Small Town. Real Life.

2013 Development Design Standards

(ORD #1147)

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City of Duvall Development Design Standards

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Subsequent amendments adopted by Ordinance and other Periodic Updates:

June 1995 (original) – Ordinance #761
July 2007 (revision) – Ordinance #1055
March 2013 (revision) – Ordinance #1147
June 2022 (update)

City of Duvall Development Design Standards

The City of Duvall has adopted the Development Design criteria herein for a two-fold purpose:

1. To set forth specific, consistent street and utility design elements for developers and other private parties constructing or modifying road or right-of-way facilities and/or utilities which require City licenses or permits; and
2. To establish uniform criteria to guide the City's own construction of new City streets and utilities or reconstruction of existing facilities.

In addition, these Development Design Standards (Standards) are intended to support the City's goal to achieve affordable housing, provide adequate facilities for development in an efficient manner, provide well-built long-lasting utilities and streets, comply with stormwater management and sensitive area policies, while balancing these goals with the general safety and needs of the public.

In adopting these Standards, the City has sought to encourage standardization of design elements where necessary for consistency and to assure so far as practical public safety needs are met. Considerations include safety, convenience, pleasant appearance, proper maintenance, and economics. The Standards also provide requirements for the location and installation of utilities within the right-of-way. The City's permitting and licensing activities require the adoption of specific, identifiable standards to guide private individuals and entities in the administrative process of procuring the necessary City approval. Yet, the City must have needed flexibility to carry out its general duty to provide streets, utilities, and facilities for the diverse needs of the public. Accordingly, these Standards are not intended to represent the legal standard by which the City's duty to the public is to be measured.

These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. It is expected that land surveyors, engineers, and architects will bring to each project the best of skills from their respective disciplines. These Standards are also not intended to limit unreasonably any innovative or creative effort that could result in better quality and cost savings, or both. Any proposed departure or variance from the Standards will be judged, however, on the likelihood that such deviation will produce a compensating or comparable result, in every way adequate for the street, utility, and community.

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Chapter 1
GENERAL PUBLIC WORKS CONSIDERATIONS

June 1995 (original) – Ordinance #761
July 2007 (revision) – Ordinance #1055
March 2013 (revision) – Ordinance #1147

June 2022 (update)

CHAPTER 1
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SECTION 1: GENERAL

1-1.01 Standard Specifications

Design detail, workmanship, and materials shall be in accordance with the current editions of the following, except where these Standards provide otherwise.

The following specifications shall be applicable when pertinent or when specifically cited in the Standards:

A. Conditions and standards as set forth in the City's Water System Comprehensive Plan, *most recent edition*.

B. Conditions and standards as set forth in the City's Comprehensive Sanitary Sewer Plan, *most recent edition*.

C. Conditions and standards as set forth in the City's Comprehensive Plan, Land Use, Zoning, and Traffic Circulation Elements.

D. Conditions and standards as set forth in the City's Surface and Storm Water Management Plan and King County Surface Water Design Manual, *most recent edition*.

E. Rules, regulations, Resolution and Ordinances as adopted in the Duvall Municipal Code.

F. Conditions and standards as set forth in the East King County Coordinated Water System Plan, *most recent edition*.

G. Criteria set forth in the Local Agency Guidelines as amended and approved by Washington State Department of Transportation.

H. City and County Design Standards for the Construction of Urban and Rural Arterial and Collector Roads Promulgated by the City Engineers Association of Washington.

I. "Standard Plans for Road, Bridge and Municipal Construction" and "Standard Specifications for Road, Bridge, and Municipal Construction" as written and promulgated by the Washington State Chapter of the American Public Works Association and the Washington State Department of Transportation (as amended).

J. U.S. Department of Transportation Manual on Uniform Traffic Control Devices as amended and approved by Washington State Department of Transportation.

K. Rules and regulations of the State Board of Health regarding public water supplies, as published by the State Department of Health.

L. Conditions and standards as set forth in the State of Washington Department of Ecology "Criteria for Sewage Works Design", *most recent edition*.

M. Conditions and standards as set forth by the State of Washington, Department of Labor and Industries.

N. Criteria set forth in Transportation and Land Development by *V.G. Stover and F. Koepke and the Institute of Transportation Engineers*.

O. Design criteria of federal agencies including Department of Housing and Urban Development and the Federal Housing Administration.

P. All cast or ductile iron items associated with sanitary sewer, water system, and stormwater drainage materials specified in these documents shall be amended such that the country of origin for manufacturing of these products shall be United States of America or Canada and meet all specified ASTM standards.

Q. Other specifications not listed above may apply when required by the City of Duvall.

1-1.02 Shortened Designation

This City of Duvall Public Works Development Design Standard shall be cited routinely in the text as “Standards”.

1-1.03 Applicability

These Standards shall govern all new construction and upgrading of existing facilities both in the right-of-way (ROW) and on-site for transportation and transportation related facilities; surface and stormwater management facilities; sewer and water improvements; and park, recreation, and open-space facilities.

1-1.04 Definitions and Terms

AASHTO – American Association of State Highway and Transportation is a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico. It represents all transportation modes, including air, highways, public transportation, active transportation, rail, and water. Its primary goal is to foster the development, operation, and maintenance of an integrated national transportation system.

ACP or **Asphalt Concrete Pavement** – Asphalt Concrete is known by many different names: hot mix asphalt, plant mix, bituminous mix, bituminous concrete, and many others. It is a combination of two primary ingredients - aggregates and asphalt cement. The aggregates total 90 to 95 percent of the total mixture by weight. Typically, they are mixed with 5 to 10 percent asphalt cement to form Asphalt Concrete Pavement.

ADA – Americans with Disabilities Act (Part 35 Nondiscrimination on the Basis of Disability in State and Local Government Services (current as of October 11, 2016)).

ADT or **Average Daily Traffic** – The average number of vehicles passing a specified point during a 24-hour period. Annual average daily traffic (AADT) denotes that daily traffic that is averaged over one calendar year.

Alley – A dedicated thoroughfare or right-of-way, whether public or private and usually narrower than a street, which may provide vehicular access to an interior boundary of one or more lots and is not designed for general traffic circulation. Alleys serve as secondary and/or primary access to the side or rear of properties whose principal frontage is on a dedicated street provided that all portions of alley-loaded homes are located within 150 feet of a dedicated street; privately maintained.

ANSI – American National Standards Institute is a private non-profit organization that oversees standards and conformity assessment activities in the United States.

Applicant- Any person, firm, partnership, association, joint venture, or corporation or any other entity responsible for a given project.

ASTM International – Formerly known as American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards for a wide variety of materials, products, systems, and services.

APWA - American Public Works Association

Auxiliary Lane - The portion of the roadway adjoining the traveled way for parking, turning or other purposes supplementary to through-traffic movement.

AWWA – American Water Works Association is an international nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water.

BMP or **Best Management Practices** – refers to physical, structural, and/or managerial practices, that when used singly or in combination, prevent or reduce pollution of water and have been approved by the Engineer. BMPs include, but are not limited to, infiltration, retention and/or detention, biofiltration facilities, open ditches with check dams, filter fabric strips, oil/water separators, wet ponds, constructed wetlands, erosion and sedimentation control, and other treatment/abatement facilities.

Biofiltration Facility – means the simultaneous processes of filtration, infiltration, absorption, and biological uptake of pollutants in stormwater that take place when runoff flows over and through vegetated treatment facilities.

Bulb – Round area for vehicle turn around typically located at the end of a cul-de-sac street.

CBR – California Bearing Ratio test is the ratio of force per unit area required to penetrate a soil mass with standard circular piston at the rate of 1.25 millimeter per minute to that required for the corresponding penetration of a standard material.

CDF – Controlled Density Fill. Is a self-compacting, cementitious material used primarily as a backfill in lieu of compacted backfill.

City Engineer – City of Duvall City Engineer, having authorities specified in RCW 36.75.050 and 36.80, or their authorized designee.

Computations – means calculations, including coefficients and other pertinent data, made to determine the rates of flow for stormwater plans, with units given in cubic feet per second.

CO – Certificate of Occupancy

Cul-de-Sac – Short street having one end open to traffic and the other temporarily or permanently terminated by a vehicle turn around.

Curb Extension – A curb-delineated roadway constriction used to protect pedestrians, channel traffic, or dedicate parking.

Current conditions – means the state, status, or conditions (land use, impervious surfaces, topography, soils, and surface water flows) present of the subject property at the time the analysis is conducted.

Design Speed – The speed approved by the City Engineer for the design of the physical features of a road as established by Sections 3-2.03 and 3-2.04 for residential and commercial access streets or equal to 10 miles per hour above the current or expected posted speed limit for arterials. In certain situations, the City Engineer may consider 5-miles per hour above the 85-percentile speed.

DOH – Department of Health

DCVA – Double Check Valve Assembly

Design storm – means a rainfall (or other precipitation) event or pattern of events for use in analyzing and designing drainage facilities, specifying both the return period in years and the duration in hours.

Detention Facilities – means facilities designed to hold runoff while gradually releasing it at a predetermined maximum rate.

Developer – Any person, firm, partnership, association, joint venture or corporation or any other entity who undertakes to improve residential, commercial, or industrial property or to subdivide for the purpose of resale and profit.

Development – means any artificial change to property, including but not limited to, building or other structures, mining, dredging, filling, all land-disturbing activities, clearing, grading, landscaping, paving, excavation, or drilling operations, any activity that requires a permit or approval, including but not limited to a building permit, grading permit, shoreline substantial development permit, conditional use permit, unclassified use permit, zoning variance or reclassification, planned unit development, subdivision, short subdivision, master plan development, building site plan, or right-of-way use permit.

Developed Conditions – means the state, status, or condition of the subject property at the time the proposed project has been completed, which may include existing buildings, impervious areas, and topography as is.

Developmental Coverage – means all developed surface areas within the subject property including but not limited to rooftops, driveways, carports, accessory buildings, parking areas, and any other impervious surfaces. During construction, “development coverage” includes the above in addition to the full extent of any alteration of previously occurring soils, slope, or vegetation due to grading, temporary storage, access areas, or other short-term causes.

DMC – Duvall Municipal Code.

Drainage Area – means area draining to a location not bounded by property lines.

Drainage Facility – means the system of collecting, conveying, and storing surface and stormwater runoff. Drainage facilities shall include but not be limited to all surface and stormwater runoff conveyance and containment facilities including streams, pipelines, channels, ditches, swamps, lakes, wetlands, closed depressions, infiltration facilities, retention/detention

facilities, erosion/sedimentation control facilities, and other drainage structures and appurtenances, both natural and man-made.

Drainage Site – means a geographical area that serves a common or combined use including but not limited to shopping malls and strips, condominiums, apartment complexes, office parks, and housing tracts. A site may include one or more parcels and/or include one or more buildings. See also Development.

Drainage System see **Drainage Facility**

Driveway – A privately maintained access to residential, commercial, or industrial properties.

Easement – The right to use a defined area of property for specific purpose/purposes as set forth in the easement document, on a plat or short plat, or as required for purposes as set forth herein.

Engineer – Any Washington State licensed Professional Engineer who represents an Individual, Applicant, or Developer.

Environmentally Sensitive Areas – means areas defined as such by Ordinance No. 652 - Sensitive Areas Regulations and Ordinance No. 1231.

Equivalent Area – means the tributary area tributary to the receiving water body equal to or less than the shortest, straight-line distance from the receiving water body (or regional facility) to the furthest point of the proposed project.

ERU or **Equivalent Residential Unit** – A unit used to calculate sewer consumption and stormwater management area.

Eyebrow – A partial bulb located adjacent to the serving road that provides access to lots and serves as a vehicle turn around.

FDC – Fire Department Connection

FHWA – Federal Highway Administration

Half-Street – A street constructed along the edge of development or parcel utilizing half the regular width of the right-of-way and permitted as an interim facility pending construction of the other half of the street by the adjacent owner.

HMA – Hot Mix Asphalt.

Illicit Discharge – means all non-stormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality, or groundwater quality standards, including but not limited to sanitary sewer connections, industrial process water, interior floor drains, car washing, and gray water systems.

Impervious Areas – means that hard surface area which prevents or retards the entry of water into the soil mantle and/or causes water to run off the surface in greater quantities or at an increased rate of flow from that present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, PCC or ACP paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of surface and

stormwater runoff. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for the purposes of this document. (See also new impervious surface).

Interceptor – Shall be a sewer that receives flow from several main or trunk sewers, force mains, etc.

Joint-Use Driveway Tract – A jointly owned and maintained tract or easement serving two properties.

KCSWDM – King County Surface Water Design Manual.

Land-disturbing Activities – means any activity that disturbs or alters land surface including clearing and grading.

Landing – A road or driveway approach area to any public or private road.

Lateral – see **Side Sewer**

Lot on Street Frontage – The distance between the two points where the lot lines intersect the boundary of public street right-of-way.

Loop – Road of limited length forming a loop, having no other intersecting road, and functioning mainly as direct access to abutting properties. A loop may be designated for one-way or two-way traffic.

LID – Low Impact Development are techniques and design considerations that mimic the natural environment and help manage rainwater that falls on the ground surface by allowing some to evaporate back into the air, some to absorb into the ground, some to be captured and used later as needed, and the rest to slowly pass into the stormwater system and into nearby stream.

Lowest Floor – means the lowest enclosed area (including basement) of a structure. An area used solely for parking of vehicles, building access, or storage, in an area other than a basement area, is not considered a building's lowest floor, provided that the enclosed area meets all of the structural requirements of the flood hazard standards.

MUTCD – Manual on Uniform Traffic Control Devices.

NEC – National Electric Code or National Fire Protection Association (NFPA) 70 is the benchmark for safe electrical design, installation, and inspections to protect people and property from electrical hazards.

Natural Location – of drainage systems refers to the location of those channels, swales, and other natural conveyance systems as defined by the first documented topographic contours existing for the subject property, either from maps or photographs, or such other means as appropriate.

New Development – means the following activities: land-disturbing activities; structural development, including construction, installation, or expansion of building or other structures; installation of impervious surfaces, and subdivisions or short plats.

New Impervious Surface – means any impervious surface proposed by a project that will increase the runoff curve number of that surface for existing site conditions (e.g. gravel to ACP).

OSHA – Occupational Safety and Health Administration is a large regulatory agency of the United States Department of Labor to assure safe and healthy working conditions for working people by setting and enforcing standards and by providing training, outreach, education, and assistance.

Off-street Parking – An area accessible to vehicles, exclusive of roadways, sidewalks, and other pedestrian facilities, that is improved, maintained, and used for the purpose of parking a motor vehicle.

Pavement Width – Paved area on shoulder-type roads or paved surface between curb, thickened edge or gutter flow line on all other roads as depicted on in the Public Works Standard Details and as described in Chapter 3 – Road Design Standards, herein.

Permanent Stormwater Quality Control Plan – means a plan which includes permanent BMPs for the control of pollution from stormwater runoff after construction and/or land-disturbing activity has been completed.

Pipe Stem – A strip of land having a width narrower than that of the lot or parcel to be served and is designed for providing access to that lot or parcel.

Plans or Construction Drawings – The plans, profiles, cross sections, elevations, details, and supplementary specifications, signed by a licensed Professional Engineer and approved by the City Engineer, which show the location, character, dimensions, and details of the work to be performed.

Planner – means City of Duvall Community Development Director or their designee.

Pollutant – shall mean any substance which, when added to water, would contaminate, or alter the chemical, physical, or biological properties of any waters of the City's drainage system or of the State. This includes a change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the City's drainage system or of the State as will or is likely to create a nuisance. It also includes any substance which renders such waters harmful, detrimental, or injurious to the public health, safety, or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial use, or to livestock, wild animals, birds, fish, or other aquatic life.

Predeveloped – means the land cover or land use existing as of the effective date of Ordinance No. 730 (November 17, 1994).

Private Access Tract – A privately owned and maintained tract providing vehicular access to a limited number of residential properties.

Private Drainage System – means drainage systems located on private property and designed to discharge directly as through pipes, channels, etc., or indirectly as sheet flow, subsurface flow, etc. into the City's drainage system.

Private Sewer – See **Side Sewer**.

Private Street – A privately owned and maintained access provided by a tract, easement, or other legal means, typically serving three or more potential dwelling units that is privately owned and maintained.

Project – General term encompassing all phases of the work to be performed and is synonymous to the term “improvement” or “work”.

PRV – Pressure Reducing Valve.

PUD or **Planned Unit Development** – refers to residential developments which are planned and/or developed in several stages but submitted together for approvals, and which typically consist of clusters of structures interspersed with areas of common open spaces.

Public Drainage System – means that portion of the drainage system of the City located on public right-of-way or other property owned by the City, and those portions of private drainage systems assumed by the City.

Public Sewer – Shall be that portion of the system located within public rights-of-way or public easements which are owned, operated, and maintained by the City.

Public Street – Publicly owned facility that provides access, including the roadway and all other improvements, inside the right-of-way.

Receiving Waters – means bodies of water or surface water systems receiving water from upstream manmade (or natural) systems. For the purpose of this document, receiving water is the Snoqualmie River.

Redevelopment – means on an already developed site, the creation and/or addition of impervious surfaces, structural development including construction, installation, or expansion of a building or other structure, and/or replacement of impervious surface that is not part of a routine maintenance activity, and land-disturbing activities associated with structural or impervious redevelopment on an already developed site.

Retention/detention facility (R/D) – means a type of drainage facility designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration and/or infiltration into the ground; or to hold surface and stormwater runoff for short period of time and then release it to the surface and stormwater management system.

RCW – Revised Code of Washington

ROW or **Right-of-Way** – A general term denoting public land, property, or interest therein (e.g., an easement) acquired for or devoted to a public street, public access, or public use.

Road – A facility providing public or private access including the roadway and all other improvements inside the right-of-way.

Road and Street will be considered interchangeable terms for the purpose of these Standards.

Roadway – Pavement width plus any non-paved shoulders.

RPBA – Reduced Pressure Backflow Assembly

SEPA – State Environmental Policy Act process identifies and analyzes environmental impacts associated with governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilities, or adopting regulations, policies, and plans.

Sewer Main or Trunk – Shall be a sewer that receives flow from one or more mains.

Shoulder – The paved or unpaved portion of the roadway outside the traveled way that is available for emergency parking or non-motorized use.

Side Sewer – Shall be that portion of the line beginning from outside the outer foundation wall of the structure connecting to the sanitary sewer main. Maintenance, service, or repair of a building or side sewer from a home or business to the City owned main shall be the responsibility of the property owner(s).

Standard Plan – Washington State Department of Transportation Standard Plans for Road, Bridge, and Municipal Construction.

Stormwater Plan – means a plan approved by the City of Duvall for the purpose of controlling the quantity and quality of stormwater from the subject property, consisting of a TIR and site improvement plans.

Street – Used interchangeably with road.

Subject Property – means the tract of land which is the subject of the permit and/or approval action, as defined by the full legal description of all parcels involved in the proposed development.

TIA – Traffic Impacts Analysis.

TIR – Technical Information Report means a comprehensive supplemental report containing all technical information and analysis necessary to develop a stormwater plan. This report should contain all calculations, conceptual design analysis, reports and studies required and used to construct a complete stormwater plan based on sound engineering practices and careful geotechnical and hydrological design.

Traveled Way – The part of the road made for vehicle travel excluding shoulders and auxiliary lanes.

Uncontaminated – means water that has not come into contact with illicit discharges.

Undeveloped Conditions – means the state, status, or condition of the subject property prior to any development of the property that has occurred, which may include trees, pastures, meadows, or native features.

UPC – Uniform Plumbing Code.

Use of Pronoun – As used herein, the singular shall include the plural, and the plural the singular; any masculine pronoun shall include the feminine or neuter gender and vice versa; and the term “person” includes natural person or persons, firm, co-partnership, corporation or association, or combination thereof.

Utility – A company providing public service including, but not limited to, gas, oil, electric power, street lighting, telephone, telegraph, communication line, water, sewer, stormwater management or cable television, whether such company is privately owned or owned by a governmental entity.1-1.05 Changes to Standards

UDEA – Utility Developer Extension Agreement

WAC – Washington State Administrative Code

WISHA – Washington Industrial Safety and Health Act (Chapter 49.17 RCW).

WSDOT – Washington State Department of Transportation

1-1.05 Changes to Standards

From time to time, changes may be needed to add, delete, or modify the provisions of these Standards. These Standards may be changed and, upon approval of the City Engineer, shall become effective and shall be incorporated into the existing provisions.

1-1.06 Severability

If any part of these Standards as established by Ordinance shall be found invalid, all other parts shall remain in effect.

1-1.07 Design Standards

A. Detailed plans, prepared by a licensed professional engineer registered in the State of Washington, must be submitted to the City for plan review and approval prior to the commencement of any construction. The applicant or developer's engineer, prior to submittal for review, must stamp and sign all plans. The City Engineer, Public Works Superintendent, and Community Development, prior to the start of construction, shall approve and sign the Construction Drawings.

   i. An electronic copy and two paper rolled copies of the plans shall be submitted along with a completed Plan Review Application. All drawings shall be 24-inch by 36-inch sheet size unless requested otherwise. Original sheets shall be good quality reproducible ink on mylar. Original drawings of the approved plan shall become the property of the Applicant's Engineer.

B. Plan and profile drawings are required for all proposed transportation-related improvements; street illumination; traffic signalization; storm drainage facilities; and sewer and water improvements. For specific minimum requirements, see the Construction Plan Checklist on the following pages. Other checklists can be found in the Appendix. On occasion, the scope of a project (i.e., relocating one hydrant) may not require engineered plans and can instead be handled via a Street Use Permit. This option will be decided during a Site Plan Review.

C. Specifications shall be required and submitted with the plans if General Notes do not adequately cover the project requirements.

CITY OF DUVALL

CONSTRUCTION DRAWING PLAN CHECKLIST

Standard Items: Water, Sewer, Storm Drainage, Streets, Lighting, and Signals

Construction Drawings should be assembled in an orderly package, explain the proposed development, and contain the following information:

- ☐ Cover Sheet
- ☐ Survey of Existing Conditions
- ☐ General Notes (sewer, water, storm, construction, TESC, etc.)
- ☐ Layout Plan
- ☐ Grading and Drainage Plan
- ☐ Utilities Plan / Profile
- ☐ Temporary Erosion Sediment Control (TESC) Plan
- ☐ Roadway Plan / Profile
- ☐ Construction Details
- ☐ Landscape Plan
- ☐ Technical Information Report outlined and numbered per tasks in KCSWDM (separate document)

General Requirements:

- ☐ Sheet size 24” x 36”
- ☐ Mylar reproducible plans (for Right-of-Way Improvements)
- ☐ Site plans match preliminary approved application, conditions of approval letter, and special requirements.
- ☐ Table of Contents on Cover Sheet if more than three (3) plan sheets.
- ☐ Written and graphic scale (all sheets)
  - Scale not more than 1” = 20’ nor less than 1” = 50’ for plan views.
  - Scale not more than 1” = 10’ vertical and 1” = 50’ horizontal for profiles and/or cross sections.
- ☐ Topographic Contours at 2 intervals
- ☐ All affected utilities are shown; utility poles and fire hydrants marked.
- ☐ All road adjoining and within the subdivision are labeled.
- ☐ Existing and proposed utilities have been checked for conflicts.
- ☐ Vicinity Map
- ☐ Legend (APWA Standard Symbols, all sheets)
- ☐ North arrow with reference (magnetic, state plane, etc., all sheets)
- ☐ Scale
- ☐ Datum – NAVD 1988, NAD 83, Benchmark Elevation and Location (cover sheet)
- ☐ Title Block (all Sheets)
  - Title:
  - Design by:

General Requirements:

Drawn by:
Date:
Checked by:

- ☐ Revision number and date (if applicable, all sheets)
- ☐ Construction Drawing Signature Approval Block (all sheets)

APPROVED FOR CONSTRUCTION

BY: _____ DATE: _____

City Engineer

BY: _____ DATE: _____

Public Works Superintendent

BY: _____ DATE: _____

Community Development

APPROVAL EXPIRES: _____

Errors or Omissions are the sole responsibility of the Owner, Architect, Engineer and/or Contractor

- ☐ Sheet number of total sheets.
- ☐ Section, Township, and Range (cover sheet)
- ☐ Engineers Stamp (signed and dated, all sheets)
- ☐ Owner name and contact information
- ☐ Design Professional(s) name and contact information
- ☐ Municipality and Utility contacts
- ☐ 811 Call Before You Dig notification
- ☐ Utility Systems Map (showing all proposed utilities on one drawing)
- ☐ Revision Block (all sheets)
- ☐ Mailbox location approval by Postmaster & Public Works Department

A. Standard Items:

PLAN:

- ☐ Existing Utilities: Water, Sewer, Storm, Gas, Telephone, Electric, Cable
- ☐ Centerline and Stations
- ☐ Edge of Pavement
- ☐ Distance between utilities
- ☐ Existing Power Poles
- ☐ Right-of-way and width
- ☐ Proposed Survey Monumentation Locations and Details
- ☐ Sidewalk and width
- ☐ Road sections
- ☐ Adjacent property lines; ownership; parcel number; and street address

A. Standard Items:

- ☐ Sensitive Areas on-site and within 300 feet of the site
- ☐ Identify Street Names, Right-of-Way, Lots, adjacent Lots and Developments
- ☐ Identify Match Existing Sheet Numbers and Stations
- ☐ Define survey baseline
- ☐ Stations and offsets for structures
- ☐ Easements: Label and dimension
- ☐ Seepage barriers if greater than 7 percent slope (see Section 2-1.05(D))
- ☐ Backflow prevention device, if required
- ☐ Fire Department Connection (FDC), if required
- ☐ Grease interceptor, if required
- ☐ Dumpster pad drains, if required (restaurant and food service)
- ☐ General Notes (construction, sewer, water, storm, TESC, etc.)
- ☐ Sanitary Sewer:
  a. Pipes: size, type, length, slope, stationing at 50' intervals
  b. Manholes: type, rim, inverts in and out, station
  c. Service connection: size, material type, invert elevation
  d. Pump station: easement
  e. Force main: size, type, length, stationing at 50' intervals
  f. Force main air release and cleanout manholes, station, elevations
  g. Identification number and stationing (ex. Line 13, MH-101)
- ☐ Water (provide horizontal and vertical control as required):
  a. Pipes: size, material type and zone
  b. Fire Hydrants: existing and proposed
  c. Valves: size, type, connections, etc. (3-tee, 4-cross)
  d. Blow-off, air-vac, PRV, etc.
  e. Tees, Crosses, Elbows, Adapters and Valves need coupling type
  f. Water service connections: size, material type, meter locations
  g. Thrust Blocking and/or Restrained joints (field-lock gaskets) within 50 feet are required for change main direction, bend, cross, or tee unless otherwise approved by the Public Works Superintendent or City Engineer.
- ☐ Storm:
  a. Pipes: size, type, length, slope
  b. Manhole/Catch Basin: type, size, identification number, stationing and offset
  c. Service connection: size, material type, invert elevation
  d. Minimum Pipe Cover Specified

PROFILE:

- ☐ Show exiting utilities in profile view (if available)
- ☐ Show minimum cover depth on pipe(s)
- ☐ Structures:
  a. Station of structure (left or right)
  b. Rim elevation
  c. Inverts: in, out, each pipe
  d. Pipe: check clearance with casting
  e. Identification Number (Section B, No. 3, Item g.)

A. Standard Items:

f. Show piping conflicts and clearance

☐ Mains:

a. Size
b. Material, type
c. Length in feet
d. Slope (decimal percent)
e. Check cover and clearance with water and storm pipes
f. Concrete encasements at crossings
g. Show existing pipe / manholes in different symbols

B. Roads

PLAN:

☐ Right-of-way (ROW) width
☐ Centerline elevations (shown every 1+00 whole station)
☐ Spot elevations and Curb Returns
☐ Station PC, PT, PI and Intersections
☐ Curve information (delta, radius, length, and tangent)
☐ Begin Curb Radius, End Curb Radius (BCR, ECR)
☐ Identify all field design situations
☐ Plan to note:

a. "Full Width 1.5-inch minimum thickness overlay for road widening and/or utility patches parallel to roadway".
b. If approved by City Engineer: "Transverse utility trenches to be restored with full road width T-Cut patch extending a minimum of 3-feet beyond trench edge".
c. "Any and all replaced or damaged curb and sidewalk shall be replaced joint-to-joint".

☐ Typical road sections include ROW/pavement/sidewalk/landscape width and pavement and rock section thickness.
☐ Pavement marking details with station and offset
☐ Sidewalks:

a. ADA ramps - Detail and Type. Ramps shall be provided for each direction of crossing and shall include receiving ramps. Any on-site ramps or off-site receiving ramps shall be improved to current standards as part of the project.

☐ Driveway entrance & surfacing type:

a. Station
b. Width, material
c. Driveway openings to be clustered to maximize available on-street parking and minimize access conflict with adjacent/opposing driveway openings

☐ Survey Monuments Existing and Proposed
☐ Signage, striping, and channelization

PROFILE:

☐ Vertical Information VPI, BVC, EVC, AP, Low Point, High Point
☐ Show Grades in Decimal Form with (+ or -) Slope
☐ Superelevated Roadways:

a. Detail – show transitions
b. Special detail showing gutter flowing adequately

MISCELLANEOUS:

☐ PSE approved lighting plan:
   a. Station and offset to fixtures
   b. Pole type, mounting height, arm length, anchor bolt size and pattern (follow WSDOT spec unless otherwise required by PSE).

☐ Signals (follow WSDOT spec unless otherwise required by the City)

C. Drainage and Storm Design:

TECHNICAL INFORMATION REPORT (in accordance with KCSWDM outline):

☐ Cover sheet
☐ Project Overview
☐ Existing Conditions Summary
☐ Vicinity Map
☐ Basin/Sub-basin Boundaries Map
☐ Project Boundaries Delineated
☐ Off-Site Area Tributary to Project Delineated
☐ Contours
☐ Off-Site Analysis
☐ Retention/Detention Analysis and Design using WWHM
☐ Low Impact Design Feasibility Evaluation in accordance with NPDES Phase II
☐ Conveyance System Analysis and Design with Design Velocities
☐ Special Reports and Studies (i.e., soils/geotechnical analysis and report)
☐ Comprehensive/Basin Plan Areas
☐ Other Permits and City requirements (i.e., HPA, etc.)
☐ Erosion/Sedimentation Control Design
☐ City of Duvall Bond Quantities Worksheet
☐ Retention/Detention Facilities Summary
☐ Maintenance and Operations Manual (as applicable)

SITE MAP/PLAN:

☐ Existing Topography at Least 50 Feet Beyond Site Boundaries
☐ Finished Grades
☐ Existing Structures within 100 Feet of Project Boundary
☐ Existing Utilities
☐ Easements, Both Existing and Proposed
☐ Environmentally Sensitive Areas on-site and within 300 feet.
(delineated boundaries and 40% slope top/toe)
☐ 100-Year Flood Plain Boundary
☐ Existing and Proposed Wells and drain fields on-site and within 300 feet of Proposed Retention/Detention

FACILITY:

☐ Existing and Proposed Fuel Tanks
☐ Existing On-Site Sanitary Systems within 100 feet of Detention/Retention Facilities

C. Drainage and Storm Design:

- ☐ Proposed Structures Including Roads and Parking Surfaces
- ☐ Lot Dimensions and Areas, Dedicated ROW and Easements
- ☐ Proposed Drainage Facilities and Sufficient Cross-Sections and Details to Build
- ☐ Cross Sections for Ditches and Swales
- ☐ Construction Sequence and Procedures
- ☐ N.G.P.E. Delineation, Major Drainage Features Delineation
- ☐ Compaction Requirements
- ☐ Flow Control Structure with Orifice Size, Elevations, Water Surface, and Dead Storage Shown

TESC:

- ☐ Soil type
- ☐ Locations of soil pits and Infiltration tests
- ☐ Construction entrance detail
- ☐ Silt fence and traps
- ☐ Mulching and vegetation specifications
- ☐ Clearing and grubbing limits
- ☐ Existing and final grade
- ☐ Details and locations of all recommended BMPs
- ☐ Location and details of Temporary Sediment ponds
- ☐ Notes for: Required Type and Frequency of Maintenance, Frequency of Sediment Removal, Cleaning of Catch Basins.
- ☐ Identification of Responsible Maintenance Organization
- ☐ Construction Sequence

DETENTION AND WATER QUALITY FACILITIES

- ☐ Facilities designed in accordance with KCSWDM
- ☐ Plan to include facility design volumes
- ☐ Vaults must be designed in accordance with KCSWDM and these provisions
- ☐ Plan to note that “All Stormwater facilities, catch basins, and conveyance shall be cleaned for City inspection prior to Final Plat and also for City inspection prior to Performance and Maintenance Bond release”.
- ☐ Location
    a. Located in individual tract, not be located within existing or future roadway
    b. Vault to tract/easement line = 5 feet
    c. Vault to adjacent buildings = 10 feet
- ☐ Vault Structure
    a. Clearly marked entrances as confined space
    b. Provisions made for the passage of water when there is a plugged outlet
    c. Pipes sealed with grout
- ☐ Wetpool
    a. Inlet and outlet at opposing corners of the vault
    b. Lockable grates instead of manhole covers
    c. Flow path from inlet to outlet maximized
- ☐ Inlet and Outlet
    a. Distance between inlet and outlet is maximized

C. Drainage and Storm Design:

b. Ratio of flow path length to width from inlet to outlet is at least 3:1
c. All inlets enter first cell
d. Top of inlet submerged at least one foot
e. Inlet pipe invert a minimum of 3 feet from the vault bottom, submerged below wetpool surface
f. Outlet invert elevation – Elevated above the bottom to provide at least 6" of sediment storage and elevated above bottom orifice a minimum of 2 feet
g. Outlet pipe conveys the 100–year design flow for developed site conditions
h. Available head above the outlet pipe at least 6 inches
i. Outlet pipe back sloped or tee section with lower arm 1 foot below the WQ design water surface
j. Gravity drain for maintenance is required
    i. Invert 6-inches above the base elevation of the vault side walls
    ii. 8-inch minimum diameter
    iii. Valve with operational access to valve (one foot of paving around valve box, maximum depth of valve box = 5 feet, manhole required if depth over 5 feet)

☐ Control Structure

a. Located in separate catch basin outside of vault within (minimum) a 52" diameter catch basin with locking manhole and catch basin lids. Lids to provide unimpeded access to ladder and control structure inspection.
b. Clearly marked entrance as confined space
c. Outlet capacity = 100 year developed peak flow
d. Metal Parts – corrosion resistant, no galvanized materials
e. Frame and ladder located such that cleanout gate is visible from top, climb down space is clear of riser and frame is clear of curb
f. At least one orifice at bottom of control structure and one near the top of the riser except for split flow/multiple control structures
g. Minimum orifice diameter = 0.5 inches
h. Orifices constructed on a tee section or baffle
i. Downstream tailwater considered
j. Design provides for overflow of the developed 100-year peak flow with all orifices plugged

☐ Materials

a. Material – minimum 3,000 psi structurally reinforced concrete.
b. Plan to note that "Concrete finish to be smooth with no fins, voids, rock pockets, or other irregularities."
c. Walls shall be designed as retaining walls.
d. Wall drains to be constructed of a minimum 6-inch PVC pipe, shall be located at the wall base, shall include cleanout all corners, and shall gravity flow to discharge point. No one-way valves allowed as part of drainage system.
e. All construction joints shall be provided with waterstops and plan to note that "All waterstops to be installed per plan and specification and to be inspected by the City". Waterstop specification and detail to be included on plan.
f. Plan to note that "Cone snap (or approved equivalent break-beak) ties are required for formwork and are to be removed and epoxy grout sealed at all interior and exterior wall surfaces. No flat ties allowed".

C. Drainage and Storm Design:

☐ Structural Stability

a. H-20 traffic loading minimum.
b. Stamped by a licensed structural engineer.
c. Located on firm and unyielding native soil.
d. Vaults not allowed on fill unless analyzed in a geotechnical report for stability and constructability

☐ Vault Access

a. Plan to note that "Vault excavation to be fenced and secured by contractor. Safety fencing, shoring, excavation safety, and other safety items are the responsibility of the contractor. All access to have secure covering during construction".
b. Access opening and ladder over inlet pipe.
c. Access opening and ladder over outlet pipe.
d. Access opening located within 50 ft of any location within the vault.
e. Access opening for each "v" provided in the vault floor.
f. Access opening is solid, round, locking cover or 3-ft square locking diamond plate covers. Cover type, specification, and model to be stated on plans and to be approved by the City.
g. Type 2 catch basin or Type 1 manhole structure provided at openings where the depth from the cover to the top of vault exceeds 24 inches.
h. 5- x 10-foot removable, locking panel provided for vaults with floor area greater than 1,250 square feet.
i. Removable panel located outside of travel lanes OR multiple standard locking manholes provided at 12 feet on center. Ladders and handholds provided at outlet and inlet pipes.
j. Removable lids are provided for vaults with widths of 10 feet or less.
k. Maximum depth from finished grade to vault invert = 20 feet.
l. Internal structural walls of larger vaults have openings for maintenance between cells.
m. Minimum internal height from highest point on vault floor (not sump) = 7 feet (exceptions for tanks and areas covered with removable panels).
n. Minimum width = 4 feet.
o. Clearly marked entrances to confined spaces.
p. Ventilation pipes (min. 12-inch diameter) are provided at all corners. Vent pipe shall be Schedule 40 PVC or better and shall have locking ductile iron rings and lids. Vent specifications shall be stated on the plans and to be approved by the City.
q. Minimum of 50 square feet of grate provided over the second cell. If the surface area of the second cell is greater than 1,250 SF, 4% of the total surface area shall be grated.

☐ Access Road

a. Access to panel, control structure and at least one point per cell.
b. Maximum grade = 12% for paved access roads, gravel or modular grid paving, width on straight sections = 12 feet.
c. Minimum outside turning radius = 40 feet, width on curves = 15 feet.
d. Fence gates on straight portion of road. Access to panel, control structure and at least one point per cell.
e. Maximum grade = 12% for paved access roads, gravel or modular grid paving, width on straight sections = 12 feet.
f. Minimum outside turning radius = 40 feet, width on curves = 15 feet.
g. Fence gates on straight portion of road.

C. Drainage and Storm Design:

h. Paved apron provided where access connects with paved public
i. Paved apron provided where access connects with paved public road

D. Miscellaneous Items:

- ☐ Easements and/or Dedication Deeds
- ☐ Contract Documents/Specifications
- ☐ Signing Schedule
- ☐ Field Verify Note on Drawings - Expose Connection Points and Verify Fittings 48 Hours Prior to Distributing Shut-Down Notices
- ☐ Signing - Temporary and Permanent
- ☐ Roadway channelization
- ☐ Location of Cluster Mailboxes
- ☐ Location of School Bus (and or) Bus Shelter/Pad
- ☐ Root barrier specification for all landscape strips within or adjacent to public roadway or drainage facilities.
- ☐ Plan to note: "Corrected (as-built) drawings shall be provided for review and approval prior to project approval. Upon approval, the developer/contractor shall submit mylar as-builts, a copy of the drawing files in AutoCAD format, and/or other electronic format as required by the City Engineer".

1-1.08 Plan Review

All plans are to be submitted to the City's Public Works Department. Any necessary off-site easements or dedications shall be submitted for review along with the Plans. City staff will make a cursory check of the Plans against the Construction Drawing checklist from the previous section (1-1.07). If the plans meet the minimum checklist requirements as to context, they will be routed to the appropriate Department and the Plan review process shall begin. **Please see Appendix G for General Construction Notes to be incorporated into Plan sets or Construction Drawing sets.**

If the first review of plans is acceptable, the Design Engineer is then requested to submit the original drawings for approval or is notified of additional required revisions. Additional review time will be required if revisions are necessary.

Approved plans will be signed and returned to the Engineer, Applicant or Developer only after all Plan Review fees have been paid.

Plans that have been approved more than one year before construction begins (i.e., a preconstruction meeting scheduled and bonds in place) shall be subject to re-review at the discretion of the City Engineer.

The following sections summarize report requirements.

A. **Traffic Impacts Analysis (TIA) Requirement**: A TIA is required for projects that impact traffic volumes, safety, and performance. The TIA shall be completed by a licensed engineer in general accordance with the outline presented in the Public Works section of the City of Duvall Website.

B. **Geotechnical Report Requirements**: Geotechnical reports shall be prepared by a licensed geotechnical engineer and shall cover all portions of the project within their expertise including site history; geologic structures; surface conditions; subsurface conditions; geologic and geotechnical hazards per DMC 14.42 including slope stability and mitigation, seismic hazards (International Building Code (IBC) seismic classification, liquefaction, fault rupture, lateral spreading), erosion and sedimentation hazards and controls; site preparation; structural fill placement and testing; use of on-site materials for structural fill and backfill; surface and subsurface drainage; dewatering; recommendations for foundation support; excavation conditions and associated hazards; recommendations for temporary and permanent slopes; design parameters for retaining structures and structure backfill and drainage; and pavement design. The geotechnical engineer shall be retained as the engineer-of-record for the duration of the project.

C. **Technical Information Report (TIR)**: The TIR includes a downstream analysis and is required for all projects that impact, improve, modify, or expand the surface water drainage system. The TIR shall be prepared by a licensed engineer and shall be formatted to reflect the TIR outline, and content presented in the most recent version of the King County Surface Water Design Manual (KCSWDM).

1-1.09 Construction Control

Work performed for the construction or improvement of City roads, Commercial sites, Residential Neighborhoods and/or utilities whether by or for a private developer, City forces, or by a City contractor, shall be done to the satisfaction of the Public Works Inspector and in accordance with approved Plans. It is emphasized that no work shall be started until such Plans are approved. The City Engineer shall approve any Plan revision prior to changes or revisions being implemented. Failure to receive the City Engineer's approval can result in removal or modification of construction at the Contractor or Developer's expense to bring it into conformance with approved Plans.

The City requires a Developer and or their Contractor to retain a Professional Engineer Licensed and registered in the State of Washington to practice in the specialty of Geotechnical Engineering and that this engineer be kept on retainer for their representative project during the entire construction process. The geotechnical engineer shall make periodic site visits and inspections for, but not limited to, trench excavation & backfill, preparation of subgrade for roadways, roadway fill and compaction efforts, slope stability, hillside construction efforts, subterranean drainage and general erosion control issues, and any other pertinent issues that arise throughout construction. When the geotechnical engineer is not onsite, a representative of the owner or the City shall bring to attention any matter they see fit of having the geotechnical engineer address at any time.

1-1.10 Inspection

The City shall have authority to enforce these Standards as well as other referenced or pertinent specifications. The City will appoint project engineers, assistants, and inspectors as necessary to inspect the work and they will exercise such authority as the City Engineer may delegate.

Failure to comply with the provisions of these Standards may result in Stop Work Orders, removal of work accomplished, or other penalties as established by Ordinance.

A. **Inspections.** It is the responsibility of the developer, contractor, or their agents to notify the City in advance of the commencement of any authorized work. A preconstruction meeting and/or field review shall be required before the commencement of work. Inspection fees shall be paid on or before the preconstruction meeting if bonding for final plat approval. Any necessary easements or dedications are required before plan approval. It is the responsibility of the developer, contractor, or their agents to have an approved set of plans and any necessary permits on the job site whenever work is being accomplished.

    1. All specific inspections, test measurements or actions required of all work and materials are set forth in their respective chapters herein. Tests shall be performed at the developer or contractor's expense.

B. **As-built Plans**. Following completion of construction and approval by the City, a minimum of one electronic copy and two paper copies of As-built Drawings shall be submitted for preliminary review. Drawings shall describe all revisions to the previously approved Construction Drawings and include at a minimum, walls/grading, water, sewer, and storm.

    1. If the first As-built submittal is acceptable, the Project Engineer shall submit mylars for signature and an AutoCAD drawing file of the approved as-builts for entry into the City's infrastructure mapping and asset management system.

    2. If the As-built submittal is not acceptable, the Project Engineer will make necessary changes required by the City and re-submit for review.

    3. Final As-builts shall be reviewed and approved by the City prior to acceptance of public facilities and infrastructure by the City and start of the Maintenance period.

C. **Final Acceptance**. After completion of work by the Developer and/or General Contractor listed on the Permit, the City will make a final walk-through which might generate a punch list of required corrections or additional work that must be completed on the project.

    1. After completed improvements are reviewed for conformance with the approved Construction Drawings and all required corrections or additions are completed the City will issue a letter of Final Acceptance of public facilities and infrastructure to the party responsible for the project. For residential subdivisions please use the Final Plat Application and Checklist found in the Appendix.

D. No water meters shall be released for any lot or building served by a project until final acceptance has been granted.

1-1.11 Fees

Fees, charges, or bonding requirements shall be as established by the City Council by the passage of a Resolution adopting a fee, charge, and bonding requirement schedule except where specifically set forth in DMC.

All plan check fees are due prior to the release of approved Plans.

For individual lot development and upon project final approval, all individual site plan review fees are due as a deposit as defined by the City Engineer or invoiced separately. These review fees are not included in the Building Permit fees collected by the Permit Specialist.

All inspection fees are due at the time of the preconstruction meeting as well as any appropriate bonds for construction and additional insurance paperwork.

In addition, there are various miscellaneous service and connection fees and charges. We strongly urge all applicants to request an estimate of these fees and charges from the City Engineer as soon as practical.

A. **Plan Review Fees.** A filing fee as determined by City personnel shall accompany the application at the time of submittal meeting Resolution 02-16. Resolution 02-16 states a deposit in the minimum amount of $5,000 shall be given at time of application and thereafter the City may request more funds if the amount listed above is not great enough to cover costs incurred. The total fee for field and office checking by City personnel shall be the actual cost of the work at rates derived by the Finance Director for personnel under the supervision of a Professional Engineer and any other cost that the City may incur in checking the Plans. Wage rates shall be made available to the Developer upon request prior to submission of the application. The balance of the application fee, if any shall be paid prior to its approval by the City. If the City's cost does not equal or exceed the application fee, the remainder of the fee will be returned to the applicant following approval by the City Engineer.

B. **Field Inspection Fees.** Before construction starts on any approved Plan, an inspection fee as determined by City personnel shall be filed with the City. The total fee for field inspection by City personnel shall be the actual cost of the work at rates derived by the Finance Director for personnel under the supervision of a Professional Engineer and any other costs that the City may incur in inspecting improvements. Wage rates shall be made available to the Developer upon request prior to submission of the application. The balance of the inspection fee, if any shall be paid to the project's final acceptance by the City. If the City's cost does not equal or exceed the inspection fee paid, the remainder of the fee will be returned to the applicant following acceptance by the City Engineer.

1-1.12 Permits

Before any person, firm, or corporation shall commence or permit any other person, firm, or corporation to commence any work to grade, pave, level, alter, construct, repair, remove, excavate, or place any pavement, sidewalk, crosswalk, curb, driveway, gutter, drain, sewer, water, conduit, tank, vault, street banner or any other structure, utility or improvement located over, under or upon any public ROW or easement in the City of Duvall, or place any structure, building, barricade, material, earth, gravel, rock, debris, or any other material or thing tending to obstruct, damage, disturb, occupy, or interfere with the free use thereof or any improvement situate therein, or cause a dangerous condition, a Street Use Permit shall be obtained. A separate

permit shall be obtained for each separate project as determined by the City Engineer or their designee.

In the case of work contracted for by the Public Works Department, the signing of the Contract for Professional Services shall constitute a Street Use Permit.

Much of the work covered under these Standards will require multiple permit authority review and approvals. Several types of permits and approvals require prior approval from the authority before a building or other permit can be issued. Any questions regarding information about permits, approvals and agreements should be directed to the appropriate Departments.

The following general categories describe some of the permits, approvals, and agreements, along with issuing permit/code authority identified in parenthesis:

A. Environmental Review

For most projects a State Environmental Policy Act (SEPA) Checklist must be completed by the applicant and submitted along with plans, specifications, and other information when approval or permits are being requested for a project. The Community Development Department manages the SEPA process and makes a Threshold Determination for the City.

B. Construction Permits

1. **Clear and Grade Permit** (Issued by the Public Works Department). A Clear and Grade Permit is required for all significant tree alterations and grading alterations of more than 50 cubic yards, including Plats and are typically issued separately. A strict inventory and Landscaping Plan (as applicable) are required for all Clear & Grade Permits.
2. **Building Permit** (issued by the Building Department). A Building Permit is required for most all construction work including alteration, repairs, and demolition. Demolition Permits for structures greater than four thousand square feet (4,000 sq. ft.) require a SEPA Checklist submittal.
3. **Street Use Permit** (Issued by the Public Works Department). A Street Use Permit is required for any work within the ROW as outlined at the beginning of this Chapter. Such work may include utilities work, lane closures, driveways, curbs, sidewalks, and haul routes. Permission to temporarily close a street or portion thereof for construction activities is obtained through the Street Use Permit.

C. Approvals and Other Permits

There are several other permits or approvals which may be required and referred to in these Standards such as: Site Plan Review, Subdivision, Preliminary Plat or Final Plat, Wet Weather, and Certificate of Occupancy.

In addition, there are several other City approvals (land use) which may have to be obtained prior to the above listed permits and which may affect the Standards as contained in this document: Rezone; Conditional Use; Planned Residential Development; Planned Unit Development; and Shoreline Substantial Development Permit.

1-1.13 Bonding or Financial Guarantee

Financial Guarantees, Bonds or other allowable securities may be required by the City to guarantee the performance of or maintenance of required work. The type and amount of security shall be determined by code, or, if not specified, be at the discretion of the City Engineer. Types of securities include but are not limited to a bond with a surety qualified to do a bonding business in this state, a cash deposit, or an assigned savings account.

The following are the most frequent bonds required:

A. Restoration/Construction Bond (Erosion Control costs are included in this bond)**.** Construction associated with a Public Works or Building permit shall not commence until a Construction bond as outlined above is posted with the City in an amount equal to 150 percent of the cost of the required public improvements. No Certificate of Occupancy shall be issued until all public improvements are completed and approved unless otherwise allowed by the City Engineer.

B. Performance Bond. For outstanding (remaining) work. Construction associated with a Public Works or Building permit shall not be approved until all required public improvements are completed and final acceptance granted, or, with the approval of the City Engineer, a performance bond as outlined above posted with the City in an amount equal to 150 percent of the cost of the outstanding (remaining) public improvements. No certificate of occupancy shall be issued until all public improvements are completed and approved unless otherwise allowed by the City Engineer.

C. Maintenance Bond. Prior to final Public Works approval and/or release of any Performance Bonds, the permittee or the Contractor for the permittee shall post with the City a Maintenance Bond for maintenance and guarantee of the public improvements in an amount equal to 15 percent of the estimated cost of the improvements for a minimum of two years after the completed job is accepted by the City. During the Maintenance Bond period all public improvements shall be maintained by the Developer or Contractor. Release of the Maintenance Bond shall occur when the Maintenance release inspection shows no damaged, deficient, or failing items.

D. Liability Bond (Storm Drainage Facilities). At the discretion of the City Engineer the person constructing the facility shall maintain a liability policy in an amount as determined by the City but in no instance less than one million dollars per individual, per occurrence, and for property damage, which shall name the City of Duvall from any liability up to those amounts for any accident, negligence, failure of the facility, or any other liability whatsoever relating to the construction or maintenance of the facility. Said liability policy shall be maintained for the duration of the maintenance by the owner of the facility provided that in the case of facilities assumed by the City of Duvall for maintenance said liability policy shall be terminated when said City maintenance responsibility commences.

There shall be only one Restoration/Construction Bond, Performance Bond, and Maintenance Bond allowed for Plat/Subdivision development.

1-1.14 Utility Locations

A. All utilities within a ROW or easement, existing or new subdivisions, road projects, utility projects, or other development on new roads or in roadways shall be located as noted in these Standards. Where existing utilities are in place, new utilities shall conform to these Standards as nearly as practical and yet be compatible with the existing installations. Deviations of location shall be approved by the City Engineer. Existing utilities shall be shown using the best information available. This verification may require exploration or excavation (potholing) if utilities conflict with proposed design.

   The Contractor/Developer shall be responsible for utility locates in conjunction with their project until final Public Works approval is given.

B. All overhead service utility lines shall be undergrounded to the nearest primary source; undergrounding to a secondary source will not be allowed unless approved by the City Engineer. All existing overhead lines in the public ROW adjacent to development shall be undergrounded to the nearest primary source unless determined to be unfeasible by the City Engineer or utility purveyor. New and existing facilities shall comply with provision as set forth in DMC, and provisions as set forth in franchise agreements between the City and the Utility.

   Utilities converted from overhead to underground on existing roadways may be located within the ROW.

C. A Street Use Permit is required of any utility, except City owned facilities and utilities, for any work done within the ROW and shall comply with all provisions set forth in DMC, and applicable sections of these Standards.

1-1.15 Easements

A copy of the Easement Preparation Standards can be found in the Appendix.

A. Where City owned public utilities and/or their conveyance systems cross private lands, an easement must be granted to the City. The Developer or their representative will generally process, record, and file all easements. If the property is platted the easement may be conveyed when the Final Plat is filed. All easements not shown on a Plat must be prepared by a Land Surveyor licensed in the State of Washington or engineering firm capable of performing such work.

B. Easement widths shall be 15 feet for a single utility and 20 feet for dual utilities or as otherwise approved by the City Engineer. Construction easements shall be a minimum of 25 feet in total width. When trench depths dictate or where pipe diameter or vault widths exceed four feet, the City Engineer may require a wider easement.

C. Easements are required to be submitted in draft, unsigned for review and approval prior to Plan or Final Plat approval, at the City Engineer's discretion. Signed copies are required prior to final approval. Any change in design that places an amenity (i.e., water, sewer, sidewalk, etc.) outside of the easement may necessitate work stoppage until Plans and easements can be resubmitted and approved. Easements will be filed/recorded by the Developer or their representative upon satisfactory completion of the work.

1-1.16 Latecomers Agreements (Recovery Contract)

Any person who constructs a water or sewer main extension at the direction of the City, in excess of that which is required to meet minimum standards or which meets minimum standards and will benefit properties abutting the new main, may, with the approval of the City Engineer, enter into a contract with the City which will allow the Developer to be reimbursed for that portion of the construction cost that benefits the adjoining properties and/or is in excess of the minimum standard and in accordance with the Revised Code of Washington (RCW 35.91). This contact is commonly termed a "Latecomers Agreement" or Recovery Contract. The format for a Latecomers Agreement must be submitted for review prior to Plan approval to be considered. Latecomers Agreement must be recorded prior to Final Plat approval.

The Developer is responsible for initiating, executing, and, after City approval, filing the Latecomers Agreement. The agreement shall include: a list of those properties that will benefit from the extension, a map outlining and designating these properties, and backup data supporting the costs submitted. The City will collect the latecomer's fee from persons wanting to connect to the water or sewer extension and subsequently see that the Developer receives the payment.

1-1.17 Utility Development Extension Agreement

A. Any person who constructs additions or extensions to City owned sewer, water, and storm drainage utilities may be required to sign a Utility Development Extension Agreement (UDEA) and shall contact the Public Works Department for any associated Fee Estimate and/or special extension requirements.

B. Anyone wishing to extend or connect to the City Sanitary Sewer shall complete repairs identified immediately upstream and downstream of the subject property per the most recent City of Duvall Infiltration and Inflow Study or as determined by the City Engineer.

   i. Sanitary Sewer mains shall be extended to and through the extremes of the property being developed for future development as determined by the City Engineer.

C. Anyone wishing to connect to the City water supply system shall install mains, fire hydrants, water services, and other appurtenances and improvements to provide adequate water to the site for both domestic use and fire protection per these Standards. Off-site water main extension or improvements may be required for adequate water system performance per the City Engineer.

   i. Utility mains shall be extended to and through the extremes of the property being developed for loop closures and/or future development as determined by the City Engineer.

   ii. Fire hydrants shall be installed where and, in the manner specified by Duvall-King County Fire District No. 45 or City contracted third party and these Standards.

1-1.18 Utility Services Outside of City Boundary

Owners of properties lying outside of, but contiguous to, City limits and within the water service boundary as defined by the City's Comprehensive Water System Plan, may be served by the City water system upon approval and completion of required water system improvements to convey water safely and effectively to the property as determined by the City Engineer. Service to the City sewer system is not available to properties outside of City limits.

1-1.19 Traffic Control

City utilities constructed within King County ROW shall follow all traffic control requirements as set forth by King County Department of Public Works and the MUTCD.

Signs must be legible and visible and should be removed at the end of each workday if not applicable after construction hours.

A Street Use Permit may be required before work within the road can commence. Contact the Public Works Department for specific permit information.

A. Interim Traffic Control:
    1. The Developer/Contractor shall be responsible for interim traffic control during construction on or along traveled City roadways. When road or drainage work is to be performed on City roads that are open to traffic, the Developer/Contractor will be required to submit a traffic control plan for approval by the City Engineer prior to beginning work. Traffic control shall follow the guidelines of the WSDOT/APWA Standard Specifications.
    2. All barricades, signs, and flagging shall conform to the requirements of the MUTCD. For more specific requirements for barricades, see Section 3-5.07 and Standard Detail 3-05-003.

B. When road closures and detours cannot be avoided the Contractor/Developer shall notify the City Engineer. The City may require a detour plan to be prepared, submitted, and approved prior to closing any portion of a City roadway.
    1. Temporary Road Closures and Detours:
        a. When temporary road closures cannot be avoided the Developer/Contractor shall post "To Be Closed" signs a minimum of five days prior to the closing. The types and locations of the signs shall be shown on a detour plan. A detour plan must be prepared and submitted to the City Engineer at least 10 working days in advance and approved prior to closing any City street. In addition, the developer/contractor must notify, in writing, local fire, school, law enforcement authorities, Metro transit, and any other affected persons as directed by the City Engineer at least five days prior to closing.
    2. Haul Routes:
        a. If the construction of a proposed development is determined by the City Engineer to require special routing of large trucks or heavy construction equipment to prevent impacts to surrounding roads, residences or

businesses, the developer/contractor shall be required to develop and use an approved haul route.

b. When required, the haul route plan must be prepared and submitted to the City Engineer and approved prior to beginning or continuing construction. The haul route plan shall address routing, hours of operation, signage and flagging, and daily maintenance.

c. If the developer/contractor's traffic fails to use the designated haul route, the City Engineer may prohibit, or limit further work on the development until such time as the requirements of the haul route are complied with.

3. Haul Road Agreement:

a. When identified as a need by the SEPA review process or by the City Engineer, a haul road agreement shall be obtained by the franchised utility, developer or property owner establishing restoration procedures to be performed upon completion of the haul operation.

1-1.20 Call Before You Dig

All Developers/Contractors or persons working within (or near) the ROW or utility easement area are responsible for timely notification of all utilities in advance of any construction. The utilities "Call Before You Dig" or One-call Underground Location Center phone number is 1-800-424-5555 or 811.

1-1.21 Responsibility to Provide Required Road and Infrastructure Improvements

A. Any development that will impact the service level, safety, or operational efficiency of roads, or is required by DMC or Ordinance to improve such roads, shall improve those roads in accordance with these Standards. The extent of off-site improvements to roads shall be based on an assessment of the impacts of the proposed land development by the City Engineer.

B. Any development abutting and impacting a ROW shall improve the frontage of those ROW in accordance with these Standards as part of a Construction Permit as discussed in this Chapter. The extent of improvements shall be based on these Standards and on an assessment of the impacts of the proposed land development by the City Engineer.

C. Any Boundary Line Adjustments (BLA) abutting and impacting a ROW shall improve the frontage of those ROWs in accordance with these Standards as part of the Boundary Line Adjustment and Site Plan Review or Street Use Permit approval process. The extent of improvements shall be based on these Standards and on an assessment of the impacts of the Boundary Line Adjustment by the City Engineer.

D. Any land development that contains internal roads shall construct or improve those roadways to these Standards.

E. It is the City's practice to not allow subdivisions to be recorded unless there exists a recorded continuous public access to the subdivision except as provided for in Section 3-

2.06, nor will the City accept a road for maintenance until the road is directly connected to a City or other publicly maintained road.

F. All road improvement and development projects shall include approved pedestrian access as a part of the design. The City may require the applicant to install public pedestrian walkways, other than sidewalks as otherwise required by this chapter, where the walkway is reasonably necessary as a result of the development activity.

G. **Waiver**: The applicant shall comply with the provisions of this chapter if the applicant is granted a Construction Permit unless:

1. The cost of the frontage improvement is greater than 20 percent of the cumulative building alterations in any five-year period according to the following:

    a. Street improvement costs shall include, but not be limited to roadway pavement, storm drainage, curb and gutter, landscape strip, street trees, and concrete sidewalk.

        i. Street improvement costs shall be evaluated based on the most recent version of the Public Works Department Cost estimate worksheet.

    b. For properties with multiple street frontages, improvements shall be required on each of the frontages provided that the cost of improvements along the average length of the combined multiple street frontages does not exceed 20 percent of the cumulative building alterations in any five-year period.

    c. Building alteration costs shall be evaluated using the current Building Valuation Data charts published annually by the International Code Council (ICC) on file with the City Building Department. Any valuations not specified in that publication will be determined by the Building Official. Other site improvements such as driveways, sidewalks, utility lines, sheds, etc., will not be included in the valuation.

    d. The City shall track the cumulative building alterations in a five-year timeframe using historical Building Permit information.

    e. Partial improvements, up to the 20 percent threshold, will be required at the discretion of the City Engineer.

2. The applicant or previous owner of the subject property installed improvements in the adjacent ROW as part of a subdivision or discretionary land use permit approved within four years prior of the date of the present development permit application.

3. The requirements are waived under the following circumstances as approved by the City Engineer:

    a. If the installation of the improvements will cause a safety hazard or an environmental impact that cannot be mitigated; or

b. If the project results in alterations or improvements constituting less than 50 percent of the assessed value of the existing structures per DMC 8.04.010.

H. **Required Road and Infrastructure Improvements**:

1. **Frontage Improvements:** Except as specified in subsection (A)(2) of this section, the applicant shall install the specified improvements from the center line of the ROW to the applicant's property line. A full width roadway overlay may be required based on pavement condition as determined by the City Engineer or their designee. The specified improvements shall be designed and constructed per requirements of these Standards unless additional improvements are required by an adopted Comprehensive Plan, DMC, or other City Council adopted Plan, Ordinance, Resolution, or requirement. The applicant may increase the dimensions of any required improvement or install additional improvements in the ROW with the written consent of the City Engineer.

2. **Half-Street Improvements:** If the one-half of the ROW opposite the subject property has not been improved based on the provisions of this Chapter, the applicant shall install improvements in the ROW as follows:

   a. The applicant shall install the required improvements from the subject property line to, and including, the curb.

   b. The applicant shall grade to finished grade all the required driving and parking lanes in the entire ROW and a five-foot-wide shoulder on the side of the ROW opposite the subject property or as otherwise required and approved by the City Engineer.

   c. The applicant shall pave outward a minimum drive lane width of 20 feet adjacent to the subject property or as otherwise required and approved by the City Engineer.

3. **Alleys**: The applicant shall install the required improvements for the entire width of the alley adjacent to the property in accordance with the requirements of these Standards. The applicant shall also complete the following additional alley improvements as required by the City Engineer:

   a. The applicant shall install the required improvements including pavement for the entire width of the alley from and including the subject property to the nearest intersecting street.

   b. The applicant shall grade to finished grade and install a minimum 6-inch-thick gravel driving surface between the limits of the improvements to the farthest intersecting street.

   c. The applicant shall install a 20-foot-long pavement landing at the farthest intersecting street per requirements of these Standards.

d. The applicant shall install the required improvements for the remaining section of the alley if the required improvements in Subsections a, b, and c of this section (above) have been previously completed.

e. LID approaches for alley surfacing will be allowed as a substitute for new pavement upon approval by the City Engineer provided access, safety, maintenance, drainage, and other geotechnical constraints are adequately evaluated and addressed.

4. **Modifications to required improvements:** The City may require or grant a modification to the nature or extent of any required improvement for any of the following reasons:

   a. If the improvement as required would not match the existing improvements.

   b. If unusual topographic or physical conditions preclude the construction of the improvements as required.

   c. If other unusual circumstances preclude the construction of the improvements as required.

   d. All modifications will include required clearing of invasive vegetation, removal of structures, fences, and other non-City improvements from the ROW, and possible construction of pedestrian facilities within ROWs that are not to be fully improved.

I. **Dedication of ROW (right-of-way):** If a ROW abutting the subject property is not wide enough to contain the required improvements, the applicant shall dedicate as ROW a strip of land adjacent to the existing ROW wide enough to encompass the required improvements. The Public Works Director may require the applicant to make land available, by dedication, for new ROWs and utility infrastructure if this is reasonably necessary as a result of the development activity.

J. **Replacement of Damaged or Substandard Existing Street Improvements:** For properties that have existing street improvements, the owner shall remove and replace any damaged or substandard improvements in conjunction with the development of the property. Replacement shall include, but not be limited to, cracked curb, gutter, landscape strip, sidewalk, storm drainage infrastructure, barrier free ramps and receiving ramps, and installation of street trees.

K. **Street Signs and Traffic Control Devices:** The applicant shall install all street signs and traffic control devices in the location and manner established by the Public Works Department.

L. **Sewer and Water Improvements:** The applicant shall install sewer and water extensions and required appurtenances and devices to the farthest limit of the applicant property or as required by the City Engineer. Water and sewer line deficiencies identified immediately adjacent to the applicant property shall be repaired by the applicant as required by the City Engineer.

M. **Other Necessary Improvements:** The applicant shall install any other improvements necessary for the installation or proper operations or maintenance of infrastructure in accordance with these Standards.

1-1.22 Variances

Variances from these Standards may be granted by the City Engineer upon evidence that such variances are in the public interest and that requirements for safety, function, fire protection, appearance and maintainability based upon sound engineering judgment are fully met. Detailed procedures for requesting variances and appealing variance decisions are contained in the Appendix. Variance requests for subdivisions should be proposed during the Preliminary Plat process and prior to any Public Hearing. Variances must be approved prior to approval of the Plans for construction. Any anticipated variances from these Standards which do not meet the Uniform Fire Code (UFC) shall also require concurrence by the Fire Chief or City contracted consultant.

A. Procedure: A person requesting a variance from these Standards shall file an application with the City Engineer setting forth the location of the Development or project, the owner of the property, the nature of the variance request, and the reason for the variance.
   A filing fee is determined at time of application, unless otherwise established by City Council Resolution, shall accompany the application. The filing fee shall be applied to all the costs and expenses incurred by the City in processing the application. In the event the filing fee is inadequate the City shall bill any additional costs to the applicant, which must be paid within 30 days and prior to the granting of any variance herein.

B. In considering an application for variance, the City Engineer shall consider the following factors:

   1. Whether or not the variance would have an adverse effect upon the goals and policies of the City as outlined in this chapter.
   2. Whether or not the proposed variance is consistent with the City's Comprehensive Plan.
   3. Whether or not there would be adverse effects upon adjoining properties or neighboring properties.
   4. Any positive benefits to the City resulting from the proposed variance.
   5. That such variance is necessary because of special circumstances relating to the subject property to provide it with the use, rights, and privileges permitted other properties in the vicinity and in the zone in which the subject property is located.
   6. The capacity of downstream facilities, the acceptability of receiving bodies of water; possibility of adverse effects or retention, utilization of regional retention facilities, and capability of maintaining the system.

C. To complete the application please include the following information with the application form:

1. The specific section of the PWDDS or other adopted manual you are requesting the adjustment or modification.
2. The reason you are requesting the adjustment or modification. Please note that the cost of meeting the standard is not by itself a sufficient reason for approval.
3. An explanation on how the proposed design will provide compensating or comparable outcomes as intended by the standards to be adjusted or modified.
4. Other relevant information in support of your request such as an Assessor's map with the boundaries of the pertinent parcel highlighted, site plans, vicinity maps, preliminary approval conditions, engineering plans, sketches, photos, etc.
5. Payment of all applicable fees.

D. Variance Requests more likely to be granted by Public Works clearly show the request:
   1. Produces a compensating or comparable result (to the standard being adjusted or modified) that is in the public interest, and
   2. Meets the objectives for safety, function, appearance, environmental impact, maintainability, and
   3. Is based on sound engineering judgement.

E. The City Engineer may place any conditions on the variance deemed necessary to achieve the goals of this chapter.

F. Upon reaching a decision, the City Engineer shall notify the applicant, the City Council, and the Mayor. The notice shall be in writing.

G. The applicant, any aggrieved party, any member of the City Council, or the Mayor, may appeal a decision of the City Engineer to grant or deny a variance to the full City Council. A notice of appeal must be filed with the City Clerk within 10 days of the issuance of the City Engineer's decision. The City Council shall consider the appeal within 30 days and may affirm, reverse, or modify the decision of the City Engineer in accordance with the standards set forth herein.

1-1.23 Vesting

Not subject to vesting: Stormwater regulations required under municipal stormwater permit (NPDES) issued by Department of Ecology and Engineering best practices regarding the health, life, and safety of the public.

Questions regarding interpretation of these Standards may be directed to the City Engineer.

Chapter 2
WATER DESIGN STANDARDS

June 1995 (original) – Ordinance #761
July 2007 (revision) – Ordinance #1055
March 2013 (revision) – Ordinance #1147

June 2022 (update)

CHAPTER 2
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CHAPTER 2 – Water Design Standards

SECTION 1: GENERAL

The Public Works Department must approve any extension of the City's water supply system. All extensions must conform to DOH guidelines, the East King County Coordinated Water System Plan, City Comprehensive Water System Plan, and any additional Duvall-King County Fire District No. 45 requirements.

In designing and planning for any development, it is the Developers' responsibility to see that adequate water for both domestic use and fire protection is attainable. The Developer must show, in the proposed Plans, how water will be supplied and whether adequate water pressure will be attained in case of fire. An analysis of the system performed by the City may be required if it appears that the system might be inadequate to support development. The full cost of such an analysis and any applicable fees shall be borne by the Developer.

Anyone who wishes to extend or connect to the City's water system should contact the Public Works Department for a Utility Developer Extension Agreement (UDEA) and water extension/connection fee estimate for costs due to the City. The fees provided are an estimate of costs for a waterline extension or connection. A copy of the Fee Estimate form may be found in the Appendix.

Prior to the release of any water meters, all Public Works required improvements must be completed and approved including granting of ROW or easements, and all applicable fees are paid.

Issuance of building permits for new construction of single-family residences shall not occur until final Public Works approval is given. For commercial projects, building permits may be issued upon completion and acceptance of the required fire protection facilities. A bond, in accordance with DMC 9.02.020, may be required for the remaining Public Works required improvements. Certificate of Occupancy will not be issued until final Public Works approval is given for all improvements.

2-1.01 VACANT

2-1.02 Design Standards

The design of any water extension/connection shall conform to these Standards as stated in DMC Title 9 and UDEA requirements.

The layout of extensions shall provide for the future continuation and/or "looping" of the existing system as determined by the Public Works Department. Utility mains shall be extended to and through the extremes of the property being developed. Main lines shall be extended as required in DMC 9.02.030.

The General Notes for Water Main Installation can be found in Appendix G and shall be included in any Plans dealing with water system design.

2-1.03 Connection to Existing Water Main

The Developer's engineer shall be responsible for determining the scope of work for connection to existing water mains.

It shall be the Contractor's responsibility to field verify the location, size, material, and depth of the existing main and the fittings required to make connections to the existing mains.

2-1.04 Service Interruption

The Contractor shall give the City a minimum of 72 hours' notice of any planned connection to an existing water main. This includes all cut-ins and hot taps. Notice is required so any disruptions to existing services can be scheduled. The City will notify customers affected by the water service interruption. The Contractor shall make every effort to schedule water main construction with minimum interruption of water service. In certain situations, the City may dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific times to existing customers.

2-1.05 Water System Materials

A. 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 (i.e. WSDOT Standard Specifications), it shall be the latest revision at the time of construction, except as noted on the plans or herein. All materials not specifically referenced shall comply with applicable sections of ANSI, ASTM, AWWA or the APWA/WSDOT Standard Specifications.

   Approved manufacturers and model numbers of various materials are listed in Section 2: Water System Approved Materials List of this Chapter. When specific manufacturers or models are listed, no substitutions will be allowed without prior approval by the City Engineer.

B. All pipe for water mains shall have flexible gasketed joints and shall comply with the following:

   i. Ductile Iron (DI) Pipe: Ductile iron pipe shall conform to AWWA C 151 thickness Class 52 and have a cement mortar lining conforming to AWWA C 104. All pipes shall be joined at a minimum using non-restrained joints, which shall be rubber gasketed, push-on type or mechanical joint, conforming to AWWA C 111.

      a. The Contractor shall furnish submittals to the Public Works Department that contain certification from the manufacturer of the pipe and gasket being supplied that the inspection and all the specified tests have been made and the results thereof comply with the requirements of the above referenced Standards.

      b. All fittings for ductile iron pipe shall be ductile iron compact (short body) fittings conforming to AWWA C153 or Class 250 gray iron conforming to AWWA C110 and C111. All fittings shall be cement mortar lined conforming to AWWA C 104. Plain end fittings shall be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings shall be connected by flanges or mechanical joints.

c. Rubber gaskets for push-on-joints or mechanical joint (M.J.) shall be in accordance with AWWA C111.

i. Gasket material for flanges shall be neoprene, Buna N, chlorinated butyl, or cloth-inserted rubber.

d. The type of connections shall be specified on the plans as push-on joint, mechanical joint (MJ), plain end (PE), flanged (FL), and threaded.

e. Bolts shall be high strength; low alloy steel trackhead bolts with national course rolled thread and heavy hex nuts. Steel shall meet AWWA/ANSI C111/A21.11 composition specifications.

f. Polyethylene encasement, if required by the City Engineer in areas of reactive soil (corrosive, humic, or otherwise reactive) shall be eight mil. tube or sheet stock. Materials shall comply with AWWA C105.

g. The minimum cover for all water mains from top of pipe to finish grade shall be 42 inches, and maximum depth of 60 inches, unless otherwise approved by the City Engineer.

ii. Couplings**:** Flexible couplings and transition coupling cast components shall be ductile iron. Center rings and end rings shall be ductile iron in accordance with ASTM 536-80, Grade 65-45-12.

a. Gasket material shall be virgin SBR in accordance with ASTM D2000 3 BA715.

b. Bolts shall be high strength; low alloy steel trackhead bolts with national course rolled thread and heavy hex nuts. Steel shall meet AWWA/ANSI C111/A21.11 composition specifications.

iii. Adapters: All adapters shall be ductile iron.

iv. Bolts in Piping: Bolts shall be malleable iron Cor-ten, or stainless steel.

T-bolts shall be malleable iron Cor-ten in accordance with AWWA/ANSI C111/A21.11. Stainless steel bolts shall meet the requirements of ASTM A-307, Grade A. Shackle rods shall be Stainless steel with Stainless steel nuts, bolts, and washers shall be type 304.

C. **Main Line**: Water mains shall be sized to provide adequate domestic and fire flow demands at the required residual pressure. Fire flow requirements will be determined by Duvall-King County Fire District 45 or the City's contract consultant, and or guidelines set forward by the DOH and any and all applicable portions of the Washington State Administrative Code (WAC) or Revised Code of Washington (RCW); however, the quantity of water required will in no case be less than 1,000 gallons per minute (gpm) at 20 pounds per square inch (psi) residual pressure for single family residential areas.

The minimum water main size shall be 8-inches in diameter if fire flow requirements can be met. Larger size mains are required in specific areas outlined in the Comprehensive Water System Plan. The City reserves the right to require the installation of a larger sized

main in areas not addressed in the Comprehensive Water System Plan to meet fire protection requirements or for future service. Reduction in water main sizing to provide water quality may be approved by the City Engineer if it is proven fire protection requirements are met.

D. **Seepage Barriers:** Utility trenches for water main shall have "Seepage Barriers" installed periodically in the trench according to the following criteria:

   i. If the roadway slope that contains the utility trench is equal to or greater than 7-percent but less than 10-percent there shall be seepage barriers installed at 200-foot intervals; or

   ii. If the roadway slope that contains the utility trench is equal to or greater than 10 percent but less than 15 percent there shall be seepage barriers installed at 150-foot intervals; or

   iii. If the roadway slope that contains the utility trench is equal to or greater than 15 percent but less than 20 percent there shall be seepage barriers installed at 100-foot intervals; or

   iv. If the roadway slope that contains the utility trench is equal to or greater than 20 percent, it shall be the City Engineer's decision as to the spacing of said "seepage barriers".

All Seepage Barriers shall consist of Controlled Density Fill (CDF) or an alternative approved by the City Engineer. A french drain shall be made using geotextile fabric and 1-inch drain rock. Pea gravel shall not be placed anywhere within the utility trench. See detail 3-1-012.

E. **Dead End Line**: No dead-end line shall be less than 8-inches in diameter and longer than 300 linear feet unless approved by the City Engineer. Dead end waterline shall be extended to the appropriate property line in a ROW or an easement at the Developers expense so that future extension and connection is possible. Fire protection must be attainable for all lots from main line hydrants. If these circumstances cannot be met, the Developer shall be directed to loop the system as the City Engineer sees appropriate or provide fire suppression systems.

2-1.06 Hydrants

All areas served by the City's water system shall have fire hydrants per these Standards. Fire hydrants shall be interconnected to the City water system as approved by the City Engineer and Duvall-King County Fire District 45 or City contracted consultant.

A. The lead from the service main to the fire hydrant shall be ductile iron cement mortar lined Class 52 no less than 6-inches in diameter, with a maximum length of lead of 50 feet in accordance with DMC 9.02.030 or as otherwise approved be the City Engineer.

B. Fire Hydrants shall be Mueller type A-423, with a non-locking 4-inch Stortz quarter turn fitting. All new hydrants shall be bagged until the system is approved.

i. The hydrant shall be painted with two coats of quick-set enamel. Paint code is 'Yellow Hydrant Paint' #403472 from Far West Paint Co. or as otherwise approved by Public Works.

ii. Fire hydrants shall have two, 2½-inch outlets and one main pumper port outlet. All outlet threads shall be National Standard thread. The valve opening shall be 5¼-inch diameter. The fire hydrant shall have a positive and automatic barrel drain and shall be of the "safety" or breakaway style DMC 9.02.030.

iii. Where needed, hydrants may require protection by two or more posts, each 4-inches in diameter by 5-feet in height made of either reinforced concrete or steel pipe filled with concrete painted yellow.

iv. For requirements regarding use, size, and location of a Fire Department Connection (FDC) and/or post indicator valve, contact the Building Department or Duvall-King County Fire District 45. The location of FDC shall be shown on water plans.

C. Fire hydrants shall be installed with a gate valve (foot valve) between the service main and the hydrant sufficient to allow repair and replacement of the hydrant without disruption of water service. The location of all valves and fire hydrants installed shall be properly and accurately marked on identifiable plans or drawings.

D. Fire hydrants shall stand plumb and be set so the break-away flange is no more than 6-inches above the finished grade. The hydrant shall be positioned so the pumper port shall face the street. Where the street cannot be clearly defined or recognized, the port shall face the most likely route of approach and location of the fire truck while pumping as determined by the City Engineer.

E. Fire hydrants shall be installed at the ends of dead-end lines which are greater than or equal to 300 feet in length. See 2-1.04(E) of this Chapter for further direction since dead ends are not allowed $\geq$ 300 feet in length. Said fire hydrants may later be moved to conform to standard spacing requirements when the main is again extended, under supervision of the City Engineer or their designee.

F. **Operational Clearance:** Hydrants shall have a minimum of 3-feet working clearance in all directions as measured from the center of the hydrant. This is a no obstruction area free of plants, trees, and structures reserved for adequate clearance to operate the hydrant. No one shall plant any vegetation, erect any structure, or perform any action which results in obstructing the view of a fire hydrant for 50 feet. The owner and/or occupant of any area in which a hydrant is located shall be responsible for removing weed and tree growth from around the hydrant for not less than 10 feet.

G. **Maintenance Clearance:** Hydrants shall have a 10-foot maintenance area in all directions as measured from the center of the hydrant. This area shall be free of any permanent structures or shrubbery so as not to hinder the maintenance or replacement of the hydrant. This included rockeries. No one shall perform any action, which results in obstructing the view of a fire hydrant within this distance. If plants or shrubs are planted, they cannot mature to over 1-foot tall. The owner and/or occupant of any area in which

a hydrant is located shall be responsible for maintaining these clearances. If the homeowner chooses not to complete maintenance the City will complete the maintenance at the homeowner's expense.

H. The Public Works Department and Duvall-King County Fire District 45 or City contracted consultant, work together to ensure that adequate hydrant spacing, and installation are achieved and shall be set as shown in Standard Detail 2-060-001.

Unless otherwise required by the governing authority, the following guidelines shall apply for hydrant number and location:

i. **Intersections**:

a. At least one hydrant shall be installed at all intersections including intersections with alleys and access tracts as required by the City Engineer and Duvall-King County Fire District 45.

ii. **Residential Areas**:

b. All hydrants newly installed in a single-family residential area shall be supplied by not less than 8-inch diameter circulating mains. Dead end mains supplying fire hydrants must be at least 8-inches in diameter, except hydrant leads up to 50 feet long may be 6-inches in diameter.

c. Hydrant spacing of 600 feet shall be required for single family residential areas with a maximum 300-foot frontage length from any lot to a hydrant.

iii. **Business, commercial, institutional, or industrial facilities**:

a. When any portion of a proposed building is more than 200 feet from a public street ROW, on-site hydrants shall be required. Such hydrants shall be located per Duvall-King County Fire District 45 or City contracted consultant and easements for such hydrants, leads, and water mains, shall be granted to the City.

b. Buildings that require fire flows of less than 2,500 gpm, may have fire hydrants on one side of the building only.

c. When the required fire flow is over 2,500 gpm, the fire hydrants shall be served by a main, which loops around the building or complex of buildings and reconnects back into the distribution main.

d. The number of fire hydrants shall be determined on an average spacing of 300 feet computed on an imaginary line parallel to and not less than 50 feet from the structure. All hydrants are to be accessible to Fire Department pumpers over roads capable of supporting such fire apparatus. The City Engineer shall determine the location of the fire hydrants depending on utility, topography, and building location. Hydrants shall be a minimum of 50 feet out from the building, minor deviations may be granted.

e. The lead from the service main to the hydrant shall be no less than 6-inches in diameter. Any hydrant leads over 50 feet in length from service to the hydrant

shall be no less than 8-inches in diameter. The provisions of this part shall apply without exception and regardless of the size of the service main.

I. **Private Hydrants**: The installation of private hydrants as defined herein shall be limited to those cases when the number of public hydrants installed under the distance provision of these Standards shall be insufficient in number. Private hydrants shall meet City requirements for public hydrants and shall be located as designated by the approving authority. The City shall have an easement which grants the right to go upon the premises and to use the private hydrant for public purposes, including testing, flushing, and emergency uses.

J. Fire hydrants must be installed, tested, and accepted prior to the issuance of a Building Permit per DMC 13.60.170.

All fire hydrants installed as required by these Standards shall be served by the City of Duvall unless conditions warrant a waiver of this provision.

2-1.07 Valves

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends. Only Public Works staff shall operate the existing water system valves.

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case shall be less than one valve every 1000 feet. There shall be three valves on each "T" and four valves on each cross unless otherwise approved by the City Engineer.

Specific requirements for valve spacing will be made at the Plan review stage.

A. **Gate Valves** (≤ 12 inches mains): The design, materials, and workmanship of all gate valves shall conform to AWWA C509-80 latest revision. Gate valves shall be resilient wedge non-rising stem (NRS) with two internal O-ring stem seals. Gate valves shall be Mueller.

Gate valves shall be used on all lines ≤ 12-inches.

B. **Butterfly valves** (≥ 14 inches mains): The design, materials, and workmanship of all butterfly valves shall conform to ANSI/AWWA C504, Class 150, with cast iron short body and "O" ring stem seal. Valves in chambers shall have a manual crank operation. Buried valves shall have a 2-inch operating nut and suitable valve box. Butterfly valves shall be Mueller.

Butterfly valves shall be used on all lines ≥ 14 inches.

C. Valve Box. All valves shall have a standard APWA cast iron water valve box set to grade with slip type, cast iron riser from valve. Valve box shall have a lug type cover, 18-inch top and 24-inch bottom. If valves are not set in paved area, a 3-foot by 3-foot by 4-inch-thick concrete pad shall be set around each valve box at finished grade, the subgrade for the concrete pad shall be firm and unyielding and have a minimum of 4-inches of crushed rock underneath. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing a concrete pad. See Standard Details 2-07-001 and 2-08-001.

D. **Valve Operating Nut Extension**: Use where valves are installed more than 5-feet below finished grade. Extensions are to be a minimum of 1-foot with only one extension per valve.

E. **Valve Marker Post**: Valve marker posts shall be reinforced concrete and measure 4-inch by 4-inch by 3½-feet long. Posts shall be stamped with "V" and have the distance to valve stenciled on the front. The post shall be painted with two coats of quick-set enamel. The paint code is 'Yellow Hydrant Paint' #403472 from Far West Paint Co. See Standard Detail 2-07-002.

F. **Check Valve**: Check valves shall be for 150 psi working pressure, unless otherwise specified. Valve shall have adjustable tension lever and spring to provide non-slamming action under all conditions unless otherwise specified.

G. **Air and Vacuum Release Valve:** Air and vacuum release valves (ARV) shall be APCO 145C combination air release valve. The installation shall be set at the high point of the line. Where possible pipes are to be graded to limit the number of ARV's needed. See Standard Detail 2-07-003.

2-1.08 Pressure Reducing Stations and Pressure Reducing Valves

Unless otherwise noted in the City's Comprehensive Water System Plan, a standard pressure reducing station shall have the following (unless otherwise approved by the City Engineer):

A. Cla-Val model 90G-01 ABCSKC 8-inch pressure reduction valve (PRV) for fire flow and a 4-inch for service flow. Both shall have flanged ends. Valves shall have:

   i. Flow opening/closing speed controls, epoxy coated body, and valve position indicator.

   ii. PRVs 3-inches and smaller:

      a. shall be equipped with stainless steel trim (seat, stem, and cover bearing).

B. Pilot controls shall be on the side of PRV facing vault interior.

C. All stations shall include at a minimum, pressure detection / sending units on the in- and out-side of the PRV vault, computer controls and radio or telephone (or cellular) system to relay signal and information to a master control center at the Public Works Department for monitoring and system function purposes. System shall be tied into the City's water control system.

D. Strainers shall be installed on the inlet side of each pressure reducing valve. Strainers shall be iron bodied "Y" type equal in size to corresponding pressure reducing valve and shall feature bolted cover machined to hold screen securely in place and tapped with iron pipe threads for corporation stop. The screen shall be constructed from perforated stainless steel. Main-line strainer shall have flanged-ends and bypass strainer shall have threaded ends. The bypass shall be fitted with bronze ball valves sized to correspond with the bypass inlet and outlet size. A 2-inch Cla-Val model 50G-01KC pressure relief valve with threaded ends shall be installed on the discharge side of the 2-inch pressure reducing valve line for all pressure reducing stations servicing the 450 and 330 pressure zones

(refer to Comprehensive Water System Plan for pressure zone boundaries and specific valve requirements).

E. The vault shall be equal to Utility Vault Co. model 687-LA with cover as specified in the Standard Detail. The Vault exterior shall be coated with coal tar enamel, or equal. Vaults shall have 8-inch sump with gravity drain to storm drainage system or be equipped with water-pressure powered sump pumps and power to run appropriate controls as approved by the City Engineer.

F. **Individual PRV (Residential, Multi-Family, & Commercial)**: All service connections shall have an individual PRV installed on the house or building side of the meter and shall:

   i. Installed and shall be direct-action piston type with integral strainer and bypass.

   ii. Valve body shall be bronze with threaded outlet end and integral union on inlet end.

   iii. Valve shall be line-sized with spring range from 25 to 75 psi.

   iv. For new individual PRVs: Manufacturer shall be Mueller Model H-9300, Wilkens 600 series, Watts U5, or approved equal. An individual PRV shall be preceded by a strainer and the valve shall be line sized.

2-1.09 Service Connection

A. **Residential**: All service connections relating to new development shall be installed by the Developer at the time of mainline construction. All single and double services shall be 1-inch diameter unless a larger size is required by the Owner's Engineer. After the service lines have been constructed, tested, and approved, the Owner may apply for a water meter. The City will install a water meter after the application has been made and all applicable fees have been paid. Water meters will be set only after the system is inspected and approved.

   i. **Fire suppression:** Services serving fire flow shall include Backflow Prevention as required in Section 2-1.15 except for residential combination (flow-through) systems. Residential fire sprinklers, and fire sprinkler connections, shall be required in accordance with Ordinance 1097 (July 8, 2012) and where the distance from the nearest roadway to the farthest portion of the residence is greater than 150 feet (hose-length) unless otherwise approved by Public Works, Duvall-King County Fire District 45, or City consultant.

B. **Commercial**: All commercial service connections shall be sized by the developer's engineer and approved by the Public Works Department. Fire sprinklers shall be installed as required by the Developer's Engineer, Public Works, DMC, and as approved by Duvall-King County Fire District 45 or City contracted consultant.

C. When water is desired to a parcel fronting an existing main but not served by an existing service, an application must be made to the City. Upon approval of the application and payment of all applicable fees, the City will allow tapping of the main, and installation of the meter, box, and setter.

D. Corporation stops shall be all bronze and shall be Ford or Mueller brand with AWWA tapered thread (CC) or Iron Pipe (IP) threads. All Corporation stops shall be the ball valve (Ball-Corp) style.

E. Service saddle shall be all bronze construction with stainless steel straps and shall be either Romac 202NS or Ford FC202. Water mains may be direct tapped if desired and as approved by the City Engineer.

F. Water services shall be:

   i. High-density polyethylene (HDPE) pipe for underground manufactured from ultrahigh molecular weight, high-density polyethylene resin PE 3408 and shall meet the requirements of Type III, Class C, category 5-P34 polyethylene as defined by ASTM specification D-1248 and D-2239.

   ii. Minimum pressure class 200 (psi).

   iii. No glued joints will be accepted.

   iv. Tracer tape/wire shall be installed on all service lines.

   v. Service lines 1-inch or smaller shall be iron pipe size (IPS) with a Mueller Inst-Tite fitting connection.

   vi. Service lines 1½-inch and larger shall be copper tubing size (CTS) pipe with either a Mueller 110 Compression Connection or a Ford Quick-Joint coupling connection.

G. Master meters will not be allowed for service to more than one per building. If a master meter is used, an approved backflow prevention system must be installed to prevent cross contamination between dwelling units. Deviations to this may be granted by the City Engineer.

H. Meter setters (1-inch and smaller) shall have double purpose couplings, unless otherwise specified, angle meter valve with drilled wings for padlock, 12 inches high. The angle copper setter for the size meter to be installed, see Standard Details 2-090-001, 2-090-002, 2-090-003.

   1½-inch meter setters shall have vertical inlet and outlet tees with 1-inch lateral bypass, flanged ball meter valves on inlet and outlet, ball valve on bypass, and padlock wings on all valves, see Standard Details 2-090-003.

I. Meter Box shall be HDPE and shall be complete with lid as specified in Standard Detail 2-090-004.

2-1.10 Steel Casing

Structural water pipe protection shall be used where water mains are located beneath walls, rockeries or other elements with high point load as required by the City Engineer.

A. **Steel Casing**: Steel casing may be used providing it is a 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. If pipe casing is being

used, pipe spacers are required. Pipe spacers shall be Cascade style CC5 with 8-inch runners as available from Cascade Waterworks. Casing pipe and spacers shall be sized for pipe being installed. Install minimum of three spacers per section of pipe.

2-1.11 Galvanized Iron Pipe

Galvanized pipe shall be used only for dry pipe in pressure relief and vacuum breaker assemblies. Where galvanized iron pipe is specified, the pipe shall be standard weight, Schedule 40, steel pipe per Standard Specification for black and hot-dipped, zinc-coated (galvanized) welded and seamless steel pipe for ordinary uses (ASTM A-120). Fittings shall be screwed malleable iron galvanized per ANSI B16.3.

2-1.12 Blow-off Assembly

If a fire hydrant is not located at the end of a dead end main, at a minimum a blow-off assembly shall be required for water quality. Locate the blow off saddle as close as practical to the end of the line. The end of the line should be mechanically capped with a restrained joint and redundant thrust blocking. Installation shall be as shown on Standard Detail 2-120-001.

2-1.13 Concrete Bedding and Blocking

Blocking, encasement, or slope anchor 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 sacks of cement per cubic yard and shall be of such consistency that the slump is between 1- and 5-inches. All concrete shall be mechanically mixed.

Location of thrust blocking shall be shown on Plans. Thrust block concrete shall be poured against firm, undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings. See Standard Detail 2-130-002 for thrust block locations and calculations. Concrete blocking shall not be backfilled until adequate curing and setting has occurred (typically 12 hours).

2-1.14 Joint Restraint

Joint restraint methods shall be in accordance with the approved materials list and/or the Plan details and required notes.

2-1.15 Backflow Prevention

The installation of all backflow devices is required to protect the existing water system and users from possible contamination. All water system connections to serve buildings or properties with domestic potable water, fire sprinkler systems, irrigation or other potential cross-connection hazard systems shall comply with the minimum backflow requirements as established by the DOH and Public Works Department.

For service connections with fire protection systems other than flow-through or combination systems, backflow protection is required in accordance with Chapter 51-56 WAC. Backflow protection is not required for residential flow-through or combination fire protection systems constructed of potable water piping and materials.

An approved premise isolation backflow prevention system shall be installed within all commercial, industrial, or mixed-use buildings immediately downstream of the meter or within the premise prior to any branching. In addition, premise isolation shall also be installed in all facilities listed in Table 9 of the *Cross Connection Control Rules and Definitions* by DOH, PUB. #331 – 355).

Public Works shall get the certificate of testing of any backflow prevention device before releasing the CO on any building and on an annual basis thereafter. A list of approved testers may be obtained from Washington Environmental Training Resource Center (WETRC) located in Auburn, Washington. Testing shall be completed annually at the owner's expense and results shall be submitted to Public Works.

Duvall-King County Fire District 45 or City contracted consultant will test the fire line and obtain the certificate for underground piping. In any situation, Duvall-King County Fire District 45 will not test their portion of underground until Public Works has tested and approved their main up to the fire line.

2-1.16 Reduced Pressure Backflow Assembly with Detector

This assembly shall include a DOH approved Reduced Pressure Backflow Assembly (RPBA) device scaled to match the input line size. Each assembly shall include a resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks. The reduced pressure backflow device must be listed on the **most recent** copy of *Cross Connection Control Rules and Definitions* by DOH, PUB. #331 – 355.

2-1.17 Double Check Valve Assembly

All Double Check Valve Assemblies (DCVA) shall be the one listed on the **most recent** copy of *Cross Connection Control Rules and Definitions* by DOH, PUB. #331 – 355. The assembly shall include a resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks.

2-1.18 Double Check Detector Assembly

This assembly shall include a DOH approved Double Check Detector Assembly (DCDA) scaled to the assembly to match intake line size. Each assembly shall include a resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks. The reduced pressure backflow device must be listed on the **most recent** copy of *Cross Connection Control Rules and Definitions* by DOH, PUB. #331 – 355.

2-1.19 Backflow Device Resilient Seated Shut-off Valves

Each valve shall be marked with model number with designation of resilient seat, such as "RS" or "R", which must be cast, molded, or affixed onto the body or bonnet of the valve. All ferrous bodied valves shall be coated with a minimum of 4 millimeters of epoxy or equivalent polymerized coating. For 2-inch and smaller RPBAs and DCVAs shall use ball valves. For all 2½-inch and larger RPBAs and DCVAs shall use resilient seated gate valves for domestic supply and resilient seated RS and R valves for fire lines.

The minimum requirements for all resilient seated gate valves shall, in design, material, and workmanship, conform to the standards of AWWA C509.

2-1.20 Water Main/Sanitary Sewer Crossings

The Contractor shall maintain a minimum of 18 inches of vertical separation and 10 feet of horizontal separation between sanitary sewers and water mains. This clearance is measured from the closest outside diameter of one pipe to the next. If this is not possible construction cannot continue without the express approval by the City Engineer in accordance with the *Criteria for Sewage Works Design* (Orange Book, Department of Ecology).

The minimum cover for water mains is 42 inches and may be reduced to 24 inches upon approval by the City Engineer to provide for as much vertical separation as possible.

The longest standard length of water pipe shall be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the water pipe and/or sewer service in a carrier pipe, concrete, or controlled density fill (CDF). No concrete or CDF shall be installed unless specifically directed by the City.

2-1.21 Staking

All surveying and staking shall be performed by a Land Surveyor licensed in the State of Washington or engineering firm capable of performing such work.

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 waterlines shall be as directed by the City Engineer or as follows:

A. Stake centerline alignment every 50 feet with cut or fill to invert of pipe maintaining 42 inches of cover over pipe.

B. Stake alignment of all fire hydrants, tees, water meters, setters and other fixtures and mark cut or fill to hydrant flange finished grade.

2-1.22 Trench Excavation

A. Clearing and grubbing where required shall be performed within an easement or public ROW 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 Plans to provide a minimum of 42 inches of cover over the pipe. Except for unusual circumstances approved by the City, the trench sides shall be excavated vertically, and the trench width shall be the pipe diameter plus 2 feet (one foot for each side of the pipe). 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 Owner shall maintain sufficient pumping equipment on the job to

ensure that these provisions are carried out. See Standard Detail 5-010-007 and Section 3-8.03 for additional information.

C. The Contractor is responsible for all excavation activities. This includes but is not limited to the removal of all boulders, rocks, roots, or any other unforeseen obstructions that are encountered to a full trench depth and width as defined above. Standard pipe bedding shall be 5/8-inch minus crushed rock. An approved alternative may be requested but will require the City Engineer's approval. Backfill in the pipe zone shall conform to Standard Detail 5-010-007.

D. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval from the City and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standards.

E. The bottom of the trench and pipe bedding shall be finished to provide bearing along the entire length of the barrel. The bell hole shall be excavated to sufficient size to make up the joint while providing bearing along the entire barrel.

2-1.23 Bedding, Backfilling, and Compaction

Trench backfilling, compaction and applicable surface restoration shall closely follow installation of pipe so that no more than 100 feet is left exposed during construction hours without approval from the City. A modified proctor and sieve analysis are required for each material to be tested before any results from compaction shall be accepted. If the material type or source of material changes during a project, a new proctor report and sieve analysis will be required.

A. Water main pipe bedding shall be 6-inches under to 8-inches over the pipe by the width of the standard trench (pipe diameter plus 2-feet unless otherwise approved by the City Engineer or Public Works Superintendent).

B. Without exception, the entire trench shall be backfilled with crushed surfacing top course meeting the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications.

C. Backfill shall be placed and compacted mechanically in 6-inch lifts with a City Inspector present. The remaining trench backfill compaction requirements shall be decided based on two factors:

    1. **Areas in Right-of-Way or within areas with structural loads** (including parking, non-paved access roads, and foundations) structural fill with 95% compaction as described in Section 2-03 of the WSDOT/APWA Standard Specifications, is required in the top 4-feet of trench (which is typically the whole depth in water line construction) and 90% compaction below if applicable. The trench bottom shall be firm and unyielding prior to fill placement.

        a. If the capability can be demonstrated, based on compaction equipment or quality of backfill to achieve 95% density (modified proctor) in thicker lifts, the depth of backfill lifts may be increased up to one foot.

2. **Areas outside of Right-of-Way** structural fill with 90% compaction required the entire trench depth.

    a. All trench backfill under roadway shall be mechanically compacted to 95% of maximum density (modified proctor) except for trenches over 8-feet in depth. Throughout the length of any pipe run, manhole to manhole, in which any part is over 8-feet deep, backfill at depths over 4-feet shall be compacted to 90% maximum density by mechanical compaction. The top four feet of the trench line shall then be mechanically compacted to 95%. All densities shall be determined by testing specified in Section 2-03.3(14)D of WSDOT/APWA Standard Specifications.

    b. In any trench in which 95% density (modified proctor) cannot be achieved with existing backfill, the top 4-feet shall be replaced with gravel base as specified in the WSDOT/APWA Standard Specifications, Section 9-03.10. This new material shall then be mechanically compacted to 95% density (modified proctor).

    c. On Proposed Roads (e.g., New Subdivisions): Backfill compaction for trenches within the roadway shall be achieved throughout the entire depth of the trench, by mechanical compaction as described above.

D. Compaction Testing:

1. Consistent with the above and prior to placing any surface materials on the roadway, it shall be the responsibility of the Developer or Utility to provide density test reports certified by a professional Engineer. The following testing minimum requirements shall apply:

    a. Compaction of laterals or service line trenches shall be tested where directed by the City Engineer.

    b. A minimum of one test shall be taken in every trench, and one test every 100 feet of trench length at depths up to 50 percent of trench depth (see D.2 below), or as otherwise directed by the City Engineer; and

    c. In-place densities and moisture contents shall be determined by using a nuclear density gauge; and

    d. Test as trench is backfilled; and

    e. CDF may be used above bedding (testing of CDF shall be in accordance with ASTM D4832).

2. Whichever compaction method the installer elects, the backfill below 4-feet must test no less than 90% maximum density (modified proctor) and the upper 4-feet of backfill must test no less than 95% maximum density (modified proctor). Where this cannot be achieved, all affected backfill in the top four feet shall be removed and replaced by gravel base and mechanically compacted to 95% as in C.3.b above.

E. 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.

F. The City reserves the right to require temporary plating and/or backfill to decrease traffic impact.

2-1.24 Controlled Density Fill

Controlled Density Fill (CDF aka flowable fill) shall be a mixture of Portland cement, fly-ash (optional), aggregates, and water. It shall be proportioned to provide a grouty, non-segregating, free flowing, self-consolidating and excavatable material that will result in a non-settling fill, which has measurable unconfined compressive strength. Unless otherwise specified, unit weights shall range from 125 pounds per cubic foot (pcf) to 155 pcf.

Materials testing shall be with unconfined compressive test cylinders. Test data may be either laboratory trail batch test data or field test data.

Specific mix designs may be required at the Engineer's discretion.

The unconfined compressive strength at 28 days shall be a minimum of 50 psi and a maximum of 100 psi. Material shall be a sand/grout slurry proportioned to be easily diggable by hand after long-term strength gain.

2-1.25 Temporary Street Patching

Temporary restoration of trenches shall be accomplished by a using 2-inch thick, Asphalt Concrete Pavement (ACP) that consists of ½-inch Hot Mix Asphalt (HMA) or temporarily cover trenches with steel plates secured with pins and pavement ramps.

ACP used for temporary restoration may be dumped directly into the trench, bladed, and compacted. After compacting, the trench must be filled flush with the existing ACP to provide a smooth riding surface.

All temporary patches shall be maintained by the Contractor until such time as the permanent patch is in place. If the Contractor is unable to maintain a patch for whatever reason, the City will patch it at actual cost plus overhead and labor at the Contractor's expense. All temporary patches shall be removed prior to final patching and paving unless otherwise approved by the City Engineer.

2-1.26 Trench Restoration

Trench restoration shall be either by a patch or patch with overlay as required by the City and subject to DMC 8.4.050 – Street Use Permit.

A. All trench and pavement cuts shall be made by saw cutting. The cuts shall be a minimum distance outside the trench width as prescribed by the City Engineer.

B. Trenches made in the ROW that are parallel with the road and greater than 50-feet in length shall be backfilled with crushed surfacing materials conforming to the WSDOT/APWA Standard Specifications.

C. After backfilling and compaction, an immediate temporary cold mix patch shall be placed and maintained in a manner acceptable to the City Engineer. On pavement, a permanent hot mix patch equal to the existing depth plus 1-inch or a total of 3-inches, whichever is greater, shall be placed and sealed with ACP within 30 calendar days. Cement concrete pavement shall be restored with an eight-sack mix, using either Type II or Type III cement, within 30 calendar days.

D. Trenches made parallel with the road of lengths less than 50 feet and/or trenches perpendicular to the road, of any length (typically not greater than 30 feet) shall be backfilled in accordance with WSDOT/APWA Standard Specifications unless otherwise approved by the City Engineer. The trench bottom shall be firm and unyielding prior to fill placement and comply with the following:

    i. Restoration of a trench within pavement shall include a minimum of 6-inches of crushed surfacing material and ACP the same thickness as the existing pavement plus 1-inch or a minimum of 3-inches, whichever is greater. Pavement shall then be overlaid full width with a minimum of 1 ½-inches of compacted ACP. Any exceptions to this overlay requirement will be on a case-by-case basis, subject to approval by the City Engineer, considering the existing conditions of the pavement. Concrete pavement shall be restored consistent with Section 6-02 of the WSDOT/APWA Standard Specifications. Any concrete pavement traffic lane affected by the trenching shall have all affected panels replaced.

E. Asphalt Emulsion Tack shall be applied to the existing pavement and edge of cut and shall grade CSS-1 as specified in the WSDOT/APWA Standard Specifications. A tack coat shall be applied as specified in the WSDOT/APWA Standard Specifications.

F. ACP (½-inch HMA) shall be placed on the prepared surface by an approved paving machine and shall be in accordance with the applicable requirements of the WSDOT/APWA Standard Specifications, except that longitudinal joints between successive layers of ACP shall be displaced laterally a minimum of 12 inches unless otherwise approved by the City Engineer. Fine and coarse aggregate shall be in accordance with the WSDOT/APWA Standard Specifications. ACP over 2-inches thick shall be placed in equal lifts not to exceed 2 inches each unless otherwise approved by the City Engineer.

G. All street surfacing, sidewalks or driveways within the street trenching areas affected by the trenching shall be feathered and leveled to an extent that provides a smooth-riding connection and expedites drainage flow for the newly paved surface. Leveling and feathering as required by the City Engineer shall be accomplished by raking out the oversized aggregates from the ACP mix as appropriate.

H. Surface smoothness shall be per the WSDOT/APWA Standard Specifications.

I. All joints shall be sealed using liquid rubberized tar (AR4000W) and then coated in sand.

J. When trenching within the roadway shoulder(s), the shoulder shall be restored to its original or better condition.

K. The final patch shall be completed as soon as possible and shall be completed within 30 days after first opening the trench. This timeframe may be adjusted if delays are due to inclement weather, or other adverse conditions that may exist. However, delay of the final patch is subject to the City Engineer's approval.

2-1.27 Hydrostatic Tests

The Public Works Superintendent or their representative will require a minimum of 24-hour notification before observing a hydrostatic pressure test.

Prior to the acceptance of work, all new water lines shall be subjected to a hydrostatic pressure test of 240 psi for 15 minutes with zero losses. The pressure testing pump shall be located at the high point of the line unless otherwise approved by the Public Works Superintendent. Any leaks developed shall be remedied by the Contractor before final acceptance of the work. Prior to testing, reasonable effort shall be made by the contractor to remove all air in the lines. The mains shall be tested between valves. If possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation is inspected. The Contractor shall provide all necessary equipment and shall perform all work connected with the test. If the test does not pass inspection for any reason, additional trips required to witness the test shall be done at the Contractor's expense.

All tests shall be successfully completed and approved by the inspector before the new system may be connected to the existing. A temporary plug (or 2" blow-off assembly on lines without hydrants) shall be installed at the end of the new main. This shall include concrete blocking necessary to withstand pressures encountered during the hydrostatic test.

2-1.28 Disinfection and Flushing of Water Mains

The Contractor shall contact the Public Works Superintendent at least 24 hours in advance of the completion of disinfection and flushing and their representative shall be present when water samples are taken.

If the contractor wishes, the water line can be pressure tested at the same time as disinfection, but the required notices stand.

Disinfection of water system construction, connection, repair, or loss of integrity shall be completed in accordance with WAC 246-290-451, standards published by the American Water Works Association (AWWA), and in a manner satisfactory to the Public Works Superintendent:

A. In cases of new construction, drinking water shall not be furnished to the consumer until satisfactory bacteriological samples have been analyzed by a laboratory certified by the state.

B. In cases of existing water mains, when repair/replacement is completed or the integrity of the main is lost resulting in a significant loss of pressure that places the main at risk to cross-connection contamination, the City shall require standard industry practices such as flushing, disinfection, and/or bacteriological sampling to ensure adequate and safe water quality prior to the return of the line to service.

Super-chlorinated water may not be left in the water line for more than 48 hours under any circumstance.

Proper de-chlorination and diffusing will be required when flushing. Flushing in any way that impacts the vegetation, landscaping or adjacent properties will not be allowed.

The section to be disinfected shall be thoroughly flushed at maximum flow established by the City Engineer prior to chlorination. The City Engineer shall approve the flushing period. Sections will ordinarily be disinfected between adjacent valves unless, in the opinion of the City Engineer, a longer section may be satisfactorily handled. Chlorine shall be applied by solution feed at one end of the section with a valve or hydrant at the opposite end open sufficiently to permit a flow through during chlorine application. The chlorine solution shall be fed into the pipeline already mixed by an automatically proportioning applicator to provide a steady application rate of not less than 60 parts per million (ppm) chlorine. Fire hydrants along the chlorinated section shall be open during application until the presence of chlorine has been detected in each hydrant run. When a chlorine concentration of not less than 50 ppm has been established throughout the line, the valves shall be closed, and the line left undisturbed for 24 hours.

As an alternative, the Contractor may use granulated chlorine. Granulated chlorine (dry calcium hypochlorite at 65% - 70% chlorine) shall be placed in the pipe to yield a dosage of not less than 50 ppm. The number of ounces of 65% test calcium hypochlorite required for a 20-foot length of pipe equals 0.00843ld, in which “d” is the diameter in inches.

The line shall then be thoroughly flushed, and water samples taken for approval in accordance with local health agency requirements. The City Engineer shall approve the flushing period. The Contractor shall exercise special care in flushing to avoid damage to surrounding property and conform with Water Quality Considerations.

Should the initial treatment result in an unsatisfactory bacteriological test, additional chlorine using the first procedure shall be repeated by the Contractor until satisfactory results are obtained. The Contractor shall be responsible for the disposal of treated water flushed from mains and at no time shall chlorinated water from a new main be flushed into a body of fresh water. This is to include lakes, rivers, streams, storm drainage systems, and any and all other waters where fish or other natural water life can be expected. Disposal may be made to any available sanitary sewer only upon written approval by the City Engineer.

Main extensions shall not be connected to the City water system until pressure and bacteriological tests have passed all required standards. Once the standards are met, the plug (or blow-off) shall be removed and the connection to the existing main completed.

The Contractor shall provide special plugs and blocking necessary in those locations where it would be necessary to test against butterfly valves to ensure that the pressure rating of these valves is not exceeded during testing.

Please see Appendix G for Water Main Construction Notes to be incorporated into Plan Sets.

SECTION 2: WATER SYSTEM APPROVED MATERIALS LIST

The following manufacturers have been approved for water and sewer use. Where specific manufacturers are listed no other manufacturer may be used without prior approval by the City.

2-2.01 Water Pipe and Couplings

DUCTILE IRON PIPE

All manufacturers that meet the performance requirements specified under the material section of the Standards.

DUCTILE IRON FITTINGS

All manufacturers that meet the performance requirements specified under the material section of the Standards.

GALVANIZED IRON PIPE

All manufacturers that meet the performance requirements specified under the material section of the Standards.

JOINT RESTRAINT SYSTEMS

- EBAA Iron (MEGALUG Series 1100 and 1100SD) or approved equal
- Romac (Grip Ring)
- Romac Piranha Field Lock Gasket upon approval
- Star National Products (Shackle Products) upon approval
- US Pipe (TR FLEX) or approved equal

COUPLINGS

- Dresser
- EBAA (Mega-Coupling Series 3800)
- Romac, 501 and RFCA series

2-2.02 Water Main Accessories

AIR AND VACUUM RELEASE VALVES

- APCO No. 145-C or equivalent

FIRE HYDRANTS

- Mueller with a non-locking 4-inch Stortz quarter turn fitting on main port.

CASING INSULATORS AND END SEALS

- Pipeline Seal and Insulator Co.
    - 8-inch band Model C8G-2

  - 12-inch band Model C12G-2
- Standard Pull-on (Model S)
- Custom Pull-on (Model G)

Cascade Waterworks Mfg. Co.

- Stainless Steel Casing Spacers (catalog number depends on size)
- CCES Rubber End Seal

GATE VALVES

- Mueller A-2360 Resilient Wedge (non-rising stem)

2-2.03 Water Vault Assemblies**

PRESSURE REDUCING VALVES

- CLA-VAL 90G-01ABCSKC 6-inch
- CLA-VAL 90G-01ACSKC 2-inch

STRAINERS

- MEUSSCO 751 6-inch
- MEUSSCO 11-BC 2-inch

(With brass or stainless-steel perforated screen, 1/16-inch diameter, 144 holes per square inch)

CHECK VALVES

- Rennselaer List 340

2-2.04 Water Service Parts

SERVICE SADDLES UP TO 2-inch

- Ford FC202
- Romac 202NS

CORPORATION STOPS UP TO 2-inch

- Ford FB400 (BallCorp Style)
- Mueller 300 (BallCorp Style)

ANGLE BALL METER VALVES

- Ford BA13-342W (Meter Swivel Nut x F.I.P.)
- Mueller 300 (Meter swivel nut x F.I.P.)

ANGLE DOUBLE CHECK VALVES

- Ford HHA31-323
- Mueller H-1424

U BRANCH CONNECTIONS FOR DOUBLE SERVICES

- Up to ¾-inch meters
  - Ford: U18-43-12.5
  - Mueller: H-15364 (size 1 x ¾ x 13½)
- 1-inch meters
  - Ford: U18-64-12.5
- Greater than 1-inch meters
  - One meter per service line required

METER SETTERS

- 5/8 X 3/4:
  - Ford – VBH72-xxW-11-xx-NL
  - Mueller - 5/8-inch x 3/4-inch No. H-1404 x 12 with multi-purpose connection No. H-14222

Additional sizes shall be Ford or Mueller or as otherwise approved by Public Works.

RESIDENTIAL PRESSURE REDUCING VALVES (up to 1½-inch)

- Wilkins 600 with built-in bypass or approved equivalent

COMMERCIAL PRESSURE REDUCING VALVES (2-inch and larger)

- Mueller H-9300, No. 2 setting or approved equivalent

METER BOXES

(Non-Traffic Rated)

- Up to 1-inch Single Services: Carson 1419 HDPE box
- Up to 1-inch Double Services: Carson 1730 HDPE box (1 box turned sideways)
- 1½-inch and larger meters (all singles): Carson 1730 HDPE box

(Traffic Rated)

- Up to 1-inch Single Services: Mid-States 1118-R HDPE box
- Up to 1-inch Double Services: Mid-States 1730-R HDPE box
- 1½-inch and larger (all singles): Mid-States 1730-R HDPE box

UTILITY BOXES (AIR-VAC/BLOW-OFF)

(Non-Traffic Rated)

- Carson 1730 HDPE box

(Traffic Rated)

- Mid-States 1730-R HDPE box

2-2.05 Irrigation Meter and Control Boxes

- Up to 1-inch: Carson 1419 HDPE box with Green T-Cover
- 1½-inch and larger: Carson 1730 HDPE box with Green T-Cover

REDUCED PRESSURE BACKFLOW ASSEMBLIES

As approved on the most current Department of Health list for cross connection devices.

DOUBLE CHECK VALVE ASSEMBLIES

As approved on the most current Department of Health list for cross connection devices.

RESILIENT SEATED SHUT-OFF VALVES

All manufacturers that meet the performance requirements specified under the material section of the Standards.

PVC PIPE (AWWA C900) 4-inch – 12-inch

All manufacturers that meet the performance requirements specified under the material section of the Standards.

AWWA C900 FITTINGS AND MANHOLE ADAPTERS

- Head Manufacturing (Idaho)
- Vassallo (Florida)

2-2.06 Other Backfill Materials

FLOWABLE FILL - CONTROLLED DENSITY FILL (CDF)

- Stoneway, CADMAN

RECYCLED CONCRETE (FOR USE AS CRUSHED SURFACING BASE COURSE MATERIAL)

- Stoneway Recycling
- Renton Recycling (with certification that the material is free of contaminants)
- Or Approved equivalent.

****PRV Items specified on this list shall be used unless the City Engineer allows an approved equal.**

Chapter 3
ROAD DESIGN STANDARDS

June 1995 (original) – Ordinance #761
July 2007 (revision) – Ordinance #1055
March 2013 (revision) – Ordinance #1147

June 2022 (update)

CHAPTER 3

TABLE OF CONTENTS

CHAPTER 3 – Road Design Standards

CHAPTER 3 – Road Design Standards

SECTION 1: GENERAL

These Standards shall apply prospectively to all newly constructed road and right-of-way facilities, both public and private, within the City of Duvall. In the event of conflict with any other City documents, these Standards shall control.

The Standards apply to modifications of roadway features of existing facilities which are within the scope of reconstructions, required off-site road improvements for land developments, or Capital Improvement Projects when so required by the City or to the extent they are expressly referred to in project Plans and Specifications. These Standards are not intended to apply to "resurfacing, restoration, and rehabilitation" projects, as those terms are defined in the WSDOT, Local Agency Guidelines, *as amended*; however, the City Engineer may consider these Standards relevant for any project type.

The Standards shall apply to every new placement and every planned, non-emergency replacement of existing utility structures within the City ROW.

3-1.01 VACANT

3-1.02 VACANT

3-1.03 VACANT

3-1.04 VACANT

3-1.05 VACANT

3-1.06 Standard Specifications

Except where these Standards provide otherwise, design detail, construction workmanship, and materials shall be in accordance with the following publications produced separately by Washington State Department of Transportation (WSDOT), or jointly by WSDOT and Washington State Chapter of American Public Works Association (APWA).

A. Chapter Definitions and Terms:

1. WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction, as adopted, current edition as amended. These will be referred to as the "WSDOT/APWA Standard Specifications."
2. The WSDOT/APWA Standard Plans for Road and Bridge Construction, to be referred to as the "WSDOT/APWA Standard Plans," current edition as amended.
3. WSDOT Design Manual, current edition as amended.
4. City Design Standards for the Construction of Urban and Rural Arterial and Collector Roads adopted per RCW 35.78.039 and RCW 43.32.020, May 24, 1989, current edition as amended.

B. Referenced Specifications:

The following shall be applicable when pertinent, when specifically cited in the Standards or when required by state or federal funding authority.

1. WSDOT Local Agency Guidelines, as amended.
2. WSDOT Guidelines for Urban Arterial Program, as amended.
3. Design criteria of federal agencies including the Federal Housing Administration, Department of Housing and Urban Development; and the Federal Highway Administration, Department of Transportation,
4. A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials (AASHTO), or current edition when adopted by WSDOT.
5. Standard Specifications for Highway Bridges, adopted by AASHTO, current edition.
6. US Department of Transportation Manual on Uniform Traffic Control Devices, (MUTCD), as amended and approved by WSDOT, current edition.
7. Guide for the Development of Bicycle Facilities, adopted by AASHTO, current edition.
8. Associated Rockery Contractors, Standard Rock Wall Construction Guidelines.
9. American Society for Testing and Materials (ASTM).

3-1.07 Road Plans

Plans for roads and road drainage shall be prepared and submitted consistent with these Standards. These requirements shall apply to public or private roads whether constructed by a private party or public agency. Subject to review, the City Engineer may waive plan requirements, wholly or in part, based on the following criteria:

A. For improvements to existing roads if:

1. No more than 5,000 square feet will be cleared and graded within the ROW or easement; and
2. The existing grade or slope in the road ROW or easement does not exceed 12%; and
3. The work will not intercept a stream or wetland or otherwise impact natural surface drainage as set forth in DMC regarding Sensitive Areas, Surface and Stormwater Management Plan, and KCSWDM; and
4. Plans do not include a stormwater management facility within the ROW; and
5. The work is required of a short plat development, or a right-of-way use permit and involves less than 100 linear feet of existing public road improvement; and

6. City Standard Details, submitted with required permits, are sufficient to describe the improvement to be constructed.

3-1.08 VACANT

3-1.09 Penalties and Financial Guarantees

Failure to comply with these Standards may result in denial of Plan or Construction Permit approval, revocation of prior approvals, legal action for forfeiture of financial guarantee, code enforcement, and/or other penalties as provided by law.

Refer to Chapter 1, Section 1-1.13 for Financial Guarantee information.

3-1.10 VACANT

3-1.11 VACANT

SECTION 2: ROAD TYPE & GEOMETRICS

3-2.01 Road Classifications

A. City streets are classified functionally as indicated in Sections 3-2.02, 3-2.03, and 3-2.04. Function is the controlling element for classification and shall govern ROW width, paved width, and road geometries. Other given elements such as access, arterial spacing and average daily traffic count (ADT) are typical.

   i. Land developments shall provide the type of roadway improvements specified in Sections 1-1.21, 3-2.02, 3-2.03, and 3-2.04. Exceptions to this may be approved by the City Engineer for Short Plats, BLAs or other land development type.

   ii. Based on residential development densities and proposed housing types within new developments, the street widths required may be increased above the minimum up to a total pavement width of 34 feet to accommodate for on street parking, consistent with DMC 14.44, in those areas.

   iii. Based on residential development densities and proposed housing types within new developments, Residential Subcollector Street widths may be decreased to 26 feet upon Community Development and Public Works Director approval provided that the applicant can demonstrate that at least 0.5 guest parking spaces are provided per dwelling unit within dedicated on-street or other public parking areas consistently distributed throughout the site.

   iv. To support innovative housing in accordance with DMC (cottages or clustered housing), Residential Subaccess/Minor Access Street widths may be decreased from 26 feet to 20 feet upon Community Development and Public Works Director approval provided that the applicant can demonstrate that at least 0.5 guest parking spaces are provided per dwelling unit within dedicated on-street or other public parking area consistently distributed throughout the site.

3-2.02 Arterial Streets

Table 3-1: Arterial Street Design (see Standard Detail 3-010-002)

CLASSIFICATION	PRINCIPAL ARTERIALS	MINOR ARTERIALS	COLLECTOR ARTERIALS OR "COLLECTORS"	
FUNCTION	Intercommunity highways connecting largest centers & facilities. (SR-203)	Intercommunity highways connecting community centers and facilities. (Big Rock & Cherry Valley Roads)	Intercommunity highways connecting residential neighborhoods with community centers and facilities. (1st & 3rd Avenues, NE 143rd, 145th, 150th, 275th, 284th Streets, Batten, Bruett (NE 152nd), Kennedy, Roney, Stephens, Valley & Virginia Streets.)	
ACCESS	Controlled with very restricted access to abutting properties.	Partially controlled with infrequent access to abutting properties.	Partially controlled with infrequent access to abutting properties.	
ADT		≥ 2000	≥ 1500	≤ 500
CRITERIA				
A. Typical Road Type		Vertical Curb [10]	Vertical Curb [10]	Vertical Curb [9]
B. Design Speed (MPH) [2]		Varies, 25-40	Varies, 25-35	Varies, 20-30
C. Standard Superelevation (ft/ft) [8]		0.02 - 0.06	0.02 - 0.06	0.02 - 0.06
D. Horizontal Curvature		See Table 3-2.1	See Table 3-2.1	See Table 3-2.1
E. Maximum Grade (%) [3]		9	10	12
F. Standard Stopping Sight Distance (ft) [4]		See Table 3-2.1	See Table 3-2.1	See Table 3-2.1
G. Standard Entering Sight Distance (ft) [5]		See Table 3-2.1	See Table 3-2.1	See Table 3-2.1
H. Concrete Sidewalks		Both sides with LS Strip [9]	Both sides with LS Strip [9]	Both sides with LS Strip [9]
I. Minimum Roadway Width (ft) [6]		26/32 [11,12]	26/32 [11,12]	26/32 [11,12]
J. Minimum Right-of-Way Width (ft)		60	60	60
K. Type of Curb or Shoulder & Ditch		Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter
L. Minimum Half Street Paved Width (ft)		24	22	20

NOTES:

1. Within the above parameters, geometric design requirements shall be determined for specific arterial roads consistent with the WSDOT Design Manual.
2. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed. Curves shall be designed within parameters of above (See Section 3-2.05).
3. Maximum grade may be exceeded for short distance (See Section 3-2.05).
4. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the City Engineer (See Section 3-2.12). AASHTO may be used if approved by the City Engineer.
5. Standard Entering Sight Distance (ESD) shall apply at intersections and driveways unless otherwise approved by the City Engineer (See Section 3-2.13). AASHTO may be used if approved by the City Engineer.
6. Criteria for state and federal funding may require greater width. For guardrail installations, shoulders shall be two feet wider.
7. Pavement width may be reduced on Arterials where bikeways are not required by the Transportation Plan.
8. See Section 3-2.05 for allowed use of superelevations greater than 6%.
9. In residential areas, 5-foot sidewalks shall be required on both sides of the street behind a 5-foot landscape strip unless otherwise approved. The standard landscape strips are 5-feet wide unless topographical limitations require a reduction to the minimum 3-foot width, as approved by the City Engineer.
10. Median (and additional ROW for median) is required unless otherwise approved by Community Development and Public Works Directors.
11. Parking lanes are required on both sides of roadway for all zones except residential zones less than R8 or as otherwise approved by the Community Development and Public Works Director.
12. **Residential zoning less than R8**: Pavement width for parking one side 26 feet, parking both sides 32 feet. **Residential zoning R8 or greater (and other applicable zoning designations)**: Pavement width for parking one side 28 feet, parking both sides 34 feet unless otherwise approved by the Community Development and Public Works Director.

3-2.03 Residential Access Streets

For multiple-dwelling development, see Table 3-3 – Commercial Access Design

Table 3-2: Residential Access Design (see Standard Detail 3-010-002)

CLASSIFICATION	NEIGHBORHOOD COLLECTORS	SUBCOLLECTORS	SUBACCESS / MINOR ACCESS STREETS	
FUNCTION	Streets connecting two or more neighborhoods and typically connecting to arterials or other neighborhood collectors.	Streets providing circulation within neighborhoods typically connecting to neighborhood collectors. (R8 neighborhoods included)	Permanent cul-de-sacs, or short loops [2], connecting to subcollectors and not supportive of through traffic. Streets providing circulation and access to off-street parking within residential development boundaries.	
PUBLIC OR PRIVATE	Public street	Public streets	Typically, public streets or private streets (See Sec. 3-2.06)	
ACCESS	Restricted. Lots front on Local Access street where feasible.	As needed with some restrictions.	As needed with only minimal restrictions.	
No. DWELLING UNITS SERVED	Over 100 [3]	100 Max [4]	50 Max.	
CRITERIA				
A. Typical Road Type	Vertical Curb [16]	Vertical Curb [16]	Vertical Curb [16]	Vertical Curb [16]
B. Design Speed (MPH) [5]	25-30	25-30	25-30	Low Speed Curve See Sec. 3-2.10
C. Maximum Superelevation (ft/ft)	See Sec. 3-2.05B	See Sec. 3-2.05B	See Sec. 3-2.05B	See Sec 3-2.05B
D. Horizontal Curvature Minimum Radius (ft)	See Table 3-5	See Table 3-5	See Table 3-5	Low Speed Curve See Sec. 3-2.10
E. Maximum Grade (%) [6]	12	12	15	15
F. Standard Stopping & Entering Sight Distance (ft) [7, 8]	See Table 3-5	See Table 3-5	See Table 3-5	150
G. Concrete Sidewalks	Both sides with LS Strip [15]	Both sides with LS Strip [15]	Both sides with LS Strip [15]	Both sides with LS Strip [15]
H. Minimum Pavement Width (ft)	26/32 [18, 19]	26/32 [18, 19]	26/32 [17, 18, 19]	26/32 [17, 18, 19]
I. Minimum Roadway Width (ft) [11]	26/32 [18, 19]	26/32 [18, 19]	26/32 [17, 18, 19]	26/32 [17, 18, 19]
J. Minimum Right-of-way Width [12]	51 [16]	51 [16]	51 [12, 16]	47 [12]
K. Type of Curb or Shoulder and Ditch [11]	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter
L. Minimum Half Street Paved Width (ft)	20	20	20	20
M. Minimum One-Way Street Paved Width (ft)	20	20	20	20

NOTES:

1. Within the above parameters, geometric design for specific streets shall be consistent with AASHTO Policy on Geometric Design of Highways and Streets.
2. See Section 3-2.15 for one-way loops.
3. See Section 3-2.19 for Access and Circulation Requirements.
4. See Section 3-2.20 for Exception criteria.
5. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed. Curves shall be designed within parameters above (see Section 3-2.05).
6. Maximum grade may be exceeded for short distances (see Section 3-2.11).
7. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the City Engineer (see Section 3-2.12).
8. Standard Entering Sight Distance (ESD) shall apply at intersections and driveways on neighborhood collectors unless otherwise approved by the City Engineer (see Section 3-2.13).
9. A vertical curb & gutter road may be required based on site conditions and City Engineer recommendations.
10. Exception to paving requirement on minor access shoulder type streets (see Section 3-2.17).
11. For guardrail installation, shoulders shall be two feet wider.
12. ROW (on easement) may be reduced to minimum roadway width, plus sidewalks, provided that all potential serving utilities and necessary drainage are otherwise accommodated on permanent easements within the development (see Section 3-2.19).
13. As alternative to shoulder and ditch, underground pipe drainage with Thickened Edge (Standard Detail 3-1-005) or Extruded Curb (Standard Detail 3-1-006) is acceptable.
14. In residential areas, 5-foot Sidewalks shall be required on both sides of the street behind a 5-foot landscape strip or as otherwise approved. The standard landscape strips are 5-feet wide unless topographical limitations require a reduction to the minimum 3-foot width, as approved by the City Engineer.
15. Median (and additional ROW for median) is required to separate commercial and residential uses or as otherwise required unless approved by Planning and Public Works Directors.
16. Road width may be reduced per Section 3-2.01 upon approval of Community Development and Public Works Director.
17. Parking lanes required on both sides of roadway for all zones except residential zones less than R8 unless otherwise approved by the Community Development and Public Works Director.
18. **Residential zoning less than R8**: Pavement width for parking one side 26 feet, parking both sides 32 feet. **Residential zoning R8 or greater (and other applicable zoning designations)**: Pavement width for parking one side 28 feet, parking both sides 34 feet unless otherwise approved by the Community Development and Public Works Director.

3-2.04 Commercial Access Streets

Commercial Access Streets serve multiple-dwelling, business, and industrial developments. Within the parameters below geometric design requirements shall be determined for specific streets consistent with the WSDOT Design Manual.

Table 3-3: Commercial Access Streets (see Standard Details 3-010-002)

CLASSIFICATION	MIXED USE ACCESS STREETS	BUSINESS ACCESS STREETS	INDUSTRIAL ACCESS STREETS	MINOR ACCESS
FUNCTION	Local streets abutting multiple-dwelling development, retail, and professional offices.	Local streets abutting commercial services, office, and retail.	Local streets abutting light industrial, manufacturing, processing, storing, and handling activities.	Local streets providing circulation and access to parking and loading sites within multi-dwelling, business, and industrial development boundaries.
PUBLIC OR PRIVATE	Public streets serving mixed use district (typical)	Public streets serving commercial office zones (typical)	Public streets serving employment office (typical)	Public or private streets (See Section 3-2.06)
CRITERIA				
A. Typical Road Type	Curb	Curb	Curb	Curb
B. Design Speed (MPH) [1]	35	35	35	Low Speed See Sec. 3-2.10
C. Maximum Superelevation (ft/ft)	0.06	0.06	0.06	0.06
D. Horizontal Curvature Minimum Radius (ft)	See Table 3-4	See Table 3-4	See Table 3-4	See Table 3-1
E. Maximum Grade (%) [2]	12	12	11	12
F. Standard Stopping Site Distance (ft) [3]	See Table 3-4	See Table 3-4	See Table 3-4	150
G. Standard Entering Sight Distance (ft) [4]	See Table 3-4	See Table 3-4	See Table 3-4	NA
H. Minimum Pavement Width (ft)	36 [7]	36 [7]	40	30
I. Minimum Roadway Width (ft) [5]	36	36	40	34 [8, 9]
J. Minimum Right-of-Way Width (ft)	60	60	60	54 [6]
K. Type of Curb or Shoulder & Ditch [5]	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter
L. Minimum Half Street Paved Width (ft)	20	20	20	20
M. Minimum One-Way Street Paved Width (ft)	20	22	24	20

NOTES:

1. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed. Curves shall be designed within parameters (see Section 3-2.05).

2. Maximum grade may be exceeded for short distances (see Section 3-2.11).
3. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the Engineer (see Section 3-2.12).
4. Standard Entering Sight Distance (ESD) shall apply at intersections and driveways except on minor access streets unless otherwise approved by the Engineer (see Section 3-2.13).
5. For guardrail installations, shoulders shall be two feet wider.
6. ROW (or easements) may be reduced to minimum roadway width, plus sidewalk, providing that potential serving utilities and necessary drainage are otherwise accommodated within permanent easements through the development (see Section 3-2.19).
7. Median (and additional ROW for median) is required to separate commercial and residential uses or as otherwise required unless approved by Community Development and Public Works Directors.
8. Parking lanes required on both sides of roadway for all zones except residential zones less than R8 unless otherwise approved by the Planning and Public Works Director.
9. **Residential zoning less than R8**: Pavement width for parking one side 26 feet, parking both sides 32 feet. **Residential zoning R8 or greater (and other applicable zoning designations)**: Pavement width for parking one side 28 feet, parking both sides 34 feet unless otherwise approved by the Community Development and Public Works Director.

3-2.05 Horizontal Curvature and Sight Distance Design Values

A. The design values shown in Tables 3-4 and 3-5 are minimum values necessary to meet the requirements of Sections 3-2.02, 3-2.03 and 3-2.04 for a selected design speed and road classification. A maximum of 8% superelevation may be used, upon approval of the City Engineer, for design of improvements to existing arterials, as necessary, to meet terrain and ROW conditions. Superelevation runoff lengths on arterials, residential and commercial access streets shall be calculated in accordance with the WSDOT Design Manual. The City Engineer may reduce the standards if the situation requires if safety is still the number one priority.

B. Superelevation, is not required in the design of horizontal curves on urban residential access streets; however, horizontal curves must be designed based on design speed and selected cross section as indicated in Table 3-5, which is based on AASHTO "Low Speed Urban Streets" design methodology. Superelevation may be used on residential streets as necessary to meet terrain and ROW conditions.

Table 3-4: Arterial Streets and Commercial Access Streets Design Values

Design Speed – miles per hour (mph)	**30**	**35**	**40**	**45**
Horizontal Curvature for 6% Superelevation, Radius (ft)	273	380	509	656
Horizontal Curvature for 8% Superelevation, Radius (ft)*	250	350	465	600
Stopping Sight Distance (ft)	200	250	325	400
Entering Sight Distance (ft)	330	385	440	500
No passing within City Limits	NA	NA	NA	NA

*Maximum allowable on Arterials. Requires approval of the City Engineer.

Table 3-5: Residential Access Streets Design Values

Design Speed – miles per hour (mph)	**25**	**30**	**35**
Horizontal Curvature, for 6% Superelevation, Radius (ft)	135	215	320
Horizontal Curvature, for 4% Superelevation, Radius (ft)	145	230	34
Horizontal Curvature, for 2% Superelevation, Radius (ft)	155	250	375
Horizontal Curvature, Normal Crown Section, Radius (ft)	180	300	460
Stopping Sight Distance (ft)	150	200	250
Entering Sight Distance (ft)	275	330	385
Minimum Run-Off Length (ft)	80	90	100

3-2.06 Private Streets

A. While street requirements for residential development are usually best served by public streets, owned and maintained by the City, private streets may be appropriate for some local access streets. Usually these are minor access streets, either residential or commercial and are secondary accesses.

B. Private streets may be approved only when they are:

   i. Permanently established by ROW, tract or easement providing legal access to each affected lot, dwelling unit, or business and sufficient to accommodate required improvements, to include provision for future use by adjacent property owners when applicable; and

   ii. Built to these Standards, as set forth herein; and

   iii. Accessible at all times for emergency and public service vehicle use; and

   iv. Not obstructing, or part of, the present or future public neighborhood circulation plan developed in the City's Comprehensive Plan; and

   v. Not going to result in land locking of present or future parcels; and

   vi. Not needed as public roads to meet the minimum road spacing requirements of these Standards; and

   vii. Covenants have been approved, recorded, and verified with the City which provide for maintenance of the private streets and associated parking areas by owners in the development; and

   viii. At least one of the following conditions exists:

      a. The Plat or Short Plat street will ultimately serve four or fewer lots.

      b. The roadways are a part of a Planned Unit Development (PUD).

      c. The roadways serve commercial or industrial facilities where no circulation continuity is necessary.

      d. The City Engineer and Fire Chief determine that no other access is available, and the private road is adequate for health, life, and safety.

   ix. Maintained by a capable and legally responsible Owner (OA) or Homeowner Association (HOA) or other legal entity made up of all benefited property owners; and

   x. Clearly described on the face of the Plat, Short Plat, or other development authorization and clearly signed at street location as a private street, for the maintenance of which City is not responsible.

C. The City will not accept private streets for maintenance as public streets.

D. The City will not accept private streets within Short Plats when the roads providing access to the Plat are private and already have the potential to serve more than the number of lots specified in Section 3-2.06(B)(viii). Short Plats proposed on properties to which the access is over private streets that do not meet the standards outlined in this section shall be denied.

E. Private Access Tracts (PAT) shall conform to the following criteria:

   i. Maximum tract length of 150 feet is measured from the curb line of the nearest intersecting street to the furthest extent of paved tract.

ii. Designated 0.5 visitor parking spaces for each dwelling unit within dedicate pull-outs along the PAT or other dedicated public parking locations consistently distributed within the development.

iii. Direct pedestrian access to an access tract or road frontage is required for each unit. Pedestrian access to support innovative housing in accordance with DMC is only allowed with direct access to a minimum 5-foot wide concrete sidewalk with Community Development and Public Works Director approval.

iv. Front yard setbacks shall be applied from the access tract unless the front yard setback can be measured from public ROW or common open space.

v. Tract Width:

When not meeting minimum standards, Community Development and Public Works Director approval is required. Approval is granted when it is demonstrated that no other options are feasible.

a. **For up to two units**: Minimum tract width of 25 feet with a minimum pavement width of 10 feet and a maximum pavement width of 20 feet in accordance with joint use driveway standards (Section 3-3.01).

b. **For up to four units**: Minimum tract width of 30 feet with a minimum pavement width of 20 feet. The road shall be designed in accordance with Section 3-2.03 for residential minor access streets. Sidewalk and landscape strips shall not be required.

c. **For greater than 4 units**: Minimum tract width of 30 feet with a minimum pavement width of 20 feet unless otherwise approved in accordance with Section 3-2.03 for residential minor access streets provided the following requirements are satisfied:

1. The total number of residential units accessed shall be limited density and zoning requirements (four for R-4 and R-4.5, six for R-6, and eight for R-8, R-12 and MU-12). All units shall be attached if more than six units are served along a tract unless otherwise approved by the Community Development and Public Works Directors.

2. Additional minimum requirements for greater than four units to be satisfied based on City review and approval:

a) Designated 0.5 visitor parking spaces per dwelling unit within dedicated pull-outs along the access tract or other dedicated public parking locations within the tract.

b) Sidewalk and landscape strips shall be required unless otherwise approved.

c) Access tract surface may be designed with a standard crown, curb line drainage, and pavement differentiation to delineate

pathway and parking with a minimum integrated 4-foot wide dedicated concrete walk zone within, and along the edge, of the 20-foot wide access tract surface.

d) Alternatively, the 20-foot wide access tract may be surfaced entirely with concrete with either standard crown or curb line drainage.

e) Overall on-site and off-site connectivity, safety, and topographic requirements are satisfied.

3-2.07 Half Streets

See Standard Detail 3-010-010.

A. A half street may be permitted as an interim facility when:

   i. Such street shall not serve as primary access to more than 35 dwelling units or tax lots; and
   ii. Such alignment is consistent with or will establish a reasonable circulation pattern; and
   iii. There is reasonable assurance of obtaining the prescribed additional ROW from the adjoining property with topography suitable for completion of a full-section road.

B. A half street shall meet the following requirements:

   i. ROW width of the half street shall equal at least 30 feet; and

   ii. The applicant shall pave outward 20 feet from the curb adjacent to the subject property or as required by the City Engineer; and

      a. Traveled way shall be surfaced the same as the designated road type to a width not less than 20 feet, curb gutter, and sidewalk shall be constructed as required for the designated road; and

   iii. The half street shall be graded consistent with locating centerline of the ultimate road section on the property line or within existing ROW unless otherwise approved by the City Engineer; and

   iv. The applicant shall install the required improvements from the subject property line to, and including, the curb; and

   v. For existing ROW and easements secured by the applicant on adjacent property, the applicant shall grade to finished grade all the required driving and parking lanes in the entire ROW and a 5-foot wide shoulder on the side of the ROW opposite the subject property or as required by the City Engineer; and

   vi. Property line edge of street shall be finished with temporary curbing, shoulders, ditches, and/or side slopes to assure proper drainage, bank stability, and traffic safety; and

vii. Half streets shall not intersect other half streets unless so approved by the City Engineer.

C. When the remaining half street is eventually completed to a whole street, the completing builder shall reconstruct the original half street as necessary to produce a proper full-width street of designated section with the proper symmetry of a cull crown section, unless an alternatively approved section is granted by the City Engineer.

D. The obtaining of any ROW or easements needed to accomplish the above shall be the responsibility of the owning builder or developer.

3-2.08 Cul-de-sacs and Eyebrows

See Standard Detail 3-1-007.

A. Whenever a cul-de-sac street serves more than six lots or extends more than 150 feet from centerline of accessing street to farthest extent of surfaced traveled way a widened "bulb" shall be constructed as follows:

i. Minimum ROW diameter across bulb section: 100 feet in a permanent cul-de-sac; 84 feet in a temporary cul-de-sac, with bulb area lying outside straight-street ROW provided as temporary easement pending forward extension of the street. ROW may be reduced, provided utilities and necessary drainage are accommodated on permanent easements within the development. See Section 3-2.19 for access and circulation requirements.

ii. Minimum diameter of surfacing across bulb: 80 feet of paving in curb type road; 80 feet total in shoulder type road to include 64 feet of paving and 8-foot shoulders with compacted crushed surfacing material.

iii. Cul-de-sac Island: A feature for any cul-de-sac when bulb paved diameter is 80 feet or less; mandatory when bulb paved diameter exceeds 80 feet. If island provided, it shall have full-depth vertical curb. Minimum diameter shall be 20 feet and at least 22 feet of paved traveled way in a shoulder type section; 30 feet of paved traveled way in a curb type section around the circumference. The island shall be grassed or landscaped. The adjoining lot owners or a legally created HOA shall maintain the landscape island.

B. A permanent cul-de-sac shall not be longer than 600 feet as measured from centerline of intersecting street to the center of the bulb section. Proposed exceptions to this rule will be considered by the City Engineer based on pertinent traffic planning factors such as topography, sensitive areas and existing development. The cul-de-sac length may extend to 1,000 feet if 50 or fewer potential lots are to be served and there is provision for emergency turnaround (half bulb) near mid-length.

C. The City Engineer may require an off-street walk or an emergency vehicle access to connect a cul-de-sac at its terminus with other streets, parks, schools, bus stops, or other pedestrian traffic generators, if the need exists.

D. If a street temporarily terminated at a property boundary serves more than six lots or is longer than 150 feet, a temporary bulb shall be constructed near the plat boundary. The paved bulb shall be 84 feet in diameter with sidewalks terminated at the point where the bulb radius begins. Removal of the temporary cul-de-sac and extension of the sidewalk shall be the responsibility of the developer who extends the road. See Standard Detail 3-010-008.

E. The maximum cross slope in a bulb shall not exceed 6 percent.

F. Partial bulbs or eyebrows shall have a minimum paved radius and an island configuration as shown on Standard Detail 3-010-009. Island shall be offset two feet from edge of traveled way.

3-2.09 Alleys

A. An alley is considered a private road. Requirements of Section 3-2.03 and 3-2.05 for Residential Subaccess streets apply. Additional minimum requirements:

i. Maximum length of 400 feet, serving a maximum of 30 lots.

ii. Maximum of 600 feet, serving a maximum 45 lots; and

a. A mid-block pedestrian corridor is provided unless otherwise approved by the City Engineer.

iii. Minimum width 20 feet with a pavement surface of 19 feet; four feet concrete (both sides), 11 feet of ACP in accordance with Standard Detail 3-010-011. Unless otherwise approved by the City Engineer.

iv. For differing structure setback requirements, alley configuration shall be designated to provide for safe turning access to properties.

v. Paved surface shall provide drainage along a minimum of one side of the alley in accordance with Standard Detail 3-010-011. Drainage provided by alternative paving materials or thickened edge on one side and cross slope in one direction shall be allowed only upon approval of the City Engineer.

vi. Alleys shall only connect and intersect with Public Streets unless approved by the City Engineer. Public streets to which an alley connects, or which provide access to the front boundary of the properties served by the alley shall be 26-foot minimum paved width with vertical curb. Alley entries shall be provided by a standard driveway type cut through the curb and gutter and sidewalk section. Horizontal curves shall not be allowed if slope exceeds 7% and all alleys shall be straight unless otherwise approved by the City Engineer.

a. No dead ends, curves, cul-de-sacs, or intersections with adjacent alleys unless otherwise approved by the City Engineer.

vii. Modifications to existing alleys serving commercial or industrial properties, in accordance with the above, will be determined on a case-by-case basis subject to approval by the City Engineer.

3-2.10 Intersections and Low Speed Curves

Table 3-6: Intersection Design

Angle of intersection (measured at 10 feet beyond road classification right-of-way)	Minimum 85 Degrees Maximum 95 degrees
Minimum centerline radius (2-lane)	55 Feet
Minimum curb radius: A. Urban streets and roads classified neighborhood collector or higher B. Urban residential access street intersections where the highest classification involved is subcollector	 35 feet 25 feet
Minimum right-of-way line radius	25 Feet

Table 3-7: Intersection Spacing (crossing or T-connecting)

When highest classification involved is:	Minimum centerline offset shall be:
Principal arterial	1,000 Feet
Minor arterial	500 Feet
Collector arterial	300 Feet
Neighborhood collector	150 Feet
Any lesser street classification	100 Feet

A. On sloping approaches at an intersection, landings shall be provided with grade not to exceed one foot difference in elevation for a distance of 30 feet approaching an arterial or 20 feet approaching a residential or commercial street, measured from future ROW line (extended) of intersecting street as provided in Section 3-2.02, 3-2.03 or 3-2.04.

B. For Entering Sight Distance (ESD) requirements see Sections 3-2.02, 3-2.03, 3-2.04 and 3-2.13 for design requirements. See Tables 3-4 or 3-5 for specific ESD values based on required design speed and road type.

C. Low Speed Curves applicable to subaccess and minor access streets only, see Sections 3-2.03 and 3-2.04.

Table 3-8: Low Speed Curve Design

	Up to 75°	75° & Over
Minimum centerline radius (2-lane)	100 feet	55 feet
Minimum curb radius	80 feet	35 feet
Minimum right-of-way line radius	70 feet	25 feet

3-2.11 Maximum Grade and Grade Transitions

A. Maximum grade as shown in Sections 3-2.02, 3-2.03, and 3-2.04 may be exceeded for short distances of 300 feet or less, upon showing that no practical alternative exists.

Roadway exceptions that exceed 15% require verification by the Fire Chief that additional fire protection requirements will be met. Grades exceeding 12% shall be paved with ACP or Portland cement concrete (PCC) at City Engineer discretion, and any grade over 15% must be PCC. No roadways over 20% are allowed except with approval of the City Engineer and only for short distances when no other reasonable alternative exists.

B. Grade transitions shall be constructed as smooth vertical curves except in intersections where the difference in grade is one percent or less and upon approval of the City Engineer.

3-2.12 Stopping Sight Distance

Stopping Sight Distance (SSD) applies to street classifications as shown in Sections 3-2.02, 3-2.03 and 3-2.04. See Tables 3-4 and 3-5 for specific SSD values based on required design speed.

A. Height of eye is 3.5-feet and height of object is 2-feet.

B. Minimum SSD for any downgrade averaging 3% or steeper as provided in Section 3-2.05, Tables 3-4 and 3-5 shall be increased by the values shown below (AASHTO Policy on Geometric Design, Table III-2). Interpolate values for other design speeds and grades.

Table 3-9: Stopping Sight Distance Adjustment Values (ft.)

DESIGN SPEED (MPH)	DOWNGRADE		
	3 %	6 %	9 %
40	20	40	70
35	15	30	50
30	10	20	30
20	0	10	20

C. Sag vertical curves on subaccess and minor access streets with SSD less than that called for in Section 3-2.03 may be approved by the City Engineer if no practical design exists and if road lighting consistent with current design standards is provided throughout the curve.

D. Intersection SSD:

i. SSD for the design speeds of proposed commercial access streets, neighborhood collector streets and arterials must be met when intersecting arterials.

ii. The minimum SSD on proposed intersection approaches for all other classifications of intersecting roadways shall be 125 feet.

3-2.13 Entering Sight Distance

Entering Sight Distance (ESD) applies on driveways and on streets approaching intersections as set forth in Sections 3-2.02, 3-2.03, and 3-2.04. ESD criteria will not apply on local access streets or minor access streets (commercial). Specific ESD values for required design speeds are listed in Section 3-2.05, Tables 3-4 and 3-5.

A. Entering vehicle eye height is 3.5 feet, measured 10-feet back from edge of traveled way. Approaching vehicle height is 4.25 feet.

B. Requirements in Section 3-2.05, Tables 3-4 and 3-5 apply to an intersection or driveway approach to a typical road under average conditions. In difficult topography the City Engineer may authorize a reduction in the ESD based on factors mitigating the hazard. Such factors may include an anticipated posted or average running speed less than the design speed or the provision of acceleration lanes and/or a median space allowing an intermediate stop by an approaching vehicle making a left turn.

C. Where a significant number of trucks will be using the approach road, the City Engineer may increase the entering sight distance requirements by up to 30% for single-unit trucks and 70% for semi-trailer combinations.

3-2.14 Medians

Design Feature: Median width shall be additional to, not part of, the specified width of traveled way and minimum ROW as determined by the City Engineer. Edges shall be similar to outer road edges: either extruded or formed vertical curb. Medians on Minor Arterials shall have a minimum 10-foot interior/11-foot exterior width. All other medians shall have a minimum 6-foot interior/7-foot exterior width. Medians shall have a minimum of 16 feet of ACP or PCC surface on either side or as otherwise approved by the City Engineer.

Medians shall be grassed, landscaped, or surfaced with aesthetically pleasing stamped concrete or pavement. Median shall be designed so as not to limit turning radii or sight distance at intersections. No portion of a side street median may extend into the ROW of any connecting street. The City Engineer may require revisions to medians as necessary to provide for new access points and to maintain required sight distance. Non-yielding or non-breakaway structures shall not be installed in medians. Street trees may be planted in medians subject to approval by the City Engineer.

3-2.15 One-Way Streets

Local access streets, including loops, may be designated as one-way upon a finding by the City Engineer that topography or other site features make two-way traffic impractical or unsafe.

3-2.16 Bus Zones and Turnouts

During the design of arterials and neighborhood collectors, the designer shall contact King County Metro Service Planning, phone 206-684-1622 (or current phone number) and the Riverview School District (RSD) to determine bus stop locations and other bus operation needs.

All projects that propose road improvements shall provide ADA (Americans with Disabilities Act) compliant landings at designated bus zones in accordance with Section 3-3.02 of these Standards and where required include turnouts and shelter pads. Pedestrian and ADA access improvements within the ROW to and from the bus loading zone or turn-out from nearby businesses or residences shall also be provided as part of the road improvement in accordance with Section 3-2.19. Surfacing requirements may also be affected, particularly on shoulders. See Section 3-

4.01(B) of these Standards and Metro's publication, "Metro Transportation Facility Design Guidelines," if applicable.

3-2.17 Intersections with State or Federal Highways

In the event that the City has jurisdiction over a development that requires the construction or improvement of a commercial/industrial driveway or any classification of street that intersects a County, State or Federal highway, minimum intersection spacing, ESD, SSD and landing requirements in accordance with these Standards shall be satisfied in addition to the requirements of all other applicable permits. In the instance County, State, or Federal standards exceed these Standards, the more restrictive standards shall govern.

3-2.18 Slope, Wall, & Drainage Easements and Right-of-Way Reduction

A. **Easements**: Either the functional classification or particular design features of a road may necessitate slope, sight distance, wall or drainage easements beyond the ROW line. Such easements may be required by the City Engineer in conjunction with dedication or acquisition of ROW.

B. **ROW reduction on subcollectors, local access (residential) and minor access (commercial)**: In proposed developments served by underground utilities within easements, the ROW may be reduced to the minimum roadway width plus sidewalk, as allowed in Sections 3-2.03 and 3-2.04, with the approval of the City Engineer. Where it is desired to reduce ROW to a minimum width, the ROW, plus easement, shall allow for construction and maintenance of the following as appropriate, sidewalks, planter strips, drainage facilities, future roadway widening sign placement, and also allow sidewalk widening around mailbox locations. On subcollectors, installation of fixed objects, other than required above ground utility structures, greater than 4-inches in diameter within 4-feet of back of sidewalk shall not be permitted.

3-2.19 Access and Circulation Requirements

A. **Pedestrian Facilities**: Where ever pedestrian facilities are intended to be a part of the transportation facility, federal regulations (28 CFR Part 35) require that those pedestrian facilities meet ADA guidelines. All new construction or alteration of existing transportation facilities must be designed and constructed to be accessible to and usable by persons with disabilities. Federal Highway Administration (FHWA) is one of the federal agencies designated by the Department of Justice to ensure compliance with the ADA for transportation projects (WSDOT Design Manual M 22-01.15, Chapter 1510).

B. **Secondary Access**: In order to provide a second access to a residential subdivision, Short Plat subdivision, or PUD, no residential street shall serve more than 100 lots or dwelling units unless the street is connected in at least two locations with another street that functions at a level consistent with Sections 3-2.02 and 3-2.03.

   i. The second access requirement may be satisfied through use of connecting a new street to an existing street in an adjacent neighborhood if:

a. No other practical alternative exists; or

b. Existing street was previously stubbed indicating intent for future access; or

c. An easement has been recorded specifically for said purpose.

ii. The second access requirement may not be satisfied through use of an existing roadway network in the existing adjacent neighborhood if:

a. A more practical alternative exists; or

b. Existing streets do not meet Section 3-2.03.

These provisions are not intended to preclude the state statute on land-locking.

This section does not preclude a commercial project from gaining access through a residential development. Traffic impacts for such projects will be analyzed during the SEPA process.

3-2.20 Exception for Maximum Dwelling Units on Subcollectors

Proposed subcollectors serving developments with an average density of seven to eight dwelling units per acre and which meet the access requirements of Section 3-2.19 may serve up to 250 single family dwelling units, if approved by the City Engineer. Prior to approval, the City Engineer may require a traffic circulation study showing a balanced traffic flow of less than 1,500 vehicles per day past any access point.

Street trees shall be mandatory along subcollectors serving higher densities of eight to eighteen dwelling units per acre and shall be in conformance with Section 3-5.03.

3-2.21 Fire Apparatus Access Roads

A. **Definition**: A fire apparatus access road is a road that provides fire apparatus access from a fire station to a facility, building, or portion thereof. This is a general term that includes all other terms such as fire lane, Public Street, Private Street, parking lot lane and access roadway.

B. **Timing of Installation**: When a fire apparatus access road or a water supply for fire protection is required to be installed, such protection shall be installed and made serviceable prior to and during the time of construction except when approved alternative methods of protection are provided.

C. Where required:

i. **Buildings and Facilities**: Approved fire apparatus access roads shall be provided for every facility, building, or portion of a building hereafter constructed or moved into or within the City. The fire apparatus access road shall comply with the requirements of this section and shall extend to within 150 feet of all portions of the exterior walls of the first story of the building as measured by an approved route, around the exterior of the building or facility.

Exception: The Fire Chief or designee is authorized to increase the dimension of 150 feet when:

a. The building is equipped throughout with an approved automatic sprinkler system.

b. Fire apparatus access roads cannot be installed because of location on property, topography, waterways, nonnegotiable grades or other similar conditions, and an approved alternative means of fire protection is provided.

c. There is not more than two group R-3 or Group U occupancies.

ii. **Additional Access**: The Fire Chief is authorized to require more than one fire apparatus access road based on the potential for impairment of a single road by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

D. Specifications:

i. **Dimensions**: Fire apparatus access roads shall have an unobstructed width of not less than 20 feet except for approved security gates and an unobstructed vertical clearance of not less than 13 feet 6 inches. The Fire Chief or designee shall have the authority to require an increase in the minimum access widths where they are inadequate for fire or rescue operations.

ii. **Surface**: Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus (25 tons unless otherwise specified by the Fire Chief or designee) and shall be surfaced with Asphalt Concrete Pavement (ACP) so as to provide all-weather driving capabilities.

a. **Turning Radius**: The required turning radius of a fire apparatus access road shall be determined by the Fire Chief or their designee.

b. **Dead Ends**: Dead end fire apparatus access roads in excess of 150 feet in length shall be provided with an approved area for turning around fire apparatus. When designed and installed to meet this requirement, cul-de-sacs with less than 90 foot-paved diameter (curb to curb) shall be signed "No Parking".

c. **Bridges and Elevated Surfaces**: Where a bridge or an elevated surface is a part of a fire apparatus access road, the bridge shall be constructed and maintained in accordance with American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Highway Bridges.* Bridges and elevated surfaces shall be designed for a live load sufficient to carry the imposed loads of fire apparatus. Vehicle load limits shall be posted at both entrances to bridges.

d. **Grade**: If the grade of a fire apparatus access road is 15% or greater, the Fire Chief or their designee may require additional fire protection for all structures affected or served by said roadway.

iii. **Marking**: Where required by the Fire Chief or their designee, approved signs or other approved notices shall be provided for fire apparatus access roads to identify such roads or to prohibit obstruction thereof. Signs and notices shall always be maintained in a clean and legible condition at all times and be replaced or repaired when necessary to provide adequate visibility.

a. **Obstruction of Fire Apparatus Access Roads**: The minimum width and clearance of a fire apparatus access road shall not be obstructed in any manner, including the parking of vehicles. This includes any roadway that serves as a fire apparatus access road. Any fire apparatus access road with an emergency vehicle drivable width (capable of supporting 25 tons) of less than 30 feet shall be posted "No Parking" on one side. Any fire apparatus access road with an emergency vehicle drivable width (capable of supporting 25 tons) of less than 24 feet shall be marked as a "Fire Lane" with no parking on either side.

b. **Security Gates and Barricades**: The Fire Chief or their designee is authorized to require the installation and maintenance of gates or other approved barricades across fire apparatus access roads, trails, or other access ways, not including public streets, alleys, or highways. When required, gates and barricades shall have an approved means of emergency operation, be secured in an approved manner, and shall remain operational at all times.

3-2.22 Curb Extensions

The use of curb extensions is required unless otherwise approved by the City Engineer. Emergency access, essential services, roadside parking, pedestrian and bicycle use, and other facilities and uses shall be adequately served.

A. Curb extensions shall be designed and constructed to:

i. Reduce pavement width (pollution generating impervious surfaces)

ii. Increase traffic calming and safety

iii. Reduce pedestrian exposure at crosswalks and intersections

iv. Adequately delineate dedicated parking within the ROW

v. Prohibit parking within 30 feet of an intersection

vi. Provide a minimum 20-foot pavement width

SECTION 3: DRIVEWAYS, WALKS & TRAILS

3-3.01 Driveways

A. Dimensions, slope, and detail shall be as shown in Standard Details: 3-030-001, 3-030-003, 3-030-004, 3-030-005 and 3-030-006, and as further specified in the following subsections. See Section 3-2.13 for ESD requirements.

B. Conditions for Approval (COA) for New Driveways:

   i. Driveways directly giving access onto arterials may be denied if alternate access is available.

   ii. All abandoned driveway areas on the same frontage shall be removed and the curbing and sidewalk shall be properly restored by the owner whose property they serve.

   iii. Maintenance of driveway approaches shall be the responsibility of the owner whose property they serve.

   iv. Driveways shall be sloped to provide gravity stormwater drainage to an approved existing or proposed stormwater system. Driveway drainage shall be configured to prevent stormwater flow into adjacent structures or other structures, buildings or facilities.

C. Location and Width of New Driveways (refer to Standard Detail 3-3-006):

   i. A residential driveway shall typically serve only one parcel. A driveway serving more than one parcel shall be classed as a commercial driveway or a private street, except as provided in 3a and 3b below. Shared type driveways are allowed with approval from the City Engineer.

   ii. On frontages 75 feet or less, no more than one driveway per lot shall be constructed; on frontages over 75 feet, two or more driveways per lot may be permitted, subject to approval by the City Engineer.

   iii. No portion of driveway width shall be allowed within 5-feet of side property lines except as follows:

      a. A Joint Use Driveway (JUD) tract may be used to serve two parcels:

         1. Minimum tract width shall be 25 feet, with a cross slope in one direction and curb or thickened edge on one side. Minimum tract length shall be 20 feet from the ROW line. Radius returns on paved apron shall have 10-foot radii.

         2. The City Engineer may allow use of an easement if the only access to a serving roadway is through an adjacent parcel not owned by the applicant or for residential short plats to satisfy minimum lot width requirements.

      b. Driveways may utilize full width of narrow “pipe-stem” parcels or easements if approved by City Engineer.

      c. On cul-de-sac bulbs as necessary for proposed residential access.

2. Grade transitions, excluding the tie to the roadway, shall be constructed as smooth vertical curves. Ties to the roadway shall be constructed as shown in Standards Details 3-3-003 and 3-3-004.

    a. **Grade**: The design Engineer for proposed developments shall consider the access driveway profile when designing the serving road to ensure that required grade transitions can be complied with considering building set back and lot terrain conditions. The maximum change in driveway grade:

        i. Within the ROW, shall be 8% within any 10 feet of distance on a crest; and

        ii. Within the ROW, shall be 12% within any 10 feet of distance in a sag vertical curve; and

        iii. From the ROW to the structure shall not exceed 12%; only the City Engineer may authorize a steeper slope if no other alternative exists. Driveway lengths that have been reduced from the 20-foot requirement shall not exceed 10% on either end.

    b. Driveways shall be graded to match into possible future widened road section without encroachment into graded shoulder or sidewalk.

    c. Reverse slope driveways shall include drainage (strip drain) at the structure or inflection point.

3. Driveways in rolled curb sections may be constructed abutting and flush with sidewalk or back of curb without gapping or lowering height of curb.

D. Existing driveways may be reconstructed as they exist provided such reconstruction is compatible with the adjacent road.

E. For commercial or industrial driveways with heavy traffic volumes or significant numbers of trucks, the City Engineer may require construction of the access as a road intersection. This requirement will be based on a Traffic Impact Analysis (TIA) completed by a Professional Engineer registered in the State of Washington, submitted by the applicant that considers, among other factors, intersection spacing, sight distance and traffic volumes.

F. Notwithstanding any other provisions, driveways will not be allowed where they are prohibited by separate City Council action or where they are determined by the City Engineer to create a hazard or impede the operation of traffic on the roadway.

3-3.02 VACANT

3-3.03 Sidewalks, Curb and Gutter

A. Sidewalks shall be required in accordance with Sections 3-2.03, 3-2.04, 3-2.05 and as follows:

i. **All arterials, neighborhood collectors, subcollectors, multiple-dwelling and business access streets**: Both sides or as otherwise approved by the Community Development and Public Works Directors.

ii. **Subaccess, minor access (commercial), and industrial access streets**: Both sides unless the City Engineer reduces the requirement to one side because of excessive topography or environmental impacts making construction impractical.

iii. **Minor access (residential) streets, tract roads or cul-de-sacs with walkways extending from their termini to other streets, parks, schools, bus stops, or other pedestrian traffic generators**: Both sides unless otherwise approved by the Community Development and Public Works Directors.

Other extended off-street walkways may be required by the City Engineer to provide direct connections for ease and safety of pedestrians.

B. Sidewalks shall be constructed:

i. Next to the curb unless planting strips are part of the design and are approved by the City Engineer as part of a landscaping plan along Arterials; and

ii. Outside of a 5-foot planting strip unless excessive topography warrants the City Engineer to reduce landscape strip to 3-feet or entirely for all roadways other than Arterials; and

iii. At least 5-feet wide on residential and commercial access streets. This includes maintained a 5-foot clearance of mailboxes or other obstructions, except where approved as a Variance; and

iv. With a minimum width of 6½-feet on Arterials if curb is next to traveled lane (but not necessarily next to designated parking or bike lanes). The additional width of 1 1/2-feet or more, may be finished to match the sidewalk or may be finished with contrasting texture, ACP, PCC, brick, or paving blocks as approved by the City Engineer; and

v. At least eight to twelve feet wide:

a. In business/commercial districts where most of the store frontage is within 80 feet of the street ROW.

b. Within the curb radius returns of all Arterial intersections where curb ramps are required.

c. Within designated bus zones to provide a landing area for ADA compliant access to transit services.

vi. With specified, widths greater than 8-feet where the City Engineer determines this is warranted by expected pedestrian traffic volume or DMC; and

vii. With PCC surfacing as provided below in 3D and Section 3-4.01; and

viii. Specifications for joints in Section 3-3.04 and Standard Detail 3-3-001.

C. Subgrade compaction for curbs, gutters, and sidewalks shall meet a minimum 95% of maximum density (MDD) modified proctor and be prepared with a minimum 6-inches of 5/8-inch minus crushed rock meeting 95% MDD compaction.

D. Concrete for curbs, gutters, and sidewalks shall be a minimum Class 3000, except at driveway entrances in accordance with WSDOT/APWA Standard Specifications, Sections 6-02, 8-04, and 8-14. Cold weather precautions as set forth in WSDOT/APWA Standard Specifications Section 5-05.3(14) shall apply.

   i. The City Engineer may reject any of the curb, gutter or sidewalk based on installation means and methods, performance or aesthetics (true vertically, i.e. no ponding and true horizontally, i.e. not choppy and/or wavy).

E. Extruded cement concrete curb shall be placed in conformance with WSDOT/APWA Standard Specification Section 8-04.3(1).

F. Extruded ACP curbs shall be anchored by means of a tack coat of asphalt in accordance with WSDOT/APWA Standard Specification Section 8-04.3(2).

G. Curb extensions or bulb-outs shall be installed on new roadways or existing roads to be tied into to ensure high pedestrian safety and visibility as determined by the City Engineer.

3-3.04 Expansion and Dummy Joints

A. An expansion joint consisting of 3/8-inch or 1/4-inch x full depth of a pre-molded joint material shall be placed around fire hydrants, poles, posts, and utility castings and along walls or structures in paved areas. Joint material shall conform to the requirements of ASTM D994 (AASHTO M33).

   i. As alternative to expansion joints around structures, reinforcing bars may be embedded in concrete on four sides of structures.

B. A dummy joint consisting of 3/8-inch or 1/4-inch x 2-inch of a pre-molded joint material shall be placed in curbs and sidewalks at a minimum of 15-foot intervals and at sides of drainage inlets. When curbs and/or sidewalks are placed by slip-forming, a pre-molded strip up to 1/2-inch thick and up to full depth may be used.

C. Dummy joints in sidewalk shall be located so as to match the joints in the curb whether sidewalk is adjacent to curb or separated by planting strip.

D. Tool marks consisting of 1/4-inch V-grooves shall be made in sidewalk at 5-foot intervals, intermediate to the dummy joints.

E. Interface between curb and adjacent sidewalk on integral pour construction shall be formed with 1/4-inch radius edging tool. On separate pour construction an expansion joint consisting of 3/8-inch or 1/4-inch x full depth of a pre-molded joint material shall be placed between the curb or thickened edge and the adjacent sidewalk.

3-3.05 Curb Ramps

On all streets with vertical or rolled curb, ADA compliant ramped sections shall be constructed through curb and sidewalk at street intersections and other crossing locations. See WSDOT approved specifications and Standard Details 3-040-002 through 3-040-006. Where a curb ramp is constructed on one side of the street, a receiving curb ramp shall be provided on the opposite side of the street if a curb exists. Deficient on-site and off-site curb ramps and sidewalk approaches shall be improved to current standards or as otherwise required by the City Engineer. Curb ramps shall be single direction (two separate ramps per intersection corner) and be positioned so that the curb ramp opening is situated within the marked crosswalk or crossing area if unmarked unless otherwise approved by the City Engineer.

3-3.06 Concrete Steps, Metal Handrail and Handicapped Access Ramps

A. Steps shall only be used where acceptable alternative access is available for ADA access and there is a need for a separate stairway. Where used, concrete steps shall be constructed in accordance with Standard Detail 3-050-008 or other design acceptable to the City Engineer and consistent with ADA criteria and WSDOT/APWA Standard Specifications.

B. Handrails, whether for steps or other applications, shall be provided consistent with Standard Detail 3-050-008 and WSDOT/APWA Standard Specifications.

C. Ramps used to provide ADA compliant access shall have a maximum slope of 12:1 with a maximum rise of 30 inches between landings. Landings shall meet all current ADA standards.

3-3.07 Shoulders

A. ACP shoulders may be used where approved by the City Engineer on existing roads to provide for bicycle and pedestrian use and to provide continuity of design. When allowed, paved shoulders shall be placed in conformance with Sections 3-2.03.

B. Where shoulders are paved on one side only, they shall be delineated by a four-inch white thermoplastic edge line.

3-3.08 Separated Walkways, Bikeways and Trails

Separated pedestrian walkway, bikeway and trail facilities shall be provided where designated in the City's Comprehensive Plan or where required by the Development Review Committee (DRC) because of anticipated significant public usage.

Separated facilities are typically located on an easement or within the ROW when separated from the roadway by a drainage ditch or other barrier. Where separate facilities intersect with motorized traffic; sight distance, marking and signalization (if warranted) shall be as provided in accordance with MUTCD.

A. Walkway or pathway facilities shall be designed as follows:

    i. Separated pedestrian walkways minimum width shall be 5-feet.

a. Soft surface neighborhood pathways designed for pedestrians shall be a minimum 4-feet wide with at least 1½-foot clearance to obstructions on both sides and 10-foot vertical clearance.

ii. Pathways shall be designed and located so as to avoid drainage and erosion problems and shall be constructed with a minimum 6-inches of crushed surfacing top course, manufactured border strip, and approved geotextile fabric over firm and unyielding subgrade or as otherwise approved by the City Engineer.

B. Bikeways and multi-purpose trails are generally shared with other transportation modes, although they may be provided exclusively for bicycle or pedestrian use. Bikeways are categorized based on degree of separation from motor vehicles and other transportation modes (this classification does not denote preference of one type over another) as follows:

- **Bike Path (Class I)**: A separate paved multipurpose trail for the principal use of bicycles and other non-motorized modes. Bike paths are 10 feet wide except in high usage areas where they should be 12 feet wide.
- **Bike Lane (Class II)**: A portion of the road that is designated by pavement striping for exclusive bicycle use. Bicycle lanes may be signed as part of a directional route system. Bicycle lanes are five feet wide on a curbed road and minimum four feet wide as a shoulder bike lane unless otherwise approved by the City Engineer.
- **Wide Curb Lane (Class III)**: A road that provides a widened paved outer curb lane to accommodate bicycles in the same lane as motor vehicles, also known as "sharrow" bike lane. Lane width shall be increased at least three feet.
- **Shoulder**: A lane contiguous to the traveled way but separated by a stripe. Typically shared with pedestrians and occasional emergency vehicle access.
- **Shared Roadway**: All roads not categorized above where bicycles share the roadway with motor vehicles.

i. A bikeway shall be provided:

a. Wherever called for in the City's Comprehensive Plan, Transportation Plan or Capital Improvement Program.

b. When substantial bike usage is expected which would benefit from construction of a bicycle facility.

ii. Bikeway striping and signing shall be implemented as follows:

a. Pavement markings shall be used on bike lanes and paths according to MUTCD.

iii. The design of all signalized intersections shall consider bicycle usage and the need for bicyclists to actuate the signal.

iv. The planning and design of bikeways in any category shall be in accordance with the WSDOT Design Manual and the AASHTO Guide for the Development of Bicycle Facilities, current edition.

3-3.09 School Access

School access required as part of development approval shall be provided by a walkway, concrete sidewalk or full width delineated shoulder unless another alternative is available and approved by the City Engineer through a road variance request.

3-3.10 VACANT

3-3.11 Equestrian Facilities

A. Equestrian facilities adjacent to the traveled way shall be provided where proposed by the City's Comprehensive Plan or as required by the Development Review Committee (DRC). Facilities shall be provided as follows:

   i. Shoulders adjacent to the traveled way intended for equestrian use shall be surfaced full-width, minimum 4-feet (8-feet desirable). Surface shall be 2 1/2-inches of crushed surfacing base course and 1 1/2-inches of crushed surfacing top course.

   ii. A separated equestrian trail shall be constructed with an 18% maximum grade, 10-foot vertical clearance and a 5-foot wide pathway zone. The trail shall be constructed of native soil or, where drainage or erosion problems are present, a minimum of 2 1/2-inches of crushed surfacing top course on graded and compacted native soil. Native soil which is not free draining shall be removed and replaced with free draining soil as necessary to provide a maintainable and well-drained subgrade. Additional crushed surfacing, cinders or other stabilizing materials shall be required if heavy usage is anticipated or if there is any evidence of instability in the subgrade, including free water, swamp conditions, fine-grained or organic soils, slides, or uneven trails.

SECTION 4: SURFACING

3-4.01 Residential Streets, Pedestrian and Bike

The minimum paved section, with alternative combinations of materials, for residential streets, shoulders, sidewalks, and bikeways shall be as indicated below. These sections are acceptable only over firm and unyielding subgrade that is well drained and compacted. Proof rolling is required on all subgrade areas prior to ACP or PCC placement (roads, curb & gutter, and sidewalks). Any proposed exception to these materials will be subject to soils strength testing and traffic loading analysis and subject to review and approval by the City Engineer as outlined in Section 3-4.02 below. Additional thickness shall be required by the City Engineer upon review of an engineered pavement evaluation. All expenses for determining revised materials shall be borne by the Developer.

Table 3-10: Pavement Section Details

TYPE OF FACILITIES	Top lift (inches)	Base lift (inches)	PCC (inches)	Crushed Surface Top Course (inches)	Crushed Surface Base Course (inches)
Residential Access Streets (in both cut or fill section) Portland Cement Type Neighborhood Collectors* Arterials**	2-inches 3-inches* 4-inches**	4-inches 6-inches**	5-inches Class 4000	4-inches 6-inches**	8-inches 12-inches**
Shoulders On bus routes*	2-inches 3-inches*	4-inches		4-inches	8-inches
Concrete Sidewalks			5-inches Class 3,000[1]	6-inches	
Pathways & Bikeways					
Alternative I			5-inches Class 3,000	2-inches	4-inches
Alternative II	2-inches			2-inches	4-inches

[1]At driveways, shall comply with WSDOT standard specification (Class 4,000)

When a walkway or bikeway is incorporated into a road shoulder, the required shoulder section, if higher strength, shall govern. Subgrade compaction for bikeways and paved walkways shall meet a minimum of 95 percent maximum density (modified proctor).

A. **DRIVEWAYS** may be surfaced as desired by the owner, except:

   i. On curbed streets with sidewalks, driveway shall be paved with PCC Class 4000, in accordance WSDOT specifications. See also, Standard Detail 3-030-004 and 3-030-005.

   ii. On shoulder and ditch section, driveway between edge of pavement and ROW line shall be surfaced as required by Standard Detail 3-030-003.

   iii. On thickened edge roadways with underground utilities, PCC may be used for driveways between the thickened edge and the ROW line provided that a construction joint is installed at the ROW line.

B. **STREET WIDENING or ADDING TRAVELED WAY TO EXISTING ROADS:**

   i. When an existing paved street is to be widened, the edge of pavement shall be saw cut to provide a clean, vertical edge for joining to the new pavement. After

placement of the new pavement section, the joint shall be sealed and the street overlaid with a minimum 1 1/2-inch (plus a pre-level course), full width overlay throughout the widened area. The requirement for overlay may be waived by the City Engineer based on the condition of existing pavement and the extent of required changes to channelization.

ii. When an existing shoulder is to become part of a proposed traveled way a pavement evaluation shall be performed. This evaluation shall analyze the structural capacity and determine any need for improvement. Designs based on these evaluations are subject to review and approval by the City Engineer. The responsibility for any shoulder material thickness improvement shall be considered part of the requirement for roadway widening. The shoulder shall be replaced in width as specified in Sections 3-2.02, 3-2.03 and 3-2.04.

iii. Any widening of an existing roadway, either to add traveled way or paved shoulder shall have the same surfacing material as the existing roadway.

iv. Where pavement widening is completed, a minimum 6:1 taper shall be constructed within off-site ROW to transition between road edge locations.

3-4.02 Requirements for Residential Streets on Poor Subgrade

The minimum material thicknesses indicated in Section 3-4.01 are not acceptable if there is any evidence of instability in the subgrade. This includes free water, wetland/over optimum conditions, fine-grained or organic soil, slides or uneven settlement. If there are any of these characteristics, the soil shall be sampled and tested sufficiently to establish a pavement design that will support the proposed construction. Any deficiencies, including an R-value of less than 55 or a California Bearing Ratio (CBR) of less than 20, shall be fully considered in the design.

Remedial measures may include, but are not limited to: a stronger paved section, a strengthening of subgrade by adding or substituting fractured aggregate including over excavated the deficient area to a minimum of 24-inches and placement of compacted structural fill, installing a geotextile fabric and also placing a gravel borrow imported material, more extensive drainage or any combination of such measures as directed by the City Engineer. Both the soils test report and the resulting pavement design will be subject to review and approval by the City Engineer.

3-4.03 Arterials and Commercial Access Streets

Any pavement for arterials and commercial access streets shall be designed using currently accepted methodology that considers the load bearing capacity of the soils and the traffic-carrying requirements of the roadway (see table in Section 3-4.01).

Plans shall be accompanied by a pavement thickness design based on soil strength parameters reflecting actual field tests and traffic loading analyses. The analysis shall include the traffic volume and axle loading, the type and thickness of roadway materials and the recommended method of placement. Pavement sections shall not be less than those required for neighborhood collectors.

3-4.04 Materials and Lay-Down Procedures

Shall be in accordance with WSDOT/APWA Standard Specifications and the following requirements:

A. All ACP lifts shall be 1/2-inch HMA unless otherwise required or approved by the City Engineer.

B. During surfacing activities utility covers in roadway shall be adjusted in accordance with Section 3-8.04.

C. The final lift of ACP shall not be placed until 80% of Plat home build out to allow time for the observation and repair of failures in the subgrade and base ACP lift unless otherwise approved by the City Engineer. The ACP base layer must stay exposed for a minimum 12 months even if home construction is completed before that time period.

D. ACP pavers shall be self-contained, power-propelled units. Truck mounted type pavers shall only be used for City maintenance and paving of irregularly shaped or minor areas as approved by the City Engineer, or as follows:

   i. Pavement widths less than 8-feet; and

   ii. Pavement lengths less than 150 feet.

E. Pavement shall be compacted to not less than 91% maximum density. ACP design, equipment, and testing information shall be provided as part of a preconstruction meeting not less than 48 hours prior to paving.

3-4.05 Pavement Markings, Markers, and Pavement Tapers

A. Pavement markings, markers or striping shall be used to delineate channelization, lane endings, crosswalks and longitudinal lines to control or guide traffic. Channelization plans or crosswalk locations shall be approved by the City Engineer.

B. Channelization shall be required when:

   i. Through traffic is diverted around a lane or obstacle; and

   ii. When connecting full width streets with different cross sections; and

   iii. When extending an existing street with a new cross section different than the existing one.

C. The channelization shall provide tapers equal in length to the value derived from the following formula.

$$L = \frac{WS^2}{60}$$

Where L = length of taper

W = width of diversion from the road centerline or the original alignment of travel, or the offset distance, as applicable.

S = speed in miles per hour.

D. Channelization shall also be required to redirect traffic back to their original alignment.

E. Left turn channelization shall include a minimum of 150 feet of full width lane to include storage and a reverse curve 90 feet in length for posted speeds up to 40 miles per hour (MPH). The reverse curve may be included within the taper distance. A deceleration taper as shown in the WSDOT/APWA Standard Plans may be used in place of a reverse curve. Standard left turn lanes shall be 12 feet wide. Type 2L arrows shall be installed in the lane 25 feet and 100 feet behind the stop bar, crosswalk or stopping area. Additional storage may be required for long vehicles or anticipated left turn queues longer than the minimum storage.

F. Centerline for channelization shall consist of two 4-inch yellow lines with a 4-inch separation. Type 2d lane markers shall be installed at 40-foot centers between the lines. Holding lines for additional lanes shall be 8-inch white lines with Type 2e lane marker on the inside of the lane at 20-foot centers. Edge lines for tapering thru traffic back to the original alignment shall consist of 4-inch white lines.

G. Pavement markings for legends and crosswalks shall be reflectorized hot or cold applied plastic. Centerlines and lane markings shall employ raised pavement markings consistent with WSDOT/APWA Standards Plans. Extruded or sprayed markings shall be dressed with glass beads for initial reflectance. All materials shall be designed to maintain reflectance while the material wears.

H. Where pavement widening less than 300 feet in length is abruptly ended and edge lines do not direct traffic to through lanes, Type 2e lane markers shall be installed at 10-foot centers near the end of the paved area at a 10:1 taper.

I. Crosswalks shall be installed at all intersections controlled by traffic signals and other areas required by the City Engineer including bulb-outs for pedestrian safety and traffic calming. Crosswalks shall consist of sets of longitudinal lines eight inches wide by 10 feet and with 8-inch separation. A set of these lines shall be installed between each lane, between the wheel tracks in each lane and at the pavement edges.

J. All pavement markings shall be laid out with spray paint and approved by the City Engineer before they are installed. Approval may require a three working day advance notice to have field lay-out approved by the City Engineer or to make arrangements to meet the City Engineer on site during the installation.

SECTION 5: ROADSIDE FEATURES

3-5.01 Rock Facings

A. Rock facings may be used for the protection of cut or fill embankments up to a maximum height of 4-feet above the keyway in stable soil conditions, which will result in no significant foundation settlement or outward thrust upon the walls. DMC does not allow for certain types of walls dependent upon location and proximity to roads and public areas, additional height and wall type restrictions may apply. See Standard Details 3-05-

004 through 3-05-006. For heights over 4-feet above the keyway or when soil is unstable, a structural wall of acceptable design shall be used. Terracing of walls is mandatory (4-foot max height per wall) unless otherwise approved and engineered. The placement of any rockery type wall is subject to approval by the City Engineer.

B. **Materials**

i. Size categories shall include:

a. Two-man rocks (200 to 700 pounds), 18”-28” in average dimension;

b. Three-man rocks (701 to 2000 pounds), 28-36” in average dimension; and

c. Four-man rocks (2001 to 4000 pounds), 36-48” in average dimension.

d. Four-man rocks shall be used for bottom course rock in all rock facings over six feet in height.

ii. The rock material shall be as nearly rectangular as possible. No stone shall be used which does not extend through the wall. The quarried trap rock shall be hard, sound, durable and free from weathered portions, seams, cracks and other defects. The rock density shall be a minimum of 160 pounds per cubic foot, measured according to WSDOT Test Method 107 (Bulk Specific Gravity - S.S.D. basis). Additionally, rock subjected to the U.S. Army Corps of Engineers Test Method CRD-C-148 (“Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol”) must have less than 15% breakdown.

C. **Keyway**: A keyway consisting of a shallow trench of minimum 12-inch depth shall be constructed the full rockery length, and slightly inclined towards the face being protected. It shall be excavated the full rockery width including the rock filter layer. The keyway subgrade shall be firm and acceptable to the City Engineer. See Standard Detail 3-05-004.

D. **Underdrains**: A minimum 6-inch diameter perforated, or slotted drainpipe shall be placed in a shallow excavated trench located along the inside edge of the keyway and shall be connected to the storm drain system or an acceptable outfall. The pipe shall be bedded on and surrounded by “Gravel Backfill for Drains” (WSDOT/APWA 9-03.12(4)) to a minimum height of 18 inches above bottom of pipe. A filter fabric shall surround the gravel backfill and shall have a minimum one-foot overlap along the top surface of the gravel. This requirement for fabric may be waived by the City Engineer if shown that soils and water conditions make it unnecessary. See Standard Details 3-05-004 through 3-05-006.

E. **Rock Selection and Placement**: Rock selection and placement shall be such that there will be minimum voids and, in the exposed face, no open voids over 6-inches across in any direction. The final course shall have a continuous appearance and be placed to minimize erosion of the backfill material. The larger rocks shall be placed at the base of the facing so that it will be stable and have a stable appearance. The rocks shall be placed in a manner such that the longitudinal axis of the rock shall be at right angles to the face. The rocks shall have all inclined faces sloping to the back of the facing. Each course of rocks shall be seated as tightly and evenly as possible on the course beneath. The rocks shall be

placed so that there are no continuous joint planes either horizontally or vertically. After setting each course of rock, all voids between the rocks shall be chinked on the back with quarry rock to eliminate any void sufficient to pass a 2-inch square probe. See Standard Detail 3-05-004 through 3-05-006.

F. **Rock Filter Layers**: The rock filter layer shall consist of quarry spalls with a maximum size of 4-inches and a minimum size of 2-inches. This material shall be placed to a 12-inch minimum thickness between the entire facing and the cut or fill material. The backfill material shall be placed in lifts to an elevation approximately 6-inches below the top of each course of rocks as they are placed, until the uppermost course is placed. Any backfill material on the bearing surface of one rock course shall be removed before setting the next course.

G. **Fill Rockery Facing Supporting Roadway Embankment**: Embankment behind rookeries exceeding four feet in height above the keyway shall be reinforced with a geosynthetic fabric or geogrid specifically manufactured for soil reinforcement, designed on a project specific basis by the City Engineer, see Standard Detail 3-050-007.

H. **Sidewalks Above Rockery Facings**: Sidewalks shall not be built directly over rockeries. When it is proven there is no alternative, the top of the facing shall be sealed and leveled with a cap constructed of cement concrete Class 3000 in accordance with the applicable provisions of Section 6-02 of the WSDOT/APWA Standard Specifications, but with reduced water content resulting in slump of not over 2-inches.

I. **Fences and Handrails**: A chain link fence or metal handrail shall be installed when rockery is 3-feet or greater in height.

3-5.02 Side Slopes

A. Side slopes shall generally be constructed no steeper than 3:1 on both fill and cut slopes. Steeper slopes may be approved by the City Engineer upon showing that the steeper slopes, based on soils analyses, will be stable.

B. Side slopes shall be stabilized by grass sod, hydroseed or by other planting or surfacing materials as approved by the City Engineer.

C. Side slopes on projects funded by Federal grants shall be constructed in conformance with Local Agency Guidelines.

3-5.03 Street Trees and Landscaping

A. Street trees and landscaping should be incorporated into the design of road improvements for all classifications of roads. Such landscaping shall be coordinated with off-street landscaping required on developer's property under the provisions of DMC.

B. Planting strips are required along all classifications of roads and may be considered as part of the landscape mitigation requirements established during the SEPA review process. The design of planting strips must be approved by the City Engineer and must include a landscaping plan in which plant maintenance, utilities and traffic safety requirements are discussed.

C. An approved root barrier is required for all landscape strips within or adjacent to public roadways, sidewalks, or drainage facilities.

D. Existing trees and landscaping shall be preserved where desirable and placement of new trees shall be compatible with other features of the environment. Maximum heights and spacing shall not conflict unduly with overhead utilities, or root development with underground utilities. If street trees are planted, they shall conform reasonably to Standard Detail 3-050-009 and applicable DMC requirements.

E. The Planning Department maintains a list of approved street trees. New trees shall not include:

1. Poplar
2. Cottonwood or Alder
3. Soft Maples
4. Gum Tree type species
5. Fruit bearing trees
6. Any other tree or shrub whose roots are likely to obstruct or damage sanitary or storm sewers.

F. New street trees shall not obstruct ESD for intersections or driveways. Specific trees to avoid include:

1. Bigleaf Maple
2. Box Elder
3. Silver Maple
4. Catalpa
5. London Plane
6. Cottonwood
7. Weeping Willows
8. Douglas Fir
9. Western Red Cedar
10. Western Hemlock
11. Deodara Cedar
12. Spruce
13. Pines

G. Street tree plans on bus routes shall be reviewed by King County Metro Service Planning, phone 206-684-1622 (or current phone number).

3-5.04 Mailboxes

A. The responsibilities for location and installation of mailboxes in connection with the construction or reconstruction of City streets are as follows:

i. City Engineer or their representative will:

a. Require street improvement plans, whether for construction by the City or by private development, clearly show the designated location or relocation of mailboxes, whether single or clustered.

b. Require with this information any necessary widening or reconfiguration of sidewalks with suitable knockouts or open strips for mailbox posts or pedestal.

c. Require plans to bear a statement on the first sheet that mailbox locations as shown on these plans have been coordinated with the Duvall Post Office.

d. Require construction of mailbox locations in accordance with approved plans, through usual inspection and enforcement procedures.

e. Require Planning Department review and approval for design.

ii. Duvall Post Office will:

a. Designate location and manner of mailbox clustering when so requested by the City or directly by the Applicant or Developer. Note on the plans the type of mailbox delivery: MBCU (Mailbox Collection Unit), or Rural type box. Authenticate by stamp or signature when the data has been correctly incorporated into the plans.

b. Do all necessary coordination with owners or residents involved to secure agreement as to mailbox location and to instruct them regarding mailbox installation. Installation or relocation of MBCU's is the responsibility of the owner.

iii. Owners or residents served by mailboxes, at time of original installation, will:

a. If using individual mailboxes or clustered units, install and thereafter maintain their own mailboxes as instructed by the Post Office.

b. If MBCU delivery, rely on Post Office to provide and maintain MBCU'S.

iv. Developer's or their contractors shall:

a. Where there are existing mailboxes with no plan to replace them with MBCU'S:

1. When it becomes necessary to remove or otherwise disturb existing mailboxes within the limits of any project, install the boxes temporarily in such a position that their function will not be impaired. After construction work has been completed, reinstall boxes at original locations or at new approved locations as indicated on the approved plans or as otherwise directed by the City Engineer.

2. Use only existing posts or materials except that any damage caused by the builder or their contractor is to be repaired at the expense of the builder.

b. Where there are existing MBCU's or plans to install MBCU'S:

1. Call the Duvall Post Office to locate or relocate MBCU's and make the necessary installation.

B. Installation methods are as follows:

i. MBCU's shall be installed for the Postal Service generally in accordance with Standard Detail 3-050-012A. Design requirements are subject to Planning Department approval.

ii. Mailboxes, in the general case, shall be set in accordance with Standard Detail 3-050-010 or 3-050-011, and shall be clustered together when practical and reasonably convenient to the houses served.

3-5.05 Street Illumination

The City utilizes the Illuminating Engineering Society (IES) of North America recommended roadway design criteria in *Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting* (ANSI-IES RP-8-18). See Table 3-11 through 3-14 for illumination requirements.

Puget Sound Energy (PSE) provides, installs, owns and maintains the street illumination system for the City.

A. Design Parameters:

i. Where street frontage improvements are required street illumination systems shall be required.

ii. Streetlights shall be provided with the development of all-new subdivisions and short plats, and for other commercial, industrial, or institutional property development.

iii. New roadway construction and shall be built to the current light standards and take into consideration all hazardous areas, safety for vehicles, pedestrian, shared lanes (motor vehicles, bicycle), bikeways and bus stops and security for pedestrians and homeowners. **The utilization of cut-off luminaires is required.**

iv. If there is an existing streetlight system, the portion of the system required to meet the Photometric Design Values along the frontage shall be brought into compliance with the current streetlight standards.

v. All new streetlight wiring, conduit and service connections shall be located underground. The applicant will be responsible for providing or obtaining necessary easements for underground power for street lighting systems designed and constructed as part of an approved permit.

vi. Streetlight poles shall be direct buried as specified by PSE.

vii. Line loss calculations shall show that no more than a 5% voltage drop occur in any circuits. Branch circuits shall serve a minimum of four luminaires.

viii. For conductors, the minimum wire size for any illumination circuit shall be No. 8. No. 10 wire will be acceptable for the pole and bracket cable within the light standard only.

ix. The City Engineer may approve a deviation from these Standards.

B. Light Standards:

i. Light standards shall be located on one side of the roadway only or shall be located opposite each other when placed along both sides of the roadway.

ii. Staggered spacing will be allowed upon approval of the City Engineer where there is an established staggered pattern and it is necessary to continue this patter, or when site or safety conditions prevent locating luminaires on only one side of the roadway.

iii. In areas where the street width differs from the City standard, or there are other factors influencing the location of the streetlights, the City Engineer will provide input to the applicant on acceptable options.

C. The area classification for specific areas shall be determined by the City. The following are minimum standards for lighting levels based on road classification:

i. **Arterial Streets**: Theses Standards have organized roads into three classifications for arterial streetlight levels – Principal, Minor, and Collector (Section 3-2.03, Table 3.1). These classifications and associated design parameters are in Table 3.11.

ii. **Residential Access Streets**: No specific photometric design values have been established for local residential access streets. For new development, lighting systems are required to be installed as follows:

a. at intersections
b. at horizontal curves
c. at vertical curves
d. at street ends
e. at marked pedestrian crossings
f. at traffic calming devices
g. at locations where there are vehicle or pedestrian safety concerns
h. and at no greater than 300-foot intervals

iii. **Commercial Access Streets**: Theses Standards have organized roads into three classifications for arterial streetlight levels – Mixed Use, Business, Industrial, and Minor (Section 3-2.04, Table 3.3). These classifications will comply with Arterial Collector design parameters in Table 3.11 below.

Measuring Unit of light – Illuminance

Illuminance is measured in foot candles (fc) or lux (in the metric SI system). A foot candle is actually one lumen of light density per square foot; one lux is one lumen per square meter.

- 1 lux = 1 lumen / square meter = 0.0001 phot = 0.0929-foot candle (fc)
- 1 phot = 1 lumen / square centimeter = 10000 lumens / square meter = 10000 lux
- 1-foot candle (fc) = 1 lumen / square foot = 10.752 lux

D. Pedestrian Conflict Areas are defined as:

- **High Pedestrian Conflict Areas** (pedestrian activity between 6 PM to 7 PM – over 100): Areas with significant numbers of pedestrians expected to be on the sidewalks or crossing the streets during darkness. Examples are downtown retail areas, near theaters, concert halls, and transit terminals.
- **Medium Pedestrian Conflict Areas** (pedestrian activity between 6 PM to 7 PM – 11 to 100): Areas where lesser numbers of pedestrians utilize the streets at night. Typical are downtown office area, block with libraries, apartments neighborhood shopping, industrial, older city areas, and street with transit lines.
- **Low Pedestrian Conflict Areas** (pedestrian activity between 6 PM to 7 PM – 10 or fewer): Areas with very low volumes of night pedestrian usage. These areas can be in any of the cited roadway classifications but may be typified by suburban single-family streets, very low-density residential developments, and rural or semi-rural areas.
- **Rural areas are set at 0.2 fc for sidewalk illumination.**

Table 3-11: Roadway Illumination Levels

Roadway				
Classification	**Pedestrian Conflict Area**	**Pavement Classification**		**Uniformity Ratio** (E_{avg}/E_{min})
		Portland Cement Concrete (lux/fc)	**Asphalt Concrete** (lux/fc)	
Principal	High	10.0 / 1.0	13.0 / 1.3	3.0
	Medium	8.0 / 0.8	10.0 / 1.0	3.0
	Low	6.0 / 0.6	8.0 / 0.8	3.0
Minor	High	12.0 / 1.2	15.0 / 1.5	3.0
	Medium	9.0 / 0.9	11.0 / 1.1	3.0
	Low	6.0 / 0.6	8.0 / 0.8	3.0
Collector	High	8.0 / 0.8	10.0 / 1.0	4.0
	Medium	6.0 / 0.6	8.0 / 0.8	4.0
	Low	4.0 / 0.4	5.0 / 0.5	4.0

Table 3-12: Intersection Illumination Levels

Intersections			
Classification	**Average Maintained Illumination Values** (lux/fc)		**Uniformity Ratio** (E_{avg}/E_{min})
	Portland Cement Concrete (lux/fc)	**Asphalt Concrete** (lux/fc)	
Principal – Principal	18.0 / 1.8	26.0 / 2.6	3.0
Principal – Minor	15.0 / 1.5	22.0 / 2.2	3.0
Principal – Collector	13.0 / 1.3	20.0 / 2.0	3.0
Minor – Minor	12.0 / 1.2	18.0 / 1.8	4.0
Minor – Collector	10.0 / 1.0	16.0 / 1.6	4.0
Collector – Collector	8.0 / 0.8	14.0 / 1.4	6.0

Table 3-13: Miscellaneous Illumination Levels

Miscellaneous System	**Illumination** (lux/fc)
Cul-de-sac	4.0 / 0.4
Curves	4.0 / 0.4
Hills	4.0 / 0.4
Parks	8.0 / 0.8 – 16.0 / 1.6
Sag Curves	6.0 / 0.6 – 8.0 / 0.8
Sidewalks	0.7x adjacent roadway
Mid-block Crossings (marked)	1.5x adjacent intersection/corridor
Crosswalk at Intersection (unmarked)	Same as adjacent intersection
Other Residential[1]	4.0 / 0.4 – 8.0 / 0.8

[1]Decision Point Lighting may be applied to residential access streets with 300 ft spacing maximum between luminaires. See Section B.2 above for required locations.

Table 3-14: Luminaire Requirements

Classification	Maximum Wattage	Maximum Arm Length (ft)	Mounting Height (ft)
Arterial	250	16	25 - 30
Residential, Private	135	12	13 - 15

3-5.06 Survey Monuments

A. All existing survey monuments, which are disturbed, lost, or destroyed during surveying or building shall be replaced by a land surveyor registered in the State of Washington at the expense of the responsible party.

B. Survey monuments shall be placed or replaced in accordance with recognized good practice in land surveying, and in conformance with Standard Detail 3-05-014 and 3-05-015.

3-5.07 Roadway Barricades

Temporary and permanent barricades shall conform to the standards described in Section 6C-8 of the Manual on Uniform Traffic Control Devices (MUTCD) and Standard Detail. 3-05-003.

A. Type I or Type II barricades may be used when:

   i. Traffic is maintained through the area being constructed/reconstructed.

B. Type III barricades may be used when:

   i. Roadways and/or proposed future roadways are closed to traffic.

   ii. Provision must be made for access of equipment and authorized vehicles, movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry.

   iii. As job site access. The Developer/Contractor shall assure proper closure at the end of each working day.

   iv. Or extend completely across a roadway (as a fence) or from curb to curb.

C. Type III permanent barricades shall be installed to:

   i. Close arterials or other through streets hazardous to traffic. They shall close off lanes where tapers are not sufficiently delineated.

   ii. At the end of a local access street terminating abruptly without cul-de-sac bulb or on temporarily stubbed off streets. Each such barricade shall be used together with an end-of-road marker.

3-5.08 Bollards

When necessary to deny motor vehicle access to an easement, tract, or trail, except for maintenance or emergency vehicles, the point of access shall be closed by a line of bollards. These shall include one or more fixed bollards on each side of the traveled way and removable, locking

bollards across the traveled way. Spacing shall provide one bollard on centerline of trail and other bollards spaced at minimum 50 inches on center on trails 10 feet wide or less. Spacing shall be 60 inches on center on trails wider than 10 feet. Bollards shall be located at least 10 feet laterally from the paved edge of roadway. Bollard design shall be in accordance with Standard Detail 3-05-013 or other design acceptable to the City Engineer.

No fire apparatus access roads shall be blocked in this manner without the concurrence of the Fire Chief.

3-5.09 Guardrail/Embankment Heights

Guardrail and end anchor installations shall conform to WSDOT/APWA Standard Plans, Guardrail Placement, and Beam Guardrail Anchor.

Evaluation of embankments for guardrail installations shall be in accordance with the WSDOT Design Manual.

3-5.10 Off-Street Parking Spaces

The number of off-street parking spaces required shall conform to DMC and applicable Building Code requirements. The specifications for off-street parking spaces shall be as provided in DMC.

3-5.11 Roadside Obstacles

Non-yielding or non-breakaway structures, including rookeries and retaining walls, which may be potential hazards to the traveling public shall be placed with due regard to safety. On roads with a shoulder or mountable curb, hazardous objects shall be placed as close to the ROW line as practicable and a minimum of 10 feet from the edge of the traveled way or auxiliary lane.

On urban roads with a vertical curb section, hazardous objects shall be placed as far from the edge of the traveled way or auxiliary lane as practical. Such an object shall not be placed in a sidewalk or with the object edge nearest the roadway less than 8½-feet from the face of the curb in business areas or 5½-feet from face of curb in residential areas.

Signage, fire hydrants, streetlights, and other safety devices may be located as required for safe usage. Placement of any utility structures shall be in accordance with requirements of Section 8 of this Chapter, to include constraints on placement of poles on the outside of curves.

SECTION 6: BRIDGES

3-6.01 Principal References

A. Except as specified below, City of Duvall bridges, whether on public roads or on private roads serving subdivided land, shall be designed and constructed to meet the minimum requirements set forth in the latest edition, including all interim addenda, of "Standard Specifications for Highway Bridges," adopted by AASHTO and in accordance with the requirements of WSDOT/APWA Standard Specifications. Bridge and approach railings shall be provided in accordance with those references or with WSDOT/APWA Standard Plans.

B. All new bridges shall be designed to carry an AASHTO HS 20-44 live load or greater.

C. All bridge type work shall comply with City Codes regarding sensitive and shoreline management areas for stream and wetland protection and flooding concerns.

3-6.02 Bridge Geometrics

A. In the general case, the bridge shall comprise the full width and configuration of the road being served -- traveled way plus curb, sidewalks, walkway, bike lane, equestrian lane and/or shoulder on one or both sides. Requirements of utilities shall be duly considered. Bridge roadway width shall be measured between curbs or between faces of rails, whichever is less, but in no case shall be less than 28 feet.

B. Where typical speed is 35 MPH or higher *and* significant pedestrian, bike and/or horseback traffic can be expected, the City Engineer may require that the lanes for these other modes of traffic be separated from motor vehicle traffic by use of a bridge traffic rail and further protected by a rail at outer edge. On designated bike routes, combination traffic and bicycle railings shall be used.

C. Approach railings shall be made structurally continuous with bridge railings and shall meet AASHTO specifications as cited above.

D. Overhead vertical clearances for motor traffic on the traveled way or under overpasses shall be 16 1/2-feet minimum. Vertical clearance of structures above a walkway or sidewalk shall be 8-feet minimum and shall be 10 feet on designated equestrian routes.

E. The height of bridge clearance above streams shall be as required by the KCSWDM.

3-6.03 Bridge Design Criteria

A. Approach slabs will be required for all bridges and new bridge plans shall provide pavement seats for approach slabs unless otherwise approved by the City Engineer. Waiver or modification of the requirement for approach slabs will be considered only on the basis of adequate geotechnical analysis. Approach slabs shall be constructed in accordance with WSDOT/APWA Standard Plan A-2.

B. New bridge decks and approach slabs shall be designed with a protective system to prevent corrosion of the reinforcing steel.

C. Criteria under other recognized road and bridge project classifications, such as those of 3-R projects, set forth in WSDOT Local Agency Guidelines, may be applied under conditions deemed appropriate by the City Engineer.

D. The design of bridge expansion joints shall consider the presence of bicycle traffic.

3-6.04 Special Permits

Permit requirements for construction or reconstruction of bridges include but are not limited to the following:

A. Bridges over navigable waters require United States (US) Coast Guard permits.

B. Bridges involving deposition of material in waters of the United States or their adjacent wetlands require an Army Corps of Engineers Permit.

C. Any work involving alteration of flow or bed materials below the ordinary high-water line of any water body or water course requires a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife (WDFW).

D. Any work within waters of the US, requires a Water Quality Certification Waiver from the Washington State Department of Ecology (Ecology).

E. Where bridge structures lie on or over submerged lands a lease from the Washington State Department of Natural Resources (DNR) may be necessary.

F. Structures located on shoreline zones as defined in DMC require a permit from the City, subject to concurrence of the State Department of Ecology.

G. Bridges over waterways require the City Engineer's approval of the size and shape of the hydraulic opening, the height of the superstructure over high water, the location of piers, channel, improvement, and other hydraulic considerations.

SECTION 7: DRAINAGE

3-7.01 General

A. **Designs**: Drainage facilities shall be designed consistent with these Standards and the latest edition of the KCSWDM. See also Chapter 4 – Drainage Design Standards. Structures shall be placed and constructed as shown in the Standard Details.

B. **Specifications**: Materials, construction, and testing are specified in the WSDOT/APWA Standard Specifications. The City Engineer may amend, delete, or add specifications or Standard Details.

C. **Conflicts**: Where technical conflicts may occur between these Standards and the KCSWDM, the City Engineer shall decide which document governs.

3-7.02 Road Ditches

The following standards shall only apply in design of drainage ditches not requiring drainage review under the provisions of the KCSWDM and Drainage Design Standards.

A. **For grades between 0-3%**: grass lining is all that is required.

B. **For grades between 3-6%**: grass lining alone may not be sufficient to stop erosion. Preferred methods to further reduce potential erosion problems include the use of check dams or wider ditch sections. Rock-lined ditches shall be avoided whenever possible.

C. **For grades over 6% and not over 9%**: The City Engineer may direct use of a standard rock-lined ditch or alternatively a closed (pipe) drainage system under a paved shoulder with ACP curb or turnpike shoulder. As an exception, cul-de-sacs with over 6% grade shall be provided with pipe drainage and not with rock-lined ditches.

1. The standard rock lining shall be in accordance with the King County Surface Water Design Manual and Section 9-13.6 of the WSDOT/APWA Standard Specifications. Rock gradation shall be as follows:

Passing 8-inch square sieve	100%
Passing 3-inch square sieve	40% max.
Passing 3/4-inch square sieve	10% max.

2. Rocks shall be placed so as to form a firm, dense, protective mat consistent with examples in Standard Detail 3-02-024 and conforming to the design surface of the ditch. Individual rocks shall not protrude more than three inches from that surface.

D. **For grades over 9%**: either pipe drainage or a special rock-lined ditch shall be provided unless otherwise approved by the City Engineer. The special rock-lined ditch shall be designed by a professional Engineer, based on soils and hydraulic analyses. Design shall include rock sizing, together with filter rock gradations and/or filter fabric and be subject to approval by the City Engineer.

E. **Alternatively (and upon approval of the City Engineer), on grades up to 12%**: grass lined ditches with grasses as specified below shall be used for the drainage requirement. These ditches shall be designed and constructed in accordance with Standard Details 3-01-001, 3-01-004 and 3-01-007. Grass in swales or ditches shall be established by usual sod in the swale bottom and hydroseed on the side slopes, other methods including jute-matting may be required in certain areas and shall be used as determined by the City Engineer.

1. Grass seed mixture by weight may be:
    a. 10% Highland Colonial Bentgrass, 50% Perennial Rye, 40% Pennlawn Red fescue.
    b. Hydroseed at 150 pounds per acre, or
    c. Hand seed at 3 pounds per 1,000 square feet.
    d. Where there is a high groundwater, the following species may be substituted or added: Meadow or Pacific foxtail, Timothy, or Redtop.

3-7.03 Storm Conveyance and Culverts

A. Minimum pipe size shall be 12-inch diameter with minimum 2-foot cover over top of pipe unless otherwise approved. Reduced pipe diameter may be permitted on cross street laterals less than 70 feet long to avoid utility conflict or meet shallow gradient and shall be approved by the City Engineer.

B. Minimum pipe slope shall be 1% unless otherwise approved by the City Engineer.

C. No partially or fully submerged outfalls or pipe systems shall be approved.

D. Where the time of concentration creating the greatest flow is less than 15 minutes and the system predominately serves the road, determine flow rates using the rational formula.

$$Q = CiA$$

Where Q = peak runoff rate (flow unit)

C = runoff coefficient (unitless)

i = rainfall intensity (intensity unit)

A = watershed area (area unit)

E. Driveway culverts shall conform to Standard Detail 3-030-003.

F. The following pipes are allowed for use within the City's storm drainage system:

1. Profile Wall PVC; and
2. Ductile Iron (DI) or reinforced concrete pipe (RCP) for shallow or excessively deep situations; and
3. High Density Polyethylene (HDPE) pipe.

G. Pipe shall be bedded on gravel backfill for pipe bedding as specified in the general notes for storm drainage in Appendix G.

H. Temporary above ground installation of solid wall polyethylene (SWPE; also known as HPDE pipe or HDPPP) does not require pipe bedding.

I. PVC, Line Corrugated Polyethylene (LCPE) and SWPE may be used for temporary situations but not for permanent ones unless otherwise approved by the City Engineer.

J. Concrete pipe shall be rubber gasketed and securely banded. Leak testing shall be conducted if required by the City Engineer.

K. Bevel all projecting ends of culverts within the ROW and provide trash rack for pipes over 12-inches.

L. Driveway culvert installation, maintenance, and replacement is the responsibility of the property owner served.

3-7.04 Catch Basins and Junctions

A. Use catch basin to collect water from road surfaces.

B. Catch basins shall be spaced no greater than:

1. 150 feet for road grades less than 1%.
2. 200 feet for grades between 1-3%.
3. 300 feet for grades 3% and greater.
4. Where the width of the tributary road surface exceeds 35 feet, the cross slope exceeds 4%, or the 10-year, 24-hour rainfall exceeds 3 ½-inches, catch basin

spacing analysis is required. The analysis must show the depth of water at the edge of the traveled way does not exceed 0.12 feet or extend more than 5-feet into the traveled way for the 10-year storm event, using flows generated by the rational formula.

C. Connections to pipe systems may be made without placing a catch basin or manhole on the mainline by meeting all the following conditions:

1. The mainline pipe is 48 inches or greater and at least two times the size of the connecting pipe; and
2. Connections are made in accordance with the manufacturer's recommendations. Standard shop fabricated tees, wyes and saddles shall be used; and
3. There shall be a catch basin or manhole on the connecting pipe within two to ten feet of the external wall of the main line; and
4. Offset angle of connecting pipe to mainline, horizontally and vertically, shall be less than 45 degrees.

D. Connections to an existing system shall avoid directing project runoff through downstream water quality or flow control facilities. Receiving systems may have separate conveyance facilities: one connecting to water quality or flow control facilities and one by-passing them. Connection shall be to the bypass system where available.

E. Use Type 2 catch basins where the depth to the invert of the pipe exceeds 5-feet.

F. Roof and yard drains, or other concentrated flow from adjacent property shall not discharge over the surface of roadways or sidewalks.

G. Catch basins are required when joining differing types of pipes.

3-7.05 Frames, Grates, and Covers

A. Unless otherwise specified, use herringbone grates with standard frame in the traveled way, gutter, or shoulder. Vaned grates shall not be located within crosswalks.

B. At sag vertical curves, or before intersections with a grade 4% or greater, use through curb inlet frames. Where through curb inlets cannot be used, three vaned inlets shall be used. One shall be located at the approximate low point and another on either side at 25 foot horizontal spacing, but not greater than 0.1 foot above the low point.

C. New catch basins that do not collect runoff shall use solid covers. See Standard Detail 3-020-022. Existing catch basins which no longer collect runoff shall have their frame and grates replaced with solid covers. See Standard Detail 3-020-015.

D. All storm drain covers, and grates shall be locking. Manufacturer as approved by the City Engineer.

E. Slit drains may be used when approved by the City Engineer. At a minimum a slit drain shall have catch basins at either end unless used as a driveway culvert. The maximum distance between catch basins along a slit drain shall be 50 feet.

3-7.06 Erosion Control

Provide erosion control as required in Chapter 4 - Drainage Design Standards.

Filter fabric fences shall be constructed of material designed specifically for erosion control. The fabric shall be composed of rot-proof woven or non-woven polymeric fibers and be free of chemical treatment or coating that may reduce permeability. The fabric shall meet the following test requirements: minimum 110-pound grab tensile strength per ASTM D-1682, minimum 40-pound puncture strength per ASTM D-751 Modified, and 20-100 Equivalent Opening Size (EOS) based on US standard sieves.

3-7.07 Trenches

See Section 3-8.03.

SECTION 8: UTILITIES

3-8.01 Franchising Policy and Permit Procedure

A. Utilities to be located within existing and proposed City road ROW shall be constructed in accordance with current franchise and/or permit procedure and in compliance with these Standards. In their use of the ROW, utilities will be given consideration in concert with the traffic carrying requirements of the road which are, namely, to provide safe, efficient and convenient passage for motor vehicles, pedestrians, and other transportation uses. Aesthetics shall be a consideration. As a matter of policy, undergrounding of electric and communication utilities will be required except as otherwise approved by the Public Works Director. Also, utilities are subject to City policies relating to drainage, erosion/sedimentation control and sensitive areas as set forth in DMC and the Storm Drainage Design Standards Chapter.

B. All franchise utilities shall install blank conduit in ROW sections for future system upgrades as required by the Public Works Director.

C. All permits for new placement and replacement of existing utility poles and other utility structures above grade shall be accompanied by written certification from a professional Engineer or from an agent authorized by the franchise utility to certify that the installations conform to these Standards and that the proposed work is in conformity with sound engineering principles relating to safety.

D. Requests for exceptions to these Standards will be processed in accordance with variance procedure as referenced in Section 1-1.22.

3-8.02 Standard Utility Locations Within the Right-of-Way

Utilities within the ROW on new roads or on roads where existing topography, utilities or storm drains are not in conflict, shall be located as shown in typical sections, Standard Detail 3-010-002, and as indicated below. All projects shall install blank conduit in new ROW sections for future system upgrades as required by the Public Works Director. Where existing utilities or storm drains

are in place, new utilities shall conform to these Standards as nearly as practicable and yet be compatible with the existing installations. Above ground utilities located within intersections shall be placed as to avoid conflict with placement of curb ramps.

A. **Gas and Water Lines**:

1. Shoulder-and-Ditch Section:

   If practical: Outside of ditch line.

   Otherwise: In shoulder 3-feet from edge of traveled lane.

2. Curb and Gutter Section:

   Preferable: 1 ½-feet from the back of curb, or at distance which will clear root masses of street trees if these are present or anticipated.

   Otherwise: In the street as close to the curb as practical without encroaching on the storm drainage system. Mains and service connections to all lots shall be completed prior to placing of surface materials.

3. Designated Side of Centerline:

   GAS: South and West.

   WATER: North and East.

4. Depth: 36 inches and 42 inches minimum cover from finished grade, ditch bottom or natural ground for gas and water respectively.

5. Individual water service lines shall:

   a. Be placed with minimum 36-inch cover from finished grade, ditch bottom or natural ground.

   b. Use road ROW only as necessary to make side connections.

   c. For any one connection, not extend more than 60 feet along or through the ROW, or the minimum width of the existing ROW.

   d. Water meter boxes, when placed or re-placed, shall be located on the ROW line immediately adjacent to the property being served, unless otherwise approved by the City Engineer. Meter box locations within the ROW may be approved by the City Engineer based on site conditions which make routine service access difficult or impractical.

B. **Sanitary Sewers**:

1. In the general case, 5-feet south and west of centerline; depth 36-inch minimum cover from finished grade, ditch bottom or natural ground.

2. In the case of individual sanitary sewer service lines which are force mains the pipe shall:

   a. Be minimum 2-inches inner diameter (ID), or as otherwise required by Public Works to maintain internal scouring velocity.

b. If nonmetallic, contain wire or other acceptable proximity detection features; or be placed in a detectable metal casing.

c. Be placed with minimum three-foot cover from finished grade, ditch bottom or natural ground, within 10 degrees of perpendicular to road centerline, and extend to ROW line.

d. Be jacked or bored under road unless otherwise approved by the City Engineer.

C. Sanitary sewer and water lines shall be separated by a minimum of 10-feet, in accordance with the Criteria for Sewage Work Design, Washington Department of Ecology, latest edition.

D. Gravity systems, whether sanitary or storm drainage, shall have precedence over other systems in planning and installation except where a non-gravity system has already been installed under previous approved permit and subject to applicable provisions of such permits or franchises.

E. **Electric utilities, Power, Telephone, Cable TV**:

Preferable: Underground with 36-inch minimum cover, either side of road, at plan location and depth compatible with other utilities and storm drains.

Otherwise: Every new placement and every replacement of existing utility poles and other utility structures above grade shall conform to the following:

1. Utility poles or other obstacles may be placed within the ROW and shall be as far back from the traveled way or auxiliary lane as practicable.

   a. On shoulder type roads, poles or obstacles shall be located behind ditches and in accordance with criteria in Standard Detail 3-05-001 unless protected by concrete barrier, suitable impact attenuating device or placed more than 3 ½-feet behind face of guardrail, or as allowed by an approved Engineering Variance.

   b. On vertical curb type roads with a speed limit less than 40 MPH, poles or obstacles shall be placed clear of sidewalks and at least 8 ½-feet from face of curb in business areas and 5 ½-feet from curb face in residential areas. On urban roads with a speed limit of 40 MPH hour or greater, poles and obstacles shall be placed in accordance with Standard Detail 3-05-001.

   c. Notwithstanding the other provisions regarding pole locations described in these Standards, no pole shall be located so that it poses a hazard to the general public. Utilities shall place and replace poles with primary consideration given to public safety.

2. The above constraints on pole and obstacle location will not apply to locations not accessible by moving vehicles, “breakaway” structures whose break-off resistance does not exceed that of 4-inch by 4-inch wood post or a 1 ½-inch standard (hollow) iron pipe or “breakaway” fire hydrants installed to manufacturer’s specifications.

3. Deviations from these pole and obstacle clearance criteria may be allowed by an approved Engineering Variance when justified by suitable engineering study considering traffic safety. Only the franchise utility may request a variance from pole and obstacle clearance criteria. Up to three contiguous damaged or weakened poles may be replaced at existing locations under permit in accordance with emergency procedures, however, sequential permits resulting in continuous replacement of a pole line shall not be allowed. A pole or other obstacle which incurs repeated damage from errant vehicles shall be relocated or protected.
4. Locations of poles shall also be compatible with driveways, intersections, and other road features (i.e., they shall not interfere with sight distances, road signing, traffic signals, culverts, etc.). To the extent possible, utilities shall share facilities so that a minimum number of poles is needed.
5. Where road uses leave insufficient overhang, anchor, and tree-trimming space for overhead utilities, consideration will be given to variance from the Standards or to acquisition of additional easements and/or right-of-way for this purpose. Costs incurred for said acquisition shall be borne by the developer, builder, or other party initiating the road construction. However, the associated cost of relocating the utility shall not be borne by the City.

F. Notwithstanding other provisions, underground systems shall be located at least five feet away from road centerline and where they will not otherwise disturb existing survey monumentation.

3-8.03 Underground Utility Installation

Refer to Sections 2-1.22, 2-1.23, 2-1.24 and 2-1.25 for details about trench excavation, bedding, backfill, compaction, CDF and trench restoration.

A. Utility Cuts on Existing Traveled Roads:
    1. In trenching through existing pavement and cuts parallel to the road alignment:
        a. See Sections 2-1.22, 2-1.23, 2-1.24 and 2-1.25 for details.
    2. In cuts transverse to road alignment:
        a. In general, utility trenching through existing pavement across the road alignment will be discouraged. It will not be permitted unless it can be shown that alternatives such as boring or jacking are not possible due to conflicts or soil conditions, or unless the utility can be installed just prior to reconstruction or overlay of the road.
        b. See Section 2-1.22, 2-1.23, 2-1.24 and 2-1.25 for details.

B. Notification and Inspection:
    1. Consistent with Section 3-9.02 of these Standards, any Developers, Utilities, or others intending to trench in existing or proposed streets shall submit and obtain a Street Use Permit and notify the Public Works Department not less than one

working day prior to doing the work. This permit application and notification shall include:

a. Location of the work
b. Method of compaction to be used
c. Traffic Control Plan (as required)
d. Work start (day, time)
e. Time when testing is to be done
f. Work closeout

2. As set forth in Section 3-9.03 of these Standards, failure to notify may necessitate testing or retesting by the Public Works Inspector at the expense of the Developer or franchise utility. Furthermore, the work may be suspended pending satisfactory test results.

3-8.04 Final Utility Adjustment to Finish Grade

A. All utility covers which are located on proposed roadways shall be temporarily placed at subgrade elevation prior to placing crushed surfacing material.

B. Final adjustment of all covers and access entries shall be made following final paving by:

1. Saw-cutting or neat-line jackhammering of the pavement around lids and covers. Opening should not be larger than 12 inches beyond the radius of the cover.
2. Removing base material, surfacing course, and frame; adding raising rings; replacing frame and cover to finished grade of pavement.
3. Filling and mechanically compacting around the structure and frame with crushed surfacing material within 6-inches of the finished grade.
4. Filling the remaining 6-inches with ½-inch HMA, compacted and sealed to provide a dense, uniform surface.
5. Final adjustment of all covers and access entries shall be completed within 30 days of final paving.

3-8.05 Final Cleanup, Restoration of Surface Drainage and Erosion Control

In addition to restoration of the road as described above, the responsible franchise utility shall care for adjacent areas in accordance with WSDOT/APWA Standard Specifications Sections 1-04.11 “Final Cleanup” and 8-02.3(5) “Roadside Seeding, Lawn and Planting Area Preparation”. In particular:

A. Streets and roads shall be cleaned and swept both during and after installation work.

B. Disturbed soils shall be final graded, seeded and mulched after installation of the franchise utility. In limited areas seeding and mulching by hand, using approved methods, will be acceptable.

C. Ditch lines with erodible soil and subject to rapid flows may require seeding, jute matting, netting, or rock lining to control erosion.

D. Any silting of downstream drainage facilities, whether ditches or pipe and catch basins, which results from the franchise utility installation shall be cleaned out and the work site restored to a stable condition as part of site cleanup.

SECTION 9: CONSTRUCTION CONTROL AND INSPECTION

3-9.01 Basis for Control of the Work

Refer to Section 1-1.09.

3-9.02 Subdivision, Commercial and Right-Of-Way Inspection

On all road and drainage facility construction, proposed or in progress, which relates to subdivision, commercial and ROW development, control and inspection will be done by Public Works, acting for the City Engineer. Unless otherwise instructed by the City Engineer, construction events which require monitoring or inspection are identified as follows, with prior notification to Public Works Department (telephone 425.788.3434):

A. **Preconstruction Conference**: Three working days prior notice. Conference must precede the beginning of construction and include contractor, designing Engineer, utilities, and other parties affected. Plan approvals, permits, bonds and insurance must be in hand prior to the conference.

B. **Clearing, Grading, and Temporary Erosion/Sedimentation Control**: One working day notice prior to initial site work involving drainage and installation of temporary water quality, retention/detention control. Such work to be in accordance with Section 3-7.06 of these Standards and in accordance with the approved plans.

C. **Utility Installation**: One working day notice prior to trenching and placing of underground utilities such as storm, sanitary sewer, water, gas, power, telephone, and TV lines. See Section 3-8.03(B) for additional information.

D. **Utility Backfill and Compaction**: One working day notice before backfilling and compaction of underground utilities.

E. **Subgrade Completion**: One working day notice at stage that underground utilities and roadway grading are complete, to include placement of gravel base if required. Inspection to include compaction tests and certifications described in Chapter 2 and Sections 3-8.03 and 3-9.04.

F. **Curb and Sidewalk Forming**: One working day notice to verify proper forming and preparation prior to pouring concrete.

G. **Curb and Sidewalk Placement**: One working day notice to check placement of concrete.

H. **Crushed Surfacing Placement**: One working day notice to check placement and compaction of crushed surfacing base course and top course.

I. **Paving**: Three working days-notice in advance of paving with ACP or PCC. Include equipment list, mix design, and testing information.

J. **Structural**: Three working days-notice prior to each of critical stages such as placing foundation piling or footings, placement and assembly of major components, and completion of structure and approaches. Tests and certification requirements will be as directed by the City Engineer.

K. **Final Construction Inspection**: 15 working days prior to overall check of road or drainage project site, to include completion of paving and associated appurtenances and improvements, cleaning of drainage system, and all necessary final clean-up. Prior to approval of construction work, acceptance for maintenance and release of construction bonds, the developer/contractor shall pay any required fees, submit any required maintenance and defect financial guarantees, provide a certificate of monumentation and other survey work, and submit corrected plans (as-built) reflecting all minor and design plan changes of the road, sewer, water, and drainage systems for review and approval. As-built drawings shall not have shading or adhesive addition in any areas. Upon approval, the developer/contractor shall submit mylar as-builts, a copy of the CADD drawing files in AutoCAD format, and any other electronic format as required by the City Engineer.

L. **Final Maintenance Inspection**: 30 days prior to the end of the maintenance period and prior to release of the maintenance bond, there shall be successful completion of the maintenance period as described in Section 1-1.13, repair of any failed facilities and the payment of any outstanding fees.

3-9.03 Penalties for Failure to Notify for Inspection

Timely notification by the Developer as noted above is essential for the City to verify through inspection that the work meets these Standards. Failure to notify in time may oblige the City to arrange appropriate sampling and testing after-the-fact, with certification by a professional Engineer. Costs of such testing and certification shall be borne by the Developer. At the time that such action is directed by the City Engineer, the City Engineer may prohibit or limit further work on the development until all directed tests have been completed and corrections made to the satisfaction of the City Engineer. If necessary, the City may take further action as set forth in DMC.

3-9.04 Embankment Construction Control in Developments

The provisions of Section 2-03 of the WSDOT/APWA Standard Specifications apply in all respects to development construction unless otherwise instructed by the City Engineer. The following elements are mentioned for clarification and emphasis:

A. Embankment and Cut Section Compaction:

   1. Compaction shall meet WSDOT/APWA Standard Specifications Section 2-03.3(14)C - Method B.

B. Testing for Density:

1. Prior to placing any surfacing material on the roadway, it will be the responsibility of the Developer and/or Contractor to provide density test reports reviewed and approved by a professional Engineer. Optimum moisture content and maximum density shall be determined by methods cited in Section 2-03.3(14)D of WSDOT/APWA Standard Specifications or by other test procedures approved by the City Engineer. In fill sections, a minimum of one test shall be taken for every 1,000 cubic yards or fraction thereof and on each lift of embankment. In cut sections, the interval shall be every 100 feet of roadway. For work to be accepted tests must show consistent uniform density as required by tests referenced above.
2. In cases where tests do not meet the minimum standard, corrective action shall be taken such as applying more compactive effort, correcting moisture content, or replacing material as directed by the Developer's Engineer. Retests shall show passing densities prior to placing the next lift of subgrade fill.
3. For trenching in existing roads, see Section 3-8.03.

C. Finishing Subgrade:

1. After subgrade preparation has been completed, it shall be thoroughly checked by the Developer and/or Contractor using a level, string line, crown board, or other means to determine that the subgrade conforms to the typical section or special plan conditions prior to placing any surfacing material.

3-9.05 Traffic Control

Refer to Section 1-1.19.

3-9.06 City Forces and City Contract Road Inspection

Road construction performed by City forces or by contract for the City will be inspected under the supervision of the City Engineer.

3-9.07 Call Before You Dig

Refer to Section 1-1.20.

Please see Appendix G for Road Construction Notes to be incorporated into Plan Sets.

Chapter 4
DRAINAGE DESIGN STANDARDS

June 1995 (original) – Ordinance #761
July 2007 (revision) – Ordinance #1055
March 2013 (revision) – Ordinance #1147

June 2022 (update)

CHAPTER 4
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CHAPTER 4 – Drainage Design Standards

SECTION 1: GENERAL

It is the purpose of this chapter to implement the City Storm Drainage Utility (DMC Section 9.06), Storm Drainage Ordinance #730, and National Pollution Discharge Elimination System (NPDES) Illicit Discharge and Compliance Ordinance #1090. The City's DRC shall review all storm drainage improvement plans.

It is the City's responsibility to:

1) Provide for and promote the health, safety, and welfare of the general public through sound development policies and construction procedures which respect and preserve the City's watercourses;
2) Minimize water quality degradation and control of sedimentation of creeks, streams, ponds, lakes, and other water bodies;
3) Preserve and enhance the suitability of waters for contact recreation and fish habitat;
4) Preserve and enhance the aesthetic quality of the waters;
5) Maintain and protect valuable groundwater quantities, locations, and flow patterns;
6) Ensure the safety of City roads and ROW; and
7) Decrease drainage-related damages to public and private property.

The standards established by this Chapter are intended to represent the minimum design standards for the construction of storm drainage facilities and stream channel improvements.

Compliance with these Standards does not relieve the designer of the responsibility to apply conservative and sound professional judgment to protect the health, safety, and welfare of the general public. Special site conditions and environmental constraints may require a greater level of protection than would normally be required under these Standards. The designer must apply these Standards bearing in mind these constraints.

The City is encouraging the use of Low Impact Development (LID) features within the Storm Drain Utility and will try to implement items into Capital Projects as well as new Developments with the assistance of Land Developers. LID type designs will be accepted on a case-by-case basis as an alternative to the standard works within these and the City adopted King County design standards.

4-1.01 VACANT

4-1.02 Additional Referenced Standards

Design of storm drainage, detention or water quality facilities, and related improvements shall conform to these Standards, current edition of the King County Surface Design Manual including and subsequent amendments thereto, is hereby adopted by reference and is hereinafter referred to as the "KCSWDM". All commercial and residential developments shall be designed in accordance with this manual. As approved or required by the City Engineer, certain sections of

the current addition of the Washington State Department of Ecology's Stormwater Management Manual for Western Washington may be used for design of stormwater systems.

4-1.03 Applicability

A. All persons taking any of the following actions or applying for any of the following permits and/or approvals may be required to submit for approval a Stormwater Plan with their application and/or request:

1. New development;
2. Redevelopment;
3. Building permit;
4. Subdivision or Plat approval;
5. Short Plat approval;
6. Commercial, industrial, or other Site Plan Review approval;
7. Planned Unit Development or Master Plan Development;
8. Conditional use permits;
9. Substantial Construction Permit required under RCW 90.58 (Shoreline Management Act of 1971);
10. Street Use Permit;
11. Logging, clearing, grading and other land disturbing activities;
12. Contain, or be adjacent to, a floodplain, stream, lake, closed depression, or sensitive area as defined by DMC 14.42, or is located within an adopted Critical Drainage Area.

B. Commencement of construction work under any of the actions, permits, or applications set forth in subsection (A) of this section shall not begin until the City approves a Stormwater Plan which may include one or more of the following as required by this chapter:

1. Water quantity analysis as set forth in the KCSWDM;
2. Site evaluations and requirements per the KCSWDM; and
3. The King County Stormwater Pollution Prevention Manual (KCSPPM) as applicable.

C. Guidance on preparing a Stormwater Plan is contained in the KCSWDM.

D. Other agencies such as those listed in Table 4-1 below may require drainage review for a proposed project's impact on surface waters. The applicant should take care to note that these other agency drainage requirements are separate from, and in addition to, King County's drainage requirements. The applicant will be responsible to coordinate joint agency drainage review, including resolution of any conflicting requirements between agencies.

Table 4-1: Other Agency or Jurisdictions for Required Permits

Agency	Permit/Approval
Seattle/King County Health Department	On-Site Sewage Disposal and Well Permits
Washington State Department of Transportation	Developer/Local Agency Agreement
Washington State Department of Ecology	Short Term Water Quality Modification Approval
Washington State Department of Ecology	Construction Stormwater General Permit
Washington State Department of Fisheries	Hydraulic Project Approval
Washington State Department of Wildlife	Hydraulic Project Approval
Washington State Department of Ecology	Dam Safety Permit
United States Army Corps of Engineers	Section 10 Permit
United States Army Corps of Engineers	Section 404 Permit

4-1.04 Illicit Discharges

Illicit discharges to stormwater drainage systems are prohibited in accordance with DMC 9.06.035.

4-1.05 Storm Drainage Standards and Plan Review Procedures

A. Stormwater Plan Submittals: The initial submittal of any type of permit application shall be completed in accordance with the KCSWDM requirements and shall include:

1. Documentation on how all Core and Special Requirements apply to the project; and
2. A downstream analysis (Core Requirement #2: Off-Site Analysis); and
3. A Low Impact Development (LID) Feasibility Evaluation; and
4. An environmental checklist; and
5. Any other requirements specific to the permit type.

4-1.06 General Storm Drainage Requirements

A. All preliminary and final engineering plans and specification must be stamped by a professional civil engineer registered in the State of Washington. All reproductions of site improvement plans and the cover page of copies of the Technical Information Report (TIR) submitted must be signed and dated by the professional civil engineer approving the design.

B. All land surveys used, and legal descriptions prepared, for preparing preliminary and final engineering plans must be stamped by a professional land surveyor registered in the State

of Washington. Topographic survey data and mapping prepared specifically for a proposed project may be performed by the professional civil engineer stamping the engineering plans as allowed by the Washington State Board of Registration for Professional Engineers and Land Surveyors.

C. All retention/detention facilities shall be analyzed using methods and routing procedures included in the KCSWDM, or as otherwise approved by the City Engineer.

D. Open retention/detention ponds and infiltration facilities shall not be located in dedicated public road ROW areas unless specifically approved by the City Engineer. Vaults, detention pipes, and other underground stormwater facilities shall not be located within the road ROW unless specifically approved by the City Engineer.

E. Emergency overflow provisions shall be installed in such a manner as to direct waters away from all structures without causing failure of those structures. The impact of a system failure should be analyzed both in terms of on-site and off-site effects. The impacts may be to adjacent properties or to elements of the public drainage system or other private systems. Retention/detention and infiltration facility design must consider overflows, which may result from:

    1. Higher-intensity or longer-duration storms than the design storm;
    2. Plugged orifices;
    3. Inadequate storage due to sediment buildup;
    4. Debris blockage; or
    5. Other reasons causing system failure.

F. Maximum Allowable release rates from stormwater detention systems shall be based upon the pre-development runoff from the development site during a storm event. The allowable release rate shall be determined as specified in the KCSWDM and may be modified on a case-by-case basis due to constraints in the drainage system downstream of the point of connection.

G. All drainage system elements shall always provide for adequate maintenance and accessibility. All pipe types shall be “Profile Wall PVC”. No storm drainage system elements shall be located within ten feet of or underneath any structure and the system shall be designed to eliminate interference from underground utilities and from conditions, which exceed design loads for any pipe or other structural elements.

H. The City shall encourage developments to design and install LID features within projects.

I. All aspects of public health and safety must be carefully reviewed in every drainage control system plan. Protective measures are often necessary and shall be required to and in maintaining natural hydrologic functions during land development whenever deemed appropriate by the City Engineer. The protective measures themselves shall be designed so as not to constitute hazards or nuisances.

J. The designer should consider system reliability in terms of layout, specification of materials and methods of installation, and the influence of other activities in the area both during and after construction.

K. The frequency and difficulty of future maintenance should be minimized by thorough consideration of all possible failures in the system during design and what would be required to correct the problem. Design adjustments to ease maintenance should be a major consideration.

L. The designer should consider multiple use of elements of the drainage system. This multiple use may require compromise, but no adjustments to usual policies or standards will be made which would impact the system to the degree that risks failure, impact of system failure or exposure of the general public to hazard is increased.

M. The use of the site should be evaluated to determine if hazardous materials or other pollutants are likely to be present, and if extraordinary design considerations are necessary.

N. The visual impact and other potential problems (mosquito breeding, smell, etc.) should be considered. Concerns will vary with the site environment, but aesthetics should always be of concern to the designer.

O. Offsite improvements may be required if on-site controls are insufficient to mitigate impacts due to flooding, erosion, sedimentation, pollution, or habitat degradation.

P. Roof drains shall only be connected to the storm drainage system. **Never** to the sanitary sewer system.

Q. The Developer shall meet all applicable federal, state, and local water quality standards prior to discharge to any wetland, stream, river, or lake.

4-1.07 VACANT

4-1.08 VACANT

4-1.09 VACANT

4-1.10 Modification of Facilities During Construction

The Engineer may require that the construction of drainage facilities and associated project designs be modified or redesigned if conditions occur or are discovered which were not considered or known at the time the permit or approval was issued, such as uncovering unexpected soil and/or water conditions, weather-generated problems, or undue materials shortages. Any such modifications made during the construction of drainage control facilities shall be shown on the final as-built plans, as well as a memorandum for the project Engineer certifying all stormwater facilities were built in accordance with the approved plans.

4-1.11 Operation and Maintenance Requirements

Operation and Maintenance shall be completed in accordance with the requirements in the adopted KCSWDM and all relevant City Drainage Ordinances'. At a minimum, annual inspection, maintenance, and reporting is required for both public and private facilities.

4-1.12 Authority of the City Engineer

The City Engineer shall have the authority to enforce this Chapter. The City Engineer is directed and authorized to develop and maintain an inspection program for stormwater facilities for the City. Persons or occupants of the site shall allow the City Engineer or their designee access at all reasonable times to all parts of the premises for the purpose of inspection, sampling, and record examinations. The City Engineer shall have the authority to issue a Developer and/or property owner an order to maintain or repair a component of the stormwater facility or best management practice (BMP) to bring it in compliance with this Chapter, and/or other applicable City, State or Federal regulations. The order shall include:

1) A description of the specific nature, extent, and time of the violation and the damage or potential damage that reasonably might occur;
2) A notice that the violations or potential violations cause and desist and, in appropriate cases, the specific corrective actions to be taken;
3) A reasonable time to comply, as determined by the City Engineer depending upon the circumstances; and
4) A penalty for non-compliance as outlined in Section 4-1.19.

4-1.13 Inspections

A. **Construction Inspections.** The holder of any permit that requires a stormwater plan shall arrange with the Engineer or Utilities Superintendent for scheduling the following inspections:

    1. Initial Inspection - Whenever work on the grading, excavations, or fill is ready to commence.
    2. Rough Grading - Whenever all rough grading has been completed.
    3. Bury Inspection - Prior to placing bedding material and then bury of any underground drainage structure. Trench shall be inspected for soft spots and consistency. A follow-up inspection will be as required by the City Inspector or City Engineer for compaction and lift thickness requirements.
    4. Finish Grading - When all work including installation of all drainage structure and other protective devices has been completed.
    5. Planting - When erosion control planting shows active growth.
    6. The site may be inspected for compliance with planting requirements upon receiving such notice, the City Engineer or their designee shall inspect the work and shall either approve the same or notify the Developer and Applicant in what respects there has been failure to comply with the requirements of these

Standards. Any portion of the work which does not comply shall be promptly corrected by the Developer or Applicant. In addition, the City shall make unscheduled site inspections to ensure compliance with any permit or approval and installation per these Standards.

B. **Maintenance and Investigatory Inspection**

1. Authority: Whenever implementing the provisions of the inspection program or whenever there is cause to believe that a violation of these Standards has been or is being committed, the inspector is authorized to inspect during regular working hours and at other reasonable times all stormwater drainage systems within the City to determine compliance with the provisions of these Standards.
2. Procedures: Prior to making any inspections, the inspector shall present identification, state the reason for the inspection, and request entry.
    a. If the property or any building or structure on the property is unoccupied, the inspector shall first make a reasonable effort to locate the owner or other person(s) having charge or control of the property or portions of the property and request entry.
    b. If after reasonable effort, the inspector is unable to locate the owner or other person(s) having charge or control of the property and has reason to believe the condition of the stormwater drainage system creates an imminent hazard to persons or property, the inspector may enter.
    c. Unless entry is consented to by the owner or person(s) in control of the property or portion of the property or unless conditions are reasonably believed to exist which create imminent hazard, the inspector shall obtain a search warrant prior to entry, as authorized by the laws of the State of Washington.
    d. The inspector may inspect the stormwater drainage system without obtaining a search warrant provided for in Subsection (c) above, provided the inspection can be conducted while remaining on public property or other property when permission to enter has been obtained.
3. Inspection Schedule: The engineer shall establish a master inspection and maintenance schedule to inspect appropriate stormwater facilities that are not owned by the City. Inspections shall be annual. Critical stormwater facilities may require a more frequent inspection schedule.
4. Inspection and Maintenance Records: Existing stormwater facilities shall be added to the master inspection and maintenance schedule. Records of new stormwater facilities shall include the following:
    a. As-built plans and locations.
    b. Findings of fact from any exemption granted by the local government.

c. Operation and maintenance requirements and records of inspection, maintenance actions and frequencies.

d. Engineering reports, as appropriate.

4-1.14 Exemptions

Stormwater facilities owned and maintained by the Washington State Department of Transportation in state highway ROW which are regulated by and met the requirements of Chapter 173-270 WAC, the Puget Sound Highway Runoff Program, are exempted from the requirements of this Chapter.

4-1.15 Variances

Refer to Section 1-1.22 for details.

4-1.16 Establishment of Regional Facilities

A. In the event that public benefits would accrue due to modification of the stormwater plan for a subject property to better implement the recommendations of the City's future drainage plans, the City Engineer may recommend the City assume some responsibility for further design, construction, operation, and maintenance of the drainage facilities receiving runoff from the subject property. Such a decision shall be made concurrently with review and approval of the stormwater plan as specified in this chapter.

B. In the event the City decides to assume some responsibility for design, construction, operation, and maintenance of the facilities, the Developer will be required to contribute a pro rata share to the construction cost of the facilities. The Developer may be required to supply additional information at the request of the City Engineer to aid in a determination by the City. Guidelines for implementing this section will be defined by the City Engineer.

4-1.17 Bonds Required

Refer to Section 1-1.13 for details.

4-1.18 Fees

A. Plan Review Fees:

1. Refer to Section 1-1.11 for details.

B. Storm Drainage Construction Fund and Acreage Charge. Undeveloped real property within City limits is responsible to pay a service charge in accordance with DMC 9.06.120.

C. General Facility Charge:

1. No building permit shall be issued on any property within the City unless the owner pays to the City a Stormwater General Facility Charge (GFC) in accordance with Resolution 18-12.

4-1.19 Enforcement and Penalties

A. Enforcement:
    1. Refer to DMC 2.24 for details.
B. Penalties for Failure to Notify for Inspection:
    1. Refer to Section 3-9.03 for details.

Please see Appendix G for Storm Drainage and Erosion Control Construction Notes to be incorporated into Plan Sets.

Chapter 5
SANITARY SEWER DESIGN STANDARDS

June 1995 (original) – Ordinance #761
July 2007 (revision) – Ordinance #1055
March 2013 (revision) – Ordinance #1147

June 2022 (update)

CHAPTER 5
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CHAPTER 5 – Sanitary Sewer Design Standards

SECTION 1: GENERAL

Sanitary sewerage refers to wastewater derived from domestic, commercial, and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted.

Any extension of or connection to the City's sanitary sewer system must be approved by the Public Works Department and must conform to the City's Comprehensive Sanitary Sewer Plan.

Within the corporate City limits where a public sewer is available it must be used in accordance with DMC 9.04.020. Where public sewer is not available within the City limits, connection is required provided that the sewage from the structure originates within 100 feet of the property line, except in the case of private residential or commercial developments where the developed property abuts a ROW in which a public sewer is located or in the future may be located to provide service. In this case, connection of all structures generating sewage shall be required to connect to the public sewer regardless of distance from the public sewer.

The standards established by this Chapter are intended to represent the **minimum** standards for the design and construction of sanitary sewer facilities. Greater or lesser requirements may be mandated by the City due to localized conditions. Ecology's Design Standards shall also be employed by the City in its review and approval of system connections, extensions, and/or modifications.

Anyone who wishes to extend or connect to the City's sewer system should contact the Public Works for a Utility Developer Extension Agreement (UDEA) and utility extension/connection fee estimate of the costs due the City. A copy of this Fee Estimate form may be found in the Appendix.

Prior to the release of any water meters, connection to the public sewer system must be completed and approved and all applicable fees must be paid.

Maintenance of the building or side sewer shall be the responsibility of the property owner.

5-1.01 VACANT

5-1.02 Standard Specifications

The design of sanitary sewer systems shall be dependent on local site conditions. The design elements of sanitary sewer systems shall conform to minimum City Standards set forth herein, Department of Ecology's "Criteria of Sewerage Works Design" and follow current industry design best practice. All sewers shall be designed as a gravity sewer whenever physically and/or economically feasible or as outlined in the City's Comprehensive Sanitary Sewer Plan.

A. Detailed Construction/Engineering Plans shall be submitted for the City's review which provide plan and profiles for the proposed sewers and the connection with existing sewers. These plans shall be separate from water plan sheets.

B. Plans and profiles shall show:

    1. Location of streets, ROW, existing utilities, and proposed sanitary sewers.

2. Ground surface, pipe type, class and size, manhole stationing, invert and surface elevation at each manhole, and grade of sewer between adjacent manholes.
    a. All manholes shall be numbered on the plans and correspondingly numbered on the profile.
3. Where there is any question of the sewer being sufficiently deep to serve any residence, the elevation and location of the basement floor, if basements are served, shall be plotted on the profile of the sewer, which is to serve the house in question. The Developer shall state that all sewers are sufficiently deep to serve adjacent basements, except where otherwise noted on the Plans.
4. All known existing structures, both above and below ground, which might interfere with the proposed construction, particularly water mains, gas mains, storm drain, overhead and underground power and communication lines.
5. All utility easements, including County recording numbers.
6. Details in scale drawings which clearly show special sewer joints and cross-sections, and sewer appurtenances such as manholes and related items and all other items as required by the City to clearly identify construction items, materials, and/or methods.

C. Construction of new sewer systems or extensions of existing systems will be allowed only if the existing receiving system can support the added hydraulic load. This may require additional modeling of the City's system at the expense of the Developer or Applicant.
    1. Sewers shall be extended to the far property line(s) to facilitate future extensions of same. When a sewer line extends to a cul-de-sac there shall be a manhole located in the cul-de-sac and service laterals shall come into the manhole. Cleanouts are not allowed at the beginning of a sewer line.

D. Collection and interceptor sanitary sewers shall be designed and constructed for the ultimate development of the tributary areas.

E. Sanitary sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow.

F. Computations and other data used for design of the sewer system shall be submitted to the City for approval.

G. Sanitary sewage facilities shall be constructed in conformance with the most recent edition of the WSDOT/APWA Standard Specifications, and as modified by any special City requirements and standards.
    1. Material and installation specifications shall contain appropriate requirements that have been established by the industry in its technical publications, such as ASTM, AWWA, WPCF, and APWA standards. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling so as not to damage the pipe or its joints, impede cleaning operations and future tapping, nor create excessive side fill pressure or egging of the pipe, nor impair flow capacity.

H. All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer because of the width and depth of trench should be made. When standard-strength sewer pipe is not sufficient, extra-strength pipe shall be required.

I. The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City with a written guarantee covering all materials and workmanship for a period of two years (see Section 1-1.13 for details) after the date of final acceptance and the Developer shall make all necessary repairs during that period at his own expense, if such repairs are necessitated as the result of furnishing poor materials and/or workmanship. The Developer shall obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required and shall deliver copies to the City upon completion of the work.

J. New gravity sewer systems shall be designed based on an average daily per capita (per person, typically three people per household) flow of sewerage of not less than 100 gallons per day. ***Please refer to the most current version of the City's Wastewater Facility Plan and the Comprehensive Water System Plan for capacity and sizing requirements.*** Generally, laterals or collector sewers should be designed with a peaking factor of four to be applied to the average daily per capita flow rate. Therefore, laterals or collectors should be designed to carry, when running full, not less than 400 gallons daily per capita contributions of sewage. The procedure used for sewer design shall be submitted to the Public Works Department for review and approval.

5-1.03 VACANT

5-1.04 Main Line - Gravity

A. **Size.** Sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet the requirements for future service.

   1. The minimum size for collectors and mains shall be 8-inch inside diameter. The minimum size for a side service, from the mainline or submain line to the lot line shall be 6 inches. Unless otherwise approved by the City Engineer.

   2. The design is subject to all other design requirements as noted in this Chapter.

B. **Material**. Sewer main shall be PVC, ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.

C. **Depth**. Gravity sewer shall have a minimum of 5-feet of cover to provide gravity service to adjoining parcels, adequate headroom within manholes for maintenance personnel and vertical clearance between water and sewer lines. Actual depth will be determined by slope, flow, velocity, and elevation of existing system.

D. **Connection**. All building sewer connections to the main shall be made with a "T" type of connection. All new mains connecting to existing mains shall require the installation of a new manhole if the connection is not made at an existing manhole.

5-1.05 Connection to Existing System

A. At connection to existing system, all new sewer connections shall be physically plugged until all tests have been completed and the City approves the removal of the plug.

B. Connection of new pipelines to existing manholes shall be accomplished by using provided knockouts. Where knockouts are not available, the manhole shall be core drilled for connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

C. Connection of a pipeline to a system where a manhole is not available shall be accomplished by setting a new manhole. The existing pipe shall not be cut into until approval is received from the City.

D. Connections to manholes requiring a drop shall follow the criteria as outlined in Section 5-140 of this Chapter.

E. Connections where an existing stub out is not available or where a new building sewer is the same size as the existing main shall be accomplished by the installation of a new manhole.

F. Taps shall not be allowed to protrude more than 1-inch into the existing main. A Public Works Inspector shall be notified 48 hours prior to any tap of a City sewer and shall be present to witness the tap.

5-1.06 Manholes

A. Waterproofing structures: Manhole joints shall be rubber gasketed and have joint wrap on the outside of the manhole. The adjustment rings shall be grouted between joints and a joint wrap applied between the eccentric ring and the casting. The exterior surface of the manhole base and riser sections shall be factory coated with Tnemec Series 46H-413 Hi-build Tneme-Tar coal epoxy. Exterior coating shall be applied in accordance with manufacturer's specifications.

    1. Joint wrap shall be "Wrapid Seal" as manufactured by Canusa_CPS, Info-Shield as manufactured by Sealing Systems, Inc., or approved equal. The City Engineer may waive this requirement.

B. Precast manholes shall meet the requirements of ASTM C 478 with either a precast base or a cast-in-place base made from 3000 psi structural concrete. Manholes shall be:

    1. Type 1, 48-inch diameter minimum for depths 8 feet and over
    2. Type 3, 48-inch diameter for depths under 8 feet
    3. The minimum clear opening in the manhole frame shall be 24 inches.
    4. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside.
    5. Lift holes shall be grouted from the outside and inside of the manhole.

6. Eccentric manhole cone shall be offset so as not to be located in the tire track of a traveled lane.
7. Manhole frames and covers shall be cast iron casting marked “Sewer” and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability and shall have no pick holes.
    a. Manhole cover shall be watertight, non-locking lids or approved equivalent. Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted.
    b. The minimum amount of manhole riser sections for adjustment shall be not less than 18 inches and not more than 24 inches worth of combined height in risers.
    c. Manhole rings and covers shall be machine-finished or ground-on seating surfaces so as to assure non-rocking fit in any position and interchangeability.
    d. Manholes located in areas subject to inflow or infiltration shall be equipped with a PRECOR sewer guard watertight manhole insert or approved equal.
        i. Where lock-type castings are called for, the casting device shall be such that the cover may be readily released from the ring and all moveable parts shall be made of non-corrosive materials and otherwise arranged to avoid possible binding.
    e. All castings shall be coated with bituminous coating prior to delivery to the job site.

C. Safety steps shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2-inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread. 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-inches on center.

D. Gravity sewers shall be designed with straight alignment between manholes.

E. Manholes shall be provided at a maximum of 300-foot intervals for 8-inch to 15-inch sewers, 500-foot intervals for 18-inch to 24-inch sewers, at intersections, and at changes in direction, grade, or pipe size. Greater spacing may be permitted in larger sewers.

F. Minimum drop through the manhole shall be 1/10th of one foot from invert in to invert out.

G. Manhole sizing shall be determined by the following criteria:

1. 48-inch Manhole

a. Two connecting pipes, 8- to 12-inch diameter

b. Three connecting pipes, 8- to 10-inch diameter, perpendicular

c. Four connecting pipes, 8-inch diameter, perpendicular

d. Piping networks less than or equal to 10-feet deep

2. 54-inch Manhole

a. Two connecting pipes, 8- to 12-inch with more than 45-degree deflection

b. Three connecting pipes, 10- to 12-inch diameter, perpendicular

c. Four connecting pipes, 10- to 12-inch diameter, perpendicular

d. Piping networks greater than 10-feet deep but less than or equal to 20-feet deep.

3. 72-inch Manhole

a. Two connecting pipes, 15- to 18-inch diameter with less than 45-degree deflection

b. Three connecting pipes, 15-inch diameter, perpendicular

c. Four connecting pipes, 15-inch diameter, perpendicular

d. Piping networks greater than 20-feet deep.

In the above criteria "deflection" refers to the angle between any two-pipe channels in the manhole.

H. Gravity sewers shall be designed with straight alignments between manholes.

I. For other pipe configurations, the size of the manhole shall be approved by the City Engineer.

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

5-1.07 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 (fps) based on Manning's formula using an "n" value of 0.013. Use of other practical "n" values may be permitted by the City if deemed justifiable on the basis of research or field data submitted. Table 5-1 shows the minimum pipe slopes allowed; when feasible, slopes greater than these are desirable.

Table 5-1: Minimum Sanitary Sewer Pipe Slope

Sewer Size (inches)	Minimum Slope (%) or feet per 100 feet
8 to 24	0.5 or (0.005 ft/ft)
24 to 36	0.4 or (0.004ft/ft)

B. Under special conditions, slopes slightly less than those required by the 2.0 fps velocity may be permitted by the City Engineer. Such decreased slopes will only be considered

where the depth of flow will be 0.3 of the diameter or greater, for the design average flow.

C. Whenever such decreased slopes are proposed, the design Engineer shall furnish, with Plans, their computations of the depths of flow in such pipes at minimum, average, and daily or hourly rates of flow. Larger pipe size shall not be allowed to achieve lesser slopes.

5-1.08 Increasing Size

Manholes shall be provided where pipe size changes occur.

Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

5-1.09 High Velocity Protection

Where velocities greater than 15 fps are expected, special provisions such as thrust blocking and pipe materials shall be made to protect against displacement by erosion and shock.

5-1.10 Drops

A. Straight grades between invert out of last manhole and connection to existing are preferred over drops whenever possible. Care must be taken when designing steep grades or sweeps so as not to create a situation of excessive velocity or excavation. Grade changes associated with “sweeps” shall not be allowed unless otherwise approved by the City Engineer.

B. An outside drop connection will not be allowed by the City unless otherwise approved by the City Engineer. See Standard Detail 5-140-002.

C. An inside drop connection shall be provided when the sewer inlet pipe enters a manhole at an elevation of 24 inches or more above the invert. See Standard Detail 5-140-001.

5-1.11 Cleanouts

A. Cleanouts are not an acceptable substitute for manholes. This does not include a 6-inch building sewer to serve one or two single-family dwellings.

B. Location of cleanout for lateral sewer service connection is governed by the Uniform Plumbing Code (UPC).

C. All cleanouts in City ROW shall be extended to grade and a 3-foot square by 4-inch thick concrete pad shall be installed around all cleanouts that are not in a pavement area. See Standard detail 5-145-001.

5-1.12 Sewer Service Connection

A building side sewer (or lateral) refers to the extension from a building beginning two feet outside the outer foundation wall at the structure to the sanitary sewer main. Side sewer connections from the main to the ROW line shall be minimum 4-inch diameter. Maintenance of the side sewer is the responsibility of the property owner. Prior to connection of a side sewer to

the public sanitary sewer main, a connection permit must be obtained from the City. Materials and design criteria for a side sewer is covered by the UPC and any part of the side sewer connection not covered by UPC shall comply with these Standards. Inspection of the building sewer within the building envelope is the responsibility of the Building Department. Inspection outside the building envelope is the responsibility of the Public Works Department.

Shared side sewers or multi-family type dwellings shall connect to the main or collector line with a minimum 6-inch diameter pipe (from the building to the main or collection line).

5-1.13 Marking Side Sewers

The location of all side sewers shall be marked with a 12-foot-long 2-inch by 4-inch wood "marker" at the termination of the stub. The "marker" shall extend from the bottom of the trench to above finished grade. Above the ground surface, it shall be painted "white" with "S/S" and the depth, in feet, stenciled in black letters 2-inches high.

5-1.14 Sanitary Sewer/Water Main Crossings

See Section 2-1.20 for requirements regarding sewer and water separation and/or Washington State DOH standards.

5-1.15 Survey and Construction Staking

All surveying and staking shall be performed by a reputable engineering or surveying firm capable of performing such work. The Engineer or Surveyor directing such work shall be licensed as a Professional Engineer or Professional Land Surveyor by the State of Washington.

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

The minimum staking of sewer lines shall be as directed by the City Engineer or as follows:

A. Stake location of mainline pipe and laterals every 50 feet with cut or fill to invert of pipe.

B. Stake location of all manholes for alignment and grade with cut or fill to rim and invert of pipes.

C. Front lot corners shall be staked prior to construction for side sewer "T" location.

5-1.16 Trench Excavation

See Section 2-1.22 for requirements regarding trench excavation.

5-1.17 Bedding, Backfilling and Compaction

See Section 2-1.22 for requirements regarding bedding, backfilling and compaction.

Detectable marking tape or tracer tape shall be installed one foot above the sewer line and shall extend its full length.

5-1.18 Temporary Street Patching and Restoration

See Sections 2-1.24 for Temporary Street Patching and 2-1.25 for trench restoration details.

5-1.19 Testing Gravity Sewers

Prior to acceptance and approval of construction, the following tests shall apply to each type of construction.

A. Gravity Sewer

1. Immediately following pipe cleaning, the pipe installation shall be tested with low-pressure air.
2. The Contractor shall furnish all equipment and personnel for conducting the test under the observation of the City inspector. The testing equipment shall be subject to the approval of the City.
3. The Contractor shall make an air test for their own purposes prior to notifying the City to witness the test. The acceptance air test shall be made after trench is backfilled and compacted and the roadway section is completed to subgrade.
4. All wyes, "T's", and end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternates, 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 a flexible jointed lateral connection or extension.
5. Prior to acceptance of the project, the gravity sewer pipe shall successfully complete a low-pressure air test:
    a. At a minimum, following the general guidelines of 7-17.3(2)F WSDOT/APWA Standards, as amended below:
        i. Air shall be slowly supplied to the plugged pipe section until the internal air pressure reaches 4 pounds per square inch gage (psig). Wait at least 2 minutes to allow for pressure and temperature stabilization to occur.
        ii. With a maximum 0.5 psig pressure loss, the air pressure test shall begin. The pipe shall be considered acceptable if there is no pressure loss in 5 minutes.
6. A video inspection by the Contractor shall be required.
    a. Video inspection shall be done after the air test has passed and before the roadway is paved.
    b. Immediately prior to video inspection, enough water with colored testing Dye shall be run down the line, so it comes out the lower manhole.
    c. A copy of the video and written report shall be submitted to the City. Acceptance of the sewer line will be made after the video recording has been reviewed and approved by the Public Works Inspector.
    d. Any tap to an existing system shall be video inspected as well.

e. Low spots or "bellies" in the flow line are not allowed.

f. All pipes shall be laid in straight lines and at a uniform rate of grade between manholes.

g. Variance from established line and grade shall not be greater than ½-inch, provided that such variation does not result in a level or reverse sloping invert;

   i. Also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces does not exceed 1/64-inch per inch of pipe (i.e., 8-inch pipe = max standing water of 8/64-inch or 1/8-inch).

   ii. No pipe shall have more than 3/8-inch standing water in it at any location. Any corrections required in the line and grade shall be reviewed with the City Engineer and shall be corrected at the expense of the Developer and/or Contractor.

h. Prior to final acceptance and maintenance bond release, the Developer and/or Contractor will have the sewer lines video inspected and recorded again to ensure no settling has occurred or any other installation related deficiency.

7. An infiltration test of all manholes may also be required. The infiltration test shall be performed by the Contractor first by filling the manhole with water and letting it sit for 24-hours, allowing the water to saturate the concrete. After 24 hours the manhole shall be "topped-off" or filled to the top of the cone. In a successful test, the water cannot drop more than 0.05 gallons in 15 minutes per foot of head above invert. Upon completion of the infiltration test, the water shall be pumped out of the manhole and not allowed to be released to the system.

8. A mandrel test in accordance with Section 7-17.3(2)G of the WSDOT/APWA Standard Specifications shall be required on all sewers except side sewers (laterals). The City Engineer can waive this requirement upon approval of required system testing and inspections.

SECTION 2: SANITARY SEWER LIFT STATIONS

This chapter covers the design and construction of Sanitary Sewer lift stations (also referred to as *pump* stations) and force mains.

5-2.01 Standard Specifications

The design of any lift station shall conform to these Standards, Ecology's "Criteria of Sewage Works Design" and any additional applicable standards as set forth herein. In addition, the Plans shall include the following:

A. An overall site drawing of the lift station showing the location of all components including elevations;

B. Service size, voltage, and enclosure type and location in relation to the lift station;

C. A list of specific materials used to include quantity description and manufacturer name;

D. A schematic and line diagram of the service and motor control center and lift station;

E. The electrical and controls systems shall be designed to meet state and local electrical code requirements;

F. The Plans shall show all applicable telemetry installation with schematics; and

G. An operation and maintenance manual from the lift station manufacturer shall be supplied;

H. A lift station emergency pumper connection/by-pass connection shall be installed. See Standard Detail 5-120-001;

I. Pump operation, alarms, and electrical inspection of all lift stations is required.

J. Surge Protection - The lift station shall be sized to minimize rapid changes in velocities along with a properly sized wet well to limit short cycling times.

5-2.02 Location and Flood Protection

A. Lift stations should be located as far as practical from present or proposed built-up residential areas, and an all-weather road shall be provided. Noise control, odor control, and station architectural design should be taken into consideration. Sites for lift stations shall be sufficiently sized for future expansion or addition based on the drainage basin or as otherwise required.

B. Lift station operational components shall be located at an elevation that is not subject to the 100-year flood stage or shall otherwise be adequately protected against the 100-year flood stage damage. Lift stations shall be designed to remain fully operational during the 100-year flood event.

C. All lift stations will be designed to serve the appropriate basin as identified in the City's "Comprehensive Sanitary Sewer Plan".

D. Site planning and design shall be completed to reduce the need for, and number of, sewage lift stations. Multiple stations or single-family residential pumps shall only be allowed if approved by the City Engineer based on information that other options are not feasible.

5-2.03 Pumping Rate and Number of Units

A. At least two pump units shall be provided, each capable of handling the expected maximum flow.

B. Where three or more units are provided, they shall be designed to fit actual flow conditions and must be of such capacity that with any one unit out of service, the remaining units will have the capacity to handle the maximum design flow.

C. When the station is expected to operate at a flow rate less than 0.5 times the average design flow for an extended period, the design shall address measures taken to prevent septicity due to long holding times in the wet well.

D. Consideration should be given to the use of variable-speed pumps, particularly when the pump station delivers flow directly to a treatment plant, so that sewage will be delivered at approximately the same rate as it is received at the pump station.

5-2.04 Grit and Clogging Protection

A. The design of the wet well should receive special attention, and the discharge piping should be designed to prevent grit settling in pump discharge lines of pumps not operating.

B. For large pump stations handling raw sewage, consideration should be given to installation of readily accessible bar racks with clear openings not exceeding 2 1/2-inches, unless pneumatic ejectors are used, or special devices are installed to protect the pumps from clogging or damage. Where the size of the installation warrants, fine screens shall be utilized. Where screens are located below ground, convenient facilities must be provided for handling screenings. For the larger or deeper stations, duplicate protection units, each sized at full capacity, are preferred.

5-2.05 Pumping Units

A. Pump Openings - Pumps shall be capable of passing spheres of at least 3-inches in diameter. Pump suction and discharge openings shall be at least 4-inches in diameter.

B. Priming - Pumps shall be so placed that under normal operating conditions they will operate under a positive suction head (except for suction lift pumps).

C. Intake - Each pump should have an individual intake. Wet well design should be such as to avoid turbulence/cavitation near the intake.

D. Controls - Control float cages should be so located as not to be affected by the flows entering the wet well or by the suction of the pumps. Pressure transducer controls are preferred for all sewage pump stations. Provisions should be made to automatically alternate the pumps in use. Pump stations with motors and/or controls below grade should be equipped with a secure external disconnect switch. A back-up battery powered high level float and alarm attached to the monitoring system shall be supplied.

5-2.06 Flow Measurement

Suitable devices for measuring sewage flow should be provided at pumping stations with flow capacity greater than 1.0 million gallons per day (mgd).

5-2.07 Bypasses/Storage

Provision may be made for controlled bypasses and/or storage, if necessary, to avoid excessive property or equipment damage. The controlled bypass shall be a manually operated valve or plate covering the bypass discharge shall act as a pump connection port.

Where overflows affect public water supplies, shellfish production, or water used for culinary or food-processing purpose, a storage-detention basin, or tank, shall be provided that has a minimum 2 hours of detention capacity at the anticipated overflow rate. Storage-detention tanks, or basins, shall be designed to drain to the station wet well.

5-2.08 Alarm System

An alarm system shall be provided for all lift stations. The alarm system shall conform with the existing telemetry system and shall include a service contract for the duration of the warranty period. All lift stations shall have a telemetry alarm to 24-hour monitoring stations or telephone alarms to duty personnel. An audio-visual device should be installed at the station for external observation.

At a minimum, alarms for high wet well, low wet well, high temperature, control failure, and power failure shall be provided for all lift stations. For larger stations, alarms signalizing pumps and other component failures, or malfunctions shall also be provided as directed by the City Engineer.

A backup power supply, such as a battery pack with automatic switchover features, shall be provided for the alarm system, such that a failure of the primary power source will not disable the alarm system. Test circuits shall be provided to enable the alarm system to be tested and verified as in good working order.

5-2.09 Materials Considerations

In the selection of materials, consideration shall be given to the presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage.

5-2.10 Electrical Equipment

Electrical systems and components (e.g., motors, light, cables, conduits, switchboxes, control circuits) in enclosed or partially enclosed spaces where flammable mixtures occasionally may be present (including raw sewage wet wells) shall comply with the National Electrical Code requirements for Class I Division 1 locations.

5-2.11 Water Supply

There shall be no physical connection between any potable water supply and a sewage pumping station, which under any conditions might cause contamination of the potable water supply. If a potable water supply is brought to the station, it should comply with conditions stipulated in the DOH Criteria for Accepted Cross Connection Control Assemblies.

5-2.12 Lighting

Adequate interior and exterior lighting for the entire pump station shall be provided.

5-2.13 Pump and Motor Removal

Provisions shall be made to facilitate removing pumps, motors, and other equipment, without interruption of system service.

5-2.14 Access

Suitable and safe means of access should be provided to equipment requiring inspection or maintenance. Stairways and ladders shall satisfy all OSHA and WISHA requirements. All permanent lift stations shall be fenced to discourage the entrance of unauthorized persons and animals.

5-2.15 Valves and Piping

Shutoff valves shall be placed on suction and discharge lines of each pump (as applicable) for normal pump isolation. A check valve shall be placed on each discharge line, between the shutoff valve and the pump. Pump suction and discharge piping should not be less than 4-inches in diameter except where design of special equipment allows. The velocity in the suction line should not exceed 6 feet per second and in the discharge piping, 8 feet per second.

A. Valves 4 to 12 inches shall be resilient wedge Mueller gate valves with an epoxy coating to resist corrosion. A ball or gate valve shall be located at a maximum of every 500 feet along a force main. Valve may be installed in conjunction with required pigging ports.

B. Check Valves - Check valves used on lift stations shall have adjustable tension levers and spring and shall have a working pressure of 150 psi. Valves shall be designed for use with corrosive fluids. Check valve shall be installed in a valve vault located adjacent to the lift station. Check valves shall conform to AWWA standards, such as Prenselar List 340, or approved equal.

C. Valve Box Lids - Valve box lids may be used for isolation valves on a force main. Valve box lids shall be marked with “SEWER” so they can quickly be distinguished from valves in the water system.

5-2.16 VACANT

5-2.17 Ventilation

Ventilation shall be provided for all pump stations during all periods when the station is manned. Where the pump is belowground, mechanical ventilation is required and should be arranged to independently ventilate the dry well. If screens or mechanical equipment, which might require periodic maintenance and inspection, are in the wet well, then it should also be mechanically ventilated.

There should be no interconnection between the wet well and the dry well ventilation systems. In pits over 15 feet deep, multiple inlets and outlets are desirable.

Dampers should not be used on exhaust or fresh air ducts and should be avoided to prevent clogging. Switches for operation of ventilation equipment should be marked and conveniently located above grade and near pump station entrance. Consideration should be given also to automatic controls where intermittent operation is used. The fan wheel should be fabricated from non-sparking material. In climates where excessive moisture or low temperature is a problem, consideration should be given to installation of automatic heating and/or dehumidifying equipment. Where heat buildup from pump motors may be a problem, consideration should be given to automatic ventilation to dissipate motor heat.

SECTION 3: WET WELL – DRY WELL STATIONS

5-3.01 Separation

Wet and dry wells, including their superstructures, should be completely separated.

Where continuity of pump station operation is necessary, consideration should be given to dividing the wet well into two sections, properly interconnected, to facilitate repairs and cleaning.

5-3.02 Wet Well Size

The effective capacity of the wet well should provide a holding period not to exceed 10 minutes for the design average flow.

5-3.03 Floor Slope

The wet well floor should have a minimum slope of 1-to-1 to the hopper bottom. The horizontal area of the hopper bottom should be no greater than necessary for proper installation and function of the inlet.

5-3.04 Ventilation

Wet well ventilation may be either continuous or intermittent. Ventilation, if continuous, should provide at least 12 complete air changes per hour; if intermittent, at least 30 complete air changes per hour. Such ventilation should be accomplished by introduction of fresh air into the wet well by mechanical means.

Dry well ventilation may be either continuous or intermittent. Ventilation, if continuous, should provide at least 6 complete air changes per hour; if intermittent, at least 30 complete air changes per hour.

5-3.05 Dry Well Dewatering

A separate sump pump should be provided in the dry wells to remove leakage or drainage within the discharge above the overflow level of the wet well. Water ejectors connected to a potable

water supply will not be approved. All floor and walkway surface should have an adequate slope to a point of drainage.

5-3.06 Testing

A water infiltration test for all wet wells shall be required. Refer to Section 5-1.19 for details.

SECTION 4: SUCTION LIFT STATIONS

5-4.01 Priming

Suction lift pumps should be of the self-priming type, as demonstrated by a reliable record of satisfactory operation. The maximum recommended lift for a suction lift pump station is 15 feet, using pumps of 200 gallons per minute (gpm) capacity or less.

5-4.02 Capacity

The capacity of suction lift pump stations should be limited by the net positive suction head and specific speed requirements, as stated on the manufacturer's pump curve for the most severe operating conditions.

5-4.03 Air Relief

A. Air Relief Lines - All suction lift pumps should be provided with an air relief line on the pump discharge piping. This line should be located at the maximum elevation between the pump discharge flange and the discharge check valve to ensure the maximum bleed-off of entrapped air. Air relief piping should have a minimum diameter of 1¼-inches. A separate air relief line shall be provided for each pump discharge. The air relief line should terminate in the wet well or suitable sump and be open to the atmosphere.

B. Air Relief Valves - Air relief valves should be provided in air relief lines on pumps not discharging to gravity sewer collection systems. The air relief valve should be located as close as practical to the discharge side of the pump.

C. Unvalved Air Relief - Unvalved air relief piping should be provided on all pumps discharging to varying head force mains, except that an air relief valve may be used where actual operating test data can be submitted that indicate that a particular air relief valve will fail in the open position under varying head conditions. **NOTE**: Unvalved air relief piping will materially affect pump efficiency and capacity and should be considered by the designing engineer.

5-4.04 Pump Location

Suction lift pumps should not be located within the wet well.

5-4.05 Access to Wet Well

Access to the wet well should not be through the dry well, and the dry well should have a gastight seal when mounted directly above the wet well.

SECTION 5: SUBMERSIBLE PUMPS

5-5.01 Pump Removal

Submersible pumps shall be readily removable and replaceable without dewatering the wet well or requiring personnel to enter the wet well. Continuity of operation and other units should be maintained.

A hoist and accessories for removing the pumps from the wet well shall be provided.

5-5.02 Controls

The control panel shall be located outside the wet well and suitably protected from weather, humidity, and vandalism.

5-5.03 Valves

All control valves on the discharge line for each pump shall be placed in a convenient location outside the wet well in a separate vault and be suitably protected from weather and vandalism. Outside valve covers shall not be allowed.

5-5.04 Submergence

Positive provision, such as backup controls, shall be made to assure submergence of the pumping units.

SECTION 6: RELIABILITY

5-6.01 Objective

The objective of reliability is to prevent the discharge of raw or partially treated sewage to any waters and to protect public health by preventing backup of sewage and subsequent discharge to basements, streets, and other public and private property.

5-6.02 Backup Units

A minimum of two pumps shall be provided in each station.

5-6.03 Power Outages

An emergency power source shall be provided to ensure continuous operability. A temporary lift station is defined as a lift station, which is anticipated to be in operation for less than five years and backup power will be as needed.

5-6.04 Emergency Power Supply

An emergency power source shall be provided.

5-6.05 General

Provision of an emergency power supply for pumping stations shall be made and may be accomplished by connection of the station to at least two independent public utility sources, or by provision of in-place internal combustion engine equipment that will generate electrical or mechanical energy.

Emergency power shall be provided that, alone or combined with storage, will prevent overflows from occurring during any power outage that is equal to the maximum outage in the immediate area during the last 10 years. If available data is less than 10 years old, an evaluation of a similar area served by the power utility for 10 years would be appropriate.

5-6.06 In Place Equipment

Where in-place internal combustion equipment is utilized, the following shall be applied:

A. Placement - The unit shall be bolted in place. Facilities shall be provided for unit removal for purposes of major repair or routine maintenance.

B. Controls - Provision shall be made for automatic and manual startup and cut-in.

C. Size - Unit size shall be adequate to provide power for lighting and ventilating systems and such further systems that affect capability and safety as well as the pumps. Unit shall be configured to utilize natural gas with a natural gas service installed to the closest main and shall include a back-up propane tank fuel supply.

D. Engine Location - The unit internal combustion engine should be located above grade, with suitable and adequate ventilation of exhaust gases.

SECTION 7: FORCE MAINS

5-7.01 Design

A. **Size** - Minimum size force mains should be not less than 4 inches in diameter.

B. **Depth** - Force mains shall have a minimum 36 inches of cover to top of pipe. See Chapter 2, Section 2-1.20 for sanitary sewer/water main crossing requirements.

C. **Velocity** - At pumping capacity, a minimum self-scouring velocity of 2 feet per second (fps) at average Dry Weather Flow should be maintained unless flushing facilities are provided. However, 3 fps is desired to scour settled solids. Velocity should not exceed 8 fps.

D. **Air Relief Valve** - Air relief valve should be placed at the necessary high points in the force main to relieve air locking.

E. **Termination** - The force main should enter the receiving manhole with its centerline horizontal and with an invert elevation that will ensure a smooth flow transition to the gravity flow section; but in no case shall the force main enter the gravity sewer system at

a point more than 1 foot above the flow line of the receiving manhole. The design should minimize turbulence at the point of discharge.

Consideration should be given to the use of inert materials or protective coatings for the receiving manhole to prevent deterioration as a result of hydrogen sulfide or other chemicals are present or suspected to be present because of long force mains.

F. **Materials of Construction** - The pipe should be adapted to local conditions, such as character of wastes, soil characteristics, exceptionally heavy external loadings, internal erosion, corrosion, and similar problems.

Installation specification shall contain appropriate requirements based on the criteria, standards, and requirements established by the industry in its technical publications. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling thereof so as not to damage the pipe or its joints, impede cleaning operations, not create excessive side fill pressures or egging of the pipe, nor seriously impair flow capacity.

All pipes shall be designed to prevent damage from super-imposed loads. Proper allowance for loads on the pipe shall be made because of the width and depth of trench.

Force mains for sizes up to 8-inches shall be ductile iron AWWA C151 Class 52 or PVC C900 with ductile iron fittings and gasketed joints. For 12 to 24-inch mains, pipe shall be ductile iron AWWA C151 Class 50 with ductile iron fittings and gasketed joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron pipe and fittings shall be epoxy coated and mortar lined and designed for use with corrosive materials.

G. **Air/Vacuum Valves** - Air release valves and air/vacuum valves shall be located at the high points on the force main within a standard 48-inch manhole or a comparable sized, approved vault. Air release valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance.

H. **Anchorage** - Force mains shall be sufficiently anchored within the pump station and throughout the line length. The number of bends shall be as few as possible. Thrust blocks, restrained joints, and/or tie rods shall be provided where restraint is needed.

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings. See Standard Detail Drawing 2-130-001 in water section.

Designed and approved restraining joint systems may be allowed in lieu of thrust blocking. Restraining joint brand, type, and size shall be specified on the plans.

5-7.02 Testing

a. **Pressure Test** - All ductile iron force mains shall be tested at a minimum pressure of at least 50% above the design operating pressure or 200 psi, whichever is

greater, for at least 30 minutes. Leakage shall not exceed the amount given by the following formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

Where,

L is allowable leakage in gallons per hour

N is the number of pipe joints

D is the pipe diameter in inches

P is the test pressure in psi

Any leaks or imperfections developing under said pressure shall be remedied by the Contractor. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The pressure test shall be maintained while the entire installation is inspected.

When testing HPDE force mains (where alternative material is approved by the City Engineer), the minimum hydrostatic testing pressure shall be:

$$Hydrostatic\ test\ pressure = P(N)(1.5)$$

Where,

P is the lift station operating pressure

N is the number of pumps

For a minimum of 30 minutes with no leakage or loss.

Example: Two pumps at 35 psi each – (35 psi)(2)(1.5) = 105 psi

The Contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. This is to include all connections as shown on the plan. The Contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

b. **Deflection Test for Thermoplastic Pipe** – Also known as mandrel or "pigging" test in accordance with Section 7-17.3(2)G of the WSDOT/APWA Standard Specifications is required.

Pigging ports may be required (a pigging port is used as a point to send or retrieve the pig):

i. At every change in pipeline size.
ii. At bends in the line.

iii. No more than every 1,000 feet.

These locations are subject to review and approval by the City.

The following General Notes shall be included on any plans dealing with sanitary sewer design.

Please see Appendix G for Sanitary Sewer Main Construction Notes to be incorporated into Engineering Plan Sets.