| Sanitary Sewer | Section 3 |
|---|---|

**General.**

Plans for the existing sewer system are maintained in digital and printed form by the City. Copies may be obtained from the Utility Division of the Public Works Department.

Future expansion of the sanitary sewer system is planned by the City and maintained in the "Comprehensive Plan Update, Sanitary Sewer System", available from the Planning Department.

Every subdivision, including long plats and short plats, and all other land use developments, shall be provided with a complete sanitary sewer system connected to the existing City system, conforming with the Comprehensive Sanitary Sewer Plan.

All design, materials, and work (methods) shall conform to the following list. *All design, materials, and methods not specifically referenced in these City standards and specifications shall comply with applicable sections of ASTM, AWWA, DOE, and APWA/WSDOT Standard Specifications.* In the case of differences among the standards and specifications, the most restrictive standards shall apply unless directed otherwise by the Public Works Director. The Public Works Director retains the authority to modify, revise, or deviate from the approved plans at his discretion. Approval of the plans does not warrant the accuracy of the plans.

a. The latest edition of the City of Poulsbo Developer's Guide and Construction Standards and Specifications adopted by the City of Poulsbo, and subsequent revisions;
b. The latest edition of "Standard Specifications for Road, Bridge, and Municipal Construction" and "Standard Plans For Road, Bridge and Municipal Construction" prepared by the Washington State Chapter American Public Works Association (APWA) and the Washington State Department of Transportation (WSDOT), and subsequent revisions;
c. The latest edition of the Department of Ecology "Criteria for Sewage Works Design", and subsequent revisions.

The developer's engineer is responsible for verifying the invert elevations, alignments, and dimensions of the existing system for which expansions are being contemplated. Plans must conform to this design guide, and permits are required before any construction that connects any new work to the existing system.

Building sewers require plans and specifications to be submitted for approval and issuance of a plumbing permit. All proposed work shall comply with the currently adopted edition of the Uniform Plumbing Code and these construction standards. Application for said permit shall be made to the City of Poulsbo Building Department.

## A. Planning Criteria

1. Sewer systems shall be gravity systems unless approved otherwise by the Public Works Director.

2. Ensure sewer service can be provided to adjacent properties. Sewer systems shall extend across property frontages and within the site to adjacent properties, when appropriate, for the ultimate development of tributary areas, as determined by the Public Works Director. The Public Works Director will determine if sewer systems on a site that are not within public right-of-way will be publicly (City) owned or privately owned.

   In general, sewer systems not within public right-of-way which serve commercial projects, multi-family projects, or more than one parcel, shall remain privately owned and maintained. When required by the Public Works Director, the applicant shall record an agreement that runs with the land which identifies the ownership and maintenance obligations of the applicable parties. The agreement shall be reviewed and approved by the City before recording. The agreement shall be recorded before the City grants final approval of the construction of the sewer unless required earlier by the Public Works Director. The City shall retain the option to take over ownership and operation of the sewer at its sole discretion.

3. Private systems shall conform to the same specifications as public systems.

4. All side sewers must gravity into the City's sanitary system. The City does not promote the construction of individual side sewer pumps or public side sewer pump stations. The City will only consider this method if no area gravity system can be constructed. Private pressure lines are not permitted in public right-of-way. If no gravity system can be constructed and a non-gravity system has been approved by the City, the private pressure lines must enter a cleanout or manhole (as determined by the Public Works Director) on private property and flow by gravity through the public right-of-way into the public system. The minimum manhole size permitted for this application is a 48 inch diameter manhole with a locking lid frame and cover.

## B. General Design and Drawing Standards

Design. Using the latest version of the City's Comprehensive Plan, sewer systems shall be designed to accommodate the 20-year projected sewer flows within the basin or sub-basin.

Drawings

1. The drawings shall conform to all requirements listed in Section 1 of these standards and specifications under Drafting Requirements.

2. The drawings shall show existing manholes or give reference distances to existing manholes near the project, including manhole invert and rim elevations and the reference datum.

3. Dimension existing and new manhole locations from right-of-way line and/or property line on the drawings.

4. Plan View
   a. List pipe length, size and material along side of pipe, e.g. 150 LF 8" PVC.
   b. Indicate stationing of the side sewer tee from the nearest downstream manhole.

5. Profile View
   a. List pipe length, size, material and slope (ft per ft), e.g. 150 LF 8" PVC s=0.0125. All lengths to be nominal except slope which shall be to 4 decimal places (1/10,000).
   b. Slope shall be calculated based on the invert elevation (i.e.) out of the upstream manhole and the invert elevation into the downstream manhole. Horizontal distances shall be calculated between the centers of the connecting manholes.

## C. Gravity Sewers

Main Lines

1. Minimum Pipe Size
   a. Pipe shall be sized according to the expected future demand of common lines that are intended to serve beyond the current project. No sewer shall be less than eight (8) inches in diameter except that in special cases, six (6) inch diameter sewer lines may be approved by the Public Works Director if they meet the following criteria:
   b. The probable maximum number of services will not exceed 30 persons (minimum 3 persons per residence).
   c. The maximum length of 6-inch lines shall not exceed 150 feet.
   d. A manhole shall be provided where the 6-inch line connects to an 8-inch or larger line. This does not include the 6-inch side sewer that serves one or two single- family dwellings or commercial buildings.
   e. A manhole or cleanout shall be provided at the end of the 6-inch line.
   f. No extension of the 6-inch line will be possible at a later date.

2. Pipe Slope
   a. All sewers shall be designed and constructed to give mean velocities when flowing full, of not less than 2.0 feet per second. The following

minimum slopes may be provided; however, slopes greater than these are desirable. When sewer mains are extended to serve an area without enough near-term "build-out" to provide sufficient flows for pipe cleansing, the Public Works Director may require the minimum pipe slope to be increased. Self-cleaning velocity shall be provided and demonstrated by the design engineer to the City to accept the problem caused by a lack of sufficient flow. The table below lists the minimum slopes that should be provided; however, slopes greater than those listed in this table are desirable under low-flow conditions.

| Sewer Diameter (inches) | Minimum Slope (ft/100ft) |
|---|---|
| 4 | 2.00 |
| 6 | 1.00 |
| 8 | 0.50 |
| 10 | 0.28 |

b. Maximum main line slope shall not induce velocities of greater than 10 feet per second under daily peak flows.
c. Sewers shall be laid with uniform slope between manholes.
d. Sewers on 20% slope or greater shall be anchored securely with concrete anchors. The standard design for pipe anchor blocks shall be shown as follows or as designed by the engineer of record (or geo-technical engineer when warranted by site conditions) to meet expected loads, stresses, seismic or other engineering design criteria. Approval of deviations from the standard design will be at the discretion of the Public Works Director.

| Grade % | Maximum Spacing center to center (ft) |
|---|---|
| 20-34 | 36 |
| 35-49 | 24 |
| 50+ | 16 |

e. To reduce bedding migration and ground water velocity, clay dams shall be placed at 100-foot intervals on gravity mains laid on 6 percent or greater slopes.
f. Sanitary sewer pipe installed on slopes greater than 20 percent shall be HDPE (high density polyethylene) or epoxy-lined ductile iron.

3. Pipe Cover. Minimum depth of cover shall be 6 feet. In special circumstances the Public Works Director may approve less cover. Pipe cover is defined as the distance from finish grade to the top of the pipe.

4. Pipe Depth. Generally, sewers should not be less than six (6) feet deep but should be sufficiently deep to prevent freezing and physical damage and should receive sewage from existing dwellings by gravity. The maximum depth of a sewer line shall be fifteen (15) feet unless approved otherwise by the Public Works Director.

5. Pipe Protection
   a. When the sewer cover is less than or equal to three (3) feet, or greater than or equal to fifteen (15) feet, the pipe shall be Class 52 epoxy-lined ductile iron or PVC-C900. PVC pipe shall be encased in steel casing when crossing under rockeries or retaining walls over 3 feet high. The casing shall extend beyond the footings or rockery face a minimum of 5 feet, or the height of the wall or rockery, whichever is greater.
   b. All mains shall have locate tape placed two (2) feet above the top of the pipe.

6. Other
   a. Gravity sewers shall be designed with straight alignment between manholes.
   b. Where sewer casing is required, the casing shall be twice the diameter of the carrier pipe. Casing spacers shall be required per the standard plans
   c. Cap end of existing sewer lines to be abandoned as follows:
      *i.* Cast or ductile iron lines: Use MJ (mechanical joint) cap or plug.
      *ii*. Concrete lines: Fill end of line with cement concrete minimum of 12" from end of line.
      *iii.* Plastic lines: Use cap or plug fitting compatible with plastic pipe to be abandoned.

Side Sewers and Building Sewers

1. General
   a. A “side sewer” (or “lateral” or “service line”) is considered to be that portion of a sewer line that will be constructed between a main sewer line and the property line or easement line of a residence or other building in which the sanitary sewage originates.
   b. A “building sewer” is considered to be that portion of a sanitary sewer line that will be constructed from the end of the side sewer to the residence or building in which the sewage originates.

2. Side Sewers
   a. 6-inch pipe shall be used for side sewers from the main line to a cleanout at the property line (unless expected flows require a larger size line).
   b. The minimum slope of side sewers shall be 2%. Special circumstances requiring consideration of slopes of less than 2% must be approved by the Public Works Director.

c. The maximum slope of side sewers shall be 45%. Slopes in excess of 45% will be considered by the Public Works Director only to resolve exceptionally steep site conditions. Pipe anchors, and possibly clay dams, will be required for slopes steeper than 45%.
d. In plats, side sewers may be single or double as shown in the standard plans. Double services are preferred. If minimum pipe slopes and depth for the building sewer for both lots cannot be met due to lot topography, provide a single connection point at the lowest property frontage corner.
e. Side sewers shall be constructed with main lines unless approved otherwise by the Public Works Director. Side sewers constructed at the time of main line construction shall connect to the main with a sanitary or sweeping tee. Wyes are not allowed.
f. Taps into existing mains (mains in service) shall be with a saddle tee with stainless steel straps or an "inserta-tee".
g. A maximum of 2 residential units or, depending on design flow, 1 commercial or multi-family building shall be allowed to connect to each side sewer.
h. No side sewers shall connect directly to a manhole unless that connection is specifically approved by the Public Works Director. Side sewer connections shall not be within 10 feet of a manhole.
i. For plats, side sewers must extend a minimum of 12 feet behind the property line in order to terminate outside of the 10-foot utility easement that parallels the frontage of all lots. The ends of each sewer stub shall be capped and located with an 8' long 2" x 4" board, embedded to the stub cap and extending at least 3 feet above grade, and marked permanently "SEWER". A copper 12-guage locate wire shall be firmly attached. The stub depth shall be indicated on the marker.
j. Side sewers shall be pressure tested in conjunction with main lines.

3. Building Sewers. Building sewers shall meet the requirements of the codes of the Building Department.

**D. Cleanouts**

1. All cleanouts for mains and laterals, whether installed in paved or unpaved areas, shall have a cast iron frame and cover, with the word "sewer" integrally cast in the cover, and shall be placed at finish grade. The riser pipe shall be the same diameter as the main or lateral, have a screw cap, and not be more than 8 inches, or less than 4 inches, below the finish grade elevation.

2. Cleanouts shall be installed at the property/easement line for both single and double services.

## E. Manholes

1. Manholes shall be installed at:
   a. The end of each main of 8-inch diameter or greater which is more than 150 feet long, unless the 8-inch main is expected to be extended in the foreseeable future, in which case the Public Works Director may approve installation of a cleanout instead on a case by case basis.
   b. All changes in grade, size, or alignment.

2. Cleanouts may be used in lieu of manholes at the end of mains six (6) or eight (8) inches in diameter and not more than 150 feet long unless required otherwise by the Public Works Director on a case by case basis.

3. Maximum length of main line between manholes shall be 300 feet.

4. All manhole covers shall be set flush with ground surface.

5. Side sewers shall not connect to manholes.

6. Terminal manholes shall not be channeled. A wedge of concrete shall be poured in the base section to provide positive drainage toward pipe, using Class A (3,000 psi) Portland Cement Concrete.

7. Manhole Sizing. All manholes ten (10) feet or greater in depth, as measured from rim to invert elevation shall be a minimum of 54-inches in diameter, unless specified otherwise by the Public Works Director. The following requirements shall apply in addition to the requirement based on depth:

| **48-inch Manhole** | |
|---|---|
| **Connecting Pipes** | **Pipe Diameter (inches)** |
| 2 | 8 to 12 |
| 3 | 8 to 10 |
| 4 | 8 |

| **54-inch Manhole** | |
|---|---|
| **Connecting Pipes** | **Pipe Diameter (inches)** |
| 2 | 15 to 21 |
| 3 | 10 to 15 |
| 4 | 10 to 12 |

| **72-inch Manhole** | |
|---|---|
| **Connecting Pipes** | **Pipe Diameter (inches)** |
| 2 | 21 to 24 |
| 3 | 15 |
| 4 | 15 |

a. For other pipe configurations, the size of the manhole will be reviewed on a case-by-case basis.
b. The minimum angle between the incoming and the outgoing pipe shall be $90^{o}$; pipe shall be radial with the center of manhole.
c. The above configurations shall provide adequate shelves and room for maintenance and performing television inspections.

8. Channels shall be centered in manhole.

9. Ladder rungs shall be placed on the side of the manhole with the largest shelf.

10. Manholes shall be constructed under the crown of the roadway.

11. Manholes shall be installed with inserts to prevent stormwater inflow. The inserts shall be "Rainstopper" HDPE inserts as manufactured by Southwestern Packing and Seals, Inc., Shreveport, Louisiana.

12. A drop connection shall be provided for a sewer entering a manhole at an elevation of two and one-half (2.5) feet or more above the outgoing pipe invert. Where the difference in elevation between the incoming pipe invert and the outgoing pipe invert is less than 12 inches, a concrete channel shall be constructed from the incoming invert to the outgoing invert.

## F. Separation and Clearances with Other Utilities

1. Crossing or parallel utilities. Maintain minimum vertical and horizontal clearances. Water mains and sewers should be separated as far as is reasonable in both the horizontal and vertical direction, with sewer mains always lower than water mains. Avoid crossing at highly acute angles (smallest angle measure between utilities should be between 45 and 90 degrees).

2. Horizontal and Vertical Separation (Parallel). A minimum horizontal separation of ten (10) feet between sanitary sewers, reclaimed water lines, and any existing potable water lines, and a minimum vertical separation of 18 inches between the bottom of the potable water line and the crown of the sewer shall be maintained. The distance shall be measured edge to edge (i.e., from the outer diameter of the pipes.)

3. Unusual Conditions (Parallel). When local conditions prevent the separations described above, a sewer may be laid closer than 10 feet horizontally or 18 inches vertically to a water line or reclaimed water line, provided the guidelines below are followed:
   a. It is laid in a separate trench from the water line.
   b. When this vertical separation cannot be obtained, the sewer shall be constructed of materials and joints that are equivalent to water main

standards of construction and shall be pressure tested to ensure water tightness prior to backfilling. Adequate restraint should be provided to allow testing to occur.

c. If sewers must be located in the same trench as a potable water line, special construction and mitigation is required. Both water lines and sewer lines shall be constructed with a casing pipe of pressure-rated pipe material designed to withstand a minimum static pressure of 150 psi.

d. The water line shall be placed on a bench of undisturbed earth with the bottom of the water pipe at least 18 inches above the crown of the sewer, and shall have at least 5 feet of horizontal separation at all times. Additional mitigation efforts, such as impermeable barriers, may be required. (See Figure C1-3 in the DOE Criteria for Sewage Works Design manual).

4. Vertical Separation (Perpendicular). Sewer lines crossing water lines at angles, including perpendicular, shall be laid below the water lines to provide a separation of at least 18 inches between the invert of the water line and the crown of the sewer. When local conditions prevent a vertical separation as described above, construction shall be used for crossing pipes as follows:

   Gravity Sewers Passing Under Water Lines. The sewer pipe shall be:

   a. Constructed of Class 52 epoxy-lined ductile iron or PVC-C900. One segment of the maximum standard length of pipe (but not less than 18 feet long) shall be used with the pipes centered to maximize joint separation; OR

   b. Standard gravity-sewer material encased in concrete or in a one quarter-inch thick continuous steel, ductile iron, or pressure rated PVC pipe with a dimension ratio (DR) (the ratio of the outside diameter to the pipe wall thickness) of 18 or less, with all voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skids and end seals are acceptable. When using steel or ductile iron casing, design consideration for corrosion protection should be considered; AND

   c. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.

   Gravity Sewers Passing Over Water Lines. Water lines shall be protected by providing:

   a. A vertical separation of at least 18 inches between the invert of the sewer and the crown of the water line.

   b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water lines.

   c. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far a possible from the water

line. The sewer pipe shall be the longest standard length available from the manufacturer.

d. A water line casing equivalent to that specified above.

5. Horizontal and vertical clearances from sanitary sewer shall be:

| Utility | Horizontal (ft) | Vertical (ft) |
|---|---|---|
| Cable | 5 | 1 |
| Gas | 5 | 1 |
| Power | 5 | 1 |
| Telephone | 5 | 1 |
| Storm | 5 | 1 |
| Water | 10 | 1.5 |

6. Separation of building sewer services with building water services shall be per the adopted codes of the Building Department.

## G. Future Extensions and Connections to Existing System

1. All street ends with the possibility for extension must have utilities stubbed out of the paved area a minimum of six feet or as directed by the City Engineer.

2. New sewer mains (8 inches and larger) shall connect to the existing sewer main at existing manholes, or with a new manhole at the end of the existing sewer.

3. Where the new main is larger in diameter than the existing downstream main, check that the capacity of the existing main is not exceeded by flow from the new main.

4. If connecting to an existing manhole which has access less than 24 inches in diameter and/or a concentric cone (manholes over 5 feet deep), the manhole shall be upgraded to include a new 24-inch frame and cover and/or eccentric cone.

## H. Lift Stations

1. The designed capacity of the lift station shall:
   a. Provide for one (1) hour additional storage capacity beyond the high water level.
   b. Be based on the average flow rates that are calculated in the lift station design document.
   c. Will account for the worst case scenario of total electrical and mechanical failure of the facility.

2. A permanent generator shall be required. The generator shall have automatic and manual starting capability.

3. A portable generator hook-up shall be required.

4. The standby generator shall be fueled with natural gas if it is available.

5. An automatic transfer switch shall be included to transfer the electrical feed from the primary to standby unit.

6. Telemetry shall be required. See the "New Lift Station Telemetry Design Standards" for specifications.

7. Any new lift station will have an impact on the existing telemetry system. The applicant will be required to cover all City expenses associated with necessary upgrades to the master telemetry system. These costs will include materials and labor for the installation.

8. Alarms at the sewage pump station shall include: high water, low water, power failure, pump failure, surge control system, and engine generator failure alarms as well as fire alarm and pump station intrusion alarm.

9. Three phase electric service shall be provided to the site. Pump motors shall be three phase electric.

10. Pumps shall allow the station to provide the peak design flow with the largest pump out of order.

11. Electric soft start/stop shall be provided at the pump station.

12. Pumps shall be controlled with a variable frequency drive and shall have a user interface for starting/stopping and adjusting motor speeds.

13. Provisions shall be made to facilitate removing pumps, motors, and valves.

14. A frost free hose bib on the outside wall of the building after the RPBA shall be required.

15. Trash pump connections shall be required.

16. Devices for measuring pressure and sewage flows in the force main shall be installed.

17. The lift station building shall be completely enclosed for security and protection from weather. There shall also be sufficient room and lighting to facilitate maintenance activities.

18. The odor control system shall meet or exceed applicable standards.

19. Noise control systems shall meet or exceed the PMC (Poulsbo Municipal Code) or RCW (Revised Code of Washington) standards.

20. Gas detection equipment and alarm system shall be installed.

21. Specifications for the permanent generator, telemetry, and pumps shall be submitted to the City with the construction drawings.

22. Pursuant to WAC 246-290-490 (Washington Administrative Code), the water services for the domestic, irrigation and fire suppression systems shall be installed with the proper backflow prevention facilities. Install a reduced pressure backflow assembly (RPBA) inside of the building.

## I. Lift Station Instrumentation and Telemetry

1. Liquid level controllers are required and shall be submersible hydrostatic level transducers. The level controllers shall be specifically designed for wastewater applications, and shall be compliant with appropriate hazardous regulations. Level controllers shall be located so as not to be affected by flows entering the lift station.

2. Additional backup high level / low level float switches shall be provided for the emergency backup and alarm system in the event of a primary level control failure. A dry well float switch shall be installed to detect basement flooding.

3. The pumps shall operate in on/off control, unless practical and feasible to install continuous level control pumps.

4. If practical and feasible, pumps shall operate in continuous level control, unless a failure in the system occurs. During continuous control mode pump speeds shall be varied by a control loop to maintain a constant level in the wet well. The HMI (human machine interface) on the control panel shall allow control parameters to be available and adjustable by the field operator.

5. A magnetic flowmeter, or equivalent type, shall be installed to measure wastewater flow leaving the lift station. Flowmeters shall be provided with a signal converter to transmit analog signals (4-20 mA) via telemetry. In addition, a local electronic reading of flow should be available. Readings should include both instantaneous and totalized values. Transmitters shall be calibrated to full range and shall be field adjustable.

6. The following digital outputs are required (typical of 2 Pump lift station):
   Pump 1 Run Status (Run / Off)

Pump 2 Run Status (Run / Off)
Pump 1 Failure (On / Off)
Pump 2 Failure (On / Off)
Communication Failure
Power Failure
High Level
Low Level
Drywell flood
Generator Fail
Generator Running

7. The following analog output is required (typical of 2 Pump lift station):
   Lift Station Flow (4-20 mA signal to telemetry)

8. Communication shall be through radio telemetry and including the following:
   a. Antenna height will be measured at least 20 ft from grade. Schedule 40 galvanized pipe, no greater than 2" OD, shall be used for the antenna mount.
   b. Low loss coaxial cable shall be used and shall be shielded and protected. Coax lengths shall not exceed 50 feet. Connections shall be used with N type RF connectors. All connections shall be soldered at terminations, and where connections are exposed to adverse weather conditions, they shall be properly sealed with shrink tubing and coax sealant.
   c. All telemetry controls may either be mounted in the main control panel or in a separate telemetry panel. All wires shall be labeled and numbered with heat shrink labels. All contacts and relays shall be pin type.

## J. Materials and Methods

1. General
   a. All materials and methods not specifically referenced in this manual shall comply with the applicable sections of the most currently adopted editions of the ASTM, APWA, and APWA/WSDOT Standard Specifications. When there are differences between the specifications, the Public Works Director shall determine which shall apply.

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

c. When specific manufacturers or models of various materials are listed, no substitutions will be allowed without prior approval by the Public Works Director.

2. Manholes
   a. All manhole sections shall be grouted on the inside and outside of the structure.
   b. Insert shall conform to the following specifications as manufactured by: Southwestern Packing and Seals, Inc.
      PO Box 19369, Shreveport, LA 77149-0369
      Phone 800.843.4950 ▪ Phone 318.687.4330 ▪ Fax 318.687.4337

## HDPE RAINSTOPPER SPECIFICATIONS

**1. Scope**
Under this item, the contractor shall supply and install to manufacturer's recommendations a "Rainstopper" manhole insert as shown on contract drawings and specified hereafter.

**2. Materials and Design**

**General**

2.1 The Rainstopper insert and components shall be manufactured of materials resistant to corrosion from atmospheres containing hydrogen sulfide and dilute sulfuric acid.

**The Insert**

2.2 The insert body shall be manufactured of High Density Ethylene Hexene-1 Copolymer equal to Phillips Chemical Co. Marlex HHM-5502, meeting the requirements of ASTM D1248 Class A, Category 5. The insert shall exceed 5½" in depth to allow penetration of the manhole lid through the clear opening of the ring. The insert shall have a straight-side design to allow a loose fit into ring for easy removal. The insert manufacturer must furnish a "Load Test Verification" showing a load test failure in excess of 800 lbs.

**The Gasket**

2.3 The gasket shall be made of close cell neoprene, and shall have a pressure sensitive adhesive on one side. The gasket shall be installed by the manufacturer and must be compatible with the insert material to form a long lasting bond in wet or dry conditions.

**The Relief Valve**

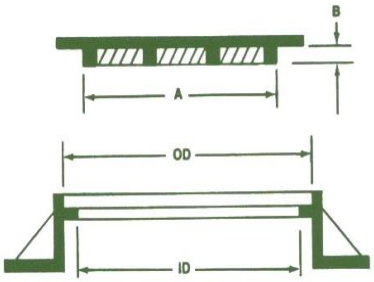
2.4 The gas relief valve shall be designed to release at a pressure of .5 to 1.5 psi. and have a water leak down rate no greater than 5 gallons per 24 hours. The valve shall be installed in the insert by means of a hole tapped in the insert by the manufacturer, and secured by a special designed lip, molded into the insert, to prevent being knocked out by lid rotation. The valve shall be made of Nitrile for prevention of corrosion from contact with hydrogen sulfide, dilute sulfuric acid and other gases associated with wastewater collection systems.

**The Handle**

2.5 The handle shall be made of 1" wide nylon webbing and shall be installed on the insert body with two #6 high grade stainless steel rivets and washers. The handle shall be installed on the insert in such a way that it does not interfere with the installation of the manhole lid. The handle shall be able to withstand a pull of 500 pounds of force before it fails or separates from the insert.

**3. Installation**
The manhole frame rim shall be free of all dirt and debris prior to the installation of the "Rainstopper" insert. The "Rainstopper" insert should be fully seated around the manhole frame rim to insure against water seepage between the insert and manhole frame rim. A generous coating of grease on gasket is helpful in seating and prevents rust.

When ordering "Rainstopper" manhole inserts, the following dimensions should be furnished:




ID - Inside Frame Diameter (Clear Opening)
OD - Outside Frame Diameter (Seat Diameter)
A - Drop Ring Diameter
B - Drop Ring Depth (From Underside Cover)

Note: Some lids have no drop ring and are essentially flat underneath.

## K. Testing

1. The contractor shall furnish all labor and equipment necessary to make the tests. The City inspector shall witness all tests.

2. Gravity sewer mains and side sewers shall be tested by the low pressure air test method at 3 pounds for 5 minutes with no pressure drop. Force mains shall be tested per the WSDOT Standard Specifications and the DOE Criteria for Sewage Works Design or as directed by the Public Works Director.

3. A television inspection is required before final acceptance. The Contractor shall furnish all equipment for video inspection. The video equipment shall be capable of recording the inspection on DVD format and a copy of the DVD shall be supplied to the City. A report shall be provided which documents distances between manholes, locations/distances and directions of laterals, observations of defects or potential defects, and any other information which would be beneficial for determining the as-built configuration and condition of the sewer main.