SECTION 5

STORM DRAINAGE

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. 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 potential 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 pre-development ratio. 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%, 300 feet when the road grade is 3% or greater and 500 feet maximum on main storm drains between access structures, whether catch basins or manholes. No surface water (unless otherwise approved in writing by the City Engineer) shall be designed to flow across any roadway. In addition, catch basins shall be placed whenever the length of surface drainage exceeds 300 feet of road grade, extending either direction from crest or sag on vertical curves. Vaned grates on drainage structures shall be utilized on street grades exceeding 6% 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 or twice the bury depth of the utility whichever is greater. Where the City is to maintain the storm drain, a permanent easement will be required. 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 compliance with the City's currently adopted Surface Water Manual, and any amendments thereto. Local conditions or site specific concerns may warrant higher standards as may be determined by the City. 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.

F. The General Notes, numbered 1 thru 10, as shown and further referenced herein 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 of **Long Beach** Standards, policies, and the 1998 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 and/or Best Management Practices (D.O.E.).

3. Comply with all other permits and other requirements by the City of **Long Beach**, **Pacific** County or other governing authority or regulatory agency as may be applicable.

4. A preconstruction meeting shall be held with the City prior to the start of construction.

5. All storm drains and retention/detention areas shall be staked for grade and alignment by an engineering or surveying firm qualified to perform such work, and currently licensed in the State of Washington to do so.

6. Storm drain pipe shall meet the following requirements:

   A. Plain or reinforced concrete pipe conforming to the requirements of ASTM Class 14-3 or C76-IV, respectively, as required by City Engineer.

   B. PVC pipe shall conform to ASTM D 3034-73 SDR 35 for 4" thru 15" diameter PVC pipe, and shall conform to ASTM F 679 for 18" thru 27" diameter PVC pipe, with joints and gaskets conforming to ASTM D 3212 and ASTM F 477.

   C. Ductile iron pipe conforming to the requirements of ANSI A21.51, and AWWA C 151, thickness class as approved by City Engineer.

   D. Polyethylene smooth wall pipe per Advanced Drainage Systems (ADS) N-12, bell and spigot, constructed per WSDOT Standard Specifications 7-04. Note: This type of pipe will only be approved with the City's specific approval. Approval shall be based on site specific conditions and if additional on-site inspection time for witnessing proper pipe installation can be scheduled by the City.

7. Special structures, oil/water separators and outlet controls shall be installed per plans and manufacturers recommendations.

8. Provide traffic control plan(s) as required in accordance with MUTCD.

9. Call underground locate line 1-800-424-5555 minimum 48 hours prior to any excavations. Notify agencies that do not belong to 1-CALL but are known to have utilities located in the "general" area.

10. Where connections require "field verifications", connection points will be exposed by contractor and fittings verified 48 hours prior to distributing shut-down notices.

11. Storm drain pipelines shall be installed to the far property line(s) to serve adjacent tributary areas a may be warranted. They shall be appropriately sized to accommodate flows as further identified herein. Pipes shall be designed to facilitate a minimum 3 feet/second flow unless otherwise approved by the City Engineer.

5.03 Conveyance

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 "pre-approved" 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 6, D (page 5-3) above.

Corrugated Metal: Zinc-coated (galvanized) corrugated iron, or aluminum pipe. Thickness to be as directed by City.

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. See Detail. 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:

Sieve Size	Percent Passing*
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:

Sieve Size	Percent Passing*
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:

Sieve Size	Percent Passing*
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 Standard Detail and Chapter 4 for requirements regarding street patching and trench restoration.