

# Chapter 6

## Wastewater

City of Kelso  
Engineering Design Manual  
June 2008  
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## CHAPTER 6 – WASTEWATER

### 6.00 Extension of the Sewer System and Service

#### A. General

Sewer main extensions are required to assure orderly and adequate extension of the sewer utility system. These extensions are to be in accordance with requirements of development and service availability as established by the City and the Washington State Department of Ecology.

#### B. Main Line Extensions

1. Design and construction of sewer mains and facilities, including but not limited to: sewer lift stations, telemetering facilities, and appurtenances shall be in compliance with the latest edition of the City's ordinances, these Standards, the Standard Details and the latest issue or revision of "Criteria for Sewage Works Design" published by the Washington State Department of Ecology, the current WSDOT Standard Specifications.
2. The minimum size sewer main to be installed shall be 8-inches. Larger sewer mains will be required where it is determined by the City that an 8-inch sewer is inadequate to handle the capacity of the users in the new or downstream facility, or for future service needs.
3. Minimum slopes of main lines shall be designed to provide a minimum velocity of two (2) feet per second. All dead end sewer mainline runs shall have a minimum of one percent (1%).
4. Manholes shall be placed at all angle points in the line, change in slope, and at the end of the line. Manhole shall be spaced no further than four-hundred (400) feet apart, unless authorized above by the city engineer. Manholes shall also have two tenths (2/10) of a foot slope from inflow to outflow unless otherwise approved by the City. The crown of all upstream pipes shall not be lower than the crown of the downstream pipe.
5. Sewers shall be located within public right-of-way whenever possible. All sewer mains designed on public utility tracts or easements shall have a minimum of one percent (1%) slope and shall be offset from the property line a minimum of five (5) feet with manhole accesses located on offsets ten (10) feet from property line and property corners.
6. Sewer mains shall be extended through and to the extremes of the property being developed, to provide connection points for future development of unserved

property as determined by the City. The depth of the main shall be determined by the Engineer. This shall be done by evaluating the feasible drainage basin that could contribute to that mainline and design the depth accordingly.

7. All manholes and cleanouts shall be constructed to finished grade. Any re-adjustment of finish grade by the Applicant or lot owner shall require that party to adjust the manhole and/or cleanout fixtures to the new finished grade.
8. All manholes in unimproved surfaces shall be two (2) feet higher than surrounding grade. All cleanouts in unimproved surfaces shall be constructed to finished grade. Further, a 3-foot diameter concrete pad is required around all cleanouts.
9. Rights-of-way or easements shall be provided to the City for access and maintenance of all conveyance systems, or other facilities as deemed appropriate by the City Engineer, within the development site, which are to be maintained by the City. The minimum widths of rights-of-way or easements shall be as follows, although the City Engineer may require increased widths when necessary to insure adequate area for equipment access and maintenance:
  - a. Pipes with an inside diameter less than or equal to thirty-six (36) inches: twenty (20) feet;
  - b. Pipes with an inside diameter greater than thirty-six (36) inches: twenty (20) feet or larger as required by the City;
  - c. Pipes shall be centered within the right-of-way or easement;
  - d. Pipes with more than a seven (7) foot depth to the invert shall require wider easements. A slope of one (1) horizontal to one (1) vertical from the storm drain invert to the ground surface shall be used in determining easement width.

No buildings or other structures that prevent access are permitted within rights-of-way or easements. Fences crossing rights-of-way shall provide gates of sufficient width to provide access by maintenance vehicles.

When possible, easements for apartment complexes or commercial/industrial developments shall be in parking lots, private drives, or similar areas that allow unobstructed vehicle access for maintenance.

#### C. Side Sewers

1. Side sewer permits for commercial and multifamily projects will be issued to owners as an extension agreement pre-construction requirement and shall be installed by a licensed, bonded and insured contractor. The Owner is required to make application and pay all necessary fees to obtain a permit. The side sewer can be installed as part of the mainline extension and put in use only after acceptance of the mainline system by the City.

2. A subdivider shall stub side sewers to the property line and terminate it in a cleanout. Side sewer permits for lots will be issued for installation only after the final plat is recorded. The lot owner or his licensed, bonded and insured contractor is required to make application and pay all necessary fees, obtain a side sewer permit and connect the side sewer from the mainline lateral to the house plumbing.
3. A separate and independent side sewer shall be provided for every building except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway, the side sewer from the front building may be extended to the rear building.
4. Where, because of physical complications the city engineer finds that it may be necessary or beneficial to allow two adjacent buildings to connect to the public sewer through a common side sewer; such connection will be allowed by written approval. Old side sewers may be used in connection with new buildings only when they are found, on examination or test to meet all requirements of the KEDM.
5. Pipe material for side sewers shall be the same as the pipe material used on the mainline in that area, unless otherwise approved by the City Engineer.
6. Side sewers shall have an internal diameter not less than six (6) inches. If more than one occupied building is attached, or the possibility to attach additional structures exists the diameter of the side sewer shall not be less than eight (8) inches.
7. Minimum slopes of side sewers shall be designed to provide a minimum velocity of two (2) feet per second. All dead end sewer mainline runs shall have a minimum of one percent (1%).
8. Side sewers shall be laid in straight horizontal alignments. Changes in horizontal alignment shall be made only with wye branches, bends, or a combination of wye branch and bend. Changes in horizontal alignments greater than twenty-two (22) degrees shall be made with a cleanout. No changes in horizontal alignment shall be allowed within right-of-way.
9. Cleanouts shall be placed at the property lines of all lots. Additional cleanouts including those for commercial and industrial properties shall be installed at locations designated by the City Engineer. In no case shall the distance between cleanouts exceed one-hundred (100) feet.
10. Test tees shall be installed at any required or other points to ensure that all portions of the side sewer can be tested. It is the responsibility of the permit holder to install all risers, cleanouts, castings, concrete blocks, etc. before the side sewer will be approved.

11. Minimum cover for all side sewers shall be eighteen inches, except; minimum cover for side sewers at property line shall be four feet below the crest of the right-of-way easement, and minimum cover for side sewers crossing a ditch in the right-of-way or easement shall be two (2) feet, six (6) inches.
12. Water mains parallel to a sewer will normally be above and separated by a distance of ten feet horizontally.

Under unusual circumstances, the horizontal spacing may be adjusted subject to the approval of the city engineer. Water mains crossing sewers should not be less than three feet above the sewer. Where it is necessary for a sewer to cross within eighteen (18) inches or over the water main, the sewer shall be constructed of ductile iron for a distance of ten feet on either side of the water main as approved by the city engineer. At no time shall the water main design not be in accordance with the DOE Orange Book

13. The location of all side sewers crossing curbs shall be indicated by an “S” stamped into the concrete curb.

#### D. Tracer Wire

Tracer wire shall be installed on all sanitary mains and side sewers.

#### E. Materials

1. Pipe material for side sewers shall be as follows:
  - a. Solid Wall PVC Sanitary Sewer Pipe: WSDOT Standard Specification 9-05.12(1);
  - b. Profile Wall PVC Sanitary Sewer Pipe: WSDOT Standard Specification 9-05.12(2);
  - c. Ductile Iron Sewer Pipe: WSDOT Standard Specification 9-05.13;
  - d. ABS Composite Sewer Pipe: WSDOT Standard Specification 9-05.14;
  - e. HDPE Pipe: WSDOT Standard Specification 9-05.21.
2. Pipe material for sewer mains shall be as follows:
  - a. Ductile iron pipe: ANSI A21.51 Thickness Class 51;
  - b. PVC pipe and fittings; ASTM 3034, SDR35 with Elastomeric Gasket
3. All joints and connections shall be airtight and watertight, as determined by the testing and inspection procedures outlined in this chapter. Joints for ductile iron pipe shall be push-on type or mechanical joint conforming to WSDOT standards specifications. Joints for concrete pipe shall be rubber gasketed coupling type conforming to the WSDOT standard specifications. Pipe and jointing shall be installed in accordance with the instructions furnished by the pipe manufacturer and

approved by the city engineer. Other jointing materials and methods may be used only with the approval of the city engineer.

F. Fees and Charges

All fees and charges related to development shall be in accordance with the latest requirements of the KMC.

G. Latecomer Agreements

Should the Applicant deem that the utility extension as an undue hardship and will benefit other property owners, the Applicant may request for a latecomer agreement, in accordance with the KMC.

### **6.01 Plans and Specifications**

All extensions to the sewer system shall conform to the most recent design standards of the City and other requirements of the City. All work and materials shall be in accordance with this document and the WSDOT Standard Specifications. Where conflicts exist, the more stringent specification shall apply. The system must be capable of future expansion and be constructed of permanent materials.

The installation of sewer extensions shall be in accordance with construction plans and specifications prepared by the Applicant's engineer and reviewed and approved by the City.

### **6.02 Connection to Existing Systems**

- A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs. Where knock-outs are not available the manhole shall be core drilled for connection.

Connection to an existing manhole requires the installation of ¼ -inch mesh screen in the downstream line while making connection to eliminate debris from entering the existing system. Where a heavy flow exists in the connection manhole and when unable to use the ¼-inch mesh screen, due care should be used to keep debris out of the downstream line.

- B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by pouring a concrete base and setting manhole sections. The existing pipe shall not be cut into until approval is received from the City.
- C. Connections to manholes using inside or outside drop structures shall be as approved by the City.
- D. Connection of new service laterals to existing mains shall be a minimum of 6-inches

and shall be accomplished by tapping the main where the lateral is to be installed using a 6" PVC tee, Romac saddle or approved equal. All taps shall be accomplished in the presence of a City inspector at the Owner's expense. The new service lateral shall be constructed of the same material as the main.

- E. Connection of a side sewer greater than six (6) inches in diameter shall require a manhole connection.

### **6.03 Roadway and Railway Crossing**

The Owner shall use the method, which has been designed on the plans and is acceptable to the City and the governmental or private agency having control of the road or railway. Permits are required, shall be obtained, and written documentation provided to the City prior to the City granting construction approval.

### **6.04 Trench Excavation**

- A. Trench excavation shall be completed in accordance with the WSDOT Standard Specifications.
- B. Trenching operations shall not proceed more than one-hundred (100) feet in advance of pipe laying except with written approval of the City.
- C. When trenching operations involve cutting through concrete pavement, the removal and reconstruction of the entire concrete panel shall be required.
- D. Where a sewer main crosses under an A.C. water main the Contractor shall replace the existing A.C. main over the excavation with Ductile Iron Pipe Class 52 to a point of bearing soil a minimum of three (3) feet each side of the excavation.

### **6.05 Pipe Laying**

Pipe laying shall be in accordance with the WSDOT Standard Specifications.

### **6.06 Pipe Bedding**

Imported bedding will be required of all sewer pipes and service pipe, located under pavement, curb, sidewalk, or usable shoulder. Bedding shall be compacted and tested every five-hundred (500) feet per the WSDOT Standard Specifications prior to placement of the next layer.

### **6.07 Pipe Backfilling**

- A. Pipe installations shall be backfilled in accordance with the WSDOT Standard Specifications and the manufacturer's specifications.

- B. No backfill shall be placed over the pipe until the work has been inspected and approved by the City. Any portion of the sewer covered before inspection shall be uncovered at the owner's expense within two days after notice to do so has been issued by the City.
- C. Trenches shall be carefully backfilled by tamping to a depth of six inches above the pipe. All backfill shall be Class B in accordance with WSDOT Standard Specifications.

### **6.08 Pipe in Filled Areas**

Where pipe is to be installed in filled areas, special treatment may be required at the discretion of the City. This treatment may consist of compacting the backfill in 6-inch layers, careful choice of backfill materials, use of Mechanical Joint Ductile Iron Pipe in short lengths, or such other reasonable method or combinations as may be necessary or as required by the City.

### **6.09 Cleaning and Flushing**

Clean and flush per the WSDOT Standard Specifications.

### **6.10 Testing of Gravity Sewers**

Test all sewers per the WSDOT Standard Specifications

### **6.11 Testing of Manholes**

All manholes shall be hydrostatically tested. In substitution for hydrostatic testing all manholes may be vacuum tested.

### **6.12 Television Inspection**

- A. Sanitary sewers shall be inspected by the use of a television camera before acceptance. The costs incurred in making the inspection shall be borne by the Applicant.
- B. Films shall be submitted to the City on DVD.
- C. The Applicant shall bear all costs incurred in correcting any deficiencies found during television inspection including the cost of any additional television inspection that may be required by the City to verify the correction of said deficiency.
- D. Test films will become the property of the City.

### **6.13 Testing of Pressure Sewer Mains**

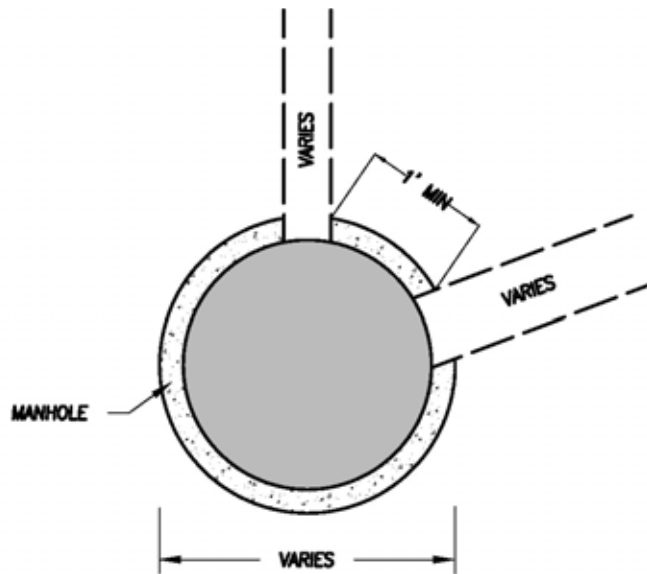
Test all pressure sewer mains per the WSDOT Standard Specifications.

## 6.14 Manholes

The Contractor is to grout and channel one manhole to prove proficiency in concrete work to City inspectors. Work may continue on remaining manholes (in an as good or better standard) after acceptance.

- A. Materials and construction shall be per the WSDOT Standard Specifications.
- B. Manhole sizing
  - 1. 48-inch Manhole
    - a. Two (2) connecting pipes, 8-inch to 12-inch diameter.
    - b. Three (3) connecting pipes, 8-inch to 10-inch diam., perpendicular.
    - c. Four (4) connecting pipes, 8-inch diam.
  - 2. 54-inch Manhole
    - a. Two (2) connecting pipes, 8-inch to 12-inch with more than forty-five degree (45°) deflection, 15-inch to 18-inch diam. with forty-five degree (45°) or more deflection.
    - b. Three (3) connecting pipes, 10-inch to 12-inch diam., perpendicular.
    - c. Four (4) connecting pipes, 10-inch to 12-inch diam., perpendicular.
  - 3. 72-inch Manhole
    - a. Two (2) connecting pipes, 15-inch to 18-inch diam. with less than forty-five degree (45°) deflection.
    - b. Three (3) connecting pipes, 15-inch diam., perpendicular.
    - c. Four (4) connecting pipes, 15-inch diam., perpendicular.
  - 4. In the above criteria "deflection" refers to the angle between any two (2) pipe channels in the manhole. Channels shall be centered in manhole with ladder rungs placed on side with larger shelf.  
  
For other pipe configurations, the size of the manhole shall be approved by the City.
- C. Locking manhole covers shall be provided in areas outside of the public right-of-way.
- D. At all manhole connections where the groundwater level is above the invert of the connecting sewer or sewers, the Contractor shall install a Wrapid Seal on each connection in accordance with the written instructions of the seal manufacturer.
- E. The contractor shall furnish and install "Man Pan" (shallow dish) watertight manhole cover inserts, or an approved equal, in new manholes and in existing manholes as shown on the Plans.

**Figure 6-1: Manhole Sizing**



## 6.15 Side Sewers

### A. General

Owners of properties located within the sanitary sewer services area with conventional service available shall be required to extend from the structure plumbing system to the main line side sewer connection.

Each premises shall have a separate sewer connection except where special conditions exist as delineated in this chapter. Any person desiring sewer service for any premise shall make application at the City Hall. The application shall be made on a printed form furnished by the city for that purpose.

### B. Application for Side Sewer Permit

Before construction and connection of a side sewer on public or private property, the Owner is required to apply for and have a permit issued by the City.

C. All applicants that obtain or can obtain water from sources other than municipal supply may be required to supply the public works department with an inorganic analysis of the water from such other sources before application for sewer service will be approved.

D. Applicants for sewer service for industrial or commercial establishments shall be required to have an approved water meter installed if such meter is not already installed. Such meters shall be used by the city to determine sewer use charges.

- E. Applicants desiring to make a new connection to the public sewer for the purpose of discharging industrial wastes shall prepare and file with the city engineer a report that shall include actual or predicted data relating to the quantity and characteristics of the waste to be discharged and such other information as the city engineer may require.

## **6.16 Pump Stations**

- A. Pump stations shall only serve those properties which cannot otherwise be served by conventional gravity sewers, as determined by the City Engineer.
- B. Unless otherwise authorized by the City Engineer, all pump stations shall be designed in accordance with the requirements of the latest edition of the City of Vancouver “General Requirements and Details for Sanitary Pump and Lift Stations,” with the following amendments:
  - 1. In all cases, the design shall conform to the requirements of the Washington State Department of Ecology;
  - 2. The installations of Romtech (or approved equal) prefabricated lift stations shall be installed unless otherwise approved by the City Engineer;
  - 3. Pumps shall be four-hundred and sixty (460) volt, three (3) phase Flygt pumps or approved equal;
  - 4. All check valves shall be Flygt ball check or approved equal;
  - 5. A yard hydrant shall be provided on the downstream end of the potable water service;
  - 6. Transducers shall be used in place of floats unless otherwise approved by the City Engineer;
  - 7. Telemetry shall be Mission RTU with US filter controller;
  - 8. Exterior lighting shall be installed;
  - 9. An approved lift station sign shall be installed;
  - 10. All pump stations shall be furnished with fixed on-site generation supplied with natural gas;
  - 11. City of Kelso Standard Details shall be used on the installation of water service, backflow preventer, and combination air valve with odor control;

12. An air discharge permit, naming the City of Kelso as the owner, shall be obtained from the Southwest Washington Clean Air Agency.

### **6.17 Mechanical Lifting Devices**

- A. Mechanical lifting devices such as ejectors, pumps, or other equally efficient approved mechanical lifting devices shall be installed in any building, structure, or premises in which the elevation of plumbing fixtures is too low to permit gravity flow to the public sewer, or achieve the minimum slope requirement.
- B. When only the lower floor(s) of a structure is too low for gravity flow, the remaining floors must flow by gravity.
- C. The discharge line from the mechanical lifting device shall be provided with an accessible backwater valve and gate valve. The discharge line shall connect to the gravity side sewer at the crown through a wye fitting.
- D. When there is a possibility that the sewer may backup in the side sewer from the pressure, minimum elevations may be prescribed by which gravity flow may be obtained, and any fixture below the prescribed elevation a backwater valve shall be installed at the owner's expense.
- E. All pump or mechanical lifting device installations must meet pertinent building and plumbing codes and must be approved by the city engineer before installation

### **6.18 Pretreatment Facilities**

- A. Where required, in the opinion of the city engineer to modify or eliminate wastes that are harmful to the structures, processes or operation of the sewage disposal works, the owner shall provide at their expense such pretreatment facilities as may be necessary to render their wastes acceptable for admission to the public sewers.
- B. All wastes containing soil, dirt, and/or sand shall be settled a minimum of two hours in an acceptable basin before discharge to a sewer.
- C. All industrial wastes shall be pre-treated in accordance with the KMC.
- D. Plans specifications and any other pertinent information relating to proposed pretreatment or processing facilities shall be submitted to the city engineer for review and comment if the effluent from such facilities is to be discharged into the public sewers. Any costs associated therewith shall be borne by the applicant.
- E. Where required by the city engineering, the owner of any property serviced by a sewer carrying industrial wastes shall install a suitable control manhole in each building sewer to facilitate observation, sampling, and measurement of the wastes. The manhole

shall be accessible and safely located and shall be constructed in accordance with plans approved by the city engineer. Any costs for pretreatment facilities shall be borne by the customer.

- F. Pretreatment facilities provided for any waters or wastes shall be maintained continuously in satisfactory and effective operation by the owner at their expense.
- G. Waste samples from pretreatment facilities shall be taken at a minimum of 50 samples per operating day. Other control variations will be acceptable if it can be demonstrated that the sampling procedure will result in a waste sample which is proportional to the waste flow; but in no case shall the daily collected sample be less than two quarts in volume. The flow measurement and sampling station shall be located and constructed in a manner acceptable to the city for approval prior to construction. The person discharging the waste shall keep flow records as required by the city and shall provide qualified personnel to properly maintain and operate the facilities.
- H. Waste samples will be analyzed at the regional wastewater treatment plant. Any cost connected with the testing shall be borne by the user. Laboratory procedures used in the examination of wastes shall be those set forth in “Standard Methods” However, alternate methods for certain analyses of industrial wastes may be used.