Chapter 5

5.000 Sanitary Sewers

5.010 Sewer System Alterations, Extensions and Connections

To allow the City to provide timely assistance and advice, anyone who wishes to alter, extend or connect to the sanitary sewer system should contact the City as soon as possible. Any alteration of, extension of, or connection to the City of Shelton’s sanitary sewer system must conform to the Comprehensive Sewer Plan, State Department of Ecology (DOE), and the Department of Health (DOH) requirements, Section 7 of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction, and these Standards.

In the case of development where the property abuts a right-of-way or public easement in which a public sewer is located, or where a service connection is or can be otherwise provided, connection of all structures generating sewage shall be required. Whenever a structure that generates sewage originates within 300 feet of the public sewer, the structure shall connect to the public sewer in compliance with these Standards. Sewer main extensions shall be required when the property does not front on a sewer main or when the existing sewer main is not adequate for the increased use that is being proposed. The minimum extension shall be to the far property line or for corner lots, to the middle of the adjacent intersection of the right of way (alley or street). Any sewage spills on City Right of Way shall be reported to the City immediately at (360) 432-5178 during business hours, or (360) 426-4441 during non-business hours.

City utilities may be extended to properties within the Shelton Urban Growth Area only after the property is legally committed to eventual annexation per Section 1.200.

Development on new lots or sites created by subdivisions or site plans shall have a sewer service installed as required by these Standards. In single family subdivisions and in mobile home/manufactured home parks, a service shall be provided to each lot, site or residential dwelling unit.

Development of multi-family residential buildings (3 or more units) and commercial complexes shall have a single side sewer
or lateral installed per separate building or ownership. Duplex units shall have a separate side sewer or lateral for each living unit that connects directly to the service main.

5.020 Sewer Design Standards

The design of any sewer extension/connection shall conform to the State Department of Ecology's *Criteria for Sewage Works Design* and any applicable standards as set forth herein. The layout of extensions shall provide for the future continuation of the existing system as determined by the City. All sewers shall be designed as a gravity sewer whenever physically feasible.

Sewer mains shall be sized for the ultimate development of the tributary area as determined by the City. The minimum size for sub-mains and mains shall be 8-inch inside diameter. The minimum size for a lateral shall be 4 inches. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size or a greater installation depth is needed to meet the requirements for future service.

Gravity sewers shall be designed with a straight alignment between manholes, or as otherwise approved by the City. New gravity sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day. See the following DOE table on Design Basis for Sewage. This figure is assumed to cover normal infiltration, but an additional allowance may be required by the City 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 for review.

<table>
<thead>
<tr>
<th>Discharge Facility</th>
<th>Design Units</th>
<th>Flow* (gpd)</th>
<th>BOD (lb/day)</th>
<th>SS (lb/day)</th>
<th>Flow Duration (hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwellings</td>
<td>Per person</td>
<td>100</td>
<td>0.2</td>
<td>0.2</td>
<td>24</td>
</tr>
<tr>
<td>Schools w/showers and cafeteria</td>
<td>Per person</td>
<td>16</td>
<td>0.04</td>
<td>0.04</td>
<td>8</td>
</tr>
<tr>
<td>Schools w/o showers and cafeteria</td>
<td>Per person</td>
<td>10</td>
<td>0.025</td>
<td>0.025</td>
<td>8</td>
</tr>
<tr>
<td>Boarding schools</td>
<td>Per person</td>
<td>75</td>
<td>0.2</td>
<td>0.2</td>
<td>16</td>
</tr>
<tr>
<td>Motels at 65 gal/person (rooms)</td>
<td>Per room</td>
<td>130</td>
<td>0.26</td>
<td>0.26</td>
<td>24</td>
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### DESIGN BASIS FOR NEW SEWAGE WORKS

<table>
<thead>
<tr>
<th>Discharge Facility</th>
<th>Design Units</th>
<th>Flow* (gpd)</th>
<th>BOD (lb/day)</th>
<th>SS (lb/day)</th>
<th>Flow Duration (hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer courts at 3 persons/trailer</td>
<td>Per trailer</td>
<td>300</td>
<td>0.6</td>
<td>0.6</td>
<td>24</td>
</tr>
<tr>
<td>Restaurants</td>
<td>Per seat</td>
<td>50</td>
<td>0.2</td>
<td>0.2</td>
<td>16</td>
</tr>
<tr>
<td>Interstate or through highway restaurants</td>
<td>Per seat</td>
<td>180</td>
<td>0.7</td>
<td>0.7</td>
<td>16</td>
</tr>
<tr>
<td>Interstate rest areas</td>
<td>Per person</td>
<td>5</td>
<td>0.01</td>
<td>0.01</td>
<td>24</td>
</tr>
<tr>
<td>Service stations</td>
<td>Per vehicle serviced</td>
<td>10</td>
<td>0.01</td>
<td>0.01</td>
<td>16</td>
</tr>
<tr>
<td>Factories</td>
<td>Per person per 8-hr shift</td>
<td>15-35</td>
<td>0.03-0.07</td>
<td>0.03-0.07</td>
<td>Operating Period</td>
</tr>
<tr>
<td>Shopping centers</td>
<td>Per 1,000 sq. ft. of ultimate floor space</td>
<td>200-300</td>
<td>0.01</td>
<td>0.01</td>
<td>12</td>
</tr>
<tr>
<td>Hospitals</td>
<td>Per bed</td>
<td>300</td>
<td>0.6</td>
<td>0.6</td>
<td>24</td>
</tr>
<tr>
<td>Nursing homes</td>
<td>Per bed</td>
<td>200</td>
<td>0.3</td>
<td>0.3</td>
<td>24</td>
</tr>
<tr>
<td>Homes for the aged</td>
<td>Per bed</td>
<td>100</td>
<td>0.2</td>
<td>0.2</td>
<td>24</td>
</tr>
<tr>
<td>Doctor's office in medical center</td>
<td>Per 1,000 sq. ft</td>
<td>500</td>
<td>0.1</td>
<td>0.1</td>
<td>12</td>
</tr>
<tr>
<td>Laundromats, 9 to 12 machines</td>
<td>Per machine</td>
<td>500</td>
<td>0.3</td>
<td>0.3</td>
<td>16</td>
</tr>
<tr>
<td>Community colleges</td>
<td>Per student and faculty</td>
<td>15</td>
<td>0.03</td>
<td>0.03</td>
<td>12</td>
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<tr>
<td>Swimming pools</td>
<td>Per swimmer</td>
<td>10</td>
<td>0.001</td>
<td>0.001</td>
<td>12</td>
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<tr>
<td>Theaters, drive-in type</td>
<td>Per car</td>
<td>5</td>
<td>0.01</td>
<td>0.01</td>
<td>4</td>
</tr>
<tr>
<td>Theaters, auditorium type</td>
<td>Per seat</td>
<td>5</td>
<td>0.01</td>
<td>0.01</td>
<td>12</td>
</tr>
<tr>
<td>Picnic areas</td>
<td>Per person</td>
<td>5</td>
<td>0.01</td>
<td>0.01</td>
<td>12</td>
</tr>
<tr>
<td>Resort camps, day &amp; night, w/limited plumbing</td>
<td>Per campsite</td>
<td>50</td>
<td>0.05</td>
<td>0.05</td>
<td>24</td>
</tr>
<tr>
<td>Luxury camps w/flush toilets</td>
<td>Per campsite</td>
<td>100</td>
<td>0.1</td>
<td>0.1</td>
<td>24</td>
</tr>
</tbody>
</table>

* Includes normal filtration

Taken from: “Criteria for Sewage Works Design”  
By: State of Washington Department of Ecology  
December 2008 (Table G2 – 2)

Gravity sewer mains shall be Class 52 ductile iron pipe or solid wall PVC and shall conform to the requirements of WSDOT Standard Specification Section 9-05.

Gravity sewer shall be as deep as possible while still being functional and will have a typical minimum depth of 7 feet 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 the existing system. Additional depth may be required by the City.

All new mains connecting to the existing system shall connect either to a new manhole or existing manhole and 180° to the lay of the main provided the manhole placement, two mains cannot meet without manhole as per Chapter 5.070 is met. See Chapter 5.040 and Standard Details SS-05 and SS-06 for requirements for building or side sewer connections.

All new mains and laterals shall include Tracer Wire.

Septic Tank Effluent Pump (STEP) systems are not allowed by the City except as approved by the City. For a grinder pump system refer to Chapter 5.170.

5.030 Connection to Existing System

Before connection to the existing system, all new sewers shall be physically plugged until all tests have been completed and the City approves the removal of the plug.

Connection of new sewer pipe lines to existing manholes shall be accomplished by core drilling and inserting a "Kor-N-Seal" boot, or as otherwise approved by the City. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

Connection of a sewer pipe line to a sewer system where a manhole is not available shall be accomplished by installing an approved precast base or pouring a concrete base and setting manhole sections. The existing sewer pipe shall not be cut into until approval is received from the City. At connections where an existing stub-out is not available, or where a new building sewer is the same size as the existing main, a replacement manhole shall be installed, unless otherwise approved by the City. All sewer main installations shall be per Section 5.020.

When sewer service is needed to a parcel fronting an existing sewer main, a Utility Application must be made to the City. Following approval of the application and payment of all related fees, the contractor may tap the existing sewer main and install all building side sewers or laterals required by the approved plans shall be installed by the contractor. All connections to the sewer main shall be shown on the plans. The City shall inspect the contractor's work and testing.
Taps shall not be allowed to protrude into the existing main. The City shall be notified 48 hours prior to any tap of a City sewer and a City Inspector shall be present to witness the tap. The mainline at the tap location shall be televised after tapping and prior to approval to ensure compliance upon City direction.

When it is necessary to break out or repair an existing sewer during construction, only new pipe having the same inside diameter will be used in reconnecting the sewer. Where joints must be made between pipes with a mismatched wall thickness, the contractor shall use a flexible gasketed coupling, adapter, or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by Romac or Smith-Blair for reinforced pipe and Fernco for non-reinforced pipe, or City approved equal.

Taps on PVC sewer mains shall be made with a PVC gasketed sewer main saddle wye conforming to ASTM D 3034 SDR 35, or City approved equal. Taps on a ductile iron sewer main shall be made with a Romac style CB sewer saddle with Ductile+Plus saddle, stainless steel strap and rubber gasket meeting ASTM D-2000 3 BA715 or City approved equal. See Standard Detail SS-14. The manufactured bevel on the pipe to be inserted into the saddle shall be cut off to avoid pushing the pipe into the main.

\section{5.040 Sewer Service and Laterals}

Building side sewers and lateral sewers shall be a minimum 4-inch inside diameter. Installation and maintenance of building side sewers and laterals up to the connection with the service main is the responsibility of the property owner. Prior to connection of a building side sewer or a lateral to the public sewer, an approved Utility Application must be obtained. Materials and design criteria for a building side sewer are covered by the Uniform Plumbing Code (UPC) and these Standards.

Each separate building shall have its own separate side sewer (per SMC Chapter 14.12.020) and each property shall have its own lateral connection to the system, except that duplex units shall have a separate side sewer or lateral for each living unit that connects directly to the service main. Laterals for single-family residential properties shall not be connected to the system at a manhole, unless otherwise approved by the City. Multifamily and commercial complexes may connect directly to
a manhole if the lateral sewer is six inches in diameter or larger and the manhole is channeled to accommodate the lateral. Manhole sizing where laterals are connected shall be the same as designated in Section 5.070 of these Standards.

Lateral sewers shall be PVC ASTM D 3034 SDR 35 with flexible gasket joints. Ductile iron pipe may be required in areas with insufficient cover. Lateral connections shall be made by a tap to an existing sewer main by a licensed and bonded contractor upon approval of the right of way permit, or by a Y branch from a new main connected above the spring-line of the pipe. PVC sewer T-Y fittings shall be GPK Products part number 113-004 to 113-0278 depending on application size, or 114-0044 to 114-0278 depending on application size, manufactured in accordance with ASTM D-3033 79 SDR 35, SDR 41, or ASTM D-3034 78 SDR 42 or SDR 35, or City-approved equal.

A cleanout is required on the lateral at the right-of-way line or easement line, unless otherwise approved by the City. Cleanout ring and cover shall be Inland Foundry, East Jordan, or City approved equal. See Standard Detail SS-10. A backflow prevention device (backwater valve) is required on the side sewer in an accessible location near the building unless otherwise approved by the City. See Standard Detail SS-07.

If the property abuts an existing sewer main, an application for sewer service shall be made by the owner of the property on which the work is to be performed or by a properly licensed and bonded contractor representing the owner. All fees required by the City shall accompany the completed application. The charge for connection to the City’s sewer system is established by the City Council and may be amended by the Council from time to time as necessary. All charges incurred in establishing a connection to the City’s sewer system shall be at the sole expense of the applicant.

No person other than authorized personnel of the City, or a properly permitted, licensed and bonded contractor who is approved by the City, shall make any connection to or opening into, use, alter, or disturb any part of the City sewer system or appurtenance thereto without the expressed consent of the City.

Taps shall not be allowed to protrude into the existing main. The City shall be notified 48 hours prior to any tap of a City sewer and a City inspector shall be present to witness the tap.
The mainline at the tap location shall be televised after tapping and prior to approval to ensure compliance.

Sewer main extensions shall be required when the property does not front on a sewer main or when the existing sewer main is not adequate for the increased use that is being proposed. The minimum extension shall be to a point at least 5 feet inside the prolongation of the property line.

5.050 Pressure Sewer (Force Main) Design Standards

A. Force Mains

Force mains may be considered for situations where topography makes a gravity sewer impractical.

Force mains shall be ductile iron AWWA C151 Class 52 or an approved equal. A restraint-joint pipe may be required where excess trench widths occur. All ductile iron pipe and fittings shall be Protecto 401 epoxy coated or PE lined pipe or City approved equal, and designed for use with corrosive materials.

Force mains over 2” shall have a minimum 68 inches of cover to top of pipe. This minimum assumes 42 inches cover to an 8-inch diameter water pipe and 18 inches separation from the bottom of water pipe to top of sewer line. See Section 4.060 for sanitary sewer/water main crossing requirements.

The minimum velocity allowed is 2 feet per second (fps) at average dry weather flow. Two fps is required to maintain solids in suspension although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.

B. Valves

Sewer force main valves shall be ductile iron and epoxy-coated, or PE lined and designed for use with corrosive materials. 4” to 12” valves shall be Waterous Series 500 plug valves or an approved equal.

Three valves shall be installed at each cross and two valves shall be installed at every tee. At every lift station, a force main isolation valve is required within 10 feet of the station. Valves shall be installed at all locations where the size of the pipe changes. Valves shall also be installed in-line between nodes at sufficient intervals to facilitate system repair, but shall not exceed the following:
• Every 6,000’ for 4” diameter pipe
• Every 3,000’ for 6” diameter pipe
• Every 1,500’ for 8” diameter pipe
• Every 1,000’ for 10” diameter pipe
• Every 700’ for 12” diameter pipe
• Every 500’ for 14” diameter pipe

C. Air/Vacuum Valves

Air release valves and air/vacuum valves shall be located at the high points of the force main within a standard 48-inch manhole or a comparable sized approved vault. 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 the each air release/vacuum valve is required for maintenance.

D. Force Main Drain

Provisions to drain a pressure main to facilitate repairs or to temporarily remove the force main from service shall be provided. This shall be accomplished through the use of a valved tee connected to a drain line at the low point of the line. A manhole shall be set over the force main at the valved tee.

E. Thrust Blocking

Locations of thrust blocking shall be shown on the plans. Thrust blocks shall be designed for the test pressures set forth in Section 4.170 of these Standards. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings. 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. See Standard Details W-12, W-13 and W-14 for examples.

F. Force Main Termination

Hydrogen sulfide odors (H₂S), and the buildup of sulfuric acid (H₂SO₄) occur in the operation of a force main. 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 re-aeration of the wastewater at or near the terminus. Re-aeration may include the following:

1. Construction of a vault housing and aspiration assembly.

2. The use of a hydraulic fall (vertical siphon) within the terminal manhole.

3. High velocity discharge with smooth transition so as not to cause splashing of force main into the downstream gravity sewer.

These methods all require an adequate source of fresh air at the vault or manhole. At a minimum, the manhole at the terminus and the first manhole downstream of the terminus shall be coated with Tnemec 120 vinyl ester, Quantum polymorphic resin or approved equal, under the direction of the product representative. If new gravity manholes are to be installed, two PVC lined manholes shall be installed downstream of the force main terminus. Aerators shall be contained within an appropriately sized manhole or suitably constructed building.

The pressure main discharge shall be made with a smooth transition of flow into the existing flow so as not to cause

5.060 Sanitary Sewer/Water Main Crossings

See Section 4.060 for requirements regarding sewer main and water main separation at crossings.

5.070 Manholes

Manholes shall be provided at a maximum of 300-foot intervals. Manholes shall be provided at all intersections, at changes in direction, at changes in grade, or where the pipe size changes. Mastic is required between risers and between risers and castings. A shim will be required under the frame to prevent settling. Minimum slope through the manhole shall be 1/10th of one foot from invert "in" to invert "out". The manhole cone shall be offset to be located out of the tire track of a traveled lane.

Precast manholes shall meet the requirements of ASTM C 478 with a precast base or a cast-in-place base made from 3000 psi structural concrete. Sanitary sewer manholes shall be 48-inch
diameter minimum. The minimum clear opening in the manhole frame shall be 24-inches. Where a drop manhole is used, a larger opening may be required. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside and outside with an approved grout and installed per the manufacturer's recommendations. Lift holes shall be filled entirely with grout. Acceptance of precast manholes, inlets and catch basins will be based on the presence of a “WSDOT Inspected” stamp or tag provided in the field, as specified in Section 9-4.41 of WSDOT Construction Manual and Section 9-12 of the State of Washington’s Standard Specifications. See Details SS-01 and SS-02.

Manhole covers and frames shall be hinged lid East Jordan within paved areas or unless approved by Public Works Director. See Standard Detail SS-11. Manhole rings and covers shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability.

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) fit in any position and be interchangeable in other standard manhole frames. All castings shall be coated with a bituminous coating prior to delivery to the job site.

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. Where lock-type castings are required, the casting device shall be such that the cover may be readily released from the ring and all movable parts shall be made of non-corrosive materials and otherwise arranged to avoid possible binding. See Detail SS-11.

Safety steps shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2-inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread, per Section 7 of WSDOT Standard Specifications. 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-inch centers.

Manhole sizing shall be determined by the following criteria:
A. 48-inch Manhole

1. 2 connecting pipes, 8-inch to 12-inch diameter.

2. 3 connecting pipes, 8-inch to 10-inch diameter, 90 to 120 degrees between all pipes.

3. 4 connecting pipes, 8-inch diameter, perpendicular.

B. 54-inch Manhole

1. 2 connecting pipes, 8-inch to 12-inch with less than 45 degrees deflection. Deflection=angle between any two pipe channels in the manhole.

2. 3 connecting pipes, 10-inch to 12-inch diameter, 90 to 120 degrees between all pipes.

3. 4 connecting pipes, 10-inch to 12-inch diameter, perpendicular.

C. 72-inch Manhole

1. 2 connecting pipes, 15-inch to 18-inch diameter with less than 45 degrees deflection.

2. 3 connecting pipes, 15-inch diameter, 90 to 120 degrees between all pipes.

3. 4 connecting pipes, 15-inch diameter, perpendicular.

The above configurations shall provide adequate shelves and room for maintenance and performing TV inspections. For other sewer pipe configurations, the size of the manhole shall be approved by the City.

5.080 Slope

All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet 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 field data submitted. The following minimum slopes should be provided; however, slopes greater than these are desirable.
### MINIMUM SLOPE

<table>
<thead>
<tr>
<th>Sewer Size (inches)</th>
<th>Minimum %Slope (Feet per 100 Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1.0 (0.0100 Ft/Ft)</td>
</tr>
<tr>
<td>8</td>
<td>0.40 (0.0040 Ft/Ft)</td>
</tr>
<tr>
<td>10</td>
<td>0.28 (0.0028 Ft/Ft)</td>
</tr>
<tr>
<td>12</td>
<td>0.22 (0.0022 Ft/Ft)</td>
</tr>
<tr>
<td>14</td>
<td>0.17 (0.0017 Ft/Ft)</td>
</tr>
<tr>
<td>15</td>
<td>0.15 (0.0015 Ft/Ft)</td>
</tr>
<tr>
<td>16</td>
<td>0.14 (0.0014 Ft/Ft)</td>
</tr>
<tr>
<td>18</td>
<td>0.12 (0.0012 Ft/Ft)</td>
</tr>
<tr>
<td>21</td>
<td>0.10 (0.0010 Ft/Ft)</td>
</tr>
<tr>
<td>24</td>
<td>0.08 (0.0008 Ft/Ft)</td>
</tr>
<tr>
<td>27</td>
<td>0.07 (0.0007 Ft/Ft)</td>
</tr>
<tr>
<td>30</td>
<td>0.07 (0.0006 Ft/Ft)</td>
</tr>
<tr>
<td>36</td>
<td>0.05 (0.0005 Ft/Ft)</td>
</tr>
</tbody>
</table>

Sewers shall be laid with uniform slope between manholes. Under special conditions, slopes slightly less than those required for the 2.0 feet per second velocity may be permitted by the City. Such decreased slopes will only be considered where the depth of flow will be 0.3 of the diameter or greater for design average flow. Whenever such decreased slopes are proposed, the engineer shall furnish 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 unless otherwise approved by the City.

The maximum tolerance from true line and grade shall be as follows:

A. Maximum deviation from established line and grade shall not exceed .0026 feet (1/32-inch) per inch of pipe diameter, and not exceed .042 feet (1/2-inch) per pipe length.

B. No adverse grade in any pipe length will be permitted.

C. The difference in deviation from established line and grade between two successive joints shall not exceed 1/3 of the amounts specified above.

#### 5.090 High Velocity Protection

Where velocities greater than 15 feet per second are expected, special provisions shall be applied such as thrust blocking,
abrasion-resistant manhole and pipe materials, and anti-abrasive coatings as required by the City.

Anti-abrasive coatings shall be Tnemec 120-5002 Vinester (vinyl ester) for prime coat, and Tnemec Series 120-5001 Vinester (vinyl ester) for the finish coat, applied in a neat and workmanlike manner in accordance with the manufacturer's recommendations, or City-approved equal.

5.100 Drops

Straight grades between inverts of manholes are preferred over drops. Care must be taken when designing steep grades so as not to create a situation of excessive velocity or excavation.

Drops may be allowed as approved by the City.

An inside drop connection shall be provided for a sewer entering a manhole at an elevation of 24-inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition. An outside drop will not be allowed unless specifically approved by the City Public Works Director. Drop structures shall be constructed per Standard Details SS-08 and SS-09.

5.110 Lampholes

Lampholes are not an acceptable substitute for manholes. However, lampholes may be used in lieu of manholes at the end of 6 or 8 inch diameter lines, when approved by the City. This does not include a 6 inch building or side sewer to serve one or two single-family dwellings. Location of the cleanout for a building sewer is governed by the Uniform Plumbing Code.

All lampholes in City right-of-way shall be extended to grade. A cast iron ring and cover shall be installed around all lampholes. See Standard Detail SS-13.

5.120 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 professional land surveyor by the State of Washington. All construction staking shall be
inspected by the City prior to construction. The minimum staking of sewer lines shall be as follows, or as otherwise directed by the City:

A. Stake the location of mainline pipe every 50-feet with cut to invert of pipe.

B. Stake the location of all manholes for alignment and grade with cut or fill to rim and invert of pipes with a minimum of two offsets.

C. Stake the location of all laterals and cleanouts at the property line.

Any deviations from these minimum staking requirements shall be approved by the City.

5.130 Trench Excavation and Pipe Laying

Clearing and grubbing shall be performed within the easement where required, or within the public right-of-way as permitted by the City. Debris resulting from the clearing and grubbing shall be disposed of by the contractor in accordance with the terms of all applicable permits and regulations. Track-mounted equipment shall not be allowed on City streets and public rights-of-way outside of the approved project boundaries unless authorized by Public Works Director.

The contractor shall perform all excavation of every description. Where native materials are unsuitable for pipe bedding (i.e. boulders, hardpan, clay, rocks, roots and other obstructions) the materials shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below sewer grade. Where materials are removed from below sewer main grade, the trench shall be backfilled to grade with material meeting pipe bedding specifications and thoroughly compacted.

Trenches shall be excavated to the line and depth approved by the City. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space. When the support of existing utilities or public safety concerns exist, the City may require more stringent trenching standards. Trenching, shoring and pipe laying shall be in conformance with Washington Industrial Safety and Health Administration.
(WISHA), Washington Department of Labor and Industries (L&I) and the Office of Safety and Health Administration (OSHA) Safety Standards. Surface water shall be diverted so as not to enter the trench. Where water is encountered in the trench, it shall be removed during pipe laying operations, and shall be so maintained until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. Trench water or other deleterious materials shall not be allowed to enter the pipe at any time. The contractor shall maintain sufficient pumping equipment on the job to ensure that these provisions are all carried out. Disposal of all trench water shall meet all local, state and federal guidelines.

The contractor shall handle all types of pipe in a manner that will prevent damage to the pipe. Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall pipe be dropped, skidded, or rolled against another pipe. If the Inspector determines that the contractor’s methods are damaging to the pipe, the contractor shall correct the handling methods. Damaged pipe will be rejected, and the contractor shall immediately place all damaged pipe apart from undamaged pipe, and shall remove damaged pipe from the site within 24 hours. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. A clean whisk broom shall be used for this purpose, and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Engineer, to ensure cleanliness inside the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers 4-inches by 4-inches in size shall be placed between tiers, and chocks shall be placed at each end to prevent movement. For public safety, each size of pipe shall be stacked separately.

The trench bottom shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire
length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint.

Pea gravel backfill will be allowed only to the spring line of the sewer main pipe. For additional requirements regarding trench backfilling, temporary patching and pavement restoration, see Chapter 2 of these Standards.

5.140 Testing

A. Gravity Sewer Main

Immediately following pipe cleaning, the gravity sewer pipe installation shall be tested with low pressure air per WSDOT Standard 7.17.3.

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 backfilled and compacted and the roadway section is completed to subgrade.

All wyes, tees, and ends of building or side sewer stubs shall be plugged with flexible joint caps, or acceptable alternates and 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.

Prior to approval and acceptance of gravity sewer construction, gravity sewer pipes shall be subject to a low pressure air test and meet a 4 psi for 15 minutes standard. A mandrel test or equivalent shall be required on all sewers except laterals. The contractor shall furnish all equipment and personnel for conducting the tests.

Testing of the gravity sewer main shall include a television inspection by the contractor. The camera must be equipped with a rotating head to allow televising of the building or side sewers as mainline inspection is occurring. Any tap to an existing sewer system also needs to be inspected by television.

Television inspection shall be done after the air test has been approved 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.
One copy of the videotape and any accompanying written report shall be submitted to the City. Camera work must be completed utilizing the latest version of Cues’ GraniteNet Software, or as approved by the City. Acceptance of the gravity sewer line will be made after the tape has been reviewed by the City.

B. Manholes

A water or a negative air pressure (vacuum) test of all manholes on the gravity sewer line is also required.

1. The water test shall be made by the contractor 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 foot of head above invert to pass.

2. The negative air pressure (vacuum) test may be used for testing concrete manholes. After backfilling, plug all inverts and lift holes with plugs suitably rated for the test pressures. Plugs shall be placed a minimum of 6 inches beyond the manhole wall. Once the vacuum tester head assembly is suitably attached to the tip of the manhole, the manhole shall be evacuated to 10 inches Hg (0.3 bar). Once a vacuum of 10 inches Hg (0.3 bar) is attained, the contractor and the City Inspector will monitor to ensure the vacuum does not drop in excess of 1-inch Hg over the time specified in the table below. If the manhole fails the test, the contractor will identify and seal the leak and retest until satisfactory. This procedure shall be repeated after backfilling for final acceptance.

**VACUUM TEST TIMETABLE**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Manhole Diameter in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48-Inch</td>
</tr>
<tr>
<td>4 feet</td>
<td>10 seconds</td>
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<tr>
<td>8 feet</td>
<td>20 seconds</td>
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<tr>
<td>12 feet</td>
<td>30 seconds</td>
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<tr>
<td>16 feet</td>
<td>40 seconds</td>
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<tr>
<td>20 feet</td>
<td>50 seconds</td>
</tr>
<tr>
<td>24 feet</td>
<td>60 seconds</td>
</tr>
</tbody>
</table>
VACUUM TEST TIMETABLE

<table>
<thead>
<tr>
<th>Depth</th>
<th>Manhole Diameter in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48-Inch</td>
</tr>
<tr>
<td>*</td>
<td>0.5 seconds</td>
</tr>
</tbody>
</table>
| * Add "I" times for each additional 2-foot depth. (The values listed above have been extrapolated from ASTM designation C924-85.)

C. Force Mains

Prior to acceptance of force main construction, force main and service lines shall be subjected to a hydrostatic pressure test of 200 pounds for 4 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 force 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 contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections shown on the plans have been made. The contractor shall perform all tests to ensure 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.

A water test for all wet wells in accordance with the manhole water test for gravity sewers shall be required.

5.150 Sewer Lift Station Design Standards

The design of any public sewer lift station shall conform to the Department of Ecology’s Criteria of Sewage Works Design and these Standards as applicable. Public lift stations shall conform to the Uniform Plumbing Code and these Standards as applicable. The City may require some lift station applications to be customized, depending on the size of service area, introduction flow to the station and the pumping requirements of the station.

Five copies of a Design Report with engineering plans shall be submitted with each lift station (custom designed or packaged), demonstrating its conformance with the Standards. The design report and plans shall provide:
A. Overall site drawing(s) of the lift station showing the location of all components including elevations;

B. List(s) of specific materials and components used including quantity, description, manufacturer and area representative;

C. Schematic and line diagrams of the service, motor control center and lift station. Terminology and abbreviations shall be per industry standards. A legend shall be provided on all schematics and line diagram, which shall show applicable telemetry points. A common termination point shall be provided in the lift station to interface between the lift station and the Remote Telemetry Unit (RTU). Telemetry points shall consist of:

- High Wet Well
- 1 Pump Run
- Power Fail
- Intrusion
- Low Wet Well
- 2 Pump Run
- Pump Fail for each pump
- Spare

D. An electrical system designed to meet NEC, State and City standards. A 460/277 three-phase system with 100 amp outlet and cover shall be provided, equipped with an Appleton reverse service receptacle, model ADR1044-RS for connection to an emergency generator in the event of a power failure, or a City-approved equal. The receptacle outlet cover shall be painted red.

E. All pumps shall have rail guides to facilitate removal and replacement.

F. Pump Data:

- Size and type
- Pump curves
- Head capacity
- Velocity
- Manufacturer/distributor

G. Motor Data:
• Size and type
• Horsepower
• Service factor
• Motor insulation
• Cycle length
• Full load amps
• Voltage
• Frame and type of mount
• Manufacturer/distributor

H. Controls
• Timers and relay mounting
• Motor starter size
• Phase monitor
• NEMA type enclosure
• Thermal magnetic circuit breakers
• Alternator
• GFI outlet
• Indicating lights
• Level controls approved by City
• Telemetry failure points
• Elapse time meters
• Component manufacturer/distributor

I. Telemetry
• Alarm system (compatible with City system)

J. Housing
• Size and type
• Ventilation
• Access
• Insulation
• Locking mechanism
• Hold open device
• Safety chain

K. Testing
• Factory test
• Operational test
• Pressure test
• Personnel at test
L. Piping and Valves

- Size and type
- Bypass
- Manufacturer/distributor

M. Spare Parts

- Spare motor
- One complete mechanical seal unit
- Two intrinsically safe relays
- One set of replacement O-rings for all components
- Spare gaskets for all components

N. Miscellaneous: Water hose big service (unmetered) connected to a double check valve assembly mounted to the side of the lift station.

O. A lift station emergency by-pass connection shall be installed.

5.160 Packaged Lift Stations

In addition to provisions of Section 5.150, the following are minimum requirements for packaged lift stations.

A. Three mercury float switches or transducers as approved by the City to control pump down levels in the wet well. Each float shall function as follows: two pumps run; one pumps run and pumps off.

B. One mercury float switch or transducer as approved by the City in the wet well to signal low wet well conditions.

C. One mercury float switch or transducer as approved by the City in the wet well to signal high wet well conditions.

D. Auxiliary Power: Provision for connection required of all lift stations. The developer may also be required to furnish or participate in the cost of an auxiliary generator, at the discretion of the City.

E. Well Sizing:

- Type
• Size
• Storage capacity
• Access
• Access to locking mechanism
• Welding
• Safety entry equipment

F. Maintenance:

• Warranty
• Staff training upon completion
• Tools and equipment required

G. Electrical Service

• Specifications (service size, voltage, motor size, enclosure type, etc.)
• Source of power
• Calculations
• Single line diagram
• Primary distribution equipment
• Service entrance
• Branch circuiting
• Mechanical equipment power requirements
• Control diagrams and schematics
• Schedules of fixtures, panel boards and switch gear
• Shop drawings

H. Corrosion Protection

• Type of materials
• Primer and finish coatings
• Total thickness in mils, dry
• Linings
• Maintenance

I. The control pump down mercury float switches in the wet well must be powered through intrinsically safe devices.

J. Mercury float switches or transducers as approved by the City in the wet well shall be separated from each other by means of a wooden board and spaces to prevent tangling.

K. Wet well ladder rungs shall not extend beyond the specified inlet pipe invert elevation into the wet well.
L. Inlet pipes into the wet well shall be baffled to reduce turbulence in the wet well.

M. Lift station motors and pumps shall be close coupled and mounted vertically.

N. A manual toggle switch to allow selection of lead and lag pump is required.

O. A five-digit hour meter to 1/10 hour increments is required for each pump so that run time can be accounted for.

P. The heater shall be controlled by an adjustable thermostat.

Q. Lift stations shall have a blower capable of a minimum 300 cfm.

R. Pump motors shall have sealed bearings requiring no lubrication.

A complete operation and maintenance manual from the lift station manufacturer shall be supplied. Two copies shall be submitted for the initial review. Upon completion of construction, 5 copies are to be submitted to the City. Specific components and model numbers shall be in the manual.

5.170 Private Grinder Pump Systems

All grinder pump systems shall be privately owned. A private grinder pump system may be installed to serve single-family residential, multi-family residential, and certain commercial and industrial applications where approved by the City. Private grinder pump systems will only be allowed where the City has accessible sewer service that is at an elevation generally higher than the subject property. The purpose for permitting private grinder pump systems and requiring a Grinder Sewer System Agreement is to provide a mechanism that alerts future property owners of the presence of a pressurized sewer system on the property. Although the on-site system is private, the Public Works Department requires specific wet well and pump standards in addition to inspection and testing of the system to reduce the likelihood of inflow and infiltration of groundwater into the City’s sanitary sewer system and to insure that the pump head and pressure are
compatible with the existing sewer system. The system must meet City Standards for Cross Connection Control (see section 4.160).

If an entire plat is approved for private grinder pump systems, Grinder Sewer System Plat Covenants shall be included on the plat in lieu of the individual Grinder Sewer System Agreement.

A Private Grinder Sewer System is an on-site facility consisting of a wet well for collecting gravity effluent from the building, and a grinder pump situated in the wet well to process the effluent into a slurry and convey it into the City sewer system.

Operation and maintenance of the entire system, including, but not limited to, the wet well, pump, controls and piping, from the structure to the City sewer main is the responsibility of the property owner. The property owner shall maintain access to the wet well to facilitate maintenance of the system. The wet well lid should not be covered or buried although the owner may place a birdbath, potted plant or other yard decoration on the lid as long as it can be readily removed for repair or maintenance.

Private grinder pump systems located on commercially zoned properties that have kitchen or cooking facilities such as churches, community gathering places, restaurants, schools, etc., shall require installation of a grease trap per the Uniform Plumbing Code (UPC). The grease trap shall be installed on the gravity building sewer between the building and the wet well. Grease traps shall be maintained by the customer to the satisfaction of the City and DOH requirements.

Commercial private grinder pump systems and wet wells installed for the purpose of pumping industrial cleaning effluent, truck wash bays or car washes shall require the installation of an oil/water separator prior to the wet well.

Excessive use of a garbage disposal may clog the pump and piping assembly. The City encourages composting food materials instead of using a garbage disposal with grinder systems.

Only sanitary wastewater shall be discharged into the wet well. Roof drains and other storm water sources shall be strictly prohibited.
The property owner shall be responsible for curtailing water usage in the event of a high water alarm or a power outage. In the event of an extended power outage, the property owner may have to have the wet well pumped to avoid a sewage backup on the property or into the structure.

A. Design Standards

The design of any sewer shall meet all applicable standards and specifications as specified herein and as outlined in Section 5.020. Engineered plans are not required for private, on-site systems, however, a Grinder Sewer System Application complete with a sketch and submittals for the pumping system are required. In addition, either a Grinder Sewer System Agreement or Plat Covenants is required. If the property is located outside the City limits and within the City's Urban Growth Management Area boundary, a Special Power of Attorney for Annexation is required as a condition of service.

B. Building Sewer and Service Lateral

The gravity building sewer pipe between the building and the wet well shall be designed and installed in accordance with the Uniform Plumbing Code and Section 5.040. A cleanout shall be installed on the gravity building sewer, located between the structure and the tank, raised to grade and installed per the plumbing code. A backwater valve per Section 5.040 is required on the gravity line downstream of the cleanout and prior to the wet well.

The pressure service line from the pump to the City main 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. Solvent weld fittings for 1 and 2-inch pipe shall be socket type Schedule 80 and shall comply with ASTM D 1784 and ASTM D 2466. Pressure sewer services shall have a minimum 24-inches cover to top of pipe.

All pressure pipes shall be installed with continuous tracer tape installed 12 to 18-inches under the proposed finished grade. The marker tape shall be plastic, non-biodegradable, metal core or backing that can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal.

C. Pressure Lateral Valve and Valve Boxes
A ball valve shall be required at the end of the service stub at the property line. Ball valves at the property line shall be 1-1/4 or 2-inch Philmac FIPT x FIPT ball valves or approved equal. Valves shall be left in the "off" position and have a threaded plug installed in the end until the lot is inspected and approved for connection.

A check valve is required at the end of the service stub at the property line and shall be installed horizontally in a valve box along with the ball valve mentioned above. Check valves shall be a tee or wye pattern swing check rated for a minimum working pressure of 150 psi. Check valves shall be King Brothers, KSC or approved equal.

All valves shall be designed for use with corrosive fluids.

The valve box lid shall be marked "Sewer" so they can quickly be distinguished from valves in the water system. Valve boxes located in traffic areas shall be rated for traffic bearing loads.

D. Wet Well

The wet well tank shall be high density polyethylene (HDPE), fiberglass, or as approved by the City. Both shall be designed specifically to function as a sewer wet well for use in corrosive environments and shall be sized for the pump and the specific contributory flows.

All tanks shall be furnished with one EPDM grommet fitting to accept a 4-1/2-inch outside diameter schedule 40 sewer pipe.

The access-ways shall be an integral extension of the wet well and include a lockable cover assembly. Access-way design and construction shall facilitate field adjustment rings in increments of 3-inches without the use of any adhesives or sealants requiring cure time before installation can be completed.

All wet wells shall have all the necessary penetrations molded in and factory sealed. To ensure a leak-free installation, no field penetrations shall be acceptable.

All discharge piping shall be constructed of 304 series stainless steel and terminate outside the access-way bulkhead with a stainless steel, 1-1/4-inch female NPT fitting. The discharge
piping shall include a stainless steel ball valve rated for 200 psi.

The access way shall include a single NEMA 6P electrical quick disconnect for all power and control functions, factory installed with access way penetrations warranted by the manufacturer to be watertight.

The access-way shall also include a 2-inch PVC vent to prevent sewerage gases from accumulating in the tank.

HDPE wells shall have a melt index of 2.0 grams/10 minutes or lower to assure high environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Any incidental sections of a single wall portion of the double wall construction area are to be a minimum .250-inch thick. The wet well shall have a nominal thickness of 1/2-inch. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at the maximum designed burial depth. All wet wells must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

Fiberglass wet wells shall be custom molded fiberglass reinforced polyester resin. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent maximum external soil and hydrostatic pressure.

All wet wells shall have level transducers with float backup.

E. Anti-Flotation Device

Groundwater shall be rerouted or pumped to provide a firm, dry subgrade for the wet well and to guard against flotation or other damage resulting from general water or flooding.

A concrete anti-flotation collar, sized per the manufacturer’s instructions, shall be required and shall be pre-cast to the grinder pump station or poured in place. Each grinder pump station with its pre-cast anti-flotation collar shall have a minimum of 3 lifting eyes for loading and unloading purposes.
If the concrete is poured in place, the unit shall be leveled, and filled with water to the bottom of the inlet to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8-inch sleeve is required over the inlet prior to the concrete being poured.

F. Backfill for Wet Well

Proper backfill is critical to the long-term reliability of the wet well. The preferred backfill shall be controlled density fill (CDF) meeting WSDOT/APWA Standard Specification 2-09.3(1)E. CDF is the desired method as it assures proper compaction, especially where tight clearances make it difficult to assure proper compaction with dry materials. CDF shall not be dropped more than 4-feet from the discharge to the bottom of the hole to avoid separation of the constituent materials.

A minimum 6-inches of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8-inch or more than 3/4-inch shall be used as bedding material under the wet well.

Native backfill may be used if it meets Class I or Class II backfill material as defined in ASTM 2321. Class 1A and Class 1B are recommended where frost heave is a concern. Class 1B shall be used where the native soil is sand or if a high, fluctuating water table is expected.

If native soil consists of clean, compactable soil, with less than 12 percent fines, free of rocks, roots and organic material, it may be an acceptable backfill. It is recommended that a geotechnical evaluation of the material be obtained before specifying backfill. Non-compactable clays and silts are not suitable backfill for this or any underground structure such as inlet or discharge lines.

Soil must be compacted in lifts not to exceed six inches to reach a minimum final density of 85 percent. The finish grade line shall be between 1 and 4 inches below the bottom of the lid and final grade shall slope away from the grinder pump station.

G. Grinder Pump and Assembly
The grinder pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. Stainless steel plated rotors are not allowed. The stator shall be of an ethylene propylene synthetic elastomer. The material shall be suitable for use in wastewater environments. The pump shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 psig) and 9 GPM against a rated total dynamic head of 138 feet (60 psig). The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder will be of the rotating type with a stationary hardened and ground stainless steel shredding ring spaced in close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars. The grinder shall be positioned in such a way that solids are fed in an upward flow direction. The maximum flow rate through the cutting mechanism must not exceed 4-feet per second. The inlet shroud shall have a diameter of no less than 5-inches. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm's. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects" to finely divided particles that will pass freely through the passages of the pump.

At a maximum, the motor shall be a 1 hp, 1725 rpm, 240 Volt 60 Hertz, 1 phase, capacitor start, ball bearing, air-cooled induction type with a low starting current not to exceed 30 amperes. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor.

The grinder pump core unit shall have two lifting hooks complete with nylon lift-out harness connected to its top housing to facilitate easy core removal when necessary. All
mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. A push-to-run feature will be provided for field troubleshooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

The pump, grinder, motor and control assembly shall be E/One complete system as manufactured by Environment One Corporation or City approved equal. City approved equals shall meet the requirements of a high head, low-pressure system as specified herein.

H. Control Panel

The electrical controls shall be furnished and prewired to operate the pump and motor assembly. A built-in alarm system shall be required on every system. All alarm systems shall be UL approved for use in wastewater systems. The alarm panel shall be located in a conspicuous location as per the National Electrical Code (NEC) and local codes.

The power and alarm circuits must be on separate, 15 amp; single pole circuit breakers. The alarm panel shall include both audio and visual alarm, push-to-run switches and high level (redundant) pump starting controls. The alarm sequence is to be as follows:

1. When liquid level in the sewage wet well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.

2. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.

3. Visual alarm remains illuminated until the sewage level in the wet well drops below the “off” setting of the alarm pressure switch.

4. The visual alarm shall be mounted to the control panel in such a manner as to maintain NEMA 4X rating. For duplex units, in addition to the above, two high-level indicator lights shall be mounted behind the access door.

I. Backflow Prevention Device
A backflow prevention device, in accordance with the provisions of WAC 246-290-490, is necessary to protect the domestic water system from contamination. The owner shall install a backflow prevention device into the water system on the property. The backflow prevention device shall be selected, installed and maintained to satisfy any governmental regulation and requirements and shall be in accordance with Department of Ecology standards.

The owner, at the owner’s sole expense, shall have the backflow prevention device inspected annually by a contractor certified by the State of Washington for inspection of these devices. A report shall be provided to the City of Shelton immediately upon receipt by the owner. In the event that the City does not have a current annual inspection report on file, it shall have the right, but not the responsibility, to obtain one from a contractor of its choice. All costs or expenses, and a 20 percent administrative fee will be billed to the owner.

5.180 Interim Sewage Facilities – Urban Growth Area

In those areas located within the City of Shelton’s Urban Growth Area where annexation or connection to a permanent public sewerage system is not feasible, an interim community on-site sewer system may be constructed to serve residential and light commercial locations, when approved by the City prior to design and construction. In certain cases, a value engineering study or approved equivalent may be required by the City prior to granting approval for an interim sewerage facility.

Maintenance and pumping of Interim Sewerage Facilities shall be the responsibility of the property owner(s).

5.190 Design Standards for Interim Community On-Site Sewer Systems

The design of any interim on-site sewer system shall conform to the criteria as set forth in the City of Shelton Comprehensive Plan and these Standards.

All collection lines, dry lines, pumping stations and all other sewer appurtenances and sizing shall be installed at the time of initial construction. The layout of the dry line main extension shall provide for the future continuation of the existing public sewer system as determined by the City. In
addition, the dry line main extension shall be installed within a plat or property prior to new roadway construction and extended to and through the side of the affected property fronting the main to the existing roadway and sewer main.

The interim community on-site sewer system shall be designed in such a way that each residence will discharge into their own on-site septic tank, which will then discharge by gravity into a community wet well. The community wet well will pump the effluent into a pressurized community drain field. Upon approval of the City of Shelton and Mason County, a community system may be designed utilizing an appropriately sized community solids tank and subsequent settling tanks before discharge into a community wet well. Tank design standards shall meet the applicable standards as set forth below for septic tanks.

Plan for the proposed on-site sewer system shall be prepared by a licensed professional engineer registered in the State of Washington and shall be submitted to the City for review and approval. The City will coordinate the review by the State and County Health Departments, whose approval is also required.

A. Pumping Chamber

The pumping chamber leading to the pressurized drain field shall be designed and constructed as set forth in Sections 5.150 and 5.160 for Lift Stations. The dry line installed for future connection to the public sewer system shall terminate in the pumping chamber. A valve shall be installed outside the wet well connected to the dry line for future use.

B. Grinder Pump

All private pumps on service lines shall be grinder pumps. Grinder pumps must meet all Uniform Plumbing Code requirements and shall connect to a gravity sewer lateral at the property or easement line.

C. Septic Tank

Each residence shall have its own septic tank. Only sanitary wastewater shall be discharged into the tank. Roof drains and other stormwater sources shall be strictly excluded. The tank shall be watertight, and shall be equipped with twin risers as specified, with the exception
that the 24-inch solids riser may be covered a maximum of 12 inches. It is the homeowner's responsibility to locate and uncover the solids riser when pumping of the septic tank is required. The 30-inch pump chamber riser may not be covered. It is the property owner's responsibility to pump the tanks.

The effluent shall be discharged by gravity to the community pumping chamber. In the event that topography prohibits a specific lot from achieving a gravity discharge, an approved STEP system shall be installed.

D. Pipe

1. Pressurized Drain Field

All pipe used in construction of the pressurized drain field shall be as specified in these Standards and shall be specified on the approved plans.

2. Gravity Lines

All pipe installed from the septic tanks to the pumping chamber, and all dry lines installed for future extension shall meet the criteria set forth in Section 5.020 of the Standards for gravity sewer lines.

3. Side Sewer or Lateral

The gravity side sewer or lateral between the building and the tank shall be designed and installed in accordance with the Uniform Plumbing Code. Maintenance of this line is the property owner's responsibility.

4. Connection

When the dry line is activated by the City, each property owner shall be required to connect to the public sewer system and decommission the septic tank on their property per the applicable Standards. This requirement shall be placed on the property title prior to the initial sale of the property.

5.200 Sanitary Sewer Main Construction (General Notes)
In addition to the General Construction Notes in Chapter One, the Engineer shall include the following notes on any plans dealing with the construction of alterations, extensions or connections to the sanitary sewer system.

A. The City shall be notified at least 48 hours in advance of a tap connection to an existing sewer main. The City’s inspector shall be present at the time of the tap.

B. All sewer mains shall be field staked for grades and alignment by a registered land surveyor or licensed engineer.

C. Pre-cast manholes shall meet the requirements of ASTM C478. Manholes shall be Type 1-48" manhole unless otherwise specified on the plans. Joints shall be rubber gasket conforming to ASTM C443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole with an approved grout, installed per the manufacturer’s recommendations.

D. Side sewer services shall be PVC, ASTM D 3034 SDR 35 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. All services shall include Tracer Wire.

E. All lines shall be high velocity cleaned, vacuumed and pressure tested in conformance with these Standards. Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main shall include TVing of the main by the contractor. Immediately prior to TVing enough water shall be run down the line so it comes out the lower manhole. The video tape shall show the distance from the manhole that the camera enters to all connections and to the next manhole. Camera work must be completed utilizing the latest version of Cues’ GraniteNet Software, or as approved by the City. A copy of the video tape shall be submitted to the City. Acceptance of the line will be made after the tape has been reviewed and approved by the City.

F. The contractor 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. A vacuum test of all manholes in accordance with these Standards is also required. Testing shall take place after all underground
utilities are installed and compaction of the roadway subgrade is completed.

G. All discharges from the sewerage collection system and spills of any type that may affect human health or the environment must be immediately reported by the contractor to the City.

H. Pea gravel shall be allowed for pipe bedding up to the spring line of pipe.
LIFT STATION INSPECTION CHECKLIST

Inspectors: ___________________________________  Date: _______________________

___________________________________  _____________________________________

Name of Lift Station: ____________________________________________________________
Location:_______________________________________________________________________
Address: __________________________________________ ____________________________
Assigned Lift Station Number: ______________

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 and #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 ____________  

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:     _______________________________________
___________________________________________________

Sealed Bearings:     _____  _____
Comments:     _______________________________________
___________________________________________________

Pump Alternator Operation:     _____  _____
Comments:     _______________________________________
___________________________________________________

Control Panel components:
  Pump Run Lights:     _____  _____
  Hour Meters:     _____  _____
  H.O.A.:     _____  _____
  Limit Switches:     _____  _____
Comments:     _______________________________________
___________________________________________________

OPERATION OKAY
Yes  No

Alarm Functions:
  Power Fail:     _____  _____
  High Wet Well:     _____  _____
  Low Wet Well:     _____  _____
<table>
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<tr>
<td>Pump #1 Fail</td>
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<td>Dry Well Flood</td>
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</table>

**Actual Wet Well Pump down and fill levels:**

- **High Water:**
- **Fill Level:**
- **Pump Down:**
- **Low Level:**

**Wet Well blower Operation:**

- **Comments:**

- **Wet Well Ladder:**

- **Comments:**

- **Spare Parts Furnished:**

- **Comments:**

- **O & M Manuals (5 copies):**

- **Comments:**

**Telemetry Function at Maintenance Shop:**

- **Power Fail:**
- **High Wet Well:**
- **Low Wet Well:**
- **Pump #1 Fail:**
- **Pump #2 Fail:**
- **Dry Well Flood:**
- **Smoke and Fire:**
- **Intrusion:**
- **Pump #1 Run:**
- **Pump #2 Run:**

**Comments:**
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# LIST OF DRAWINGS

## CHAPTER 5 SEWER

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<td>Type 1 Manhole (48” &amp; 54”)</td>
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<tr>
<td>Type 2 Manhole (72” &amp; 96”)</td>
<td>SS-02</td>
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<tr>
<td>Type 3 Manhole</td>
<td>SS-03</td>
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<td>Polypropylene Ladder</td>
<td>SS-04</td>
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<tr>
<td>Alternate Polypropylene Plastic Step</td>
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<td>4” Single Sanitary Sewer Lateral Service</td>
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<tr>
<td>6” Single Sanitary Sewer Lateral Service</td>
<td>SS-06</td>
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<tr>
<td>Typical Cleanout and Backwater Valve</td>
<td>SS-07</td>
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<tr>
<td>Outside Drop Manhole Connection</td>
<td>SS-08</td>
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<tr>
<td>Inside Drop Manhole Connection</td>
<td>SS-09</td>
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<tr>
<td>Manhole Ring and Cover</td>
<td>SS-10</td>
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<tr>
<td>East Jordan Manhole Frame And Cover</td>
<td>SS-11</td>
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<tr>
<td>Manhole &amp; Lamphole Surface Restoration within Right-of-Way</td>
<td>SS-12</td>
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<tr>
<td>Cleanout Detail</td>
<td>SS-13</td>
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<tr>
<td>Sewer Main Lamphole Detail</td>
<td>SS-13A</td>
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<tr>
<td>ROMAC Style “CB” Sewer Saddle</td>
<td>SS-14</td>
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<tr>
<td>Sewer Line Terminology</td>
<td>SS-15</td>
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# TABLE OF CONTENTS

## SANITARY SEWER DETAILS

| SS-01     | TYPE 1 MANHOLE (48" & 54")          |
| SS-02     | TYPE 2 MANHOLE (72" & 96")          |
| SS-03     | TYPE 3 MANHOLE                      |
| SS-04     | POLYPROPYLENE LADDER                |
| SS-04A    | ALTERNATE POLYPROPYLENE PLASTIC STEP|
| SS-05     | 4" SINGLE SANITARY SEWER LATERAL SERVICE |
| SS-06     | 6" SINGLE SANITARY SEWER LATERAL SERVICE |
| SS-07     | TYPICAL CLEANOUT & BACKWATER VALVE  |
| SS-08     | OUTSIDE DROP MANHOLE CONNECTION     |
| SS-09     | INSIDE DROP MANHOLE CONNECTION      |
| SS-10     | MANHOLE RING AND COVER              |
| SS-11     | EAST JORDAN MANHOLE FRAME & COVER   |
| SS-12     | MANHOLE & LAMPHOLE SURFACE RESTORATION WITHIN THE RIGHT-OF-WAY |
| SS-13     | CLEANOUT DETAIL                     |
| SS-13A    | SEWER MAIN LAMPHOLE DETAIL          |
| SS-14     | ROMAC STYLE "CB" SEWER SADDLE       |
|           | (TYPICAL SEWER CONNECTION TO EXISTING SEWER MAIN) |
| SS-15     | SEWER LINE TERMINOLOGY              |
| SS-16     | THIS PAGE INTENTIONALLY LEFT BLANK   |
| SS-17     | THIS PAGE INTENTIONALLY LEFT BLANK   |
NOTES:

1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M-199 (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN STANDARD SPECIFICATIONS.

2. ALL REINFORCED CAST IN PLACE CONCRETE SHALL BE CLASS 4000. NON-REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.

3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.

4. ALL BASE REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PS AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MINIMUM CLEARANCE.

5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAMETER PLUS MANHOLE WALL THICKNESS. MAXIMUM HOLE SIZE IS 36" FOR 48" MANHOLE, 42" FOR 54" MANHOLE. MINIMUM DISTANCE BETWEEN HOLES IS 8" (MEASURED ON THE INSIDE OF THE MANHOLE).

6. MANHOLE SIZE DEPENDS ON SIZES, LOCATION AND NUMBERS OF HOLES FOR PIPES. MANHOLE DESIGN AND SIZE SHALL BE APPROVED AND WARRANTED BY THE MANHOLE SUPPLIER.

7. FOR HEIGHTS OVER 25' MANHOLE BASE SLAB DESIGN SHALL BE DESIGNED BY A STRUCTURAL ENGINEER.

8. GROUT ALL PICK HOLES INSIDE & OUTSIDE.

9. FOR PATCHING Voids AROUND PIPES, PICKING EYE HOLES, BETWEEN SECTIONS & RISERS, AND FRAMES, USE: QUIKRETE NON-SHRINK PRECISION GROUT—PRODUCT NO. 1585-00 OR QUIKRETE® COMMERCIAL GRADE FASTSET DOT MIX PRODUCT NO. 1244-56 –81. FOLLOW ALL INSTRUCTIONS PROVIDED BY QUIKRETE® CO. SPECIFIC TO PRODUCT USED REGARDING MIXING DURATION, TEMPERATURE, ETC.

Mastic & GROUT REQUIRED BETWEEN EACH RISER LIP & BETWEEN FRAME AND RISER (SEE RISER DETAIL THIS SHEET)

ADJUSTMENT SECTION
GRADE RINGS REQUIRED

PRECAST CONC
(ECCENTRIC UNLESS OTHERWISE SPECIFIED)

STEPS
SEE DET. SS-04A

PRECAST RISER SECTIONS
(GROUT INSIDE)

LADDER
SEE DET. SS-04

CRUSHED SURFACING BASE COURSE 6" MIN. DEPTH COMPACTED TO 95% OF STANDARD DENSITY

MAHOLE
TYPE 1
48" & 54"

REINFORCING STEEL (FOR PRECAST BASE WITH INTEGRAL RISER)
0.15 SQ. FT./LIN. EACH DIRECTION FOR 48" DIA.
0.19 SQ. FT./LIN. EACH DIRECTION FOR 54" DIA.

SEPARATE CAST IN PLACE OR SEPARATE PRECAST BASE

REINFORCING STEEL (FOR SEPARATE BASE ONLY)
0.25 SQ. FT./LIN. EACH DIRECTION FOR 48" DIA.
0.30 SQ. FT./LIN. EACH DIRECTION FOR 54" DIA.

MAHOLE TYPE 1
48" & 54"

APPROVED:
CRAG GREGORY

PUBLIC WORKS DIRECTOR

1/2019 GS NTS
NOTES:

1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M-199 (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN STANDARD SPECIFICATIONS.

2. ALL REINFORCED CAST IN PLACE CONCRETE SHALL BE CLASS 4000. NON-REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.

3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.

4. ALL BASE REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PS AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MINIMUM CLEARANCE.

5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAMETER PLUS MANHOLE WALL THICKNESS. MAXIMUM HOLE SIZE IS 60" FOR 72" MANHOLE, 84" FOR 96" MANHOLE. MINIMUM DISTANCE BETWEEN HOLES IS 12" (MEASURED ON THE INSIDE OF THE MANHOLE).

6. MANHOLE SIZE DEPENDS ON SIZES, LOCATION AND NUMBERS OF HOLES FOR PIPES. MANHOLE DESIGN AND SIZE SHALL BE APPROVED AND WARRANTED BY THE MANHOLE SUPPLIER.

7. FOR HEIGHTS OVER 25' MANHOLE BASE SLAB DESIGN SHALL BE DESIGNED BY A STRUCTURAL ENGINEER.

8. GROUT ALL PICK HOLES INSIDE AND OUTSIDE.


10. MORTAR MUST BE MIXED BY A MECHANICAL DEVICE SUCH AS DRILL & PADDLE MIXER.

11. FOLLOW ALL INSTRUCTIONS PROVIDED BY QUIKRETE® CO. SPECIFIC TO PRODUCT USED REGARDING MIXING DURATION, TEMPERATURE, ETC.

MANHOLE

TYPE 2

72" & 96"

PUBLIC WORKS DIRECTOR
CRAIG GREGORY

APPROVED:

1/2019
### Riser Detail (Plan View)

- **Precast Base Joint**
- **Precast Riser Section(s)**
- **Ladder Sff. Std. Detail SS-G4**
- **Concrete Base Joint**

### Manhole Dimension Table

<table>
<thead>
<tr>
<th>Dia.</th>
<th>Min. Wall Thickness</th>
<th>Min. Base Thickness</th>
<th>Maximum Knockout Size</th>
<th>Min. Distance Between Knockouts</th>
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<tr>
<td>48&quot;</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>36&quot;</td>
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### Notes:

1. Manholes to be constructed in accordance with AASHTO M-199 (ASTM C 478) unless otherwise shown on plans or noted in standard specifications.
2. All reinforced cast in place concrete shall be class 4000. Non-reinforced concrete in channel and shelf shall be class 3000. All precast concrete shall be class 4000.
3. Precast bases shall be furnished with cutouts or knockouts. Knockouts shall have a wall thickness of 2" minimum.
4. All base reinforcing steel shall have a minimum yield strength of 60,000 psi and be placed in the upper half of the base with 1" minimum clearance.
5. Manhole size depends on sizes, location and numbers of holes for pipes. Manhole design and size shall be approved and warranted by the manhole supplier.
6. Grount all pick holes inside and outside.
7. For patching voids around pipes, picking eye holes, between sections & risers, and frames, use: Quikrete® Non-Shrink Precision Grount Product No. 1585-00 or Quikcrete® Commercial Grade Fastset DOT Mix Product No. 1244-56 -81.
8. Mortar must be mixed by a mechanical device, such as drill & paddle mixer.
9. Follow all instructions provided by Quikrete®. Specific to product used regarding mixing duration, temperature, etc.
NOTES:

1. STEPS SHALL BE STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC CONFORMING TO:
   (A) ASTM C 478 AND AASHTO M–199, MINIMUM HORIZONTAL LOAD SHALL BE 1500 LBS.
   (B) ASTM A615 GRADE 60 (DEFORMED REINFORCING STEEL BAR).
   (C) POLYPROPYLENE CONFORMS TO D–4101.

2. MANHOLE STEPS SHALL HAVE MOLDED SAFETY HAND GRIP. RED REFLECTORS ARE PREFERRED.

3. ALL FABRICATION DIMENSIONS INDICATED ARE MINIMUM.

4. THE ENTIRE POLYPROPYLENE PLASTIC MATERIAL SURROUNDING THE REINFORCING STEEL BAR SHALL BE CAST MONOLITHICALLY. MINIMUM COVER SHALL BE 3/16–INCH.

5. STEPS SHALL BE SPACED AT A MAXIMUM OF 12–INCHES.

6. STEPS SHALL BE INSTALLED IN ACCORDANCE WITH THE APPROVED MANUFACTURERS RECOMMENDED PROCEDURE.
NOTES:

1. STEPS SHALL BE STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC CONFORMING TO:
   (A) ASTM D 478 AND AASHTO M-199, EXCEPT THAT THE MINIMUM HORIZONTAL PULLOUT LOAD
   SHALL BE 1500 LBS.
   (B) ASTM A 615 GRADE 60 (DEFORMED REINFORCING STEEL BAR).

2. ONLY STEPS APPROVED BY THE ENGINEER SHALL BE USED.

3. ALL FABRICATION DIMENSIONS INDICATED ARE MINIMUM.

4. THE MINIMUM TOTAL CROSS-SECTIONAL AREA OF THE EXPOSED PORTION OF THE STEEL
   INCLUDING THE 1/2-INCH DEFORMED REINFORCING STEEL BAR, AND EXCLUDING THE NON-SLIP
   TREAD SURFACE, SHALL BE ONE SQUARE INCH.

5. THE ENTIRE POLYPROPYLENE PLASTIC MATERIAL SURROUNDING THE REINFORCING STEEL BAR
   SHALL BE CAST MONOLITHICALLY. MINIMUM COVER SHALL BE 3/16-INCH.

6. THE FOLLOWING DIMENSIONS SHALL APPLY UNLESS OTHERWISE NOTED ON THE DRAWINGS OR
   STANDARD PLANS FOR SPECIFIC STRUCTURES:
   \[ D = 6' ±1/4', E = 1/4' ±1/4' \]

7. STEP SHALL BE SPACED AT A MAXIMUM OF 12-INCHES.

8. STEPS SHALL BE INSTALLED IN ACCORDANCE WITH THE
   APPROVED MANUFACTURER’S RECOMMENDED
   PROCEDURE.

ALTERNATE
POLYPROPYLENE
PLASTIC STEP

CRAIG GREGORY
PUBLIC WORKS DIRECTOR

1/2019 GS NTS

SS-04A
NOTES:

1. NO GLUED FITTINGS ALLOWED.
2. PIPE SHALL BE PVC SDR 3035 PIPE & GASKET.
3. SEE TYPICAL CLEANOUT & BACKWATER VALVE INSTALLATION DETAIL SS-07.

BEDDING NOTES:

1. GRAVEL BACKFILL FOR PIPE ZONE BEDDING SHALL CONFORM WITH WSDOT STD. SPEC. 9-03.12(3). PEA GRAVEL ALLOWED TO 50% OF THE O.D. (SPRING LINE).
2. SEE C.O. SHELTON STD. DETAILS T-18 AND T-19 FOR TRENCH RESTORATION ABOVE THE PIPE ZONE BEDDING.
3. BEDDING AND GRADE SHALL BE ESTABLISHED PRIOR TO PIPE BEING PLACED IN TRENCH.
4. IF THE LATERALS STOPS AT THE EDGE OF RIGHT OF WAY TERMINATE THE LINE WITH A WINGNUT PIPE PLUG/CHERNE INDUSTRIES OR APPROVED EQUIVALENT IN TEE WYE.
5. IF SEWER MAIN ELEVATION DOES NOT ALLOW 6' MIN. DEPTH OF LATERAL AT R/W LINE, INSTALL LATERAL AS DEEP AS POSSIBLE WHILE MAINTAINING MIN. SLOPE. CONFIRM ELEV: W/ PROJECT ENGINEER BEFORE LATERAL INSTALLATION.

SEE CONCRETE COLLAR (DET SS-12) AND CLEANOUT (DET SS-13)

PLAN VIEW

4" MIN. DIAMETER
SINGLE SANITARY SEWER LATERAL SERVICE

Approved: CRAIG GREGORY
PUBLIC WORKS SUPERVISOR
1/2019 GS NTS

SS-05
NOTES:

1. TYPE "CB" SEWER SADDLE FOR CONNECTION TO EXISTING SEWER MAIN (SEE C.O. SHELTON STD. DETAIL SS-14)

2. RING & COVER (SEE DET. SS-12)

3. CONCRETE COLLAR (SEE DET. SS-12)

4. #6 BAR FROM INVERT OF PIPE TO 4" BELOW FINISH GROUND

BEDDING NOTES:

1. GRAVEL BACKFILL FOR PIPE ZONE BEDDING SHALL CONFORM WITH WSDOT STD. SPEC. 9-03.12(3). PEA GRAVEL ALLOWED TO 50% OF THE O.D. (SPRING LINE)

2. SEE C.O. SHELTON STD. DETAILS T-18 & T-19 FOR TRENCH RESTORATION ABOVE THE PIPE ZONE BEDDING

3. BEDDING AND GRADE SHALL BE ESTABLISHED PRIOR TO PIPE BEING PLACED IN TRENCH.

4. IF THE LATERALS STOPS AT THE EDGE OF RIGHT OF WAY, TERMINATE THE LINE WITH A WING NUT PIPE PLUG/CHERNE INDUSTRIES OR APPROVED EQUAL IN TEE WYE.

5. IF SEWER MAIN ELEVATION DOES NOT ALLOW 6' MIN. DEPTH OF LATERAL AT R/W LINE, INSTALL LATERAL AS DEEP AS POSSIBLE WHILE MAINTAINING MIN. SLOPE. CONFIRM ELEVS. W/ PROJECT ENGINEER BEFORE LATERAL INSTALLATION.

SEWER MAIN

NOTES:

1. NO GLUED FITTINGS ALLOWED.

2. PIPE SHALL BE PVC SDR 3035 PIPE & GASKET.

3. SEE TYPICAL CLEANOUT & BACKWATER VALVE INSTALLATION DETAIL SS-07.

6" MIN. DIAMETER
SINGLE SANITARY SEWER LATERAL SERVICE

SEE CONCRETE COLLAR (DET SS-12) AND CLEANOUT (DET SS-15)

#6 REBAR @ END OF STUB OUT (TYP.)

TEE WYE FOR CONNECTION TO NEW SEWER MAIN

EXTEND & SPOOL 3' OF TRACER WIRE UNDER RING AND COVER

TOP OF PLUG TO BE 4" CLR BELOW UNDERSIDE OF COVER

WING NUT PIPE PLUG—CHERNE INDUSTRIES OR APPROVED EQUAL

IF TERMINATING @ R/W — INSTALL CHERNE PLUG IN TEE WYE

FITTINGS AS REQUIRED TO GET PERPENDICULAR TO GROUND SURFACE

FITTINGS AS REQUIRED TO G/C PERPENDICULAR TO GROUND SURFACE

BETWEEN UNDERSIDE OF COVER W/ PROJECT ENGINEER}

1/2019 GS NTS
DUCTILE IRON DROP CONNECTION

Cleansout
See detail SS-13

Extend & spool 3' of tracer wire under ring and cover

10"-12" pvc riser

Install cleanout with wing nut pipe plug—cherne industries or approved equal

D.I. pipe

Tracer wire on sewer main

Pipe adaptor

One length of ductile iron cl 52 pipe to solid bearing when span is more than 4'

Diameter is same as horizontal pipe unless approved by the engineer

Ductile iron pipe 90° sweep
ANSI A21.10

Blocking shall be commercial concrete poured in place against undisturbed earth. isolate fitting from concrete thrust block with 6 mil. plastic or equal

4" clear between cap & plug

Mechanical joint w/megalugs (typ)

Pipe bedding (typ)

Existing manhole wall

1/2 blind flange as dam

Kor-n-seal boot (grout interior)

Backfill with gravel borrow unless otherwise directed by engineer. Compact to 95% max. density

Deck elevation at or above highest crown

Kor-n-seal boot (grout interior)

See notes on std. details SS-01, SS-02, or SS-03 for patching requirements

Pipe inside diameter

Channel to mainline

OUTSIDE DROP MANHOLE CONNECTION

Approved: Craig Gregory

1/2019 GS NTS

SS-08
DRILL AND TAP 5/8" - 1NC HOLE FOR 1 1/2" X 5/8" STAINLESS STEEL SOCKET HEAD CAP SCREW (TYP.)

1/2" (TYP.)

SEE DETAIL "B"

NOTES

1. THE GASKET AND GROOVE MAY BE IN THE SEAT (FRAME) OR IN THE UNDERSIDE OF THE COVER. THE GASKET MAY BE "T" SHAPED IN SECTION. THE GROOVE MAY BE CAST OR MACHINE.

2. BOLT-DOWN CAPABILITY IS REQUIRED ON ALL FRAMES, GRATES, AND COVERS, UNLESS SPECIFIED OTHERWISE IN THE CONTRACT. PROVIDE 3 HOLES IN THE FRAME THAT ARE VERTICALLY ALIGNED WITH THE GRATE OR COVER SLOTS. THE FRAME SHALL ACCEPT THE 5/8" - 1 NC X 2" ALLEN HEAD CAP SCREW BY BEING TAPPED, OR OTHER APPROVED MECHANISM. LOCATION OF BOLT DOWN HOLES VARIES BY MANUFACTURER.

3. FOR BOLT-DOWN MANHOLE RING AND COVERS THAT ARE NOT DESIGNATED "WATERTIGHT," THE NEOPRENE GASKET, GROOVE, AND WASHER ARE NOT REQUIRED.

4. WASHER SHALL BE NEOPRENE (DETAIL "B").

5. IN LIEU OF BLIND PICK NOTCH FOR MANHOLE COVERS, A SINGLE 1" PICK HOLE IS ACCEPTABLE. HOLE LOCATION AND NUMBER OF HOLES MAY VARY BY MANUFACTURER.

6. ALTERNATIVE REINFORCING DESIGNS ARE ACCEPTABLE IN LIEU OF THE RIB DESIGN.

7. WATERTIGHT MANHOLE COVER SHALL BE OLYMPIC FOUNDRY INC., OR APPROVED EQUAL.

8. ALL MANHOLE RING & COVERS TO MEET CURRENT WSDOT STD. SPECIFICATIONS.
NOTE:
A CLEANOUT SHALL BE PROVIDED FOR EACH TOTAL CHANGE OF 90 DEGREES OF GRADE OR ALIGNMENT AND IN NO CASE SHALL THE SPACING OF CLEANOUTS EXCEED 100 FEET.
NOTE:
1. ADDITIONAL FITTINGS MAY BE REQUIRED TO MAKE CLEANOUT PERPENDICULAR TO GROUND SURFACE.
2. NO TEES ALLOWED. TEE WYE'S ONLY.
3. CONCRETE COLLAR AROUND RING AND COVER IN ALL AREAS.
4. ALL CONCRETE SHALL BE COMMERCIAL CONCRETE PER CURRENT WSDOT STD. SPECIFICATIONS.
5. ALL ASPHALT PAVEMENT & MATERIAL BELOW SURFACE TREATMENT TO BE PER C.O. SHELTON STANDARDS.

CAST IRON RING & COVER
W/ CONCRETE COLLAR

CONC. COLLAR
SEE NOTE 4 & 5 THIS SHT.
SEE DET. SS-12 FOR SPECS.

RING & COVER
(DET SS-13)

12"  18"
12"  12"
36"

WING NUT PIPE
PLUG/CHERNE INDUSTRIES
OR APPROVED EQUAL

4" CLR. BETWEEN
BOTTOM OF COVER &
TOP OF WINGNUT PLUG

10"- 12" PVC
ADJUSTABLE RING

3' OF TRACER WIRE TO BE
SPOOLED UNDER RING &
COVER

TRACER WIRE
(TYP.)

8"Ø VERTICAL PIPE

1 LF OF PIPE

TEE WYE

TEE WYE

SEWER MAIN

LAMPHOLE DETAIL

SS-13A
SEWER SADDLE

TYPICAL SEWER CONNECTION TO EX. SEWER MAIN

NOTE:

1. **Check diameter of main and branch pipe to make sure you are using the correct size saddle gasket.** Also check gasket to make sure it is the size you think it is.

2. **Remove as much dirt and corrosion from pipe surfaces as possible.**

3. **Make sure no foreign materials lodge between saddle gasket and pipe as nuts are tightened.**

4. **Avoid loose fitting wrenches or wrenches too short to achieve proper torque.**

5. **Take extra care to follow proper bolt tightening procedures and torque recommendations.**

6. **Back fill and compact carefully around lateral/ outlet.**

7. **The hole cut in the main should be no larger than the inside diameter of the saddle gasket.** The 6" gasket has an I.D. of 5.20, the 8" gasket has an I.D. of 6.40.

8. **Lubricating between the saddle gasket and the main on rough or large O.D. pipe can improve the sealing capacity of the saddle.**

9. **During installation the temperature of the saddle gasket itself can be important.** The temperature of the saddle gasket should not fall below ~45° F.

10. **It is necessary to bevel the lateral/outlet pipe end and lubricate pipe end and saddle gasket hub.**

11. **When reinstalling parts with stainless steel hardware, there may be a loss in pressure holding ability due to worn or damaged threads during original installation.**

ROMAC STYLE "CB"

SEWER SADDLE

TYPICAL SEWER CONNECTION TO EX. SEWER MAIN

APPROVED: CRAIG GREGORY

PUBLIC WORKS DIRECTOR  

DATE: 1/19  

SCALE: 1/12

SS-14
LEGEND:

1. SANITARY SEWER BACKWATER VALVE DEVICE
2. SANITARY SEWER CLEANOUT
3. SANITARY SEWER MANHOLE
4. CONSTRUCTED PER "UNIFORM PLUMBING CODE" GUIDELINES

SEWER LINE TERMINOLOGY

100' MAX. BETWEEN SSCO

NO GLUED FITTINGS ALLOWED

RIGHT-OF-WAY/PROPERTY LINE

SEWER MAIN

SIDE SEWER (SERVICE CONNECTION)

LATERAL

SSCO

BLDG. SEWER

PER UPC – BUILDING DEPT.

INSPECTION REQUIRED

PUBLIC WORKS

INSPECTION REQUIRED

 legends

SSMH