

DIVISION 3: SEWER

3.1 DESIGN CRITERIA

A. APPLICABILITY

1. These Design Standards shall govern all construction and upgrading of public sanitary sewer facilities in the City of Dundee and applicable work within its service areas.
2. This section supplements the OSSC Standard Specifications
3. Permanent sanitary sewer facilities shall be provided to all properties within the City of Dundee in accordance with these Design Standards. This shall generally be interpreted to mean that permanent sanitary sewer distribution facilities shall be provided for existing legal lots of record at the time development occurs, and for new legal lots of record created by a major or minor partitioning or subdivision of land at the time of partitioning or subdivision.
4. These design requirements may be used for private systems when plumbing code requirements cannot be met, provided the system is designed and appropriately certified by a professional engineer licensed in the State of Oregon.
5. Review and approval by the City Engineer of any items not covered within these Design Standards shall be required.

B. GENERAL REQUIREMENTS

1. Sanitary sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow.
2. Sewers shall be designed to convey the peak instantaneous wet weather flows anticipated over the design period without surcharging.
3. All sanitary sewers shall be designed to flow by gravity to an existing or new sewer without lift stations where possible.
4. All developments will be required to provide public sewers to serve adjacent upstream parcels in order to provide for the orderly development of the drainage area.
5. Storm water, including street, roof or footing drainage, shall not be discharged into the sanitary sewer system.
6. Unpolluted (noncontact) cooling waters shall not be discharged into sanitary sewers.

C. DESIGN BASIS & CAPACITY

1. DESIGN BASIS
 - a. All sewers shall be designed to carry the peak domestic, commercial and industrial contributions, plus infiltration/inflow (I/I) from the individual gravity service laterals, sewer mains and manholes.

- b. New sewer systems within the City may be designed on the basis of the following flows, flows from types of establishments not listed shall be as approved by the City Engineer:
 - i. Residential domestic flows: 100 gal/capita/day (gpcd)
 - ii. Schools, non-residential students & staff: 25 gpcd
 - iii. Commercial, non-residential customers:
 - 1) Restaurant/cafe: 40 gal/day/seat
 - 2) Tavern/bar: 50 gal/day/seat
 - iv. Laundries, self-service: 500 gal/day/machine
 - v. Infiltration/inflow:
 - 1) New facilities: 1,600 gal/acre/day
 - 2) Existing facilities: as measured.

2. CAPACITY

- a. Public lateral or mainline sewers shall not be less than eight (8) inches in diameter unless approved in writing by DEQ and the City Engineer.
- b. Sewers shall be designed to carry, without surcharging, not less than four (4) times the design sanitary flow, plus I/I allowance, plus existing or planned flows from upstream properties.
- c. A minimum "n" value of 0.013 shall be used in Manning's formula for the design of all sewer facilities regardless of pipe material. The use of higher "n" values for existing pipe may be required by the City Engineer.

D. PIPE SERVICE AREA CAPACITY REQUIREMENT

- 1. Mainline and lateral sewers shall be designed for the ultimate development of the tributary area. Consideration shall be given to the maximum anticipated capacity of institutions, industrial parks, commercial establishments, etc.
- 2. Selection of the design period for trunk sewers shall be based on evaluation of functional and other considerations. Some of the factors that should be addressed in the design of trunk sewers are:
 - a. Solids deposition, odor, and pipe corrosion at initial flows.
 - b. Effect of sewer sizing on land use and development.
 - c. Population and economic growth projections and the anticipated accuracy of these projections, coupled with the comparative costs of staged construction and the anticipated manner in which the future improvements will be funded.

E. SEWER HORIZONTAL ALIGNMENT

- 1. Sewer lines shall be laid on a straight alignment and uniform slope between consecutive manholes.
- 2. Horizontal and vertical curves in sanitary sewers are not permitted.

3. Sewer mainlines and lateral mainlines shall be separated from all other utilities by a minimum of five feet clear. Separation of utilities must meet Oregon state Department of Environmental Quality (DEQ) and Oregon Health Authority - Public Health Division (OHA PHD) requirements.
4. Sewer mainlines and lateral mainlines shall generally be separated from water mainlines by a minimum of ten (10) feet.

5. WATER MAIN CROSSINGS

- a. Where sanitary sewer lines cross above or within 18 inches of vertical separation below a waterline, sewer mains and/or laterals shall be replaced with AWWA C900 PVC pipe (DR 18) in accordance with OAR 333.
- b. One full (20 foot) length of AWWA C900 PVC pipe (DR 18) shall be centered at point of crossing. C900 PVC pipe to be connected to existing sewer lines with approved rubber couplings with stainless steel bands.
- c. Sewers crossing streams or drainage channels shall be designed to cross the stream as nearly perpendicular to the stream channel as possible with no less than three (3) feet of cover and shall be free from grade changes at the crossing.

6. EASEMENTS

- a. Public sewers within easements will be permitted only upon showing that services cannot be provided from a line within a right-of-way.
- b. All easements must be furnished to the City for review and approval prior to recording. All recording costs shall be borne by the developer.
- c. Sewer easements shall not be used for any purpose which would interfere with the unrestricted use for sewer main purposes.
- d. Minimum Easement Widths
 - i. Unless otherwise specified or authorized by the City, minimum easements widths for sanitary sewers shall be as follows, additional width may be required at the discretion of the City Engineer:

Table 3.1 - Minimum Sanitary Sewer Easement Width		
Sewer Pipe Diameter	Depth To Invert	
	Less Than Or Equal To 6 Feet	Greater Than 6 Feet
8 To 10 Inches	15 Feet	15 Feet Plus 2 Feet For Each Foot (Or Fraction Thereof) Deeper Than 6 Feet To Invert
12 To 15 Inches	20 Feet	20 Feet Plus 2 Feet For Each Foot (Or Fraction Thereof) Deeper Than 6 Feet To Invert
15 To 24 Inches	25 Feet	35 Feet Plus 2 Feet For Each Foot (Or Fraction Thereof) Deeper Than 6 Feet To Invert

F. SEWER VERTICAL ALIGNMENT

1. MINIMUM PIPE SLOPE

- a. All sanitary sewers shall be designed to flow by gravity to an existing or new sewer without sewage lift stations, where possible.
- b. All sanitary sewers shall be laid on a slope which will produce a mean velocity when flowing full of at least two (2) feet per second based on manning's formula.
- c. Sewers shall be laid with uniform slope and alignment between manholes.

2. MAXIMUM PIPE SLOPE

- a. The difference between the inlet pipe slope and outlet pipe slope at any manhole shall not exceed twenty-five percent (25%).
- b. Sewers on slopes of twenty percent (20%) or greater shall be anchored with concrete anchor walls or other restraining methods approved or specified by the City.
- c. Where velocities greater than 15 feet per second are attained, the pipe material shall be ductile iron and special provision shall be made to protect manholes against erosion or displacement.

3. MINIMUM DEPTH

- a. All sanitary sewers shall be laid at a depth sufficient to drain building sewers, to protect against damage by frost or traffic and to drain basement sewers where practical.
- b. Sanitary sewers in residential areas shall be placed in the street with the following minimum cover:
 - i. Lateral and mainline sewers – six (6) feet
 - ii. Trunk sewers:
 - 1) In the roadway – seven (7) feet
 - 2) In easements – eight (8) feet
- c. Where the topography is relatively flat and existing sewers are five (5) feet or less and cannot be practically lowered, the minimum cover may be reduced to three (3) feet. Cover depths less than three (3) feet will require the approval of the City Engineer, and will require the installation of Class 52 Ductile Iron Pipe (corrosion resistant mortar lined) or Class 150 C900 PVC.

G. SERVICE LATERALS

1. GENERAL REQUIREMENTS

- a. Construction of the sewer service lateral shall be of the same quality and meet the same requirements as the public sewer. These sewers shall also conform to state and local plumbing codes and restrictions.
- b. Sewer service laterals shall not tie into manholes.
- c. Each legal lot of record shall be connected by a separate sewer service lateral connected to the public or approved private sewer main. Combined sewer

service laterals will be permitted only when the property cannot legally be further divided.

- d. Additional sanitary sewer laterals must be stubbed into the property sufficient to serve all future residential parcels where such service or future partition would require that new streets be cut to install such services.
- e. A backwater check valve shall be installed when the lowest floor level of a house to be connected to the public sewer is less than 12-inches above the top of the nearest upstream manhole or cleanout structure. A gate valve in addition to the required backwater check valve is optional but should be considered for installation for additional protection should the backwater valve fail or become clogged with debris.
- f. Sewer service laterals shall have at least 4 feet of cover from finish grade at the right-of-way or easement line.
- g. Connections of service laterals to existing sewers shall be made watertight.
- h. The entire portion of the sanitary sewer lateral or building sewer outside the public right-of-way (or outside the public sewer easement for sewer mainlines not constructed in public right-of-way) shall be the sole responsibility of the property owner. Where a property line cleanout exists, the private lateral maintenance responsibility extends to the property line cleanout wye.

2. CLEANOUTS

- a. A cleanout shall be installed at the right-of-way or easement line for all new and existing sanitary sewer service laterals. The sanitary sewer service lateral shall extend beyond the cleanout to the back of any easements fronting the right-of-way or easement.

3. MINIMUM DIAMETER AND SLOPE

- a. The minimum inside diameter of a sewer service lateral shall be 4-inches and shall be equal to or greater than the building plumbing stub (building drain) diameter.

H. MANHOLES

1. MANHOLE LOCATION

- a. Where practical, manholes shall be located at street intersections.
- b. Manholes shall be placed at the following locations:
 - i. At minimum intervals of 450 feet or less.
 - ii. The upper end of all lateral sewers
 - iii. Every change in grade or alignment
 - iv. Every change in size of sewer
 - v. Each intersection or junction of sewers, excluding service laterals 6 inches or less in diameter
 - vi. In front of the last property or lot being served, a minimum of 10 feet past the common lot line of the adjoining parcel served.
 - vii. Adjacent to the center point of a cul-de-sac
- c. Manholes shall not be located in the curb or in the gutter.

- d. Two (2) manholes shall be installed when the horizontal deflection angle between two (2) sewers is an acute angle less than or equal to 80° . Spacing of such manholes shall be a minimum of 10 feet outside to outside.
- e. Manholes constructed over existing sanitary sewers shall conform to the requirements of OSSC.

2. MANHOLE SIZING

- a. For sewer pipe 21 inches in diameter and smaller, the minimum manhole diameter shall be 48 inches.
- b. For sewer pipe larger than 21 inches in diameter, the minimum manhole diameter shall be 60 inches.
- c. Larger manholes may be required for multiple pipe connections.
- d. Manhole sizes for drop structures or metering manholes will be reviewed on a case-by-case basis.

3. VERTICAL DROP ACROSS MANHOLE

- a. Generally, the minimum vertical drop across a 4-foot diameter manhole is required as shown below:
 - i. Straight through runs: 0.1 foot minimum drop
 - ii. Bends greater than 45° : 0.2 foot minimum drop
- b. Maximum vertical drop across a 4-foot diameter manhole shall not exceed 18 inches.
- c. In cases where two pipes discharge into a manhole from opposite directions and one pipe has a slope more than four percent (4%) steeper than the pipe opposite, the invert of the pipe with the lower slope shall be set a minimum of 0.35 feet or half of the pipe diameter, whichever is greater, above the invert of the steeper pipe.
- d. Manhole Flow Channels
 - i. Flow channels in manholes shall be constructed to provide smooth transition between inlet and outlet sewers and to minimize turbulence.
 - ii. Flow channel height shall be to the crowns of the sewers. Benches beside flow channels shall be sloped from the manhole wall toward the channel to prevent accumulation of solids.
 - iii. Flow channels shall be shaped to allow the insertion of a 6-inch diameter by 3-foot long TV camera into the downstream sewer.

4. DROP MANHOLE

- a. All drop manhole installations must be approved in writing by the City Engineer on a case-by-case basis. Drop manholes will not be allowed for pipe greater than 12 inches in diameter.
- b. Inside drop manholes shall be a minimum of 60 inches in diameter. All inside drops shall be constructed with pipe with stainless steel support structures. No partitions will be allowed.

5. MANHOLE RIM ELEVATION

- a. The rims of all manholes located within paved or other hard-surfaced areas shall be set to finished grade.
- b. The rims of all manholes located outside of paved or other hard surfaced areas shall be set 6 inches above finish grade. Finish grade shall be defined as the final ground surface after grading and landscaping.
- c. Concrete riser rings shall be used to bring casting to grade. The height from the top of the cone or flattop section to the rim shall not exceed 18 inches.
- d. All manholes within easements shall have lock down lids.

6. MANHOLE TAPS

- a. When an existing manhole is tapped into a new sewer which will drain into the manhole, the crown of the new sewer shall generally match the crown of the existing pipes.
- b. Connection of new pipe lines to existing manholes shall be core drilled for connection using a core and seal boot with non-shrink grout and link seal.
- c. When the size of the new pipe being tapped into the existing manhole is the same size as the existing pipe exiting the manhole, the invert of the new pipe should be a minimum of 0.35 feet above the invert of the existing pipe, or higher as required to be above the normal sewage flow level.

I. CLEANOUTS

1. Mainline cleanouts will not be approved as substitutes for manholes. Cleanouts shall only be allowed at the upper end of lateral or main sewers less than 150 feet long that will be extended on the same grade and alignment during the next construction phase, and which do not have any laterals.
2. Mainline cleanouts will be considered on a case-by-case basis by the City Engineer. In all cases, plan and profile showing the alignment and depth of the anticipated future extension from the proposed cleanout to the next manhole shall be submitted prior to approval of cleanouts.

J. UNDERGROUND WARNING TAPE

1. Detectable or non-detectable acid and alkali-resistant safety warning tape shall be provided along the full length of all service laterals and all mainlines not located under sidewalks or paved portions of public streets.
2. Underground warning tape shall be placed a minimum of 12 inches and a maximum of 15 inches below the finish ground surface, and shall be continuous over the entire length of the main line and over the service laterals installed from the mainline to the back of the PUE. The warning tape shall be continuous between manholes or cleanouts.

3.2 MATERIALS

A. GENERAL

1. Unless otherwise approved by the City Engineer, materials shall conform to the most current version of the Oregon Standard Specifications for Construction, the minimum requirements outlined herein and as shown on the Standard Details. This listing is not intended to be complete nor designed to replace the any of the city required standards.
2. In the case of conflicts between the provisions of these Design Standards and the PWS, the more stringent as determined by the City Engineer shall apply. Acceptable materials shall be as outlined in these Design Standards.
3. It is not intended that materials listed herein are to be considered acceptable for all applications. The Design Engineer shall determine the materials suitable for the project to the satisfaction of the City Engineer.

B. NON-PRESSURE PVC PIPE

1. Pipe and fittings 15 inches in diameter or less shall conform to ASTM D-3034, SDR 35.
2. Pipe and fittings 18 through 27 inches in diameter shall conform to ASTM F-679.
3. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM classification.

C. JOINTS

1. Joints shall conform to ASTM D-3212, joints for drain and sewer plastic pipes using flexible elastomeric seals.
2. Joints for pipe shall be push-on joints using factory installed elastomeric ring gaskets. The gaskets shall be securely fixed into place by the manufacturer so that they cannot be dislodged during joint assembly.
3. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and groundwater, and which will endure permanently under the conditions of the proposed use.

D. PIPE ACCESSORIES

1. Fittings shall be of the same material as the pipe, molded or formed to suit pipe size and end design.
2. FLEXIBLE, MECHANICAL COUPLINGS AND ADAPTERS (GRAVITY APPLICATIONS)
 - a. Flexible, mechanical couplers and adapters shall be used for connecting plain ends of non-compatible types or sizes of pipe and for the installation of cut-in tee connections and other fittings into existing lines.
 - b. Couplers and adapters shall be supplied with stainless steel bands.
 - c. Flexible mechanical couplers and adapters shall be as manufactured by fernco or approved equivalent.

E. MANHOLES

1. Manholes shall conform to ASTM C478.
2. Unless otherwise approved, all joints between manhole sections shall be keylock or o-ring type conforming to ASTM C443.
3. Precast base sections shall be of monolithic construction and shall be manufactured such that the base riser section is integral with the base slab.
4. The bottom of the precast base section shall be a minimum of 6 inches thick, and contain a minimum of 0.32 sq. Inches of reinforcing steel each way in the top of the base slab.
5. Sanitary sewer manhole bases shall be provided with core-drilled openings and flexible manhole-to-pipe connectors for the connection of stub outs.

F. MANHOLE STEPS

1. All manholes shall be equipped with permanent factory-installed steps to provide a continuous ladder of 12 inch center-to-center rung spacing.
2. Manhole steps shall be of polypropylene plastic reinforced with a ½ inch, grade 60 reinforcing rod.
3. There shall be no more than 30 inches from the manhole rim and the rung of the top step.

G. MANHOLE GRADE RINGS

1. Concrete grade rings shall have precast keyway grooves, and the height from the top of the cone or the bottom of the flattop section shall not exceed 18 inches in height.

H. MANHOLE FRAME AND COVER ASSEMBLIES

1. Castings shall be cast iron conforming to the requirements of ASTM A48, Class 30, and shall match the dimensional requirements of the Standard Details.
2. Standard frames and covers shall be used for all paved areas.
3. Where pressure tight manhole covers are called for, lid seals shall be a continuous round rubber gasket supplied by the manufacturer. Threaded inserts shall be cast in eccentric cones or flat slab tops and holes formed or cored in adjusting rings to match bolt size and spacing specified for the manhole casting.

I. MAINLINE CLEANOUTS

1. Mainline cleanouts shall consist of a lid and frame of heavy duty cast iron construction with closed lid design. A 3,300 psi concrete collar is required for cleanouts located in paved areas.