notes in Section 5B.020 shall be included on any plans dealing with pressure sanitary sewer design.

The standards outlined in Section 5D.080 "Pressure Main Termination" shall be used for STEP main termination.

**5E.030 Concrete STEP / Septic Tanks**

Tanks shall be rectangular, pre-cast concrete, dual chamber, and shall have been designed by a registered structural engineer. The chambers shall be divided in such a way that 1/3 of the tank capacity is designed as the pumping chamber and 2/3 of the tank capacity is designed as the settling chamber. All tanks shall be manufactured for acceptance of pump assemblies and effluent filters. Tanks shall use Orenco flanged tank adapters cast into the concrete for the 24 in. and 30 in. openings to allow positive attachment of the risers. The interior shall be coated after installation with an approved coating. The exterior shall be coated with a coal tar epoxy. The manufacturer shall provide the structural design and certification to the City for review. The design or analysis shall be in accordance with accepted engineering practice. Tanks 1.5 ft. to 4 ft. in depth shall be designed for the following loading conditions:

## Loading Criteria

- A. Top of tank 400 pounds per square ft.
- B. Lateral load of 62.4 pounds per square ft. (62.4 pcf equivalent fluid).
- C. The tank shall be designed to support a 2,500 pound wheel load with minimum allowable earth cover.
- D. The tank shall be designed to withstand hydrostatic loading equal to the maximum depth of bury, in addition to the soil loading. Maximum depth of bury shall be measured from the ground elevation to the invert of the sewer line entering the tank.

Deeper installations, if required by local conditions, will require special consideration, as will tanks located where a vehicle might be driven over them. Tanks approved as traffic bearing tanks shall be designed to withstand an H-20 live load with a minimum soil cover of 18 in. Load rating of tank shall be clearly stamped in lid and side of tank. A specific design done by a structural engineer needs to be submitted to verify that the tank specified is designed for the depth and loading to be incurred.

All tanks shall be guaranteed in writing by the tank manufacturer for a period of five years from the date of delivery to the project. Manufacturer's signed guarantee shall accompany delivery.

Systems installed on a site where an existing septic tank exists may not use the existing tank. The existing tank must be removed or abandoned per DOH and/or county requirements.

Concrete material and construction shall meet the requirements of Section 6-02 of the *WSDOT Standard Specifications for Road, Bridge, and Municipal Construction*, most current edition.

The concrete mix shall not be modified unless the mix design is reviewed and approved by the City.

Walls, bottom and top of reinforced-concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame.

The walls and bottom slab shall be poured monolithically. Concrete shall achieve a minimum compressive strength of 4000 psi in 28 days. Date of manufacture shall be clearly stamped in lid and side of tank.

Reinforcing steel shall be ASTM A-615, Grade 60,  $f_y = 60,000$  psi. Details and placement shall be in accordance with ACI 315 and ACI 318.

Modification of completed or existing tanks will not be permitted for structural, warranty, and liability reasons. In order to demonstrate water tightness, tanks shall be tested prior to acceptance. Each tank shall be tested at the factory, by filling with water to the base of the riser and letting stand. After 24 hours, the tank shall be refilled to the soffit and the ex-filtration rate shall be determined by measuring the water loss during the next two hours. The two-hour water loss shall not exceed one gallon.

Tanks shall not be moved from the manufacturer's site to the job site until the tank has cured for at least seven days and has reached two-thirds of the design strength.

Tanks shall be bedded on 6 5/8 in. crushed rock (CSTC). Backfill material shall be sand to within 12 in. of the finished grade. Sides shall be compacted in 2 ft. lifts to the same or greater density than the surrounding area.

After the tanks have been set in place and the riser installed, but prior to back filling, and after coatings have been applied, each tank shall be tested by filling the tank riser with water to the top or to a level that equals 3 psi against the tank to riser seal for a two-hour period. Water loss during the test shall not exceed 1 gallon. Electrical "J" box shall not be submerged during the test.

Tanks, installed where groundwater levels are above tank bottom, require precautions to prevent flotation. In general, tanks shall immediately be filled with water, after coating, and shall not be pumped down more than 3 ft. below top of tank.

Finish grading, cleanup, and restoration shall be completed prior to final acceptance by the City.

Fiberglass tanks will not be allowed.

#### **5E.040 Service Lateral Pipe and Building Sewer**

- A. Service line: See City of Gig Harbor STEP System Requirement Chart for pipe size. Pipe shall be schedule 80 PVC water pipe, solvent weld joint located at 90 degrees to the mainline when possible. Solvent cements and primer for joining

PVC pipe and fittings shall comply with ASTM D 2564 and shall be used as recommended by the pipe and fitting manufacturers. Poly pipe shall be high-density ASTM D 3350, SDR 11 3408 socket or butt fusion welded. Services shall have a minimum 24 in. cover to top of pipe. Pressure services must cross under any water line. See Section 4.130 for water and sewer separation requirements.

- B. Building Sewer: The gravity building sewer pipe between the building and the tank for a single family system shall be designed and installed in accordance with the Uniform Plumbing Code as adopted in GHMC Chapter 15. A clean out shall be installed on the gravity building sewer, located between the structure and the tank, raised to grade and installed per plumbing code.
- C. All pipe shall be installed with continuous tracer tape installed 12 in. to 18 in. under the proposed finished grade. The marker tape shall be plastic, non-biodegradable, with a metal core or backing which can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal. In addition to tracer tape, install 14 gauge, green coated copper wire, wrapped around the pipe, brought up and tied off at the valve boxes.
- D. Bedding:
  - 1. Bedding shall be crushed material meeting the requirements of Section 9-03 of the WSDOT Standard Specifications latest edition.
  - 2. Bedding shall be installed as shown on the construction details. No pea gravel shall be used.

#### **5E.050 Fittings**

Solvent weld fittings for one inch through two inches of pipe shall be socket type Schedule 80 and shall comply with ASTM D 1584 and ASTM D 2466. Poly fittings shall be electro fusion welded high density ASTM D 3350 socket or butt fusion welded and of the same pressure rating and classification as the pipe.

#### **5E.060 Service Lateral Valves**

- A. All service valves shall be 1 ¼ in. or 2 in. Philmac FIPT x FIPT ball valves. Valves shall be left "off" and have a threaded plug installed in the end until the lot is connected.
- B. Check Valves: Check valves used on service lines shall be a tee or wye pattern swing check PVC. Valves shall have a working pressure of 150 psi. Valves shall be designed for use with corrosive fluids. A check valve shall be installed at the end of the service stub out at the property line to be installed in a valve box. Check valves shall be King Brothers, KSC or approved equal. The check valve shall be mounted horizontally and be visible in the valve box along with the ball valve. Check valve shall not be buried.
- C. Service valve box lids. Valve box lids shall be specified to be marked "SEWER" so they can quickly be distinguished from valves in the water system.

**D. Service Valve Boxes:**

## Earth Bury:

- Carson 1419E. For single service.
- Carson 1324E. For large or community type service.

## Traffic Areas:

- Midstates Plastics BCF 1419SL. For single family service.
- Midstates Plastics BCF 1324SL for large or community type service.

**5E.070 Tank Risers and Lids**

A. Tank chamber risers shall be 8, 24, 30 or 48 in. diameter, fiberglass ribbed or PVC as manufactured by Orenco Systems, INC., 2826 Colonial Road, Roseburg, Oregon 95450 or approved equal. Solids compartment risers shall be 24 in. diameter. Clean out risers between compartments on 1,500 and 3,000 tanks shall be 8 in. diameter. Pump chamber risers shall be 30 in. diameter. 3,000 and 1,500 gallon tank riser height shall not exceed 48 in. from top of tank to finished grade. All tank riser lids shall be set to grade for maintenance access.

1. Primary tanks shall have 24 in. risers evenly spaced along tank length to facilitate pumping. Spacing of risers shall not exceed 10 ft. to center of risers. No shrubs, bushes, ground cover or trees shall be planted within a 3 ft. radius of the tank lids. All tank riser lids shall be set to grade for maintenance access.

Pump chamber risers shall be factory equipped with the following:

- B. Appropriately sized (IPS) neoprene grommets shall be installed no less than 8 in. from the top of the riser and no more than 12 in. from the top of the riser around the pump discharge pipe(s) and electrical splice box conduits where they exit the riser and create a seal to prevent the infiltration of ground water into the tank.
- C. Single family tank splice box shall be Orenco Model SB4.
- D. Motor leads shall exit riser and be housed in a standard concrete electrical junction box. There shall be a slack loop in the junction box along with Erickson union and seal off. Motor leads shall be continuous from motors to electrical cabinet without splices.

A lid shall be furnished with each riser. It shall be latching and constructed of fiberglass with an aggregate finish. Riser and lid combination shall be able to support a 2500 pound wheel load. This does not imply that PVC risers are intended for traffic areas.

Each riser shall be bonded to the top of the concrete tank with a two-part epoxy that shall be supplied with the riser by the manufacturer. The epoxy shall be applied in accordance with the manufacturer's recommendations. A generous bead of epoxy shall be laid completely around the bottom of the riser prior to

mounting the riser on the top of the tank. After the riser is in place, a generous fillet shall be run completely around the inside base. The epoxy shall be allowed 4-hours curing time at 64 degrees Fahrenheit; otherwise a greater time shall be allowed based on the manufacturer's recommendations before backfill is placed over tank. Care shall be exercised during the curing period to avoid dislodging the riser or disrupting the water-tight seal between the riser and tank.

#### **5E.080 Pumping Tank Equipment**

Pumps shall be UL listed for use in effluent. All pumping systems shall be Orenco Systems Model OSI S 4000 Series High Head Pumping Assemblies or approved equal. See City of Gig Harbor STEP System Requirement Chart and details. All pumping systems shall be installed in accordance with the manufacturer's recommendations.

#### **5E.090 Control Panel Power**

See Detail 5-17 for single family control panel and Section 5E.095.

All buried power shall be installed with continuous tracer tape installed 6 in. above the buried power. The marker tape(s) shall be plastic non-biodegradable and be labeled with the appropriate marking.

Wiring from the pump control panel to the splice box in the wet well riser shall be a minimum #14 stranded wire and colored insulation matching the manufacturer's diagram. Connections in the riser junction box shall be installed as per the manufacturer's specification. A good quality heat shrink shall be used on all leads. Splices shall be capable of lifting out of the junction box a minimum of 6 in. The motor and control circuits will be merged as part of the inspection procedure and shall be no less than 50 mega ohms before acceptance by the City.

#### **5E.095 Control Panels**

A. Control panels for single family dwellings shall be Orenco Systems Model #ORS1DS, City of Gig Harbor Control Panel or City approved equal. Control panel boxes shall not be painted. The control panel and riser junction box shall be dry and clean before acceptance. The control panel shall be furnished with the following features:

1. Rating: 1 HP/115 VAC, 2 HP/230 VAC, single phase, 60 Hz. Motor start contact shall be rated for 25 FLA (full load amps), single phase, 60 Hz
2. Audible alarm, panel mount with a minimum of 80 dB sound pressure at 24 in. continuous sound
3. Oil-tight visual alarm, red lens, with push-to-silence feature
4. Automatic audio-alarm reset

5. 15 amp motor rated toggle switch, single-pole, double-throw with three positions: manual (MAN), automatic (AUTO) and center (OFF)
6. NEMA 4X-rated fiberglass enclosure with gasketed, hinged cover, and locking latch. Padlock will be installed by City at time of City's acceptance of the completed installation and shall signify final acceptance.
7. Alarm circuit shall be wired separately from the pump, so that if the internal pump overload switch is tripped, the alarm will still function.
8. 20-amp power disconnect assembly toggle switch to de-energize entire control panel, to permit servicing panel without access to the customer's breaker switches.
9. All wiring systems shall be installed in accordance with the National Electrical Code (NEC) and City of Gig Harbor specifications and the manufacturer's specifications. In cases of conflict the most stringent standard shall apply.

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CHAPTER 5 SEWER**

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