

**CITY OF ANACORTES
ENGINEERING DEPARTMENT**

CHAPTER 5

SANITARY SEWER



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CHAPTER S1 – SEWER PLANNING/DESIGN STANDARDS**S1-01 PLANNING CRITERIA**

Sanitary sewer construction must conform to the City of Anacortes Comprehensive Sewer Plan and the City of Anacortes Engineering Standards. See also the Washington State Department of Ecology's Criteria for Sewage Works Design, the WSDOT/APWA Specifications, the WSDOT/APWA Plans and the current version of the WSDOT Standard Specifications for Roads, Bridge and Municipal Construction.

S1-01.1 Serve to Extreme of Property

Ensure adjacent properties can be provided sewer service (Extend to extreme of property and design for the ultimate development of the tributary areas).

Sewer service shall be provided by a gravity system (unless approved by the City of Anacortes Engineering Department).

S1-01.2 System Projections

Demand projections are taken from the City of Anacortes 1992 Comprehensive Sewer Plan:

A. Unit Demands

Residential - 100 Gallons per capita per day (GPCD)

Commercial - See Table G.2-1 Design Basis for New Sewage Works of the 1998 DOE, Criteria for Sewage Works Design, page G2-6.

B. Population Densities

3.0 People per single family unit

2.5 People per multi-family unit

C. Peaking Factors

Peaking factor is 2.5 and 4.0. Unless approved by the Public Works Director.

S1-01.3 Infiltration/Inflow (I/I) Allowances

A. For new systems, 0 gallons per acre per day (GPAD) shall be used.

S1-01.4 System Parameters

A. New sewer lines shall be designed so that, under ultimate development, peak flow, shall not exceed 50% capacity of the line. Including all lands above said sewer, which may ultimately flow into said sewer line when developed. Existing lines that have peak flows to 50% capacity of the line will require a detailed analysis of maximum expected future flows. Upsizing maybe required to meet the future conditions.

The Engineer of Record shall model sewer capacity needs to determine the required pipe sizes.

S1-01.5 Private Sanitary Sewage Pumps

- A. Unless otherwise approved, private sewage pump stations are prohibited.

If long-term maintenance costs for a public gravity system are prohibitive, the City may allow a private, onsite sanitary sewer pump to serve isolated, topographically constrained areas within a specific development. If allowed, system maintenance and operations standards are subject to City approval, and conditions relating to the pump system will be placed on the development as necessary.

S1-01.6 Public Sanitary Sewage Pumps Stations

- A. Certain locations are identified in the City of Anacortes Comprehensive Plan for sanitary sewer pump stations, and other locations may be found by engineering studies to require a public pump station. All pump station designs are subject to City approval and must be adequate to serve extended areas. See a typical pump station design schematic in the appendix.

S1-02 **GENERAL DESIGN STANDARDS**

- A. All lengths and dimensions shall be horizontal distances, no slope distances on plans.
- B. Indicate type of pavement restoration required by the City of Anacortes, if working in the streets.
- C. Dimension existing and new main locations from the Right-of-Way line and/or property line, or label stations and offsets.
- D. Check with the City of Anacortes Engineering Department to determine how surrounding development will affect design (i.e. serve to extreme of property if adjacent property has potential for future development).
- E. On plans, show existing manholes or give reference distance to existing manholes from new project including manhole number and invert/rim elevations. The City of Anacortes Engineering Department will assign a number for the manhole after first submittal.
- F. Check with the City of Anacortes for necessary permitting requirements.
- G. Existing sewer lines to be abandoned shall be filled with sand, concrete, Control Density Fill, or removed. Identify on the plans.
- H. Manholes connected to lines being abandoned, shall be re-channeled with 3,000 PSI cement concrete.
- I. Manhole lids will not be located within the traveled portion of the street or within any portion of the curb and gutter.
- J. Manholes shall not be placed in the low spot of the road that would allow inflow of street runoff.
- K. Manholes shall be placed at the end of every main. Unless the mainline can be extended, then an appropriate sized clean-out is acceptable, such as Nyloplast, or approved equal.

S1-03 MAIN LINES**S1-03.1 Minimum Pipe Size**

Minimum pipe size shall be 8 inches.

S1-03.2 Pipe Slope

- A. Minimum slope for 8-inch pipe is 0.04 ft/ft, unless otherwise approved. Sewer velocity must be not loess than 2.0 feet per second (fps) for anticipated maximum flows. The Design Engineer must provide and demonstrate self-cleaning velocity.
- B. Maximum main line slope shall not induce velocities greater than 10 feet per second (fps) under daily peak flows.
- C. Pipe anchor blocks shall be placed at 20-feet O.C. where pipe slope exceeds 20%.

S1-03.3 Plan View

- A. List pipe length, size and material along side pipe, eg. 150 LF – 8" PVC. Pipe material can be listed in a general note in lieu of listing along pipe.
- B. Pipe length is to be based on horizontal distance between center of manholes.
- C. Indicate direction of flow with arrows on end of pipe entering manhole.

S1-03.4 Profile View

- A. List pipe length, size and slope to 4 decimal places (ft per ft), eg. 150 LF – 8" PVC S=0.0125. Pipe material can be listed in a general note in lieu of listing on profile.
- B. Slope is based on I.E. OUT of upstream manhole, I.E. INTO downstream manhole and horizontal distance between center of manholes.

S1-04 MANHOLES

- A. Maximum distance between manholes shall be 400-feet.
- B. All manhole covers shall be set flush with ground surface, except where otherwise designated by the City of Anacortes. Manholes in unpaved areas, in easements, shall have bolt-locking covers. All manholes in paved areas and sidewalks shall have standard, non-bolt locking covers.
- C. Maintenance vehicles must have access to manholes located outside the street Right-of-Way. The all-weather drivable surface must be adequately wide and graded to allow maintenance vehicles to drive over and have access to manholes.
- D. Shallow manholes (Type III), less than 5-feet need special approval. The diameter shall be a minimum of 4-feet throughout with a precast H-20 rated flat top with ring and lid located directly above the steps.
- E. If manholes have rubber boots, the manholes shall be factory cored and rubber booted. No mortar pipe seals.

- F. When connecting the pipe to new manholes, the preferred method is the use of the A-LOK flexible connector, KOR-N-SEAL by NP, Inc., or approved equivalent. The connections between pipe and manhole require flexible connectors, see WSDOT/APWA Specifications Section 7-05.3. Sand-collars can be used on a case-by-case basis or when retrofitting to an existing manhole.
- G. Concrete perimeter seals shall be provided around all manhole adjustment sections in easement areas:
- Paved areas – See the current EDS Standard Detail, ST-02 - “Structure Adjustment and Perimeter Seal”.
 - Unpaved areas – See the current EDS Standard Detail, ST-02 – “Structure Adjustment and Perimeter Seal”.
- H. Existing and Terminal Manholes:
- When connecting to an existing manhole, all requirements of these Engineering Standards must be met. The design shall call-out all necessary revisions to the existing manhole, or if the existing manhole cannot be renovated to meet the standards, the manhole shall be removed and replaced with a conforming structure.
- When there is a potential for future main line extension from terminal manhole, position side sewer connections to manhole to avoid conflict with future main line connection to manhole.
 - Terminal manholes (without side sewer connection) shall not be channeled. Slope manhole base to provide positive drainage toward pipe, use 3,000 PSI concrete. When doing this, identify on the plans for ease of identification.
- I. Where side sewers connect to a manhole, invert of side sewer shall be equal to or above main sewer connection, but not to exceed 18-inches above the invert of the main sewer.
- J. Drop inverts elevation across manhole shall be from 0.1 ft to 0.2. Maximum allowable drop in invert elevation across the manhole shall be 1.0 ft.
- K. Manhole sizing:
- 48” manhole
 1. 2 connecting pipes, 8” diameter to 12” diameter.
 2. 3 connecting pipes, 8” diameter to 10” diameter.
 - 54” manhole
 1. 2 connecting pipes, 15” diameter to 21” diameter
 2. 3 connecting pipes, 10” diameter to 15” diameter
 3. 4 connecting pipes, 8” diameter to 12” diameter
 - 72” manhole
 1. 2 connecting pipes, 21” diameter to 24” diameter
 2. 3 connecting pipes, 15” diameter
 3. 4 connecting pipes, 15” diameter
- For other pipe configurations, the size of the manhole will be investigated on a case by case basis.

The minimum angle between the incoming and outgoing pipe shall be 90 degrees; pipe shall be radial with the center of the manhole.

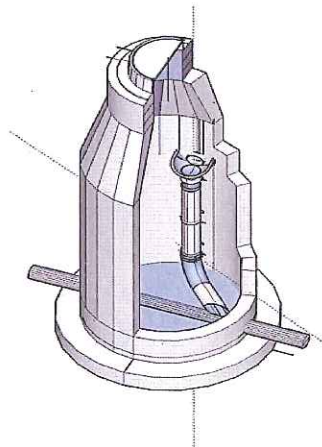
The above configurations shall provide adequate shelves and room for maintenance and performing video inspections.

- L. Channels shall be centered in manhole.
- M. Ladder rungs shall be placed on side of manhole with largest shelf.
- N. Minimum manhole depths (invert to top of rim):

MANHOLE SIZE	PIPE SIZE	MIN. MH DEPTH	COMMENTS
48"	6"	5.0'	
	8"	5.0'	
	10"-12"	5.0'	
54"	8"	5.0'	
	10"-12"	5.0'	
	15"-18"	5.0'	
72"	15"	5.0'	Flat-top manhole, 2 access lids (one over each major pipe entrance/exit).
	18"-24"	5.0'	
	27"	5.0'	

72" manholes over 11.5' in depth shall include 48" reducing section (WSDOT Type II Manhole).

- O. Glass fiber supported plastic or PVC-hard lined manhole channels will be allowed at contractor's option.
- P. Drop Manholes:
 - Inside drop structure are allowed on connections to existing manholes, unless an existing sewer main line is being replaced. The construction of an inside drop connection shall be done utilizing a Reliner Drop Bowl System, or approved equal (www.reliner.com/dropbowl/specs).



Example of Drop Bowl Connection

S1-04.1 Doghouse Style Manhole and Installation

1. This type of application is not specifically desired by the City of Anacortes Public Works Department. Each application will be reviewed on a case-by-case scenario and must have written approval by the Public Works Director.
2. An upstream sewer analysis shall be performed by a Professional Engineer, prior to any approval by the Public Works Director, to determine actual volume/flow rates.
3. The Engineer of Record shall submit a "Deviation Request" as outlined in GEN-05 of the EDS Standards.
4. See Standard Detail "S-02 – Doghouse Manhole Detail" for further installation requirements.

S1-04.2 Flow Channeling

Refer to Standard Detail "S-01 – Flow Channel Typical" for guidelines.

S1-05 **PIPE CLASS / PROTECTION / COVER****A.** Poly Vinyl Chloride (PVC) pipe class designation:

All sewer pipe shall be SDR 35 PVC conforming to ASTM D3034, unless otherwise determined by the City of Anacortes.

Depth of cover over SDR 35 PVC pipe shall be 2' minimum and 20' maximum. Pipe depths outside this range will require use of pressure class PVC conforming to AWWA C900 (dimension ratio of 18 or less).

B. PVC pipe shall be encased in a steel or ductile iron casing when crossing under improvements where the ability to remove and replace pipe without disturbance to the improvement is needed. Casings are required when:

- Crossings under rockeries are over 5' high.
- Crossings under retaining wall footings over 5' wide.
- Crossings under reinforced earth retaining walls (both wall and reinforced material).

Casings shall extend a minimum of 5' past each edge of the improvement, or a distance equal to the depth of pipe which ever is greater. The carrier pipe shall be supported by casing spacers where casing length exceeds 10'.

Minimum clearance between bottom of rockery and top of pipe or casing shall be 24-inches. The trench shall be backfilled with crushed rock when clearance is less than 36-inches.

C. Ductile Iron Pipe, Class 52, shall be used only where required by the City of Anacortes.**D.** All buried metal pipe shall be encased in 8-mil polyethylene per AWWA C-105.**E.** Building setback requirements: This is to be used in unusual conditions when it is impossible to locate the sanitary sewer mains in the Public Right-of-Way.

- 5' minimum from covered parking.
- 10' minimum from building and retaining walls, or equal to depth of pipe, whichever is greater.

- 20' minimum easement shall be provided between buildings. The legal description for said easement shall be "10-foot either side of the pipe as constructed."
- When passing between any two buildings (Residential or Commercial, Etc.) which are 25' apart or less, the easement width shall extend the full width between the buildings, and the depth of the sewer line shall not exceed 10'.

S1-06 CLEARANCE / OTHER UTILITIES

- A. All clearances listed below are from edge-to-edge of each pipe.
- B. Water services and sewer stubs shall have at least 5' horizontal separation.
- C. Check for crossing or parallel utilities. Maintain minimum vertical and horizontal clearances. Avoid crossing at highly acute angles (smallest angle measure between utilities should be between 45 and 90 degrees).
- D. Horizontal clearances from sewer main:
- | | |
|-------------------------|-----|
| Cable TV | 5' |
| Gas | 5' |
| Power | 10' |
| Storm Sewer | 5' |
| Water | 10' |
| Telephone, Fiber Optics | 10' |
- E. Vertical clearances from sewer main:
- | | |
|-------------------------|----|
| Cable TV | 1' |
| Gas | 1' |
| Power | 1' |
| Storm Sewer | 1' |
| Water | 2' |
| Telephone, Fiber Optics | 1' |
- F. Where the sewer crosses above or below the water main, one full length of sewer pipe shall be used with the pipe centered for maximum joint separation. Washington Department of Ecology criteria will also apply.
- G. Send letter and preliminary plan to existing utilities to inform them of new construction. Request as-built information and incorporate into plans. At minimum, the following utilities should be contacted; See the Contact List under Standard Notes.
- Cable Television, Natural Gas, Power, Water, Storm Drainage, Telephone, Fiber Optics

S1-07 CONNECTION TO EXISTING SYSTEM

- A. New sewer mains (8" and larger) shall connect to existing sewer main at existing manholes, or with new manhole on existing sewer.
- B. When connecting to existing manhole, core-drill opening for pipe and re-channel manhole base.

- C. Where new main is larger in diameter than existing downstream main, check that the capacity of existing main is not exceeded by flow from new main. See section S3-01.4 "System Parameters".
- D. When connecting to existing manhole, check that requirements of section S3-04.G are satisfied.
- E. If connecting to existing manhole which has access less than 24" in diameter ring and cover and/or concentric cone (manholes over 5' deep), manhole shall be upgraded to include new 24" ring and cover and/or eccentric cone.
- F. If connection to existing manholes places a channel directly under access opening, move ladder and rotate cone section to place access over concrete shelf.
- G. Connections to end of existing pipe:
- If end of pipe is known to have a bell, and new pipe is same material as existing, plans can specify connection by inserting spigot of new pipe into existing bell end, with "donut" gasket.
 - If existing line is plain end, or must be cut, plans shall specify use of a coupling to connect new and existing lines.
- H. Approved couplings for use on sewer mains include:

Ductile iron mechanical couplings (equal to ROMAC) on ductile iron, concrete, vitrified clay, or pipes with differing materials or diameters.

On PVC or PE mains, PVC or PE couplings with compatible dimension ratio and gaskets to connect new and existing pipes shall be used.

Where a section of existing PVC pipe is replaced by "dropping in", a new section of PVC pipe, the connections to existing pipe shall be made with PVC closure couplings (slip couplings).

S1-08 FATS, OILS, GREASE SEPARATION

S1-08.1 Oil/Water Separator

Businesses that regularly wash vehicles, equipment, or engines or use acids, caustics, or other metal brighteners must use zero-discharge, closed-loop water recycling systems. Contact the Skagit County Health Department regarding sludge disposal.

- A. Evaporator type systems meeting Air Pollution Authority requirements are also permissible.
- B. Contractors must submit the maintenance and operation plan for these systems for the City's approval.
- C. Miscellaneous floor drains within these businesses may discharge to the sanitary sewer system following pre-treatment for oil removal.
- D. Maintain free access to the separator at all times for inspection and compliance determination sampling. A sampling tee must be located on the outlet with a minimum 18-inch drop below the invert.

Whenever an industrial or commercial business generates mineral/petroleum oils exceeding 100 milligrams per liter to be discharged to the sanitary sewer, pre-

treatment is required. An oil/water separation device shall be installed by the property owner as specified on various standard details. Selection and sizing of an oil/water separator to the sanitary sewer system shall not contain in excess of 100 milligrams per liter of petroleum oil, non-biodegradable cutting oil or mineral products, and shall be in compliance with the City of Anacortes regulations for discharge to the sanitary sewer.

- A. Sizing of a separator facility shall be based upon maximum available flow to the separator and provision of a **forty-five minute retention time** in the separator at that flow, with a minimum capacity of at least 100 gallons.
- B. The oil/water separator shall be covered with removable section access and inspection covers, weighing not more than 30 lbs. Suitable handholds are to be provided directly above inspection "tee" and oil/grit collection compartments.
- C. Only waste water from floor drains and covered parking areas shall drain to the separator. The location and design shall minimize or eliminate the possibility of storm water reaching the separator – areas over two hundred square feet open to rainfall shall not drain to the separator. Sewage from restrooms and shower facilities shall not drain to the separator.
- D. Allowable materials for construction are as follows:
- E. The separator shall be located within 20-feet of drive for access by maintenance vehicle.
- F. A sampling tee shall be located on the outlet with a minimum 18-inch drop below the invert. Access to the separator shall be maintained free for inspection and compliance determination sampling at all times.
- G. The effluent discharge from any oil/water separator to the sanitary sewer shall not exceed 100 parts per million total oil.
- H. When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or fill with compacted crushed rock or control density fill.

S1-08.2 Grease Interceptor

Whenever a commercial and/or retail food preparation operation, regardless of size, generates animal/vegetable fats, oils or grease (F.O.G) waste, which causes a visible sheen or accumulations, to be discharged to the sanitary sewer, pre-treatment is required. A grease interception device as specified by various City of Anacortes standards, and/or other biological, chemical, or other pretreatment approved by the City of Anacortes, shall be installed by the owner. Effluent discharged from any grease interceptor shall not contain a visible sheen or accumulations of F.O.G., and shall be in compliance with the City of Anacortes regulations for discharge to the sanitary sewer.

- A. Size and design of the grease interceptor shall conform to the uniform plumbing code, appendix H standards, and shall be subject to approval by the City of Anacortes. Minimum capacity shall be 600 gallons except as noted by the City of Anacortes.

- B. Fixtures in the kitchen area which discharge waste water containing grease are to be connected to the grease interceptor. Such fixtures include dishwasher, pot sinks, range woks, janitor's sink, floor sinks, rotoclones. Toilets, urinals, and washbasins shall not flow through the interceptor.
- C. The interceptor shall be located outside the building within 20-feet of drive for access by maintenance vehicle.
- D. The interceptor shall be filled with clean water prior to start-up of system.
- E. Allowable materials for construction are as follows:
 - Tank – Concrete
 - Baffles – Concrete, Steel Plate
- F. Access to the interceptor shall be maintained free for inspection and compliance determination sampling at all times.
- G. When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or fill with compacted crushed rock or control density fill.
- H. A City of Anacortes approved maintenance program must be posted in the kitchen area.

S1-09 EASEMENTS

- A. Show easements on plans and identify width.
- B. Show easements on all private property. If easement is defined as a constant width on each side of sewer main, then show a segment of the easement and label as typical (Typ.).
- C. All easements with public utilities shall be granted to the City of Anacortes.
- D. All easements shall be a minimum of 20' in width, unless otherwise approved or required by the City of Anacortes.
- E. Also, see Section S3-05.E. "Building Setback Requirements".

S1-10 SIDE SEWERS

- A. Side sewer stubs shall extend from main line to 10-feet past edge of property line. 6-inch pipe shall be used inside the Public Right-of-Way (unless expected flows require larger size line).
- B. The end of each sanitary sewer stub shall be marked with a pressure treated 2x4 painted green, or a PVC pipe. It shall be placed at the flow line of the stub and extend 4 feet above finished grade. There shall be a permanent mark labeled "SEWER" with a depth to the flow line on the stub marker.
- C. 6-inch minimum pipe shall be used for private joint-use sewers, and when crossing a property outside the lot to be served.

Commercial side sewers shall be minimum of 6-inch pipe.

For Multi-family developments, side sewers for each separate building must be at least 6-inches in diameter. For those buildings serving over ten units or for side

sewers serving more than one building, side sewers shall be a minimum of 8-inches in diameter and must connect to a manhole.

- D. Side sewers shall have a minimum of 6-feet of cover at the property line. Greater depths may be required where elevation of lowest floor to be served is lower than surface elevation at the property line. Ensure that the stub can serve all property by gravity flow.
- E. Joint-use side sewer stubs are not allowed where the slope of the side sewer is less than 2%. Provide a single stub to "low" end of each lot, and show invert elevation of each stub on the plan. Uniform Plumbing Code may also require a backwater valve.
- F. Side sewers shall connect to main sewers with a sweeping tee/wye. Straight tees are unacceptable. All side sewers stubs shall run perpendicular to the sewer main in the Right-of-Way. The plans shall indicate the station of side sewer sweeping tee/wye from nearest downstream manhole. Also, indicate length of side sewer stub from man to plug at the end of the line. Call out invert at plugged-end of stub.
- G. Minimum side sewer slope shall be 2%. Maximum slope shall be 100 percent.
- H. All side sewers clean-outs on commercial and multi-family projects shall include at-grade access with covers.
- I. Maximum distance between side sewer clean-outs shall be 100-feet.

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CHAPTER S2 – SEWER MATERIALS**S2-01 GENERAL**

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work.

Where reference is made to other specifications, it shall be the latest revision at the time of construction, except as noted on the plans or herein.

All material not specifically referenced shall comply with applicable sections of ASTM, AWWA or the APWA/WSDOT Standard Specifications.

When specific manufacturers or models are listed, no substitutions will be allowed without prior approval by the City of Anacortes.

S2-02 GRAVITY SEWER PIPE AND FITTINGS4" to 15" Diameter PVC Pipe:

All P.V.C pipe and fittings shall be integral wall bell and spigot, rubber gasket joint, unplasticized polyvinyl chloride (P.V.C.) pipe. All PVC pipe shall have minimum "pipe stiffness" of 46 psi at 5 percent deflection at 73 degrees F when tested in accordance with ASTM Designation D2412, external loading properties of plastic pipe; and a minimum impact strength based on ASTM D3034 at 73 degrees F using a 20 pound Tup A.

All PVC sewer pipe and fittings manufacture and installation shall meet or exceed the ASTM recommended specifications D3034, SDR 35, unless otherwise specified, and all installation shall be in strict compliance with the manufacturers directions. All pipes shall be clearly marked with the date of manufacture. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, polyisoprene or any combination thereof and shall meet the requirements of ASTM D-3212.

18" to 27" Diameter PVC Pipe:

All P.V.C pipe and fittings shall be integral wall bell and spigot, rubber gasket joint, unplasticized polyvinyl chloride (P.V.C.) pipe. All PVC pipe shall have minimum "pipe stiffness" of 46 psi at 5 percent deflection at 73 degrees F when tested in accordance with ASTM Designation D2412, external loading properties of plastic pipe; and a minimum impact strength based on ASTM F679 at 73 degrees F using a 30 pound Tup B.

All PVC sewer pipe and fittings manufacture and installation shall meet or exceed the ASTM recommended specifications F679, Class T-1, unless otherwise specified, and all installation shall be in strict compliance with the manufacturers directions. All pipes shall be clearly marked with the date of manufacture. There shall be no reduction in wall thickness at the bell as a result of bell formation. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, polyisoprene or any combination thereof and shall meet the requirements of ASTM D-3212.

AWWA C900 PVC Pipe:

Where indicated on the plans, gravity sewer pipe shall be manufactured in accordance with AWWA Standard C900, with the following additional requirements or exceptions.

4" to 12" nominal diameter PVC pipe shall be furnished in cast iron pipe equivalent outside diameters.

C900 PVC pipe shall be pressure class 150 (DR 18) unless otherwise call for in the plan. Pipe joints shall be manufactured using a integral bell with an elastomeric gasket push-on type joint. Elastomeric gaskets shall conform to ASTM F477. All fittings shall be PVC, compatible with C900 PVC pipe class called for in the plan, unless otherwise approved. PVC fittings shall conform to AWWA C900 with respect to joint dimensions and physical properties.

S2-03 PRESSURE SEWER PIPE

PVC pressure pipe shall conform to AWWA C900 pressure class 100 (DR 25), unless otherwise called for in the plan. Joints shall be made up as recommended by the pipe manufacturer for pressure pipe.

PVC fittings compatible with AWWA C900 pipe shall conform to these specifications.

S2-04 FITTINGS

All fittings shall be of the same material as the pipe, unless otherwise specified. For side sewers, a sweeping tee/wye shall be installed in the pipelines 8-inches or larger (or 6-inch main lines running between manholes) with 6-inch inside diameter side outlet.

For side sewers that will connect to existing sewer lines shall be made to an existing side sewer stub. If existing side sewer stub is unavailable, a flexible stainless steel side sewer saddle shall be used for hole-cuts. If any other type of fitting is required, the type and make shall be specified on the plans.

S2-05 PLUGS

All open ends shall be sealed with a plug or material and gasket material approved by the City of Anacortes. The plug shall be able to withstand all test pressures without leakage.

S2-06 MANHOLES

- A. Manholes shall be precast concrete sections with a confined O-ring rubber gasket joints per ASTM C478 and ASTM C-443 with either a precast base or a cast-in-place base made from a 3,000 PSI structural concrete.
- B. Galvanized safety steps shall be fabricated of minimum size No. 8 (1") deformed bar conforming to ASTM A-615, intermediate or standard grade hot-bent and galvanized after bending. Galvanizing shall conform to ASTM A-123. Or Polypropylene safety step shall be constructed from polypropylene, conforming to ASTM D-4101, injected molded around a ½" diameter grade 60 steel reinforcing bar conforming to ASTM A-615. The polypropylene step shall be either cast-in-place or driven to pre-formed holes in the manhole wall. The step shall be capable of resisting pullout exceeding 1,500 pounds.

- C. Steps and ladders dimensions shall conform to the WSDOT standard details. Steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced at 12-inch centers. Steps in precast base may be cast in place safety steps, or prefabricated galvanized hanging ladder with #8 (1") reinforcing bar and #7 smooth steel bar conforming with ASTM A-615, Grade 40, galvanizing conforming with ASTM A-123.
- D. Concrete adjustment rings shall conform to the ASTM C-32, Grade MA.
- E. Mortar used shall be composed of one part cement to two parts of plaster sand.
- F. Inside drop structures shall be constructed of ASTM D3034, SDR 35 PVC pipe and fittings.
- G. As an alternate to steel reinforcement, 48-inch diameter x 3-foot high eccentric or concentric cone sections may be reinforced with synthetic fiber. The synthetic fiber shall meet the requirements of ASTM C 116 Type III. The synthetic fiber shall be added at a rate of 0.75 pounds per cubic yard of concrete and shall be a minimum of 0.75 inches and a maximum of 2-inches in length. A minimum of two (2) 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.

S2-07 MANHOLE RING AND COVER

Ductile iron and cast iron rings and covers shall conform to the WSDOT Standard details and Section 9-05.15 of the current WSDOT Specification for Roads, Bridge and Municipal Construction, as modified herein.

Castings shall conform to the requirements of the ASTM A-536, Grade 80-55-06 for ductile iron and ASTM A-30, Class 25 for cast iron, and shall be free of porosity, shrinkage cavities, cold shuts, or cracks, or any surface defects, which would impair serviceability. Repair of defects by welding or by the use of smooth-on or similar material will not be permitted.

When bolt-locking covers are required, the locking bolts shall be 5/8" – 11 NC stainless steel type 304 socket (Allen) head bolts, 2-inches long.

At the request of the Engineer, there shall be made available at the foundry a testing device suitable for proving the capacity of the assembly to resist an uplift pressure of the lid equal to 2-feet of head.

S2-08 CONCRETE BEDDING AND BLOCKING

Bedding, blocking, or encasement concrete shall be mixed from materials acceptable to the Engineer and shall have a 30-day compressive strength of not less than 2,500 psi. The mix shall contain five (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1-inch and 5-inch. All concrete shall be mechanically mixed.

S2-09 OIL/WATER SEPARATOR

Oil/Water separator vaults shall be of precast concrete construction.

Cement concrete shall have a minimum 28-day compressive strength of 4500 psi.

Deformed bars for steel reinforcement shall be in accordance with ASTM A615, grade 60. Welded-wire fabric reinforcement shall be in accordance with ASTM A185, grade 65. All interior piping shall be PVC sized to match the side sewer line size. Baffles and weir shall be ½ inch thick steel plates galvanized in accordance with ASTM A123. Vault cover shall include one (1) 24-inch diamond plat access door and two (2) 12-inch square diamond plat inspection covers centered over outlet tee and inlet. Cover shall be designed for AASHTO H-20 load. See WSDOT Standard Details for vault sizes.

S2-10 GREASE INTERCEPTOR

Grease Interceptor Vaults shall be of precast concrete construction. Cement concrete shall have a minimum 28-day compressive strength of 4500 psi.

Deformed bars for steel reinforcement shall be in accordance with ASTM A615, grade 60. Welded-wire fabric reinforcement shall be in accordance with ASTM A185, grade 65. All interior piping shall be PVC sized to match the side sewer line size.

Interior baffle shall be precast reinforced concrete, 4-inches thick. Concrete baffle shall be secured in place by slotted vault walls or with stainless steel angels.

Vault cover shall include 24-inch diameter bolt-locking manhole covers and frames located over inspection tees. Manhole covers shall not allow passage of air or gases. Vault cover shall be designed for AASHTO H-20 load with 30% impact factor.

S2-11 COMMERCIAL CLEAN-OUT WITH TEST SAMPLING TEE

Commercial clean-out and sampling tee shall consist of PVC pipe and fittings. Clean-out access shall consist of cast-iron material imbedded in class "C" concrete. Sampling tee enclosure shall be a concrete meter box.

S2-12 BACKWATER VALVE

Refer to the WA-04 and WA-05 of the Water Works Standard drawings.

S2-13 STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53.

Casing wall thickness shall be 0.250 inch for casings 24 inches or less in diameter and 0.375 inch for casings over 24 inches in diameter.

Carrier pipe for water shall be Ductile Iron, Class 50.

This does not apply to steel casings for Jacking or Boring.

S2-14 CONTROL DENSITY FILL

Pea Gravel	50%
Sand	50%
Cement	1 sack per Cubic Yard

S2-15 NEOPRENE FOAM PAD

Where approved by the City, a neoprene foam pad may be used for cushion between adjacent pipes which are not meeting vertical clearance requirements. The approved material is the Dow Plastics Ethafoam™ 220, or an approved equal meeting the same ASTM requirements.

CHAPTER 5: S3 – SEWER METHODS OF CONSTRUCTION

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CHAPTER S3 – SEWER METHODS OF CONSTRUCTION

S3-01 ALIGNMENT TOLERANCE

The maximum tolerance from true line and grade shall be as follows:

Maximum deviation from established line and grade shall not be greater than one thirty-second (1/32) inch per inch or pipe diameter and not to exceed one-half (1/2) inch.

No adverse grade in any pipe length will be permitted.

The difference in deviation from true line and grade between any two successive joints shall not exceed 1/3 of the amounts specified above.

S3-02 TESTING OF GRAVITY SEWERS

Method of testing gravity sewer shall be the option of the Contractor unless otherwise specified herein.

S3-02.1 Air Testing

The following procedures shall be used on conducting a low pressure air test. The Contractor shall furnish all facilities and personnel for conducting the test under the observation of the Engineer. The equipment and personnel shall be subject to the approval of the Engineer.

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 has been completed and compacted to subgrade elevation and provided compaction test reports from a WSDOT approved testing facilities to the Engineer.

All wyes, tees, or end of the side sewer stubs shall be plugged with flexible joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making flexible joint lateral connection or extension. No double plugs shall be allowed.

Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 5.0 pounds per square inch. The internal air pressure shall be held for 15 minutes.

S3-03 TELEVISION INSPECTION

Before a Television Inspection can be performed by the City of Anacortes, all work has to be inspected by the City of Anacortes and all items have been completed and the required information provided to the City of Anacortes:

1. Photos of installation. Including all connections made. To be supplied to the Public Works Inspector.
2. Trenches are backfilled and compacted to subgrade elevation.
3. Proctor and Sieve Analysis of the trench backfill material are supplied to the Public Works Inspector.
4. Compaction test reports for trench backfill are supplied to the Public Works Inspector.

5. Manholes are installed and backfilled, per these standards and standard specification.
6. Proper connections to the manholes.
7. Manhole channels have been installed, per these standards and standard specifications.
8. Lines have been flushed and cleaned, per these standards.
9. Every line segment has been air pressure tested and passed.
10. All work has been inspected and approved by the Public Works Inspector.

Once this work has been completed and verified by the Public Works Inspector, the Contractor can request a "Video Inspection Request" from the Public Works Inspector. The Public Works Inspector will process the request with the Operations Department for scheduling of the sewer line.

Before final acceptance of the sanitary sewer, the Contractor shall correct all deficiencies found during the Television Inspection.