

Sanitary Sewer Standards Manual



Spokane County
ENVIRONMENTAL SERVICES

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11.00 SANITARY SEWERS

The Sanitary Sewer Standards Manual, hereinafter referred to as the “Manual”, provides minimum standards, consistency in design and baseline construction specifications applicable to the design and construction of public and private sewers within Spokane County’s sewer service area. All sanitary sewer designs and construction projects shall focus on providing infrastructure that is efficient and reliable to operate with the ultimate goal of protecting the Spokane Valley – Rathdrum Prairie Aquifer, the Spokane River, the local environment, and public health.

This Manual cannot address all situations. It is intended to help but not substitute for competent work by design professionals. It is not intended to limit innovative or creative effort that could result in higher quality, cost savings or both. The Environmental Services Director will make the final determination to allow designs and techniques that depart from the Standards in this Manual. The following documents are incorporated by reference as part of the Sanitary Sewer Standards:

1. Specifications from other jurisdictions having authority
2. Construction Specifications Institute (CSI; for design of buildings only)
3. Spokane County 2014 Comprehensive Wastewater Management Plan (CWMP)
4. Dept. of Ecology “Criteria for Sewage Works Design” (aka the “Orange Book”)

Technical Reference E of the Road and Sewer Standards contains the “Side Sewer Installation Handbook”. The Handbook provides the specifications for private sewer lines constructed with pipe six inches (6”) in diameter or smaller.

In cases of conflict, the Environmental Services Director will determine the appropriate specification or standard to be used based on state and local laws and the requirements of the jurisdictions having authority.

11.01 DEFINITIONS

The following definitions are supplemental to definitions provided elsewhere in this document.

“Acceptance” – Pertains to construction plans, calculations, engineering reports and details. For documents that have not been prepared by the Environmental Services Department, the Department relies upon the responsible Professional Engineer’s seal as the indicator of the adequacy, thoroughness, and suitability of the document for its intended purpose. The Department’s acceptance of a document does not transfer any responsibility from the sealing Professional Engineer to the Department.

“Approval” – Related to design and/or construction deviation from the County Standards.

“Comprehensive Wastewater Management Plan” “(CWMP)” - The Comprehensive Wastewater Management Plan (CWMP) is intended to satisfy the regulations established by the Washington State Department of Ecology (Ecology) regarding preparation of a General Sewer Plan (GSP) per Washington Administrative Code (WAC) 173-240-050. The CWMP

outlines sewer program implementation steps necessary to fulfill the County's requirements per the Growth Management Act (GMA).

“Department” means the Spokane County Environmental Services Department (formerly Division of Utilities).

“Director” means the Director of the Spokane County Environmental Services Department, or his or her designee.

“Developer” generally refers to an individual, company, or corporation undertaking the conversion of a property to a new use or the expansion of an existing use on a property.

“Engineer” means the Professional Engineer, licensed to practice in the State of Washington, responsible for development of the design, plans, specifications, engineering reports, and other technical documents.

“Sponsor” is the party identified as the proponent of a development action. The Sponsor is ultimately responsible for the provision of the required infrastructure and documentation for the project acceptable to Spokane County.

11.02 INDUSTRIAL PRETREATMENT PROGRAM

Spokane County as the owner and operator of a wastewater collection system has the responsibility to protect its infrastructure by implementing the Industrial Pretreatment Program requirements codified in Spokane County Code (SCC) Chapter 8.03A, and related guidance. The Pretreatment program controls pollutants in wastewater from industrial facilities before they reach the water reclamation facility (wastewater treatment plant). Without proper pretreatment, these pollutants have the potential to interfere with the operation of the water reclamation facility and/or pass through untreated into the Spokane River and the local environment.

Industrial users are responsible for all cost and liability to provide wastewater pretreatment to comply with the County’s Industrial Pretreatment Program and SCC 8.03A, and shall achieve compliance with all applicable pretreatment standards and requirements. Any facilities required to pretreat wastewater to acceptable levels must comply with the regulations for submission of plans and reports for construction of wastewater facilities, Chapter 173-240 WAC. Engineering reports, detailed plans and specifications, and an operations and maintenance manual acceptable to the Director showing pretreatment facilities and operating procedures, together with any other information required by the Director shall be submitted to the Director for review and approval before construction.

11.03 PLANNING PROCESS

1. AVAILABILITY OF SEWER

Included in this section are excerpts of Spokane County Code Chapter 13.650, "CONCURRENCY", pertinent to sanitary sewers. The entire code chapter should be referred to for a complete discussion of the concurrency requirements.

a. Definitions

- a. Adequate Public Facilities - Facilities which have the capacity to serve development without decreasing levels of service below locally established minimums.
- b. Available Public Facilities - Those facilities or services that are either in place or have a financial commitment in place to provide the facilities or services within a specified time. In the case of transportation, the specified time is six years from the time of development.
- c. Concurrency - Means that adequate public facilities are available when the service demands of development occur: This definition includes the two concepts of "adequate public facilities" and of "available public facilities" as defined above.
- d. Dry Side Sewer - (also referred to as "double plumbing") is a sewer service line installed on properties with on-site sewage disposal systems, which will allow for future connection to a public sewer, when the public sewer becomes available. Unless otherwise indicated or approved by the Director, all side sewer requirements shall apply to dry side sewers.
- e. Dryline Sewer - A public or private sewer that is not put into service until it is connected to the operational public sewer system.
- f. Project Permit/Project Permit Application - Any land use or environmental permit or license required from a review authority for a project action, including but not limited to building permits, short plats, subdivisions, binding site plans, planned unit developments, conditional uses, variances, shoreline permits, site plan review, permits or approvals required by the Critical Area Ordinance, site-specific zone reclassifications, manufactured home parks, and change of condition request.

b. Applicability

The following facilities and services must be evaluated for Concurrency:

- a. Transportation
- b. Public Water
- c. Public Sewer
- d. Fire Protection
- e. Police Protection
- f. Parks and Recreation
- g. Libraries
- h. Solid Waste Disposal
- i. Schools

c. Direct Concurrency

Transportation, Public Water and Public Sewer shall be considered Direct Concurrency Services.

d. Water and Sewer Concurrency Inside Urban Growth Areas

New development shall not be approved within the Urban Growth Area boundary unless the proposal can demonstrate the availability of public water and sewer services consistent with adopted Levels of Service, and consistent with the definition for Concurrency in the Spokane County Comprehensive Plan Update. New development must: 1) be connected to a live (fully operational) public sewer

at the time of occupancy, or 2) be located within the Spokane County 6-year Sewer Capital Improvement Program, as adopted.

New development located within a 6-year Sewer Capital Improvement Program area may install septic systems on an interim basis until such time as sewer service is available. All new development shall install dry line sewers and double plumbing if the new development will rely on an interim septic tank/drainfield system rather than being connected to a live sewer. Once sewer service is available, the development shall be required to immediately connect to the County's sewer system.

New development shall be deemed to have met the "availability" threshold for sewer concurrency if the Developer has sewer plans approved by the Department and provides adequate financial security to cover the full cost of constructing the sewerage facilities required for the development. Acceptable plans and security shall be provided before final approval of the proposed development.

Developer-financed extensions of public sewer may be allowed within any area of the Urban Growth Area provided capacity and infrastructure needs are adequately addressed.

For purposes of this section, new development shall include subdivisions, short plats, binding site plans, manufactured home park site development plans, planned unit developments, and zoning reclassifications. Conditional use permits shall also be considered new development if the proposed use would result in an increased amount of wastewater generated on the site.

New developments not requiring sewer and/or water service (e.g. cellular towers) are exempt from this section.

e. Limitation of Services Outside Urban Growth Areas

Public Sewer Service shall not be provided outside the Urban Growth Area except as follows:

- In response to an immediate threat to public health or safety.
- When necessary for the protection of aquifers designated in accordance with RCW 6.70A.170.
- To a vested development that is required to be served with sanitary sewer as a condition of development approval.
- As may otherwise be allowed by state law.

The extension of sewer service according to the exceptions permitted in this section shall not be considered an inducement to types or levels of growth that are not appropriate in the rural area.

f. Applicability:

These regulations shall not apply to land use applications vested in accordance with state and local law.

g. Conflicts between Provisions

This ordinance shall apply as an overlay and in addition to other adopted plans, ordinances and regulations affecting lands in Spokane County. In the event of any conflict between this ordinance and other plans, ordinances and regulations, the provisions of this ordinance shall prevail.

In the event of any conflict between this ordinance and any development agreement which has been executed under RCW 36.708.170, prior to the effective date of this ordinance, the development agreement or provisions therein shall govern and prevail during the term of the agreement.

h. Effective Date:

These procedures came into full force and effect on September 1, 2001. (Res. 01-0700 Attachment A (part), 2001).

2. SCOPING MEETING

A scoping meeting shall be scheduled with the Department prior to any substantive planning of sewers for a development project. It is the responsibility of the Developer to initiate and coordinate the scoping meeting. It may be beneficial to have a joint scoping meeting to include all agencies which are affected by or can affect the project. Some of the major topics to address at the scoping meeting are:

- The purpose of the project.
- Requirements of the project to comply with the County's general sewer plan.
- Project timeline and planned phasing.
- Background projects.
- Input needed from governmental agencies.
- Planned projects by the agencies which will impact the project.
- Is a Latecomer Agreement requested.
- Connection fees.

3. ENGINEERING REPORTS

Prior to commencing the design of the project, the Engineer shall contact the Department for a determination regarding the requirement for an engineering report. **AN ENGINEERING REPORT IS REQUIRED PRIOR TO THE DESIGN OF ALL SEWAGE PUMP STATIONS.** The engineering report, when required, must be accepted by the Department prior to the Department's acceptance of construction plans for the project. The engineering report shall be submitted in both paper and electronic format and shall include the following:

- The name of the project.
- Name and contact information of the project sponsor.
- Name and contact information of the responsible Engineer.
- Professional Engineer's stamp, signature and date.
- Table of contents, including, tables and maps.
- Aspects of the design (see below).
- Design alternatives considered and the recommended alternative.

The engineering report shall, at a minimum, address the following aspects of the sewer design:

- Compatibility with the expansion and upgrades of the regional sewer system as described and/or identified in the County's (CWMP).
- The total service area, projected population and land use forecasts that will contribute wastewater flows to the proposed project and be used to determine the ultimate size of the proposed sewer infrastructure.
- The projected wastewater flows and loads from the project area and contributing drainage areas to the project. The flows and loads shall be calculated for both current and ultimate development.
- Pipe routing that will best meet the service needs of the proposed project and the ultimate contributing drainage area. The Engineer shall confer with the Department to verify the proposed routings align with the County's regional plans for sewer system expansion.
- Conditions and environmental constraints that would impact the overall project and alternatives to avoid or mitigate the impact.
- Special design features planned to address difficult or unusual challenges to the project.
- Additional concerns related to the project expressed by the Environmental Services Department.
- Other concerns expressed by the Department.

The planning criteria to be used is included in Table 11.04A.

Additionally, the Director may require calculation of the projected wastewater loads for BOD, TSS, TP and TKN as defined in SCC 8.03.1970 – Standard Strength Sewage, or SCC 8.03.1450 – Non-standard Strength Sewage, whichever is applicable.

11.04 DESIGN OF SANITARY SEWERS

1. GENERAL DESIGN APPROACH

This section serves as a guide for the design of sewage collection systems within Spokane County's sewer service area. The goals are:

- To ensure that the design of the sewage collection infrastructure is consistent with public health and water quality objectives of Spokane County and the State of Washington.
- To establish a basis for the design and review of plans and specifications for public and private sewer systems.
- To provide guidelines to engineers for the preparation of plans, specifications, reports and other data.

All designs for public sewer systems and pump stations shall be stamped and signed by a Professional Engineer licensed to practice in the State of Washington. Designs shall meet or

exceed the minimum requirements and criteria set forth in Table 11.04A and conform to design parameters specified by the Criteria for Sewage Works Design issued by the Washington State Department of Ecology, a.k.a. the "Orange Book". These design criteria are minimum standards and are intended to assist, but not substitute for competent work by design professionals.

Sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow. Storm water discharges into the County's sanitary sewers are not allowed. Computations and data used for the design of the sewer system shall be provided to the Director upon request.

Collection systems shall be designed to serve the ultimate development of the tributary areas within the sewer service area defined by the County's CWMP. In selecting the size of the sewer system components, the Engineer shall take into account:

- Population and economic growth projections, feasibility, benefit, and comparative cost of staged construction alternatives.
- Growth Management Area boundaries.
- Possibility of solids deposition, odor and corrosion that might occur at initial low flows.

2. SERVICE TO EXISTING AND FUTURE PROPERTIES REQUIRED

Extensions of the public sewer system must be designed to comply with the County's CWMP and to facilitate future expansion of the system. To meet this goal, the design must support the County's general sewer plan in the following ways:

- The final pipe size, slope, depth and alignment must be acceptable to the Environmental Services Department.
- To facilitate service to future areas and to protect newly paved roadways, sewers shall be constructed beneath all new roadways and beneath existing paved surfaces that are required to be improved in conjunction with the development.
- When sewer is being installed adjacent to properties outside of the project necessitating the extension of sewer, side sewer stubs must be provided to each of those properties. The side sewer stubs shall be installed deep enough to permit a gravity connection of all sewage facilities on the property, if practicable. The property owners shall be contacted for their input regarding preferred side sewer stub locations and needs for future development. Documentation confirming this effort shall be provided to the Department. The final location, size, and number of side sewer stubs are subject to approval by the Department.

3. GENERAL SEWER DESIGN CRITERIA

In addition to the design criteria specified in Table 11.04A, the Standard Plans, and other technical manuals included by reference, design and construction specifications shall adhere to the following requirements:

- The specified pipe material shall be manufactured and adapted for local conditions such as soil characteristics, characteristics of wastewater, external loads,

susceptibility to corrosive environments and other installation and operating conditions anticipated by the Engineer or the Department.

- Material and installation specifications shall adhere to appropriate requirements as established by the industry in technical publications such as ASTM, AWWA and APWA standards.
- The method of joining pipe and the material used shall be included in the specifications. Joints specifications shall meet the requirements established by the ASTM.
- Pipe slope shall be designed to achieve a minimum flow velocity of 2.0 feet per second when flowing full. Refer to the “Orange Book” for minimum pipe slopes by pipe size. When practicable, pipe slopes should be 1.25 times the minimum slope, particularly at the upstream end of the system or in low flow areas.
- Gravity sewers shall be straight line and uniform grade between manholes.
- Distance between manholes shall not exceed 400 feet unless approved by the Director.
- Pipe systems and manholes should be designed to maintain a uniform energy grade line throughout the manhole to minimize turbulence.
- Flow channels in manholes shall be of such shape and slope to provide a smooth transition from inlet to outlet pipes.
- Manholes must be installed at the upstream end of each sewer line of 8-inch diameter or greater unless the line is expected to be extended in the near future, in which case, a cleanout may be installed, but no further than 100 feet from the downstream manhole. No more than one live sewer connection will be allowed between the cleanout and the next downstream manhole.
- Ductile iron pipe must be used:
 - a. When wastewater velocities are anticipated to exceed 15 fps.
 - b. When the pipe will have less than three feet of cover.
 - c. For all above-ground installations such as bridge crossings.
- 4” diameter side sewers shall be limited to serving a maximum of two equivalent residential units on a single property.
- Commercial properties shall be served by 6” minimum diameter side sewer stubs.
- Side sewers are not allowed to connect directly into a manhole unless the manhole is, and will remain, the upstream terminal manhole in that branch of the system. A maximum of three side sewers, 6” diameter or smaller may be allowed in a single terminal manhole.

4. EASEMENTS

Easement for public sanitary sewers shall be a minimum of 20 feet wide or 1.8 times the depth of the sewer, whichever is greater. Easements must be recorded with Spokane County prior to acceptance of the sewer system by the Department for ownership and maintenance.

Maintenance access roads shall be 14 feet wide, and shall be constructed with 8-inch thick crushed surfacing base course at a maximum longitudinal grade of 12% and with maximum cross slopes of 2%. The crushed surfacing shall be compacted to 92% of maximum density.

11.05 DESIGN OF PUBLIC SEWAGE PUMP STATIONS

In the interest of cost savings and efficiency for construction and operation, the Department has established a generalized standard design for the construction of public sewage pump stations. All sewage pump stations which are to be owned and operated by the County shall be based upon this design unless site conditions or operational requirements present the need for an alternate design. Any alternative designs shall be subject to approval by the Department. Pump station designers shall contact the Department to acquire a template of the pump station plans and additional design criteria. Following are some of the design features to be incorporated into the pump station design:

- The pump station must fit in aesthetically with the surrounding neighborhood including an acceptable color scheme.
- The structure shall be constructed of split-face CMUs and have a 40-year rated asphalt shingle roof to provide Class A fire rating.
- The site must be able to accommodate the County's large service trucks and equipment as well as parking for three pickup trucks.
- Facility power shall be 3-phase where available.
- Electrical and HVAC controls shall be located in a room separate from the room housing the pumps, piping and back-up power equipment.
- HVAC equipment shall be designed to maintain the inside space at temperatures between 45 and 90 F.
- The station shall be a submersible pump style. There shall be a minimum of two pumps, each capable of pumping the design flow.
- The station shall be designed to accommodate the ultimate wastewater flow. Some equipment may be permitted to be downsized for the initial flow.
- The wet well shall be located outside of the building and accessible to the County equipment for cleaning.
- The pump suction and discharge openings shall be at least 4 inches in diameter.
- All piping in the wet well, station and within the boundary of the pump station site shall be ductile iron.
- Back-up power supply shall be required in one of two methods, as determined by the Department:
 - a. Provision of power receptacle of type and size to mate to the County's mobile generator, or
 - b. Provision of an on-site generator, either natural gas or diesel, to be determined by the Department. Diesel fuel storage shall be above ground with appropriate spill prevention and containment provisions.
- The station shall include space and electrical connections for the SCADA equipment. When required, the SCADA equipment shall be designed and provided by the Department's contractor. The Sponsor is responsible for SCADA-related costs.
- In most cases, equipment for odor mitigation will be required, typically using activated carbon.
- Depending on the wet well and force main detention time, equipment to mitigate H₂S generation may be required.
- Arc flash hazard analysis must be performed in accordance with NFPA 70E. Resultant stickers shall be placed as required.
- Two hard copies and one electronic copy of Operation and Maintenance (O&M) manuals shall be provided to the Department. Electronic O&M manuals shall be compatible with the Department's electronic O&M database.

The Engineer shall contact the Department for specific design requirements.

It is the Department's preference that the ownership of the land upon which the pump station is constructed be transferred to Spokane County prior to the Department's acceptance of the pump station. Under certain circumstances, an easement granting the Department the right to access, operate, construct and maintain the sewage facilities on site may be acceptable, subject to the approval of the Director. The easement must be in the form of a sewer easement document or noted on the final plat. A sewer easement document must be recorded with the County Auditor's Office.

11.06 SEWER FORCE MAINS

- All force main piping shall generally be ductile iron. Subject to the Department's consideration, smaller diameter force mains (generally less than eight (8) inches in diameter may be AWWA C900 PVC. When the force main has less than 3 feet of cover or is installed above ground such as for a bridge crossing, ductile iron pipe material is required.
- Force mains shall typically have at least 5 feet of cover.
- Force mains should be sized to operate at velocities between 2.5 and 6.0 feet per second. In no case should force main velocities exceed 8 feet per second.
- Force mains shall be designed and tested to withstand twice the operating pressure expected for a minimum of 40 minutes. The minimum test pressure is 100 psi.
- Force mains shall be designed without intermediate high points if possible. Force main designs shall include a surge analysis as appropriate. When necessary, air release valves and vacuum valves shall be of the make and model acceptable to the Department.
- Force mains shall also be designed to adequately manage grease and other potentially clogging materials. Appurtenant piping such as for air release and/or vacuum valves must be designed to manage such impacts.

11.07 PLAN SUBMITTAL PROCESS

1. PLAN SUBMITTALS

For public and private sanitary sewer infrastructure proposed to be constructed within Spokane County's sewer service area, plans must be submitted and accepted by the Department prior to construction. Two (2) sets of plans are required for initial submittal. Plans accepted by the Department are valid for one year from the date of acceptance. If construction of the sewer improvements has not commenced within the one-year period following acceptance, resubmittal of the plans is required.

The plans shall include the items listed below. Additional items may be required depending on the project.

- Project name and site address.
- Tax parcel number of all parcels within or adjacent to the project.

- Section, Township, Range and Qtr. Section of the Project Site.
- Engineering firm's name, address and phone number.
- Name and address of the owner(s) of the subject property.
- Vicinity Map showing the project location.
- State of Washington Professional Engineer's seal with signature and date on each sheet.
- Plan sheets are to be 24" x 36".
- Plan Scale; Plan & Profile sheets, Horz. 1"=50', Vert. 1"=10'.
- Design must be based on NAVD 88 and so noted on plan sheets.
- North arrow (located at the top or right side of page).
- Depiction of all existing sanitary sewer lines, manholes and side sewer stubs, within the drawing extent, with a dashed line.
- Sewer easements noting the County Auditor's recording number.
- Location of all water well sites within proposed development with a 100-foot buffer also depicted.
- The following language placed inside or directly beneath the Developer approval / signature block - "This construction plan expires one (1) year from date of approval".
- Adjacent roads identified. Include road names, existing and proposed edge of pavement, road centerline, shoulders, and curbs. Curbs are to be shown with two (2) lines.
- Number of units, buildings, lots, and blocks identified on plans.
- Standard Spokane County Environmental Services Department construction notes and details shall be included on the plans.
- Cover sheet showing the proposed project referenced to section lines or corners (*Suggested scale: 1"=200'*).
- Cover sheet showing the proposed project tied to section lines or corners (*Suggested scale: 1"=200'*).
- Provide an overall schematic of the pipe system showing existing adjacent sewers with dashed lines and proposed sewer lines with solid lines with flow direction indicated.
- Invert and rim elevations and stationing shall be provided for all manholes in both plan and profile views.
- Show all existing and proposed manholes (*with County manhole numbers*) and sewer lines located on or adjacent to project. Depending on the size of the project, the pipe schematic with County manhole numbers may be on the cover sheet or may require a separate sheet.

2. FEES AND OTHER COSTS

The Project Sponsor should anticipate payment of various fees, charges and security costs in connection with the project. The required fees may include, but not limited to:

- Connection fees including General Facility Charges and Special Connection Charges as calculated by the Department.
- Sewer Connection Permit Fees.
- Sewer Tap Permit Fees.
- Video Inspection Fees.
- Construction and/or Warranty Security.

- Concurrency Review Fee.
- Plan Review Fees.
- Recording Fees.

11.08 CONSTRUCTION - GENERAL REQUIREMENTS

Refer also to the General Provisions of this Manual

1. PERMITS

It is the Sponsor's responsibility to make sure that all required permits have been obtained and complied with during the course of the project. Examples permits that may be required by other agencies are:

- Right-of-Way Permits (for work within the public right-of-way).
- Plumbing, Mechanical and Electrical Permits.
- Utility Crossing Permits.
- Shoreline Permits.

Some agencies, such as the Washington State Department of Transportation, require a public agency to be the applicant and ultimate owner of any resulting franchises. In those cases, the Sponsor is responsible for paying all costs associated with the application of, and compliance with, the permit. When the application is acceptable to the Environmental Services Department, the Director may execute the associated permit documents as the future facility owner.

2. INSPECTIONS

Refer also to Technical Reference C

<u>Inspection of</u>	<u>...Shall be performed by...</u>
Public and private gravity sewer installation, 8" dia. and larger.	...the Sponsor's independent inspection firm.
4" & 6" side sewer stub installation from the main to the property line.	...the Sponsor's independent inspection firm.
4" & 6" side sewer from the property line to the building drain connection.	Spokane County Environmental Services Dept. A Sewer Connection Permit is required.
All taps of existing sewer mains and manholes.	Spokane County Environmental Services Dept. A Main Line / Manhole Tap Permit is required.
Pressure sewers within the right-of-way.	...the Sponsor's independent inspection firm.

Pressure side sewer from the property line to the sewage pump.	Spokane County Environmental Services Dept. A Sewer Connection Permit is required.
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VIDEO INSPECTION

Sanitary sewer lines 8-inch diameter and larger must be video inspected by the Department before final acceptance by the Department. Refer to Technical Reference C, Attachment 5 for the protocol for the video inspection of sewers.

It is recommended that the sewer lines be video inspected prior to paving over the pipe. The Department may be contacted to provide this additional inspection and all costs to perform this pre-pavement inspection shall be borne by the Developer or Contractor. The Contractor must provide safe, unobstructed access to the manholes for the Department’s video inspection vehicle and personnel.

3. LAWS TO BE OBSERVED

The Sponsor shall ensure that the project and associated work complies with all applicable federal, state, tribal, or local laws, ordinances, and regulations. Spokane County shall be indemnified and held harmless by the Sponsor against any and all claims that may arise as a result of the negligence of the Sponsor or his/her representatives and agents in the prosecution of the project.

The Contractor and the Engineer are responsible to immediately report to the Department violations pertaining to environmental compliance, including but not limited to spills, unauthorized fill in waters of the state or in wetlands, water quality standards, noise, and/or air quality.

The Contractor shall be responsible for the safety of all workers and shall comply with all appropriate state safety and health standards, codes, rules, and regulations, including, but not limited to those promulgated under the Washington Industry Safety and Health Act RCW 49.17 (WISHA), and as set forth in Title 296 WAC (Department of Labor and Industries). In particular the Contractor’s attention is drawn to the requirements of WAC 296.800 which requires employers to provide a safe workplace.

4. PRIVATE / PUBLIC PROPERTY

Property shall not be utilized or entered upon without written approval from the property owner or the jurisdiction having authority. The Sponsor shall bear all costs associated with providing protection measures and repair, replacement or compensation for any damage to property and improvements resulting from the Sponsor’s project.

The Developer, Engineer and/or Contractor shall be responsible for the preconstruction documentation and replacement of all property corners and survey monuments disturbed or removed due to construction operations. Replacement of property corners shall be performed only by a Washington State licensed Land Surveyor and shall be in accordance with all applicable regulations, including those of the Washington State Department of Natural Resources.

5. PRECONSTRUCTION MEETING REQUIRED

Prior to the Contractor beginning the work, a preconstruction conference may be required by the Department, including representatives from the Department, the Contractor, the Sponsor's Engineer and other interested parties. The purpose of the preconstruction conference is to discuss the prosecution of the work, inspection requirements, requirements for providing record information and other documentation to the Department, and to clarify requirements of installation and material specifications.

11.09 ACCEPTANCE OF NEW INFRASTRUCTURE

WARRANTY SECURITY

The Sponsor shall post security to warrant the sanitary sewer infrastructure and related work as follows:

- Warranty for two years all work and materials of all pump station components constructed or installed within the pump station site.
- Warranty for two years all pressure pipe installations including all appurtenances to the pipe system.
- Warranty for one year all gravity pipe installations including all appurtenances to the pipe system.
- Warranty for one year for any other sanitary sewer items not covered above.

The warranty period shall commence when:

1. All project elements have passed the required testing.
2. Record drawings have been submitted and accepted by the Department.
3. Recorded easement documentation and titles have been received (if applicable).
4. Operation & Maintenance manuals have been submitted and accepted (if applicable).
5. The Warranty Security has been provided in an acceptable form.

TABLE 11.04A

SPOKANE COUNTY
SEWER DESIGN CRITERIA

Capita per Equivalent Residential Unit (ERU)	
Single Family	2.5
Multi-Family	2.0
Wastewater Flow Per Capita	80 GPD
Depth of Flow; 15" Dia. Pipe and Larger	70%
Depth of Flow; 8" to 12" Dia. Pipe	100%
Peaking Factor Curve (See Table 11.04B)	Ten States Standards
Infiltration/Inflow (I/I) Allocation	Residential – 125 GPAD Commercial/Industrial – 200 GPAD
Manning's "n" factor	0.013
Commercial/Industrial Flow	2,000 GPAD Unless Reliable Data is Available

Minimum Slope	Sewer Size (Inches)	Minimum Slope* (Feet Per 100 Feet)
	8"	0.40
	10"	0.28
	12"	0.22
	15"	0.15
	18"	0.12
	21"	0.10
	24"	0.08

* When grade is available, the preferred pipe slope is 25% steeper than the minimum slopes stated above, especially for the upper reaches of the system.

Table 11.04B
PEAK FACTORS based on TEN STATES STANDARDS

ERUs	Population (rounded up)	Average Flows*		Peak Factor**
		MGD	CFS	
1	3	0.000	0.000	4.5
2	5	0.000	0.001	4.4
5	13	0.001	0.002	4.4
9	23	0.002	0.003	4.4
13	33	0.003	0.004	4.3
38	95	0.008	0.012	4.2
80	200	0.016	0.025	4.1
140	350	0.028	0.043	4.0
223	558	0.045	0.069	3.9
336	840	0.067	0.104	3.8
477	1,193	0.095	0.148	3.7
660	1,650	0.132	0.204	3.6
890	2,225	0.178	0.275	3.5
1,180	2,950	0.236	0.365	3.4
1,540	3,850	0.308	0.477	3.3
1,980	4,950	0.396	0.613	3.2
2,530	6,325	0.506	0.783	3.1
3,210	8,025	0.642	0.993	3.0
4,050	10,125	0.810	1.253	2.9
5,100	12,750	1.020	1.578	2.8
6,410	16,025	1.282	1.984	2.7
8,050	20,125	1.610	2.491	2.6
10,130	25,325	2.026	3.135	2.5
12,800	32,000	2.560	3.961	2.4
16,240	40,600	3.248	5.025	2.3
20,740	51,850	4.148	6.418	2.2
26,730	66,825	5.346	8.271	2.1
34,850	87,125	6.970	10.784	2.0

*Average flow based on 200 gpd per ERU
 **Determined by formula $\frac{(18 + \sqrt{P})}{(4 + \sqrt{P})}$
 'P' = population in thousands

DIVISION 7

7-05 MANHOLES, INLETS, AND CATCH BASINS

Refer also to Standard Plans U-1 through U-14

7-05.2 MATERIALS

Precast concrete manholes for sanitary sewers shall meet the requirements of AASHTO M199. The joints may be the tongue and groove type or the shiplap type, sufficiently deep to prevent lateral displacement.

As an alternative to steel reinforcing, 48-inch diameter precast manhole barrel sections with no knock-outs using synthetic structural fibers may be used. These components shall meet the following requirements:

1. Synthetic fibers shall be monofilament or monofilament/fibrillated blend made of polyolefin, polypropylene, or polypropylene/polyethylene blend, meeting the requirements of ASTM C1116, Section 4.1.3, and ICC ES Acceptance Criteria 32, Sections 4.1.3 and 4.1.2. The fibers shall have a minimum tensile strength of 50 ksi and a minimum modulus of elasticity of 600, when tested in accordance with ASTM D3822. Additionally, the vendor or manufacturer must furnish an Engineering Report that provides test data in accordance with ASTM C1018 and/or ASTM C1399 from an ICC-qualified commercial laboratory relating to the specification requirements. The fibers shall be a minimum of 2 inches in length and have an aspect ratio (length divided by the equivalent diameter of the fiber) between 70 and 100 when the fibers are in their final phase.
2. When secondary synthetic fiber reinforcement is used in the cone section, a minimum of two hoops of W2 wire shall be placed in the 48-inch end of each cone. No steel is required in the remainder of the cone. The fiber shall meet the requirements of ASTM C1116, Section 4.1.3 3 and ICC ES AC 32, Sections 4.1.1 and 4.1.2. Synthetic fibers shall be added at a minimum dosage rate of 1.0 pound of nylon multifilament fibers per cubic yard of concrete or 1.5 pounds of polypropylene fibrillated fibers per cubic yard of concrete and shall be thoroughly mixed with the concrete before placement in the forms. The synthetic fibers shall be a minimum of 0.75 inches and a maximum length of 2 inches.

Manhole steps are required for all manholes except Type III manholes, which shall have no steps. Steps shall be reinforced copolymer polypropylene plastic as manufactured by Lane International Corporation or an alternate acceptable to the Department. Manhole steps shall have integral restraints to prevent side slippage of feet.

Manhole bases shall be monolithically cast with a wall which shall extend a minimum of twelve inches (12") above the top of the highest inflowing pipe. The channels shall conform accurately to the sewer grade. Entry couplings shall be "Kor-N-Seal" or a PVC manhole adapter as manufactured by GPK Products, Inc. or a Dura-Seal III gasket as manufactured by Dura-Tech, Inc., or acceptable alternate. Gasket material shall comply with the provision of ASTM D-2000 3 BA715. Kor-N-Seal shall be installed at the manhole manufacturer's plant. Field installation will not be permitted.

All manholes shall be constructed with gasketed eccentric cone sections, unless otherwise allowed by the Department.

Frames shall be cast iron conforming to the provisions of ASTM A48, Class 35B or ductile iron conforming to the provisions of ASTM A-536, Grade 80-55-06. Covers shall be ductile iron conforming to the provisions of ASTM A-536, Grade 80-55-06. Frames and covers shall provide a minimum 24-inch diameter opening. Castings shall be free of porosity, shrink cavities, cold shots or cracks, and all surface defects that impair serviceability. Frames and covers shall be machine ground on seating surfaces so as to insure non-rocking fit in any position and interchangeability.

7-05.3 CONSTRUCTION REQUIREMENTS

- The subgrade for the manhole shall be compacted with a rammer-type compactor to a level and uniform foundation before setting the manhole base.
- Covers shall be seated properly to prevent rocking.
- Leveling and adjustment devices that do not modify the structural integrity of the metal frame, grate or cover, and do not void the originating foundry's compliance to these specifications and warranty are allowed.
- Leveling and adjusting devices that interfere with the backfilling, backfill density, grouting and asphalt density will not be allowed. The hardware for leveling and adjusting devices shall be completely removed.
- The entry opening and manhole steps shall be vertically aligned and centered over the largest-diameter incoming pipe. Steps shall be cast in manhole sections or installed by being driven into a drilled or formed hole per manufacturer's recommendations. Chipping out or drilling an oversized hole and grouting in the steps shall not be acceptable.
- In the event any pipe enters the manhole through the precast concrete units, the Contractor shall make the necessary cut through the manhole wall and steel mesh. The steel shall be cut flush with the face of the concrete and shall be cut in such a manner that it will not loosen the reinforcement in the manhole wall. The cut shall be made by drilling or sawing but not by a sledgehammer.
- The ends of all pipes shall be trimmed flush with the inside walls.
- Joints between precast manhole units used for sanitary sewers shall be made watertight with a rubber gasket. All other joints and all openings cut through the walls shall be grouted and watertight. If gaskets are used, handling of the precast units after the gasket has been affixed shall be done carefully to avoid disturbing or damaging the gasket or contaminating it with foreign material. Care shall be exercised to attain proper alignment before the joints are entirely forced home. During insertion of the tongue or spigot, the units shall be partially supported to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned.
- Rigid pipes connecting to sanitary sewer manholes shall be provided with a flexible joint at a distance from the face of the manhole of not more than 1½ times the nominal pipe diameter or 18 inches, whichever is greater.
- Flexible pipes connecting to sanitary sewer manholes shall be provided with an entry coupling or gasket acceptable to the Department. No pipe joint in flexible pipe shall be placed within 10 feet of the manhole. Entry couplings shall be installed per manufacturer's recommendations. The opening shall be pre-formed or cored. Breaking an opening with a sledgehammer is not acceptable.

7-05.3(1) ADJUSTING MANHOLES TO GRADE

The adjustment section of the manhole shall be constructed using precast concrete adjustment rings, concrete brick or metal shims. Polyethylene adjustment rings may also be used, subject to the acceptance of the Department. "Infra-Riser", manufactured by East Jordan Iron Works, may be used. Each component of the adjustment section must be mortared in place with waterproof non-shrink mortar grout. The casting shall also be set in mortar. The adjustment section shall then receive coating of waterproof non-shrink mortar grout on the outside and inside and the joints on the inside shall be struck off and pointed.

The final rim elevation shall be set at 1/8- to 3/8-inches below the surrounding final pavement elevation or ground.

7-05.3(3) CONNECTION TO EXISTING MANHOLES

Connections to existing manholes shall be coordinated through Spokane County Environmental Services Department at least 24 hours in advance of the work. The County's representative shall be on-site prior to manhole core drilling and during connection. In addition, the Contractor shall notify Spokane County Wastewater Operations at (509) 477-1984 at least 24 hours prior to performing the work.

In making connection to existing manholes, core the manhole to the diameter sufficient for installation of the adapter diameter required for the pipe diameter shown on the Plans. Coring shall extend through the manhole shelf to the existing channel. Install the adapter and connect the new pipe to the manhole. Adapters shall be "Inserta-Tee" by Fowler Industries, and no substitutes will be accepted. Shape the new manhole channel to provide a smooth and uniform transition to the existing channel. The new channel shall slope at a minimum of 0.5% slope.

The crown elevation of laterals shall be the same as the crown elevation of the incoming pipe unless the Department authorizes a deviation. The existing base shall be reshaped to provide a channel equivalent to that specified for a new manhole.

Water used for flushing and testing shall not be allowed to enter sewer lines owned and operated by the County.

7-05.3(4) TESTING OF MANHOLES

The Department requires testing of all or some of the manholes constructed as part of the project. The number and location of the manholes to be tested will be determined by the Department. For each selected manhole that fails the test, the Department may require testing of an additional manhole in addition to re-testing the failed manhole.

Either the water exfiltration method or vacuum method described below shall be used for the manhole test.

1. Water Exfiltration Test: Prior to testing, the manhole shall be completely constructed, and all inlet and outlet pipes shall be plugged. The Contractor shall fill the manhole to a depth of 6-feet above the highest pipe crown with water. Four hours after the manhole has been filled, the Contractor shall refill the manhole to original water level and commence the test. The Contractor shall keep the water surface to the six-foot level for a 6-hour period. The leakage rate shall not exceed 0.2 gallons per hour per foot at test head above the pipe crown elevation.

2. Vacuum Testing: Each manhole shall not be tested until after final assembly and backfilling is completed. Plug all openings in the sides of the manhole and all pipes entering the manhole, taking care to securely brace the plugs from being drawn into the manhole. Openings shall be plugged with a non-shrink grout acceptable to the Sponsor's Engineer. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the test time is in accordance with the following table:

<u>Depth (ft.) of Manhole</u>	<u>Diameter (inches) / Time (seconds)</u>		
	<u>48"</u>	<u>60"</u>	<u>72"</u>
8	14	18	23
10	17	23	28
12	21	28	34
14	25	32	40
16	28	37	45
18	32	41	51
20	35	46	57
22	39	51	62
24	42	55	68
26	46	60	74
28	49	64	80
30	53	69	85

7-08 GENERAL PIPE INSTALLATION REQUIREMENTS

7-08.3 CONSTRUCTION REQUIREMENTS

Pipe installed within public right-of-way shall be constructed in accordance with the rules and specifications of the jurisdiction having authority. The contractor shall take measures to protect the public from property damage and personal injury that could be incurred by the contractor's work. The Contractor shall provide a Trench Excavation Safety System, per Chapter 39.04 RCW, meeting the provisions of the Washington Industrial Safety and Health Act, Chapter 296-155-655 WAC. The trench shall be of such width to provide safe working conditions in accordance with federal, state and local requirements.

For common excavation, the depth to be excavated below the pipe invert elevation shall be 4 inches where native material does not meet pipe zone bedding specifications, in the written opinion of the Engineer, and 6 inches for rock excavation. Pipe bell holes shall be provided at each piping joint to permit the joint to be made properly and to ensure that the pipe is supported along the full length of the pipe barrel and not at the joint. All ledge rock, boulders, and stones shall be removed to provide a minimum of 6 inches clearance under all portions of the pipe. All material excavated from trenches and piled adjacent to the trench shall be maintained so that the toe of the slope is at least 2 feet from the edge of the trench. It shall be piled to cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where necessary. Free access shall be provided to all fire hydrants, water valves, and meters; and clearance shall be provided to enable free flow of storm water in gutters, conduits, or natural watercourses.

Tracer wire shall be installed over all non-metallic pressure sewer pipe, including side services. The wire shall be placed approximately one foot above the top of the sewer pipe and shall be continuous its entire length. The tracing wire shall be directed vertically inside the mainline flushing connection points and service line curb stops and terminate approximately six inches below valve box or manhole cover. For the main line, the tracer wire shall be secured to the flushing connection assembly in a manner acceptable to the Department.

The Sponsor's Engineer is responsible for confirming during construction that the trench bottom material is adequate to support pipe and manholes. If the trench material is not adequate, the unsuitable material shall be over-excavated as needed and replaced with crushed surfacing top course.

7-08.3(1)C BEDDING THE PIPE

Placement of bedding material shall precede the installation of all pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will be supported on a uniformly dense unyielding foundation. Pipe zone bedding shall provide uniform support along the entire pipe barrel, without load concentration at joint collars or bells. All adjustment to line and grade shall be made by scraping away or filling in with bedding material under the body of the pipe and not by blocking or wedging.

Pipe zone bedding shall be compacted to 92 percent maximum density. Bedding shall be placed, spread, and compacted before the pipe is installed so that the pipe is uniformly supported along the barrel. The Contractor shall compact the bedding beneath the spring line of the pipe with a "J" bar or similar device acceptable to the Engineer. A maximum of 6 inches of bedding material shall be placed before use of the "J" bar. Bedding material shall be placed a minimum of 12 inches horizontally to each side of the pipe to facilitate compaction of the bedding material. Bedding material shall be placed to a minimum depth of 12 inches above the pipe prior to backfilling.

Native material meeting the gradation limits provided below may be used for bedding the pipe unless the Engineer requires the use of imported bedding. Imported bedding shall be Crushed Surfacing Top Course or a clean sand/gravel mixture. All pipe zone bedding shall be free from organic matter and conform to the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
¾" square	100
U.S. No. 4	50-100
U.S. No. 200	0-15

7-08.3(2)B PIPE LAYING – GENERAL

SEPARATION BETWEEN WATER AND SANITARY SEWER LINES

Sanitary sewers shall be installed in compliance with Section C1-9.1 of the Criteria for

Sewage Works Design regarding the required separation from potable and reclaimed water lines. When a sewer line is sleeved, the ends of the pipe sleeve shall be plugged with grout to prevent soil and groundwater migration into the casing.

7-08.3(3) BACKFILLING

Pipe zone backfill material shall be clean earth or sand, free from clay, frozen lumps, roots, or moisture in excess of that permitting required compaction. Rocks or lumps larger than 3 inches maximum shall not be used for pipe zone backfill.

Pipe zone backfill shall be placed and compacted in accordance with the jurisdiction having authority over the roads and rights-of-way in which the work takes place. Backfill shall be brought up simultaneously on each side of the pipe to the top of the pipe zone. The pipe shall then be covered to the top of the pipe zone and the materials compacted in a manner to avoid damaging or disturbing the completed pipe.

7-08.3(4) PLUGGING EXISTING PIPE

Existing pipes and conduits greater than nominal 4" diameter and not being utilized shall be plugged on the exposed open end for a distance of two pipe diameters with commercial concrete or mortar. Care shall be used in placing the concrete in the pipe to see that the opening of the pipe is completely filled and thoroughly plugged.

7-17 SANITARY SEWERS

7-17.2 MATERIALS

Acceptable pipe for Gravity Sewers:

- Solid Wall PVC pipe conforming to ASTM D3034, SDR 35 or ASTM F-789. Joints shall meet ASTM D 3212 with integral elastomeric gaskets conforming to ASTM 477. Profile wall PVC pipe shall not be used, unless allowed by the Director for a specific situation. PVC Pipe fittings conforming to ASTM 3034, SDR 35 except that all main line tees and wyes shall be SDR 26.
- Ductile Iron pipe conforming to ASTM A746. Cement-mortar lined. Bell and spigot type with push on joints conforming to ANSI A21.11. Exterior coating meeting ANSI A21.51
- Vitrified Clay sewer pipe conforming to ASTM C700. Joints shall be compression joints in accordance with ASTM C425.
- Reinforced Concrete Pipe, RCP, conforming to ASTM C76 or ASTM C655. The appropriate ASTM specification and pipe class shall be determined by the installation and operating conditions.

Acceptable pipe for Pressure Sewers:

- Ductile Iron pipe for pressure sewers shall conform to ANSI/AWWA C150/A21.51 and ASTM A746-03. The pipe shall be lined with ceramic epoxy ("Protecto 401[®]"), or an alternate lining system acceptable to the Department, to effectively resist corrosion. Installation shall be consistent with AWWA C-600. In corrosive soils, the piping may be required to be protected with polyethylene encasement in accordance with AWWA C105. Joints and method of joint restraint shall be determined by anticipated pressure

conditions as approved by the Department. When thrust blocking is permitted, it shall be achieved with pour-in-place concrete. Using pre-cast blocks is not permitted.

- The Department shall make case-by-case determinations regarding the use of PVC pipe for specific sewer force mains. When allowed, PVC pipe (4-inch diameter and greater) shall be AWWA Class C-900 or C-905 conforming to ASTM D 1785 with fittings per ASTM D 2466 and D 2467. Pipe must be solid-wall. Cellular core pipe is not acceptable.
- PVC pipe (3-inch diameter and smaller); Schedule 80 per ASTM D 1784 and D 1785.
- High Density Polyethylene (HDPE) (1-1/4" – 3" dia.) shall be manufactured in accordance with ANSI/AWWA C901 and shall meet ASTM D3035, ASTM F714 SDR 11. Joints shall be Standard Mechanical HDPE couplings or fusion welding conforming to ASTM D3261. Joining of plain-end pipes shall be by butt fusion per PPI TR-33. Inserted Stiffeners are required when using mechanical couplings.

It is not intended that materials listed are to be considered equal or generally interchangeable for all applications. The Sponsor's Engineer shall specify the pipe material on the plans and the use of the selected material shall be subject to review and acceptance by the Department.

All pipe shall be clearly marked with type, class, and thickness designation as appropriate. Lettering shall be legible and permanent under normal conditions of handling and storage.

Couplings are subject to the acceptance of the Department. Only rigid couplings will be allowed.

Ball valves for flushing connections and mainline shutoff valves on 3-inch diameter and smaller pressure lines shall be 2-way, full port, stainless steel ball valves, sized to match force main diameter. Provide operating nut in place of shutoff handle. Provide valve key.

Valve box covers for mainline shutoff valves shall have the word "Sewer" cast in the lids.

Tracing wire for force main and pressure side sewers shall be 10 gauge galvanized aluminum.

Detectable marking tape for force main and pressure side sewers shall be 2-inch wide with encased aluminum wire, minimum 10 gauge and identified for buried sewer.

7-17.3 CONSTRUCTION REQUIREMENTS

TRENCHLESS UNDERCROSSINGS

Reference Standard Plans U-24 & U-25

In addition to the typical warranty required by the Spokane County Environmental Services Department for sanitary sewer projects, the Environmental Services Department requires a five year warranty for the Contractor to repair any ground settlement within twenty five feet (25') of either side of the centerline of trenchless undercrossings. The five (5) year warranty shall commence on the date of acceptance of the system by the Environmental Services Department.

A permit to work within the public right-of-way must be obtained from the jurisdiction having authority prior to performing any trenchless undercrossing work. The Developer and his Contractor are fully responsible to meet the requirements of all municipal agency, railroad and

WSDOT Franchise / Utility permit(s) associated with the specific undercrossing even though the WSDOT Franchise / Utility permit may list Spokane County as the utility owner.

Unless otherwise approved by the Director, only the Auger Boring or the Pipe Ramming methods are allowed for trenchless undercrossing installations.

AUGER BORING METHOD: Auger Boring is a trenchless construction method that involves simultaneously jacking a casing pipe through the earth while removing the soil using a flight of augers within the jacking pipe. The auger flights are rotated to transport the spoils to the jacking pit. Hydraulic jacks located in the jacking pit are used to propel the boring head, auger flights and jacked pipe sections forward. Casing Pipe for Auger Boring shall be steel casing pipe conforming to ASTM 139, Grade B, and shall have minimum yield strength of 36,000 psi or as specified by the requirements of the permitting agencies. Ends of the steel casing pipe shall be beveled or field butt-welded joints in accordance with the requirements of AWWA C 206 or a press-fit connection manufactured by Perma-Lok or an approved equal. All Casing Pipe shall be joined by a full penetration butt weld around the entire Casing Pipe.

Casing grout ports shall be installed on both sides of the spring line and at the crown of the casing pipe. Sets of three casing grout ports shall be installed on maximum ten (10) foot spacing. Immediately upon completion of the Auger Boring operation the Contractor shall grout the exterior of the casing pipe to fill any voids caused by the Auger Boring and to prevent any ground settlement of the surrounding material. Grout shall conform to ASTM C 476, Fine Grout standard and shall have a 28-day compressive strength of 300 psi Minimum.

PIPE RAMMING METHOD: Pipe Ramming is a trenchless installation of an open-ended steel casing by repeated, percussive forces that impart energy to the end of the casing. During the pipe ramming process, soil enters into the open ended casing. Upon completion of the pipe ramming process, soil is removed from within the pipe.

The Casing Pipe for the Pipe Ramming method shall be steel pipe conforming to ASTM 139, Grade B, and shall have a minimum yield strength of 50,000 psi and meet the requirements of the permitting agency(s). No hydrostatic testing is required for the casing pipe; however, all other requirements for of ASTM 139, Grade B will apply. Ends of the steel casing pipe shall be beveled or field butt-welded joints in accordance with the requirements of AWWA C 206. All Casing Pipe shall be joined by a full penetration butt weld around the entire Casing Pipe.

Formation Grouting

The Department may require formation grouting to take place prior to installation of the casing to provide soil stabilization along the alignment and shaft base stability. Typical methods include jet grouting, permeation grouting and compaction grouting. The Sponsor's Engineer is responsible for determining the proper method and material for this process.

Casing Spacers

Pre-Fabricated casing spacers shall be a minimum width of eight inches (8") and have a minimum of four runners. Spacers shall be T-304 stainless steel or coated steel structures with dielectric insulators when ductile iron carrier pipes are specified. For PVC carrier pipe up to 48" O.D., spacers are required within one foot of each end of the pipe and intermediate spacers

installed at a maximum spacing of six feet. For ductile iron carrier pipe, the maximum intermediate spacing is ten feet. Spacing shall be reduced if recommended by the casing spacer manufacturer. The spacing and the weight-bearing structure of steel casing pipe and the pre-fabricated spacers shall be designed for a full pipe condition. The design shall be stamped and signed by a Professional Engineer licensed in the State of Washington. The design shall verify that the carrier pipe will not be damaged during installation of the carrier pipe and spacers into the casing pipe.

End Seals

End Seals shall be installed at both ends of the casing pipe. End seals shall be pre-manufactured, designed for the specific purpose of preventing the migration of soil or liquid into the annular space of the casing pipe.

The annular space between the carrier pipe and the casing pipe shall not be filled except as necessary to seal the ends of the casing.

7-17.3(2) CLEANING AND TESTING

All sewers and appurtenances shall be reasonably clean prior to acceptance by the Department. All sewer mains and sewer service stubs shall be tested by the low pressure air method. Tested portions of gravity pipe shall include main line and all side sewers between manholes. Tested portions of force mains shall include flushing connections. All mandrel and pressure testing shall be witnessed and recorded by the Sponsor's Engineer.

All wyes, tees, and stubs shall be plugged or capped to withstand the internal test pressure. The ends of the stubs shall be beveled carefully prior to installing the plugs or caps to facilitate future connection to the stub. Plugs and caps shall be readily removable.

- Low Pressure Air Test Method for Gravity Sewers of Non Air Permeable Material

Non air permeable materials include ductile iron, ABS composite, polyvinyl chloride (PVC), and polyethylene (PE). When non air permeable pipe is subjected to a low-pressure air test, all of the provisions of Section 7-17.3(2)E shall apply, except that the time in seconds for the pressure drop shall be equal to or greater than four times the required time calculated in Section 7-17.3(2)E.

Pipe over 30 inches in diameter shall be tested one joint at a time in accordance with ASTM C 1103.

Reaches of thermoplastic pipe containing no joints are exempt from testing requirements.

- Testing Force Main

Force mains shall be hydrostatically tested with a minimum pressure 50 percent greater than the design working pressure for 15 minutes. No loss in pressure is permitted. The force main shall be tested with shut off valves at the main open and the outermost stub valves closed. A test plug shall be used only at the manhole connection point.

7-18 SIDE SEWERS

Reference Standard Plans U-16 through U-19

7-18.3 CONSTRUCTION REQUIREMENTS

Side sewer stubs shall meet the same material and installation requirements as the sewer mains. All PVC tees and wyes must be SDR 26. Compaction of the pipe zone material immediately below side sewer adjacent to the main line tees is critical to reducing stress on the tees and pipe.

For gravity service, Side Sewers Stubs shall be Type "A" whenever possible. Refer to Standard Plan U-17. Type "B" stubs are permitted when the Sponsor's Engineer feels the additional depth is beneficial to obtaining gravity service. Type "C" stubs are only allowed between the last and the next to last manholes on a branch of the pipe system. Type "C" stubs are not allowed if an upstream extension of the pipe system is anticipated in the future.

All side sewers shall be installed by open trenching.

Testing of the stubs must be incorporated with the main line testing.

CONNECTION OF EXISTING DRY LINES

Where directed by the Department, existing dry lines shall be connected to the new sewer main. The Contractor shall field verify the location and elevation of the existing dry line prior to installing the side sewer tee. The connection shall not be made until after the new mainline sewer and side sewer stubs have been successfully tested. A cleanout shall be installed at the point of connection to the dry line.

SIDE SEWER RECORD DRAWINGS REQUIRED

The Sponsor's Engineer will prepare and provide to the Department a record drawing for each side sewer stub. The required record information shall be provided on Spokane County Standard Plan U-16 or a similar form acceptable to the Department.

INSTALLING NEW SERVICES TO EXISTING PUBLIC SEWER

Connection to existing public sewer mains shall be coordinated through the Department a minimum of 24 hours in advance of the work. The existing mainline pipe shall not be cored or cut until a representative of the Department is on-site. In addition, the Contractor shall notify Wastewater Operations (477-1984) 24 hours prior to performing the work.

When adding service connections to existing PVC sewer line, the Contractor shall use a hole saw to cut the PVC sewer line at 10 o'clock or 2 o'clock positions. Other locations must be authorized by the Department. Saddle taps shall utilize the "GPK Saddle with Centering Ring", Series 136 CR. or approved equal.

When installing a new 6-inch service to existing 8-inch PVC sewer lines, saddle taps are not permitted. The connection must be made by installing an 8-inch x 8-inch x 6-inch PVC Tee, using two 8-inch PVC rigid, slip repair couplings with rubber gaskets.

When adding service connections to existing RCP sewer line, the Contractor shall core drill RCP sewer line at 10 o'clock or 2 o'clock positions and install "Inserta Tee" by Fowler Industries.

SLEEVING SIDE SEWER PIPE

All side sewer pipe installed above a water pipe shall be sleeved. All side sewer pipe installed with less than 18-inches of clearance between the outside wall of the sewer pipe and the

outside wall of the water pipe shall be sleeved. The sleeve shall be one continuous segment of pipe 20-feet in length, and shall be centered over the waterline crossing. Waterproof grout shall be placed in the annular space at the ends of the sleeve to prevent soil migration into the sleeve.

When a side sewer is required to be sleeved, the sleeve shall be material meeting AWWA C900 minimum requirements. In cases where the top of the side sewer pipe is less than 4-feet below grade at the edge of traveled way, steel casing material shall be used.

END PIPE MARKER

The Contractor shall mark the location of the side sewers at the property line with a 2-inch by 4-inch board that extends from the top of the side sewer riser to within 6-inches below the top of the ground. An 18-inch length of ½-inch rebar shall be secured to the top portion of the board and set at 6-inches below grade.

7-19 SEWER CLEANOUTS

Reference Standard Plan U-15

7-19.3 CONSTRUCTION REQUIREMENTS

Sewer Cleanouts for sanitary sewer main lines may be allowed in lieu of manholes when approved by the Director *and* only as a temporary installation. The maximum distance from a main line clean-out to the downstream manhole shall not exceed one hundred feet.

All cleanouts located in public rights of way shall be extended to grade and accessible through a traffic-rated valve box.