DESIGN STANDARDS

REVISED FEBUARY 2023

This document will be periodically updated as new technology, policy changes, procedure changes, and/or updated methods of design and construction are implemented.
IT IS THE RESPONSIBILITY OF THE DEVELOPER TO CONTACT SSSD TO ENSURE THAT THE LATEST SSSD DESIGN STANDARDS ARE BEING UTILIZED.

SOUTH SUBURBAN SANITARY DISTRICT DESIGN STANDARDS

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SOUTH SUBURBAN SANITARY DISTRICT
DESIGN STANDARDS

REVISED: 02-14-2023

1. GENERAL CONDITIONS

1.1. DEVELOPER RESPONSIBILITY OVERVIEW

a. Before connecting to or altering South Suburban Sanitary District (District) system:
    1. Submit site plan drawings for all projects, except for laterals. Site plan must be drawn to scale; see SECTION 1.6 for submittal requirements.
    2. All designs connecting to District system must adhere to the design standards found in SECTION 2.
    3. All connections or alterations to District system must be approved before construction may begin.
    4. Developer must notify District forty-eight hours before beginning construction.
b. During Construction:
    1. Developer shall adhere to all inspection requirements listed in SECTION 3.
    2. A set of District-approved plans and District standards shall be kept on the construction site while any work is performed.
c. After Construction:
    1. Developer shall submit to-scale as-built plans to District.
    2. Developer shall submit CAD file of as-built plans to District.

1.2. GENERAL INFORMATION

a. It is the Developer's responsibility to ensure they have the latest version of District Design Standards.

b. The District may vary or modify any District Design Standard, on a case-by-case basis, if it is found that the strict application of the District Design Standard is impractical or if it would result in hardship. Exceptions granted in any instance will not be binding in the future. The District is charged with responsibility for the interpretation and application of the Design Standards.

c. Minimum Design Criteria: The District developed the District Design Standards to provide minimum design criteria to Developers for the design of wastewater facilities or conveyance systems that are owned by and/or will be dedicated to District. These District Design Standards include District Standard Drawings. Any design and/or construction changes that deviate from these District Design Standards must first be approved by District before work may commence. Be aware that upon plan review, District may require changes in the design depending upon the nature of the work performed or the presence of unusual field conditions. Furthermore, compliance to District Design Standards does not exempt the Developers from meeting further requirements of any other governmental or regulatory agency. The District has a plan review exemption.

d. Applicability: These District Design Standards shall apply to the design and construction of facilities that are owned by and/or will be dedicated to District, and whenever any

public or private work is performed within an easement owned or maintained by District. District shall determine if the Design Standards apply.

e. Correspondence: District must be notified at least forty-eight (48) hours prior to commencement of construction. All correspondence and submittals associated with, or related to, any District sanitary system shall be addressed to:

South Suburban Sanitary District
2201 Laverne Ave.
Klamath Falls, OR 97603

Phone: (541) 882-5744
FAX: (541) 882-5013

f. Updates: This document will be periodically updated as new technology, policy changes, procedure changes, or updated methods of design and construction are implemented. It is the responsibility of the Developer to contact District to ensure that the latest District Design Standards are being utilized.

g. Deviation From Standards: At any time, if the Engineer feels that a portion of the District Design Standards is not an adequate design, or if the Engineer can show that a particular design is equal to or exceeds the specific District Design Standard requirements, or if field conditions restrict the ability of the Engineer to comply with District Design Standards, they may request, verbally and in writing, that their design be implemented in its place. Any deviations from the District Design Standards shall be brought to the attention of District verbally and in writing. Upon review of the requested deviation, District will determine if it equals or exceeds District Design Standards and will notify the Engineer and/or Contractor of its decision.

h. Accountability: Approval from District does not exempt the Developer from requirements of any other governmental regulatory agency. Any and all permits and submittals required by other agencies are the responsibility of the Developer. District will not accept responsibility for any requirements not addressed.

1.3. DEFINITIONS

Per Capita---------- Per Person
LF----------Linear Feet
PVC---------- Polyvinylchloride Pipe-ASTM D3034 SDR35
HDPE ---------- High Density Polyethylene Pipe
CFS, cfs ---------- Cubic Feet per Second
CFM ---------- Cubic Feet per Minute
ADF ---------- Average Daily Flow
gpd---------- Gallons Per Day
gpm ---------- Gallons Per Minute

1.4. REFERENCE SOURCES

All sanitary sewer conveyance systems, facilities, and connections shall be designed and constructed to District Design Standards. However, unless otherwise noted, all construction and materials shall also comply with requirements of appropriate standards of publications from all other regulatory agencies as they apply to the system being designed. Portions of District Design Standards were adopted from publications by engineering and educational sources listed below:

APWA	American Public Works Association
ASTM	American Standards for Testing Materials
AWWA	American Water Works Association
DEQ	Oregon Department of Environmental Quality
ODOT	Oregon Department of Transportation
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes

All design parameters utilized must comply with District Design Standards unless otherwise approved by District.

1.5. SYSTEM DEVELOPMENT CHARGE

SEE Current SDC ordinance

1.6. SUBMITTAL REQUIREMENTS

1.1.2. Testing Fee: A cost estimate of District facilities to be constructed shall be prepared by the Design Engineer and provided to District. Prior to commencing construction of facilities to be owned by District, a fee for the cost of inspections and testing in the amount of two (2) percent of the Engineer's estimated cost of construction shall be submitted to District after design approval. This fee covers the actual cost for on-site inspections by District staff. This fee is only applicable to that construction within Public Right of Way or dedicated easement.

1.1.3. Plan Review Fee: A one-time plan review fee will be required at the time of submittal of design plans to District. This fee will pay for the cost of review of the submitted design plans associated with a single project, including re-submittals after District initial review comments. The amount of this fee will be determined by District based on the size and complexity of the project but shall not be less than $150.00. A review will not commence until this fee is paid to District. **This plan review fee is only applicable to those developments being constructed in Public Right of Way or dedicated easement**.

1.1.4. Submittals Required: Design Plans shall be submitted for review and approval for all new construction that involves connection to any District system, except for residential laterals. No sewer construction shall take place without first obtaining approval from District.

1.1.5. Sign & Seal: All plans submitted must be signed and sealed by a registered professional licensed in the State of Oregon to provide the services rendered.

1.1.6. Plan & Profile: A Plan & Profile drawing must be submitted on 22" x 34" size paper at an engineering scale appropriate for the project.

a. District Standard Details related to the proposed development shall be shown on the set of plans.
b. Text size shall be 0.08 inches or larger.
c. Proposed and existing ground must be shown on the profile.
d. A District signature block must be provided on the first sheet of all plans submitted to other regulatory agencies such as City, County, State, or Federal Government.
e. Each plan view must show current zoning, existing conditions, proposed sewer systems, and, if available, any expected future build-out, all existing on-site and neighboring utilities, and any feature that may affect the system design.
f. The following labeling shall be shown on the profile:

1. Gravity Sewers: Label pipes to indicate length, size, type, & percent slope.
   Example: *35 LF 8" PVC @ 0.40%*

2. Manholes: Label manholes to show top elevation, invert elevations, pipe sizes, whether pipe is flowing in or out, and direction of pipe indicated by N, S, E, W, NW, NE, SW, or SE according to which it is closest to.

   Example: *MH #5*
   Top Elev. = 4300.00
   I.E (12"OUT-S) = 4293.00
   I.E. (8"IN-N) = 4294.00
   I.E. (8"IN-SW) = 4293.90

3. Surface: Label surface elevations appropriately (Proposed and Existing).

4. Crossings: Label crossings of existing and proposed utilities with appropriate clearance called out. See District Design Standards Section 2.3.1(m) for crossing requirements.

5. Service Laterals: Label laterals with distances from the center of the downhill manhole.

g. Existing System Connection: District will not accept any new facilities connected to the existing sanitary collection system unless they are inspected and approved by District.
h. Approval Requirement: No construction of any wastewater conveyance system to be owned by District shall commence without first gaining approval of District.

1.1.7. Construction Submittals: The Contractor shall submit Shop Drawings, Samples or

manufacturer's data sheets in accordance with Section 1.6 of this document. The District may require Shop Drawings for other items not described in Section 1.6. A minimum of 3 paper copies of each item shall be submitted, unless approved otherwise by the District.

a. Submittal Procedure: Contractor shall label and submit Shop Drawings and Samples to the District for review and approval in accordance with the accepted Schedule of Submittals.
b. District's Review Procedure: The District will return 3 prints of each Shop Drawing to the Contractor, with comments noted thereon, within 15 calendar days following their receipt at the District's office.
    1. If Shop Drawings are returned to the Contractor marked "NO EXCEPTIONS NOTED," or "NO EXCEPTIONS, PROVIDED THE FOLLOWING CONDITIONS ARE MET," or "MAKE CORRECTIONS NOTED," formal revision and resubmittal of said Shop Drawings will not be required.
    2. If Shop Drawings are returned to the Contractor marked "REVISE AND RESUBMIT," or "REJECTED," the Contractor shall revise said Shop Drawings and shall resubmit 3 copies of said revised Shop Drawings to the District.
c. Resubmittal Procedure: The Contractor shall make any corrections required by the District and shall return the required number of corrected copies of Shop Drawings and resubmit new Samples for review. For each resubmittal necessary, an additional 15 calendar days shall be allowed for review. The Contractor shall include copies of all approved submittal information in the Contractor's Record Drawings and O&M Manual. A copy of each Shop Drawing and Sample shall also be kept in good order by the Contractor at the job Site and shall be available to the District.
d. Submittals Other Than Shop Drawings, Samples, and Owner-Delegated Designs: Procedure to submit to follow that outlined in Section 1.6.6(a) through 1.6.6(c).

1.7. RECORD DRAWINGS REQUIREMENTS

a. Record drawings shall be submitted within (60) sixty days of completion of construction on paper and shall consist of the full set of plans.
b. In addition to record drawings, a plan view shall be submitted on paper reproducible vellum or mylar at a scale of 1" = 100'. No exceptions to scale will be accepted.
c. An electronic file, labeled and dated, of the Record Drawings shall be submitted with the hard copy in a District approved version of AutoCAD on CD or USB drive.
d. Record Drawings shall include the following information:
    - Title, date, and information of submitter
    - All sheets shall be labeled "Record Drawings"
    - Pipe sizes and slopes
    - Manhole labels for all inverts
    - All connection points to existing, proposed, or future systems
    - All crossings with other utilities
    - All other utilities in the area
    - All service connections, cleanouts, and lamp-hole risers
    - All information that deviates from District Design Standards
    - Label all roads and major structures in the area
e. Final approval shall be obtained from District and all testing and inspections shall be

completed and accepted prior to completing the Record Drawings. (See District Design Standards, Section 3 for Inspection and Testing Requirements.) No connections to the facility shall be made until final approval is obtained from District.

2. DESIGN CRITERIA

This section provides general design criteria and guidance for the implementation of sanitary sewer collection systems.

2.1. GENERAL DESIGN CRITERIA

a. District Design Standard: All sanitary sewer collection systems that will be owned and maintained by District, including all connections and appurtenances thereto to its right-of-way line, shall be constructed to District approved Design.

b. Easements: Will only be accepted when all other options have been exhausted. All sanitary sewers, gravity or force mains, which are not located in a public right-of-way, but which are to be maintained by District, shall be centered in a minimum sixteen (16) foot wide easement owned by District. If for any reason the sewer line cannot be centered in the easement, special approval must be obtained by District. Easements shall be accurately located with dimensions shown on the plan sheets. All easement locations must be approved by District and created prior to acceptance of the sewer improvement. No permanent structures, other than sanitary sewers, shall be constructed within the easement. No trees will be allowed in the District easements unless they are existing trees and are approved by District. Removal of any structures or trees will be at the expense of the property owner who placed them in the easement at a time and material rate. Landscaping in an easement must be approved by District and District vehicle access must still be made available. All plantings must be of shallow root type.

c. Grease Traps: District will not accept grease traps in the District system. Grease Traps are to be on private property, operated and maintained by the property owner, meet and be approved by County Building and DEQ requirements.

d. Amalgam Separator (Dental Office): A dentist who places in or removes from the human oral cavity dental materials containing mercury shall have an amalgam separator installed on a wastewater drain in a dental facility where the dentist practices if dental materials containing amalgam pass through the wastewater drain. The amalgam separator must be verified by the manufacturer to remove at least 95 percent of the amalgam that passes through the drain on which it is installed.

2.2. DESIGN FLOWS

Flow Calculation Table

Daily

Contributor	ADF (gpd)	Oper. Hours	ADF (gpm)
Single Family Residence	364	18	0.34

Multiple Family Residence	260	18	0.24
Light Commercial Flow (per acre)	2800	18	0.74

a. Single Family Occupancy: Residential single-family occupancy shall be estimated at 2.8 persons per unit unless it can be shown that a lesser number of occupants can be justified to District.
b. Single Family Residence: A residence designed to house a single family.
c. Multiple Family Occupancy: Multiple family residence occupancy shall be estimated at 2.0 persons per unit unless it can be shown that a lesser number of occupants can be justified by District.
d. Multiple Family Residence: A living unit within a building or group of buildings designed to house two (2) or more families, living independently of each other.
e. Residential Design Flows: Residential average flows shall be computed on a per-capita basis using a minimum of 130 gallons per capita per day. See the Flow Calculation Table above for actual design flows.
f. Commercial & Industrial Report: Commercial and Industrial developments producing waste that will enter a District system shall be required to submit a report in writing that includes the following:
    - general site information
    - type of waste being discharged
    - amount of waste being discharged

    After review District may require, at their discretion, that pretreatment take place prior to discharge into a District system. If deemed necessary, District may also require that a more detailed report be submitted.
g. Light Commercial Design Flow: Design flows for Light Commercial shall be computed at 2800 gallons per day per acre of land unless otherwise determined by District. (See the Flow Calculation Table above.)
h. Heavy Industrial Design Flow: District will not accept Industrial flow.

2.3. PIPING FOR SANITARY SEWERS

2.3.1. General

a. Construction Drainage: No stormwater or drainage of any type will be allowed to flow through any sanitary sewer pipes during construction.

b. Construct to Design Standards: All sewer mains, laterals, manholes and sanitary sewer facilities shall be constructed to District Design Standards and/or approved revision thereto.

c. Installation of Pipe: All types of sewer pipe shall be installed with the bell-end upgrade or forward from the connection on an existing sewer or from a designated starting point approved by District. Nipple ends of all gasketed pipe shall be beveled prior to installation. After placing a length of pipe in the trench, the spigot shall be centered in the bell and the pipe seated within and brought to correct line and grade. During joining, the pipe shall be partially supported to minimize unequal lateral pressure and to maintain concentricity. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing and dislocating the gasket. Any disturbed or dislocated

gaskets shall be removed, the pipe cleaned, gasket replaced, and lubricated before joining the sections.

d. Tracer Wires and Warning Tape: Regular tracer wire shall be used when open digging. The copper head needs to be used when boring. Tracer wire must be placed on top of all new pipes being installed secured with tape. Warning tape must be installed above all new pipes eighteen (18) inches. Tracer wire must be a minimum of twelve (12) inches looped or coiled inside the manhole or cleanout housing and must be easily accessible from the top as shown in the District Standard Drawings. Tracer wire shall be 18 AWG single strand copper encased in green sheathing (Boring tracer wire shall be Copperhead Industries High Strength 1030 or equivalent). Splices shall be made using Direct Bury Splice Kits from 3M Electrical Products Division.

e. Jointing: All joints shall be connected with approved non-shear coupling to include rubber, synthetic rubber, and plastic materials specially manufactured for the joint and pipe size.

f. Labeling: All pipe shall be clearly marked with type, class, and/or thickness, as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.

g. Fittings: All fittings including caps and plugs shall be of an approved material and gasketed with the same gasket material as the pipe unit.

h. Connect to Existing: Where it is necessary to connect to an existing sewer during construction, only new pipe having the same inside diameter will be used in reconnecting the sewer. Where joints must be made between pipes with a mismatched wall thickness, the Contractor shall use non-sheer coupling, adapter, or coupling-adapter to make a watertight joint.

i. New Construction: Install 4”x4” wood vertical post at new cleanout and end of pipe. Post must extend minimum 2 ft above grade and minimum 2 ft depth.

j. Design Life: All sanitary sewer pipe systems shall be designed and installed with a design life of not less than fifty (50) years.

k. Minimum Cover: Minimum covers for all sewer pipes in public rights-of-way or easements shall be thirty-six (36) inches, including laterals, unless otherwise noted on the plans and approved by District.

l. Load Calculations: When shallow installations and/or heavy traffic loads will ensue, load calculations will be required to be submitted. The Engineer is responsible to demonstrate that the system will be able to withstand the anticipated loads.

m. Crossings: When crossing a water main, the sanitary sewer pipe must cross beneath the water main with a minimum of eighteen (18) inches between the top of the sewer pipe and the bottom of the water main and one full length of pipe, twenty (20) feet, must be centered at the crossing. All other utility crossings shall have a minimum of six (6)

inches clearance between utility line and sewer pipe. Any deviations to this requirement must be approved by District.

2.3.2. Gravity Sewer Pipes

a. No Curved Pipes: No curved sewers will be accepted. All sewer mains shall have line and grade staked by a Professional Engineer or Land Surveyor, prior to construction. All mains are to be laid straight between manholes. No 90-degree horizontal bends will be accepted.

b. Material: All PVC gravity sewer pipe shall be new, green in color and shall meet the minimum requirements of ASTM D3034 SDR 35 pipe. All Ductile Iron Pipe shall be Class 50, cement mortar lined and meet the requirements of AWWA C151 unless load conditions dictate Class 52.

c. Defective Piping: No broken or defective sewer pipe or damaged materials will be allowed.

d. Minimum Pipe Diameter: The minimum pipe diameter for gravity sewer mains shall be eight (8) inches unless otherwise approved by District.

e. Trenches: All gravity sewer pipes shall have a minimum of thirty-six (36) inches of cover, including laterals within the right-of-way. Trenches shall be excavated to the depth and grade specified. Pipe bedding shall be placed to provide a uniform and continuous bearing and support for the pipe on solid undisturbed or compacted ground.

f. Flow Velocity: Gravity sewers shall be sized assuming pipes to be flowing full to ensure average daily velocities in the range of 2-5 feet per second, with optimum velocity design being 2.5 feet per second. At Peak Flows, the maximum design velocity shall not exceed seven (7) feet per second. Nor should the Average Daily Flow drop below two (2) feet per second.

g. Slopes, & Lengths: Minimum gravity sewer slopes, and manhole spacing shall be as follows:

Sewer Size (inches)	Minimum Slope (%)	Manhole Spacing (feet) .	Minimum Manhole Depth (Feet)
8	0.40	400	3 Feet above
10	0.28	400	top of sewer
12	0.22	400	line for all sewer
15	0.15	400	line size
18	0.12	400	
21	0.10	500	
24	0.08	500	

(Manhole spacing shall be measured from the center of each manhole and pipe lengths shall be called out as if they extend to the center of the manhole.)

h. Extreme Slopes: Sewer lines approved by District with slopes greater than 7%, or velocities over 15 fps shall be designed and constructed with pipe restraints and manhole scour protection on a case-by-case basis and in accordance with DEQ requirements.

2.3.3. Service Connections & Laterals

a. Cleanouts: District is responsible for the maintenance of sewer laterals from District's sewer main to boundary of utility right-of-way. A cleanout and service box shall be installed to surface grade at the boundary of utility right-of-way behind the curb or the sidewalk, as shown on District Standard Drawings. The property owner is responsible for the section of the lateral that lies outside the boundary of utility right-of-way.

b. Fittings: All fittings shall be factory-produced and shall be designed for installation on the pipe to be used.

c. Sizing of Laterals: The portion of the lateral located within the public right-of-way shall have a minimum diameter of four (4) inches for all residential units. Commercial or Industrial service connections may require larger pipe sizes. Sizes must be approved by District prior to any construction taking place.

d. Number of Connections: There shall be no more than one service connection per lateral without District approval.

e. Existing Connection to Main: When connecting laterals to an existing main, the main line must be core drilled and a Romac saddle shall be installed. (See District Standard Drawings for clarity.)

f. Stormwater Runoff: Stormwater runoff, including roof drains, shall not be connected to or discharged into the sanitary sewer system.

g. Systems Development Charge: The Systems Development Charge (SDC) must be paid prior to any connections to the sanitary sewer main.

h. Plugs or Caps: All laterals shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand internal test pressure. These plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

2.3.4. Force Mains in Public Right of Way

a. Flow: All force mains shall be designed with a flow velocity in the range of 3 to 6 feet per second.

b. Diameter: All force mains must be at least four (4) inches diameter.

c. Trenches: All force mains shall have a minimum of thirty-six (36) inches of cover to finish grade. Trenches shall be excavated to the depth and grade specified. Pipe bedding shall be placed to provide a uniform and continuous bearing and support for the pipe on solid undisturbed or compacted ground.

d. Pipe Material: Pipe sizes from four (4) inches to eight (8) inches shall be either PVC or HDPE. Larger pipe sizes shall be Ductile Iron Pipe. Concrete pipe will not be considered for use in force mains unless first approved by District.

e. Restrained Pipes: PVC or ductile iron pipe may be restrained with Meg-a-lug type joints if deemed necessary by District. HDPE pipe with heat fusion joints, do not require additional restraining. A surge analysis must be performed to determine the maximum pressure that the pipe will need to withstand and shall address the placement and sizing of air and vacuum relief valves.

f. Air Release Valves: Air release valves will be required at any section of pipe that is a high point that exceeds the nominal diameter of the pipe.

2.4. MANHOLES

a. District Design Standard: All manholes shall be constructed according to District Design Standards.

Material: All manholes shall be constructed as shown in District Standard Drawings. All cones, rings and bases shall be pre-cast concrete. All pre-cast sections shall be Class 4000 concrete.

b. Cone Sections: All cones must be pre-cast, Class 4000 concrete. Cones shall provide a diameter reduction from forty-eight (48) to twenty-four (24) inches and be eccentric in construction.

c. Joints: All joints between pre-cast manhole elements shall be watertight gasketed.

d. Mortar Lining: After the manhole is assembled in place, the Contractor shall mortar the manhole at all connected parts. All pipes and obstructions that protrude thru the walls or base of the manhole shall be grouted smooth with the wall of the manhole inside and out. All debris shall be removed from manholes. There shall be no standing water allowed in the invert of manholes. All grouting, inside and outside, shall be smooth and flush.

e. Grade Rings: Concrete (masonry), and steel grade rings may be used for adjustment of the casting to final street grade. The total grade rings height shall be not less than two (2) inches and not more than twelve (12) inches.

f. Frame & Cover: Frame & Cover shall be as shown in District Standard Drawings and be twenty-four (24) inch by Titus Industrial Group, Inc. or approved equal. District reserves the right to require locking manhole covers as they deem necessary.

g. Spacing: Maximum spacing of manholes shall be 400 feet for 8, 10, 15, and 18 inch diameter pipe and 500 feet for 21 inch and larger. If the slope of the pipe is greater than seven (7) percent, spacing of manholes shall be no greater than 200 feet.

h. Channeling: All manholes shall be channeled as shown in the District Standard Drawings. Channels shall match existing sewer grades. Channels shall converge smoothly and be well rounded into well finished junctions. Channel sides shall be carried up vertically to the crown elevation of the various pipes. Concrete shelves between channels shall be smoothly finished and sloped 2% into the channel.

i. Connections: PVC pipe connected to manholes shall be provided with a manhole adapter complete with sand-coated outer surface and gasketed inner surface. Connection openings to existing manholes shall be core drilled, no jack hammering, or chipping allowed. Adapter must be mortared in place. Drilled holes must not exceed more than two (2) inches clearance around adapter perimeter.

j. Drop Across Manhole: All manholes shall have a minimum drop of 0.10 feet across the manhole and a maximum drop of six (6) inches, from inlet invert to outlet invert.

k. Drop Manholes: Drop manholes shall be required when the maximum design invert elevation is two (2) feet or greater above the outlet invert elevation. In cases where the invert elevation is less than two (2) feet but over six (6) inches, the inlet pipe shall be re-graded, so the invert elevation is no more than six (6) inches above the outlet invert. Drop manholes shall be constructed as indicated in the District Standard Drawings. In place of the standard District Drop Manhole, for pipes up to twelve (12) inches diameter, Redliner® Inside Drop System may be used or an equivalent inside drop system approved by District.

l. Bedding: All manholes shall be constructed with a base section placed to grade upon twelve (12) inches minimum crushed compacted rock. The approved base course shall be compacted to 95% of maximum density per AASHTO T-99.

m. Where Required: A manhole shall be required at any change in pipe slope, alignment, or size and at all intersections where pipes come together at a junction and at the ends of all sewer mains.

n. Accessibility: All manholes shall have graveled (or equal) all-weather access capable of conveying all District equipment. Access surface shall extend fifteen (15) feet from center of manhole cover in all directions, or to right-of-way limits, whichever is less.

o. Installation Not Allowed: Manholes shall not be placed in fill sections unless fill material is well compacted and meets the bedding requirements above and approved by District.

p. Odor and Corrosion: The Developer may be required to use special non-corrosive materials for manholes and sewer connections if current odor and corrosion problems exist in the connecting trunk or interceptor connection. Any indication observed in the field by the Contractor or Developer of excessive odor or evidence of corrosion, must be reported to District when submitting plans. If District anticipates a potential odor problem at any connections, a ventilating pipe to discharge foul air through a bio-filter may be

required.

q. Orientation: All eccentric manholes shall have the vertical sections facing upstream.

2.5. LIFT STATIONS (When Permitted by District)

a. Design: All lift station designs must be approved by DEQ and the District.

b. Odor and Corrosion Control: All proposed pumping and lift stations shall be equipped for chemical addition to control sulfides. Common chemicals used for this purpose are ferric chloride, bioxide, peroxide, and hypochlorite. Other effective approved chemicals may be used. Specific application of odor control and corrosion control shall be evaluated on a case-by-case basis.

c. Location: No permanent structures shall be constructed within 100 feet of any lift station. Elevation must be set, and the surrounding ground graded to avoid storm runoff from entering the system.

d. Service Access: Adequate access must be furnished for vehicles that may be necessary to deliver, or to remove station equipment.

e. Fencing & Landscaping: The site shall be fenced with a six (6) foot high chain link fence with a four (4) feet wide pedestrian gate and a sixteen (16) feet wide vehicle access gate, recessed a minimum of twenty (20) feet to allow for off-street parking.

3. TESTING & INSPECTION REQUIREMENTS

District or its designated representative shall have the right to enter onto all construction sites where facilities owned or to be owned by District, are being repaired, replaced, or constructed, for the purpose of verifying construction compliance with approved design.

The Contractor shall be responsible for all required testing and shall coordinate such testing with the Engineer and District. In order for the facility to be accepted, an impartial Professional Licensed Engineer in the State of Oregon, or designated representative, must observe and the Engineer must approve each test and, if deemed necessary by District, a representative of District must be present to observe the test. For any test that fails, the cause for failure shall be identified and necessary repairs made by a District approved method and re-testing must take place. Contractor shall be responsible for costs associated with re-testing. Re-testing shall continue until the system being tested satisfactorily passes the test. After all required tests and inspections have been successfully completed, the Engineer shall indicate in a signed and sealed letter to District indicating that all tests were performed and passed satisfactorily. Upon request by District, the Engineer shall provide District with the individual results of each test.

3.1. REQUIRED INSPECTIONS

a. Material: All materials shall be inspected prior to construction to ensure conformity to required standards.
b. Pipe Inverts: Inverts of pipes in manholes shall be checked prior to District final approval.
c. Trench Bedding: Pipe bedding shall be inspected, and compaction tests shall be performed on trench bedding prior to trenches being backfilled.
d. Trench Backfill: Backfill shall be inspected for suitability. No sharp objects or large rocks will be allowed in the backfill. Backfill shall be tested for compaction.
e. Manholes: Manholes shall be inspected for smoothness of mortar and concrete, slope of base, and to ensure covers are located according to District Design Standards.

3.2. PRESSURE TESTING

All pressure testing shall be by the Time Pressure Drop Method in accordance with APWA 303.3.09D2, in the presence of District, by the Developer/Contractor.
Prior to testing, the Engineer shall verify the average height of the groundwater above the crown of the sewer pipe. Also, the Engineer shall prepare a test sheet that indicates the internal surface area of each pipe being tested. The Engineer shall then calculate the acceptable time required for the pipe to pass the test. The pipe shall be considered acceptable if it does not lose air at a rate greater than 0.003 CFM per square foot of internal pipeline surface tested, or 2 CFM, whichever is greater.

Testing shall commence with the Contractor plugging one end of the line from within the manhole with an appropriate pressurized boot. In the manhole at the opposite end of the pipe, the Contractor shall plug the pipe in a manner to allow air to be pumped into the line. The Engineer must verify that the initial pressure is zero on the gage before the Contractor adds pressure. The Contractor shall then pump the line up to 4 psig plus 0.433 psig per foot of groundwater above the crown of the pipe. Once the pipe is fully pressurized, the Engineer shall

start a timer and record the amount of time it takes for the pressure to drop. If the measured time exceeds the calculated time without losing the minimal required pressure, then the system shall be considered acceptable. Upon request, the Engineer shall submit the test results to District.

It is the Contractor's responsibility to ensure that cleanouts and lamphole risers are sufficiently plugged. For pressure testing only, the required PVC screw-in plug may be substituted for a more pressure resistant seal.

3.3. HYDROSTATIC TESTING MANHOLES

Hydrostatic testing may be used in place of vacuum testing.

Hydrostatic testing shall consist of plugging all inlets and outlets and filling the manhole with water. Each manhole shall be filled to the rim at the start of the test. Leakage in each manhole shall not exceed 0.2 gallons per hour per foot of head above the highest invert. Leakage shall be determined by refilling to the rim using a calibrated volumetric container. Manholes may be filled twenty-four (24) hours prior to the time of testing to permit normal absorption into the manhole walls. If manholes are constructed in high groundwater areas, District will not accept inflow of ground water into the manholes.

3.4. VACUUM TESTING MANHOLES

Vacuum testing may be used in place of hydrostatic testing. There is no need to perform hydrostatic and vacuum testing. Only one of these tests will be required.

Vacuum testing shall be done in accordance with ASTM C1244-93. All pipes entering the manhole shall be temporarily plugged, and plugs shall be braced. The test head shall be placed in or on top of the manhole ring. A vacuum of ten (10) inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop one inch, to nine (9) inches of mercury. The manhole shall pass the vacuum test if the time for the vacuum reading meets or exceeds the values indicated in the following table.

Depth (ft)	< 8	10	12	14	16	18	20	22	24	26
Time (sec)	20	25	30	35	40	45	50	55	59	64

Note: The table above is only for a typical District standard 48" manhole.

3.5. DEFLECTION TESTING

Deflection testing shall be performed on all flexible sanitary sewer lines in accordance with APWA 303.3.10 in addition to pressure testing and television inspection. The testing shall be conducted by pulling an approved mandrel through the constructed pipeline. The diameter of the mandrel shall be 95% of the pipe initial inside diameter.

Testing shall be conducted on a manhole-to-manhole basis and shall be performed after the line has been completely flushed with water. The tests shall be conducted not less than thirty (30) days after the trench backfill and compaction has been completed. Test may be conducted concurrently with television inspection.

3.6. LAMPHOLE TESTING

Lamphole testing shall be performed by placing a high wattage light in a manhole at one end of the sewer line. In the manhole located at the opposite end of the sewer pipe a mirror is lowered into the manhole and positioned in front of the opening. If the circle of light is less than 95% of a "full moon", the results shall be submitted to District, and if deemed necessary by District, appropriate action will take place. The Engineer must observe and record the results in a written report. The Engineer then must be prepared to submit the report to District upon request.

3.7. TELEVISION INSPECTION OF SANITARY SEWERS

Television inspection shall be performed by District according to APWA 303.3.11. After completion of all sewer construction, testing, repairs, and DEQ requirements have been met, the Contractor shall contact District to schedule a television inspection of all four (4) inch to seventy- two (72) inch installed sanitary pipes and facilities. All laterals and cleanouts will be inspected to the property line/right-of-way line. The first television inspection shall be conducted without charge to the Contractor. If any of the system fails, all additional inspections will be charged to the Contractor. Acceptance of the sewer shall be at the discretion of District; however, District will not accept any installed pipes that have standing water or debris in them.

3.8. DISTRICT FINAL INSPECTIONS

Upon completion of the project construction, the Contractor shall schedule a walk-through inspection with District. Any or all criteria stated in the District Design Standards may be inspected. Noncompliant items, if any, will be brought to the Contractor's attention and given in writing. After all items found in noncompliance have been addressed, the Contractor shall schedule a second walk-through inspection with District. Additional walk-through inspections shall be scheduled until all noncompliant items are brought into compliance with District Design Standards. After District has performed a final walk-through inspection and has found all construction work to be satisfactorily completed, a letter of acceptance will be written by the General Manager and be submitted to the developer/contractor. (See Section 3.7 for District Television Inspection sewer lines.)

3.9. DISTRICT STANDARD DRAWINGS

These District Standard Drawings are part of the District Design Standards. Any conflicts, if any, between the District Design Standards and the District Standard Drawings must be brought to the attention of District. Any design standards the Engineer utilizes that are not addressed in the District Design Standards shall be reviewed and approved by District prior to commencement of construction. Be aware that upon plan review, District reserves the right to invoke more rigorous standards depending upon the nature of the work performed or the presence of unusual field conditions. Furthermore, compliance to District Design Standards does not exempt the Engineer, Developer, or Contractor from meeting obligations of any other governmental or regulatory agency.