

DRAFT

# **Water Environment Services Sanitary Sewer Standards**

December 2021







## Sanitary Sewer Standards

# Table of Contents

<b>SECTION 1. DECLARATION OF POLICY .....</b>	<b>1-1</b>
1.1 Authority and Purpose.....	1-1
1.2 Applicability .....	1-1
1.3 Objectives .....	1-1
1.4 Amendments to Sanitary Standards.....	1-2
1.4.1 Updates to the Sanitary Standards.....	1-2
1.5 Administration of Sanitary Standards.....	1-2
1.6 Sanitary Sewer Standard Variance Request.....	1-2
1.6.1 Variance Request Submittal .....	1-3
1.6.2 Criteria for Variance of Sanitary Standards .....	1-3
1.6.3 Review Variance Request .....	1-4
1.6.4 Appealing Variance Request Decision .....	1-4
<b>SECTION 2. DEFINITIONS .....</b>	<b>2-1</b>
2.1 Words and Terms.....	2-1
2.2 Abbreviations .....	2-7
<b>SECTION 3. GENERAL SANITARY STANDARDS .....</b>	<b>3-1</b>
3.1 General Policy.....	3-1
3.2 Development Policy.....	3-1
3.2.1 Existing Onsite Sewage Disposal Systems .....	3-1
3.2.2 Point of Service for Upstream Parcels.....	3-2
3.2.3 Trunk Line Sanitary Sewers.....	3-2
3.3 Engineering Policy.....	3-2
3.4 Sanitary Sewer Standard Detail Drawings .....	3-2
3.5 Approval of Alternate Materials and Methods .....	3-2
3.6 Special Design Applications .....	3-3
<b>SECTION 4. PUBLIC SANITARY SEWER EXTENSION .....</b>	<b>4-1</b>
4.1 Public Sanitary Sewer Extension Permit.....	4-1
4.2 Responsibilities .....	4-1
4.2.1 District Responsibilities .....	4-1
4.2.2 Developer Responsibilities .....	4-2
4.2.3 Developer's Engineer Responsibilities .....	4-2
4.2.4 Contractor's Responsibilities .....	4-2
4.3 Plan Submittal, Review and Approval Process .....	4-3

4.3.1	Application Submittal.....	4-3
4.3.2	Construction Plans .....	4-3
4.3.3	Pre-Construction Meeting .....	4-4
4.4	Project Construction.....	4-4
4.4.1	Variance or Deviation from the Approved Plans.....	4-4
4.4.2	Inspection and Testing .....	4-5
4.5	Acceptance and Warranty .....	4-5
4.5.1	Video Inspection of Gravity Sewers .....	4-5
4.5.2	Test Results .....	4-6
4.5.3	Service Connection Drawings.....	4-6
4.5.4	As-built Plan Requirements .....	4-6
4.5.5	Certification of Completion .....	4-7
4.5.6	Final Inspection .....	4-7
4.5.7	Construction and Engineering Cost .....	4-8
4.5.8	Letter of Conveyance .....	4-8
4.5.9	Warranty Bond .....	4-8
4.5.10	Letter of Acceptance .....	4-8
4.5.11	Warranty Period .....	4-8
<b>SECTION 5. DESIGN REQUIREMENTS.....</b>		<b>5-1</b>
5.1	General Design Requirements.....	5-1
5.1.1	Performance Sanitary Standards.....	5-1
5.2	Sanitary Sewer Requirements .....	5-2
5.2.1	Pipe and Fitting Material and Size .....	5-2
5.2.2	Design Sewage Flow .....	5-2
5.2.3	Minimum Slope Design .....	5-3
5.2.4	Velocity Design.....	5-4
5.3	Alignment and Cover.....	5-4
5.3.1	Right-Of-Way.....	5-4
5.3.2	Sanitary Sewer Easement .....	5-4
5.3.3	Relation to Water Lines and Other Utilities.....	5-6
5.3.4	Special Conditions .....	5-6
5.3.5	Relation to Stream and Drainage Channels .....	5-7
5.3.6	Minimum Cover .....	5-8
5.4	Mainline Cleanout .....	5-8
5.5	Manholes.....	5-8
5.5.1	Location.....	5-8
5.5.2	Slope of Manhole Channel.....	5-9
5.5.3	Drop Manholes.....	5-9
5.5.4	Rim Elevations of Manholes .....	5-10
5.5.5	Design and Size .....	5-10
5.5.6	Connection .....	5-10
5.5.7	Anticipated Future Extensions .....	5-10

<b>5.6</b>	<b>Service Connections .....</b>	<b>5-10</b>
5.6.1	General .....	5-10
5.6.2	Service Connection Materials .....	5-11
5.6.3	Location .....	5-11
5.6.4	Direct Service Connection .....	5-11
5.6.5	Separate Service Connection .....	5-12
5.6.6	Restricted Connections .....	5-12
5.6.7	User Requiring Pumping Facility .....	5-12
5.6.8	Tap-In Connections .....	5-13
5.6.9	Slope and Alignment .....	5-13
5.6.10	Minimum Depth .....	5-13
5.6.11	Detectable Markings .....	5-13
5.6.12	Service Connection Cleanout .....	5-14
5.6.13	Inspection .....	5-15
<b>SECTION 6</b>	<b>CONSTRUCTION REQUIREMENTS .....</b>	<b>6-1</b>
<b>6.1</b>	<b>Material and Installation References .....</b>	<b>6-1</b>
6.1.1	Trench Width .....	6-1
6.1.2	Trench Grade .....	6-1
6.1.3	Shoring and Sheet piling .....	6-2
6.1.4	Trench Dewatering .....	6-2
6.1.5	Trench Foundation .....	6-2
<b>6.2</b>	<b>Sanitary Sewer Installation .....</b>	<b>6-2</b>
6.2.1	Sub-Grade .....	6-2
6.2.2	Pipe Base/Bedding .....	6-2
6.2.3	Bell Holes .....	6-3
6.2.4	Preparation of Sanitary Sewer Pipe .....	6-3
6.2.5	Line and Grade .....	6-3
6.2.6	Manhole Connections .....	6-3
6.2.7	Pipe Installation .....	6-3
6.2.8	Waterline Crossings .....	6-4
6.2.9	Anchor Block .....	6-4
6.2.10	Impervious Zone .....	6-4
6.2.11	Service Connection .....	6-4
6.2.12	Manhole Installation .....	6-5
6.2.13	Mainline Cleanout Pad and Cover .....	6-7
6.2.14	Sanitary Sewer Standard Detail Drawings .....	6-7
<b>6.3</b>	<b>Materials .....</b>	<b>6-7</b>
6.3.1	Trench Backfill Stabilization .....	6-7
6.3.2	Pipe Base and Pipe Zone .....	6-8
6.3.3	Trench Backfill .....	6-8
6.3.4	Controlled Density Fill (CDF) .....	6-8
6.3.5	District Manhole Connection .....	6-8

6.3.6	Pipe .....	6-8
6.3.7	Precast Manhole Base Bedding.....	6-9
6.3.8	Detectable Caution Tape .....	6-9
6.3.9	Concrete .....	6-9
6.3.10	Manhole Bases.....	6-9
6.3.11	Manhole Barrel Sections .....	6-9
6.3.12	Non-Shrink Grout .....	6-9
6.3.13	Manhole Extension Rings .....	6-9
6.3.14	Manhole Frames .....	6-9
6.3.15	Manhole Covers .....	6-10
6.3.16	Manhole Steps .....	6-10
6.4	Backfill Compaction.....	6-10
6.4.1	General Compaction .....	6-10
6.4.2	Pipe Zone .....	6-11
6.4.3	Easements .....	6-11
6.5	Backfill Classifications (District) .....	6-11
6.5.1	Class "A" Backfill.....	6-11
6.5.2	Class "B" Backfill.....	6-11
6.5.3	Class "C" Backfill.....	6-11
6.5.4	Class "D" Backfill.....	6-12
6.6	Testing of Sanitary Sewer Mainline and Appurtenances .....	6-12
6.6.1	Low Pressure Air Test.....	6-12
6.6.2	Manhole Vacuum Test .....	6-15
6.6.3	Mandrel Test .....	6-16
6.6.4	Video Inspection and Reports.....	6-17
6.6.5	Dye-Testing for Non Single-Family Residential Properties .....	6-18
A.1	GENERAL PROCESSES.....	1
A.1.1	General Plan Review and Approval Process.....	1
A.2	SERVICE PROVIDER LETTER.....	3
A.2.1	Submittal for Service Provider Letter .....	3
A.3	LAND USE/DESIGN REVIEW SUBMITTAL REQUIREMENTS .....	4
A.4	PLAN REVIEW SUBMITTAL REQUIREMENTS .....	4
A.5	PLAN SUBMITTALS .....	5
A.5.1	Specific Sheet Submittal Requirements and Specifications.....	5
A.5.2	Title Sheet .....	6
A.5.3	Composite Utility Plan .....	6
A.5.4	Composite Plan Cover Sheet (separate sanitary & storm).....	6
A.5.5	Plan and Profile Views .....	7
A.5.6	Grading Plan .....	9
A.5.7	Erosion and Sedimentation Control Plan.....	10
A.5.8	Vegetated Buffer Planting Plan.....	10
A.5.9	Stormwater BMP Facility Planting Plan .....	11

A.5.10 Standard Drawings/Detail Sheets .....	12
A.5.11 General Sanitary/Stormwater Construction Notes .....	12
A.5.12 General Sheet Submittal Specifications and As-built Requirements .....	12
A.5.13 Plan and Profile View Sheet Specifications .....	17
A.5.14 Landscape Plans .....	18
A.6 AS-BUILT SUBMITTAL REQUIREMENTS .....	18
A.6.1 As-built Drawing Requirements .....	19
A.6.2 CAD Requirements for As-Built Drawings .....	19
A.6.3 PDF File Requirements for As-Built Drawings .....	20
A.7 GENERAL BUILDING PERMIT, PARTITION/SUBDIVISION APPROVAL PROCESSES .....	21
A.7.1 Building Permit Review and Approval .....	21
A.7.2 Partition/Subdivision Plat Review and Approval .....	21
A.8 GENERAL CONDITIONS FOR PERFORMANCE AND WARRANTY SURETY .....	22
A.8.1 Surety – Types of Acceptable Guarantees .....	22
A.8.2 Surety Forms .....	22
A.8.3 Performance Surety .....	22
A.8.4 Warranty Surety .....	23

## LIST OF TABLES

Table 1: Revisions .....	1-2
Table 2: Minimum Pipeslope Design for 8-Inch Diameter .....	5-3
Table 3: Minimum Anchor Spacing .....	5-3
Table 4: Low Air Test Minimum Testing Time .....	6-14
Table 5: Times for a Successful Vacuum Test for Different Size Manholes .....	6-16
Table 6: Key Field Equipment for Dye Testing .....	6-18

## Appendices

Appendix A: Permitting Process .....	A-1
Appendix B: Sanitary Sewer Standard Detail Drawings .....	B-1







## SECTION 1. DECLARATION OF POLICY

These Sanitary Sewer Standards ("Sanitary Standards") present the adopted policies, standards, and specification requirements necessary to meet all provisions of the Water Environment Services ("WES" or "District") Rules and Regulations, as originally adopted August 22, 1974. All subsequent revisions set forth in Board orders are incorporated herein by reference.

### 1.1 Authority and Purpose

WES, located in Clackamas County, Oregon, is an intergovernmental entity formed pursuant to Oregon Revised Statutes Chapter 190 for the purpose of providing regional sewerage works, including all facilities necessary for collecting, pumping, treating, and disposing of sanitary or storm sewage within its boundaries. It is further declared to be the policy of the District to provide and offer sewage disposal service for such areas adjacent to the District as may, in the judgment of the District, be feasibly served upon such terms, conditions, and rates as the District shall determine, and as provided in other applicable federal and state laws.

The purpose of these Sanitary Standards is to provide a consistent policy under which certain physical aspects of sanitary sewer design will be implemented. Most of the elements contained in this document are public works oriented and most are related to public improvements; however, it is intended they apply to both public and private work designated herein.

### 1.2 Applicability

These Sanitary Standards shall govern construction and upgrading of all publicly and privately financed public sewerage facilities in the District and applicable work within the District, unless it is shown that the District's authority to impose these standards are superseded by another local jurisdiction.

### 1.3 Objectives

The objectives of the Sanitary Standards are as follows:

1. To advance public health and welfare.
2. To support the long-term operation and maintenance of the Public Sanitary Sewer System.
3. To prevent the introduction of pollutants that will interfere with the operation of the Public Sanitary Sewer System or contaminate the resulting biosolids.
4. To prevent the introduction of pollutants that will pass through the Public Sanitary Sewer System, inadequately treated, into receiving waters or the atmosphere, or otherwise be incompatible with the system.
5. To protect District personnel who may come into contact with sewage, sludge, and effluent in the course of their employment, as well as protecting the general public.

6. To ensure that the District complies with its National Pollutant Discharge Elimination System waste discharge permit conditions.
7. To ensure all development shall be planned, designed, constructed, and maintained to:
  - a. Improve the opportunity to recycle and reclaim wastewater and biosolids from the system.
  - b. Provide for the equitable distribution of the costs of the Public Sanitary Sewer System.
  - c. Construct a cost efficient and low maintenance conveyance system.

## 1.4 Amendments to Sanitary Standards

The District may amend these Sanitary Standards in accordance with the District's Rules and Regulations or upon approval by the Board.

### 1.4.1 Updates to the Sanitary Standards

Updates to the Sanitary Standards are noted in **Table 1** below. The dates shown in **Table 1** provide the date of the latest revision of the Sanitary Standards. Users should apply the most current Sanitary Standards to their projects. Approved Sanitary Standards with the most current updates can be found at the District website. The administrative process for updating the Sanitary Standards is described in the District's Rules and Regulations Section 5.4. Changes to the Sanitary Standards will be effective as of the date specified in the signed approval.

Table 1. Revisions		
Date	Description	WES Director
September 2019	Sanitary Sewer Standards	Greg Geist
TBD in 2020	Sanitary Sewer Standards	Greg Geist

## 1.5 Administration of Sanitary Standards

The District Director has the authority to administer all the requirements, regulations, and provisions set forth in these Sanitary Standards.

## 1.6 Variance

Alternative materials and methods will only be accepted if the applicant can demonstrate that the existing standards are not appropriate for a given site and the proposed alternative provides the same or greater level of performance as defined in these standards. Alternate materials or methods not explicitly approved herein will be considered for approval through the variance process outlined below.

### 1.6.1 Variance Request

A variance request to the (Standards) shall be submitted in writing to the District. The written request for a variance should be submitted to the District prior to land use approval if a land use action is required. Land use conditions of approval are commonly written so there is little, if any, flexibility after land use approval is issued. If land use approval has already been issued or not required, then the variance request should be submitted in writing along with the first plan review submittal.

Once the District approves the plans, a variance request will only be accepted at the discretion of the District, and if the request is the only feasible solution without regards to delays or cost. Only minor variance requests will be considered during the construction phase of the project to address a specific design or construction problem. It is the responsibility of the applicant to obtain all approvals from any local, county, state or federal authority having any jurisdiction or permitting of the activities before proceeding with an approved variance.

This written request shall include the following:

- The desired variance(s);
- The reason(s) for the request(s);
- A comparison between the specification(s) and standard(s), and the variance(s) for performance, function, maintainability, safety, etc.;
- References to regionally and/or nationally accepted standards, records of successful use by other agencies, or other supportive information.

### 1.6.2 Criteria for Variance

The District may grant a variance when the request does not compromise the following: public safety, environmental protection, maintenance/repair/replacement, and when any one of the following conditions are met:

- Topography or other geographic conditions impose an environmental or safety concern and the request is considered an equivalent alternative, which can accomplish the intent and criteria that is provided in these standards.
- A minor change to the standard is required to address a specific design or construction problem which, if not enacted, will result in an unreasonable or disproportionate burden or obstacle to development. The financial viability of meeting the requirements of these design standards is not in itself a justification for a design exception.
- The variance request is in the public interest and requirements for safety, function, appearance, and maintainability are based upon sound engineering and functionality of the proposed system is a feasible alternative.

All requests will be evaluated on a case-by-case basis, and approval of alternative materials and methods for one development proposal will not imply an approval under similar circumstances in another proposal. Approval of a variance, or denial of a site-specific request shall not constitute a precedent for use at other locations with potentially similar circumstances.

### 1.6.3 Review Process

The variance request shall be reviewed by the District and a decision will be issued, in writing, to the applicant within 30 calendar days indicating one of the following:

1. Approve as proposed, or
2. Approve with changes, or
3. Deny with an explanation.

~~A decision will be issued in writing to the applicant within 30 calendar days. The written decision can be appealed as outlined in the WES Rules and Regulations.~~

~~It is the responsibility of the applicant to obtain all approvals from any local, county, state or federal authority having any jurisdiction or permitting of the activities before proceeding with an approved variance.~~

**Commented [A1]:** Redundant with above and below.  
Change in both the sanitary and storm standards.

### 1.6.4 Appealing Variance Request Decision

The applicant may make a written request to the District to appeal the variance request decision as outlined in the appeals process contained in Section 3.9 of the District Rules and Regulations.

## SECTION 2. DEFINITIONS

Section 2 provides the definitions and abbreviations used in these Sanitary Standards.

### 2.1 Words and Terms

Unless the context specifically indicates otherwise, the following words and terms, as used in these Sanitary Standards, shall have the meanings hereinafter designated:

Term	Definition
Accessory Dwelling Unit (ADU)	An ADU is a secondary dwelling and defined as a single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation. The ADU can be created by conversion of existing living area, attic, basement, adding floor area, or constructing a new structure, attached structure, or manufactured home with an internal or detached accessory dwelling unit.  The local building official shall determine whether a building permit application is considered an ADU. ADUs will be assessed Equivalent Dwelling Unit charges and monthly service fees in accordance with the Rules and Regulations and Sanitary Standards.
Act	The Federal Water Pollution Control Act, also known as the Clean Water Act, as amended, 33 U.S.C. §1251, et. seq. (1972).
Annexation	A boundary change according to the provisions of ORS Chapter 198.
Applicant	The person or entity applying for a Public Sanitary Sewer Extension Permit or other sanitary sewer-related permit.
ASTM Specifications	The standard specifications or methods of ASTM International. Unless otherwise stated, it shall refer to the latest adopted revisions of said specifications.
Board	The Board of County Commissioners of Clackamas County, acting as the governing body of the District.
Bond, Performance	As required by the District, a surety bond, cash deposit or escrow account, assignment of savings, irrevocable letter of credit or other means acceptable to and required by the District to guarantee that work is completed in compliance with all requirements of the District Rules and Regulations and/or for a maintenance period specified in these Sanitary Standards.  A performance bond is issued to one party of a contract as a guarantee against the failure of the other party to meet obligations specified in the contract. It is also referred to as a contract bond. A performance bond is usually provided by a bank or an insurance company to make sure a contractor completes designated projects.
Bond, Warranty	A warranty bond is a legal document that guarantees to the project owner that the contractor who did the work will come back and fix defective work or material should an issue arise during the warranty period specified in the contract.
Building	Any structure containing plumbing.
Building Drain	That part of the lowest piping of a sewerage system which receives the discharge from the drainage pipes inside the walls of the building and conveys it to the Building Sewer, extending 5 feet outside the building wall.
Building Sewer	The private piping system from the Building Drain to the Service Connection.

Term	Definition
Capital Improvement(s)	Facilities or assets used for the purpose of providing sanitary sewerage collection, transmission, treatment and/or disposal.
Capital Improvement Plan	The Capital Improvement Plan adopted by the District and any updates to the Plan.
Cleanout	A sealed aperture extending to the ground surface permitting access to a sanitary sewer pipe for access cleaning and maintenance or testing purposes.
Collection Sewer Charge	A one-time charge by the District to recover a representation of the present-day cost to construct the Public Sanitary Sewer System.
Combined Sewer System	A conduit or system of conduits in which both sewage and storm water are transported. Combined systems are prohibited by District Rules and Regulations.
Commercial User	Any user of the sanitary sewer who is neither a residential nor industrial user.
Contractor	A person duly licensed or approved by the State of Oregon to perform the type of work to be done under a permit or contract.
Conveyance System	The sanitary sewer conveyance system includes all gravity mains, force mains, pumping or lift facilities, manholes, and related facilities.
County	Clackamas County, Oregon.
Datum, Horizontal	Unless otherwise specified, the horizontal control network shall be the North American Datum 83(91) (NAD83(91)) expressed in Oregon North Zone State Plane Coordinates in international feet.
Datum, Vertical	Unless otherwise specified, the vertical elevation control shall be the National Geodetic Vertical Datum of 1988 (NGVD88).
Day	A continuous 24-hour period from 12:01 am to 12:00 pm.
Developer	An individual or organized group of partnerships, corporations, etc., proposing to develop land which will contribute sewage to the District.
Development	All human-induced changes to improved or unimproved real property, including division, buildings, partition of a parcel of property.
Director	The Water Environment Services (WES) Director, or designated representative.
District	The administrative authority of WES, an ORS 190 intergovernmental entity, and a Department of Clackamas County with a service area encompassing Clackamas County Service District No. 1 (CCSD#1), Tri-City Service District (TCSD) and the Surface Water Management Agency of Clackamas County (SWMACC).
District Easement	An easement granted to the District for the express purpose to install, maintain, repair, or replace District-owned infrastructure.
District's Engineer	The District's engineering manager, or their duly authorized representative(s), or any duly authorized representative(s) as designated by the Director.
District System	Any sanitary or stormwater conveyance, treatment or pumping facilities that are owned, operated, and maintained by the District.
Domestic Sewage	Sewage derived from the ordinary living processes free from industrial wastes and of such character as to permit satisfactory disposal without special treatment into the District Public Sanitary Sewer System.
Dwelling Unit	A living unit with kitchen with cook stove facilities including, but not limited to, those in multiple dwellings, apartments, hotels, motels, mobile homes, ADU accessory dwelling units, and recreational vehicles RVs, or camper trailers.

Term	Definition
Easement	The legal right to use a described piece of land for a particular purpose. It does not include fee ownership but may restrict the owner's use of the land. Easements granted to the District shall be accepted by the District and recorded as a land record at the Clackamas County Clerk's office.
Emergency Work	Work that must be performed to ensure the safety and health of the public or the environment.
Engineer	A registered professional Engineer licensed to practice in the State of Oregon by the Oregon Board of Engineering Examiners.
Engineer's Inspector	The Engineer's Inspector(s) shall be the engineer of record, or recognized as representatives of the Engineer, and their duties shall be to approve materials and workmanship as required by the plans and specifications in accordance with District Sanitary Standards.
Environmental Protection Agency (EPA)	The U.S. Environmental Protection Agency, or where appropriate the term may also be used as a designation for the Administrator or other duly authorized official of said agency.
Equivalent Dwelling Unit (EDU)	A unit of measurement of sewer discharge which is assumed to be equivalent to the discharge of a single-family dwelling unit.
Federal Endangered Species Act (ESA)	The Federal Endangered Species Act provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing ESA are the U.S. Fish and Wildlife Service (FWS) and the U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries Service. The FWS maintains a worldwide list of endangered species. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.
Government Agency	Any municipal or quasi-municipal corporation, or local, state, or federal agency.
Hazardous Materials	Materials described as hazardous under state and federal law, including, but not limited to, any toxic chemicals listed as toxic under Section 307(a) of the Clean Water Act or Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA).
Industrial User	Any person who discharges industrial waste into the District conveyance system.
Industrial Waste	Any liquid, gaseous, radioactive, or solid waste substance, or a combination thereof, resulting from any process of industry, manufacturing, trade or business, or from the development or recovery of any natural resources, or as defined by the Oregon State Department of Environmental Quality or the United States Environmental Protection Agency, exclusive of domestic sewage.
Infiltration and Inflow (I&I)	<p>Infiltration is water other than sanitary wastewater that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes. Infiltration does not include inflow. Inflow is water other than sanitary wastewater that enters a sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, and catch basins. Inflow does not include infiltration.</p> <p>I&amp;I causes dilution in sanitary sewers. Dilution of sewage decreases the efficiency of treatment and may cause sewage volumes to exceed design capacity. Although inflow is technically different from infiltration, it may be difficult to determine which is causing dilution problems in inaccessible sewers.</p> <p>The United States Environmental Protection Agency defines infiltration and inflow as combined contributions from both.</p>
Inspector	A person designated by the District to inspect, construction sites, construction activities, stormwater systems, activities that affect surface water, building sewers, service connections, and other installations to be connected to the District sewerage, stormwater, or surface water systems.

Term	Definition
Installer	Either the owner of the property being served or a Contractor doing work in connection with the installation of a building sewer or conveyance system under a permit from the District, City, or County.
Local Collection Facilities	All sewerage facilities that are owned, operated, and maintained by a city that collect and convey sewage to the District conveyance system.
May	The word "may" is permissive.
Operation, Maintenance, and Replacement; or O, M, & R	Those functions that result in expenditures during the useful life of the conveyance system for materials, labor, utilities, administrative costs, and other items that are necessary for managing and maintaining the conveyance system to achieve the capacity and performance for which such infrastructure was designed and constructed.
Oregon Department of Environmental Quality, or ODEQ, or DEQ	The Oregon Department of Environmental Quality.
Owner	The owner(s) of record title or the purchaser(s) under a recorded sale agreement and other persons having an interest of record in the described real property.
Parcel of Land	A lot, parcel, block, or other tract of land that is occupied or may be occupied by a structure or structures or other use and includes yards and other undeveloped areas required under the zoning, subdivision, or other development ordinances.
Performance Surety	See definition of Bond, Performance.
Permit	An official document, permit, or certificate issued by the District that authorizes performance of a specified activity.
Permittee	The person who applies for, and/or is issued a building permit, connection permit, development permit or any other permit described in these standards.
Person	Any individual, public, or private corporation, political subdivision, governmental agency, municipality, industry, partnership, association, firm, trust, or any other legal entity.
Phased Development Plan	A single development scheme that has received appropriate approvals on a project site and has also obtained necessary vested rights to be constructed in multiple stages, sometimes covering several years. A development plan shall not be segmented or phased in a manner to avoid compliance with the Rules and Regulations and Sanitary Standards.
Plans	Construction plans submitted to the District for review and approval, in accordance with the Sanitary Standards.
Private Sanitary Sewer Collection System	A privately owned and maintained sanitary sewer conveyance system installed to serve non-single-family residential structures on a single ownership property, which cannot legally be further divided, such as apartments, mobile home parks and schools or installed in commercial or industrial subdivisions.  A single-family residence with an unattached garage or shop with sanitary facilities is exempt from this definition.
Private Sanitary Sewer Easement	An easement that grants rights from one private owner to install and maintain a Building Drain to a Service Connection.



Term	Definition
Public Right-of-Way	Any Right-of-Way dedicated to a public agency for ownership and maintenance such as a county or city owned highway, road, street, avenue, or alleyway. All land or interest therein which by deed, conveyance, agreement, easement, dedication, usage, or process of law is reserved for or dedicated to the use of the general public for roadway purposes, within which the District shall have the right to install and maintain Public Sanitary Sewers (ORS758.010).
Public Sanitary Sewer System	All or any part of the facilities for collection, pumping, treating, and disposing of sewage as acquired, constructed, owned, or maintained by the District. See Conveyance System definition.
Public Sanitary Sewer Easement	Any easement in which the District or other public agency has the right to construct and maintain a Public Sanitary Sewer System.
Public Sanitary Sewer Extension	Any extension or addition of the public conveyance system.
Public Sanitary Sewer Mainline	The portion of the Public Sanitary Sewer System which conveys wastewater through a piping system flowing by gravity that is located in the public right-of-way, or an easement, and the piping system is owned, operated, and maintained by the District. Public Sanitary Sewer Mainlines shall be installed in a straight line and constant grade with no bends, or bellies in accordance with these Sanitary Standards, excluding Service Connections that are the responsibility of the property owner(s).
Publicly Owned Treatment Works (POTW)	A treatment works as defined by Section 212 of the Act (33 U.S.C. §1292), which is owned by a governmental entity. This definition includes any public sewers that convey wastewater to the POTW treatment plan, but does not include pipes, sewers, or other conveyances not connected to a facility providing treatment. For the purposes of these Rules and Regulations, "POTW" shall also include any sewers that convey wastewaters to the POTW from persons outside the District who are, by contract or agreement with the District, users of the District's POTW.
Qualified Public Improvements	A Qualified Public Improvement is: (a) required as a condition of development approval; (b) identified in the District's adopted Capital Improvement Plan pursuant to ORS 223; and (c) either not located on or contiguous to a parcel of land that is the subject of a development approval, or located in whole or in part on, or contiguous to property that is the subject of development approval and required to be built larger or with greater capacity than is necessary for the particular development project to which the improvement fee is related.
Rules and Regulations	The Water Environment Services Rules and Regulations as adopted, and any and all rules and orders adopted pursuant hereto, and all amendments thereto.
Sampling Manhole	Sampling Manholes are specialized manholes designed for: measurement of wastewater and pre-treatment flows, water quality sampling, and parameter monitoring. Sampling manholes are most commonly used by industrial dischargers as part of a District's permit process for the release of pre-treatment flows to the sewer system. They are also used by the District to measure in-system flows and where flows are sent to another agency's system for treatment. A sampling manhole shall be constructed in accordance with a typical Public Sanitary Sewer manhole detail (see the applicable standard detail drawing).
Sanitary Sewer Mainline	Any gravity transmitted conveyance system that has a primary purpose of serving adjacent property (minimum 8 inches in diameter). The mainline sanitary sewers are located within public right-of-way or Public Sanitary Sewer Easements.
Sanitary Sewer System	A conduit intended to carry liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions, together with minor quantities of ground, storm, and surface waters that are not admitted intentionally.
Sanitary Standards	These adopted sanitary standards, principles, and policies established by the District to meet the intent of the District's Rules and Regulations.

Term	Definition
Service Area	An area served by the District Public Sanitary Sewer System or surface water management within the District boundaries or a defined geographic area that becomes a part of the District.
Service Connection	The part of the piping system within the public right of way, or public easement which extends from the Public Sanitary Sewer Mainline to serve a property and conveys discharge from the property into the mainline. Service Connections are maintained, repaired and/or replaced by the property owner benefitting from the service at their sole expense, up to and including the connection to the Public Sanitary Sewer Mainline.
Sewage	The water-carried human, animal, or vegetable wastes from residences, business buildings, institutions, and industrial establishments, together with groundwater infiltration and surface water as may be present. The admixture with sewage of industrial wastes or water shall be considered "sewage" within the meaning of this definition.
Sewer	See <i>Conveyance System</i> .
Shall	The word "shall" means mandatory.
Stop Work Order	An order issued by the District for violation of District Sanitary Standards. All work contributing to the violation must cease when a Stop Work Order is issued, and the Stop Work Order will stay in place until such time as removed by the District in writing.
Storm Sewer	A conveyance system designed to carry only stormwater, surface runoff, street wash water or stormwater drainage.
Stormwater	Waters on the surface of the ground resulting from precipitation.
Trunk Sanitary Sewer	Any conveyance system sized and located to serve general topographical areas and mainline sanitary sewers (the minimum pipe size is normally 12 inches in diameter or larger). Trunk sanitary sewers are located within public right-of-way or Public Sanitary Sewer Easements.
Undue Hardship	Special or specified circumstances that partially or fully exempt a person from performance of these Sanitary Standards, so as to avoid an unreasonable or disproportionate burden or obstacle.
Useful Life	The time period during which a treatment works, conveyance system or other specific facility operates.
Variance	A change or alteration made to the application of these Sanitary Standards to improve something or make it more suitable. A variance shall not change the functionality, the ability to maintain the system, or the intent of these Sanitary Standards.
Waters of the State	Those waters defined in Oregon Revised Statutes (ORS) Chapter 468B.005 or as amended which include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon, and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.
Water Resource Recovery Facility	An arrangement of devices, structures, and equipment for treating sewage.

## 2.2 Abbreviations

The following abbreviations shall have the designated meanings:

AASHTO	American Association of State Hwy and Transportation Officials
APWA	American Public Works Association
ASTM	ASTM International
CCSD	Clackamas County Service District
CDF	controlled density fill
CWA	Clean Water Act
DIP	ductile iron pipe
District	Water Environment Services
EDU	Equivalent Dwelling Unit
ESA	Federal Endangered Species Act
fps	feet per second
gpcd	gallons per capita per day
HDPE	high density polyethylene pipe
I.E.	invert elevation
I.D.	inside diameter
NRCP/RCP	non-reinforced concrete pipe/reinforced concrete non-pressure pipe
OAR	Oregon Administrative Rules
O.D.	outside diameter
ODEQ	Oregon Department of Environmental Quality
ORS	Oregon Revised Statutes
P.E.	Professional Engineer
POTW	publicly owned treatment works
psi	pounds per square inch
psig	pounds per square inch gage
PUE	Public Utility Easement
PVC	polyvinyl chloride
PSSE	Private Sanitary Sewer Easement
SSE	Public Sanitary Sewer Easement
TCSD	Tri-City Service District
Sanitary Standards	Sanitary Sewer Standards
SDR	Standard Dimensional Ratio
Si	Slope (inlet)
So	Slope (outlet)
SWM	Surface Water Management
UNI	Unibell Publications
UPC	Uniform Plumbing Code
WES	Water Environment Services



## SECTION 3. GENERAL SANITARY STANDARDS

Section 3 of the Sanitary Standards presents an overview of the general policies, methods, and processes associated with the Sanitary Standards as a whole.

### 3.1 General Policy

Public improvements are conditioned through the development review and land use approval process, described, and administered under the local planning department administering the zoning and development ordinance, or by federal, state, or other local government regulation. These Sanitary Standards cannot provide for all situations and are intended to assist, but not to substitute for competent work by design professionals. It is expected that the design professionals will bring to each project the best of skills from their respective disciplines.

1. These Sanitary Standards are not intended to limit unreasonably any innovative or creative effort that could result in better quality, cost savings, or both.
2. Pursuant to the objectives found in Section 1 of these Sanitary Standards, any conveyance system designed and constructed shall:
  - a. Be of adequate design to carry the expected flow, within the design life, and at sufficient size and depth to serve adjacent properties;
  - b. Have sufficient slope as determined by the District to maintain a conveyance system that will self-clean as specified in these Sanitary Standards;
  - c. Have sufficient structural strength to withstand all external loads which may be imposed;
  - d. Be of materials resistant to both corrosion and erosion with a minimum design life of 100 years;
  - e. Be economical and safe to build and maintain; and
  - f. Prevent infiltration or inflow of ground and surface waters and exfiltration of sewage.

### 3.2 Development Policy

When development of a property or tract of land is proposed, all residential dwelling units and commercial, and industrial buildings with sewer drains within the boundaries of the proposed tract shall be connected to the Public Sanitary Sewer System as part of an approved plan.

#### 3.2.1 Existing Onsite Sewage Disposal Systems

All existing onsite sewage disposal systems shall be abandoned per Oregon Department of Environmental Quality (ODEQ) Regulations. For additional information contact Clackamas County Septic and Onsite Wastewater Program.

### **3.2.2 Point of Service for Upstream Parcels**

A point of service for upstream parcels shall be provided to facilitate an orderly extension of the Public Sanitary Sewer System. This shall include the extension of Public Sanitary Sewer Systems in right-of-way or easements across the property to serve the upstream properties in a location as approved by the District.

Development projects that construct Public Sanitary Sewer Extensions, which can directly serve adjacent properties may qualify for the establishment of a Reimbursement District as defined in Section 6.6 of the Rules and Regulations.

### **3.2.3 Trunk Line Sanitary Sewers**

Trunk line sanitary sewers, if required, will be sized to provide capacity for the entire future development of the upstream basin based on projected zoning. Public Sanitary Sewer System for future development shall be designed per the District's Master Plan or, in absence of such plan, the system shall be developed on a case-by-case basis as approved by the District.

## **3.3 Engineering Policy**

It shall be the policy of the District to require compliance with ORS 672 for Professional Engineers, Surveyors, Photogrammetrists, and Geologists.

All engineering plans, reports, or documents shall be prepared by a registered professional Engineer, or by a subordinate employee under the Engineer's direction, and shall be stamped with the Engineer's seal and signed to indicate the Engineer's responsibility for the design. It shall be the Engineer's responsibility to review any proposed Public Sanitary Sewer System, variance, or other change with the District prior to engineering or proposed design work, to determine any special requirements and/or whether the proposal is permissible. A "Plans Approved for Construction" (or equivalent) stamp of the District on the Plans, etc., for any project, does not in any way relieve the Engineer of responsibility to meet all requirements of the District or obligation to provide a Public Sanitary Sewer System in accordance with the Rules and Regulations, and Sanitary Standards, and protect life, health, and property of the public. The District reserves the right to change the Plan for any project prior to final acceptance at any time it is determined that the full requirements of the District Rules and Regulations have not been met.

All Drawings submitted for approval shall be stamped and signed by a registered Professional Engineer. No Plan review or approval shall be made without the Plans being stamped and signed by the Professional Engineer.

## **3.4 Sanitary Sewer Standard Detail Drawings**

Except as otherwise provided by these Sanitary Standards, the engineering design and construction shall be in accordance with the most updated revision of the Sanitary Sewer Standard Detail Drawings included in Appendix B.

## **3.5 Approval of Alternate Materials and Methods**

Any substitution of materials or alternate methods not explicitly approved herein will be considered for approval as set forth in Section 1.6 of these Sanitary Standards. Persons seeking such approvals shall make application in writing. Approval of any deviation from

these Sanitary Standards shall be provided in writing. Approval of minor matters will be made in writing, if requested.

Any alternative materials and/or methods must meet or exceed the minimum requirements set forth in these Sanitary Standards.

The written request is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, reason and justification, and other pertinent supporting information.

Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the District. When requested by the District, full design calculations shall be submitted for review with the request for approval.

### **3.6 Special Design Applications**

Special applications not covered in these Sanitary Standards require review and approval by the District. Submittal of full design calculations, supplemental drawings, and other information shall be required before any approval is considered.





## SECTION 4. PUBLIC SANITARY SEWER EXTENSION

The provisions presented in this section of the Sanitary Standards specify the responsibilities of the parties involved and the process followed by the District prior to acceptance of a Public Sanitary Sewer Extension that is not constructed by the District. These requirements are intended to meet the goals and objectives of the District in combination with all other state, federal, county, and local laws, and ordinances.

### 4.1 Public Sanitary Sewer Extension Permit

Prior to the commencement of construction of any Public Sanitary Sewer System, a valid Public Sanitary Sewer Extension Permit shall be issued by the District in accordance with these Standards. An Extension Permit is required to construct or reconstruct any Public Sanitary Sewer appurtenances which are owned by, or intended to be conveyed to, the District. All other sanitary sewer piping not intended to be conveyed to the District shall be permitted by the Local Plumbing Authority.

### 4.2 Responsibilities

The responsibilities of the District, Developer, Developer's Engineer, and Contractor are defined in the following subsections.

#### 4.2.1 District Responsibilities

The District's responsibilities are summarized below:

1. The District shall be responsible for the review and approval of Plans, issuance of the Public Sanitary Sewer Extension Permit and the final inspection and acceptance of the conveyance system. The District's review constitutes review under OAR 340-52 and ORS 672.
2. During the planning, preliminary design phase, and plan review process, the District will be determining whether the proposal complies with these Sanitary Standards and District Rules and Regulations. It is the Applicant's responsibility to check with other applicable agencies with respect to state laws, and other laws incorporated by specific reference.
3. Any Development activity may be subject to other laws not addressed in this process. The Federal Endangered Species Act (ESA) is one such law. The ESA is a federal law that is adopted, administered, and enforced by agencies of the Federal government and not the District. The District, in its review of this application, will not make any evaluation on whether activities taken pursuant to an approval will or will not result in a violation of the ESA or of any local, state, or federal agencies' requirements.

#### **4.2.2 Developer Responsibilities**

It shall be the responsibility of the Developer to obtain land use approval through the appropriate Planning Authority. The Developer shall make application for a Public Sanitary Sewer Extension Permit to the District. The Developer shall have ultimate responsibility for compliance with all requirements specified in these Sanitary Standards and the District's Regulations. The Developer shall be directly responsible for all administrative requirements including application for service, submittal of all required Plans, bonds and insurance, and payment of fees. The Developer shall submit a signed and executed Sanitary Sewer Engineering Agreement form can be found online and shall be responsible for performance of the Developer's Engineer in meeting all design requirements, and for the performance of the Contractor in meeting all construction-related requirements. The Developer is specifically put on notice that it is their responsibility, and not the responsibility of the District to determine whether activities taken pursuant to a Plan approved by the District do not conflict with the provisions of the ESA or of any other federal or state regulatory laws or other jurisdiction requirements.

#### **4.2.3 Developer's Engineer Responsibilities**

These Sanitary Standards establish minimum requirements for designing the District's Public Sanitary Sewer System. They are not intended to be a substitute for engineering knowledge, judgment, or experience. The information presented herein shall be reviewed by the Developer's Engineer and shall be applied as necessary to the project. The Developer's Engineer shall be responsible for specifically complying with these Sanitary Standards and District Rules and Regulations.

Any Public Sanitary Sewer Extension proposed for connection to the District Sanitary Sewer System must be constructed under the continuous inspection of a registered Professional Engineer or Engineer's Inspector. The Engineer's Inspector(s) shall be recognized as representatives of the Engineer and their duties shall be to approve materials and workmanship as required by the plans and specifications. The Engineer may give written notice that all work be stopped until the Engineer and/or their Inspector is satisfied that materials and workmanship conform to the applicable specifications.

The Sanitary Sewer Engineering Agreement between the Developer and the Engineer shall establish that the Engineer shall have the sole responsibility for determining that design, materials, and construction of the Public Sanitary Sewer Extension conform to these Sanitary Standards. Such agreement shall further provide that the Engineer shall certify such testing and inspection services as are required by the District and are deemed necessary by the Engineer to stamp and sign the Certification of Completion (form can be found online) as required by these Sanitary Standards and the District Rules and Regulations.

If a determination is made that the public sanitary sewer system is being constructed without inspection by the Engineer as specified in the engineering agreement, the District shall have the right to responsibly halt the installation of the public sanitary sewer system until an inspector is present.

#### **4.2.4 Contractor's Responsibilities**

The Contractor shall be duly licensed by the State of Oregon and other licensing political subdivisions having jurisdiction over the work and be bonded to perform such work. It shall be the Contractor's responsibility to notify the Engineer as required in Section 4.4.2 of these Sanitary Standards.

### 4.3 Plan Submittal, Review and Approval Process

The requirements for Plan submittal, review, and approval are defined in the following subsections.

#### 4.3.1 Application Submittal

The Public Sanitary Sewer Extension submittal shall include all required information along with any other information requested by the District. The required information includes, but is not limited to the following:

1. Two sets of complete civil construction Plans.
2. Sanitary Sewer Engineering Agreement ([form can be found online](#)).
3. Construction and Engineering Cost Estimate ([form can be found online](#)).
4. Sanitary Plan review fees.

All submittals will be reviewed for completeness and the Engineer will be notified if required information is missing. Upon acceptance of a complete submittal, subsequent project review and approval steps shall be undertaken.

#### 4.3.2 Construction Plans

Construction plans and specifications shall be prepared by a Professional Engineer in accordance with the requirements described in Appendix A.

##### 4.3.2.1 Standard Detail Drawings Sheets

All applicable standard detail drawings shall be included on a separate sheet, in a clear legible size. If a standard detail drawing, such as a sanitary sewer manhole, must be modified to fit existing, or unique conditions, the modified detailed drawing shall be shown on the plan and profile sheet. When appropriate, due to required detail complexity, a separate detail sheet shall be used.

##### 4.3.2.2 General Notes

As a minimum, the District's general sanitary sewer construction notes ([form can be found online](#)) shall be included on the Plans, with additional notes added at the discretion of the designing Engineer.

##### 4.3.2.3 Supporting Information

The Engineer shall submit sufficient supporting information to justify the proposed design as determined by the District.

##### 4.3.2.4 Other Requirements

Periodically, the District may require additional information to support design assumptions used for sanitary sewer design. When required, the information shall be included on the Plans or submitted in memorandum form to the District. The following may be required:

- Potential size of Drainage Basin
- Number of potential EDUs

#### **4.3.2.5 Reviewing Agencies**

The District shall review all submitted proposals and Plans for Public Sanitary Sewer Extension construction.

The design and construction of public and private improvements within the District may involve numerous agencies, districts, and private utilities. It shall be the Developer's responsibility to coordinate the design, permit process, and construction with the applicable agencies, districts, and private utilities.

#### **4.3.2.6 Permits and Fees**

The Developer shall obtain all necessary District plan review and approval and construction permits and pay all applicable District fees prior to the commencement of any work.

#### **4.3.2.7 Sanitary Sewer Engineering Agreement**

The Developer and the Developer's Engineer shall submit a signed Sanitary Sewer Engineering Agreement on a District-supplied form ([form can be found online](#)) which outlines the responsibilities of the Developer and Engineer, with regard to surveying, costing, design, inspection, testing, certification, and as-built requirements of the District for acceptance of the proposed Public Sanitary Sewer Extension project.

### **4.3.3 Pre-Construction Meeting**

A pre-construction meeting shall be arranged by the Developer's Engineer to be held at either the District, County, or City offices prior to issuing of the Public Sanitary Sewer Extension Permit. Attendees must include the Developer, Developer's Engineer, Contractor, and the District representatives. Other interested parties may also attend the meeting. The purpose of the meeting is to discuss issues surrounding the project including, but not limited to, materials, construction, standard detail drawings, sequencing, Engineer testing and inspection requirements. If requested by the District, the Contractor shall present certification of the District's license requirements found in Section 11.6 of the District's Rules and Regulations.

It is the sole responsibility of the Developer, Engineer and Contractor to obtain all other applicable authorization from local agencies, state, and federal approvals prior to proceeding with any construction that is approved by the District.

## **4.4 Project Construction**

The requirements for project construction are defined in the following subsections.

### **4.4.1 Variance or Deviation from the Approved Plans**

No variance, deviation, or minor change from the approved Plans and specifications shall be made without the prior written approval of the District. When any variance or deviation of the approved Plans is requested by the Developer's Engineer, two sets of Plans showing the revisions shall be submitted to the District for approval. No construction of the modified section can commence until these revised Plans are reviewed and approved by the District. Approvals shall be made by the District in writing.

#### 4.4.2 Inspection and Testing

The Developer's Engineer is responsible for all testing and inspection services as required by the District and to certify the material, construction, and testing results to the District. The Developer's Engineer or the Engineer's Inspector shall be allowed full access to all parts of the work; and shall be furnished with every reasonable facility for ascertaining whether or not the work, as performed, is in accordance with the requirements and intent of the approved Plans and specifications.

The Contractor shall furnish, at the Contractor's own expense, such samples as are customarily required for testing purposes. The District does not furnish inspection of sanitary sewer construction. For this reason, it is imperative that the Developer and/or the Developer's Contractor provide prompt and complete notification to the Engineer and the District as to the progress of the construction of sanitary sewer improvements.

Notification must be given to the Engineer when the following work is to be scheduled:

1. Excavation and installation of the Public Sanitary Sewer Mainlines
2. Compaction testing/proof roll of trench backfill and fill areas
3. Construction of structures (including manholes, service connections, and cleanouts)
4. All required manhole and sanitary sewer line testing, including vacuum, air, mandrel, and video testing.

Failure to give the Engineer proper notification (48 hours) of the Contractors work schedule may invalidate the work performed and make necessary, testing and inspection from an independent testing laboratory for compliance with the District's construction specifications. Such tests shall be furnished, at no expense to the District.

#### 4.5 Acceptance and Warranty

Acceptance of the Public Sanitary Sewer Extension will be made in writing by the District after all conditions of the Public Sanitary Sewer Extension Permit have been met. The following subsections outline the District's post-construction requirements prior to final acceptance.

##### 4.5.1 Video Inspection of Gravity Sewers

After the project Engineer certifies the construction is completed, then the entire Public Sanitary Sewer System shall be video inspected and recorded prior to the District conducting the final construction inspection in preparation of the acceptance of the Public Sanitary Sewer Extension. All pipes shall be thoroughly flushed immediately prior to the video inspection.

The video recording shall:

1. Be in color electronic format acceptable to the Engineer and be continuous from beginning to end of each pipe run.
2. Be clear, usable, and free of visual distortions; the image in the video shall appear level.
3. Include a visual footage meter recording on the tape.
4. Include a voice recording of suspected deficiencies.

5. Provide a means of gauging the depth of deflection within the pipe system.
6. Be performed by experienced personnel trained in locating pipe and grade breaks, obstacles, and service connections by remote video inspection utilizing a 360° pan and tilt camera.
7. Identify visually, with audio and on the written report, the location of the beginning and end of each pipe run, the lineal feet of pipe, all deficiencies, the name of the company creating the tape recording, name of the operator, and date and time of the recording.
8. Include a 360° inspection of each joint.
9. Include a clear view up each Service Connection.
10. Identify groundwater infiltration sources associated with construction or material defects.
11. Video inspection for District review shall be performed at the end of the project once all construction is complete.

The Engineer shall review the video recordings and inspection report(s) prior to submitting them to the District.

The video and report shall record all horizontal and vertical deflection in the piping system. Any vertical deflection is unacceptable. Horizontal deflection that creates a half-inch belly in the Public Sanitary Sewer Piping System is unacceptable. The project Engineer shall be immediately notified, the deficiency corrected, and re-videoed prior to submitting the final video inspection and report to the District.

Once the engineer has reviewed and approved the video recording in accordance with the Sanitary Standards, a copy of the video recordings, and written inspection report(s) shall be submitted to the District for review and approval. Illegible, or incomplete video, or inspection report(s) will be returned to the Engineer.

The District shall approve the video recording prior to scheduling the District inspection of the Public Sanitary Sewer System.

#### 4.5.2 Test Results

The installation and/or construction of Public Sanitary Sewer System in accordance with the District Standards, including the mainline, manhole, and service connection testing shall be observed by the Engineer or Engineer's Inspector and the results shall be certified to the District on the approved District forms ([form can be found online](#)). All required testing, including but not limited to low air, mandrel or vacuum testing, and video recording shall be performed. Dye testing shall be performed for non-single-family developments.

#### 4.5.3 Service Connection Drawings

Provide appropriate information to locate newly installed Sanitary Sewer Service Connection for each lot or parcel within the project boundaries. Provide stationing, depth, and horizontal dimensions ~~of the at the end of the pipe, or if installed the~~ cleanout at the property line, to permanent physical objects in the field to assure that the service connection can be located after construction is completed. Service connection drawings shall become the property of the District and are Public Records. [The form can be found online.](#)

#### 4.5.4 As-built Plan Requirements

For all Public Sanitary Sewer Extensions, the Engineer shall submit certified as-built Plan and Profile drawings. Record drawings shall be submitted for all other connections to the

Public Sanitary Sewer system. As-built drawings shall meet the District's requirements and shall be of archival quality. Each page shall be stamped and signed by the Engineer and state, in writing, that this is an as-built drawing. As-built drawings shall become the property of the District and are Public Records.

Two sets of "Draft" as-built full-size paper drawings shall be submitted to the District for review and approval prior to final AutoCAD and PDF file submittals. At minimum, the final AutoCAD and PDF as-built drawings shall be a legible black line drawing ~~printed on 4 mil Mylar~~, capable of being reproduced.

The following Public Sanitary Sewer System structures shall be surveyed, and the as-built elevation and location shall be noted on the final as-built drawings:

1. I.E. ins, outs & rim elevations of the:
  - a. Point of connection, existing downstream manholes, and structures,
  - b. Dead end manholes, cleanouts, and structures,
  - c. Any manhole or structure that may be extended in the future,
  - d. Any substantial change in the approved plans that deviate more than 0.250 feet in elevation or alignment.
2. A table listing the service connections for each building lot noting the mainline stationing, the measurement in linear feet of the location of the Service Connection from the center of the upstream and downstream manholes, pipe size, pipe length, and pipe depth at the property line crossing.
3. Show alignment changes, slope changes, invert elevation changes, pipe size changes and changes in construction materials.
4. Measured depth from existing ground surface of all storm, sanitary, waterline and utilities that cross the pipeline alignment in profile.
5. Type of pipe, backfill material and location.
6. Indicate areas of rock removal not completed by standard backhoe, i.e., splitter or blasting.
7. The subdivision name shown in the title block shall match the name shown on the plat.

Drawings shall also be submitted electronically in a release of AutoCAD and PDF file acceptable to the District. The electronic submittal shall become the property of the District.

#### 4.5.5 Certification of Completion

A stamped and signed Certificate of Completion (form can be found online) shall be provided by the Developer's Engineer. This statement certifies to the District that all construction methods, workmanship, and materials, have been inspected, tested by approved methods, and found to conform to the approved Plans and the specifications of the District.

#### 4.5.6 Final Inspection

A final inspection of the Public Sanitary Sewer System by the project Engineer shall be conducted to determine that the construction was completed in conformance with Plans, specifications, and these Sanitary Standards. The Developer's Engineer shall inspect and verify that all newly constructed structures meet the District's Sanitary Standards. Once

inspected and verified, the Developer's Engineer may notify the District upon completion of construction and request a final inspection conducted by District personnel. Any deficiencies resulting in non-acceptance of the work shall be identified in writing and presented to the Developer's Engineer for correction. Upon correction of the noted deficiencies the Developer's Engineer shall inspect and verify corrections have been made and then notify the District and request a re-inspection. If the work is accepted, the Developer's Engineer will be notified.

#### **4.5.7 Construction and Engineering Cost**

The Developer's Engineer shall calculate and submit on District forms the actual construction and engineering cost of the Public Sanitary Sewer Extension. The Construction and Engineering Cost Data Sheet can be found [online](#). District plan review fees shall be based on the cost to construct the Public Sanitary Sewer Extension.

#### **4.5.8 Letter of Conveyance**

The Developer/Owner shall convey (at no cost to the District) all right, title, and interest in the Public Sanitary Sewer Extension to the District. The Conveyance of Public Sanitary Sewer Main Extension form can be found [online](#).

#### **4.5.9 Warranty Bond**

A warranty bond or cash security in an amount equal to 25% of the actual construction and engineering cost to complete the Public Sanitary Sewer Extension shall be provided to the District by the Developer/Owner at no cost to the District. This bond shall guarantee the workmanship and materials of the Public Sanitary Sewer Extension for a minimum period of 2 years from the date of acceptance by the District unless a longer period is required by the District. A sample Warranty Bond form can be found [online](#).

#### **4.5.10 Letter of Acceptance**

Upon completion of all the requirements of the Public Sanitary Sewer Extension Permit, District Rules and Regulations, and these Sanitary Standards, the District shall issue a letter stating the District will accept for ownership and maintenance the Public Sanitary Sewer Extension and specify the date the warranty period will begin.

#### **4.5.11 Warranty Period**

The Owner/Developer or Contractor's warranty period shall be in effect for a minimum period of 2 years from the date specified in the Letter of Acceptance unless a longer period is required by the District.

Prior to the end of the warranty period, the District will conduct a warranty bond inspection of the Public Sanitary Sewer Extension and notify the Owner/Developer, or the Developer's Engineer of any deficiencies found. The request and scheduling of the warranty bond is the responsibility of the Owner/Developer. Any faulty workmanship and/or defective materials which are discovered within the warranty period shall be corrected and/or replaced by the Owner/Developer at no expense to the District. Such warranty period and warranty bond may be extended upon the disclosure of a defect for a minimum of 2 years after the correction of the defect is completed at the sole discretion of the District.

All repair work required during the warranty period shall be performed within 30 days of issuance of written notification to the Owner/Developer. Emergency work performed by the District and all work performed by the District due to the nonperformance of the Contractor



shall be reimbursed to the District within 30 days of invoice. If the Contractor fails to reimburse the District in 30 days, the District may file a bond claim.

After the warranty inspection and completion of all work required to bring the Public Sanitary Sewer Extension into conformance with these Sanitary Standards, all sureties shall be released unless the warranty period and warranty bond is extended at the sole discretion of the District.



## SECTION 5. DESIGN REQUIREMENTS

This section provides the design requirements mandated by the District for Public Sanitary Sewer System construction projects.

### 5.1 General Design Requirements

Except where these Sanitary Standards specify otherwise, the design detail, workmanship, construction specifications, and materials shall be in accordance with the following (in the following order of precedence):

1. Rules and Regulations
2. District Sanitary Sewer Standard Detail Drawings
3. Sanitary Standards
4. District Stormwater Standards
5. Clackamas County Transportation Standard Detail Drawings (if applicable)
6. Local City Standard Detail Drawings (if applicable)
7. Current APWA Standard Specifications and Drawings for Public Works Construction published by the Oregon Chapter of the APWA, and Clackamas County Road Use Ordinance
8. ODOT Standard Specifications
9. AASHTO Standard Specifications

It is the Engineer's responsibility to comply with other applicable federal, state, and local regulations, particularly with respect to wetland regulations and other development requirements.

#### 5.1.1 Performance Sanitary Standards

1. Public Sanitary Sewer Extension design shall meet the policies and guidelines of OAR Chapter 340 Division 52 Section 0020 and its updates. Design shall comply with Oregon Department of Environmental Quality (ODEQ) sanitary sewer design guidelines.
2. The Public Sanitary Sewer System capacity shall be designed for ultimate development density of the drainage basin. The system shall allow for future system extensions and for future development. The Public Sanitary Sewer System shall be designed to provide gravity conveyance to the lowest building drain including from basements of houses, commercial or industrial buildings, and all public and private establishments where possible. Only District owned and maintained regional pump stations that are included in the District's sanitary sewer Capital Improvement Plan will be permitted to convey (pump) wastewater collected by the Public Sanitary Sewer System. Private pump stations may be allowed as specified in Section 5.6.7.

3. Stormwater, including street, roof, or footing drainage, shall not be discharged into the sanitary sewer system but shall be removed by a system of storm drains or by some other method separate from the Public Sanitary Sewer System.

## 5.2 Sanitary Sewer Requirements

The following subsections provide design details for sanitary sewer construction within the District.

### 5.2.1 Pipe and Fitting Material and Size

1. All Public Sanitary Sewers shall be designed with materials as specified in these Sanitary Standards. Where required for added strength, C900 or C905 PVC shall be used. Public Sanitary Sewer Mainline, Service Connections, and fitting material shall be the following types or equal when approved in writing by the District:
  - a. Polyvinyl Chloride Pipe – PVC:
    - ASTM D3034 SDR 35, 4 to 24 inches
    - ASTM C-900 D-1784 DR, 4 to 24 inches (preferred by District)
    - ASTM C-905 D-1784 DR, 4 to 24 inches (preferred by District)
  - a. HDPE: ASTM D-3035
  - b. Tees, Service Connections, and Fittings:
    - A factory tee shall be installed in the mainline for each Service Connection.
    - All fittings shall be of sufficient strength to withstand all handling and load stresses encountered.
    - All tees, service connections and fittings shall be of the same materials as the sanitary sewer mainline pipe unless otherwise approved.
    - Tees and fittings shall be free from cracks and shall adhere tightly to each joining surface.
    - All tees and fittings shall have a gasket with the same material as the mainline pipe joint.
2. All sanitary sewer mainlines shall be a minimum diameter of 8 inches and shall begin at a manhole and shall terminate at a manhole, unless otherwise approved by the District.
3. Private sanitary sewer piping systems constructed on private property shall be Permitted by the Local Plumbing Authority and meet the appropriate sections of the Uniform Plumbing Code (UPC), excluding Service Connection within the public right of ways and public easement that will be constructed in accordance with these Standards.

### 5.2.2 Design Sewage Flow

1. Design flows shall be determined by using the factors of the specific Sanitary Sewer Master Plan, if available, in which the development is situated.
2. In the absence of a Master Plan the District shall determine the applicable location, depth, slope, and pipe diameter of the Public Sanitary Sewer Mainline.

### 5.2.3 Minimum Slope Design

The District requires the Public Sanitary Sewer System be designed with the minimum slope of 0.0100-ft/ft (1.0%), except for dead-end lines, for which the District requires a minimum slope of 0.0200-ft/ft (2.0%). See Table 2 for exceptions based on topography challenged sites where the minimum design slope as stated above cannot be designed. The minimum slope design as specified in the table is based on the number of service connections upstream

Newly constructed mainlines in the Public Sanitary Sewer System shall be designed with sufficient slope to obtain a flow and velocity that will self-clean the system. ~~Public Sanitary Sewer Mainlines designed at less than the minimum slope of 0.0050 ft/ft and constructed at a slope of less than 0.0045 ft/ft will not be accepted by the District.~~

~~The District requires the Public Sanitary Sewer System be designed with the minimum slope of 0.0100 ft/ft (1.0%), except for dead-end lines, for which the District requires a minimum slope of 0.0200 ft/ft (2.0%). See Table 2 for exceptions based on topography challenged sites where the minimum design slope as stated above cannot be designed. The minimum slope design as specified in the table is based on the number of service connections upstream.~~

Table 2. Minimum Pipe Slope Design for 8-Inch Diameter Pipe	
Number of Homes Upstream	Minimum Pipe Slope for Segment Design
1-5	0.0200-ft/ft, 2-percent
6-20	0.0100-ft/ft, 1-percent
21-40	0.0075-ft/ft, 0.75-percent
>40	0.0050-ft/ft, 0.50-percent

The project engineer may design pipe slope in accordance with Oregon Administrative Rules (OAR) 340, Division 52 – Review of Plans and Specifications, Appendix A – Sewer Pipelines. The project engineer must submit calculations that demonstrate the proposed design slope(s) will achieve the minimum velocity based on the anticipated flow including, but not limited to the following design guide criteria.

OAR 340, Division 52, Appendix A, Section (2) Guidelines for Sewer Pipelines:

- Section (2)(b) Velocity (A): Sewers should be laid on a gradient which will produce a mean velocity, when flowing full or half full, of at least (2) two feet per second, based upon the Manning formula with "n", the coefficient of roughness, valued at 0.013.
- Section (2)(b) Velocity (B): Sewers with minimal flow such as upper reaches of laterals or those sewers serving few dwellings should be steepened and/or reduced in diameter to approach a (2) two feet per second self cleaning velocity. Actual flows during initial years of use should be carefully evaluated in this regard. (Section 5.2.1 Pipe and Fitting Material and Size specifies that all sanitary sewer mainlines shall be a minimum diameter of 8 inches.)
- Section (2)(b) Velocity (D): The minimum gradient for 8 inch sewers should be no less than 0.4 percent regardless of pipe material.

**Anchor Walls:** Sanitary sewers on slopes in excess of 20% shall be secured with concrete anchor walls. Spacing for anchors shall be as shown in **Table 3**.

Table 3. Minimum Anchor Spacing	
Slope (%)	(Center to Center)
20-34	35 feet
35-50	25 feet
51+	15 feet or Concrete Encasement

**Impervious Zone:** When designing the sewer corridors through steep topography identified on the Plans, an impervious zone shall be placed as required to limit the migration of water through the length of the trench. The Engineer will make a final determination of the locations and the number required. See Section 6.2.10 for further details on impervious zones.

#### 5.2.4 Velocity Design

Where flow velocities are determined to be greater than 8 feet per second, the pipe material shall be C900 or C905 PVC and special provision shall be made to protect manholes against erosion and displacement by shock. This may be accomplished by installing one additional manhole to decrease the slope or to split a 90-degree horizontal direction change into two, 45-degree incremental changes. The flow must be fully contained in the channel.

### 5.3 Alignment and Cover

Curved alignments in Public Sanitary Sewer Mainlines or Service Connection are not permitted. All pipe shall be laid on a straight line and grade. Horizontal deflection that creates a half-inch or more of belly in the Public Sanitary Sewer Piping System is unacceptable. All Public Sanitary Sewer Extensions shall be located within the public right-of-way or in a Public Sanitary Sewer Easement as determined by the District. Generally, public sanitary sewer mainlines within the right of way must be a minimum of 8-feet deep, and 6-feet deep within a public easement.

#### 5.3.1 Right-Of-Way

Public Sanitary Sewer Mainlines shall be constructed in a straight line and grade from manhole to manhole, and outside of the normal wheel path of a vehicle. The general location is about 5 feet north or west from the right-of-way centerline. All changes in the direction of the pipe shall be made at a manhole. Public Sanitary Sewer Systems shall generally be located in the street right-of-way. If streets have curved alignments, the center of the manhole shall not be in the wheel path, sidewalk, curb, or gutter.

#### 5.3.2 Sanitary Sewer Easement

Sanitary sewer mainlines shall be placed within a right-of-way whenever possible. Sanitary sewer mainlines in easements shall only be allowed as determined by the District.

1. All Public Sanitary Sewer Easements relevant to Plan approval shall be reviewed and approved prior to final Plan approval and issuance of the Public Sanitary Sewer Extension Permit. All easements granted to the District must be recorded via PLAT map or deed instrument. The District requires an easement granted to "Water Environment Services" and will not accept easements granted to the public, or as a Public Utility Easements. Public Sanitary Sewer Easements granted by deed instrument shall be granted on District forms or forms approved by the District. There shall be no cost to the

District for obtaining or processing the easements. Public Sanitary Sewer Easements shall provide for restrictions of permanent construction within the easement, ingress and egress for maintenance, reconstruction, and connection to the conveyance system. Some easements may require temporary construction easements adequate to allow construction activities.

2. Subdivision Plats shall contain all existing and proposed Public Sanitary Sewer Easements and Private Sanitary Sewer Easements. A Public Sanitary Sewer Easement granted to WES via a Plat shall be labeled in accordance with the plat notes.
3. For other than subdivision plats, dedication of Public Sanitary Sewer Easements to the District shall occur by means of recording a Public Sanitary Sewer Easement that encumbers a parcel of property, which references a recorded deed record. All Public Sanitary Sewer Easements must be furnished to the District for review and approval and must be accepted by the District prior to recording. A surveyor shall provide the District with dedication documents, site maps, and descriptions necessary to convey the easements during the plan review process, at which time the width of permanent and temporary easements will be determined. A record of survey meeting all requirements of ORS 209.250, as amended, must accompany the dedication. Acceptance and recording of this dedication deed instrument will be provided free of charge by the District.
4. Placement of permanent structures within the Public Sanitary Sewer Easement shall not be allowed, unless authorized by the District as a separate Encroachment Agreement.
5. When locating sanitary sewer mainlines in Public Sanitary Sewer Easements the mainline shall be centered in the easement, unless otherwise approved by the District, and the conditions of the easement shall be such that the easement shall not be used for any purpose that would interfere with the unrestricted use of the sanitary sewer mainline.
6. Sanitary sewer mainlines placed in easements along a property line where both properties are owned by the Grantor shall have the location of the mainline and easement line determined by the District.
7. Public Sanitary Sewer Easements for mainline sanitary sewers shall have a minimum width of 15 feet. Easements for trunk sanitary sewers shall have a minimum easement width of 20 feet. The District has the right to require additional width at the sole discretion of the District. Easements that combine both mainline sanitary sewers and storm sewers shall have a minimum width of 20 feet.
8. Public Sanitary Sewers with more than 8 feet of cover or combined with public storm sewers will require wider easements, which will be determined by the District. A slope of one horizontal to one vertical from the invert of the Sanitary Sewer Mainline to ground surface will be used to determine easement width. Easement widths shall vary from the 15-foot minimum by 5-foot increments; 20, 25 feet, etc.
9. Public Sanitary Sewer Easement locations for Public Sanitary Sewer Mainlines serving a planned unit development, subdivisions, condominium, apartment complex, or commercial/industrial development shall be located in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance by District personnel. Common easements for other utilities will be reviewed on a case-by-case basis. Separation of utilities must meet ODEQ and Oregon Department of Health requirements. Slope easements are required when necessary to encompass cut or fill slopes.
10. Combined easements shall be a minimum of 20-feet wide with a minimum separation of 5-feet between utilities and be approved by the District on a case-by-case basis.

### 5.3.3 Relation to Water Lines and Other Utilities

No Public Sanitary Sewer shall be located less than 50 feet from any well, spring, or other source of domestic water supply unless approved by the District. All Public Sanitary Sewers or parts thereof that are located within 50 feet of any source of domestic water supply shall be designed of C905 PVC pipe with watertight joints, or of other approved pipe.

The basic separation requirements apply to all gravity and pressure sanitary sewers of 24-inch-diameter or less. Trunk sanitary sewers may create special hazards because of flow volumes and joint types, and accordingly require additional separation requirements. The special design requirements given below are for the normal conditions found with sewage and water systems. More stringent requirements may also be necessary in areas of high ground water, unstable soil conditions, etc.

1. **No Special Conditions (Parallel):** A minimum horizontal separation of 10 feet between sanitary sewers and any existing potable water lines, and a minimum vertical separation of 18 inches between the bottom of the water line and the crown of the sanitary sewer, shall be maintained. The distance shall be measured edge to edge.
2. **Justification Required (Parallel):** When conditions prevent the separations described above, a sanitary sewer may be laid closer than 10 feet horizontally or 18 inches vertically to a water line, provided:
  - a. It is laid in a separate trench from the water line.
  - b. The elevation of the crown of the sanitary sewer mainline must be at least 18 inches below the bottom of the water line. When this vertical separation cannot be obtained, the sanitary sewer shall be designed of materials and joints that are equivalent to water main standards of construction and shall be pressure tested to ensure water tightness prior to backfilling. Adequate restraint should be provided to allow testing to occur.
  - c. If sanitary sewers must be located in the same trench as a potable water line, special construction and mitigation is required. Both water lines and sanitary sewer mainlines shall be designed with a casing pipe of pressure-rated pipe material designed to withstand a minimum static pressure of 150 pounds per square inch (psi). The water line shall be placed on a bench of undisturbed earth with the bottom of the water pipe at least 18 inches above the crown of the sanitary sewer and shall have at least 5 feet of horizontal separation at all times.
3. **Minimum Separation (Perpendicular):** Sanitary sewer mainlines that cross water lines shall be laid below the water lines whenever possible to provide a separation of at least 18 inches between the invert of the water line and the crown of the sanitary sewer. See Special Conditions (Section 5.3.4) if this is not possible.

### 5.3.4 Special Conditions

When conditions prevent a vertical separation as described above, the design shall be as follows:

1. **Gravity Sanitary Sewers Passing Over or Under Water Lines:** Gravity sanitary sewers shall be designed as specified with material as described below:
  - a. Standard bell and spigot C900 or C905 PVC pipe shall be required. The length of sanitary sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sanitary sewer pipe shall be the longest standard length available from the manufacturer.



- b. Pipe Material:
  - 1) Polyvinyl Chloride Pipe – PVC
    - ASTM C900 or C905 D-1784 DR, 4 to 24 inches
- 2. **Water Lines Passing Under Gravity Sanitary Sewers:** Water Lines shall be protected by providing the following:
  - a. There shall be a vertical separation of at least 18 inches between the invert of the sanitary sewer and the crown of the water line.
  - b. There shall be adequate structural support for the sanitary sewers to prevent excessive deflection of joints and settling on and breaking of the water lines.
  - c. The length of sanitary sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sanitary sewer pipe shall be the longest standard length available from the manufacturer. Any design implementing the measures described in Section 5.3.4 shall obtain written approval from both the District and local water authority.

### 5.3.5 Relation to Stream and Drainage Channels

The design requirements in relation to stream and drainage channels are described below.

1. Sanitary sewers crossing streams or drainage channels shall be designed to cross the stream as nearly perpendicular to the stream channel as possible and shall be free from change of slope.
2. The sanitary sewer mainline shall be the same material type installed in the entire run from the downstream to the upstream manhole. No fittings will be allowed to transition from different pipe types, manufactures or repairs.
3. The top of all sanitary sewers entering, crossing or adjacent to streams shall be at sufficient depth below the natural bottom of the stream bed to protect the sanitary sewer mainline. One foot of cover is required where the sanitary sewer is in rock, 3 feet of cover is required in other materials and a minimum of 6 inches cover is required in paved channels.
4. Pipe material shall be bell and spigot C900 or C905 as determined by the District, with the longest pipe length that the manufacturer can provide. The pipe shall extend to a point, where a one-to-one slope, which begins at the top of the bank and slopes down from the bank away from the channel centerline, intersects the top of the pipe.
5. Sanitary sewers located parallel to streams shall be located outside of the stream bed. All manhole covers, at or below the 100-year flood elevation shall be watertight.
6. Check dams are required in trench lines to prevent migration of groundwater.
7. All construction shall be designed to comply with the latest regulations as determined by the Army Corps of Engineers and Department of State Lands for removal and filling in waterways. In addition, all requirements for the Federal Endangered Species Act must be met. The activities authorized by the approval of the request in this application may be subject to other laws and regulations not addressed in this process. River crossings shall be approved on a case-by-case basis.

### 5.3.6 Minimum Cover

1. All Public Sanitary Sewers shall be laid at sufficient depth to drain building sewers, protect against damage from traffic and afford protection from other utilities. Sufficient depth shall mean the cover from the top of the pipe to finish grade along the sanitary sewer alignment.
2. Under normal conditions, Public Sanitary Sewer Mainlines shall be placed with a minimum cover of 8 feet in roadways and 6 feet of cover in Public Sanitary Sewer Easements.
3. In hillside subdivisions, Public Sanitary Sewers shall be placed in the street at a depth sufficient to drain building sewers by gravity on the low side of the street, unless otherwise approved by the District.
4. If approved by the District, where less than 3 feet of cover is proposed, the District shall determine the pipe material which will be:
  - a. Polyvinyl Chloride Pipe – PVC
    - ASTM C900 D-1784 DR, 4 inches to 12 inches
    - ASTM C905 D-1784 DR, 4 inches to 12 inches

## 5.4 Mainline Cleanout

Cleanouts will not be approved as substitutes for manholes, except temporarily at the upper end of a sanitary sewer mainline that will be extended on the same slope and alignment during the next construction phase. The cleanout shall be removed, and the sanitary sewer mainline extended meeting all design criteria in these Sanitary Standards. All mainline cleanouts will be reviewed and approved by the District on a case-by-case basis.

## 5.5 Manholes

The following subsections provide the design requirements for manholes.

### 5.5.1 Location

Manholes shall be placed at the following locations:

- At every change in slope, alignment, or size of pipe.
- At each intersection or junction of a sanitary sewer mainline.
- Where practical, manholes shall be located at street intersections.
- At the upper end of all sanitary sewers, except as provided under Section 5.4.
- At intervals of 500 feet or less. Deviation from this requirement shall be reviewed on a case-by-case basis for approval, considering whether maintenance equipment can adequately service the proposed sanitary sewer mainline.
- At service connections of 8 inches or larger.
- At 6-inch service connections on an 8-inch mainline.
- Where required by the Industrial Pretreatment Program for sampling.

Manholes shall not be placed in the following locations:

- In the wheel path, curb, or gutter.

- Behind the curb line. Placement of manholes behind the curb shall be reviewed on a case-by-case basis for approval. Consideration shall be given to sanitary sewer mainlines which already exist behind the curb.

### 5.5.2 Slope of Manhole Channel

Standard elevation differences or the drop across the manholes have been established to compensate for normal energy losses and to prevent surcharging of a sanitary sewer. The intent of this subsection is to prevent the difference in pipe inverts at the manhole wall on steep sanitary sewers from exceeding 1 foot, which renders it impossible to insert closed-circuit television equipment into the outfall mainline if the average slope exceeds 25%.

The rules for elevation differences at manholes are provided below:

1. The drop across a standard 48-inch manhole shall be two-tenths (0.20-ft) of a foot unless the mainline sanitary sewer has a slope greater than 20%, or otherwise directed by the District.
2. If incoming pipes are smaller in diameter than the outgoing pipe the crowns of all incoming pipes shall ~~be at least as high as~~ match the crown of the outgoing sanitary sewer pipe.
3. For mainline sanitary sewer with slopes greater than 20% the slope in the channel will be determined on a case-by-case basis by the District.
4. In general, the slope shall be determined to the center of the manhole. The average between any inlet Slope (Si) and outlet Slope (So) in percent across the manhole shall not exceed 25%.

$$\frac{Si + So}{2} = \text{less than 25\% (feet per 100 feet)}$$

The above formula will limit the difference between the inlet and outlet inverts measured at the manhole walls from exceeding 1 foot for an average manhole diameter of 4 feet. This formula applies to sanitary sewers with a slope in excess of 20%.

Generally, a vertical offset in slope exceeding 25% foot will not be permitted. Exceptions will be the following:

- When a smaller diameter connects to a larger diameter sanitary sewer.
- When a grade conflict exists with an existing utility, the maximum vertical drop may not exceed 1 foot or as approved.
- When a vertical drop greater than 1 foot is approved, an outside drop must be installed.

### 5.5.3 Drop Manholes

Drop manholes shall only be used in extreme cases of slope difference between existing and proposed sanitary sewer mainlines or when special conditions exist such as a conflict with existing facilities which cannot be relocated. Outside drops into manholes shall be designed per standard detail drawing. Inside drops apparatuses into manholes shall not be allowed.

#### 5.5.4 Rim Elevations of Manholes

In areas used by vehicles (paved or unpaved streets) the manhole rim elevation shall match the finished grades. In other areas the height of the manhole rim shall be 6 inches above finished grade, high-water mark, or above the top of future fill areas.

#### 5.5.5 Design and Size

All manholes shall be a minimum of 48 inches inside diameter. All manholes shall be designed per standard detail drawing.

#### 5.5.6 Connection

Connections to existing manholes shall be designed with the following guidelines:

1. No pipe shall enter an existing manhole where the angle between the incoming flow and the outgoing flow is less than 90 degrees. When the incoming flow and the outgoing flow is less than 90 degrees, two manholes shall be installed. Spacing of such manholes shall be a minimum of 10 feet apart measured outside to outside. An oversized manhole, such as 60-inch, or 72-inch in diameter, may be an option if approved by the District for use.
2. New or existing manhole walls shall be core drilled (not jack hammered) to connect a new sanitary sewer mainline or service connection. Core drilled manholes shall include use of a boot to connect the pipe. Sand collars can only be used if approved on a case-by-case basis by the District.
3. New mainlines should enter an existing manhole at a minimum of 0.20 feet of drop across a standard 48-inch manhole.
4. The flow entering the manhole shall follow a smooth unobstructed concrete channel transition from the inlet pipe into the mainline channel. The base and channel of the manhole will be rebuilt if damaged in this process. All manhole and piping apparatuses shall be water-tight to prevent exfiltration and infiltration of ground water.

#### 5.5.7 Anticipated Future Extensions

When future extensions are being designed/constructed, the existing connecting manhole will be cored at the appropriate location and alignment. Stub outs on end manholes shall only be installed when permitted by the District. An exception to this section may be made by the District on a case-by-case basis if the direction of the new mainline cannot be established at the time of construction.

### 5.6 Service Connections

The following subsections provide the requirements for Service Connections.

#### 5.6.1 General

Properties shall be served by a Service Connection designed with the following specifications:

1. The property owner(s) that benefits from the Service Connection is/are solely financially responsible to maintain, repair and/or replace the pipeline from the Building Sewer to and including the connection to the Public Mainline located within the public right-of-way, or public easement. The District shall not be liable for any damage accruing from the

failure of a Service Connection, Building Sewer, or of fixtures or appurtenances attached thereto.

2. All Service Connections smaller than 8-inches ~~shall be may~~ installed ~~with~~ a cleanout on the private side of the right-of-way ~~or easement~~ line within 5 feet of the right-of-way ~~or easement~~ line (see Standard Detail drawings).
3. Service Connections 8-inches or larger, or a ~~new~~ 6-inch Service Connection connected to an ~~existing~~ 8-inch mainline requires a manhole connection. No Service Connection shall be larger than the mainline it connects with.
4. Service Connections that are 6-inches in diameter are required to be connected into a new or existing manhole unless the mainline pipe is equal to or greater than twice the diameter of the Service Connection pipe ~~is greater than the diameter of the public mainline sanitary sewer~~. If ~~twice the diameter of the a 4" or 6"~~ Service Connection pipe is less than ~~half~~ the diameter of the public sanitary sewer mainline, then the service connection can be made by means of a tap, at the sole discretion of the District.
5. Service Connections for properties zoned for industrial use shall terminate in a manhole, which will also provide access for monitoring and sampling the discharge. The location of the manhole shall be in an area on private property easily accessible by District personnel. Property with industrial zoned areas are required to construct an accessible private sampling manhole as specified by the District.
6. For additional information regarding Service Connection construction see the Standard Detail drawings.

#### 5.6.2 Service Connection Materials

1. The Service Connection pipe, tee, cleanout, and joint materials shall be designed and constructed of the same material as the sanitary sewer mainline as specified in Section 5.2.1. Service Connections ~~to the mainline~~ shall be made by means of a manufactured tees. No ~~Inserta Tees~~, wyes or grouted connections will be allowed ~~in the extension of public sewers, unless otherwise approved by the District~~.
2. All couplings, adapters, etc., used to connect dissimilar pipe materials together shall be approved by the District.
3. Service Connections may be installed into an existing Public Sanitary Sewer Mainline with an installation of an Inserta Tee. Inserta Tees shall only be used for 4-inch Service Connections ~~into existing mainlines~~, and shall only be installed into the mainline pipe by District personnel.
4. Service Connections that are 6 inches connecting into an existing 8 inch mainline are required to be connected into an existing, or new manhole.

#### 5.6.3 Location

Generally, the Service Connection shall be located within a public right of way, ~~or public easement~~ as shown in Standard Detail drawings. Any other proposed location shall be at the discretion of the District on a case-by-case basis.

#### 5.6.4 Direct Service Connection

All building sewers and/or sanitary facilities connected to the District Public Sanitary Sewer System shall be directly connected without any intervening private sewage treatment system

such as a septic tank, cesspool, or any part of an on-site system, except for permitted Industrial Pretreatment facilities.

#### **5.6.5 Separate Service Connection**

A separate and independent Service Connection shall be provided for each tax lot, parcel of property, or lot of record. The District does not allow shared Service Connections.

Service Connections are maintained, repaired and/or replaced by the property owner benefitting from the service at their sole expense, up to and including the connection to the public mainline.

A reduced number of connection points or a single point of connection may be utilized to serve parcels of properties for projects such as condominiums, multi-family, commercial and industrial projects, whereas the parcels cannot be further divided. The landowner shall be responsible for the customer account and monthly service charges for all of the properties. The property owner shall not further divide the property, or sell a portion of the development, thus creating a shared Service Connection. If a portion of the property is either sold to another person, or divided to create a separate property, then the owner shall provide a separate Service Connection connected to the Public Sanitary Sewer System to serve the property.

Any partition of land division that is required to install a Service Connection to serve the additional lot(s), shall construct said service connection prior to the recording of the plat, if the Service Connection traverses any part of an adjoining property, common area, private easement, or shared land. The Service Connection will not be required to be constructed to serve the additional lot(s), if the property has direct access to the Public Sanitary Sewer System, and no other jurisdiction is requiring any improvement to be constructed prior to the recording of the plat. Any existing residence not currently connected to the Public Sanitary Sewer System shall construct a Service Connection and connect the residence building drain to the Public Sanitary Sewer System prior to the recording of the plat. Any existing Service Connections shall be used where feasible, as determined by WES.

#### **5.6.6 Restricted Connections**

No person shall connect any roof, surface, foundation, footing, or exterior area drains to any Service Connection, building sewer, or building drain which is connected to the Public Sanitary Sewer System. Area drains that are connected to the Public Sanitary Sewer System shall be or otherwise disconnected from stormwater entering the Public Sanitary Sewer System.

#### **5.6.7 User Requiring Pumping Facility**

If the building is below the available gravity sanitary sewer mainline, the owner or user shall install private pumping facilities in accordance with the local Plumbing Code. Flows from private pumped facilities shall enter the Public Sanitary Sewer Mainline by means of a gravity Service Connection. District shall review and approve all pumped connections on a case-by-case basis at the District's sole discretion.

Privately owned and maintained pump stations that serve multi ownership properties are prohibited.

A single property owner may utilize a private pumping system permitted by the local plumbing authority, which is owned, maintained, and operated by the property owner for the express purpose of serving only their parcel(s) of property. Each parcel served requires a

separate gravity connection to a Service Connection. The private pumping system shall not be located in a public easement that encumbers another person's property, or the public right-of-way. A pressurized private piping system may be located in a private easement or common areas such as tracts, or private streets, as long as the owner records the necessary dedication of rights and maintenance responsibilities.

#### **5.6.8 Tap-In Connections**

For tap-in connections, the mainline must be at least a minimum of two (2) times the diameter larger than the tap-in connection diameter. Only District personnel are authorized to make the tap and install a 4 to 18-inch diameter Inserta Tee to the District's Public Sanitary Sewer Mainline. The means, material, and method to tap into Public Sanitary Sewer Mainlines greater than 18 inches shall be reviewed and approved by the District, on a case-by-case basis. The installer shall give the District 72 hours advance notice prior to scheduling the tap/inspection. The tap will be scheduled and completed during the District's regularly scheduled business hours. The installer shall excavate to, and completely expose the Public Sanitary Sewer Mainline at the designated point of connection as directed by the District. The District shall tap the Public Sanitary Sewer Mainline and install the 4-inch-diameter Inserta-Tee connection fitting at the owner's expense. If the installer fails to comply with all state and federal safety codes applicable to the work, the District shall not make the tap or perform any inspection and the tap will be rescheduled. For taps other than a standard 4" tap into 3034 PVC, the owner or contractor must coordinate with the District well in advance of the required tap in case specialized connections must be ordered in advance.

The District will charge applicable fees to recoup any costs incurred by the District.

#### **5.6.9 Slope and Alignment**

The minimum slope for Service Connections shall be 2% ( $\frac{1}{4}$  inch per foot). In unusual conditions, a slope of 1% ( $\frac{1}{8}$  inch per foot) may be proposed by the Owner's Engineer and approved by the District. Maximum slope for Service Connections shall be a 100% slope (45 degrees). All changes in alignment or slope of the pipe shall be made with manufactured fittings. No bends greater than 22.5 degrees, and a totaling 45 degrees shall be allowed. Any piping system constructed on private property shall be required to obtain a plumbing permit issued by the local jurisdictional plumbing authority, such as the city or County.

#### **5.6.10 Minimum Depth**

The minimum depth of the service connection shall be 6 feet deep at the edge of the right-of-way or Public Sanitary Sewer Easement. Service connections which cannot be laid at the required minimum depth shall be reviewed and approved by the District on case-by-case basis.

#### **5.6.11 Detectable Markings**

Green detectable metallic tape labeled "CAUTION BURIED SEWER LINE BELOW" shall be installed 6 inches above the service connection pipe along its entire length from the tee connection at the mainline to the top of the green 2 x 4 stake.

Curbs shall be stamped with "SS" in a location of buried sanitary sewers and Service Connections.

### 5.6.12 Service Connections

1. ~~Each Service Connection shall be marked with a green 2x4 stake extended from the end of the pipe to at least 1-foot above the ground. Green magnetic marking tape labeled sewer shall be laid about 6 inches above the pipe from the mainline to the top of the 2x4 green marking stake. A cleanout may be installed instead of a 2x4 stake, which will be a cleanout located on private property near the edge of the right-of-way, public utility easement, or Public Sanitary Sewer Easement (see Appendix D).~~
  - a. ~~A cleanout may be installed that is the same size and material as the Service Connection. The cleanout shall extend from the invert of the pipe to 3 feet above the ground surface with a watertight cap. See Standard Detail Drawings.~~
  - b. ~~The location of the storm Service Connections shall be indicated by a permanent marker, acceptable to the District.~~
    - i. ~~Where the service connection is located in a street with curbs, the connection marker shall be a permanent stamp on the top of the curb: ST – Storm Sewer; SS – Sanitary Sewer.~~
    - ii. ~~Where the sewer is in a street without curbs, the marker shall be on the sidewalk.~~
    - iii. ~~Where the sewer is in a street without curbs or sidewalks, the Engineer shall present to the District for approval an alternative permanent marking method.~~
    - iv. ~~A storm sewer cleanout located on the private side of the right-of-way boundary is an acceptable permanent marker.~~
2. ~~If a cleanout is installed, the following shall apply:~~
  - a. The cleanout will be located on private property near the edge of the right-of-way, public utility easement, or Public Sanitary Sewer Easement (see **Appendix B**).
  - b. Cleanouts shall be of the same size diameter and pipe material type as the service connection.
  - c. The vertical cleanout riser pipe located outside of paved areas shall be extended 2-3 feet above the ground and capped with either a solvent welded end cap, or water-tight gasket cap. Upon extension of the Building Sewer, the cleanout riser pipe shall be adjusted to finish grade and a threaded end cap shall be installed.
  - d. The vertical cleanout riser pipe located within a paved area shall be constructed with an approved concrete apron, or an equivalent base that can support a flush mounted cap and is approved to be installed within a public right of way.
  - e. The Service Connection shall be extended horizontally 2 feet beyond the cleanout fitting or to the back edge of a PUE.
  - f. All solvent welded or gasket end caps on service connections shall be of sufficient strength and design to hold firmly during the low-pressure air test.
  - g. The cleanout cannot be a 2-way cleanout, therefore access for the building drain should be available upstream and downstream of the pipe in accordance with Uniform Plumbing Codes. See Standard Detail Drawings ~~SAN-020 through SAN-023~~ in **Appendix B**.



**5.6.13 Inspection**

Service Connections installed with a mainline extension shall be inspected for workmanship and materials and tested by the project Engineer. Tap in Service Connections not installed with a mainline extension shall be inspected by District personnel, and, if applicable, the project Engineer. Service connections shall be watertight at all points.





## SECTION 6. CONSTRUCTION REQUIREMENTS

This section provides District construction requirements for Public Sanitary Sewer Systems including but not limited to standards relating to sanitary sewer installation, materials, backfill compaction and classification, and testing.

### 6.1 Material and Installation References

Construction materials and installation shall meet the following specifications unless modified in Sections 6.2 through 6.8 below.

ASTM A48	Manhole Frames and Covers - Gray Iron Castings
ASTM A304	Steel Bars, Alloy, Requirements
ASTM A536-84	Manhole Frames and Covers – Gray Iron Castings
ASTM A615	Billet-Steel Bars for Concrete Reinforcement
ASTM C443	Connections between Precast Manhole Sections
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C923	Connections between Manholes and Pipe
ASTM C1107	Non-Shrink Grout
ASTM D3034	PVC Pipe and Fittings
ASTM D3035	High Density Polyethylene Pipe (HDPE) and connections
ASTM D3212	Elastomeric gasket
ASTM D4832	Testing of Controlled Low Strength Material (CDF)

#### 6.1.1 Trench Width

Minimum width of trenches in which sanitary sewer mainline is to be laid shall be 12 inches greater than the outside diameter of the pipe. Minimum width of trenches where CDF is used as the entire backfill shall be as shown on the Plans or as directed by the Engineer. In all cases, trenches must be of sufficient width to allow for shoring and permit proper joining of pipe and compaction of the backfill material along sides of the pipe.

#### 6.1.2 Trench Grade

The bottom of the trench shall be carried to the lines and grades shown on the Plans or as established by the Engineer, with proper allowance for pipe thickness and for gravel bedding. Any part of the trench excavated below grade shall be corrected with material of the type specified in Section 6.3.7 Trench Foundation, for the full width of the trench.

### 6.1.3 Shoring and Sheeting

All sheeting, shoring, and bracing shall be designed and installed in accordance with OR-OSHA Trenching and Excavation Safety Sanitary Standards: 29 CFR 1926.651 and 1926.652. Take special care to prevent movement of the pipe after installation when laid within a moveable trench shield.

### 6.1.4 Trench Dewatering

1. The Contractor during construction of the sanitary sewer system shall at all times provide and maintain ample means and devices with which to promptly remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe, and until backfill has been completed. Dispose of water in accordance with state and local regulations.
2. The control of groundwater shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation shall be prevented. Dewatering systems shall be designed and operated to prevent removal of the natural soils.
3. At no time shall stormwater or ground water be permitted to be discharged into the District's Public Sanitary Sewer System. The discharge of stormwater or ground water in the District's Public Sanitary Sewer System is a violation of District Rules and Regulations.

### 6.1.5 Trench Foundation

When, in the opinion of the Engineer, the material in the bottom of the trench is unsuitable for supporting the pipe, excavate as directed by the Engineer, and backfill with approved materials to the required grade. Any part of the trench excavated below grade shall be corrected with approved material for the full width of the trench and thoroughly compacted in layers not to exceed 6 inches, to the established grade.

## 6.2 Sanitary Sewer Installation

### 6.2.1 Sub-Grade

The bottom of the trench shall be carried to the line and grade shown on the Plans or as established by the Engineer, with proper allowance for pipe thickness and for gravel pipe bedding.

### 6.2.2 Pipe Base/Bedding

Bedding material as specified in Section 6.3.2 shall be placed in the trench to a minimum depth of 6 inches below the bottom of the pipe. The pipe bedding shall be placed and leveled to approximate grade in advance of the pipe laying and shall provide a firm, unyielding support along the entire pipe length. Immediately following the placement of each pipe section, the crushed gravel pipe bedding shall be placed to the springline of the pipe. Special effort to properly bed the pipe by slicing backfill in the pipe haunches up to the springline shall be provided. The pipe bedding shall be a minimum of 6 inches for service connections.

### 6.2.3 Bell Holes

At the location of each joint, bell holes of ample dimensions shall be dug in the bottom of the pipe bedding to permit the joint to be properly fitted, to permit easy inspection of the entire joint; and to provide uniform bearing for the barrel of the pipe for its entire length.

### 6.2.4 Preparation of Sanitary Sewer Pipe

All pipes and fittings shall be carefully inspected before being laid and no cracked, broken, or defective pipe or fittings shall be used in the work. Surface irregularities, in the form of air pockets or voids, will be cause for rejection as enumerated in ASTM D3034. The ends of the pipe shall be cleaned with a brush, washed, and thoroughly scrubbed where necessary to remove dirt or other foreign material.

### 6.2.5 Line and Grade

1. Sanitary sewer pipe shall be laid in full lengths as manufactured and shall be laid on a constant grade and in a straight alignment from manhole to manhole, or cleanout.
2. Survey control hubs for both line and grade shall be provided by the Engineer in a manner consistent with accepted practices. The Contractor shall establish line and grade for pipe by the use of lasers or by transferring the cut from the offset stakes to the trench at whatever intervals necessary to maintain the line and grade. The Contractor shall check line and grade, as necessary. In the event that the limits prescribed in this Section are not met, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding further with the work.
3. Deviation from the established line and grade shall not exceed  $\frac{1}{2}$  inch for line and  $\frac{1}{4}$  inch for grade, provided that such variation does not result in a level or reverse-sloping invert.
4. The vertical variation of the grade line shall not create standing water in a pipe that exceeds  $\frac{1}{2}$  inch in height.

### 6.2.6 Manhole Connections

Unless otherwise provided, connections to existing District manholes shall be made using a core drilling method. Use of a jackhammer or other pneumatic devices shall be prohibited. Connect PVC pipe to concrete manholes by means of an approved coupling with an elastomeric gasket or flexible sleeve conforming to ASTM C923, (Kor-N-Seal or equal). The use of Portland Cement grout for connecting PVC pipe to manholes shall be prohibited. The use of a sand collar will only be reviewed and approved by the District on a case-by-case basis.

### 6.2.7 Pipe Installation

1. The installation of sanitary sewer pipe shall commence at the lowest point in the sanitary sewer system and shall proceed so that the spigot end of the section being laid is placed into the bell end of the pipe already laid. The pipe shall be bell and spigot, same size diameter of pipe from manhole to manhole, same pipe manufacture, same pipe material without any couplings or repairs. Foreign materials shall be prevented from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.
2. Sanitary sewer pipe shall be installed in accordance with the manufacturers' installation procedures and these Sanitary Standards.

3. At no time shall stormwater or ground water be permitted to be discharged into the District's Public Sanitary Sewer System. The discharge of stormwater or ground water in the District's Public Sanitary Sewer System is a violation of District Rules and Regulations.

### 6.2.8 Waterline Crossings

1. Sanitary sewer mainline pipe material specifications shall be in accordance with Section 3 and 5.3.4 for a minimum distance of approximately 10 feet on either side of a water main crossing, when there will be less than 18 inches of clearance between the outside diameters of the water main and sanitary sewer. One standard length of pressure pipe shall be centered under the waterline.
2. It is required to maintain a consistent material type and specification in the type of sanitary sewer pipe within any manhole-to-manhole run.

### 6.2.9 Anchor Blocks

Anchor blocks shall be constructed of concrete 1 foot thick parallel to the pipe, extending 1 foot below the bottom of the pipe to 3 feet above the top of the pipe, and extending 1 foot beyond each side of the trench wall.

### 6.2.10 Impervious Zones

The impervious zone shall be constructed of CDF 2 feet thick parallel to the pipe, extending 1 foot below the bottom of the pipe zone to within 3 feet of the ground surface, and extending 1 foot beyond each side of the trench wall. The Contractor shall minimize the length of trench impacted by installing CDF using temporary forms or other means to no greater than 3 feet along the axis of the pipe. The trench in the top 3 feet shall meet all requirements of the backfill classification shown on the drawings or otherwise specified.

### 6.2.11 Service Connection Installation

1. The Contractor shall place a 90-degree factory tee at the locations indicated on the Plans or specified by the Engineer. The tee shall be installed at a maximum angle of approximately 45 degrees with the horizontal or as directed by the Engineer. After the tee is in position, special pipe bedding material and select backfill shall be hand-placed around the tee to prevent any movement of the tee when the next pipe is laid.
2. Unless otherwise specified on the Plans or directed by the Engineer, each service connection shall be laid in a separate trench on a straight line and gradient from the tee to the end of the service connection. The service connection shall be at least 6 feet deep at the property line crossing. No service connection shall be laid on a grade of less than 2%, unless approved by the District and directed by the Engineer or shown on the Plans.
3. Unless otherwise directed by the Engineer, the Contractor will use a grading line to lay the pipe and the pipe shall be installed with the same accuracy as the mainline sanitary sewer.
4. Service connections and cleanouts shall be installed as shown on the approved plans.
5. Upon extension of the Building Sewer, a cleanout shall be permitted by the local building code division and installed near the building foundation in accordance with Oregon Plumbing Specialty Code (OPSC); the cleanout riser pipe shall be adjusted to finish

~~grade and a mechanical (churn) plug/threaded end cap shall be installed. For additional information see Standard Detail drawings in Appendix D.~~

## 6.2.12 Manhole Installation

All manholes shall be made of concrete as specified on the Plans. All manholes shall be a minimum of 48 inches inside diameter. Larger diameter manholes shall be specified per the approved Plans.

### 6.2.12.1 Base

- 1) The base shall be constructed per the standard detail drawing and in locations as noted on the Plans. Knockouts for pipe extensions will be based upon the alignment as shown or directed. Minor adjustments to alignment as directed by the Engineer may be necessary to better position manholes.
- 2) The Contractor may, at their option, use precast or poured-in-place manhole bases, provided all details of construction are approved by the Engineer.
- 3) Precast manhole bases shall be installed on a level compacted layer of gravel bedding a minimum of 6 inches thick on a suitable foundation. Poured in place bases do not require additional bedding. The concrete base for the manhole shall be constructed so the first section of the manhole has a uniform bearing throughout the full circumference of the manhole wall. Sufficient non-shrink grout shall be deposited on the concrete base to provide a watertight seal between the base and the manhole wall.
- 4) The manhole shelf shall be integrally poured against the wall and over the pipe stub. Construct the shelf in such a manner that when capacity of the pipe is reached, no portion of the shelf surface is used as part of the cross-sectional flow channel required for free flow through the manhole. Manholes shall have full depth channels placed across the base. The shelf shall have a slope of 1 inch per foot. All areas of the shelf shall freely drain into the channel.
- 5) The inverts of the manholes shall be constructed in conformance with the details shown on the plans. The manhole channels shall provide a smooth flow-through characteristic. No sharp edges or rough sections which will obstruct the flow of sewerage will be permitted. All cement used in the construction of the channels shall be troweled smooth. All manhole channels must be able to pass a 7-inch x 30-inch cylinder into the mainline pipe.
- 6) Manholes added over an existing mainline shall have a base which achieves watertight connections to the existing pipe type. Manholes and adjoining pipe shall be watertight. Any noticeable infiltration shall be repaired, in a means and method approved by the District

**6.2.12.2 Manhole Barrel Sections**

- 1) Precast concrete sections for manholes shall be in 1- to 4-foot sections placed in such combinations as to achieve the finish grade shown on the Plans. The joints for the manhole sections shall be made watertight with the use of non-shrink grout or flexible material. The wall sections and flexible material used to join them shall be compatible. The walls shall be constructed true to line and grade as established by the Engineer. Ample non-shrink grout shall be placed into the groove of the lower section prior to placing the next barrel section. The entire joint shall be completely filled with non-shrink grout and troweled to a smooth surface. Preformed gaskets may be used in lieu of non-shrink grout type joints and shall be RAM-NEK, manufactured by K.T. Snyder Company, Inc., Houston, Texas; Kent-Seal by Hamilton Kent, Kent, Ohio; or as approved. Manhole sections with a captive groove rubber gasket need not be grouted between sections.
- 2) Cones shall be eccentric with the wall thickness and reinforcement like that of manhole pipe sections. The tops and bottoms of the cones shall be parallel.
- 3) Flat-top manhole sections for all size manholes shall be used in lieu of eccentric cones where the depth from shelf to the top of the last barrel section is 4 feet or less. A concentric top is required when the height from the shelf to the top of the last barrel section is 3 feet or less.

**6.2.12.3 Manhole Extensions/Grade Rings**

- 1) Install precast concrete grade rings on top of manhole cones to positively prevent all infiltration of surface or groundwater into manholes.
- 2) Grade rings shall be laid straight and true and set in a bed of non-shrink grout with the grout carried over the frame. Grade rings shall be set so the tops of the frame are flush with the finish grade or grade of adjoining pavement, or 6 inches above the finish grade in areas outside the right-of-way.
- 3) Extension rings shall be limited to achieve a maximum distance of 28 inches from the top of the first step to the top of the frame.
- 4) Precast rings shall be constructed to have an opening of 25 inches.

**6.2.12.4 Manhole Frames and Covers**

Frames. Standard frames shall have a total height of 10 inches as shown in Clackamas County Department of Transportation and Development Drawing U600. Frames shall be of the type detailed on the approved Plans or equal.

- Suburban frames shall have a total height of 6 inches and are designed for areas of light traffic loading and may be used as approved in non-traffic areas, easement areas and subdivision streets. Suburban frames are prohibited in collector streets, arterial streets, or streets in industrial areas.
- Tamperproof/Locking and Watertight (Secured) frames shall be installed in locations as noted on the approved Plans. Secured frames shall be installed per the manufacture's specifications. On secured frames with internal lugs, one lug shall be centered above the manhole steps.

Covers. Standard Sanitary Sewer Manhole covers shall have a maximum of two, 7/8-inch pick holes.



- Tamperproof/Locking covers shall match frame type and shall be installed per the manufacture's specifications.
- Watertight covers shall have no open pick holes and shall be installed per the manufacture's specifications.

#### **6.2.12.5 Manhole Steps**

Steps shall be placed where there are no incoming or outgoing lines. Steps shall be placed a maximum of 12 inches from the shelf and 28 inches from the top of the frame. Steps shall be 12 inches on center. Steps shall extend from the manhole wall 6 inches. Steps in a manhole shall be of the same type. Steps shall be installed straight and true. Loose steps shall be cause for rejection of that manhole cone or section. Manholes less than 4 feet in depth do not require steps.

#### **6.2.12.6 Manholes Future Development**

The channeling, boot, and water-tight plug for all end manholes, from which future Public Sanitary Sewer Extensions will be extended, shall be designed as determined by the District.

#### **6.2.12.7 Drop Manholes**

Drop manholes shall be outside drops and constructed at the location shown and as detailed on the Plans. The first run of pipe from the drop assembly shall be a full length of PVC, C900 or C905 (match pipe type to drop assembly type). CDF fill must be encased around the drop assemblies up the springline of the top inlet pipe.

#### **6.2.13 Mainline Cleanout Pad and Cover**

The cleanout shall be installed as shown on the Plans or as directed by the Engineer. The cleanout shall be constructed of the same size and material as the mainline. Special attention should be paid to the details for the concrete pad, frame, and cover required. When using PVC pipe for the cleanout, the concrete support block is not required. The cleanout riser shall be protected by the pad and cover but shall not touch or be a structural part of the pad. A watertight end plug shall be installed on the riser. No load from the frame, pad or cover shall be placed on the pipe or plug. Provide compacted 3/4-inch minus crushed gravel up and around the cleanout assembly to finish grade.

#### **6.2.14 Sanitary Sewer Standard Detail Drawings**

For further details regarding sanitary sewer design, the Standard Detail Drawings are provided in **Appendix B** and can also be found on the District website.

### **6.3 Materials**

#### **6.3.1 Trench Backfill Stabilization**

Trench backfill stabilization material shall be 2½ inch minus clean pit-run gravel, crushed rock, or gravel, having reasonably even gradation from coarse to fine or open graded. Maximum percent passing the ¼ inch screen shall be 20% by weight. Gravel shall be placed in thoroughly compacted layers not to exceed 6 inches to the established grade.

### 6.3.2 Pipe Base and Pipe Zone

Material for pipe base and pipe zone shall be 3/4 inch minus crushed gravel, having reasonably even gradation from coarse to fine, in accordance with the Oregon State Highway Commission Standard Specifications for Highway Construction specification for Aggregate and Aggregate Base, Section 02630.10.

### 6.3.3 Trench Backfill

1. Backfill material specifications above the pipe zone within the right-of-way shall be 3/4 inch minus crushed gravel, having reasonably even gradation from coarse to fine, in accordance with the Oregon State Highway Commission Standard Specifications for Highway Construction specification for Aggregate and Aggregate Base, Section 02630.10.
2. Backfill material specifications above the pipe zone outside the right-of-way shall be of the class (Section 6.4) specified on the approved plans.
3. Service Connection backfill will be the same as that used for the public sanitary sewer mainline to which they are connected.

### 6.3.4 Controlled Density Fill (CDF)

Controlled Density Fill (CDF) shall not be a replacement for stone pipe base/bedded within the pipe zone. The use of CDF may be required for backfill material associated with the installation of public sanitary sewer system. CDF shall be a mixture of Portland cement, pozzolans, fine aggregate, water and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing and excavatable material. CDF shall be a hardened, dense, non-settling fill with an unconfined compressive strength at 28 days of 100 to 200 psi.

### 6.3.5 District Manhole Connection

Connections to District manholes shall be made with an elastomeric gasket or flexible sleeve conforming to ASTM C923, (Kor-N-Seal or equal).

### 6.3.6 Pipe

Pipe shall be Polyvinylchloride (PVC) gravity sewer pipe conforming to ASTM D-3034, SDR 35. Pipes shall be the following materials:

1. Polyvinyl Chloride Pipe – PVC:
  - a. ASTM D3034 SDR 35, 4 to 24 inches, or
  - b. ASTM C-900 D-1784 DR, 4 to 24 inches (preferred by District), or
  - c. ASTM C-905 D-1784 DR, 4 to 24 inches (preferred by District).
2. HDPE: ASTM D-3035
  - a. Minimum stiffness shall be 46 psi. Joint type shall be elastomeric gasket conforming to ASTM D3212.

### 6.3.7 Precast Manhole Base Bedding

Material under the precast manhole base shall be 6 inches of 3/4-inch minus crushed gravel, having reasonably even gradation from coarse to fine, in accordance with the Oregon State Highway Commission Standard Specifications for Highway Construction specification for Aggregate and Aggregate Base, Section 02630.10.

### 6.3.8 Detectable Caution Tape

Tape shall be green and permanently labeled "CAUTION BURIED SEWER LINE BELOW". Tape shall be a minimum of 3 inches in width. Tape shall meet APWA Standards for underground burial tape. Tape shall be metallic such that it can be located with a metal detector. Tape shall be acid and alkali resistant polyethylene constructed with a minimum 4.5 mil solid aluminum foil core with an imprinted warning legend that is completely encased to prevent ink rub-off.

### 6.3.9 Concrete

Concrete shall be so proportioned and mixed as to meet a minimum 3,000 psi compression test after 28 days. There shall be a minimum of five sacks of cement per cubic yard of concrete.

### 6.3.10 Manhole Bases

Precast bases shall conform to ASTM C-478 specifications. Poured in place manhole bases shall be constructed using concrete. Kor-N-Seal or equal shall be used for pipe connections with precast bases. All metal parts used shall conform to ASTM A-304 stainless steel, and all neoprene shall conform to ASTM C443 specifications.

### 6.3.11 Manhole Barrel Sections

Manhole barrel section shall be made of reinforced concrete pipe, Class 2, conforming to ASTM C-478 specifications, with the added requirement that the reinforcement shall be circular and not elliptical. Material for connecting precast manhole section shall be either rigid or flexible. Rigid connection shall be made using non-shrink grout mixture. Flexible materials must conform to ASTM C443 specifications. Construction of the precast joint shall be matched to the material used for connection.

### 6.3.12 Non-Shrink Grout

Non-shrink grout shall be Sika 212, Euco N-S, Five Star, or District-approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Non-shrink grout shall be placed or packed only with the use of an approved commercial concrete bonding agent. Unused grout shall be discarded after 20 minutes and shall not be used.

### 6.3.13 Manhole Extension Rings

Extension rings shall be made of precast concrete 2 inches to 4 inches in thickness and of standard construction.

### 6.3.14 Manhole Frames

Castings shall be tough, close-grained, gray iron, free from blowholes, shrinkage, and cold shuts. They shall conform to ASTM A48 - Class 30 and shall be sound, smooth, clean, and

free from blisters and all defects. All castings shall be planed and ground where necessary to ensure perfectly flat and true surfaces. Secured frames shall meet specifications as found in the Sanitary Sewer Standard Detail Drawings.

### 6.3.15 Manhole Covers

Castings shall be tough, close-grained, gray iron, free from blowholes, shrinkage, and cold shuts. They shall conform to ASTM A48 - Class 30 and shall be sound, smooth, clean, and free from blisters and all defects. All castings shall be planed and ground where necessary to ensure perfectly flat and true surfaces. Covers shall be true and shall seat within the ring at all points. Secured covers shall meet specifications as found in the Sanitary Sewer Standard Detail Drawings.

### 6.3.16 Manhole Steps

Steps shall be Polyethylene with iron reinforcement, 8 inches x 12 inches wide with a 2-inch drop. Manhole steps shall meet specifications in the Standard Detail Drawings provided in **Appendix B**.

## 6.4 Backfill Compaction

The design standards for backfill compaction are provided below.

### 6.4.1 General Compaction

1. Backfill material shall not be placed in the trench in such a way as to permit free-fall of the material until a minimum of 2 feet of cover is provided over the top of the pipe.
2. Backfill shall be maintained at proper moisture content so that the material is within 5% plus or minus of optimum moisture.
3. Granular backfill shall be placed and compacted in a maximum of 12-inch lifts, and native material backfill shall be placed and compacted in a maximum of 24-inch lifts.
4. Maximum density and optimum moisture will be determined using Method A of AASHTO T-99. Granular backfill material must meet 95% compaction, AASHTO T-99 within public streets and paved areas, and native backfill must meet 85% compaction of AASHTO T-99 in non-paved or unimproved areas.~~All listed compaction levels are based on the T-99 compaction requirements unless otherwise stated.~~
- 3-5. Compaction testing is required at the minimum frequency of one (1) test every 100-feet of trench, unless otherwise specified by a Geotechnical Engineer.
- 4-6. Native backfill used in Class A shall be compacted to at least 90% of maximum density above the pipe zone and to within 3 feet of the ground surface. The top 3 feet shall be compacted to at least 92% of maximum density.
- 5-7. Imported trench backfill used for Class B, Class C, and the lower portions of Class D trenches where designated shall be mechanically compacted. The full trench depth to within 1 foot of the ground surface shall be compacted to a least 95% of maximum density. The top 1 foot shall be compacted to no less than 100% of maximum density prior to placement of asphalt concrete.
- 6-8. Unless otherwise noted, the Contractor shall be responsible to provide the proper size, type, and specification of backfill.

#### 6.4.2 Pipe Zone

The pipe zone for both mainline and Service Connection shall be defined as extending from the bottom of the pipe bedding to a point 12 inches above the outside of the pipe for the full width of the trench, for all classes of backfill. The pipe zone shall be backfilled with compacted 3/4 inch minus crushed gravel and shall provide a firm, unyielding support along the entire pipe length. Immediately following the placement of each pipe section, the crushed gravel pipe bedding shall be placed and compacted to the springline of the pipe. Special effort to properly bed the pipe by slicing backfill in the pipe haunches up to the springline shall be provided. Backfill shall then be placed and compacted in lifts of not greater than 6 inches to the top of the pipe zone.

#### 6.4.3 Easements

After the Contractor has backfilled the pipe zone of the trench as required, the Contractor shall then backfill the balance of the trench, with the type of backfill specified on the approved plans. The Trench Backfill shall be mechanically compacted in 1-foot layers, to 95% of maximum density in roadways and 85% to 90% in all other areas.

### 6.5 Backfill Classifications (District)

The backfill classifications used by the District for construction projects in the Public Sanitary Sewer System are listed below.

#### 6.5.1 Class "A" Backfill

The entire trench above the pipe zone shall be backfilled with native excavated material and compacted to 90% of maximum density as per AASHTO T-99 and ODOT/APWA specification 00405. Placement of native backfill material for Class A backfill shall include the working of material to achieve suitable moisture content and compaction to the specified density. In lieu of using native material excavated from the trench for Class A and C backfill, the contractor may at his/her option place and compact to specified density an approved imported backfill material. Imported material must be approved by the engineer prior to placement. Material shall be earth, gravel, rock, or combinations thereof, free of humus, organic matter, vegetative matter, frozen material, clods, sticks, and debris and containing no stones having a dimension greater than 4 inches. Sand or pea gravel will not be an approved backfill material. See Standard Detail drawing.

#### 6.5.2 Class "B" Backfill

The trench above the pipe zone shall be backfilled with gravel for Trench Backfill and compacted to 95% of maximum density as per AASHTO T-99 and ODOT/APWA specification 00405, except for the top 10 inches. The top 10 inches of the trench shall be backfilled and compacted in successive layers of 4 inches of 1-1/2-inch minus "Crushed Gravel", and 2 inches of 3/4 inch minus "Crushed Gravel". See Standard Detail drawing.

#### 6.5.3 Class "C" Backfill

The trench above the pipe zone shall be backfilled with gravel for Trench Backfill and compacted according to the specifications of the District, except for the top 11 inches. The top 11 inches of the trench shall be backfilled and compacted in successive layers with 8 inches of 1-1/2-inch minus "Crushed Gravel", and layers of Asphaltic Concrete according to the Standard Detail drawing.

#### 6.5.4 Class "D" Backfill

CDF shall not be a replacement for stone pipe base/bedding within the pipe zone. When CDF is called out on the plans as a requirement by the Engineer the entire trench shall be backfilled with CDF, except for the Trench Foundation, Pipe Base/Bedding and Pipe Zone which shall be backfilled with crushed gravel to District specifications. In paved areas the top 3 inches of the trench shall be backfilled and compacted in successive layers with two, 1-1/2-inch layers of Asphaltic Concrete. The use of CDF is required for backfill material associated with the installation of manholes constructed of any material except concrete. Contact the Roadway Authority for specifications of CDF backfill within a private street or public right-of-way. See Standard Detail.

### 6.6 Testing of Sanitary Sewer Mainline and Appurtenances

District standards for testing sanitary sewer mainlines and appurtenances are provided below (see also Section 4.5.1 regarding required video testing).

#### General

1. Test all gravity Sanitary Sewer Mainlines and Service Connections by "low pressure air testing", all mainlines by deflection testing "mandrel", and video inspection.
2. Test all manholes using the negative pressure (vacuum) method.
3. Air Tests for Gravity Sanitary Sewers: Ensure all gravity sanitary sewers and appurtenances successfully pass the air test prior to acceptance and are free of visible leakage or infiltration.
4. Conduct a video inspection of all mainline pipe in accordance with the applicable section below.
5. The Contractor may desire to make an air test prior to backfilling for his/her own purposes; however, the acceptance air test shall be made after backfilling and compaction has been completed to final grade.
6. The testing equipment and personnel shall be subject to the approval of the Engineer.
7. Acceptance testing shall be conducted on all of the manholes with the exception of existing manholes used to extend new sanitary sewer mainline.
8. The Engineer or Engineer's Inspector shall observe all testing and record and submit the results on the District testing forms.

#### 6.6.1 Low-Pressure Air Test

The Engineer or Engineer's Inspector shall observe all testing and record and submit the Low-Pressure Air Test results on the District testing forms. A summary of Low-Pressure Air Testing is as follows:

1. **Summary of Method:** Plug the section of the sewer line to be tested. Introduce low-pressure air into the plugged line. Use the quantity and rate of air loss to determine the acceptability of the section being tested. The Contractor may desire to make an air test prior to backfilling for his/her own purposes. However, the acceptance air test shall be made after backfilling and compaction has been completed to finish grade.
2. **Preparation of the sewer line:** Flush and clean the sewer line prior to testing, to clean out any debris. A wetted interior pipe surface will produce more consistent results. Plug

all pipe outlets using approved pneumatic plugs with a sealing length equal to or greater than the diameter of the line being tested to resist the test pressure. Give special attention to service connections.

3. **Infiltration:** The District does not allow new construction of sanitary sewer piping systems to have any visible sign of ground or surface water infiltration. If infiltration into the sanitary sewer piping system is visible it will need to be corrected prior to proceeding with any sanitary sewer testing.
4. **Ground Water Determination:** Install a 1/2-inch capped galvanized pipe nipple, approximately 12 inches long, through the manhole on top of the lowest sewer line in the manhole. Immediately prior to the line acceptance test, the ground water elevation shall be determined by removing the pipe cap and blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic hose to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in the plastic hose.
5. **Procedures:** Determine the test duration for the section under test by computation from the applicable formulas shown in ASTM F1417 & UNI-B-6. The pressure gauge used shall have minimum divisions of 0.10 psi and have an accuracy of 0.0625 psi. Pressure-holding time is based on an average holding pressure of 3 pounds per square inch gage (psig) or a drop from 3.5 psi to 2.5 psig above the groundwater pressure.
  - a. Add air until the internal air pressure of the sewer line is raised to approximately 4.0 psig. After an internal pressure of approximately 4.0 psig is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.
  - b. When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 psig. Record the drop-in pressure for the test period. If the pressure has dropped more than 1.0 psig during the test period, the line shall be presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psig drop has not occurred.
  - c. The test procedure may be used as a presumptive test that enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.
  - d. If the pipe to be tested is submerged in ground water, the test pressure shall be increased by 1.0 psi for every 2.31 feet the ground water level is above the invert of the sewer.
6. **Safety:** The air test may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. If as much as a force of 250 lb. is exerted on an 8-inch plug by an internal pipe pressure of 5 psi, it should be realized that sudden expulsion of a poorly installed plug or a plug that is partially deflated before the pipe pressure is released can be dangerous. As a safety precaution, pressurized equipment shall include a regulator or relief valve set at perhaps 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

**6.6.1.1 Calculating Time (T) — Low-Pressure Air Test**

- 1) Minimum Testing Times: See the Table 4 below for the “LOW AIR TEST MINIMUM TESTING TIME”.
- 2) The pipeline shall be considered acceptable when tested as described herein before if the section under test does not lose air at a rate greater than 0.0015 cubic feet per minute (cfm) per square foot of internal sewer surface. The following formula shall be used for calculating (T) for lengths of pipe and diameter of pipes not shown in the table referenced below.

$$T = (d^2)(L/42)$$

where

T = test duration, seconds

d = pipe diameter, inches

L = section length, feet

42 = conversion factor

Test PSI = (4.0) + (G/2.31)

G = Ground Water height in ft

**Commented [A2]:** Check this formula, variables listed below aren't referenced.

**Table 4: LOW AIR TEST MINIMUM TESTING TIME**

(d) Pipe Dia., in.	(T) Minimum, sec.	(L) Minimum, ft	(T) for Addition Length (T/L) seconds/foot
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676

**6.6.1.2 Low-Pressure Air Failed Test**

- 1) If the pipe installation fails to meet these requirements, the Contractor shall determine, at his/her own expense, the source or sources of leakage, and shall repair or replace all defective materials and correct all faulty workmanship. The type of repairs proposed by the Contractor must be approved by the Engineer before the repair work is begun.
- 2) The portion of sanitary sewer mainline that failed to pass the test(s) shall be repaired and retested for Low Pressure Air and Mandrel/Deflection. The completed pipe installation shall meet the requirements of the air tests before being considered acceptable.



3) Subsequent Failure:

- a) Infiltration of groundwater, in any amount, following a successful vacuum or low-pressure air test as specified, shall be considered as evidence that the original test was in error or that subsequent failure of the sanitary sewer system has occurred. The Contractor will be required to correct the infiltration of groundwater. The portion of sanitary sewer mainline that was repaired and/or failed to pass the test(s) shall be repaired and retested for Low Pressure Air and Mandrel/Deflection Tests.

### 6.6.2 Manhole Vacuum Test

1. Manhole Vacuum Test (Adapted from ASTM C1244-93). The Engineer or designated inspector shall observe all testing and record and submit the results on the District testing forms.
2. Summary of Practice: Plug all lift holes and pipes entering the manhole. A vacuum will be drawn, and the vacuum drop over a specified period of time is used to determine the acceptability of the manhole.
3. Significance and Use: This is not a routine test. The values recorded are applicable only to the manhole being tested and at the time of testing.
4. Preparation of the Manhole:
  - a. Plug all lift holes with an approved non-shrink grout.
  - b. Plug all pipes entering the manhole, taking care to securely brace the pipes and plugs from being drawn into the manhole. The manhole shall be set to finish grade and all paving (if applicable) completed.
5. Procedure
  - a. Place the test head at the inside of the top of the frame and the seal inflated in accordance with the manufacturer's recommendations.
  - b. Draw a vacuum of 10 inches of mercury, with the valve on the vacuum line of the test head closed, and the vacuum pump shut off. With the valves closed measure the time for the vacuum to drop to 9 inches.
  - c. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches meets or exceeds the values indicated below.

- d. Using the formulas that follow, the comparable times for a successful vacuum test for different size manholes are:

DEPTH (ft)	TIME (sec)		
	Manhole Diameter		
Depth of MH	4-ft	5-ft	6-ft
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

Table 5: Times for a Successful Vacuum Test for Different Size Manholes

### 6.6.3 Mandrel Test

The Engineer or Engineer's Inspector shall observe all testing and record and submit the results on the District testing forms. In addition to low pressure air testing, sanitary sewers constructed of PVC sewer pipe shall be tested for deflection not less than 30 days after the trench backfill and compaction has been completed.

#### 6.6.3.1 Mandrel Size

The rigid mandrel shall have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. All dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

#### 6.6.3.2 Mandrel Design

The rigid mandrel shall be constructed of a metal or rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" if the total number of legs is an odd number. The barrel section of the mandrel shall have an effective length of not less than the nominal diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.

**6.6.3.3 Mandrel Type**

Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test. Mandrels with removable legs or runners may be accepted on a case-by-case basis. Mechanical devices will not be used to pull the mandrel. The mandrel shall be rigid and nonadjustable with an effective length of not less than its nominal diameter.

**6.6.3.4 Manhole to Manhole**

Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely cleaned and flushed. The tests shall be performed without mechanical pulling devices. Any portion of the sewer which fails to pass the test shall be excavated, repaired or realigned, and retested with both air and deflection tests.

**6.6.3.5 Mandrel/Deflection Failed Test**

Any portion of the sanitary sewer mainline which failed to pass the test shall be excavated, repaired, or realigned and retested. The portion of sanitary sewer mainline that failed to pass the test(s) shall be repaired and retested using Low Pressure Air and other relevant Tests.

**6.6.4 Video Inspection and Reports**

1. All newly installed Public Sanitary Sewer Systems shall be inspected by means of a remote video inspection. The video inspections and reports shall be submitted to the District. The project Engineer must review the video inspection and report prior to submitting it to the District.
2. The inspections reports must note important features encountered during the inspection. The speed of travel shall be slow enough to full access the installation inspecting each pipe joint, tee connection, structural deterioration, infiltration and inflow sources, and deposits.
3. The camera must be centered in the pipe to provide accurate distance measurements to provide locations of features in the sewer and these footage measurements shall be displayed and documented on the video. The video inspection must be continuously metered from manhole to manhole. All video recording shall be continuous from structure to structure with no "pausing" of the video recording during each pipeline inspection. The pipe shall be cleaned prior to performing the video inspection to ensure all defects, features and observations are seen and logged.
4. Just prior to beginning the video inspection, while the camera is in place and recording, water shall be introduced into the upstream manhole of each pipe segment until it is observed and recorded flowing past the camera's field of vision in its entirety.
5. The camera shall have a water-level measuring device (ball, cylinder, etc.) attached that has 1/4" markings to show the depth of water in the pipe during the video inspection.
6. Per these standards the sanitary sewer mainline shall have no more than 1/2" of ponding water to be considered acceptable.
7. Any noted deficiencies shall be remedied and the applicable section of the mainline re-video inspected prior to submitting the video inspection and reports to the District.

### 6.6.5 Dye-Testing for Non Single-Family Residential Properties

Dye-testing shall be used by the Engineer's Inspector for non single-family residential properties to confirm that the Public Sanitary Sewer System is not connected to a stormwater/surface water drainage system. Before commencing dye-tests, sewer maps should be reviewed to identify and confirm access to Service Connections. In addition, to avoid costly and unintended false alarms, the Engineer's Inspector or associated field crews should contact key spill response agencies to provide information regarding when and where dye testing is planned to occur. The Engineer's Inspector should also carry a list of phone numbers, if the need arises, to notify spill response agencies in the event dye is released to a stream.

Fluorescent dye is introduced into the Sanitary Sewer Collection System and the most likely/suspected storm sewer manholes and adjacent outfalls or open channel storm drainage systems are inspected to identify potential cross connections. Two or three crews are needed to conduct proper dye-testing. One member of the crew drops the dye into the sewer trunk line, while the other crew member(s) looks for evidence of the dye in downstream sanitary sewer and storm sewer manhole(s) or outfalls to surface drainage systems. To conduct the investigation, a point of interest or down pipe "stopping point" is identified. Dye is first introduced into manholes upstream of the stopping point to determine if they are connected. The process continues in a systematic manner until an upstream manhole can no longer be identified, whereby a branch or trunk of the system can be defined, updated, or corrected.

Table 6 provides key field equipment necessary for dye testing. The equipment needed is not highly specialized. Often, the most important choice is the type of dye used for testing. It is recommended that liquid dye is used; however, solid dye tablets can also be placed in a mesh bag and lowered into a cleanout on a rope. If a longer pipe network is being tested, and dye is not expected to appear for several hours, charcoal packets can be used to detect dye. Charcoal packets can be secured and left in place for a week or two, and then analyzed for the presence of dye.

**Table 6. Key Field Equipment for Dye Testing**

Maps, Documents	<ul style="list-style-type: none"> <li>▪ Sewer drain maps (sufficient detail to locate manholes)</li> <li>▪ Site plan and building diagram</li> <li>▪ Letter describing investigation</li> <li>▪ Identification (e.g., badge or ID card)</li> <li>▪ Educational materials (to supplement pollution prevention efforts)</li> <li>▪ List of agencies to contact if the dye discharges to a stream</li> <li>▪ Name of contact at the District</li> </ul>
Equipment to Find and Safely Lift the Manhole Lid (small manhole often in a lawn)	<ul style="list-style-type: none"> <li>▪ Probe</li> <li>▪ Metal Detector</li> <li>▪ Crowbar</li> <li>▪ Safety equipment (hard hats, eye protection, gloves, safety vests, steel-toed boots, traffic control equipment, protective clothing, gas monitor)</li> </ul>

**Table 6. Key Field Equipment for Dye Testing**

Equipment for Actual Dye Testing	▪ 2- way radio, dye (liquid or test strips), high powered lamps or flashlights, water hoses and camera.
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The basic drill for dye-tests consists of four steps:

1. Flush or wash dye down the relevant sanitary system, fixture, or manhole.
2. Pop open downgradient sanitary sewer manholes and check to see if any dye appears.
3. Pop open downgradient storm sewer manholes or observe outfalls for potential appearance of dye.
4. If no dye is detected in the sewer manhole after 1 to 2 hours, check down gradient sewer manhole or connections for the presence of dye.



WES Sanitary Standards

## APPENDIX A

# Permitting Process

**Commented [A3]:** Same contents as Appendix A in the Stormwater Standards. Make sure to copy any edits from the one in the Stormwater Standards Appendix A.







Table of Contents

Appendix A - Permitting	Page
A.1 General Processes .....	A-1
A.2 Service Provider Letter .....	A-3
A.3 Land-Use Review Submittal Requirements .....	A-4
A.4 Plan Review Submittal Requirements .....	A-4
A.5 Plan Submittals.....	A-5
A.6 As-Built Submittal Requirements.....	A-18
A.7 General Building Permit, Partition/Subdivision Approval Process .....	A-21
A.8 General Conditions For Performance And Warranty Surety .....	A-22

**Note:** Plan review documents and forms can be found online.

List of Figures

Figure 1: North Arrow and Test Reading .....	A-13
Figure 2: Not accepted leader practice .....	A-14
Figure 3: Accepted leader practice .....	A-14
Figure 4: Balloon .....	A-16
Figure 5: Utility Profile .....	A-16
Figure 6: Line Weight Guide .....	A-17



## APPENDIX A. PERMITTING

Appendix A outlines the planning, plan review, and project completion requirements for both sanitary and storm sewer projects and is included in both the Sanitary Standards and the Stormwater Standards. This section is intended to standardize the submittals and clearly outline the minimum requirements. The requirement for a complete submittal package is intended to reduce the overall plan approval processing time.

### A.1 GENERAL PROCESSES

The following is a generalized overview of the District development review and permitting processes. This process may vary from one application, submittal and/or building permit to another and is only shown as a general outline of procedures and processes involved in the review and approval of projects located within the District. To obtain further information on a specific plan review or permit process contact a Development Review staff member.

#### A.1.1 General Plan Review and Approval Process

This subsection describes the most common elements of the general development review process for a typical partition, subdivision, multi-family, commercial or industrial project. It is important to discuss your project with the District and Local Planning Authority early to understand the review and approval process required for your specific project.

1. **Pre-Application Conference** – The applicant may elect to meet with the Local Planning Authority, District, and other related departments to discuss the proposed project to better understand the potential requirements. It is best if the applicant submits a preliminary concept or plan, so the District is better prepared to discuss the proposed development. The Site Planning guidance in Section 3.0 of the Stormwater Standards is a resource to help the applicant explore potential low impact development and green infrastructure strategies. Contact the local planning authority to schedule the pre-application meeting. The planning authority will invite the District to the meeting.
2. **Service Provider Letter** – Applicants proposing to develop or redevelop property shall obtain a Service Provider Letter from the District prior to submitting the land-use or design review application to the Local Planning Authority. See Section 2.2 of the Stormwater Standards for Service Provider Letter requirements.
3. **Water Quality Resource Area Boundary Verification** – If applicable, prior to the District issuing a Service Provider Letter, the Local Planning Authority must approve a WQRA Boundary Verification (see [Section 3.0 of the Stormwater Standards](#) and Section 6.0 of Buffer Standards) for water quality Vegetated Buffer requirements.
4. **Conditions of Approval** – The Local Planning Authority will process the land use/design review application and route a copy of the application for District review. The District will review the application and submit comments to the Planning Authority to be included as conditions.
5. **Jurisdictional Authority**– If the proposed project is outside the service area boundaries of the District, the developer must petition for annexation to the District. The annexation must be approved by the Clackamas Board of County Commissioners before final occupancy or plat approval. The applicant

shall submit a complete annexation packet to WES prior to any plan approvals by WES.

6. **Pre-Design Meeting** – The applicant may elect to coordinate a meeting with the Local Planning Authority and/or the District to discuss the project and requirements outlined in the conditions.
7. **Plan Submittal** – Upon land use approval, the applicant must submit required fees, civil plans and supporting documentation as specified in these standards for plan review and approval (See Section 2.0 of the Stormwater Standards and Section 4.0 of the Sanitary Standards for submittal requirements)
8. **Other approvals** – Other permits and approvals may be required prior to the District approving the plans (i.e., County, City, State or Federal).
9. **Approved Plan(s)** – Plans and applicable building permit applications will be reviewed, approved, and then signed by an authorized representative of the District. If applicable, it may be necessary to hold a Pre-Construction Meeting with the Engineer, Contractor, Applicant, District, and other related agency representatives to discuss project requirements, including processes to complete the project as specified in the Engineering Agreement.
10. **Construction** – The public sanitary and stormwater management infrastructure shall be constructed under the supervision of the Engineer as specified in the Sanitary and Stormwater Engineering Agreements.
11. **Construction Completed** – Upon final completion of the construction, the Engineer will certify the project was constructed in accordance with the approved plans, and the as-built plans are an actual record of what was constructed.

The following items will be completed and submitted prior to requesting the final inspection of the public sanitary and/or stormwater infrastructure:

- a. All sanitary and/or stormwater infrastructure shall be cleaned of sediment and debris.
  - b. A *Certification of Completion* shall be submitted – Certifies the project was constructed in accordance with the approved plans and District Standards.
  - c. If applicable, A *Vegetated Planting Certification* shall be submitted – Certifies water quality plantings were planted in accordance with the approved plans and these Standards.
  - d. Two paper copies of the as-built drawings shall be submitted.
  - e. If applicable, submit the video testing of the public sanitary and stormwater conveyance piping systems, along with the contractor's reports for review and approval. The Engineer shall review the video and reports, and note any deficiencies discovered in the system(s) prior to submitting the items to the District.
  - f. Submit a copy of the Engineer inspection reports.
  - g. Submit Service Connection drawings prepared by the Engineer (if required).
12. **Final Inspection** – The District will review the required as-built submittals and, if acceptable, will schedule the final field inspection. All repairs and corrections shall be made prior to the District deeming the project complete.

13. **Final As-built Drawings** – When requested by the District, the Engineer shall submit the corrected final as-built drawings on Mylar, electronic CAD, and PDF files of the as-built civil construction plan set.
14. **Warranty Surety** – Upon completion of the public sanitary and stormwater final inspection, the applicant will submit a sanitary and/or stormwater warranty surety in the amount of 25% of the actual cost to construct the public infrastructure. The warranty surety will be held for a minimum period of 2 years from the date of completion, or until all the requested system repairs are completed. For additional information see **Section A.6** and the District *Warranty Surety Form* which can be found on the District's website or provided upon request.
15. **Letter of Completion and Acceptance** – Upon final approval of the construction of the public sanitary and stormwater infrastructure, and all of the above noted items have been reviewed and approved by the District, then the District will issue a letter of completion of the stormwater infrastructure, and letter of acceptance of the public sanitary sewer system.
16. **Warranty Surety Inspection** – Between 20-24 months after issuance of the letter of completion and acceptance, the District will inspect the public facilities at the request of the owner. The inspection will include all public sanitary and stormwater infrastructure, included the plantings and other related improvements. Once all deficiencies are corrected, the District will issue a warranty surety release letter. For additional information see **Section A.6** and the *District Warranty Surety Form* which can be found on the District's website or provided upon request.

## A.2 SERVICE PROVIDER LETTER

The intent of the Service Provider Letter is that, prior to applying for Land Use/Design Review, the applicant must demonstrate the proposed development is viable in accordance with District Rules, Regulations, and Standards. The Service Provider Letter will only be issued once the applicant has provided sufficient plans, reports, studies, and agency approvals needed for preliminary review by the District. Based on the preliminary review, the District may require additional information prior to issuance of the letter or as part of the forthcoming land use application. Receipt of the Service Provider Letter does not imply that all District requirements have been met or guarantee that land use approval for the development will be granted.

### A.2.1 Submittal for Service Provider Letter

Applicants must submit the following to the District for review:

- ~~Site Planning Guide~~
- Preliminary Plat (if applicable)
- Preliminary Proposal for Public and Private Sanitary Infrastructure
- Proposed sanitary system layout, including compliance with minimum design standards
- Points of connection to public sanitary sewer system
- Service proposal for upstream properties
- Preliminary Stormwater Management Plan and Drainage Report
- Site Assessment and Maps

**Commented [A4]:** We are removing references to the Site Planning Guide. This could still be posted on the website and referenced during pre-apps.

- Proposed Storm Drainage System and Stormwater Facilities:
  - Infiltration, detention, and water quality facilities
  - Conveyance system design
  - Point of discharge
  - Safe Emergency overflow pathway
  - Service proposal for upstream properties
- Soils report and analysis
- Drainage area maps
- Infiltration testing results
- Drainage System Analysis (upstream and downstream)
- Sizing and conveyance calculations
- Other supporting reports and information (as deemed necessary by the District)
- BMP Sizing Tool calculations
- WQRA Boundary Verification or Natural Resource Assessment
- Preliminary Approval for Off-Site Easements
- Offsite Mitigation Measures for Downstream Conveyance

### **A.3 LAND USE/DESIGN REVIEW SUBMITTAL REQUIREMENTS**

As part of the land use/design review application process, the local Planning Agency will route applicable sanitary and stormwater plans and reports to District for comment. The applicant must provide sufficient plans, reports, studies, and agency approvals needed for preliminary review by the District. The applicant's materials shall include any additional information or revisions requested by the District with issuance of the Service Provider Letter.

### **A.4 PLAN REVIEW SUBMITTAL REQUIREMENTS**

The Developer's engineer shall submit sufficient supporting information to indicate that the proposed plan design meets all the provisions within these Standards, including the land-use conditions. The submittal information shall include, but not be limited to, the items listed within this section.

#### ***Initial/First submittal requirements:***

The following is a list of application submittals required by the District for a typical development:

- WQRA Boundary Verification and WQRA Development Permit, submit to the local planning authority as required (see Section 3 of the Stormwater Standards and Section 6.0 of Buffer Standards)
- Stormwater Management Plan complete set of drawings
- Existing Conditions
- Infiltration Testing (Infiltration see Section 2.4 and Appendix B of the Stormwater Standards)
- Proposed On-site Storm Drainage System and Stormwater Facilities
- Proposed Grading Plan

- Existing and Proposed Off-site Improvements
- Erosion Control Plan
- Details and Notes
- Stormwater Management Report (see Section 2 of the Stormwater Standards) that includes:
  - The Engineered, or BMP Sizing Tool Method used to size the stormwater facilities. BMP Tool is available online
  - A Storm Drainage System/Hydrologic and Hydraulic Calculations Report (see **Section 5 of the Stormwater Standards**)
  - Hydrology and hydraulic calculations with drainage area maps
  - Tributary drainage areas shall be calculated in table form and identified on maps submitted with the report
  - Geotechnical/Geologist Report
    - Infiltration Testing
    - Soils Report
    - Geology Report

***Other submittal requirements required by the District as applicable prior to final plan approval.***

- Standard Forms
  - Storm Sewer Engineering Agreement
  - Storm System Construction and Engineering Costs Data Sheet
  - What about sanitary forms – engineering agreement, cost estimate, etc.

• Non-Residential Questionnaire

- Easements/Agreements as applicable
  - Public/Private Sanitary and Stormwater Easements
  - Public/Private Storm Facility Operation and Maintenance Plan/Agreements
  - Conservation Easements
  - On-Site BMP Facility Maintenance Agreements
  - Other related Agreements
  - On-site Operation and Maintenance Plan

## **A.5 PLAN SUBMITTALS**

This section contains specific information and drawing specifications for submittals made to the District. This section is intended to standardize the submittals and clearly outline the minimum requirements. The requirement for a complete submittal package is intended to reduce the overall plan approval processing time. Plans will not be reviewed until a complete plan has been submitted. A complete plan shall include at a minimum all requirements listed in this section.

### **A.5.1 Specific Sheet Submittal Requirements and Specifications**

The following sheets are required as part of a complete Stormwater Management Plan submittal:

1. Title Sheet (see **Section A.2.2**)

2. Composite Utility Plan (see **Section A.2.3**)
3. Composite Stormwater Management Plan Cover Sheet (see **Section A.2.4**)
4. Stormwater and Sanitary Sewer Plans and Profiles (see **Section A.2.5**)
5. Grading Plan (**Section A.2.6**)
6. Erosion and Sedimentation Control Plan (see **Section A.2.7**)
7. Vegetated Buffer Planting Plan (see **Section A.2.8**)
8. Stormwater BMP Facility Planting Plan (see **Section A.2.9**)
9. Standard and Non-Standard Drawings/Detail Sheets (see **Section A.2.10**)
10. Standard and Non-Standard Construction Notes (see **Section A.2.11**)

All applicable standard drawings shall be included on a separate sheet in a clear and legible size.

#### **A.5.2 Title Sheet**

As a minimum the following information shall be found on the title sheet:

- Index of Sheets.
- Complete legend of symbols used.
- Vicinity Map to a scale of not less than 1" = 800' showing the project location.
- Site Plan of the entire project showing street right-of-way and/or subdivision layout.
- Temporary and permanent benchmarks including their descriptions. Total acreage including streets directly served.

#### **A.5.3 Composite Utility Plan**

The Composite Utility plan shall be scaled to show the entire site on one sheet unless otherwise approved by the District and shall show:

- All proposed sanitary and storm improvements
- All other proposed improvements
- All existing utilities and utilities adjacent to and within 100 feet of the project
- Existing natural or artificial drainage features
- Tract names and numbers
- Property lines with tax lot numbers and addresses
- Street names at a minimum shall be shown.

#### **A.5.4 Composite Plan Cover Sheet (separate sanitary & storm)**

The following information shall be included on the Composite Plan cover sheet:

- The scale shall be scale-appropriate to fit the entire site on one sheet, unless otherwise approved by the District
- Show the appropriate contour lines to demonstrate the overall site topography. Generally, these are 1', 2', 5', or 10' contour lines. The topography must extend a minimum of 50' to 100' beyond the proposed limits of development



- Show the entire systems
- Show the stormwater BMP Facilities
- Shade all other utilities not related to sanitary sewer or stormwater drainage systems.
- Show drainageway(s) as existing and/or proposed.
- Show safe overflow pathway(s) to an acceptable point of discharge.
- Show existing and/or proposed storm drainage and conservation easements.
- Show Vegetated Buffers and associated sensitive areas.
- Show all site and roadway improvements.
- Show the Subdivision, Phase Lines or Plat boundaries.

#### **A.5.5 Plan and Profile Views**

Plan and Profile views shall include the following information:

##### **A.5.5.1 Plan View**

Plan views shall contain as a minimum the following information:

- The scale shall be 1" = 50' horizontal. Alternative scales may be approved by the District on a case by case basis. The scale shall be shown for each plan and profile view.
- Entire sanitary and storm sewers clearly shown and labeled.
- Plan views showing north predominantly to the top or left of each sheet.
- Plan views showing accurate 1' or 2' contour lines and extending a minimum of 50' to 100' beyond the limits of the development. Alternative contour spacing may be approved by the District on a case by case basis.
- All proposed extensions of the conveyance systems showing mainlines, manholes and service connections.
- Manholes identified and stationed to facilitate comparison of the plan view and the profile view.
- Manhole callouts in District format.
- District stationing formats for new lines and manholes.
- Size and type of pipe, backfill material, and location.
- Sanitary/Storm Service Connection tees off the mainline. For each lot being served, show the mainline stationing, pipe size, length, and depth of lateral at end of pipe.
- Right-of-way, property, and easement lines.
- Location of water courses, stream and railroad crossings, culverts and storm drains that cross the alignment.
- Subdivision names, roadway names and lot/parcel numbers or tax lot numbers.
- Existing and proposed Sensitive Areas and the required Vegetated Buffer.

- Existing utilities, all manholes, water mains, services, gas mains, underground power, and other utilities and structures, including hydrants, pedestals, signs, mailboxes, light poles, wells, water mains, valves, pumps stations, and blowoff structures, manholes, valves, meter boxes, power poles, handicap ramps, striping, and trees.
- Existing and proposed edge of pavement on both sides of the street, including shoulders, curb, sidewalk, ditch line, culverts, and driveways.
- Plan view including the above items for a minimum distance of 50 feet to a maximum of 500 feet may be required beyond the proposed improvement in order to prevent future improvement conflicts.
- Location and dimensions of all BMP facilities, including the following:
  - Setbacks from property lines and structures,
  - Facility wall material, if required, and geotextile/waterproofing membrane specifications,
  - Growing medium specifications,
  - Drain rock and filter fabric specifications,
  - All stormwater piping associated with each facility including pipe materials, sizes, slopes, invert elevations at bends and connections,
  - Ground elevations at catchment locations, channel inverts, top and toe of slope surrounding detention/retention areas,
  - Ground slopes of channel inverts and sides, parking lots, bottoms and sides of facilities and adjacent surroundings,
  - Invert and top or bottom elevations (if applicable) of pipes, catch basins, overflows, manholes or other similar structures.
  - Location of construction fencing used to protect proposed stormwater BMP facilities from compaction and other construction disturbance.
    - Location of all drainage ways and the 100-year flood plain.
    - Show the location and direction of any surface stormwater conveyance path(s).
    - Location and detail of all existing facilities on which work is to be performed, i.e., installation, repair, or removal.
    - Location and description of all known existing property monuments, including, but not limited to, section corners, quarter corners, donation land claim corners and any other county control monuments.
    - Street stationing may be shown on the construction plans, but later removed on the final as-built plans.
    - Roof drain connection points shall be shown using the ® symbol.
    - Sanitary and storm structures should be easily visible and shown drawn at least 2x the size of the line width and in proportion to the line weight.

#### **A.5.5.2 Profile View**

Profile views shall contain as a minimum the following information:

- Plan and profiles on each sheet shall match and line up on at least one edge of the drawing (i.e., profile to show pipe in same direction as the plan view and lined up plan view over profile).
- The scale shall be 1" = 50' horizontal and 1" = 10' Vertical. Alternative scales may be approved by the District on a case by case basis. The scale shall be shown for each plan and profile view.
- Location of existing and proposed manholes and other appurtenances with each manhole numbered and stationed. Manhole numbers to be provided by District, if applicable. Manhole callouts shall be in the District format. The benchmark used as a basis for vertical control in the design shall be referenced on the plans.
- The location and elevation of an approved benchmark shall be shown on the plans or, if not within the proposed area of work, shall be referenced by number and location. Elevations shall be based on the NGVD88 datum if the project is within ½ mile of a County benchmark. A conversion factor to relate the existing connection point elevations to the plan elevations and benchmark.
- Grid lines using the horizontal and vertical scale.
- Existing and proposed ground and/or pavement surface with elevations noted at critical points.
- Sanitary/Storm lines shall be labeled with the name of the mainline centered under the profile view in large bold letters.
- Sanitary/Storm lines shall be labeled with the pipe size, material, slope (as a %), length and type of backfill between manholes.
- Nonstandard manholes must be labeled with the type (i.e., tamperproof, drop, flat top, etc.).
- Railroad, culvert, ditch, or stream crossings with elevations of the ditch or streambed and casing details.
- All existing and proposed storm, water, and any other crossing utility lines greater than 6 inches in diameter.
- Non-Standard stormwater management facilities and appurtenances shall show a typical cross-section with dimensions.

#### **A.5.6 Grading Plan**

Projects requiring grading and/or fill activities will require the submittal and approval of grading plans prior to the beginning of such operations. The District will review the grading plan in the context of the overall stormwater management plan. Generally, an additional grading permit and/or approval are required by the Local authority or State agency governing such activities. It is the responsibility of the applicant to obtain all necessary permits and approvals prior to beginning any grading activity.

Grading Plan views shall contain as a minimum the following information:

- Total land area and proposed disturbed area,
- Existing topography and impervious area,
- Proposed topography and impervious area,

- 1', 2', or 10' contour intervals (as applicable),
- Elevations of all existing and proposed streets, alleys, utilities, sanitary and stormwater sewers, and existing buildings and structures,
- Natural or artificial drainageways,
- Limits of flood plains (as applicable),
- Existing and proposed slopes, terraces, or retaining walls,
- All existing and proposed stormwater BMP facilities, drainage structures and/or features, and devices used to protect these areas during construction,
- All stormwater structures/features on-site, upstream, and downstream of the site,
- Erosion Prevention Control and Sedimentation Control Plans (as applicable),
- Drainage calculations when required,
- Drainage easements when required,
- Geotechnical report (if applicable),
- Any other supporting documentation necessary to evaluate the existing and/or proposed site conditions for stormwater management.

#### **A.5.7 Erosion and Sedimentation Control Plan**

The general process and requirements for erosion and sedimentation control plans is outlined in **Section 7** of the Stormwater Standards. For specific details on erosion control BMP measures and applications see the **Erosion Prevention and Sediment Control Planning and Design Manual** adopted by the District. A link to this manual can be found on the District website.

#### **A.5.8 Vegetated Buffer Planting Plan**

If restoration of a Water Quality Resource Area or Vegetated Buffer is required in the **Stormwater Standards**, a plan addressing the requirements shall be submitted which includes the following:

##### **A.5.8.1 Preparation of Construction Plans and Specifications**

The construction plans and specifications shall include:

- Water Quality Resource Area and Required Vegetated Buffer boundaries.
- The limits of any approved, temporary construction encroachment.
- Orange construction fencing noted at Vegetated Buffers as well as at encroachment limits during construction.
- Permanent type fencing and signage at the development and the vegetated buffer boundary noted and details shown.
- Conservation Easement documents prepared and easement area shown on the plan.
- Site Preparation plan and specifications, including limits of clearing, existing plants, and trees to be preserved, and methods for removal and control of invasive, non-native species, and location and depth of topsoil and or compost to be added to re-vegetation area.

#### A.5.8.2 Planting Plan and Specifications

Planting Plans and specifications shall include the following information:

- Planting table that documents the common name, scientific name, distribution (planting zone, spacing, and quantity), condition and size of plantings, and installation methods for plant materials listed,
- Mulching rates,
- Plant tagging for identification noted,
- Plant protection methods,
- Seeding mix, methods, rates, and areas delineated.
- Irrigation plan and specifications, including identification of water source, watering timing and frequency, and maintenance of the system,
- Maintenance schedule, including responsible party and contact information; dates of inspection (minimum three per growing season and one prior to onset of growing season); and, estimated maintenance schedule (as necessary) over the two-year monitoring period,
- Good rated corridor notes (i.e., invasive species removal shall be replanted with native vegetation),
- Access points for installation and maintenance, including vehicle access if available,
- Standard drawing details (north arrow, scale bar, property boundaries, project name, drawing date, name of designer and Property Owner).

#### A.5.9 Stormwater BMP Facility Planting Plan

The Stormwater BMP Facility Planting Plan shall include planting information for each stormwater management facility based on requirements of **Section 4** and plant materials per **Appendix F of the Stormwater Standards**.

Planting plan specifications and plans must address all elements that ensure plant survival and overall stormwater facility functional success. At a minimum, landscape specifications and plans must include:

- A planting plan that indicates existing vegetation to be preserved; protective construction fencing; the location of all landscape elements; and the size, species, and location of all proposed plantings. The plant species should be selected and placed in accordance with proper delineation and location of moisture zones where appropriate.
- A plant list or table that includes botanic and common names; size at time of planting; quantity; spacing; type of container; evergreen or deciduous; and, other information related to the facility-specific planting in accordance with landscape industry standards. Also include the square footage of each plant zone and the numbers and types of each plant required and provided in each zone.
- A soil analysis for the stormwater facility growing medium (required for all public facilities and may be required for private facilities. A soil analysis is not required for single-family residential sites). The source of the growing medium must be provided. The location of all stockpiles must be indicated on plans, and erosion protection measures included on the Erosion and Sedimentation Control Plan.

- The method of temporary irrigation to be used for the plant establishment period.
- Stormwater BMP Facility Planting Plan shall also include all areas requiring protective construction fencing to shield the area from construction traffic and compaction.

#### **A.5.10 Standard Drawings/Detail Sheets**

The construction plans shall include a sheet containing all the standard details applicable to a specific project.

The purpose of the District Standard Drawings and Details is to provide basic information as a convenience to those who use them in their designs. These drawings and details are also intended to communicate design standards and practices to the Design Engineer.

Detailed drawings shall be included with all construction plans where standard drawings do not apply. If a standard drawing, such as a manhole, must be modified to fit existing, or unique conditions, the modified detailed drawing shall be shown on the plan and profile sheet. When appropriate, due to required detail complexity, a separate detail sheet shall be used.

- Standard drawings are available for use on development projects and cannot be modified by designers on a project-by-project basis. It is the responsibility of the project Engineer of record to incorporate these drawings as originally intended.
- Non-standard detail drawings shall be the responsibility of the project Engineer to demonstrate that site conditions require a non-typical device or structure and submit the specifications and supporting documentation to the District for approval. All non-standard details shall be shown on the Stormwater Management Plan.
- Stormwater BMP Facility Detail sheets are included in **Appendix D of the Stormwater Standards**. A link to additional Standard Details can be found on the District website.

#### **A.5.11 General Sanitary/Stormwater Construction Notes**

General construction notes required on the plans can be found on the District website or provided upon request. These general construction notes shall be included on the sanitary and stormwater management plans. These notes are required, and the design professional may include other applicable notes they deem necessary.

#### **A.5.12 General Sheet Submittal Specifications and As-built Requirements**

The following subsections outline general submittal specifications for sheet size, scales, north arrow, text, labeling callout, and title block specification requirements.

##### **A.5.12.1 Sheet Dimension Requirements**

Construction plans shall be clear and legible and submitted on blue-line paper 22 by 34 inches or 24 by 36 inches in size with a 1½ inch clear margin on the left edge and ½ inch margins on all other edges.

**A.5.12.2 Title Block**

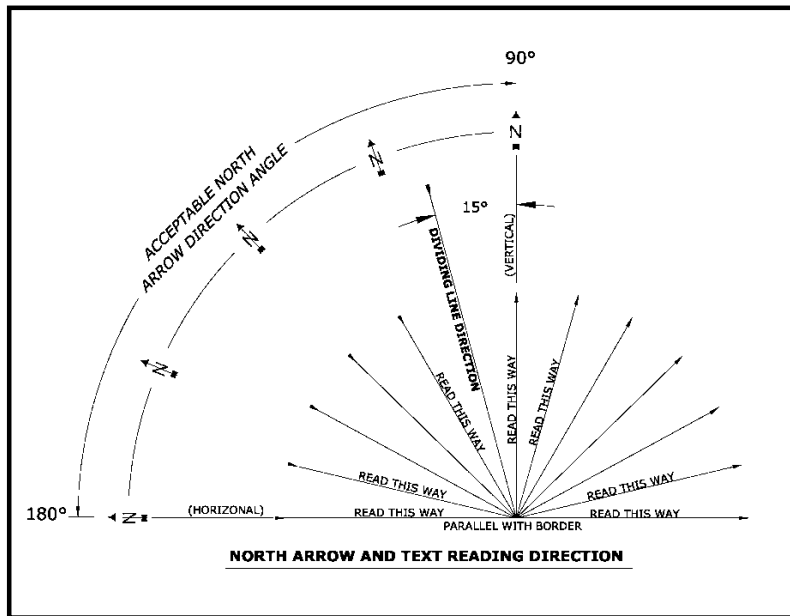
Located on the bottom edge or at the right side of the drawing, showing:

- The project name, drawing name/type, completed modification date table, the submittal date, drawing number, engineer's name, address and official stamp, the owner/developer's name and address and where applicable, the name of the plat of subdivision and/or name of development.

**A.5.12.3 Drawing Scale Requirements**

The following general layout guideline shall be used:

- Plan and Profile sheets shall be 1" = 50' horizontal and 1" = 10' vertical. The District may approve alternative scales on a case by case basis.
- Each sheet shall include a bar scale with text.

**A.5.12.4 North Arrow Requirements**

**Fig. 1 North Arrow and Text Reading**

Each sheet shall include a north arrow. Each separate view on each sheet shall have its own north arrow. The north arrow in each view should face the top (VERTICAL) on the sheet if possible. It is acceptable to align the north arrow off vertical if the project doesn't fit vertically facing north; it can be rotated counterclockwise as much as 90 degrees.

For acceptable north arrow angle directions see **Fig. 1 North Arrow and Text Reading**.

### A.5.12.5 Lettering/Text Requirements

- Text Rotation
  - Text should be readable from either the bottom or right edge of the sheet. For acceptable text reading direction see **Fig. 1 North Arrow and Text Reading**.
- Lettering Size and Style
  - Lettering Size
    - The minimum lettering size shall be eight-hundredths (0.08) of an inch high for existing items and a minimum lettering size shall be ten-hundredths (0.10) of an inch high for new items. Items shall be legible and reproducible.
  - Lettering Style
    - Standard text styles should be used. All lettering should be upper case.

### A.5.12.6 Labeling Requirements

- Sanitary/Storm structures, proposed and existing, shall be labeled on each sheet.
- All street names are to be labeled in each model space window.
- All tax lots and easements within the development and surrounding area pertaining to the project shall be clearly labeled.
- Non-standard storm structures (e.g., Flat Top Manhole) shall be labeled with the unique structure type after the structure name. See below.

### A.5.12.7 Plan and Profile Views-Structure and Pipe Callouts

- **Plan View Leader Line Requirements**
  - Leader lines must angle off horizontal and vertical planes from the center point of the structure as shown in **Fig. 3** in plan view. Horizontal and vertical leader lines are acceptable in profile view.
  - Leader lines should have an arrow. See **Fig. 3**.
  - The leader line arrow should touch the edge of the symbol and point to the center of the structure. See **Fig. 3**.

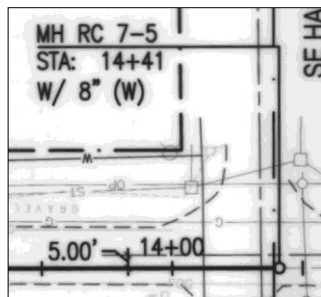


Fig. 2 Not accepted leader practice

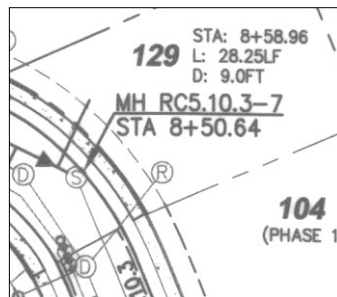


Fig. 3 Accepted leader practice



- **General Sanitary/Storm Structure Callouts in Plan and Profile Views**

- Street stationing and other related information is allowed on the construction plans; however, this must be removed on the accepted as-built plans.


- **Plan View–Non-Typical Manhole Callout:**

HV20-1, Flat Top  
STA. 15+00



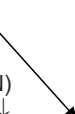
- **Plan View–Manhole Callout:**

MH3B-2  
STA 3+49.40




- **Plan View–Catch Basin and Other Structures:**

CB 3B-1  
STA 3+70  
RIM 486.50  
IE OUT 478.40 (8"N)  
15.00 LF PVC, 12" ↓  
@ S = 35.67%



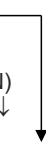
- **Profile View–Manhole Callout:**

MH3B-2  
STA 3+49.40  
RIM 486.50  
IE IN 478.60 (10"N)  
IE OUT 478.40(10"E)




- **Profile View–Catch Basin and Other Structures:**

CB 3B-1  
STA 3+70  
RIM 486.50  
IE OUT 478.40 (8"N)  
15.00 LF PVC, 12" ↓  
@ S = 35.67%



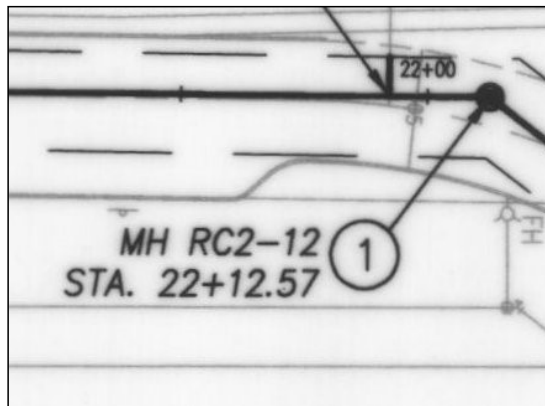
- **Profile View–Manhole Callout with Multi IE IN:**

MH3B-2  
STA 3+49.40 =  
STA 0+00 STM 4  
RIM 486.50  
IE IN 478.60 (8"N)  
IE IN 478.60 (8"E)  
IE OUT 478 (8"S)



- **Reference Balloons**

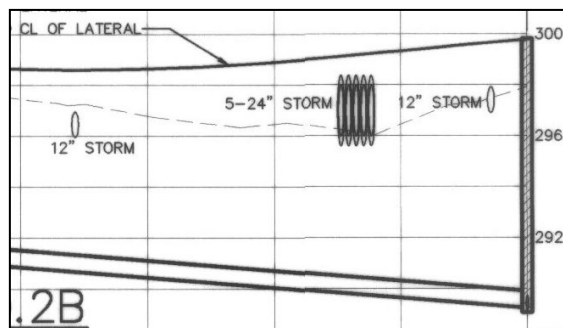
In general, note reference balloons are not allowed. The District will determine the type and format of all callouts on the final as-built drawings if notes are included. If reference balloons are used on construction drawings then the structure name callout must precede the number as shown below in **Fig. 4**.



**Fig. 4** Balloon

- **Utility Crossings**

Show and label all storm, sanitary, waterline, gas and all other utilities that are 6 inches or larger that cross the pipeline alignment in the profile view. Utility invert and crown elevations may be required if they are in close proximity to a proposed storm line. See **Fig. 5**.



**Fig. 5** Utility Profile

### A.5.13 Plan and Profile View Sheet Specifications

Plan and Profile Views shall contain the following information:

- Follow the Line Weight Guide for Drawing Submittals, **Fig. 6**.
- Screening layers during plotting will not be permitted for any line types on plots except for widely spaced hatching. Screening lines are not allowed on as-built record drawings.
- The primary structures and pipes (storm) shall appear **BOLD** and stand out against all other background features in both the plan and profile views, i.e., only the applicable conveyance lines and appurtenances should appear bold on submittals.

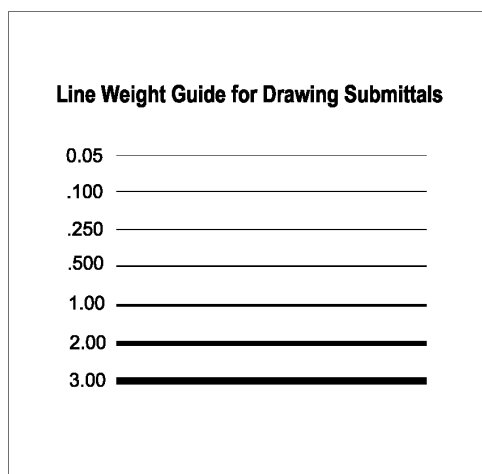


Fig. 6 Line Weight Guide

- **Plotted Line Widths:**
  - Lines shall be plotted in millimeters and widths and plotted at 1" = 50' in model space and 1:1 in paper space. The line widths should be plotted the thickness of the lines as illustrated in **Fig. 6**.
  - Screening of line weights is prohibited for illustration of line weights. Solid gray lines may be used in place of screening lines.
- **Plan View:**
  - The plan and profile showing the proposed mainline extensions and service connections shall have a line weight of 3.00 mm (black). The sanitary or storm in the background shall have a width of 1.00 mm.
  - Existing contour lines in the plan view may be drawn as a dashed or solid line type; black or gray; between 0.250-0.500 mm in weight.
- **Profile View:**
  - Profile view of the proposed system mainline shall be drawn at a line weight of 2.00 mm. Other utilities shown in the background shall be drawn at a line weight of 0.500 mm in either black or gray.

- Existing sanitary/storm lines shall be shown in the profile view as a dashed black or a gray line in a line weight of 1.00 mm.
- **Other associated line specifications for plan and profile views:**
  - Profile view gridlines:
    - Primary – 0.250 mm/black
    - Secondary – 0.050 mm/black
    - Tax lots, parcels, property, and easement lines – 1.00 mm/black
    - Roadway improvements – 0.500 mm/black
    - All other utilities – 0.250 mm/black or gray
  - Subdivision or plat boundary – 2.00 mm/black or gray

#### A.5.14 Landscape Plans

Landscape plans for publicly maintained stormwater management facilities shall be prepared, stamped with the seal of, and signed by, a Landscape Architect, registered in the State of Oregon. Plans for privately maintained stormwater management facilities do not require the involvement of a Landscape Architect. Landscape Plans shall include the following:

- A detailed landscape plan, at a scale of 1-inch equals 20 feet shall be provided for each landscaped stormwater management facility. This plan may be combined with the stormwater management facility grading plan **(Section 2.4.6 of the Stormwater Standards)**. The landscape plan shall include the following:
  - Existing vegetation to be preserved and protective construction fencing.
  - Areas of stormwater management facilities to be designated with construction fencing to protect from construction traffic and compaction.
  - Final ground contours at a minimum of a 2-foot contour interval.
  - Location of top and toe of slope.
  - Limits of embankment designed to impound water.
  - Location of all drainage structures as well as any other piped utilities in the vicinity.
  - Limits of areas to receive amended topsoil and growing medium.
  - A plant list or table, including botanic and common names, size at time of planting, quantity, spacing, type of container, evergreen or deciduous, and other information related to the facility-specific planting, in accordance with landscape industry standards.
  - Location of stockpiles (erosion protection measures must be shown on the EPSC plan).
  - Method of temporary irrigation to be used for the establishment period.
  - Location of maintenance access, as applicable.

#### A.6 AS-BUILT SUBMITTAL REQUIREMENTS

The District requires the sanitary and storm plans shall be as-built prior to the acceptance of the project. As-built drawings are necessary to assure the project was

constructed per the approved plans and/or meet the requirements of these Standards. The Engineer of record is responsible for record keeping, inspection, and preparation of the as-built drawings. Final as-built drawings will be submitted in the following manner, Mylar(s), CAD files and PDF files.

#### **A.6.1 Mylar As-built Drawing Requirements**

As-built drawings shall contain, at a minimum, the following information:

- For all publicly maintained systems and all public and private detention and stormwater BMP facilities, the engineer shall submit certified as-built plans and profile drawings.
- Each page shall be stamped by the Engineer and stated in writing that it is an as-built drawing.
- Show final pipe alignment, slope, pipe size, and pipe material type in the appropriate view.
- Indicate areas of rock removal not completed by standard backhoe, i.e., splitter or blasting.
- As-built drawings and electronic drawings shall become the unencumbered property of the District and are public records that may be distributed as the District deems necessary.
- Two (2) sets of full sized "Draft" as-built drawings on blue-line shall be submitted to the District for review and redline mark-up prior to final mylar, electronic file format submittal, and PDF files.
- The final as-built drawings shall be black-line drawings on 4-mil. Mylar. High quality plotting preferences must be used so the Mylar, when photocopied and/or scanned, is capable of being reproduced with all details legible at an archival quality.
- On the applicable Plan View sheet show a table listing the following information for each sanitary and/or storm Service Connection; mainline stationing, measurement in linear feet of the location of the Service Connection from the center of the upstream and downstream manholes, pipe size, pipe length, and pipe depth of the service lateral at the property line.
- Street stationing and information not related to the storm system construction is not allowed on the as-built plans; however, this information is acceptable on the construction plans.
- Remove all hatching associated with material type.

#### **A.6.2 CAD Requirements for As-Built Drawings**

The following provides CAD requirements for as-built drawings.

- **General Requirements:**
  - AutoCAD electronic files must be compatible with the AutoCAD version the District is currently running.
  - Standard fonts, shapes and line types are required.
  - All drawings are to be plotted in paper space at a scale of 1:1.
  - For specific line weight requirements see **Section A.3.7**.
  - Show the project boundary in **BOLD** type.

- All manholes, catch basins, fire hydrants, valves, meters, etc. are to be inserted as blocks. All blocks are to be created on layer 0.
  - Not allowed are blocked x-refs and preferences or permissions set, so that the District cannot access each layer individually.
  - All drawings are to be seamless and drawn in model space.
  - Drawings are NOT to be rotated off of world coordinate bases.
  - Drawings are to be delivered purged of all unused layers, blocks, line types, and styles.
  - The drawing files saved to disk shall be ready to plot when opened and be the same dated file used to plot the Mylar as-built.
  - SoftDesk point files are not requested and should not be transmitted. Combination files are acceptable.
  - The final as-built drawing files are to be saved under one file folder. All drawings, x-refs, plot files, images, text, and shape files are to be in this one file folder.
  - Only pertinent files are to be submitted in this project folder. NO revisions, SoftDesk files, log times, or miscellaneous DWGs are to be submitted.
  - Before approval will be given, the digital file and hard copy will be evaluated to verify that they are the identical drawings and to make sure all required and only necessary files are included.
  - The electronic as-built drawings shall be submitted along with a completed "*As-built Release of Liability Form*" and all contents shall become the property of the District.
  - Provide the CAD as-built project drawings in digital data and saved to compact disk or flash drive for transmittal to the District.
  - Use of a self-extracting PKZIP file format is acceptable. Use of compressed file(s) is allowed only if the decompression program is included.
- **Disks Labeling Requirements:**
    - Title of project
    - The District (WES Log#) project file number
    - Specify contents of the disk (DWGs)
    - Name of the engineering firm submitting the files
    - The project completion date.

#### **A.6.3 PDF File Requirements for As-Built Drawings**

- AutoCAD electronic files must be compatible with AutoCAD version the District is currently running.
- As-built drawings and electronic drawings shall become the unencumbered property of the District and are public records that may be distributed as the District deems necessary.

- The PDF files shall represent an exact copy of the Mylar as-built drawings.

## **A.7 GENERAL BUILDING PERMIT, PARTITION/SUBDIVISION APPROVAL PROCESSES**

The following is general information on the District processes for approving building permit applications, partitions, and subdivision plats.

### **A.7.1 Building Permit Review and Approval**

The following items must be completed prior to District approval of a building permit application:

- District review and approval of applicable sanitary, stormwater, and erosion control plan(s)
- Payment of applicable charges and fees by the applicant

### **A.7.2 Partition/Subdivision Plat Review and Approval**

The applicant shall submit a preliminary plat to the Local Planning Authority, who will coordinate plat review with the District. The District will only perform an official review of plats received from the Local Planning Authority. The District will review the plat in accordance with the approved sanitary and stormwater management plans, and return comments to the Local Planning Authority. Prior to final plat approval by the District, the developer shall address the following:

- Sanitary and Stormwater Construction plans shall be approved by the District.
- All associated agreements and easements shall be reviewed and approved by the District. The District will deliver the signed documents to the County Surveyor's Office at the time of plat approval.
- Sanitary and Stormwater Improvements shall be:
  - Fully constructed in accordance with the approved plans, or
  - The applicant shall obtain a performance surety for all proposed sanitary and stormwater improvements on the approved plan. If the construction work is partially completed, the surety will be based on a status report submitted by the Engineer.
- Public easement documents shall include a site plan and specify the entitlements within the boundary of the easement.
- Deferred Improvements – In some situations, the responsibility to construct improvements may be deferred to the future owner of a specific lot. Deferrals are at the discretion of the District and will be reviewed on a case-by-case basis. All deferred improvement(s) shall be fully constructed and completed in accordance with the RR&S, prior to any future occupancy permit approvals by the District. All responsibilities of the future owner to construct the deferred improvements shall be stipulated in a separate document recorded as a covenant with the plat.
  - **Subdivision Plats** – Any deferred improvements must be part of a District-approved subdivision improvement plan.
  - **Partition Plats** – Eligible improvements are limited to service connections, conveyance system, pervious surfaces, and stormwater facilities that either benefit one lot, or are shared facilities. In the case of shared facilities, the deferred improvements will be the responsibility of the first future lot owner to submit a building permit application.

- Other related agreements and documents (i.e., Homeowner's Association CC&Rs, maintenance agreements, etc.)

## **A.8 GENERAL CONDITIONS FOR PERFORMANCE AND WARRANTY SURETY**

The District may require the Applicant to submit a surety, cashier's check, or irrevocable letter of credit from an acceptable financial institution to guarantee performance or warranty in completion of the improvements required by these standards. Upon default, the District may draw upon the surety or available funds to complete the remaining work or remedy violations. The different types of acceptable surety are listed below.

### **A.8.1 Surety – Types of Acceptable Guarantees**

Surety shall be provided only through State regulated surety companies while assignment or commitment of savings or loan proceeds shall be through State regulated financial institutions. Cash Acknowledgment is a cash surety held directly by the District.

### **A.8.2 Surety Forms**

All sureties shall be submitted with forms provided by the District or other authority having jurisdiction to permit or regulate the activity. All sureties are subject to review and approval by the District's legal department.

### **A.8.3 Performance Surety**

The applicant shall provide a Performance Surety acceptable to the District prior to recording of the plat for residential developments or the issuance of building permits for commercial or industrial developments, if the required public improvements are not completed and/or accepted by the District.

The following conditions shall be met prior to acceptance of the Performance Surety:

- The Performance Surety shall be in the amount of 125% of the engineer's cost estimate for all approved but uncompleted sanitary and stormwater improvements, including landscaping requirements. The engineer's cost estimate for the required improvements will be approved by the District.
- Nothing herein shall limit the owner's responsibility for repair and maintenance to the amount of the surety.

The following conditions shall be met prior to release of the Performance Surety:

- All improvements must be completed as shown on the approved plans and accepted by the District in accordance with the Rules, Regulations, and Standards.
- A warranty surety shall be provided to the District prior to release of the Performance Surety.

If the applicant fails to comply with the conditions of approval and the approved plans, the District may call upon the Performance Surety to complete the improvements according to the approved plans.

At the end of the surety period when all conditions are satisfied, the residual surety amount shall be released.



#### A.8.4 Warranty Surety

In general, the Warranty Surety is posted by the surety principal to the District to ensure the principal will maintain, repair, replace and be responsible for damage to the improvements for a period of 2 years following the date the District deems the improvements complete and a letter of completion and/or acceptance is issued.

The following conditions shall be met prior to acceptance of the Warranty Surety:

- The Warranty Surety shall be in the amount of 25% of the actual constructed cost for all constructed sanitary, stormwater, and vegetated buffer vegetated buffers are covered in the warranty bond improvements. The engineer's cost data sheet will be approved by the District.
- The Warranty Surety shall be in favor of the District and be issued for a minimum two-year period from the date of completion of the sanitary or storm system.
- Nothing herein shall limit the owner's responsibility for repair and maintenance to the amount of the surety.
- Upon notification from the District, the principal shall, within 30 days complete corrective measures to the satisfaction of the District.
- The District may perform emergency work without notice to the principal or surety.
- All work performed by the District due to the nonperformance of the principal or in response to an emergency shall be reimbursed to the District within 30 days of invoice.
- If the principal fails to reimburse the District in 30 days, the District may demand payment from the Surety.
- The warranty period may be extended, if the required improvements show any signs of failure during a final warranty release inspection.

The following conditions shall be met prior to release of the Warranty Surety:

- The owner or developer shall perform a thorough cleaning of all sanitary and stormwater improvements.
- The owner or developer shall have a qualified landscape professional submit a *Vegetated Planting Certification* on a District form prior to releasing the Warranty Surety describing the condition of the plantings in the stormwater BMP facilities and Vegetated Buffers. If more than 20% of the total area within a Stormwater BMP facility or Vegetated Buffer is not in compliance with the approved plans, then the vegetated plantings will be replanted and/or repaired to meet the requirements of the approved plans. If replanting of the Stormwater BMP facility or Vegetated Buffer is required, then an additional 1-year warranty surety in the amount of 25% of the cost of replanting all of the effected vegetated planting areas shall be required. The additional 1-year warranty surety will be renewed annually until the Vegetated Plantings are acceptable to the District.
- The District shall make a determination of final completion in conformance with the approved plans, specifications, and District standards as well as conduct a final warranty surety inspection of all sanitary and stormwater improvements, including landscaping in any stormwater BMP facility and vegetated buffer.

- Any deficiencies resulting in non-acceptance of the work permitted shall be identified in writing on a final punch list and presented to the principal and/or permittee with a date named for correction and completion. Upon correction of the noted deficiencies and the determination that all work is in conformance with District Standards, the work will be deemed complete and all sureties shall be released.

WES Sanitary Standards

## **APPENDIX B**

# **Sanitary Sewer Standard Detail Drawings**





**Appendix B - Sanitary Sewer Standard Detail Drawings**

**Commented [A5]:** All the drawings are in separate CAD file. To be added later.

- SAN-01 Trench Restoration
- SAN-02 Trench Restoration with CDF
- SAN-03 Manhole - Typical
- SAN-04 Manhole - Flat Top
- SAN-05 Manhole - Outside Drop
- SAN-06 Manhole - Base
- SAN-07 Manhole - Connection Flexible
- SAN-08 Manhole - Step
- SAN-09 New Manhole Over Concrete Pipe
- SAN-10 New Manhole Over PVC Pipe
- SAN-11 Frame & Cover - Standard
- SAN-12 Frame & Cover - Suburban
- SAN-13 Frame & Cover - Secure/Watertight for use in Traffic Areas
- SAN-14 Frame & Cover - Watertight for use in Non-Traffic Areas
- SAN-15 Channel - Intersection
- SAN-16 Channel - 90 Degree
- SAN-17 Channel - Slide
- SAN-18 Anchor Wall
- SAN-19 Cleanout Pad
- SAN-20 Service Connection—~~PUE~~
- SAN-21 ~~Curb Stamp~~Service Connection—Easement
- SAN-22 Service Connection - Into Manholes
- SAN-23 2-Way Cleanout for Sanitary Sewer Service
- SAN-24 Concrete Cap
- SAN-25 Concrete Encasement/Closure Collar
- SAN-26 Concrete Manhole Closure Collar
- SAN-27 Manhole Chimney Seal
- SAN-28 Inserta Tee
- SAN-29 Precast Ring Extension for Typical Manhole