DIVISION 4

Storm Drainage

Department of Public Works and Utilities
Engineering Division

DIVISION 4. DRAINAGE

4-10 STORM AND SURFACE WATER DRAINAGE: Drainage control shall be provided on all property improvements within the City per these standards and the city Storm Water Management Plan.

4-20 EROSION CONTROL REQUIREMENTS: Erosion control requirements covered under DIVISION 2 shall be considered in conjunction with this section in designing drainage control.

4-30 DRAINAGE PLAN REQUIREMENTS: Drainage plans will be required for the following:

4-30.1 Grading permits and/or clearing permits.

4-30.2 Subdivision, including short plats.

4-30.3 Special property use permits (except where there is no change in site developmental coverage).

4-30.4 All construction permits for development in critical flood, drainage, or erosion areas as determined by the City Engineer.

4-30.5 Developments having impervious areas over 5000 square feet.

4-30.6 Planned residential developments.

4-30.7 All projects that involve roadway construction.

4-40 REQUIREMENTS FOR DESIGN SUBMITTAL AND PLANS:

4-40.1 Topographic Map: A topographic map shall be submitted by the developer which will indicate the natural drainage patterns of the proposed land development along with the surrounding area. Sufficient adjoining areas shall be included on the map to determine the existing storm water inflow into the proposed development as well as the areas downstream that will be impacted by the development. The map shall indicate direction of flow, site acreage, tributary acreage, the outline of the development, the length of travel and grade of the drainage courses.

4-40.2 Engineering Studies Required: Development on steep (15% or greater) slopes, or in unstable soils, may require a detailed engineering study as determined by the City Engineer to determine appropriate construction techniques.

4-40.3 Drainage Computation Required: Submission of drainage computations and evaluations prepared by a Licensed Engineer will be required.

4-40.4 Construction Plans Required:

4-40.4(1) Construction plans stamped by a License Engineer shall be submitted for review and approval for all storm drain work proposed. The following items shall be included or are required for all storm drain plans:

4-40.4(1)A Both plan and profile views of all storm drains are required.

4-40.4(1)B Show all other utilities existing, or to be constructed on plans in a lighter tone.

4-40.4(1)C All utility crossings are to be indicated in profile views.

4-40.4(1)D Provide notes that refer to specific City Standards for such things as catch basins, manholes, grates, restrictors, etc.

4-40.4(1)E Plans must indicate elevations for all flow lines, top of grates or lids, restrictor overflows, orifice sizes, etc.

4-40.4(1)F Show all easements on plans.

4-40.4(2) Required Notes for Storm Drain Plans:

4-40.4(2)A All work and materials shall conform to City Standards and/or Standard Specifications for Road, Bridge and Municipal Construction as applicable.

4-40.4(2)B No part of the drainage system shall be covered, concealed or put into use until it has been tested and testing observed by City inspector.

4-40.4(2)C Approximate locations of existing utilities have been obtained from available records and are shown for convenience. The contractor shall be responsible for verification of locations and to avoid damage to any additional utilities not shown. If conflicts with existing utilities arise during construction, the contractor shall notify the City Engineer and any changes required shall be approved by the City Engineer prior to commencement of the effected construction.

4-40.4(2)D All storm drain work must be staked for line and grade prior to starting construction.

4-50 DESIGN REQUIREMENTS: All storm drain design and construction shall

conform to King county Storm Drainage Standards.

4-50.1 Surface Water Entrance/Exit: Surface water entering the subject property shall be received at the naturally occurring location and surface water exiting the subject property shall be discharged at the natural location with adequate energy dissipators. The discharge rate of flow after development cannot exceed the rate of flow prior to development.

4-50.2 Parking Drainage: Drainage from parking lots or parking areas must be collected and controlled on the site and discharged via a tight-lined storm drain system. The final catch basin in the system prior to exiting the site must be an oil trap/separator

4-50.3 Rooftop Drainage: Rooftop drainage shall be disposed of by one of the following methods:

4-50.3(1) Tight-line to storm drain system (private or public).

4-50.3(2) Concrete splash blocks.

4-50.3(3) Tight-line to approved drywell.
In all cases, the method selected will be subject to approval by the City Engineer, with considerations given to site, soil types, slope conditions, and the nature of development.

4-50.4 Detention Systems: All developments involving 5000 sq. ft. or more of impervious surface shall install storm detention. Asphaltic concrete, Portland cement concrete, crushed rock and roofs shall be considered as impervious surfaces. Additions to existing sites which increase impervious area and result in a total impervious area of 5000 sq. ft. or more shall install detention for all of the amount of the impervious area added.

Existing developments which are demolished and redeveloped containing 5000 sq. ft. or more impervious surface shall install detention.

4-50.5 Methods of Detention:

4-50.5(1) A series of shallow basins inter-connected.

4-50.5(2) Using a large diameter pipe as an appendage to the basin.

4-50.5(3) Using several large diameter pipes with the basin as the hub.

4-50.5(4) If the development site is sufficiently higher than the street, the bleeder line may discharge in the street gutter provided proper storm facilities are not available.

4-50.6 Restrictors for Detention Systems: Restrictors for detention systems shall be constructed and installed per Standard Plans Nos. 4060 and 4061.

4-50.6(1) Gravel Access Roads: A fifteen-foot wide gravel access road must be provided from a developed access to all restrictor catch basins.

4-50.7 Open Channels:

4-50.7(1) Points of Discharge: Points of discharge from culverts or storm sewers into any open channel shall be protected from erosion by means of rip-rap, splash boards, stilling wells, and/or adequate vegetative cover. The method used is subject to approval of the City Engineer.

4-50.7(2) Non-Erosive Velocity: Where open channels or ditches are used as a means of conveying storm water run-off, the ditch or channel must be able to convey the design storm at a non-erosive velocity. Soil Conservation Service and Washington State Highway Standards will be used as guidelines for determining the maximum non-erosive velocities for the vegetative cover under consideration, as well as the extent of the re-vegetation or rip-rap protection required.

4-50.8 Detention Ponds:

4-50.8(1) Access Roads: All detention ponds shall have a 12-foot wide gravel access road with a minimum compacted thickness of six inches for vehicular traffic from a developed public way to the bottom of the pond at a maximum slope of 12%.

4-50.8(2) Compaction of Berms or Embankments:

4-50.8(2)A All berms or embankments constructed for detention ponds shall be compacted to at least 95% of the maximum relative density in lifts not to exceed six inches in depth.

4-50.8(2)B Berm soils shall consist of material conforming to the following gradation:

Sieve Size	% Passing
3”	100%
#4	65-90%
#200	12-20%

4-50.8(2)C Berm soils shall be placed and compacted over a prepared sub-grade free of organic or other deleterious materials.

4-50.8(3) Protection of Slopes: Slopes shall be protected from erosion by rock rip rap, vegetation or some other method approved by the City Engineer.

4-50.8(4) Maintenance of Surface Ponds:

4-50.8(4)A Commercial developments - maintenance of surface ponds shall be the responsibility of the owner(s).

4-50.8(4)B Residential developments - maintenance shall be the responsibility of the owner(s), homeowners' association, or community club and shall be so stated on the face of the plat, unless accepted as a public facility to be maintained by the City.

4-50.8(5) "Dry" Ponds: All detention ponds shall be the "dry" type per Standard Plan No. B-407. Dry ponds shall be designed and constructed to be completely dry between rain storms. A low flow channel will be required for any pond with springs or other dry weather flows draining into it. The cross-section of the low flow channel will be designed to provide free flowing water to the pond outlet.

4-50.8(6) All detention ponds shall be fenced with a 6 foot minimum height fence. The type of fencing shall be approved by the City Engineer.

4-50.9 Parking Lot Pond Detention Systems:

4-50.9(1) Elevation Requirements: No parking lot ponding shall occur at an elevation higher than one foot below the lowest habitable floor elevation of buildings within the proximity of the pond. Under no circumstances shall ponds or other work on detention facilities be designed in such a manner that system failure would cause flooding in any habitable building.

4-50.9(2) Location Requirements: No parking lot ponds shall be located within the primary ingress/egress portions of a site.

4-50.9(3) Plan Requirements: Parking lot pond design volumes and horizontal measurements shall be shown on the plans.

4-50.9(4) Design Depth Requirements: Maximum design depth for parking lot ponding shall be six inches.

4-50.10 Infiltration System:

4-50.10(1)Run-off Requirements: Run-off is required to flow through a water/oil separator prior to entering an infiltration system.

4-50.10(2)Soil Test Requirements: Soil test borings will be made at a minimum of four locations within the development site. This must include boring at the location of each proposed infiltration system. Test results must indicate soil characteristics to a depth of five feet or two feet below the bottom of the proposed infiltration trench, whichever is greater. The impervious strata must be at a depth greater than one foot below the bottom of the proposed infiltration trench.

4-50.10(3)Infiltration Requirements: Infiltration/drywell systems shall be designed for at least a 25-year intensity, four hour rain storm (1/4" per hour or 1" total in four hours). Storage provided shall be determined based on a minimum assumed 1/3 void ratio.

4-50.11 Piping:

4-50.11(1)Piping Requirements: All pipes used in drainage systems as culverts and in storm water detention facilities shall conform to WSDOT specifications.

4-50.11(2) Velocity Requirements: The minimum velocity in any pipe or culvert carrying the design storm flow shall be two feet per second, except for pipe installed as "equalizers" or a direct part of a detention system.

4-50.11(3) Oil Separation Requirements: Any closed storm drain system collecting runoff from paved areas shall provide for oil separation prior to discharge to the main storm system in the public right-of-way.

4-50.11(4) Public Right-of-Way Requirements: No storm drain pipe between catch basins or manholes in the public right-of-way shall be less than 6" diameter.

4-50.11(5) Debris Barrier Requirements: Debris barriers (trash racks) may be required on culvert inlets when, in the opinion of the City Engineer, circumstances warrant the elimination of miscellaneous flowing debris.

4-50.11(6) Catch Basin/Manhole Requirements: A catch basin or manhole will be required at all changes in storm drain diameters and changes in grade or alignment.

4-50.11(7) Easement Requirements: Storm drain pipes installed in easements shall be constructed as nearly as possible in the center of the easement but in no case shall the pipe be within five feet of any structure or property line.

4-50.12 Catch Basins, Inlets and Manholes:

4-50.12(1) Spacing Requirements - Surface Drainage: Maximum spacing on surface drainage courses between inlets or catch basins shall be 300 feet.

4-50.12(2) Spacing Requirements - Main Storm Drain Lines: Maximum spacing on main storm drain lines between access structures, whether manholes or catch basins, shall be 400 feet.

4-50.12(3) Direct Discharge Requirements: In cases where direct discharge into storm drain system is called for, a gas/oil trap will be required per Standard Plan No. B-401.

4-50.12(4) Catch Basin Requirements - Less than 5.5 Feet: On storm drains with depths of less than 5.5 feet to flow line from finish grade, catch basins may be one of the following:

4-50.12(4)A Catch Basin Type 1 (Standard Plan No. 4002) maximum pipe size 12".

4-50.12(4)B Catch Basin Type 1L (Standard Plan No. 4003) maximum pipe size 18".

4-50.12(4)C Catch Basin Type II (Standard Plan No. 4004) maximum pipe size 21".

4-50.12(5) Catch Basin Requirements - Greater than 5.5 Feet: On storm drains with depths exceeding 5.5 feet to the flow line, joining or inletting catch basins shall be selected from the following:

4-50.12(5)A Catch Basin Type II (Standard Plan No. 4004) maximum pipe size 42".

4-50.12(6) Ladder Requirements: All Type II Catch Basins and all manholes shall be equipped with ladders per Standard Plan No. 4030.

4-50.12(7) Material Requirements: 7-05.2, Materials (for manholes), of the Standard Specifications shall apply, unless otherwise specified, to catch basins, curb inlets and manholes.

4-50.12(8) Frame and Grate Requirements: Frame and grates shall be either standard or through-curb inlet frame and grates. Frame and grates shall be furnished and installed per Standard Plans Nos. 4010, 4011, 4012 and 4013. Through-curb inlet frame and grates shall be installed whenever possible. Exceptions must l be approved by the City Engineer.

4-50.12(9) Manhole Requirements: Storm drain manholes shall be equipped with round 24" covers and frames per Standard Plan No. 4020. Round lids on all storm drain structures shall have "DRAIN" cast into the lid.

4-50.13 Easements, Setbacks:

4-50.13(1) Open Channel Requirements: Where open channel construction is used to handle drainage within the subject property, a minimum fifteen-foot setback will be provided between any structures and the top of the bank of the defined channel.

4-50.13(2) Closed System Requirements: When a closed system is used to handle drainage within the subject property, all structures must be a minimum of five feet from the system.

4-60 CONSTRUCTION REQUIREMENTS: All trench excavation, pipe embedment, backfilling and street patching shall conform to City Standards.