



Gravity Sewer Design Review Checklist

DEQ staff use this checklist to review gravity sewer design submissions. This checklist may be used by communities and consultants to ensure a complete submission to DEQ. [Oregon Administrative Rule 340-052 appendix A](#) is attached.

Requirements for Plan Submittal to DEQ	Yes/No/NA	Comment
The submittal includes the following:		
1. Completed affirmative Land Use Compatibility Statement?		
2. Engineering plans stamped and signed by an Oregon-registered professional engineer?		
3. Completed acceptance and capacity certification form signed by the system owner?		
4. Technical activities fee paid?		
5. Transmittal letter including name of project certification inspector, construction takeoff and construction schedule?		
Technical Requirements: General	Yes/No/NA	Comment
1. Vicinity map included?		
2. All common sewer in the public right-of-way? If not, are 15-foot easements provided? If not, explain.		
3. Are all easements on private property shown on plans?		
4. Do all service laterals serve only one tax lot? If not, do shared laterals meet common sewer requirements and will be owned and maintained by the city? If not, explain.		
5. Are erosion control plans included?		
6. Is there a general note stating that current Oregon Standard Specifications for Construction (OSSC) are controlling?		
7. Are preliminary rim elevations for maintenance holes shown?		
8. Are maintenance holes on the project numbered on both plan and profile using a consistent system of designation?		
9. Are all utilities that cross over or under the trench line shown in profile as well as plan view, especially significant hazards such as gas lines, phone lines, power cables, and fiber-optic cables?		

Translation or other formats

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Capacity Appendix A Minimum Requirement (a)		
Sewers shall be of such diameter as to pass without overflow, bypass, or back flow onto damageable property of a user the design peak flow including sewage and infiltration. All unavoidable inflow from roof, surface, footing, foundation, or other groundwater or surface water sources shall be excluded from capacity allowance.		
Technical Guidelines	Yes/No/NA	Comment
1. Are collection sewers designed for the ultimate development of the tributary areas as determined by master sewerage and land use plans of the owner?		
2. Is design of sewers based on initial and ultimate flows?		
3. Are flows broken down into domestic, industrial, and infiltration/inflow fractions?		
4. Was a peaking factor (between 1.8 and 4.0) applied to domestic and industrial fractions?		
5. Are domestic design flows between 50- and 100-gallons per capita day (gpcd)?		
6. Is infiltration allowance less than 2,000 gallons per acre per day?		
7. Are pipes at least 8 inches in diameter? Short non-extendable 6-inch sections of up to 250 feet are permissible.		
8. Are replacement sewers designed commensurate with flow conditions?		
Velocity Appendix A Minimum Requirement (b)		
Sewers shall be designed to have a velocity to "self clean" or transport constituent solids to the treatment facility or the owner shall periodically service sewers to flush, transport, or remove solids from sewers with minimal velocity.		
Technical Guidelines	Yes/No/NA	Comment
1. Is velocity when flowing full or half full of at least two (2) feet per second (fps) (Manning "n" = 0.013)?		
2. Do sewers with minimal flow such as upper reaches of laterals travel at a minimum of 2 fps? <i>Increases in slope and/or decrease diameter may be acceptable.</i>		
3. Are force mains and inverted siphons designed for 3 fps at average flows?		

Technical Guidelines	Yes/No/NA	Comment
4. Do pipes meet the minimum slope requirements? <i>0.4 percent for 8-inch pipe and 0.6 (preferably 0.75) percent for 6-inch pipe.</i>		
5. Are flow channels through maintenance hole bases smooth and do they conform to the shape and slope of the inlet sewers?		
6. Are intersecting sewers, sewer connections, etc., made without causing backup into the smaller sewer?		
7. For intersecting unequally sized sewers in maintenance holes, does the elevation at 0.8 of full depth of flow in each sewer match?		

Watertightness Appendix A Minimum Requirement (c)

Completed sewer construction shall result in limited infiltration/exfiltration through pipe walls, joints, fittings, and connection fittings, etc., and no inflow. The limit shall be consistent with the pipe and maintenance hole materials and with what is obtainable at the time by the construction industry on representative jobs for the same type of construction using high quality materials and state-of-the-art methods of workmanship. All completed sewer lines in new work shall be tested for watertightness using either recognized air or water testing requirements and procedures.

Watertightness: Materials and Methods

Technical Guidelines	Yes/No/NA	Comment	
1. Are OSSC used?			
2. If Owner Specifications are used, are they more stringent than Oregon Standard Specifications for Construction (OSSC)?			
3. Are Oregon Standard Drawings Used?			
4. If Owner Drawings are used, are they more stringent than Oregon Standard Drawings?			
5. Are proposed pipe materials, joints, fittings, and appurtenances per OSSC?			
6. Are all maintenance holes in drainage, gutter, or similar low-lying points outside the crown of the street fitted with water-tight gasketed covers?			
7. Do connections to existing maintenance holes where no stubout is available include a note by each maintenance hole tap similar to the following? <i>Tap existing maintenance hole by core-drilling or sawing. Install approved commercial boot adapter per specs. Rechannel maintenance hole base per standard drawing.</i>			

Technical Guidelines	Yes/No/NA	Comment
8. Are new service laterals connected to new sewer main with manufactured wyes or tees? <i>New service laterals may be connected to existing sewer mains using flexible joints. Connections to maintenance holes are discouraged.</i>		
If connecting to a maintenance hole:		
a. Were new pre-cast maintenance hole bases used with no more than 2 connections?		
b. Were the self-cleansing channels cast into the base and maintenance hole adapters used for the connections?		
9. Do details show the installation of toning wire into maintenance holes?		
If yes, is installation consistent with Oregon Standard Details?		
Watertightness: Inspection and Testing - What is planned?		
Technical Guidelines	Yes/No/NA	Comment
1. Do the specifications include required inspections and testing, including criteria and corrective actions?		
2. Are building drains required to conform to the State Plumbing Code and be tested?		
3. Will a final inspection be performed eleven months after completion?		
Pipe testing		
Technical Guidelines	Yes/No/NA	Comment
1. Video inspection per OSSC (00445.74)?		
2. Deflection testing per OSSC (00445.73)?		
3. Hydrostatic or low-pressure air testing per OSSC (00445.72)?		
Maintenance hole testing		
Technical Guidelines	Yes/No/NA	Comment
1. Will all maintenance holes be hydrostatic or vacuum tested per OSSC (00470.71)?		
2. Will maintenance holes also be visually inspected during first wet weather season after construction for infiltration?		

Structural Strength Appendix A Minimum Requirement (d)

The completed installation including the excavated trench, the pipe, the bedding, and the pipe zone materials shall resist imposed loads from backfill, impact, and live loads (construction and design) without pipe failure through crushing, loss of watertightness, settlement, or significant capacity loss.

Technical Guidelines	Yes/No/NA	Comment
1. Is the trench designed per Oregon Standard Specifications for Construction (OSSC) and Oregon Standard Drawings?		
2. Is all pipe material flexible?		
a. If not, is the use of rigid pipe at maintenance holes limited to the least distance practicable to make a flexible connection?		
b. Is the flexible joint within 18 inches of maintenance hole with a second flexible joint within 4 feet of the maintenance hole? OSSD RD 345 Section A-A.		
3. Is all pipe buried at least 36 inches from top of pipe to finished grade?		
If not, state special measures employed such as increasing class of pipe and/or pipe bedding, use of ductile iron, concrete encasement and restriction of construction equipment from travel over partially backfilled trench.		

Ability to Pass Solids Appendix A Minimum Requirement (e)

Sewer systems shall be free of depressions, sharp edges, roughness, side sewer projections, obstructions, restrictions, displaced "O" rings, etc., which can cause solids to accumulate or deposit.

Technical Guidelines	Yes/No/NA	Comment
1. Is a note included on plans that new sewers are to be thoroughly flushed and visually inspected for accumulated debris prior to use?		
2. Are building sewer connections made with fittings that prevent any projection into the main sewer?		
3. Are all taps watertight?		
4. Do plans specify vertical deviation from true grade line no more than plus or minus 0.02 feet?		
5. Is the horizontal tolerance for deviation from line no more than plus or minus 3/8 inch?		
6. Is drop maintenance hole piping easily maintained, self-cleaning and able to "overflow" into the maintenance hole?		
7. Are pressure sewer piping connections, flow measuring devices, etc., in maintenance holes designed to not obstruct flow?		

Technical Guidelines	Yes/No/NA	Comment
8. Do flow channels in maintenance holes slope at least 0.1 feet from inlet to opposite outlet?		
9. Is slope at least 0.2 feet for outlet that is on an angle from an outlet?		

Durability Appendix A Minimum Requirement (f)

- (A) The materials and details of construction shall provide an in-place sewerage system which will resist corrosion of the pipe and maintenance hole materials caused by any source or condition. Any corrosive effect shall be consistent with the design life of the sewer.
- (B) Resistance to erosion of surfaces by grit, high velocity flow, etc., shall be addressed if appropriate.
- (C) Temperature effect upon thermoplastic materials shall be appropriate.

Technical Guidelines	Yes/No/NA	Comment
1. Are sewers constructed of materials resistant to or protected from biological degradation, acid and alkaline solutions, normal sewer temperature variations, abrasion and industrial wastes (where applicable), or other harmful service conditions which may exist in the sewerage system?		
2. Does the owner have a user ordinance which restricts discharge of harmful substances into the sewerage system?		
3. Are velocities over 15 feet per second in sewers expected?		
If yes, what special considerations for erosion control are included?		

Stability Appendix A Minimum Requirement (f)

Line and Grade: Horizontal alignment and vertical grade of in-place sewers upon construction completion and construction acceptance shall be relatively stable. Design considerations, construction specifications, inspections, etc., shall preclude pipe settlement, shifting, or flotation such that capacity, watertightness, structural integrity, ability to pass solids, maintainability, etc., are not compromised either at construction or any later time.

Diameter: Rigid, flexible and semiflexible pipes tend to lose minimum inside diameter if not designed and/or installed properly. Design considerations, construction specifications, field inspections, etc., shall preclude diameter loss such that capacity, watertightness, structural integrity, ability to pass solids, maintainability, etc., are not compromised either at construction or any later time.

Technical Guidelines	Yes/No/NA	Comment
1. Is there appropriate foundation stabilization and/or soils employed in unstable soils?		
2. Will backfill be placed in small lifts and compacted uniformly to specified density along and around the pipe?		
3. Is bedding and compaction per Oregon Standard Specifications for Construction (OSSC)?		

Technical Guidelines	Yes/No/NA	Comment
4. Is deflection testing per OSSC?		
5. Are any sewers on slopes over 25 percent?		
a. If yes, were they evaluated for slippage or pipe bedding depending upon soil type, groundwater presence, construction conditions, etc.?		
b. Are appropriate anchors provided where necessary?		

Operation, Maintenance, and Safety Appendix A Minimum Requirement (g)

Sewer systems require periodic and unscheduled maintenance for sustained operation. Designs shall conform to requirements of the sewage works owner for maintenance hole construction, spacing, size, details and easements. All parts of the sewerage system shall be readily accessible. The minimum inside bottom diameter of maintenance holes shall be 42 inches.

General maintenance hole/cleanout standards for sewers

Technical Guidelines	Yes/No/NA	Comment
1. What is the minimum inside bottom diameter? <i>The minimum inside bottom diameter should be no less than 48 inches. The least inside dimension (from the drop structure to maintenance hole wall) may be reduced to 38 inches where an integral inside drop is acceptable to the owner. No more than one inside drop should be installed in a 48-inch maintenance hole.</i>		
2. Is the minimum cover opening diameter 22 inches?		
3. Where are maintenance holes located?		
a. Every change in grade or alignment of sewer?		
b. Every point of change in size or elevation of sewer?		
c. Each intersection or junction of sewers?		
d. Upper end of a lateral sewer (except lateral sewers 250 feet or less in length)?		
e. At intervals of 500 feet or less except for 24 inch and larger sewers?		
4. Are channel width and depth equal to the pipe diameter?		
5. Are maintenance hole base ledges sloped to drain at least 1:12?		
6. Do maintenance hole rungs, if specified, meet Oregon Standard Drawings?		

Technical Guidelines	Yes/No/NA	Comment
7. Are drop maintenance holes proposed where free fall of sewage into a maintenance hole exceeds 24 inches from inlet pipe invert to maintenance hole invert?		
8. Are maintenance holes fitted with tamper-proof locking lids in vandalism-prone areas and areas outside travelled rights-of-way that are not readily visible by the public?		
9. Do inverted siphons include at least two pipes of such size and hydraulic gradient as to maintain a velocity of at least 3 feet per second in one pipe under conditions of average dry weather flow?		
a. Are control maintenance holes provided at both ends of the inverted siphon line?		
b. Are inlet and outlet details arranged so normal flow is diverted to either barrel so that the other barrel may be removed from service for maintenance?		

Separation of Water and Sewer Lines Appendix A Minimum Requirement (h)

Protection of the water supply, be it distribution system, production facilities or source is not only prudent but mandatory and absolutely necessary. Sanitary sewers and appurtenances thereto shall not physically connect to a public or private potable water supply system so as to permit the passage of any sewage or polluted water into the potable supply. Sewer construction shall not disturb, degrade, or decrease the watertightness of any existing water supply line.

Technical Guidelines	Yes/No/NA	Comment
1. Do parallel water and sewer lines conform to Figure A-1 (appendix A and figure attached bellow checklist)?		
2. Is common trench construction for water and sewer avoided where practical? <i>Where used, the minimum pipe separations of Figure A-1 should be maintained.</i>		
3. Is the top of sewer line at least 1.5 feet below bottom of waterline?		
4. Is adequate structural protection for each line provided?		

Exception: Use of Pressure Pipe Material for Sewer Line		
Technical Guidelines	Yes/No/NA	Comment
5. Where the above horizontal or vertical separations cannot be maintained, is one of the alternatives listed in Appendix A or suitable alternative pressure pipe materials used in addition to whatever waterline improvements or reconstruction that may be advisable or required for protection of water?		
6. Is the proposed pressure pipe material used from maintenance hole-to-maintenance hole to avoid discontinuity of materials?		
7. At crossings requiring pressure pipe materials, the following should apply with one standard length of special pressure pipe centered over the waterline in all cases: • Ductile iron: 18-foot standard pipe length and 18 ft minimum laying length on each side of the waterline crossing. • PVC: 20-foot standard pipe length and 20-foot minimum laying length on each side of the waterline crossing. • High-density polyethylene: 38-foot standard pipe length and 19-foot minimum laying length on each side of the waterline crossing.		
Soil Restoration at Crossings		
Technical Guidelines	Yes/No/NA	Comment
To restore any natural resistance to groundwater movement existing prior to construction, will soil removed from sewer line trench construction at waterline crossings where sewer crosses over water be replaced in all areas to as near natural densities as possible through mechanical compaction? <i>Soil should include no rock fragments over 1-1/2 inch in the pipe zone.</i>		
Well Protection		
Technical Guidelines	Yes/No/NA	Comment
Is any sewer pipe to be laid less than 50 feet from any well without specific Oregon Health Division approval?		

Technical Guidelines	Yes/No/NA	Comment
If yes, pressure pipe materials should be used to protect wells where minimum setbacks are not obtainable or where additional protection is required as determined by the Oregon Health Division.		
Pipe Testing		
Technical Guidelines	Yes/No/NA	Comment
1. If a pressure pipe material is used for any of the above purposes of separation, will a pressure test be conducted on the pressure pipe to confirm watertightness?		
2. Are test pressures no less than 15 pounds per square inch gauge where use will be for a gravity sewer?		
3. Are test pressures higher for a pressure sewer (force main)?		
<i>Are there any other exceptions?</i>		
If yes, are they resolved with the water purveyor and Oregon Health Division?		

Non-discrimination statement

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