

SECTION 5

5. STORM DRAINAGE STANDARDS

5.01 General

The standards established by this Chapter are intended to represent the **minimum** standards for the design and construction of storm drainage facilities. Greater or lesser requirements may be mandated by the City due to localized conditions. Storm drainage revisions, additions, modification, or changes shall be made in compliance with City standards, ordinances, and Best Management Practices as identified by the State Department of Ecology 1992 Stormwater Management Manual for the Puget Sound Basin. Adequate provisions shall be made for storm drainage, storm sewers, and associated appurtenances sufficient to transmit maximum seasonal flows and one hundred year flood waters characterized by the area.

If warranted based on the condition and capacity of the existing storm drainage infrastructure (or lack thereof) and, impacts caused by the proposed development, off-site improvements may be required, at the City Engineer's discretion, to mitigate impacts caused by the proposed development.

5.02 Design Standards

On-site detention systems shall be provided to ensure that stormwater flow rates following development do not exceed the predevelopment rates. The design of storm drainage and detention system shall depend on their type and local site conditions. The design elements of storm drainage systems shall conform to City Standards as set forth herein. The following design considerations shall apply:

- A. The use of commercial parking lots for detention of stormwater will be reviewed by the City Engineer and approved or denied based on the design, location and general parameters of the project. The detention area shall be situated away from areas of pedestrian movement unless means for rapid closing of the areas is incorporated in the design. The maximum depth of water in parking lot storage shall be limited to 6 inches. Curbs cannot be used for retaining storage.
- B. Maximum catch basin spacing shall be 200 feet on road grades up to 3 percent, 300 feet when the road grade is 3 percent or greater. No surface water (unless otherwise approved in writing by the Public Works Director) shall cross any roadway. In addition, catch basins shall be placed whenever the length of surface drainage exceeds 300 feet on road grade, extending

- either direction from crest or sag on vertical curves. Vaned grates shall be employed on street grades exceeding 6 percent slope.
- C. Plans for storm drainage shall indicate where the stormwater will be discharged. If the proposed development will increase the amount of storm runoff, it must be shown that the pipes and channels downstream from the discharge point (a minimum of 1/4 mile) can carry the increased runoff without damage to the adjoining properties or surcharging of the system. Wherever possible, provisions should be made for detainage and/or retainage of stormwater in order to decrease the amount of storm runoff and, more importantly, to decrease the peak runoff volume.
- D. Where storm drains run outside an existing public right-of-way, permanent easements will be required for public or private maintenance as may be required and warranted. Such easement shall be a minimum of 15 feet in width unless otherwise approved or required by the City. Where the City is to maintain the storm drain, a permanent easement will be required having a minimum width of 15 feet. A construction (temporary) easement of suitable width shall also be provided.
- E. Storm Drain Detention Systems shall be, at a minimum, designed and constructed in strict compliance with the currently adopted the Washington State Department of Ecology's 1992 Stormwater Program Guidance Manual for the Puget Sound Basin and any amendments thereto. Local prevailing conditions may warrant higher standards as determined by the City Engineer. The Developer and/or Homeowners Association shall enter into a formal, legally binding agreement, as approved by the City Attorney, regarding the landowner's duties and obligations regarding their ownership, operation and maintenance of the system. Fences shall be erected around all ponds. Drive gates with locks (City to also have key) shall be installed. The City requires a "higher" standard in regards to "release rates." Release rates shall not exceed 1/2 of the 2-year storm rate value or a downstream analysis shall be performed to verify the existing system has adequate capacity and structural integrity.
- F. The General Notes, numbered 1 thru 8, as shown and further referenced below shall be included or referenced on any plans submitted to the City for construction approval dealing with storm system design.

GENERAL NOTES (STORM DRAIN CONSTRUCTION)

1. All workmanship and materials shall be in accordance with City Standards and the most current copy of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT).
2. Temporary erosion/water pollution measures shall be required in accordance with Section 1-07.15 of the Standard Specifications.
3. Contractor shall be responsible for complying with all other permits and other requirements by the City or other governing authority or agency as may be applicable.
4. A preconstruction meeting shall be held with the City prior to the start of construction.
5. All storm mains and retention/detention areas shall be staked for grade and alignment by an engineering or surveying firm capable of performing such work, and currently licensed in the State of Washington to do so.
6. Contractor shall provide traffic control plan(s) as required in accordance with MUTCD.
7. Call underground locate line at 1-800-424-5555 a minimum of 48 hours prior to any excavations.
8. Where connections require “field verifications,” connection points will be exposed by contractor and fittings verified 48 hours prior to distributing shut-down notices.

5.03 Conveyance

Structures: Structures shall be installed at all changes in pipe size, slope, and direction. Structures shall consist of WSDOT Type 1 or Type 2 catch basins or 48-inch diameter manholes as appropriate. All inlet structures shall be WSDOT Type 1 or Type 2 catch basins as appropriate.

Pipe: Storm drain pipe within a public right-of-way or easement shall be sized to carry the maximum anticipated runoff from the possible contributing tributary area.

The minimum main size shall be 12 inches diameter. Lateral lines if

approved by the City Engineer may be 8 inches diameter. Runoff shall be computed and, if the flow requires it, a larger pipe shall be used. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to serve adjacent areas or for future service.

Storm drain gradients shall be such as to assure minimum flow velocity of three feet per second when flowing full.

All pipe for storm mains shall be “preapproved” by the City’s Engineer based on localized conditions and comply with one of the following types:

Polyvinyl Chloride: PVC pipe shall conform to ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D3212 and ASTM F477.

Plain Concrete: Plain concrete pipe per WSDOT Standard Specifications as set forth in Section 7-04.

Reinforced Concrete: Reinforced concrete pipe per WSDOT Standard Specifications as set forth in Section 7-04.

Ductile Iron: Ductile iron pipe shall conform to AWWA C151 Class 50 and have a cement mortar lining conforming to AWWA C 104. All pipes shall be joined using non-restrained joints which shall be rubber gaskets, push on type or mechanical joint, conforming to AWWA C 111.

Polyethylene: PE smooth wall pipe per Advanced Drainage Systems (ADS) N-12 (bell and spigot), or City approved equal, constructed per WSDOT Standard Specifications 7-04. See Note E above.

Corrugated Metal: Zinc-coated (galvanized) corrugated iron or steel pipe shall be coated uniformly with asphalt.

5.04 Connections

Connections of storm drain pipe leading from an existing street inlet location may be made into an existing main storm drain only with a new structure, subject to case-by-case review and approval of the City Engineer or Public Works Field Inspector/Superintendent and subject to the following additional requirements:

1. The inletting structure shall be a catch basin and not a simple inlet lacking a catch or drop section.

2. Length of inlet connection shall be as approved by the City Engineer.

5.05 Survey Staking

All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and capable of performing such work. The engineer or surveyor directing and/or performing such work shall be currently licensed by the State of Washington to perform said tasks.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of storm sewer systems shall be as follows:

- A. Stake centerline alignment every 25 feet with cuts and/or fills to bottom of trench.
- B. Stake location of all catch basins/manholes and other fixtures for grade and alignment.
- C. Stake location, size and depth of retention/detention facility.
- D. Stake finished grade of catch basin/manhole rim elevation and invert elevations of all pipes in catch basins, manholes, and those that daylight.

5.06 Trench Excavation

- A. Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.
- B. Trenches shall be excavated to the line and depth designated by the City to provide a minimum of 24 inches of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency and in compliance with all safety requirements of the prevailing agencies. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The Contractor

shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

- C. The contractor shall perform all excavation of every description and whatever substance encountered and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below storm line grade. Where materials are removed from below the pipeline grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.
- D. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without specific written approval of the City, and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standard.
- E. The bedding course shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to facilitate the construction of pipe joints.

5.07 Bedding

Gravel backfill for pipe bedding shall be installed in conformance with Section 2-09 of the Standard Specifications (WSDOT). See Detail.

Bedding for Rigid Pipe (Concrete or Ductile Iron Pipe):

Gravel backfill for rigid pipe bedding shall consist of crushed, processed, or naturally occurring granular material. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily and shall meet the following specifications for grading and quality:

| <u>Sieve Size</u> | <u>Percent Passing*</u> |
|-------------------|-------------------------|
| 3/4" Square | 100 |
| 3/8" Square | 95-100 |
| U.S. No. 8 | 0-10 |
| U.S. No. 200 | 0-3 |
| Sand Equivalent | 35 min. |

*All percentages are by weight.

Bedding for Flexible Pipe (P.V.C. pipe):

Gravel backfill for flexible pipe (P.V.C. pipe) bedding shall consist of crushed, processed, or naturally occurring granular material. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily and shall meet the following specifications for grading and quality:

| <u>Sieve Size</u> | <u>Percent Passing*</u> |
|-------------------|-------------------------|
| 3/4" Square | 100 |
| 3/8" Square | 95-100 |
| U.S. No. 8 | 0-10 |
| U.S. No. 200 | 0-3 |
| Sand Equivalent | 35 min. |

*All percentages are by weight.

Native Material shall not be used for bedding, unless approved by the Engineer.

Bedding for Flexible Pipe (H.D.P.E. pipe):

Bedding material for flexible pipe shall be a clean gravel mixture free from organic matter and conforming to the following gradation:

| <u>Sieve Size</u> | <u>Percent Passing*</u> |
|-------------------|-------------------------|
| 3/4" Square | 100 |
| 3/8" Square | 70-100 |
| U.S. No. 4 | 55-100 |
| U.S. No. 10 | 35-95 |
| U.S. No. 20 | 20-80 |
| U.S. No. 40 | 10-55 |
| U.S. No. 100 | 0-10 |
| U.S. No. 200 | 0-3 |

*All percentages are by weight.

5.08 Backfilling

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the City. Selected material shall be placed and compacted around and under the storm drain by hand tools.

Special precautions should be provided to protect the pipe to a point 12 inches above the crown of the pipe. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas, 90 percent outside driveway, roadways, road prism, shoulders, parking or other traveled areas. Where governmental agencies other than the City have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. Typically, trench sections crossing existing roadways, in roadway "prisms" or beneath traffic bearing areas shall be backfilled and compacted with 5/8-inch minus crushed rock. Due to localized conditions, the City may allow/permit the backfill of the trench section

with suitable excavated material, as determined by the City, or if this material is not available from trenching operations, the City may order the placing and compaction of gravel base conforming with Section 9-03.10 of the Standard Specifications (WSDOT) for backfilling the trench. All excess material shall be loaded and hauled to waste.

5.09 Street Patching and Restoration

See Chapter 7 for requirements regarding street patching and trench restoration.