YELM ENGINEERING SPECIFICATIONS AND STANDARD DETAILS

CHAPTER 5 SEWER

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CHAPTER 5.00 SEWER

5.00 GENERAL CONSIDERATIONS

5.00.010 General

The City of Yelm Technical Specifications were originally developed for use with onsite Septic Tank Effluent Pump (STEP) tank installations, onsite wastewater disposal system installations that were converted to STEP, and STEP collection line installations. Revisions in 2023 to these specifications added sections for the implementation of Grinder Systems and Gravity Sewers in the future.

Sanitary sewage 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 Yelm's sanitary sewer system shall be approved by the City Engineer and shall conform to the City of Yelm Comprehensive Sewer Plan, Thurston County Health Department, Department of Ecology (DOE), and Washington State Department of Health (DOH) requirements. In case of conflict between any of these Standards, the most stringent conditions shall apply. Specific site conditions may require variance from the comprehensive plan and require approval from the City Engineer and/or Public Services Director.

Within the corporate City limits where a public sewer is available it shall be used. Where public sewer is not available within the City limits, connection is required provided that the premises are within 200 feet of the public sewer measured from the lot line closest to the existing portion of the City’s collection system; however, all new homes and businesses constructed within the corporate City limits shall connect to public sewer regardless of distance from the public sewer.

All new homes and businesses constructed within the City of Yelm’s Urban Growth area shall connect to public sewer, regardless of distance, when made a condition of land use approval or where public sewer is already located within 200 feet of the property line of the parcel.

Anyone who wishes to extend or connect to the City's sewer system shall contact the Public Services Department for a sewer extension/connection fee estimate. The design of the proposed sewer shall start from the existing system.

Prior to the operation of any sewer systems, all Public Works improvements shall be completed and approved and all applicable fees shall be paid. In the event that a sewer project has no new water meters to trigger payment of

the connection fees, the sewer connection fees shall be paid prior to the start of construction.

Ownership, operation and maintenance of the tank, pump, and pump controls shall be the responsibility of the City only after the system has been inspected and approved, an easement granted, ownership of the STEP component conveyed to the City, and the warranty period of one year has expired. The City requires that easements for a new development be granted on the plat, otherwise, an easement for each lot shall be granted at the time of connection.

Currently, only the Orenco STEP Pump System shown in the drawing section of this Chapter has been approved by the City. Any alternate shall be reviewed and approved by the City.

5.00.020 Shared Sewer System

Customers located on the same parcel may share a single sewer system, regardless of whether these living units or businesses are configured as two separate structures or as a single structure. In the case of a shared tank, a separate dedicated electric service must be installed for the STEP tank.

In the event a property with a shared system is subdivided or multiple properties utilizing a single shared system desire to alter the sewer system such as upsizing, replacing, or adding another tank(s), the shared system must be separated into individual systems.

5.00.030 Grease Interceptors

Commercial systems that have kitchen or cooking facilities such as churches, community gathering places, restaurants, schools, etc. shall be required to install a grease interceptor. The grease interceptor shall be designed, installed and constructed according to applicable local regulations and the Uniform Plumbing Code. The grease interceptor shall be installed on the gravity building sewer between the building and the tank. Grease interceptors shall be maintained by the customer to the satisfaction of the City and DOH requirements. Verification of grease interceptor maintenance shall be provided to the City yearly and upon request.

5.00.040 Roof Drains and Stormwater discharges to Sanitary Sewer

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

5.00.050 Staking & Testing

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.

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

A. Gravity Sewer

a. 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 perform an air pre-test prior to notifying the City to schedule the actual test. The acceptance air test shall be made after 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.

b. Testing of the sewer main shall include a television inspection by the contractor. The camera shall 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 inch in diameter and on a flexible shaft. Television inspection shall be done after the WSDOT low pressure air test # 7-17.3(2) F has passed, the pipe line cleaned 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, unless televising is done right after the cleaning has taken place. A copy of the video and written report shall be submitted to the City. Acceptance of the line may be made after the video has been reviewed and approved by the City Inspector. Any tap to an existing system needs to be televised as well. Televising shall start at the closest manhole to the tap and extend 15 feet beyond the tap.

c. A negative air pressure "vacuum" test of all manholes is also required. The negative air pressure "vacuum" test shall 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 foot as measured from the bottom of the manhole channel to the

ring regardless of manhole diameter. The minimum test time shall be 40 seconds for all manholes 8 feet or shallower. A vacuum of 10 inches 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 inches of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 inches to 9 inches of mercury meets or exceeds the time calculated.

d. A mandrel test in accordance with Section 7-17.3 (2) G of the WSDOT/APWA Standard Specifications shall be required on all sewers except laterals.

B. STEP/Grinder Pressure Main System

a. Prior to acceptance of the project the pressure mainline and service lines shall be subject to a hydrostatic pressure test of 150 pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor. Air will not 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.

b. A water test of the septic, STEP or grinder tank both at the factory and on site after installation is required in accordance with the criteria outlined in Sections 5.10.040, 5.10.050, and 5.10.060 of this Chapter.

c. Electrical inspection and testing of all electrical system components is required. All tested parts shall pass before the City accepts the system.

d. All pressure mains shall be pigged with a soft foam swab a minimum of one size larger than the pipe for the entire length of the main.

5.10 PRESSURE SEWER MAIN

5.10.010 General

Low pressure systems, such as STEP or Grinder systems may be considered for situations where conditions make gravity sewer impractical. Lift station pressure mains, if required, also fall under these same design criteria.

5.10.020 Design Standards

The design of any sewer extension/connection shall conform to City standards and the latest version of the Criteria for Sewage Works Design prepared by the Department of Ecology (hereinafter referred to as the DOE Design Manual). In case of conflict between the two Standards, the most stringent conditions shall apply.

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 service boxes shall be installed to serve each lot.

Conveyance for pressure sewer systems (STEP or Grinder) shall be designed to accommodate the peak flow from all individual systems plus the discharge of any upstream pump stations without adversely affecting the performance of any pump connected to the system. Peak flow for individual STEP or Grinder systems shall be calculated by one of the following equations:

$$Q_p = 15 + [(0.5) \times (\textit{number of units})]$$

Or:

$$Q_p = 15 + [(0.15) \times (\textit{population})]$$

Where: Q_p = *peak flow in gallons per minute*

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

The applicable General Notes on the following pages 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 Yelm standards and the most current copy of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA).
2. All approvals and permits required by the City of Yelm shall be obtained by the contractor prior to the start of construction.
3. If construction is to take place in the County Right-of-Way, the contractor shall notify the County and obtain all the required approvals and permits.
4. A preconstruction meeting shall be held with the City of Yelm prior to the start of construction.
5. The City of Yelm shall be notified a minimum of 48 hours in advance of a tap connection to an existing main. A City representative shall be present at the time of the tap.
6. 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 1-800-424-5555 a minimum of 48 hours prior to any excavation.
7. Pressure mains less than 4 inches in diameter shall be HDPE SDR 11 or Schedule 80 PVC ASTM D1784 with rubber gasket joints. Pressure mains 4 inches in diameter or greater shall be HDPE SDR 11 or PVC C-900DR 14. Certain-Teed Certa-Lok C-900 R/J pipe is approved for use where restrained joints are required. Welded Poly (HDPE) pipe shall be Hi density ASTM D 3350, SDR 11 4710 socket welded or butt fusion welded. HDPE pipe shall be sized by inside pipe diameter. Fittings and valves shall comply with section 5.30.040 of the Development Guidelines. Piping for sewer lines shall be green, white or black. HDPE sewer pipe shall be green or black with a green stripe manufactured on the pipe.
8. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasketed or solvent weld joints.
9. All plastic pipe and services shall be installed with continuous tracer tape, installed 12 to 18 inches under the proposed subgrade. 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, heavy coated UF direct bury 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.

10. All buried power for STEP systems shall be installed with continuous tracer tape installed 12 inches above the buried power. The marker shall be plastic non-biodegradable, metal core backing marked “power”. Tape shall be furnished by contractor.
11. Bedding of the sewer main and all appurtenances shall be sand and compaction of the backfill material shall be required in accordance with the above mentioned specification (See General Note 5.60-A).
12. Temporary street patching shall be allowed as approved by the City Engineer. Temporary street patching shall be provided by placement and compaction of a minimum of 2 inches of asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
13. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
14. Traffic control plan(s) shall be required in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).
15. It shall be the responsibility of the contractor to have a copy of these approved plans on construction site at all times.
16. Any changes to the design shall be reviewed and approved by the City of Yelm.
17. All STEP mains shall be hydrostatically tested in conformance with the above-referenced specification for testing water mains (see Note 1.) In addition, all STEP mains shall be pigged/cleaned in the presence of the City Inspector prior to placing STEP main in service.
18. Prior to backfill all mains and appurtenances shall be inspected and approved by the City of Yelm. 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 Yelm for the required inspections.
19. Single and duplex family STEP pumping systems installed in the City of Yelm shall be an Orenco certified package and be accompanied by a certificate of origin letter from Orenco. The certificate of origin letter shall be presented to the City Inspector at time of installation and inspection of the pumping system. Package components and installation requirements shall also comply with City of Yelm details.
20. Single and duplex family grinder system shall be manufactured by E-One (Environment One Corporation) only and shall be purchased and

installed as a packaged system from E-One. This includes the electrical control panel, wiring from panel to pump chamber, the pump and pumping components and pump chamber. No substitution of parts shall be allowed.

21. All STEP and Grinder systems installed in commercial applications shall meet the applicative electrical requirements for commercial systems.
22. Pump control panels shall be located on a garage wall or remote post, 5-feet from top of panel to finish grade, unless otherwise authorized by the City of Yelm.
23. In the event that the Department of Labor and Industries or the City requires a separate "on-off" switch controlling power to the Pump Control Panel, said switch shall have a locking cover model # 5031-0 Rayntite Single Gang Weatherproof Cover 1.406-inch diameter.
24. Inspections for onsite STEP installations are required. A 48-hour notice to the sewer department is required prior to the inspection.

    Items needing inspection are:

    1. Tank installation, including bedding and location
    2. Tank infiltration, exfiltration test
    3. Sanitary sewer pressure test
    4. Service line pressure test
    5. Final Inspection
25. All posts used to support pump control panels, shall be hot dip galvanized Unistrut or approved equal.

5.10.030 Pipeline and Service Line Materials

Installation and materials used for construction of the City of Yelm STEP system shall conform to the requirements of sections 13.08.030 through 13.08.080 of the Standard Specifications, unless amended herein.

All STEP tanks for commercial installations shall utilize 2-inch piping for the service line.

A. All pipe less than 2 inches shall meet the following requirements:

Schedule 40 PVC pipe shall be designed for solvent weld joints and shall comply with ASTM D 1785.

All pipe 2 inches and above shall meet the following requirements:

PVC 1PS 1120 SDR 21 Class 200 pipe shall have rubber ring gasket joints, shall comply with ASTM D 1784 and have a working pressure rating of 200 psi.

B. Bedding

Bedding shall be sand.

Bedding shall be installed as shown on the Standard Details.

C. Joints

1. Solvent Weld Joints

Solvent cements and primer for joining PVC pipe and fittings shall comply with ASTM D 2564 and be as recommended by the pipe and fitting manufacturers. Primer shall be required for use on all solvent weld joints.

2. Rubber Ring Gasket Joints

Rubber ring gaskets shall comply with ASTM D 1869 and ASTM D 3139 and shall be supplied by the pipe or fitting manufacturer with a sufficient amount of lubricant. The lubricant shall be water soluble, non-toxic, unsupportive of bacterial growth, and have no deteriorating effect on the PVC or gasket.

D. Fittings

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

a. Solvent Weld Fittings - Solvent weld fittings for pipe less than 2 inches shall be socket type Schedule 40 fittings and shall comply with ASTM D 2466 and 2467.

b. Rubber Ring Gasket Fittings - Rubber ring gasket fittings for pipe 2 inches and larger shall be PVC 1120 complying with ASTM F 477, as

manufactured by Head Manufacturing Co., Preston, Idaho; Gault Fabrication Company, Stockton, California; Spears Fabrication, Stockton, California; or approved equal.

E. Ball Valves

One-inch ball valves shall be PVC ball valves and shall comply with ASTM D 2846. It shall be designed for use with corrosive fluids, for low torque manual operation, and have a working pressure of 150 psi. The PVC material shall be Type 1 (NSF). The valve shall be Model No. LT-1000-S as manufactured by KBI (King Brothers Industries), or equal approved by the City.

F. Gate Valves

Gate valves for sewer systems shall be NRS gate valves, complying with AWWA C509. Buried valves shall have 2-inch square AWWA Standard operating nuts. Valve stem extensions, if necessary, shall be installed on valves deeper than 5 feet and provided by the same supplier as the gate valves. All Gate valves shall be Resilient Wedge epoxy coated.

All gate valves shall be equipped with operator extensions that bring the operating nut to within 24 inches of the surface for valves over 5 feet deep.

G. Check Valves

Check valves for sewer systems shall be PVC swing check valves designed for use with corrosive fluids and shall have a Buna-N seal on a swing gate which lifts to allow for unobstructed flow. The PVC material shall be Type 1 (NFS). The valve shall have no metallic parts. It shall have a working pressure of 150 psi and shall require only 1/2 psi back pressure for complete closure. It shall be as manufactured by KBI (King Brothers Industries), or equal approved by the City.

H. Valve Boxes

The word SEWER shall be cast into the lid. The top section shall be made of cast iron conforming to the following specifications: ASTM A 4876; WWP 401; and CS-88. It shall be slip type with top flange, weight 40 pounds or more, be at least 10 inches in length, have an inside diameter sufficient to house the bottom section, and have an average material tensile strength of 30,000 psi. It shall be Rich Model 910 heavy duty, or equal approved by the City. The bottom section of the valve box shall be 6-inch PVC pipe (ASTM 3034), white in color. The entire valve box top and bottom shall perform as a unit that has the ability to extend.

I. Saddles

Standard saddles shall be band-type saddles designed for use on PVC pipe. The material shall be UNS S 30400 stainless steel for the shell, bolts, washers, nuts, and tapped outlet. Gaskets shall be NBR compounded rubber complying with ASTM D 2000-343K515_E34. Saddles shall be Style 304, manufactured by Romac Industries, Inc., or equal approved by the City.

Self-tapping saddles shall have a PVC body and be secured in place by four stainless steel bolts and nuts. After tapping, the tapping mechanism shall retain the coupon from the pipe and serve as a shut-off valve. The tapping mechanism shall be operated by a 5/8-inch Allen head wrench and have a PVC cover to prevent fouling of the mechanism when not in use. The saddle shall have an O-ring seal glued in place by the manufacturer.

J. Standard Service Box

The Standard Service Box shall be made from a structural plastic, have extensions as required, and have a bolt down cover. It shall be Model No. 1419, as manufactured by Carson Industries, Inc. or equal approved by the City. Larger Carson boxes for 2-inch services may be required as approved by City.

K. Traffic Bearing Service Boxes

All Traffic Bearing Service Boxes shall be a model MSBCF 1324-BCF-12 inch, manufactured by Old Castle Manufacturing. Larger Carson boxes for 2-inch services shall be model 1324-18-BCF by Old Castle Manufacturing.

Traffic bearing Carson boxes shall have 6 to 8 inches of compacted crushed rock under the base of box, per manufacturer's recommendation.

It is acceptable to use socket type tees on 2-inch Mainlines at the connection point for either a 1-inch or 2-inch service connection.

5.10.040 Pipeline and Service Line Installation

A. Grade and Alignment

Service lines shall be placed with a minimum of 18 inches of cover within private property. Deeper excavation may be required due to localized breaks in grade such as curbs, retaining walls, and terraced ground. Where required by the City, the pipeline shall be laid to the profile or elevation shown, regardless of depth. Maximum cover of any mainline within public Right-of-Way or easement shall be 92 inches, unless otherwise approved by the City Engineer. This minimum assumes 42

inches cover to an 8 inch diameter water pipe and 18 inches separation from the bottom of water pipe to the top of the reclaimed water line, and 6 inch diameter reclaimed water pipe and 18 inches separation from the bottom of reclaimed water to the top of the sewer line.

The maximum spacing between sewer main line gate valves shall not exceed a distance of 1,000 feet, but may be evaluated on a case-by-case basis.

All ductile iron fittings shall be epoxy coated or polyethylene lined both inside and outside. The coating material shall be designed for use with corrosive materials.

B. Trench Excavation and Backfill

Native material from trenches and excavations may be considered unsuitable for trench backfill. The City shall determine the suitability of native material for trench backfill. If the native material is deemed unsuitable by the City, "Bank Run Gravel for Trench Backfill" shall be used. Bank run gravel shall be equal to Section 9-03.19 of the Standard Specifications.

The Contractor has the option of jacking or boring pressure sewer lines under existing improvements. The Contractor's proposed method of construction and material type shall be submitted for the City's approval prior to commencing work. Pipeline material shall be approved by the manufacturer for jacking or boring application. No jacking operation shall exceed 40 feet unless authorized by the City.

At locations where paved or graveled streets, shoulders, alleys, parking lots, driveways, patios, and sidewalks will be reconstructed over the trenches, the backfill shall be placed in layers not exceeding 8 inches in loose thickness and be compacted by mechanical tampers to 95 percent of maximum density. Proof of compaction is required. At locations where lawn, landscaping, and unimproved surfaces will be reconstructed over the trench, the backfill shall be placed in layers not exceeding 8 inches in loose thickness and be compacted by mechanical tampers to 85 percent of maximum density.

Maximum density and optimum-moisture content shall be determined using the modified Proctor maximum dry density procedure (AASHTO T180 or ASTM D 1557). In-place density shall be determined using the Washington Densimeter method or Nuclear Gauge as outlined in the WSDOT Construction Manual.

C. Detectable Marking Tape

Heavy duty fourteen-gage insulated copper toning wire designed for direct-bury applications, shall be placed directly over all non-metallic

pressure sewer lines and service lines. The Contractor shall bring the toning wire to the surface of the valve box and service boxes for purposes of attaching a utility detection device. All connection of the toning wire for service connections shall be stripped of insulation and attached to the copper portion of the main line toning wire. The connection point shall be D.B.R. Direct Bury Splice Kits.

D. Hydrostatic Pressure Test

All sewer mains, service lines, and appurtenances shall be hydrostatically tested in lengths specified. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be accompanied with certifications of accuracy from a laboratory approved by the City.

The sewer pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing.

The sewer lines shall be filled with water and allowed to stand under pressure a sufficient length of time to allow the escape of air.

The test shall be accomplished by pumping the sewer line up to the required pressure, stop the pump for 15 minutes, and then pump the sewer line up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage. There shall not be any appreciable or abrupt loss in pressure during the 15-minutes test period.

The quantity of water required to restore the pressure shall be accurately determined by pumping through a positive displacement water meter with a sweep unit hand registering one gallon per revolution. The meter shall be approved by the City.

The maximum allowable leakage for sewer lines shall be, according to AWWA C600, Section 4 Hydrostatic Testing, as follows:

Test Pressure 150 PSI	Pipe Diameter			
	3 inch	4 inch	6 inch	8 inch
	No Loss	No Loss	No Loss	No Loss

Portions of the sewer line that are determined to be critical, or suspected of leaking, shall be left with the joints exposed during the testing procedure to allow visual inspection. The use of dye in the testing water

assists in locating leaks if ground water is present in the trench. Any visible leakage detected shall be corrected by the Contractor regardless of the allowable leakage specified above. If the tested section fails to meet the pressure test successfully as specified, the Contractor shall, at the Contractor's expense, locate and repair the defects and then retest the pipeline.

Prior to calling out the City to witness the pressure test, the Contractor shall have all equipment set up completely, ready for operation and shall have successfully performed the test to assure himself that the pipe is in a satisfactory condition.

Defective materials or workmanship, discovered as a result of a hydrostatic field test, shall be replaced by the Contractor at the Contractor's expense. Whenever it is necessary to replace defective material or correct the workmanship, the hydrostatic test shall be rerun at the Contractor's expense until a satisfactory test is obtained.

Service lines shall be sleeved under driveways, sidewalks, and where the service line could make contact with any part of the tank.

The Contractor shall provide the water necessary to fill the pipelines for testing purposes. Water may be purchased from the City. The Contractor shall coordinate with the City of Yelm Public Services Department water utility. The Contractor shall be responsible for transporting the water to the project site. The Contractor shall also be responsible for furnishing a backflow prevention device or other City approved method to avoid contamination of the water supply during loading, an appropriate water meter and all other appurtenances required. Water meter and appurtenances shall be approved by the City.

The Contractor shall demonstrate to the satisfaction of the City that the air release valves and vacuum release valves are operating correctly.

1. Sewer Main Line Testing.

   Sewer main lines shall be tested under a hydrostatic pressure of 150 psi.

   After the sewer main test has been completed, each main line valve shall be tested by closing valves in turn and relieving the pressure beyond. This test of the valves will be considered acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The Contractor shall verify that the pressure differential across the valve does not exceed the rated working pressure of the valve.

   When testing sewer main lines, they shall be tested against service line test valve at 150 psi for 15 minutes. After that time has

passed, pressure shall be reduced to 80 psi and test valves shall be opened one at a time to place pressure against the check valve. This service line between the check valve and test valve shall be pre-filled with water before testing to reduce initial pressure drop. After that, remaining pressure shall have no drop for one minute.

Prior to any main line testing, all service lines within the main line test area shall be installed, tested, and approved. The Contractor shall test no more than 500 linear feet for the first test to qualify crews and materials. Sections of collection main line to be tested shall not exceed 1,000 linear feet per each individual test. Once successful test results have been achieved, the Contractor may request in writing test sections greater than 1,000 linear feet for the City's approval. The Contractor is required to maintain pipe testing and service line testing concurrent with pipeline laying operations.

2. Sewer Service Line Testing.

   In order to test the service line, the ball valve (or self-tapping saddle if used) at the sewer main shall be closed and the test pump attached at the end of service line with ball valve and check valve, if required. This portion of the service line shall be tested under a hydrostatic pressure of 70 psi. The test shall be deemed successful if the pressure remains constant for a minimum of 1 minute.

3. The contractor shall be responsible for replacing any shut-off valve or check valve in a Carson box, if it does not maintain pressure during testing.

E. Air and Vacuum Release Valves

Air release valves and air/vacuum valves shall be located at the high points of the line. Profiles for each pipe run shall be submitted with the hydraulic grade line for both static and dynamic flow conditions to show where the critical points are for air release valves. Vehicular access to air/vacuum valves is required for maintenance.

Because the air released by these valves contains hydrogen sulfide, the valves and their enclosures shall be constructed of corrosion resistant materials. The air released from the valve may be quite odoriferous, thus, each vent shall be equipped with an odor control system such as activated carbon filters impregnated with sodium hydroxide. All air release, vacuum release, and combination air release/vacuum release valves shall be a model D-021 combination air valve "MINI SAAR".

F. Pigging Ports/Cleanouts

A pipeline pig is a projectile that is forced through the inside of a pipe to clean pressure pipelines. A pigging port/cleanout is used as a point to send the pig (see Standard Detail 7-20).

Pigging ports are required:

1. At every 2-inch diameter change in pipeline size;
2. At the end of every dead end line;

Specific locations are subject to review and approval by the City.

G. 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 Drawings 4-13 and 4-14 in Chapter 4. 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. Material shall be stainless steel, epoxy coated, or approved equal.

H. Service Connections

This work consists of installing the service line and appurtenances. The service connection at the sewer main includes a check valve and ball valve, without valve boxes, and a saddle or tee at the sewer main.

I. Service Interruption/Line Connections

The contractor shall give the City a minimum 72-hour notice of any planned connection to an existing pipeline. This includes all cut-ins and live taps. Notice is required so any disruptions to existing services can be scheduled. The City will notify customers involved or affected of the sewer service interruption. The contractor shall make every effort to schedule sewer main construction with a minimum interruption of sewer service. In certain situations, the City may dictate scheduling of sewer main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

All connections made to sewer lines 2 to 6 inches may be tapped live by the contractor using SPEARS “Hot Tap Saddle”, or a saddle previously approved by the City. Any pipe greater than 6 inches or C900 pipe shall be performed by a certified tapping company. Tap installation shall be inspected and approved by the City.

Tap installation shall be performed by a professional company that specializes in this work, and the company doing this work shall first be approved by the sewer department. When tapping non-C900 main lines (6 inches or less), “Hot Tap Saddles” as manufactured by Spears

are acceptable and can be used by the underground sewer main installer with prior approval from the Sewer department and installation shall be inspected by City Inspector.

5.20 PRESSURE SEWER (STEP/GRINDER TANKS)

5.20.010 General

A STEP system or grinder pump system may be installed to serve single family residential, multi-family residential, and commercial applications where approved by the City.

Any new single family subdivision designed with STEP or grinder sewers shall include an easement on the face of the plat for access to all lots. Other STEP or grinder applications shall require easements, and the format of these easements will be provided by the Public Services Department.

Single family subdivisions utilizing individual pressure sewer systems shall submit a scale drawing for each lot showing the building envelope(s), a 10 foot private utility trench along the front of the lot, driveway, water meter location, sewer service box location and the tank location in the front portion of the lot to assure all improvements can be accommodated on site.

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. Grinder pump systems consist of a single pump basin. The pump(s) grind the waste stream into a slurry and pump it to the City sewer system.

Single family and duplex STEP tanks or grinder pump basins shall be located in the front yard of the residence. If the lot size is too small for the STEP tanks, a community STEP system (3 to 6 EDU's) may be required and sized according to the City of Yelm STEP system sizing chart.

5.20.020 Owner Responsibilities

All STEP and grinder tank riser lids shall be set to grade for maintenance access. No shrubs, bushes, or ground cover vegetation other than grass shall be planted within a 5' radius of any tank lid. No trees shall be planted within 10' of any tank lid or valve box. All of the tank lids shall be visible.

The property owner shall maintain access to the tank and controls at all times for City maintenance purposes. The tank riser lid may not be covered or buried. For STEP applications only, the property owner may place a bird bath, potted plant or other yard decoration on the riser lid, as long as it can be readily removed for repair or maintenance. Grinder tank lids are vented and require that all dirt, beauty bark, rock, grass, debris, etc. be kept away from the lid to ensure proper venting of the pump chamber (tank).

Maintenance of all sewer pipe, drains and plumbing between the tank and the building for single family, duplex or commercial systems shall be the responsibility of the customer.

The customer shall be responsible for notifying the City when the control panel alarm buzzer is activated. The customer shall be responsible for curtailing water usage until City forces respond to the customer's notification. The City shall not accept responsibility for damages resulting from a plumbing backup, such as may occur if water usage is not curtailed during an alarm condition or if the customer disables the alarm.

The owner of commercial or residential property with a City STEP sewer system(s) shall not undertake any alterations of the sewer system(s), including covering or obstructing STEP tank riser lids, cleanouts, pump control panels and lockout switches, without the prior written approval of the City. Any damage caused by the property owner or their agents, including tree and bush roots or unmaintained trimming of the same, shall be repaired by the City at the property owner's expense.

5.20.030 STEP Tanks

STEP tanks shall be of the size and type as denoted in these specifications and as shown on the Standard Drawings. Grease interceptors shall be sized in accordance with the EPA Design Manual (625/1-80-012) and shall be of a configuration consistent with industry standards. Grease interceptor vessels shall be subject to requirements of the STEP tank.

STEP tanks with an influent pipe invert elevation of less than or equal to 4 feet, which are not placed in traffic bearing areas shall meet the loading criteria listed in section 5.10.030.

All models of tanks shall be certified by a licensed structural engineer that they meet the loading conditions specified herein. The Structural Engineer certifying each model of tank shall submit drawings including but not limiting to the following:

1. Plan view showing dimensions of tanks and the size and location of any openings in the tank.
2. Side section of tank showing dimensions and thickness.
3. End section of tank showing dimension and thickness.

STEP tanks with influent pipe inverts deeper than 4 feet, and/or are subject to traffic bearing loading, shall meet the loading criteria listed in section 5.10.030.

All models of tanks shall be designed by a licensed structural engineer. Calculations shall be submitted for review.

An inspection port shall be required over the inlet baffle for all STEP tanks. A 24″ diameter minimum riser inspection port/clean-out shall be required.

5.20.040 STEP Tank Sizing

STEP tanks for the City of Yelm shall be sized and configured as outlined, and shall meet the DOE Design Manual criteria for vessel sizing and configuration.

TABLE 1 – STEP TANK SIZING	
Description	**Tank Size**
Up to 4 bedroom home	Min 1,250 gallons liquid capacity
5 or 6 bedroom home/duplex	Min 1,500 gallons liquid capacity

STEP tanks for any applications of institution, multi-family dwelling or, other structures not listed above shall be sized in accordance with the latest version of the DOE Design Manual. Peak-day flow for purposes of sizing STEP tanks shall be calculated using an accepted engineering manual, or actual operating records, whichever is more stringent. All STEP tank configuration shall be two compartment and shall meet requirements of the DOE Design Manual with the following additions:

A. All concrete STEP tanks 1,250 to 3,000 gallons shall be two compartment tanks divided by a baffle as shown in Drawing Detail 5-10 and 5-11. For 1,500 gallon tanks, one 4-inch diameter hole shall be centered on the baffle wall 20 inches on center from bottom of floor. 3,000 gallon tanks shall have one 4-inch diameter hole centered on the tank baffle wall 29 inches from the floor of the tank.

B. For 6,000-gallon tanks, one 6-inch diameter hole shall be centered across width of tank baffle 40 inches above floor of the tank in each baffle.

C. All Dicyclopentadiene (DCPD) STEP tanks 1,000-1,500 gallons in size shall be two compartment tanks divided by a baffle as shown in Drawings 5-9 and 5-10.

D. If approved by the City, 6,000-gallon tanks used in conjunction with a pump tank may not require a baffle, depending on diameter.

E. Tanks larger than 6,000 gallons shall not be used in the City STEP system.

All fiberglass and concrete tanks shall install a 4-inch diameter hole within 1 inch of the crown of the baffle for venting or an 11 1/2-inch space between the top of the baffle wall and the top of the tank.

Designers shall consult with the City Engineer prior to design of commercial STEP installation and tanks over 3,000 gallons to verify tank sizing, vault configuration, pump requirements, and electrical requirements.

Underestimating the amount of wastewater flow to be received by either the STEP tank or primary tanks by the property owner or the owner's engineer based on estimated use will result in an increase in the septic tank holding capacity to meet the above criteria. Refusal to increase the size of the septic tank to meet the design criteria will result in discontinuance of sewage collection services.

5.20.050 Loading Criteria

A. 135 lb/cu ft weight of backfill.

B. If the water table is at ground level, lateral loading is 85 lb.cu. ft., which includes hydrostatic water pressure.

C. The tank shall support a minimum 1,000 lb. wheel load.

D. Tanks designated as traffic bearing tanks shall be designed to withstand HS-20 truck loading with appropriate impact factors. All tanks shall be structurally sound and watertight and shall be guaranteed in writing by the tank manufacturer for a period of two (2) years from the date of final acceptance. The tank guarantee/warranty shall be furnished at the time of installation. Tank warranty shall not limit liability to replacement cost of the tanks.

5.20.060 DCPD Tanks

All DCPD (Dicyclopentadiene) STEP tanks shall be manufactured by Orenco Systems, Inc. Any alternate shall be approved by the City. All DCPD STEP tanks shall be installed by qualified installers, following the manufacturer installation instructions.

A. Loading criteria:

1. The tank shall be rated for a minimum 500 lb/sq ft loading criteria, based on a saturated backfill of 140 lb/cu ft and an unsaturated backfill of 127 lb/cu ft.
2. Minimum lateral loading shall be 62.4 lb/cu ft. Lateral loading shall be determined from ground surface.
3. The tank shall support a concentrated wheel load of 2,500 lbs.

B. There are four (4) typical loading conditions that shall be analyzed as appropriate:

1. 5-foot bury + full exterior hydrostatic load
2. 5-foot bury + full exterior hydrostatic load + 2,500-lb wheel load
3. 1-foot bury + 2,500-lb wheel load
4. Interior hydrostatic load with tank full and unsupported by soil. This case represents the tank full of liquid at 62.4 lb/cu ft. This condition

addresses seam and haunch stress-strain relationships that occur during water tightness testing, as well as poor soil bedding conditions that provide inadequate support.

C. Tanks requiring deep burial (> 60 inches) or subject to truck or heavy traffic loading require special consideration. A minimum soil cover of 12 inches shall be used, unless specified otherwise by the Manufacturer.

D. All tanks shall be designed to be structurally sound and watertight and shall be warrantied in writing by Manufacturer for a period of five (5) years from the date of final acceptance. Manufacturer's warranty, including any and all limitations and exclusions, shall be furnished at the time of submittal. The tank shall be capable of withstanding long-term hydrostatic loading with a water table maintained at ground level in addition to soil loading.

E. All tanks shall be manufactured and furnished with one access opening capable of accepting a 30-inch diameter access riser of the configuration shown on Manufacturer's drawings. This access port shall provide access to both the inlet and the outlet/discharge pumping equipment. Modification of completed tanks will not be permitted.

F. Inlet plumbing shall include an inlet tee that penetrates 18 inches into the liquid from the inlet flow line. (The depth may vary depending on the tank's height; in all cases, though, the inlet shall extend to a level below the bottom of the maximum scum depth.) The inlet plumbing shall allow for natural ventilation back through the building sewer and vent stack.

G. Tanks shall be capable of successfully withstanding an above-ground static hydraulic test and shall be individually tested to Manufacturer's specifications.

H. All tanks shall be installed in strict accordance with Manufacturer's recommended installation instructions.

I. DCPD tanks shall be analyzed using finite element analysis for buried structures, and calculations shall address the following:

1. Strength
2. Buckling
3. Deflection of 5% of the tank diameter, based on service load (including long-term deflection lag)
4. Buoyancy

J. The material properties and laminates considered in this analysis shall be DCPD. The resin shall be considered acceptable for use with tank

construction. The thicknesses for different regions of the tanks shall be described and shown in shop drawings for each individual tank. Typical design strength properties are as follows:

1. Design tensile strength (psi) 6,700
2. Design flexural strength (psi) 10,500
3. Design compressive strength (psi) 9,200
4. Design shear in-plane (psi) 7,180
5. Flexural modulus (psi) 274,000

K. The tank shall be molded from thermoset dicyclopentadiene (DCPD) using the Reaction Injection Molding (RIM) process. Any permanent metal part shall be 300-series stainless steel.

L. The minimum tank weight shall be specified by Manufacturer's engineer (e.g., 450 lbs.± for 1,000-gallon tanks).

M. All penetrations specified for the tank shall be provided by Manufacturer.

N. A Manufacturer-supplied EPDM grommet, methacrylate structural adhesive, ABS inlet adapter, or approved equal, shall be used at the inlet to join the tank wall and the inlet piping.

O. In order to demonstrate watertightness, tanks shall be tested at the place of assembly and again on-site prior to acceptance. Each tank shall be tested at the factory, prior to shipping. During installation, each tank shall be backfilled to just below the mid-seam flange; then, the tank shall be completely filled with water, to a level two (2) inches into the riser. The tank shall be inspected for leaks after a minimum two-hour wait (or as required by local rules). There shall be no drop in liquid level and no visual leakage from seams, pinholes, or other imperfections. No tank will be accepted if there is any leakage over the two-hour period. Once the tank has passed this field test, the water level in the tank shall be dropped to a level below the tank invert, but not below the mid-seam.

P. Installation shall be in accordance with Manufacturer's recommendations, or as shown on the contract plans, whichever is more stringent – with no variations.

5.20.070 Fiberglass Tanks

Unless superseded by the Standard Specifications, fiberglass tanks shall meet all requirements of IAMPO (International Association of Plumbing & Mechanical Officials) Standard 1-87. If requested by the City, the manufacturer shall supply to the City, without charge, approved original laboratory report showing compliance with IAMPO Standard 1-87 and requirements of the suppliers licensed Structural Engineer. All STEP tanks

installed larger than 3,000 gallons shall be fiberglass tanks manufactured by either Containment Solutions Inc. or Xeres Inc. Any alternate shall be approved by the City.

All fiberglass STEP tanks shall be installed by a qualified installer, following the manufacturer test directions and shall be secured with tie-down straps with "dead men". Sizing and materials for dead men and strapping shall be per the manufacturer test recommendations.

A. Method of Calculations

Fiberglass tanks shall be analyzed using finite element analysis for buried structures.

Calculations shall address the following:

1. Strength with a safety factor of 2.5
2. Buckling with a safety factor of 2.5
3. Deflection of 5 percent of the tank diameter, based on service load (including long-term deflection lag).
4. Buoyancy

B. Performance Testing

In lieu of calculations for fiberglass tanks, the supplier may elect for in situ performance testing.

In situ testing of each tank model shall include use of strain gauges and deflection gauges. The tank shall be subjected to external forces equal to twice the actual load.

Maximum initial deflection based on service loading shall not exceed 2 percent of the tank diameter.

Performance testing shall be evaluated by a licensed Structural Engineer registered in the State of Washington. The Engineer shall have the sole responsibility to determine the maximum external loading on any of the tank models.

1. Inspections may be made by the City in the suppliers' yard, within the plant, upon delivery and again after installation. The wall thickness shall average at least 1/4 inch unless superseded by the requirements of the Structural Engineer. When less than 3/16 inch in thickness or any delamination is suspected within any portion of the tank wall, suitable repair shall be the responsibility of the Contractor. If repair is judged not feasible, the tank shall be rejected. If twenty percent or more of the tanks are rejected for any of the aforementioned reasons, each tank will become suspect of substandard quality and subject to rejection by the City. If the

required minimum 3/16-inch thickness is found, and no delamination is present, the repair shall be the responsibility of the Property owner.

2. The Structural Engineer shall specify the minimum weight of each tank model that will be allowed and submit those weights during the submittal process. The manufacturer will weigh each tank and label that weight on the side of each tank in a manner that will not be affected by rain or inclement weather.
3. Holes required in the tank shall be provided by the manufacturer. Resin shall be properly applied to all cut or ground edges so that no glass fibers are exposed and all voids are filled.
4. Dual Tite or Ty-Seal neoprene gaskets, or equal, shall be used at the inlet to join the tank wall and the ABS inlet piping. ABS Schedule 40 pipe and fittings shall be used at the inlets.
5. Inlet plumbing shall penetrate 18 inches into the liquid from the inlet flow line.
6. Each tank shall be water tested on the project site after assembly by the manufacturer and witnessed by the City. Every tank shall be assembled by the manufacturer and water raised to the brim of the manhole for a minimum of two (2) hours. The tank shall show no leakage from section seams, pin-holes or other imperfections. Any leakage is cause for rejection.
7. When leakage occurs, if the tank is not rejected by the City, an additional water test for a minimum of two (2) hours shall be conducted on the tank after repairs have been completed, upon request by the City. The manufacturer shall be responsible for making all corrective measures in production or assembly necessary to ensure a completely watertight tank.
8. After installation of tank with riser is completed, each tank shall be filled with water 2 inches above the rim of the riser adapter ring installed into tank lid. Water shall be held for a two (2) hour period as per paragraph 6, to assure that there is no leakage. Every tank test shall be witnessed by the City.
9. Each tank will also include a serial number and date of manufacturer.
10. Installation shall be in accordance with the manufacturer's recommendations, and as shown on the contract plans, no variations.

5.20.080 Concrete Tanks

A. Concrete tanks will be allowed in sizes up to 3,000-gallon capacity.

B. Wall, 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.

C. The walls and bottom slab shall be poured monolithically; alternatively, water stops may be provided.

D. Reinforcing steel shall be ASTM A-615 Grade 60, fy=60,000 psi. Details and placement shall be in accordance with ACI-35 and ACI-318.

E. Concrete shall be ready mix with cement conforming to ASTM C-150, Type II. It shall have a cement content of not less than six (6) sacks per cubic yard and maximum aggregate size of 3/4 inch. Water/cement ratio shall be kept low ($\pm$0.35), and concrete shall achieve a minimum compression strength of 4,000 psi in 28 days. The Contractor shall submit a concrete mix design to the City for review and approval. Three (3) concrete sample cylinders shall be taken and tested for each tank manufactured until the manufacturer and City are satisfied that the minimum compression strength is being obtained. To insure compliance, the manufacturer shall then make and test three (3) sample cylinders for a minimum of 20 percent of the remaining tanks at the discretion of the City. If the minimum compressive strength is not being obtained, the manufacturer shall be required to make and test sample cylinders for each tank manufactured. Calcium chloride will not be allowed in the mix design. The cost of testing cylinders shall be the tank manufacturer's responsibility. The tank manufacturer may supply a Swiss hammer for compressive testing in the field in lieu of sample cylinders.

F. Form release used on tank molds shall be Nox-Crete or equal. Diesel or other petroleum products are not acceptable.

G. Tanks shall not be moved from the manufacturing site to the job site until the tank has cured seven (7) days or has reached two-thirds of the design strength.

H. Tanks shall be manufactured and furnished with access openings of the size and configuration to accommodate individual packaged pump systems. Modification of completed tanks will not be permitted.

I. The tank and the top slab shall be sealed with a pre-formed flexible plastic gasket. The flexible plastic gasket shall be equal to the flexible butyl resin sealant Conseal CS-102 or CS-202 as manufactured by

Concrete Sealants, Inc. of New Carlisle, Ohio and shall conform to federal specification SS-S00210(210A) and AASHTO M-198.

J. Tanks shall be furnished without concrete access hole lids and equipped with tank riser adapters as manufactured by Orenco Systems. In order to demonstrate water tightness, the tanks shall be tested as follows:

K. Inlets to the septic tank shall be water tight pipe seal as Ty Seal pipe seal or equal. Outlets for effluent filters shall be configured as shown on the contract plans.

1. Factory Test: All of the tanks supplied by the precast manufacturer shall be hydrostatically tested in the factory. The tank shall be tested by filling with clean water to the soffit and allowed to stand for a minimum of 24 hours. After the 24-hour period, water shall be refilled to the soffit. The water level shall be recorded after 2 hours. Any water loss will not be acceptable.

2. Field Tests: After the tanks have been set in place, but prior to backfilling, each tank shall be tested for a 2-hour period. Any tank that fails the test as outlined above shall be repaired and/or replaced until the tank passes said test. After backfilling, the tank shall be filled with water to 2 inches above riser and tank connection and tested for exfiltration over a two (2) hour period. No tank will be accepted if there is any leakage over the two (2) hour period.

3. The water required to fill a tank in order to conduct the pressure test and check for leaks shall be provided by the contractor and/or property owner at their expense. This is a testing requirement associated with construction and considered "water for construction".

5.20.090 STEP Tank Installation

It shall be the Contractor's responsibility to verify the location and the elevation of all existing sewer lines prior to installing the individual tank. STEP tanks shall be located in front of the building unless otherwise approved by the City.

Existing utility lines may be encountered during installation of the STEP tank and appurtenances. Prior to starting construction the Contractor shall notify the proper utility for underground locations and also contact the property owner to determine location of foundation drains, electrical lines, etc.

The Contractor shall be responsible to obtain all necessary permits for work within public Rights-of-Way including street opening. Permit forms are

available on the City's website. All cost for permits shall be the Contractor's responsibility.

Excavations for all tanks shall be sufficient to allow a minimum of 6 inches of bedding (see tank bedding Detail Drawings 5-16 and 5-17).

Tanks set in holes with high water table issues or suspected high water table issues shall be H-20 tanks with minimum 24 inches of cover (6 inches of sand bedding and 18 inches of native backfill).

All tank installations shall adhere to the following:

A. Location of the STEP tank site shall be submitted to the City upon request for review and approval.

B. All excavation and backfill of tanks shall conform to standard specification. Compaction for non-traffic areas shall be 85 percent of maximum density. Compaction for traffic areas shall be 95 percent of maximum density.

C. For work within public Right-of-Way, the contractor shall be responsible on a daily basis for providing ingress and egress for both pedestrian and vehicle traffic on all work sites. The contractor shall clean the work area on a daily basis to comply with soil erosion control requirements and to avoid inconvenience to the public.

D. For work within public Right-of-Way, the contractor shall safeguard all work on a daily basis to prevent possible injuries. The contractor shall submit to the City a proposed method of safeguarding work prior to beginning any construction on public Right-of-Way.

E. Depth of bury shall not exceed 5 feet from invert elevation of influent pipe to finished grade on commercial systems.

F. Any modifications resulting in an existing non-H20 tank ending up in a traffic/load bearing situation shall have a 6-inch concrete pad constructed over it. It shall extend 12 inches past all sides of tank and contain rebar/wire mesh embedded in concrete with aluminum rings and covers per Drawing No. 5-19.

G. Hose bibs shall not be located above pump control panels or disconnects, and a minimum of 2 feet separation shall be provided between bibs and the sides and bottom of pump control panels or disconnects.

H. A hose bib shall be provided within 50 feet of the farthest riser of the farthest tank for maintenance and pumping.

I. STEP tanks shall not be located under sidewalks, porches, porch overhangs, or roof eaves. Tanks shall be located a minimum of 5

feet from the property line, house and porch foundations, located 2 feet on the side of the driveway closest to the inlet, and located a minimum of 2 feet from the edge of utility easements.

J. Residential non-traffic bearing risers shall be no higher than 24 inches from tank lid to finish grade, unless pre-approved by the City.

K. The property owner shall have sole ownership and responsibility of side sewer and clean out from house to tank inlet.

Tanks Located in Driveways:

A. Tanks set in driveways shall be located a minimum of 5 feet from the property line, house and porch foundations, and up to the edge of utility easements. Any undermined foundations shall require backfill with controlled density fill (CDF).

B. Access to tank risers shall have a traffic bearing lid set up according to sewer specifications, Drawing No. 5-19 with 12 inches of compacted crushed rock under concrete collars.

C. Tanks under driveways shall be rated for H-20 loading.

D. Concrete driveways shall be 4 inches in thickness with welded wire mesh placed in the concrete driveway. If a high water table is present, the concrete driveway shall be 6 inches in thickness with wire mesh to help resist buoyancy of the tank when empty after pumping.

E. The minimum depth of bury shall allow for the combination of an 18-inch riser, the thickness of the aluminum H-20 lid, and 2 to 3 inches between the fiberglass riser lid and the bottom of the aluminum H-20 lid.

5.30 PRESSURE SEWER (PUMP ASSEMBLIES)

5.30.010 Effluent Pump - 4″ Submersible Pumps

A. Simplex Pumps: Systems for tanks 1,500 gallons or less.

1. General - For Discharge to a STEP Collection System provide Orenco Model PF100511 or approved equal. Pumps shall be listed by an approved testing laboratory, e.g., UL or CSA or use as an effluent pump.

   Pumps shall be stainless steel and/or thermoplastic.

   All wetted fasteners shall be 300-series stainless steel.

2. Motors

   Motors shall be permanent split phase-type operating at 3,450 RPM. Motors shall be 1/2 HP, 115 volt, single phase, 60 Hz.

   Motors shall be thermally-protected with an automatic-reset feature.

3. Operating Conditions

   The effluent pump shall be of the submersible turbine type capable of delivering 5 gpm against a TDH of 105 feet, and with a shut-off head of not less than 160 feet. Pumps shall be provided with an orifice installed in the discharge piping to restrict flow to a maximum of 9 gpm over any head condition. The supplier shall provide a head curve showing performance of the pump with the orifice installed.

4. No flow restrictors in 10 or 20 gpm pump discharge systems.

B. Duplex Pump Systems and Triplex Pump Systems for 3,000 Gallon Tanks or Larger.

1. General - For Discharge to a STEP Collection System

   All STEP tanks housing more than one pump shall utilize 2-inch piping for the service line.

   Provide Orenco Model PF200511 or approved equal.

   Pumps shall be listed by an approved testing laboratory e.g., UL or CSA for use as an effluent pump.

   Pumps shall be stainless steel and/or thermoplastic.

   All wetted fasteners shall be 300-series stainless steel.

2. Motors

   Motors shall be permanent split phase-type operating at 3,450 RPM. Motors shall be 1/2 HP, 115 volt, single phase, 60 Hz. The supplier shall provide a head curve showing performance of the pump with the

orifice installed.

Motors shall be thermally-protected with an automatic-reset feature.

3. Operating Conditions

   The effluent pump shall be of the submersible turbine type capable of delivering 20 gpm against a TDH of 105 feet, and with a shut-off head of not less than 160 feet.

4. Bypass

   A 1/8-inch bypass orifice shall be drilled in the discharge head of the pump to allow for cooling pump motor during periods of no discharge.

5.30.015 Grinder Pumps

Grinder pumps serving 2 or less ERU's shall be Environment One (E/one) Model WH231. Systems serving 3-4 ERU's shall be E/one Model WH472. Systems serving commercial sites shall be sized on case-by-case basis and may require explosion proof rated pumps.

All pumping systems shall be installed in accordance with the manufacture's recommendations.

5.30.020 Pump Vault, Riser, and Lid

A. General

Provide an internal pump vault which shall be of sufficient size and structural integrity to house and support the pumping equipment necessary for transportation of effluent. The pump vault shall have a screen to prevent solids larger than 1/8 inch from entering the pipeline and to protect the pump and flow restriction device from plugging. The internal vault shall be removable for access into the STEP tank for septage pumping. All risers and connections to the septic tank with risers shall be water tight. Any hour meter for pump installed in pump control panel with more than 100 hours at the time of sewer final shall be considered a used pump and meter and shall be replaced.

B. Internal Vault

Simplex pump assemblies shall be a Biotube Pump Vault as manufactured by Orenco Systems, Inc., Model Number X4S 1254-18 19. Vaults for duplex 4″ submersible pump assemblies shall be a Biotube Pump Vault Model Number X4D 12xx-18 19 as manufactured by Orenco Systems, Inc., or equal.

C. Risers

Risers shall be required for access to internal vaults and access into the septic tanks for septage pumping. All risers shall be constructed of PVC,

fiberglass, or polyethylene and shall be constructed water tight. Risers over pump vault shall be 30 inches in diameter. All risers shall be of sufficient length to meet minimum requirement of the latest version of the National Electric Code (NEC) and shall vary depending on the depth of bury on the various tanks. The risers shall be attached to the tanks such that a watertight seal is provided. Epoxy required to adhere the PVC or fiberglass risers to fiberglass or concrete tanks shall be a two part epoxy as supplied by the manufacturer of the riser, or equal as approved by the City.

When applicable, Neoprene grommets shall be installed by the manufacturer for discharge piping, vent piping and/or the electrical conduit to assure a watertight seal. Neoprene grommets shall not be allowed on risers not requiring discharge piping, etc.

Risers shall be Model RR24 (length as required) for solids chamber, and RR30 (length as required) for pump chamber as manufactured by Orenco Systems, Inc., or approved equal approved by the City.

D. Lids

1. Standard Lid: The standard lid shall be a flat fiberglass lid, green in color, with a non-skid aggregate finish. The lid shall be the diameter required to fit the required riser and shall be supplied with a minimum of two stainless steel bolts and the lid shall have a gasket. Allen wrenches are not be included as part of the pump packages but 2 wrenches are be included in the spare parts. Lids shall be as manufactured by Orenco Systems, Inc., Model Number FLD24XX or FLD30xx or equal approved by the City.

2. Traffic Bearing Lid: All traffic bearing lids shall be an HS-20 loading with all frames and covers to be constructed of aluminum composite material unless otherwise approved by the City. The cover shall have the word "SEWER" cast into it. Reference DUROSTREET COM3200 30-inch with quarter turn paddle lock and pick slot. Reference DUROSTREET COM3800 36-inch with quarter turn paddle lock and pick slot.

5.30.030 Internal Splice Box

For applications with 5 or less residential units, each residential riser requiring electrical connections shall have a PVC splice box located in the interior of the riser. All splice boxes shall be installed within 12 inches of the riser lid for access purposes. The splice box shall be complete with cord grips and dual wall heat shrink with butt connectors. Splice boxes shall be UL listed for the application. The number of cord grips and heat shrink connectors shall be equivalent to the number of floats and electrical leads

within the pump vaults. The splice box and accessories shall meet all requirements of labor and industries and shall be UL listed for wet locations.

For all Class I, Division I installations more than 5 residential units or non-residential applications, risers requiring electrical connections shall have two separate splice boxes. All splice boxes shall be installed 10″ from the top of the riser to center of conduit access for access purposes. One splice box shall be for the pump wire and one splice box shall be for the low voltage wire for the float system. The splice boxes for the pump leads shall meet all requirements of the Department of Labor and Industries for a Class I, Division I, Type D gas application. The splice box for the low voltage float leads on an intrinsically safe relay shall be a non-metallic PVC splice box. The PVC splice box shall be complete with cord grips and dual wall heat shrink butt connectors. The number of cord grips and heat-shrink butt connectors within the PVC splice box shall be equivalent to the number of floats. The pump wire splice box simplex assemblies shall be single gang Model SBX-S as supplied by Orenco Systems, Inc., and the splice box for duplex assemblies shall be two gang Model SBX-D as supplied by Orenco Systems, Inc. or equal as approved by the City. Mounting box shall be mounted to riser with stainless steel bolts. An explosion proof EY fitting shall be provided directly outside of the mounting box for the pump wire connection

5.30.040 Level Control and Alarm Floats

Level control floats shall be UL or CSA listed for use in effluent on an adjustable or preset PVC stem which attaches directly to the pump vault. Floats shall consist of high level alarm, on/off, model Super G. Level control floats shall be Model PG for simplex pump assemblies and Model P2GN for duplex pump assemblies as manufactured by Orenco System, Inc. or equal as approved by the City.

A. Pump control and alarm panels for simplex pump assemblies shall be Model S1 ETM CT MTS GR-Yelm as manufactured by Orenco Systems, Inc. or equal as approved by the City. Pump control panels for simplex commercial and intrinsically safe applications shall be Model S1 IR RO SA ETM CT MTS GR-Yelm as manufactured by Orenco or equal as approved by the City.

B. Pump control and alarm panels for duplex pump assemblies shall be Model DAX1 IR RO SA ETM CT MTS GR-Yelm as manufactured by Orenco Systems, Inc. or equal as approved by the City.

C. All pump control panels shall have NEMA 4x fiberglass enclosures, an audio and visual alarm, an elapsed time meter, event counter, stainless steel latch and internal 120-volt, 20-amp circuit breaker for

each pump. Commercial and residential applications shall also include a 10-amp circuit breaker for controls.

D. Residential float set-ups shall not have low level, redundant off floats or "T" floats. Electrician is still required to pull the lead wire from pump control panel to tank "J" box and use silicone filled wire nuts, heat shrink butt connectors, or pre-approved equal on each end of spare wire.

5.30.050 Hose and Valve Assembly

Hose and valve assembly for a 4-inch submersible shall include a 1-inch diameter 100 psi PVC hose with PVC union and ball valve and anti-siphon valve Model Number HV100BASX as manufactured by Orenco Systems, Inc., or approved equal.

5.30.060 Additional Material Requirements

All equipment including but not limited to pump vault, riser, standard lid, bonding epoxy, splice box, discharge piping, control float assembly, pump(s), pump control and alarm panels, etc. shall be supplied by one single supplier or manufacturer as a packaged unit. The supplier or manufacturer shall upon request by the City, submit information on availability of replacement parts, maintenance records of operating pump assemblies. The package as supplied by the manufacturer or supplier shall have a standard guarantee against material defect for a period of not less than 1 year. The date of guarantee shall begin on the date equipment is delivered on a particular site and may be a single guarantee incorporating all the components or individual guarantees on the various components. The manufacturer or supplier shall be responsible to handle replacement or repair of defective parts.

5.30.070 Electrical Connections

All electrical equipment and materials shall be installed in conformance to requirements of the latest edition of the National Electrical Code as enforced by the State of Washington Labor and Industries Electrical Section. The Contractor shall be required to acquire all necessary permits and coordinate directly with the appropriate authority on the necessary inspection.

Splice boxes shall be installed in the STEP tank riser in accordance with the instruction from the supplier or manufacturer. The control panel shall be installed either on a remote post constructed of hot dipped galvanized unistrut or approved equal, or on the garage wall, unless approved by the City. The panel shall be affixed by stainless steel screws to either the structure or the post. The screws shall be of sufficient size and length to securely fasten the panel.

Power and control wire from the splice box in the riser to the pump control shall be UL approved with a minimum of 12 gauge for each control or power wire. Power and control wire shall be color-coded for ease of tracing between the alarm panel and pumps and float switches. The Contractor shall submit type and size of cable for review and approval by the City and Labor & Industries. Cable attached to the exterior of the building shall be contained in approved electrical conduit. All wire connections shall be made with heat shrink butt connectors.

Power and control wire for commercial or intrinsically safe applications shall be contained in two IMC or rigid metal conduits for separation of low and high voltage lines between the control panel and pump vault and shall meet the requirements of Labor & Industries.

All exterior electrical wire shall be contained within PVC conduit. Exterior conduit and wire shall be on the exterior of the house directly below the control panel and shall be installed plumb and vertical. Underground electrical cable shall have a minimum of 24 inches of earth cover. All cable or wire shall be contained in PVC conduit.

Electrical: All materials used for control and electrical connections shall meet requirements of labor and industries and the Uniform Electrical Code.

The Pumping Assemblies shall comply with the latest State of Washington's Department of Labor and Industries Electrical Inspection Section Policy.

Power supply for I.R. Commercial Systems from house breaker panel to the pump control panel shall be a 20 amp dedicated circuit for each pump with separate neutral wires. A dedicated 10 amp circuit shall be required for the control system. Residential (non I.R.) Simplex applications shall have one dedicated 20 amp breaker in-house panel.

Disconnects are required for power to all Pump Control Panels. Simplex (non I.R.) applications shall us a model B-5V one gang weatherproof outlet box as manufactured by Intermatic and two pole switches rated for 20 amp.

Duplex systems (2 pumps) shall use a Deep, one gang outlet box with 3 threaded outlets Model # DB-75V as manufactured by Intermatic. The switch shall be a three pole single throw, AC manual motor starting switch. Model # MS303 as manufactured by Leviton.

All disconnect switches shall include a Rayntite single Gang Weatherproof cover Model # 5031-0 as manufactured by Bell.

Surge arrestors shall be installed in the Pump Control Panel For all Class I Division I installations. Surge arrestors shall be a Model # AG2401 as manufactured by Intermatic, or equal approved by the City, and shall be installed on the power wire supplying power to the control circuit, and be installed within the pump Control Panel.

Buildings served by STEP sewer, utilizing on-site backup generators for power outages, shall have electrical service installed in such a manner that the STEP system will also be supplied power by the auxiliary generator.

The pump control panels for all STEP tanks housing 2 or more pumps shall be fitted with the transfer switch model DT323 URK you are K as manufactured by Cutler Hammer or approved equal and a male plug, model 70530 AMB WP as manufactured by Byrant for use with the City's portable auxiliary generator or approved equal.

5.40 GRAVITY SEWER

5.40.010 General

The City of Yelm's current sewer system is comprised of onsite Septic Tank Effluent Pump (STEP) tank installations, onsite wastewater disposal system installations that were converted to STEP, and STEP collection lines. The use of gravity sewer lines have been limited to the collections of sewage or transport of sewage to the City STEP system. This revised chapter is provided for the expected implementation of gravity sewers in the near future.

5.40.020 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.

New gravity sewer systems shall be designed on the basis of an average daily flow of not less than 100 gallons per day per person (250 gal/day/ERU). These flow rates are assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. Any such proposal shall include water consumption records, sewer discharge records, fixture counts, or other forms of documentation justifying the proposed flow rates, and is subject to the review and approval of the Public Works Department.

All gravity sewer facilities and conveyance piping shall be sized to accommodate the peak hourly flow of the contributing basin. Peak hourly flow is defined as the average flow rate times the peaking factor plus the discharge of any upstream pump stations. The peaking factor shall be calculated from the following equation:

$$PF = \frac{18 + \sqrt{poulation\ in\ thousands}}{4 + \sqrt{poulation\ in\ thousands}}$$

Conveyance for pressure sewer systems (STEP or Grinder) shall be designed to accommodate the peak flow from all individual systems plus the discharge of any upstream pump stations without adversely affecting the performance of any pump connected to the system. Peak flow for individual STEP or Grinder systems shall be calculated by one of the following equations:

$$Q_p = 15 + [(0.5)\ x\ (number\ of\ dwellings)]$$

Or:

$$Q_p = 15 + [(0.15)\ x\ (population)]$$

Where: $Q_p = peak\ flow\ in\ gallons\ per\ minute$

The General Notes on the following page shall be included on any plans containing gravity sanitary sewer.

GENERAL NOTES (GRAVITY SEWER MAIN INSTALLATION)

1. All workmanship and materials shall be in accordance with City of Yelm standards and the most current copy of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA).
2. All approvals and permits required by the City of Yelm shall be obtained by the contractor prior to the start of construction.
3. If construction is to take place in the County Right-of-Way, the contractor shall notify the County and obtain all the required approvals and permits.
4. A preconstruction meeting shall be held with the City of Yelm prior to the start of construction.
5. 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 1-800-424-5555 a minimum of 48 hours prior to any excavation.
6. Gravity sewer main shall be PVC, ASTM D 3034 SDR 35 or ASTM F 679 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
7. Pre-cast manholes shall meet the requirements of ASTM C 478. Manholes shall be a Type 1, 48-inch manhole unless otherwise specified on the plans. All manhole bases shall be positive seal type as manufactured by Predl Systems North America Inc. or approved equal. Joints shall be rubber gasket conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. (See Note 1.) Connection of a pipe line to a system where a manhole is not available shall be accomplished by the use of a saddle type or cast-in-place manhole. This is accomplished by pouring a concrete base and setting manhole sections on it. The existing pipe shall not be cut into until the manhole is vacuum tested and approved by the City.
8. Manhole frames and Logo Lids shall be EJ or Olympic Foundry WSDOT style ductile iron casting marked “SEWER”, “MADE IN USA”, and “CONFINED SPACE – PERMIT REQUIRED” and conforming to the requirements of ASTM A-30, Class 25. Frames and lids shall be free of porosity, shrink cavities, cold shunts, cracks, or any surface defects which would impair serviceability. Frames and lids shall be machine finished or ground on seating surfaces so as to assure a non-rocking, self-seating fit in any position and be interchangeable in other standard manhole frames.

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. The manhole opening shall be centered over the outlet channel regardless of the location of the ladder rungs. All casting shall be coated with a bituminous coating prior to delivery to the job site.

9. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasket joints (see detail). 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. When a tap is used to connect a new service lateral to an existing sewer main, televising from the closest manhole to 15 feet past the tap is required. Foreign objects and debris shall be removed by high pressure cleaning and/or vacuum removal.
10. All plastic pipe and services shall be installed with continuous green tracer tape 12 inches to 18 inches 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. Tape shall be Terra Tape "D" or approved equal. The tape shall be furnished by the contractor.
11. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3 inches high and 1/4 inch into concrete.
12. Bedding of the sewer main and all appurtenances shall be sand and compaction of the backfill material shall be required in accordance with the above mentioned specification (See general note 5.60-A).
13. Install a 4' x 4' square x 8-inch thick concrete pad with #4 rebar around all manhole frames and cleanouts that are not in a pavement area.
14. All lines shall be high velocity cleaned and pressure tested 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 video recording of the main by the contractor. Immediately prior to video recording, enough water shall be run down the line so it comes out the lower manhole. A copy of the video shall be submitted to the City Inspector. Acceptance of the line may be made after the video has been reviewed and approved by the City Inspector. A vacuum test of all manholes in accordance with Yelm standard 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 are complete, the Developer shall clean and videotape the sewer conveyance system again at the Developers expense. The method of cleaning shall be high velocity

water pressure cleaning. All rocks and debris shall be removed and disposed at the Developer's expense.

15. 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. The sewer system shall be televised to assure the system is clean.
16. Encasement material shall include 1/4-inch steel, ductile iron and in special or unusual cases C-900 DR 14 PVC pipe may be allowed if approved by the City in advance. Concrete, CDF and other methods of encasement shall not be allowed.
17. Temporary street patching shall be allowed for as approved by the City. Temporary street patching shall be provided by placement and compaction of a minimum of 2 inches of asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
18. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
19. Provide traffic control plan(s) in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) as required.
20. It shall be the responsibility of the contractor to have a copy of these approved plans on construction site at all times.
21. Any changes to the design shall first be reviewed and approved by the City.
22. Prior to backfill all mains and appurtenances shall be inspected and approved by the City. 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 for the required inspections.

5.40.030 Main Line - Gravity

A. Size - Sewer mains shall be sized for the ultimate development of the tributary area. 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 sub mains and mains shall be 8-inch inside diameter. The minimum size for a lateral shall be 6 inches.

B. Material - Sewer main shall be PVC, ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.

C. Depth - Gravity sewer typically has a minimum depth of 7 feet to provide gravity service to adjoining parcels. Actual depth shall be determined by slope, flow, velocity and elevation of existing system. Greater depths may be required to serve adjacent properties and to facilitate future line extensions.

D. Service Connections - All residential service connections to a new main shall be made with a wye; connections to an existing main shall be made with a tap. Commercial connections shall be made at a manhole.

   All new mains connecting to existing mains require the installation of a cast-in-place saddle manhole.

E. Flow - 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. Termination of Mains; All sewer mains shall end with a manhole.

5.40.040 Connection to Existing System

When connecting to an 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.

A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs with sand collars. Where knock-outs are not available, the manhole shall be core drilled for a core and seal boot connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by the use of a saddle type or cast-in-place manhole. This is accomplished by pouring a concrete base and setting manhole sections on it. The existing pipe shall not be cut into until the manhole is vacuum tested and approved by the City.

C. Connections to manholes requiring a drop shall follow the criteria as outlined in Section 5.40.090

D. 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.

E. Taps shall not be allowed to protrude into the existing main. The City Inspector shall be notified 48 hours prior to any tap of a City sewer main. The City Inspector shall be present to witness the tap. The mainline at the tap location shall be televised from the nearest manhole a minimum of 15 feet beyond the tap after tapping and prior to approval to insure compliance. Taps shall be Romac's style CB sewer saddle with Ductile + saddle, stainless steel strap and rubber gasket meeting ASTM D-2000 3 BA715 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.

5.40.045 Building Sewer (Side Sewer or Lateral)

A. A building sewer, side sewer or lateral refers to the extension from a building beginning two feet outside the outer foundation wall at the structure to a cleanout at the right-of-way line. Side sewer laterals from the main to the right-of-way line shall be minimum 6-inch diameter ending at a clean out. Maintenance of the building or side sewer is the responsibility of the property owner. Prior to connection of a building or side sewer to the public sewer a connection permit shall be obtained.

B. Each separate commercial/industrial building shall have its own separate side sewer connection to a manhole. The side sewer from the City's manhole to the building connection manhole shall be the responsibility of the building owner. When multiple side sewers are connected to one manhole the private side sewer shall start from that manhole. Each building owner shall be responsible for its own side sewer. If a manhole does not exist, one shall be installed. 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 5.40.050 of this manual.

C. Location of clean out for building sewer is governed by the IBC as adopted by YMC 18.23

5.40.050 Manholes and Logo Lids

Precast manholes shall meet the requirements of ASTM C 478. All manhole bases shall be positive seal type as manufactured by Predl Systems North America Inc. or approved equal. Cast-in-place bases shall be 3,000 psi

commercial concrete installed per detail. Manholes shall be Type 1, 48-inch diameter minimum. The minimum clear opening in the manhole frame shall be 24 inches. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the Director of Public Works, 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 details.

The manhole opening shall be centered over the outlet channel regardless of ladder rung locations.

Manhole frames and Logo Lids shall be EJ or Olympic foundry WSDOT style ductile iron casting marked "SEWER", "MADE IN USA", and "CONFINED SPACE – PERMIT REQUIRED" and conforming to the requirements of ASTM A-30. Class 25 and made in the United States of America.

The frames and lids shall be free of porosity, shrink cavities, cold shuts, cracks, or any surface defects which would impair serviceability. The frames and lids shall be machine-finished or ground-on seating surfaces so as to assure a non-rocking, self-seating fit in any position and be interchangeable in other standard manhole frames. All manhole frames and lids with defects shall be replaced with new. 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 or as determined by the City.

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 non-corrosive materials and otherwise arranged to avoid possible binding.

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. 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 wrapped around the manhole to the shelf. The top two safety steps (hand holds) shall not be installed in the manhole.

Gravity sewers shall be designed with straight alignment between manholes. Curved alignment of the sewer will not be permitted. Manholes shall be provided at a maximum of 400 foot intervals for 8- to 15-inch sewers, 500 foot intervals for 18- to 30-inch sewers, at intersections, and at changes in

direction, grade, pipe size or as directed by the City. (See also Section 7B.080). Greater spacing may be permitted in larger sewers.

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

The manhole opening shall be centered over the outlet channel regardless of the location of the ladder rungs.

Manhole Sizing shall be determined by the following criteria:

A. 48-inch Manhole

- 2 connecting pipes, 8- to 12-inch diameter.
- 3 connecting pipes, 8- to 10-inch diameter, perpendicular.
- 4 connecting pipes, 8-inch diameter, perpendicular.

B. 54-inch Manhole

- 2 connecting pipes, 8- to 12-inch diameter with less than 45° deflection
- 3 connecting pipes, 10- to 12-inch diameter, perpendicular
- 4 connecting pipes, 10- to 12-inch diameter, perpendicular

C. 72-inch Manhole

- 2 connecting pipes, 15- to 18-inch with less than 45° deflection
- 3 or 4 connecting pipes, 15-inch 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 provide adequate shelves and room for maintenance and televising mains.

5.40.060 Slope

All sewers shall be designed and constructed to provide peak design flow velocities of not less than 2.0 feet per second based on Manning's formula using an "n" valve of 0.013. Peak design flow shall not exceed 80% depth of flow in the pipe. Average design flow shall be greater than 20% depth of flow in the pipe, or 2.0 fps. Surcharging of manholes shall not be allowed. The following minimum slopes shall be provided; however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope %(Feet per 100')

8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.17 (0.0017 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)
27	0.07 (0.0007 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Sewers shall be laid with uniform slope between manholes.

5.40.070 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 shall be lower. 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.

5.40.080 High Velocity Protection

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

5.40.090 Drops

Straight grades between inverts shall be used whenever possible when connecting to an existing manhole. Care shall 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.

Drop connections shall only be allowed for sewer lines/laterals 8 inches in diameter or smaller, or where the line velocity would otherwise exceed 8 feet per second. An outside or inside drop (inside drops on existing manholes only, with City Engineer approval) connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. All drop structures shall be constructed per details and shall enter the manhole in a channel.

5.40.100 Clean outs

Clean outs are not an acceptable substitute for manholes on City sewer mains, Cleanouts may be installed at future main extensions and shall be installed for side sewer laterals at the right-of-way line.

All clean outs in the City right-of-way or easements shall be extended to grade. A 3-foot square by 8-inch thick concrete pad with #4 rebar shall be installed around all clean outs that are not in a pavement area. See clean out detail.

LIST OF DRAWINGS - SEWER