

**WASHOE COUNTY DEPARTMENT OF WATER
RESOURCES
GRAVITY SEWER COLLECTION DESIGN
STANDARDS**

This section of the manual contains the Washoe County Department of Water Resource’s (DWR) standards for:

- Designing Gravity Sewer Collection Facilities (“Sewer Design Standards”)

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2.1.0 SEWER COLLECTION SYSTEM DEFINITIONS

- 2.1.00.1 Average Daily Flow - The average daily design flow for a residence is 270 gallons per day. This figure includes inflow and infiltration.
- 2.1.00.2 Equivalent Residential Unit (ERU) - That portion of an industrial or commercial development which is equivalent to a single residence in terms of wastewater flow. An ERU has 25 weighted fixture units, as defined by DWR fixture unit spreadsheet, and is assumed to generate 270 gallons of sewage per day.
- 2.1.00.3 Inflow -The unauthorized discharge of water into service connections and sewer pipes from roof drains, foundation drains, air conditioners and unpolluted discharges from businesses and industries.
- 2.1.00.4 Infiltration -Groundwater which enters sewers and building connections through joints and cracks in pipes and manholes.
- 2.1.00.5 Interceptor Sewer -A sewer line that receives flow from a number of collector sewer mains and conducts such sewage to a point for treatment or disposal.
- 2.1.00.6 Lateral -That portion of a sewage collection system that conducts sewage from the edge of a public right-of-way or dedicated easement (Customer's property line) to the collector sewer. Maintenance of the lateral from the house to the property line is the responsibility of the property owner.
- 2.1.00.7 Peaking Factor - A numerical factor by which average flows are multiplied to obtain peak flows. Peaking factors will vary with tributary area and time frame.
- 2.1.00.8 Service Wyes - The fitting by which a lateral is connected to the collector. Service tees are not acceptable.
- 2.1.00.9 Private Collection System - That portion of a sewage collection system which conducts sewage from a building to the public right-of-way or customer's property line. Private collection sewer systems shall be designed and constructed to DWR specifications, but will not be dedicated to the County. Private collection sewer systems shall be maintained by the owner (or agent) of the property being served.

2.1.01 GENERAL REQUIREMENTS

2.1.01.1 Sewage collection system shall comply with the regulations imposed by Federal, State law and local ordinances, and shall be approved by the DWR. At no time shall storm water, groundwater, or other surface water be allowed to enter the sewer system. Failure to prevent inflow of storm water or other surface water into the sewer system is a violation of state and local ordinances, and is subject to penalties.

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- 2.1.01.2 The subdivider/developer shall provide DWR with information as necessary to determine the adequacy of the existing sanitary sewer system to accommodate flows from the proposed subdivision or development from the point of connection to a sanitary sewer interceptor. DWR may require modeling and analysis for all developments.
- 2.1.01.3 All sanitary sewers, including laterals, shall be constructed to a depth sufficient to allow for gravity flow to public sanitary sewers from all floors of residential or commercial structures, including basement areas. Alternative means may be approved on a case-by-case basis, and shall require the approval of DWR prior to construction. Cost for any required easements or rights-of-way shall be included in the estimate.
- 2.1.01.4 Concrete collars shall be placed around all manholes, valves or other appurtenances within any right-of-way or easement. Such collar shall encircle all casting with a minimum width of one foot. Manhole collars shall conform to standard details; all other collars shall extend to a minimum depth of one foot. Concrete shall meet the Standard Specifications for Public Works Construction for severe weather.
- 2.1.01.5 Public sewer facilities shall be installed within public street sections. No public sewer facilities will be permitted along lot lines or other locations unless approved by DWR. Appropriate public sanitary sewer easements and improved access in accordance with DWR standards are to be provided for maintenance purposes.
- 2.1.01.6 Sanitary sewer mains shall be extended with a subdivision or development to adjacent undeveloped property for future extensions in accordance with approved plans, unless otherwise approved by DWR. A sanitary sewer manhole and minimum 20 foot long stub with cap shall be placed at the terminus of the sewer main at the property line of the un-development adjacent property. A mechanical plug shall be installed into the downstream pipe and inside the terminal manhole.

2.1.02 SEWER DESIGN CRITERIA

The following design criteria shall govern the design of sewage collection systems to be dedicated to the County. The intent of these criteria is to provide safe, adequate, and dependable sewer service without excessive maintenance costs.

- 2.1.02.01 Flow Determination -The average flow from residential units shall be based on a average daily residential rate of 270 gallons. Fixture units may be used to determine

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the flow from commercial and industrial areas or by historical water consumption records. If fixture unit counts are not available, average daily flows for commercial property shall be:

1.) Parks and Open Space: 664 gallons/day/acre

2.) Commercial:

General Commercial (GC): 780 gallons/day/acre (9.9 employees/acre)

Neighborhood Commercial (NC): 2,536 gallons/day/acre (32.2 employees/acre)

Tourist Commercial (TC): 3,245 gallons/day/acre (41.2 employees/acre)

3.) Industrial: 457 gallons/day/acre

4.) or as approved by DWR

(Washoe County Community Development Standards)

2.1.02.02 Pipe Size -The minimum size of collection lines shall be 8-inches in diameter. Service laterals which serve single residences shall be a minimum of 4-inches in diameter. All other lines shall be sized using accepted hydraulic analysis techniques. Such sizing analysis shall be performed using peak hour flows.

2.1.02.03 Pipe Slope -The minimum pipe slope is the slope at which the flow velocity is at least 2.5 feet per second when flowing half full or as approved by DWR. In general, slopes which permit sewage velocities in excess of 10 feet per second will not be without DWR approval.

2.1.02.04 Depth of Flow - The depth of flow in the sanitary sewer pipes shall not exceed 0.8D where D is the nominal diameter of the pipe.

2.1.02.05 Capacity – Sewer collection system shall be designed for peak flows. Design engineer shall determine peaking factor. When sizing a sewage collection system for a given area, the system shall be sized so that it will be adequate to carry the design flow from the entire future tributary area even though it is not within the project boundaries. The minimum peaking factor shall be 3 or as approved by DWR.

2.1.02.06 Analysis - Manning’s Formula is to be used in computing depth of flow and velocities of all sanitary sewer conduits, with the roughness coefficient "n" value equal to 0.012 for PVC pipe, 0.012 for Reinforced Concrete pipe, 0.012 for Ductile Iron pipe and 0.011 for High Density Polyethylene (HDPE) pipe.

2.1.03 DEPTH

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All collection systems shall be designed at a depth to facilitate the following:

- a) Lateral and private sewer installations must have a minimum of 3 feet of cover at the curb and/or property line or as approved by DWR and shall be designed to allow for gravity flow from the furthest point within the lot.
- b) Avoid conflict with existing and proposed utilities.
- c) Have water facilities with a minimum vertical clearance of eighteen (18) inches in the event that the two utilities should cross.
- d) Provide a minimum of 4 feet of cover over all mains to be dedicated to the County.
- e) Manholes shall be a minimum depth of five (5) feet, from finish grade to invert.

2.1.04 PIPE MATERIAL

The following types of pipe are acceptable for gravity sewer mains, force mains and laterals:

- a) Reinforced Concrete Pipe in accordance with ASTM C76 and ASTM D3212, cement shall be Type II or equivalent sulfide resistant cement. Joints shall be water-tight and root-tight in accordance with ASTM C443. (Manning coefficient "n" = 0.012)
- b) Ductile Iron Pipe in accordance with AWWA C150 and C151. (Manning coefficient "n" =0.012)
- c) PVC Pipe shall be solid wall poly vinyl chloride plastic pipe, SDR 35, in accordance with ASTM D3034. Class 150PVC pipe in accordance with AWWA C900 may be used for force mains or at water line crossings. (Manning coefficient "n" = 0.012)
- d) High Density Polyethylene (HDPE) pipe in accordance with ASTM F714, D3250 and D3035 (Manning coefficient "n"=0.011)

2.1.05 LOCATION AND ALIGNMENT

All sanitary sewers shall be placed within rights-of-way dedicated for public streets unless the use

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of dedicated easements is specifically approved by the DWR. There shall be a minimum horizontal clearance of ten (10) feet between parallel water and sanitary sewer lines or five (5) feet when sewer is 18 inches deeper than water main as approved by District Health Department. Location of sewers lines within public right of way shall conform to Drawing No. W-2.1 "Utility main Locations" in the Standard Details for Public Works Construction. Water and sewer separations shall meet the requirements in DWR Standard Detail WR-2.2.1 " Water Crossings (Detail)" and W-2.1 "Water Crossing (Notes)"and as required by NAC 445A.

When sanitary sewers are to be installed in existing streets, factors such as curbs, gutters, drainage ditches, sidewalks, traffic conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered.

The minimum width of permanent dedicated easements shall be thirty (30) feet. Other factors such as side slopes, pipe size and structures within the easement may require additional width. All easements shall be dedicated to Washoe County. All-weather access roads shall be provided to all sewer manholes within an easement.

Horizontal alignment shall be parallel to the street center line and other utilities wherever possible. Minimum radius for sanitary sewers shall meet pipe manufacturer's recommendations. A larger radius shall be used wherever practical or where necessary to avoid joint deflection in excess of the pipe manufacturer's recommended maximum. Minimum radius shall be 200 feet.

Sewer mains shall be a constant slope between manholes. Vertical curves are not allowed, except when specifically approved by DWR. Requests will be reviewed on a case by case basis by DWR. Inverted siphons are not allowed.

2.1.06 MANHOLES

Manholes shall be placed at all pipeline intersections; angle points; grade changes; tangent points; reverse and compound curves of sanitary sewer lines and at the terminus end of all collector mains.

For straight line sewer mains and curves sewers of 400-foot radius the maximum manhole spacing shall be 400 ft.

For curved sewers of 200 foot radius and larger, and less than 400-foot radius:

All diameters – Maximum manhole spacing shall be 200 feet.

Curved sewer mains with radii smaller than 200 will not be acceptable.

The invert grade at the exit must be at least 0.10 foot below the invert of the entrance pipe unless otherwise approved by DWR. For two intersecting pipes of different diameters, the crown elevations of the two pipes shall match where they enter the manhole.

Manholes shall be an eccentric cone Type I-A as shown in DWR Standard Detail No.WR-1.3 "Type 1-A Manhole" with the vertical wall on the inflow side. Water tight, bolted manhole covers shall be used on manholes located in areas subject to flooding or subject to surcharge (pressure) conditions. The frames on all

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manholes located in unimproved areas shall be set between twelve (12) and eighteen (18) inches above finished grade. All manholes over five (5) feet deep shall have steps installed on the opposite side of the outlet. The manhole steps shall be per DWR Standard Detail No. WR-1.7“ Manhole Step”. Manhole covers shall be Pinkerton Type A-107 or approved equal and shall be cast with the words "WASHOE COUNTY SEWER."

Drop manholes shall be Type III-A Manholes as shown in DWR Standard Detail No. WR-1.4 “Type III-A Manhole”. If the elevation differential is less than twenty four (24) inches, an inside drop, beaver-tail type manhole will be allowed providing there are no more than two inflow lines or as approved by DWR. A drop manhole shall be used if the difference in elevation between the outlet invert and the highest inlet invert is twenty four (24) inches or greater. Vertical drops shall not exceed 8 feet in height or as approved by DWR.

The following manholes shall be used:

Type 1-A: sewer pipes less than 18 inches; depths less than 18 feet

Type IV-A: sewer pipes greater than 30 inches or greater

Type V-A: sewer mains between 18-27 inches and/or for depths greater than 18 feet

Manholes shall be vacuumed tested per the Standard Specifications for Public Works Construction

2.1.07 LATERALS

Laterals shall conform to DWR Standard Detail No. WR-1.9. at a minimum, the lateral shall extend from the sewer main or collector 10 feet beyond property line. A plan and profile of any lateral shall be supplied to the DWR upon request. The laterals shall be designed at a minimum slope of 2% and per applicable plumbing code.

All laterals shall be locatable as of 10/1/09 and shall require tracer wire. Lateral shall also be surveyed, prior to backfill, at the point of connection to sewer main, and at the crossing of the property boundary. Survey points shall be included on as-built drawings as coordinates referenced vertically to the North American Vertical Datum of 1988 in U.S. survey feet and horizontally to the Nevada State Plan coordinate system west zone, NAD 83, expressed in U.S. survey feet.

Minimum residential lateral size is four (4) inches. Schools, commercial and individual establishments and other developments shall be served by minimum six (6) inch or larger lateral unless approved by DWR. All service sewers larger than four (4) inches require a manhole at the main.

2.1.08 STREAM CROSSINGS

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Design engineer shall submit stream crossing plans and details for DWR approval.

Stream crossings and construction methods shall be in conformance with and be approved by the appropriate agency (Nevada Division of Environmental Protection, Nevada Department of Wildlife, Nevada State Lands, and the United States Army Corps of Engineers, etc.).

2.1.09 JACKING AND BORING

All pipe, except RCP, which is bored or jacked shall be placed in a welded steel conductor pipe of sufficient diameter to allow 4" of clearance from the pipe bell to the interior wall of steel conductor. The method used for installing the carrier pipe in the conductor pipe shall be specifically approved by DWR.

2.1.10 PIPE CASING

2.1.10.01 Steel Casing

Design drawings shall call for steel casings to be required on all pipe installed using jack and boring and micro-tunneling methods, where approved by the DWR and required to meet specific Railroad and/or NDOT requirements, to provide structural support, or as required under other special conditions. The pipe casing shall be designed to be laid true to line and grade with no bends or changes in grade for the full casing length. The casing material used shall be a minimum of one-quarter ($\frac{1}{4}$) inch thick steel (design calculations must be submitted by the developer's engineer) and conform to ASTM A283, Grade B, C, or D. All joints shall be welded. Interior joints shall be ground to a smooth finish. All welding shall be performed in accordance with AWWA C206, "AWWA Standard for Field Welding of Steel Water Pipe". Coatings for steel casings are not required. Other casing materials may be utilized for applications other than boring when approved by the DWR.

2.1.10.02 Pipe Spacers

The design drawings shall include details specifying the pipe to be symmetrically supported about its centerline inside the casing at each joint end with a DWR approved polyethylene spacer, sized and designed per manufacturer recommendations.

2.1.10.03 Casing End Caps

Design drawings of the water main casing shall call for the ends to be sealed.

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2.1.10.04 The annular space shall be left open and not backfilled with any material.

2.1.10.05 Pipe Material: All pipe material shall be restrained joint.

2.1.11 SEWER REPORT REQUIREMENTS

The Engineer shall provide DWR with information necessary to determine the adequacy of the existing sanitary sewer system to accommodate flows from the proposed subdivision or development from the point of connection to a major sanitary sewer interceptor as indentified by DWR. Normally the adequacy can be determined based on the developed area contributing to the existing facility. However, if infiltration is a factor, metering will be required.

The following shall be provided in the sewerage report:

1. Area of project.
2. Tributary areas outside project.
3. Adjacent areas.
4. Contours as required for adequate elevation control.
5. Line layout, pipe size, slope and material type.
6. Any non-domestic waste being introduced into system such as industrial process wastes, cooling waters, etc., and the types of pretreatment devices to be provided.
7. Calculations showing predicted average and peak flows at major junction points including flow coming from area outside the project area.
8. Direction of flow.
9. Cumulative flow.
10. Zoning used to predict flows.
11. Special areas such as hospitals, schools, large office buildings, etc.
12. Boundaries of areas within the project which are tributary to points of major flow.
13. Design calculations (hydrologic, trench design, pipe structural design, etc.).
14. Commercial/Industrial facilities shall provide estimated discharge constituents, including maximum concentrations and total daily loading for the proposed development. From which treatment fees will be determined on a case by case basis.

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