City of Duvall

Small Town. Real Life.

CITY OF DUVALL DEVELOPMENT DESIGN STANDARDS

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DEVELOPMENT DESIGN STANDARDS

CITY OF DUVALL

January 2013 - UPDATE

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CITY OF DUVALL
DEVELOPMENT DESIGN STANDARDS 2013

The City of Duvall has adopted this development design criteria 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 Standards are intended to support City of Duvall'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 storm water management and sensitive area policies, and to balance these goals with the general safety and needs of the public.

In adopting these Development Design 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 and capital 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, better cost savings, or both. Any proposed departure from the Standards will be judged, however, on the likelihood that such variance will produce a compensating or comparable result, in every way adequate for the street and utility and City resident.

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CHAPTER 1
GENERAL PUBLIC WORKS CONSIDERATIONS

CHAPTER 1:
GENERAL PUBLIC WORKS CONSIDERATIONS

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CHAPTER 1
GENERAL PUBLIC WORKS CONSIDERATIONS

SECTION 1:
1-1.00 GENERAL PUBLIC WORKS CONSIDERATIONS

1-1.01 Standard Specifications

Design detail, workmanship, and materials shall be in accordance with the current edition of the "Standard Specifications for Road, Bridge and Municipal Construction", and the "Standard Plans for Road, Bridge, and Municipal Construction", all written and promulgated by the Washington State Chapter of the American Public Works Association and the Washington State Department of Transportation, 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 of Duvall Water System Comprehensive Plan, 2011, or most current edition.

B. Conditions and standards as set forth in the City of Duvall Comprehensive Sanitary Sewer Plan, 2000 or most current edition.

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

D. Conditions and standards as set forth in the Duvall Storm Drainage Plan (King County Surface Water Design Manual, current edition).

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

F. Conditions and standards as set forth in the East King County Coordinated Water System Plan, 1996 or most current 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. Conditions and standards as set forth in the WSDOT Design Manual as amended and approved by WSDOT.

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

K. DOT Construction Manual as amended and approved by Washington State Department of Transportation.

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

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

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

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

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

Q. All cast or ductile iron items associated with sanitary sewer, storm drainage, and water system 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.

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

1-1.02 Shortened Designation

This City of Duvall 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 facilities both in the right-of-way and on-site for transportation and transportation related facilities; storm drainage facilities; sewer and water improvements; and park, recreation, and open-space facilities.

1-1.04 Definitions and Terms

“Average Daily Traffic” or ADT - 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.

“Building Sewer” or “Side Sewer” - Shall be that portion of the line beginning two feet outside the outer foundation wall of the structure to the sanitary sewer main.

“City Engineer” - The City Engineer or his/her duly authorized representative.

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

"Development" -Any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or other structures.

“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 the developer.

“ERU” - Equivalent Residential Unit, The unit used to calculate sewer consumption.

“Half-Street” - Reduced width street constructed along an edge of development including, at a minimum, full frontage improvements adjacent to the development and additional improvements to provide a minimum two lanes of travel and permitted as an interim facility pending construction of the remaining street by the adjacent owner.

“Interceptor” - Shall be a sewer that receives flow from a number of main or trunk sewers, force mains, etc.

“Lateral” - Shall be that section of the sewer line extending from the City’s main to the right-of-way or easement line (i.e., the building sewer) that has no other common sewers discharged into it.

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

“Plans” - 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.

“Private Sewer” - Shall be that portion of the system located on private property where no easements are granted to the City. Maintenance, service, or repair of a private sewer from the home or business to the City owned mainline shall be the responsibility of the property owner(s).

“Private Street” - Private vehicular access provided for by an access tract, easement, or other legal means to serve property 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”.

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

"Public Street" - Publicly owned and maintained street.

"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" - Used interchangeably with street.

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

"Street" - Used interchangeably with road.

"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, or cable television, whether or not such company is privately owned or owned by a governmental entity.

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 the City of Duvall Development Design 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 engineer, must be submitted to the City for plan review and approval prior to the commencement of any construction. Applicant's engineer shall be a Professional Engineer, registered as such in the State of Washington. The applicant's engineer prior to submittal for plan review must stamp all plans. The City Engineer prior to the start of construction shall approve finalized plans.

B. Three rolled copies of the plans shall be submitted along with a completed "Plan Checklist" form upon completion and approval of the Site Plan Approval Process or other applicable City permit process. All drawings shall be on 24" x 36" sheet size. Original sheets shall be good quality reproducible ink on mylar. An approved reproducible copy of the drawing will be returned to the City of Duvall before construction may begin.

C. 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 Plan Checklist on the following pages. On occasion, the scope of a project (i.e., relocating one hydrant) may not require engineered plans and can instead by handled via a Street Use Permit. This option will be decided during a Site Plan Review.

D. Specifications shall be required and submitted with the plans if General Notes do not adequately cover the project requirements. The specifications shall be reviewed and approved by the Public Works Superintendent prior to construction.

CITY OF DUVALL

PLAN CHECKLIST

STANDARD ITEMS: WATER, SANITARY SEWER, STORM SEWER, STREET, LIGHTING, AND SIGNALS

GENERAL REQUIREMENTS

( ) Sheet size 24” x 36”

( ) Mylar reproducible plans

( ) Site plans match preliminary approved application, conditions of approval letter, and special requirements.

( ) Table of Contents on cover page if more than 3 plan 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 ft. 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 (cover sheet)

( ) Legend (APWA Standard Symbols) (Call sheets)

( ) North Arrow

( ) Scale

( ) Datum – NAVD 1988, NAD 83, Bench Mark Elevation and Location (cover sheet)

( ) Title Block (all sheets)

- ( ) Title:
- ( ) Design by:
- ( ) Drawn by:
- ( ) Date:
- ( ) Checked By:

APPROVED FOR CONSTRUCTION

BY: _____ DATE: _____
City Engineer

BY: _____ DATE: _____
Utilities Superintendent

APPROVAL EXPIRES: _____

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

( ) Signature Approval Box (see above example) (all sheets)

( ) Sheet number of total sheets:

( ) Section, Township, and Range (cover sheet)

( ) Engineers Stamp (signed and dated) (all sheets)

( ) Project Title (all sheets)

( ) Utility Systems Map (showing all proposed utilities on one drawing)

( ) Revision Block (all sheets)

( ) One Call Number 1-800-424-5555 and/or 811(all sheets)

( ) Name and phone number of surveyor (cover sheet)

( ) Name and phone number of Engineer (cover sheet)

( ) Name and phone number of owner/agent

( ) Legal description (cover sheet)

( ) Mail box location approval by U.S. Postal Service and Public Works Department (cover sheet)

( ) Sheet Index on all sheets

PLAN PORTION STANDARD ITEMS

( ) Centerline and Stations

( ) Edge of Pavement and Width

( ) Right-of-Way and Width

( ) Proposed Survey Monumentation Locations and Details

( ) Sidewalk and Width

( ) Roadway Sections

( ) Existing Utilities (above and below ground)

( ) Adjacent Property Lines, Ownership, Parcel Number, and Street Address

( ) Sensitive Areas on-site and within 300 feet of the site and 40% slope top/toe

( ) Identify Street Names, Right-of-Way, Lots, adjacent Lots and Developments

( ) Identify Match Existing Sheet Numbers and Stations

( ) Easements, Width and Type

( ) Define Survey Baseline

( ) Stations and Offsets for Structure

PROFILE PORTION STANDARD ITEMS

( ) Profile Grades (decimal percent)

( ) Existing Ground

( ) Scale (horizontal and vertical)

( ) Stationing

( ) Vertical Elevation Increments

( ) Existing Utilities (if available)

<u>Misc.</u>

( ) Detail Sheet

( ) General Notes

SANITARY SEWER

Plan View

( ) Manhole

- ( ) Station and Offsets Shown at Each Manhole
- ( ) Manholes Numbered
- ( ) Manhole Type Designation
- ( ) Flow Direction
- ( ) Depth at Property line for Side Sewer
- ( ) Distance from Water Lines
- ( ) Service to Each Lot

Profile View

- ( ) Manholes Numbered
- ( ) Invert Elevation
- ( ) Rim Elevation
- ( ) Grades Shown (decimal percent)
- ( ) Size and type of Pipe
- ( ) Length of Pipe (in L.F.)
- ( ) Existing Utilities Shown (if available)
- ( ) Seepage dams if greater than 7 percent slope (see 2-1.05.B)

Misc.

( ) Detail Sheet

( ) Sewer General Notes

WATER

Plan View

( ) System Map showing existing and proposed with line size, valves, hydrants, services, and other appurtenances and components.

( ) Fixtures (need horizontal and vertical control)

- ( ) Fire Hydrants
- ( ) Blow-Off (at end of line)
- ( ) Vacuum and Air Release Valves When Required

( ) Tees, Crosses, Elbows, Adapters and Valves Need Coupling Type, Meter Locations

( ) Valves (3 each tee, 4 each cross)

( ) Fire Department Connection

( ) 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.

( ) Distance from Sewer

( ) Service to Each Lot

Profile View

( ) Existing Utility Crossings (if available)

( ) Cover Over Pipe if less than 42 inches

( ) Seepage dams if greater than 7 percent slope (see 2-1.05.B)

Misc.

( ) Detail Sheet

( ) Water General Notes

DRAINAGE AND STORM SEWER DESIGN

(King County Surface Water Design Manual (KCSWDM), Current edition)

( ) Technical Information Report outlined and numbered per tasks in KCSWDM

- ( ) 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 Landsburg 0.85 coefficient
- ( ) Low Impact Design Feasibility Evaluation in accordance with NPDES Phase II Permit and City requirements.
- ( ) 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 (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
- ( ) Proposed Structures Including Roads and Parking Surfaces
- ( ) Lot Dimensions and Areas, Dedicated R/W 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

( ) Plan View - Conveyance System

- ( ) Station and Offset at each Manhole/Catch Basin
- ( ) Manhole/Catch Basin Type and Size
- ( ) Manhole/Catch Basin Number
- ( ) Type and Size of Pipe
- ( ) Length of Pipe in Linear Feet
- ( ) Minimum Pipe Cover Specified
- ( ) Lot Drain Stubouts with Invert Elevations

( ) Profile View - Conveyance System

- ( ) Station and Number at each Manhole/Catch Basin
- ( ) Rim Elevation
- ( ) Invert In and Out
- ( ) Length of Pipe in Linear Feet
- ( ) Grades (decimal percent)

( ) Erosion Control Drawing

- ( ) Soil Types
- ( ) Locations of Soil Pits and Infiltration Tests
- ( ) Construction Entrance Detail

( ) Silt Fences and Traps

( ) Mulching and Vegetation Specifications

( ) Clearing and Grubbing Limits

( ) Existing and Finished Grade

( ) Details and Locations of all BMP's Recommended

( ) Location and Details of Temporary Sediment Ponds

( ) Required Type and Frequency of Maintenance, Frequency of Sediment Removal, Cleaning of Catch Basins

( ) Identification of Responsible Maintenance Organization

( ) Construction Sequence

Misc.

( ) Detail Sheet

( ) Storm Drainage General Notes

DETENTION AND WATER QUALITY FACILITIES

(King County Surface Water Design Manual (KCSWDM), current edition)

( ) Facilities designed in accordance with KCSWDM

( ) Plan to include facility design volumes.

( ) Vaults must be designed in accordance with KCSWDM and the following provisions

( ) Location

( ) Located in individual tract, not be located within existing or future roadway.

( ) Vault to tract/easement line = 5 feet.

( ) Vault to adjacent buildings = 10 feet.

( ) Vault Structure

( ) Clearly marked entrances as confined space.

( ) Provisions made for the passage of water when there is a plugged outlet.

( ) Pipes sealed with grout.

( ) Wetpool

( ) Inlet and outlet at opposing corners of the vault.

( ) Lockable grates instead of manhole covers).

( ) Flow path from inlet to outlet maximized.

( ) Inlet and Outlet

( ) Distance between inlet and outlet maximized.

( ) Ratio of flow path length to width from inlet to outlet is at least 3:1.

( ) All inlets enter first cell.

( ) Top of inlet submerged at least one foot.

( ) Inlet pipe invert a minimum of 3 feet from the vault bottom, submerged below wetpool surface.

( ) 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.

( ) Outlet pipe conveys the 100–year design flow for developed site conditions.

( ) Available head above the outlet pipe at least 6 inches.

( ) Outlet pipe backsloped or tee section with lower arm 1 ft below the WQ design water surface.

( ) Gravity drain for maintenance is required.

( ) Invert 6 inches above the base elevation of the vault side walls.

( ) 8" minimum diameter.

( ) 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

( ) Located in separate catch basin outside of vault with in Minimum 52" diameter catch basin with locking manhole and catch basin lids. Lids to provide unimpeded access to ladder and control structure inspection.

( ) Clearly marked entrance as confined space.

( ) Outlet capacity = 100 year developed peak flow.

( ) Metal Parts – corrosion resistant, no galvanized materials.

( ) 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.

( ) Clearly marked entrance to confined space.

( ) At least one orifice at bottom of control structure and one near the top of the riser except for split flow/multiple control structures.

( ) Minimum orifice diameter = 0.5 inches.

( ) Orifices constructed on a tee section or baffle.

( ) Downstream tailwater considered.

( ) Design provides for overflow of the developed 100-year peak flow with all orifices plugged.

( ) Materials

( ) Material – minimum 3,000 psi structurally reinforced concrete.

( ) Plan to note that "Concrete finish to be smooth with no fins, voids, rock pockets, or other irregularities."

( ) Walls shall be designed as retaining walls.

( ) 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.

( ) All construction joints shall be provided with waterstops.

( ) Plan to note that "Cone snap ties are required for formwork and are to be removed and epoxy sealed at all interior and exterior wall surfaces. No flat ties allowed".

( ) 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.

( ) Structural Stability

( ) H-20 traffic loading minimum.

( ) Stamped by a licensed structural engineer.

( ) Located on firm and unyielding native soil. Vaults not allowed on fill unless analyzed in a geotechnical report for stability and constructability.

( ) Vault Access

( ) 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".

( ) Access opening and ladder over inlet pipe.

( ) Access opening and ladder over outlet pipe.

( ) Access opening located within 50 ft of any location within the vault.

( ) Access opening for each "v" provided in the vault floor.

( ) 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.

( ) 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.

( ) 5' x 10' removable, locking panel provided for vaults with floor area greater than 1,250 SF.

( ) 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.

( ) Removable lids provided for vaults with widths of 10 feet or less.

( ) Maximum depth from finished grade to vault invert = 20 feet.

( ) Internal structural walls of larger vaults have opening for maintenance between cells.

( ) Minimum internal height from highest point on vault floor (not sump) = 7 feet (exceptions for tanks and areas covered with removable panels).

( ) Minimum width = 4 feet.

( ) Clearly marked entrances to confined spaces.

( ) Ventilation pipes (min. 12 inch diameter) 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.

( ) Minimum 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

( ) Access to panel, control structure and at least one point per cell.

- ( ) Maximum grade = 12% for paved access roads, gravel or modular grid paving, width on straight sections = 12 feet.
- ( ) Minimum outside turning radius = 40 feet, width on curves = 15 feet.
- ( ) Fence gates on straight portion of road.
- ( ) Paved apron provided where access connects with paved public road

( ) 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".

ROADS

Plan View - Roads

( ) Right-of-Way Width

( ) Centerline Elevations shown at every 1+00 (whole) station

( ) Spot Elevations on Curb Returns

( ) Station PC, PT, PI and Intersections

( ) Curve Information Delta, Radius, Length and Tangent

( ) BCR and ECR (Begin Curb Radius, End Curb Radius)

( ) Identify All Field Design Situations

( ) Plan to note that "Full Width 1.5-inch minimum thickness overlay for road widening and/or utility patches parallel to roadway".

( ) No transverse utility cuts unless approved by City Engineer. Plan to note that "Transverse utility trenches to be restored with full road width T-Cut patch extending a 3-foot minimum beyond trench edge".

( ) Plan to note that "Any and all damaged or replaced curb and sidewalk shall be replaced joint-to-joint".

( ) Typical Sections With R/W and Pavement Width Shown Along With Pavement Thickness

( ) Pavement Marking Details with Station and Offset

( ) Sidewalks

- ( ) Driveway Entrances & surfacing type
  - ( ) Station
  - ( ) Width, Material (AC, PCC)
  - ( ) ADA Ramps - Detail and Type. Uni-directional (one each direction of travel) 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 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 View

( ) Vertical Information VPI, BVC, EVC, AP, Low Point, High Point

( ) Show Grades in Decimal Form with (+ or -) Slope

( ) Super Elevated Roadways

  ( ) Detail - Show Transitions

  ( ) Special Detail Showing Gutter Flowing Adequately

Misc.

( ) Detail Sheet

( ) Street General Notes

( ) AASHTO Pavement Design with Soils Report, if Applicable

( ) Lighting

  ( ) Station and Offset to Fixtures

( ) Pole type, Mounting Height, Arm Length, Anchor Bolt Size and Pattern (Follow WSDOT specs unless otherwise required by Puget Sound Power & Light).

( ) Signals (Follow WSDOT Specs unless otherwise required by the City)

MISCELLANEOUS

( ) Easements and/or Dedication Deeds

( ) Contract Documents/Specifications

( ) Signing Schedule

( ) Sheet Index (on title sheet if required)

( ) Field Verify Note on Drawings - Expose Connection Points and Verify Fittings 48 Hours Prior to Distributing Shut-Down Notices

( ) Call Before You Dig Note

( ) 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 that "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 CADD drawing files in AutoCAD format, and/or other electronic format as required by the City Engineer"

( ) **General Construction Notes to be incorporated into Engineering Plan Sets (Please see Appendix G).**

1-1.08 Plan Review

All plans are to be submitted to the City 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 plans checklist. If the plans meet the minimum checklist requirements as to context, they will be routed to the appropriate City staff and the plan review process begins.

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 returned only to the Engineer only after the plan checking fees have been paid.

Plans that have been approved more than one year before construction begins (i.e., a preconstruction meeting scheduled and inspection fees paid if bonding for final plat approval) 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 his/her 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 (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, include a downstream analysis, 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 current version of the King County Surface Water Design Manual.

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, the City forces, or by a City contractor, shall be done to the satisfaction of the City and in accordance with approved plans. It is emphasized that no work shall be started until such plans are approved and the City Engineer shall approve any revision to such plans before 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 of Duvall requires a Developer and or their Contractor to retain an Engineer Licensed 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

All work performed within the public right-of-way or easements, on public or private property or as described in these Standards, whether by or for a private developer, by City forces, or by a City contractor, shall be done to the satisfaction of the City Engineer or Public Works Inspector and in accordance with the WSDOT/APWA Standard Specifications, any approved plans, and these Standards. Unless otherwise approved, the City Engineer must approve any revision to previously approved construction plans before being implemented.

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 pans and any necessary permits on the job site whenever work is being accomplished.

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.

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.

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 project is considered final when the City issues a letter of acceptance to the party responsible for the project.

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 the Duvall Municipal Code (DMC).

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

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.

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 right-of-way 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.

In the case of work contracted for by the Department of Public Works, the signing of the contract 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 an Environmental 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 Development Review Committee conducts the Environmental Review and makes a SEPA Threshold Determination for the City.

B. Construction Permits

1. Clearing and Grading Permit (Public Works Department). A Clearing and Grading Permit is required for cut and fills and all significant tree alternations, including plats. A Clearing & Grading Permit is typically issued separately. A strict inventory and Landscaping Plan (as applicable) is required for all Clearing and

Grading Permits. A Clearing and Grading permit is not required for projects outside of sensitive areas and associated buffers if all of the following requirements are satisfied: 1) excavations less than 2 feet deep; 2) a cut slope which is not greater than 4 feet in height and/or steeper than 2(horizontal):1(vertical) and less than 50 cubic yards; and 3) fills of less than 50 cubic yards on any one lot not intended for structural support, that does not obstruct a drainage course, and are less than 1-foot deep placed on natural terrain flatter than 5(horizontal):1(vertical).

2. Building Permit (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 the submittal of an Environmental Checklist.

3. Street Use Permit (Public Works Department). A Street Use Permit is required for any work within the right-of-way 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, plat and short plat approvals, Wet Weather Work, 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

"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 per 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. Construction Performance Bond. Construction associated with a Public Works or Building permit shall not commence until a Construction Performance bond as outlined above is posted with the City in an amount equal to 150 percent of the cost of the public works improvements. No certificate of occupancy shall be issued until all public works 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 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 works improvements. No certificate of occupancy shall be issued until all public works 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 works improvements in an amount equal to 15 percent of the estimated cost of the improvements for a period of two years after the completed job is accepted by the City. In addition, the improvements shall be maintained through the two-year

maintenance period. Maintenance Bond release eligibility commences two years form the date of City acceptance provided that the City's Maintenance Bond Release inspection shows no damaged, deficient, or failing items.

D. There shall be only one Public Works Construction Bond, Performance Bond, and Maintenance Bond each allowed for plat division.

E. Liability Bond (Storm Drainage Facilities). At the discretion of the 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.

1-1.14 Utility Locations

A. All utilities within a right-of-way 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/excavation (potholing) if utilities are in 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 right-of-way 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 the Duvall Municipal Code, 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 right-of-way.

C. A street use permit is required of any utility, except City owned facilities and utilities, whom hold a franchise agreement with the City for any work done within the right-of-way and shall comply with all provisions as set forth in the Duvall Municipal Code, and applicable sections of these Standards.

1-1.15 Easements

A. Where public utilities and/or their conveyance systems cross private lands, an easement must be granted to the City. The developer or his representative will generally process, record, and file all easements. If the property is platted the easement may be conveyed when the short plat or final plat is filed. All easements not shown on a plat must be prepared by a licensed land surveyor 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 otherwise approved by the City Engineer. Construction easements shall be 25 feet minimum in total width, including the permanent easement, 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 stopping of construction until plans and easements can be resubmitted and approved. Easements will be filed by the developer or his representative upon satisfactory completion of the work. A copy of the Easement Preparation Standards can be found in the Appendix.

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. This contact is commonly termed a "Latecomers Agreement". The format for a Latecomers Agreement must be submitted for review prior to plan approval to be considered. Latecomers Agreements submitted after plan approval will not be accepted. 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 Extension

A. Anyone who wishes to extend any City utility shall contact the Department of Public Works for an Extension/Connection Fee Estimate and any 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.

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.

D. 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.

E. Fire hydrants shall be installed where and in the manner specified by Duvall-King County Fire District No. 45 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 2011 "Comprehensive Water Plan" may be served by the City water system upon approval of the City Engineer and upon completion of required water system improvements to safely and effectively convey water 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

A. The developer/contractor shall be responsible for interim traffic control during construction on or along traveled roadways. Traffic control shall follow the guidelines of the WSDOT/APWA Standard Specifications. All barricades, signs, and flagging shall conform to the requirements of the MUTCD.

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

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

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.

C. A street use permit may be required before work in the road can commence. Contact the Department of Public Works for specific permit information.

1-1.20 Call Before You Dig

All developers/contractors are responsible for timely notification of all utilities in advance of any construction in right-of-way or utility easements. The utilities 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 other City code 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 rights-of-way shall improve the frontage of those rights-of-way in accordance with these Standards as part of a development permit. 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 land development that contains internal roads shall construct or improve those roadways to these Standards.

D. 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.

E. Waiver: The applicant shall comply with the provisions of this chapter if the applicant is granted a development permit unless:

1. The cost of the street improvements along the property frontage 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.

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

    d. 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 Official. 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.

e. The City shall track the cumulative building alterations in a five-year time period using historical Building Permit information.

f. 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 right-of-way 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.

F. Required Public Improvements

1. General: Except as specified in subsection (2) of this section, the applicant shall install the specified improvements from the center line of the right-of-way to the applicant's property line. The specified improvements shall be designed and constructed per requirements of these Standards unless additional improvements are required by an adopted Comprehensive Plan or other City-Council adopted plan or requirement. The applicant may increase the dimensions of any required improvement or install additional improvements in the right-of-way with the written consent of the City Engineer.

2. Half-Street Improvements: If the one-half of the right-of-way opposite the subject property has not been improved based on the provisions of this chapter, the applicant shall install improvements in the right-of-way 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 right-of-way and a five-foot-wide shoulder on the side of the right-of-way opposite the subject property or as required 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 required by the City Engineer.

3. Alleys: The applicant shall install the required improvements for the entire width of the alley adjacent to the property per Development Design Standards requirements. 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 that access, safety, maintenance, drainage, and other geotechnical constraints are adequately evaluated and addressed.

4. Modifications – 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. Modifications will include required clearing of invasive vegetation, removal of structures, fences, and other non-City improvements from the alley, and possible construction of pedestrian facilities within alleys that are not to be fully improved.

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

H. 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, on-site barrier free ramps and off-site receiving ramps, and installation of street trees.

I. 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.

J. 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 Department of Public Works.

K. 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 of Duvall Water and Sewer System Comprehensive Plans or 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.

L. Other Necessary Improvements: The applicant shall install any other improvements necessary for the installation or proper operations or maintenance of infrastructure per these Standards.

CHAPTER 2
WATER DESIGN STANDARDS

CHAPTER 2
WATER DESIGN STANDARDS

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CHAPTER 2
WATER DESIGN STANDARDS

SECTION 1:
2-1.00 WATER

2-1.01 General

The Public Works Department must approve any extension of the City of Duvall Water System. All extensions must conform to Department of Health guidelines, the East King County Coordinated Water System Plan, City of Duvall Comprehensive Water System Plan, and 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 water extension/connection fee estimate. This is an estimate of the costs due the City for a waterline extension or connection. A copy of the estimate form may be found in the appendix.

Prior to the release of any water meters, all Public Works improvements must be completed and approved including granting of right-of-way or easements, and all applicable fees must be 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 Section 9.02.020 Duvall Municipal Code (DMC), will be required for the remaining public works improvements. Certificate of occupancy will not be issued until final Public Works approval is given for all improvements.

2-1.02 Design Standards

The design of any water extension/connection shall conform to the current C.O.D. Design Standards as stated in Title 9 of the City of Duvall Municipal Code.

The layout of extensions shall provide for the future continuation and/or "looping" of the existing system as determined by the City. Utility mains shall be extended to and through the extremes of the property being developed. Main extensions shall be extended as required in Section 9.02.030 D.M.C.

The General Notes in Appendix G shall be included on 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 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 live 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 periods 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 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. 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, and or guidelines set forward by the Washington State Department of Health and any and all applicable portions of the Washington State Administrative Code or Revised Code of Washington; however, the quantity of water required will in no case be less than 1000 gpm at 20 psi residual pressure for single family residential areas.

The minimum water main size shall be 8 inches diameter as long as 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 in order to meet fire protection requirements or for future service.

Utility trenches for water main shall have "Seepage Barriers" installed periodically in the trench according to the following criteria;

1. 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;
2. 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;
3. 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;
4. 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 CDF or an alternative approved by the City Engineer. A french drain shall be made using geotextile fabric and 1" drain rock. Pea gravel shall not be placed anywhere within the utility trench. See detail 3-1-012.**

C. 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 right-of-way 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.

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

Ductile Iron 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.

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

E. All water line fittings and adapters 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. Center rings and end rings for pipe casing shall be ductile iron in accordance with ASTM 536-80, Grade 65-45-12. 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.

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

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

The type of connections shall be specified on the plans as push-on joint, mechanical joint (M.J.), plain end (P.E.), flanged (FL), and threaded.

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.

H. 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.

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

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.

I. Adapters: All adapters shall be ductile iron.

J. 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 and Stainless steel nuts, bolts, and washers shall be type 304.

2-1.06 Hydrants

A. All areas served by the Duvall 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.

B. 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. (DMC 9.02.030).

C. Fire hydrants shall have two, 2-1/2 inch outlets and one main pumper port outlet. All outport threads shall be National Standard thread. The valve opening shall be 5-1/4 inch diameter. The hydrant shall have a

positive and automatic barrel drain and shall be of the “safety” or breakaway style. (DMC 9.02.030).

Hydrants shall be Mueller Super Centurion Type (MJ), with a non-locking 4” Stortz quarter turn fitting. The hydrant shall be painted with two coats of quick-set enamel. Paint code is ‘Yellow Hydrant Paint’ #403472 from Far West Paint Co. All hydrants shall be bagged until system is approved.

D. The Department of Public Works and Duvall-King County Fire District 45 work together to ensure that adequate hydrant spacing and installation are achieved.

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

1. At least one hydrant shall be installed at all intersections. This shall include intersections with alleys and access tracts, unless minimum hydrant spacing has already been met.
2. Residential Areas
   a. All hydrants newly installed in a single-family residential area shall be supplied by not less than eight (8) inch circulating mains. Dead end mains supplying fire hydrants must be at least eight (8) inches in diameter, except hydrant leads up to fifty (50) feet long may be six (6) inches in diameter.
   b. 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.
3. Business, commercial, institutional, or industrial facilities
   a. When any portion of a proposed building is in excess of 200 feet from a public street right-of-way, on-site hydrants shall be required. Such hydrants shall be located per Duvall-King County

Fire District 45 and easements for such hydrants, leads, and water mains, shall be granted to the City.

b. Buildings having required fire flows of less than 2500 gpm, may have fire hydrants on one side of the building only.

c. When the required fire flow is over 2500 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 three hundred (300) feet computed on an imaginary line parallel to and not less than fifty (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 approve the location of the fire hydrants depending on utility, topography, and building location. Hydrants shall be a minimum of fifty feet (50') out from the building, minor deviations may be granted.

e. The lead from the service main to the hydrant shall be no less than six (6) inches in diameter. Any hydrant leads over fifty feet (50') in length from service to the hydrant shall be no less than eight (8) inches in diameter. The provisions of this part shall apply without exception and regardless of the size of the service main.

4. Fire hydrants shall be set as shown in standard detail 2-06-001.

5. For requirement regarding use, size, and location of a fire department connection (FDC) and/or post indicator valve, contact Duvall-King County Fire District 45. Location of FDC shall be shown on water plans.

6. Where needed, the Department of Public Works or Duvall-King County Fire District 45 may require hydrants to be protected by two or more

posts, each four inches in diameter by five feet in height, embedded a minimum of 2 feet into the ground, and made of either reinforced concrete or steel pipe filled with concrete.

7. Fire hydrants must be installed, tested, and accepted prior to the issuance of a building permit. (DMC 13.60.170).

8. Fire hydrants shall be installed with a gate valve (foot valve) between the service main and the hydrant sufficient to permit 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.

9. Hydrants shall stand plumb and be set so the break away flange is no more than 6" 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.

10. Fire hydrants shall be installed at the ends of dead end lines which are greater than or equal to three hundred feet (300') in length. See 2-050 C. of this Chapter for further direction since dead ends are not allowed ≥ 300' in length. Said hydrants may later be moved to conform to standard spacing requirements when the main is again extended, under supervision of the City Engineer.

11. 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.

12. 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 this Ordinance 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 of Duvall shall have the right to go upon the premises and to use the private hydrant for public purposes, including testing, flushing, and emergency uses.

13. Hydrants shall have a minimum of 3' 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 a distance of fifty (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 a distance of not less than ten (10) feet.

14. Hydrants shall have a 10' 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' 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 C.O.D. will at complete the maintenance at the home owner's expense.

2-1.07 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 tee and four valves on each cross unless approved otherwise by the City Engineer.

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

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends. Only City employees shall operate existing water system valves.

A. Gate Valves, 6 inch to 12 inch 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.

B. Butterfly valves, 14" and larger 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 2-inch operating nut and suitable valve box. Butterfly valves shall be Mueller.

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" top and 24" 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 drawings 2-07-001 and 2-07-002 for more details.

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

E. Valve Marker Post. Valve marker posts shall be reinforced concrete and measure 4-inch x 4-inch x 3 ½ feet long. Posts shall be stamped with "V" and have the distance to valve stenciled on the front. Post shall be painted with two coats of quick-set enamel. Paint code is

'Yellow Hydrant Paint' #403472 from Far West Paint Co.. See standard drawing 2-07-002 for more details.

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 drawing 2-07-003 for installation details.

2-1.08 Pressure Reducing Stations and Pressure Reducing Valves (P.R.V.)

A. Unless otherwise noted in Comprehensive Water Plans, a standard pressure reducing station shall have a Cla-Val model 90G-01 ABCSKC 8" PRV for fire flow and a 4" for service flow unless otherwise approved by the City Engineer. Both shall have flanged ends. Pressure reducing valves shall have flow opening/closing speed controls, epoxy coated body, and valve position indicator. Pressure reducing valves, 3" and smaller, shall be equipped with stainless steel trim (seat, stem, and cover bearing). Pilot controls shall be on side of PRV facing vault interior. System shall be tied into the City's water control system. System shall include at a minimum pressure detecting / sending units on the in and out side of the PRV, computer controls and radio or telephone system to relay signal and information to master control center at the Public Works department for monitoring and system function purposes.

Strainers shall be installed on the inlet side of each pressure reducing valve. The bypass shall be fitted with bronze ball valves sized to correspond with the bypass inlet and outlet size. A 2" Cla-Val model 50G-01KC pressure relief valve with threaded ends shall be installed

on the discharge side of the 2" pressure reducing valve line for all pressure reducing stations servicing the 450 and 330 pressure zones (refer to Comprehensive Water Plan for pressure zone boundaries and specific valve requirements).

Strainers shall be iron bodied "Y" type equal in size to corresponding pressure reducing valve. Strainer shall feature bolted cover machined to hold screen securely in place and tapped with iron pipe threads for corporation stop. Screen shall be constructed from perforated stainless steel. Main-line strainer shall have flanged-ends and bypass strainer shall have threaded ends.

The vault shall be equal to Utility Vault Co. model 687-LA with cover as specified in the standard detail. Vault exterior shall be coated with coal tar enamel, or equal. See standard drawings. 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 per the City Engineer.

B. Individual Pressure Reducing Valve (PRV) (Residential, Multi-Family, & Commercial). All connections shall have PRV's installed on the house / building side of the meter. An individual PRV shall be installed and shall be direct-action piston type with integral strainer and bypass. Valve body shall be bronze with threaded outlet end and integral union on inlet end. Valve shall be line-sized with spring range from 25 to 75 psi. Individual pressure reducing valves shall be Mueller Model H-9300, Wilkens 600 series, Watts U5, or approved equal. An individual PRV shall be preceded by a strainer. Valve shall be line sized.

2-1.09 Service Connection

A. All service connections relating to new development shall be installed by the developer at the time of mainline construction. All residential single and double services shall be 1" diameter unless a larger size is required by the owner's engineer. All residential services serving fire sprinklers shall be 1" diameter single services unless a larger size is required by the owner's fire engineer.

Residential services serving fire flow shall include Backflow Prevention as required in 2-1.15 except for residential combination (flow-through) systems. After the 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 system is inspected and approved.

B. 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, Duvall Municipal Code, and as approved by King County Fire District 45 and Public Works.

C. 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 King County Fire District 45 and Public Works.

D. 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.

E. 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.

F. Service saddle shall be all bronze construction with stainless steel straps and shall be either Romac 202NS or Ford FC202. Ductile Iron mains may also be direct-tapped if desired.

G. Water service shall be high-density polyethylene (PE) pipe for underground manufactured from ultrahigh molecular weight, high-density polyethylene resin PE 3408. It shall meet the requirements of Type III, Class C, category 5-P34 polyethylene as defined by ASTM specification D-1248 and D-2239. Minimum pressure class 200 (psi). No glued joints will be accepted. Tracer tape shall be installed on all service lines. Service lines 1" and smaller shall be Iron Pipe Size (IPS) PE pipe. The PE to Brass connection shall be made with a Mueller Insta-Tite fitting. Service lines 1½" and larger shall be Copper Tubing Size

(CTS) PE pipe. The PE to Brass connection shall be made with either a Mueller 110 Compression Connection or a Ford Quick-Joint coupling.

H. Meter setting and box installation details can be found on standard drawings 2-09-001 through 2-09-004.

I. 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.

2-1.10 Steel Casing

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

Steel Casing:

Steel casing may be used providing it is 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 Blowoff Assembly

If a fire hydrant is not located at the end of a dead end main, 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 drawing 2-12-001.

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 (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch 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 number 2-13-002 for thrust block locations and calculations. Concrete blocking shall not be backfilled until adequate curing & setting has occurred (typically 12 hours).

2-1.14 Joint Restraint

Joint restraint methods shall be as per the approved materials list and/or the Standard Drawings.

2-1.15 Backflow Prevention

All water system connections to serve buildings or properties with domestic potable water, fire sprinkler systems, or irrigation systems shall comply with the minimum backflow requirements as established by the Department of Health (DOH) and the City of Duvall.

For service connections with fire protection systems other than flow-through or combination systems, backflow protection is required in accordance with WAC 51-56-0600 of the Uniform plumbing Code.

Backflow protection is not required for residential flow-through or combination fire protection systems constructed of potable water piping and materials.

The installation of all backflow devices is required to protect the existing water system and users from possible contamination.

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 "Severe and High Health Cross-Connection Hazard Premises Requiring Premise Isolation by AG or RPBA" (Cross Connection Control Rules and Definitions, Washington Department of Health, PUB. #331 – 355). Backflow prevention shall be installed at all irrigation services, fire services, or other potential cross-connection hazards as determined by the City Engineer.

Approved Reduced Pressure Backflow Assemblies shall be listed on the most current copy of "Accepted Cross-Connection Control Assemblies" published by Washington State Department of Health. 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.

All other appurtenances shall be as shown in the standard detail 2-15-001.

Public Works shall get the certificate of testing of any backflow prevention device before releasing the certificate of occupancy 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 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 (RPBA)

This assembly shall include a D.O.H. approved Reduced Pressure Backflow 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 current** copy of "Accepted Cross-Connection Control Assemblies" published by Washington State Department of Health, PUB. #331 – 355

All other appurtenances shall be as shown in standard detail 2-15-001.

2-1.17 Double Check Valve Assembly

All Double Check Valve Assemblies shall be the one listed on the **most current** copy of "Accepted Cross-Connection Control Assemblies" published by Washington Department of Health, 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 Valve Assembly with Detector

This assembly shall include a D.O.H. approved Double Check Valve Assembly 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 current** copy of "Accepted Cross-Connection Control Assemblies" published by Washington Department of Health, PUB. #331 – 355

All other appurtenances shall be as shown in the standard details.

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 mils. of epoxy or equivalent polymerized coating. 2” and smaller Reduced Pressure Backflow Assemblies (R.P.B.A.s) and Double Check Valve Assemblies (D.C.V.A.s) shall use ball valves. All 2-1/2” and larger R.P.B.A.s and D.C.V.A.s shall use resilient seated gate valves for domestic supply and resilient seated O.S. and Y. 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 Manual. (Orange Book, Department of Health, Pub 98-37),

The minimum cover for water main of 42 inches (3 ½ feet) may be reduced to 24 inches (2 feet) 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 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 an engineer 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 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 (3½ feet) 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 the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

B. Trenches shall be excavated to the line and depth designated by the Plans to provide a minimum of 42 inches (3½ feet) of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be 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 drawing 5-01-007 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 drawing 5-01-007.

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

E. The 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

5/8 minus crushed rock shall be placed and compacted around and under the water mains. Pipe bedding shall be 6" under to 8" over the pipe by the width of the standard trench (pipe dia. + 2' unless otherwise approved by the City Engineer or Public Works Superintendent).

The remaining trench backfill compaction requirements shall be decided based on two factors:

Areas in Right-of-Way or within areas with structural loads (including parking, non-paved access roads, and foundations)- structural fill with 95% compaction required in the top 4' of trench

(which is typically the whole depth in water line construction) and 90% compaction below if applicable.

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

Trench backfilling, compaction and applicable surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the City. A modified proctor and sieve analysis is required for each material to be tested before any results 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.

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.

The City reserves the right to require temporary plating and/or backfill in order 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 lbs. per cubic foot to 155 lbs. per cubic foot.

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 digable by hand after long-term strength gain.

2-1.25 Temporary Street Patching

Temporary restoration of trenches shall be accomplished by a using 2" thickness of ½" HMA Asphalt Concrete Pavement (ACP) or 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 ACP 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. All temporary patches shall be removed prior to final patching and paving unless otherwise approved by the City Engineer,

2-1.26 Trench Backfill and Restoration

Trench restoration shall be either by a patch or patch with overlay as required by the City.

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

B. Trenches made in the R.O.W. that are parallel with the road and greater than fifty-feet (50') in length shall be backfilled with crushed surfacing materials conforming to the WSDOT/APWA Standard Specifications. The trench bottom shall be firm and unyielding prior to fill placement and the material shall be compacted to 95 percent maximum density, as described in Section 2-03 of the WSDOT/APWA Standard Specifications.

Backfill shall be placed in maximum 12-inch lifts unless soil type and weather require thinner lifts. All compaction shall be mechanically performed.

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

Replacement of the hard surfacing (ACP or Portland concrete cement) shall be of existing depth plus 1 inch or a total of 3 inches, whichever is greater.

C. 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. Tack coat shall be applied as specified in the WSDOT/APWA Standard Specifications.

D. 1/2" HMA ACP 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.

All street surfaces, walks 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.

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

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

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

G. The final patch shall be completed as soon as possible and shall be completed within 30 days after first opening the trench. This time frame may be adjusted if delays are due to inclement paving weather, or other adverse conditions that may exist. However, delaying of final patch of overlay work is allowable only subject to the City Engineer's approval.

2-1.27 Hydrostatic Tests

The Public Works Superintendent or his representative (Public Works Inspector) will require a minimum of 24 hour notification before observing a hydrostatic pressure test.

Prior to the acceptance of the 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 sterilization 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 sterilization but the required notices will still be required.

Disinfection of water system construction, connection, repair, or loss of integrity shall be completed in accordance with WAC 246-290-451, the standards published by the American Water Works Association, 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 requires 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 so as to provide a steady application rate of not less than 60 ppm chlorine. Hydrants along the chlorinated section shall be open during application until the presence of chlorine has definitely 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 .00843ld, in which “d” is the diameter in inches.

The line shall then be thoroughly flushed and water samples taken for approval by the local health agency. 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 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 Engineering Plan Sets.

SECTION 2:
2-2.00 WATER SYSTEM APPROVED MATERIALS LIST

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

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

WATER MAIN ACCESSORIES

AIR AND VACUUM RELEASE VALVES

APCO No. 145-C or equivalent

FIRE HYDRANTS

Mueller Super Centurion with a non-locking 4" Stortz quarter turn fitting on main port.

CASING INSULATORS AND END SEALS

Pipeline Seal and Insulator Co.

8" band Model C8G-2

12" 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)

WATER VAULT ASSEMBLIES

PRESSURE REDUCING VALVES

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

STRAINERS

MEUSSCO	751	6"
MEUSSCO	11-BC	2"

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

CHECK VALVES

Rennselaer List 340

WATER SERVICE PARTS:

SERVICE SADDLES UP TO 2”

Ford FC202

Romac 202NS

CORPORATION STOPS UP TO 2”

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” meters

Ford: U18-43-12.5

Mueller: H-15364 (size 1x¾x13½)

1” meters

Ford: U18-64-12.5

Greater than 1” meters

One meter per service line required

METER SETTERS

Up to 1”: No setters, See details 2-09-001a through 2-09-003b
1-1/2” and larger: No setters, See details 2-09-004

RESIDENTIAL PRESSURE REDUCING VALVES (up to 1½”)

Wilkins 600 with built-in bypass or approved equivalent

COMMERCIAL PRESSURE REDUCING VALVES (2" and larger)

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

METER BOXES

(Non Traffic Rated)

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

(Traffic Rated)

Up to 1" Single Services: Mid-States 1118-R HDPE box
Up to 1" Double Services: Mid-States 1730-R HDPE box
1½" 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

IRRIGATION METER AND CONTROL BOXES

Up to 1": Carson 1419 HDPE box with Green T-Cover
1½" 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" - 12"

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)

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

CHAPTER 3
ROAD DESIGN STANDARDS

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CHAPTER 3
ROAD DESIGN STANDARDS

SECTION 1:
3-1.00 GENERAL CONSIDERATIONS

3-1.01 Shortened Designation

These City of Duvall Street Standards will be cited routinely in the text as the "Standards."

3-1.02 Applicability

These Standards shall apply prospectively to all newly constructed road and right-of-way facilities, both public and private, within 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 of Duvall 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 poles and other utility structures within the City of Duvall right-of-way.

3-1.03 Intentionally Left Vacant

3-1.04 General References

The Standards implement and are intended to be consistent with:

A. Duvall Municipal Code

B. Duvall Comprehensive Plan

3-1.05 WSDOT/APWA Documents as Primary Design and Construction References

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. WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction, as adopted by the City of Duvall, current edition as amended. These will be referred to as the "WSDOT/APWA Standard Specifications."

B. The WSDOT/APWA Standard Plans for Road and Bridge Construction, to be referred to as the "WSDOT/APWA Standard Plans," current edition as amended.

C. WSDOT Design Manual, current edition as amended.

D. 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.

3-1.06 Other Specifications

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

A. WSDOT Local Agency Guidelines, as amended.

B. WSDOT Guidelines for Urban Arterial Program, as amended.

C. Design criteria of federal agencies including the Federal Housing Administration, Department of Housing and Urban Development; and the Federal Highway Administration, Department of Transportation,

D. 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.

E. Standard Specifications for Highway Bridges, adopted by AASHTO, current edition.

F. U. S. Department of Transportation Manual on Uniform Traffic Control Devices, "MUTCD", as amended and approved by Washington State Department of Transportation, current edition.

G. Guide for the Development of Bicycle Facilities, adopted by AASHTO, current edition,

H. Associated Rockery Contractors, Standard Rock Wall Construction Guidelines.

I. 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 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 right-of-way or easement; and

2. The existing grade or slope in the road right-of-way or easement does not exceed 12 percent; and

3. The work will not intercept a stream or wetland or otherwise impact natural surface drainage as set forth in City Code regarding Sensitive Areas and the Surface Water Design Manual; and

4. Plans do not include a retention/detention facility within the right-of-way; 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 of Duvall standard drawings, submitted with required permits, are sufficient to describe the improvement to be constructed.

3-1.08 Variances

A. 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 at preliminary plat stage and prior to any public hearing. Variances must be approved prior to approval of the engineering plans for construction. Any anticipated variances from these Standards which do not meet the Uniform Fire Code shall also require concurrence by the Fire Chief.

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

3-1.09 Penalties and Financial Guarantees

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

A. CONSTRUCTION PERFORMANCE GUARANTEES: Any construction work on City of Duvall right-of-way (both maintained and unmaintained)

other than Capital Improvement Projects or City maintenance work shall be guaranteed by a financial guarantee. All work on private road and drainage facilities required as a condition of a City approval process shall be guaranteed by a financial guarantee at the time of plat recording. The amount and form of the financial guarantee shall be determined by the City Engineer. The minimum performance guarantee shall be $2,000.00.

The amount of the financial guarantee may be reduced during construction, as determined by the City Engineer. At no time will the financial guarantee amount be reduced to less than $2,000.00.

B. MAINTENANCE PERFORMANCE GUARANTEES: The successful performance of the right-of-way improvements shall be guaranteed for a period of at least two years (or other period if updated by City of Duvall Code) from the latest date of either the acceptance or Final Construction Approval. The amount and form of the maintenance financial guarantee shall be determined by the City Engineer. The minimum maintenance guarantee shall be $2,000.00. Maintenance guarantees will not be required when the required performance guarantee is $2,000.00.

3-1.10 Meaning of Terms

"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 one hundred fifty (150) feet of a dedicated street; privately maintained

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

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

"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.

"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.

"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.

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

"Engineer": City of Duvall City Engineer, having authorities specified in RCW 36.75.050 and 36.80, or his/her authorized representative.

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

"Half-Street": Street constructed along edge of development, utilizing a portion of the regular width of right-of-way and permitted as an interim facility pending construction of the other half of the street by the adjacent owner.

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

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

"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.

"Off-Street Parking Space": 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 Drawings 3-1-001, 3-1-002, 3-1-005, and 3-1-006.

"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.

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

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

"Professional Engineer": A professional civil engineer licensed to practice in the State of Washington.

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

"Right-of-Way": Land, property, or property interest (e.g., an easement), usually in a strip, acquired for or devoted to transportation purposes.

"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.

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

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

"Utility": A company providing public service such as gas, electric power, telephone, telegraph, water, sewer, or cable television, whether or not such company is privately owned or owned by a governmental entity.

"Standard Plan": WSDOT Standard Plans for Road, Bridge, and Municipal Construction.

3-1.11 Severability

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

SECTION 2:
3-2.00 ROAD TYPES & 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 right-of-way, road width and road geometries. Other given elements such as access, arterial spacing and average daily traffic count (ADT) are typical.

1. 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 two-lot urban short plats are as allowed in Section 3-1.03.

2. 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 thirty-four feet (34') to accommodate for on street parking, consistent with Duvall Municipal Code section 14.48, in those areas.

3. Based on residential development densities and proposed housing types within new developments, Residential Subcollector Street widths may be decreased to twenty six feet (26') upon Planning 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 consistently distributed throughout the site.
4. To support innovative housing per the D.M.C. (cottages or clustered housing), Residential Subaccess/Minor Access Street widths may be decreased from twenty six feet (26') to twenty feet (20') upon Planning 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 consistently distributed throughout the site.

3-2.02 Arterial Roads

Comprising the City primary road system, see Drawings No. 3-1-001 and 3-1-002.

CLASSIFICATION	PRINCIPAL ARTERIALS	MINOR ARTERIALS	COLLECTOR ARTERIALS OR "COLLECTORS"	
FUNCTION	Intercommunity highways connecting largest centers & facilities. (Highway 203)	Intra-community highways connecting community centers and facilities. (Big Rock & Cherry Valley Roads)	Intra-community 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.	
LAND USE AREA				
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. Min. Right-of- Way Width (Ft)		100	84	60
K. Type of Curb or Shoulder & Ditch		Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter
L. Min. Half St. 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 B, C, and D above (See Section 3-2.05).
3. Maximum grade may be exceeded for short distances. (See Section 3-2.11).
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 Urban Arterials where bikeways are not required by the Bicycle Facilities Plan.
8. See Section 3-2.05 for allowed use of superelevations greater than 6 percent.
9. In residential areas, 5-foot Sidewalks shall be required on both sides of the street behind a 5-foot landscape strip. The standard Landscape Strips (LS) are 5-feet wide unless topographical limitations permit a reduction to the minimum 3-foot LS strip by the City Engineer.
10. Median and additional ROW for median required unless otherwise approved by Planning and Public Works Directors.
11. Parking lanes required on both sides of roadway for all zones except residential zones less than R-8 unless otherwise approved by the Planning and Public Works Director.
12. Residential (less than R-8): Pavement Width Parking one side 26', parking both sides 32'. R-8 or greater and other zoning designations Pavement Width Parking one side 28', parking both sides 34' unless otherwise approved by the Planning and Public Works Director.

3-2.03 Residential Access Streets

Serving single-family development, see Drawings No. 3-1-001 through 3-1-006.
For multiple-dwelling development, see Section 3-2.04

RESIDENTIAL ACCESS STREETS

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.
LAND USE AREA			
Serving Potential Number of Single-Family Dwelling Units	Over 100 (3)	100 Max [4]	50 Max.
CRITERIA			
A. Typical Road Type	Vertical Curb[16]	Vertical Curb[16]	Vertical Curb
B. Design Speed (MPH) [5]	25-30	25-30	Low Speed Curve See Sec. 3-2.10
C. Max. Superelevation (Ft./Ft.)	See Sec. 3-2.05B	See Sec. 3-2.05B	See Sec 3-2.05B
D. Horizontal Curvature Min. Radius (Ft.)	See Table 3-2.2	See Table 3-2.2	Low Speed Curve See Sec. 3-2.10
E. Max. Grade [6]	12	15	15
F. Standard Stopping & Entering Sight Distance (Ft.) [7] (8)	See Table 3-2.2	See Table 3-2.2	150 ft.
G. Concrete Sidewalks	Both sides with LS Strip (15)	Both sides with LS Strip (15)	Both sides with LS Strip (15)
H. Min Pavement Width (Ft.)	26/32[18,19]	26/23[17,8,19]	26/3217,8,19]
I. Min. Roadway Width (Ft.) [11]	26/32[18,19]	26/32[17,8,19]	26/32[17,8,19]
J. Min. Right-of-way Width [12]	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
L. Min. Half St. Paved Width (Ft.)	20	20	20
M. Min. One-Way Paved Width (Ft.)	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 1.25 for one-way loops.
3. See Section 3-2.20 for residential access connection requirements.
4. See Section 3-2.21 for urban 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 of B, C, and D 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 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 Engineer (See Section 3-2.13).
9. A vertical curb & gutter road may be required based on site conditions and the 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. Right-of-way (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, Dwg. 3-1-005 or Extruded Curb, Dwg. 3-1-006 is acceptable.
14. In Old Town Duvall, open ditches and gravel shoulders are acceptable. Old Town Duvall is the area lying within and including Virginia Street, Taylor Street, 1st Avenue, and 4th Avenue.
15. In residential areas, 5-foot Sidewalks shall be required on both sides of the street behind a 5-foot landscape strip. The standard Landscape Strips (LS) are 5-feet wide unless topographical limitations permit a reduction to the minimum 3-foot LS strip by the City Engineer.
16. Median and additional ROW required to separate commercial and residential uses or as otherwise required unless approved by Planning and Public Works Directors.
17. Road width may be reduced per Section 3-2.01 upon approval of Planning and Public Works Director.
18. Parking lanes required on both sides of roadway for all zones except residential zones less than R-8 unless otherwise approved by the Planning and Public Works Director.
19. Residential (less than R-8): Pavement Width Parking one side 26', parking both sides 32'. R-8 or greater and other zoning designations Pavement Width Parking one side 28', parking both sides 34' unless otherwise approved by the Planning and Public Works Director.

3-2.04 Commercial Access Streets (See Drawings No. 3-1-001 and 3-1-002.)

CLASSIFICATION	MIXED USE DISTRICT 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 Streets	Typically public streets serving mixed use district	Typically public streets serving commercial office zones.	Typically public streets serving employment office	Public or private streets (See Section 3-2.06)
Land Use Area				
CRITERIA				
A. Typical Road Type	Curb	Curb	Curb	Curb
B. Design Speed (MPH) [2]	35	35	35	Low Speed See Sec. 3-2.10
C. Max. Superelevation (Ft./Ft.)	0.06	0.06	0.06	
D. Horizontal Curvature Min. Radius (Ft.) [2]	See Table 3-2.1	See Table 3-2.1	See Table 3-2.1	See Table 3-2.1
E. Maximum Grade (%) [3]	12	12	11	12
F. Standard Stopping Site Distance (Ft.) [4]	See Table 3-2.1	See Table 3-2.1	See Table 3-2.1	15-
G. Standard Entering Sight Distance (Ft.) [5]	See Table 3-2.1	See Table 3-2.1	See Table 3-2.1	N/A
H. Minimum Pavement Width (Ft.)	36[8]	36[8]	40	30
I. Min. Roadway Width (Ft.) [6]	36	36	40	34[9,10]
J. Min. Right-of-Way Width (Ft.)	60	60	60	54 [7]
K. Type of Curb or Shoulder& Ditch [6]	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter
L. Min. Half Street Paved Width (Ft.)	20	20	20	20
M. Min. One-Way Paved Width (Ft.)	20	22	24	20

NOTES:

1. "Commercial Access Streets" serve multiple-dwelling, business, and industrial developments. Within the above parameters, geometric design requirements shall be determined for specific streets 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 B, C, and D above. (See Section 3-2.05).
3. Maximum grade may be exceeded for short distances (See Section 3-2.11).
4. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the Engineer. (See Section 3-2.12).
5. 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).
6. For guardrail installations, shoulders shall be two feet wider.
7. Right-of-way (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).
8. Median required and additional ROW required to separate commercial and residential uses or as otherwise required unless approved by Planning and Public Works Directors

.9. Parking lanes required on both sides of roadway for all zones except residential zones less than R-8 unless otherwise approved by the Planning and Public Works Director.

10. Residential (less than R-8): Pavement Width Parking one side 26', parking both sides 32'. R-8 or greater and other zoning designations Pavement Width Parking one side 28', parking both sides 34' unless otherwise approved by the Planning and Public Works Director.

3-2.05 Horizontal Curvature and Sight Distance Design Values

A. The design values shown in Tables 3-2.1 and 3-2.2 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 percent superelevation may be used, upon approval of the City Engineer, for design of improvements to existing arterials, as necessary, to meet terrain and right-of-way 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, and as long as 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 3-2.2, which is based on AASHTO "Low Speed Urban Streets" design methodology. Superelevation may be used on urban residential streets as necessary to meet terrain and right-of-way conditions.

Table 3-2.1:
Arterial Streets And Commercial Access Streets Design Values

Design Speed (mph)	30	35	40	45
Horizontal Curvature for 6 % Superelevation, Radius (Ft.)	273	380	509	656
Horizontal Curvature for 8 % (maximum allowable on arterials) Superelevation, Radius (Ft.) (requires approval of the City Engineer)	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

Table 3-2.2:
Residential Access Streets Design Values

Design Speed (mph)	25	30	35
Horizontal Curvature, for 6 Percent Superelevation, Radius (Ft.)	135	215	320
Horizontal Curvature, for 4 Percent Superelevation, Radius (Ft.)	145	230	34
Horizontal Curvature, for 2 Percent 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 community street requirements 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:

1. Permanently established by right-of-way, 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

2. Built to these Standards, as set forth herein; and
3. Accessible at all times for emergency and public service vehicle use; and
4. Not obstructing, or part of, the present or future public neighborhood circulation plan developed in the Duvall Comprehensive Plan.
5. Not going to result in land locking of present or future parcels; and
6. Not needed as public roads to meet the minimum road spacing requirements of these Standards; and
7. 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.
8. At least one of the following conditions exists:
    a. The plat or short plat street will ultimately serve four (4) 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.
9. Maintained by a capable and legally responsible owner or homeowners' association or other legal entity made up of all benefited property owners; and

10. 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 of Duvall is not responsible.

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

D. The City of Duvall 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.8. Short plats proposed on properties to which the access is over private streets that do not meet the standards in this section shall be denied.

E. Private access tracts shall conform to the following criteria:

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

2. Designated 0.5 visitor parking spaces per each dwelling unit within dedicate pull-outs along the access tract or other dedicated public parking locations consistently distributed within the tract.

3. Direct access to a vehicular access tract or road frontage is required for each unit. Non-vehicle access to support innovative housing per the D.M.C. only allowed with direct access to a minimum 5-foot wide concrete sidewalk within a pedestrian access tract and Planning and Public Works Director approval.

4. Front yard setbacks shall be applied from the access tract unless the front yard setback can be measured from public right-of-way or common open space.

5. For up to 2 units: Minimum tract width of 25 feet with a minimum pavement width of 10 feet and a maximum pavement width of 20 feet per joint use driveway standards.

6. For three 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.

7. Greater than four units allowed only upon Planning and Public Works Director approval and when demonstrated that no other options are feasible. The total number of residential units accessed shall be limited to a maximum equal to 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 Planning and Public Works Directors.

8. 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 minimum requirements are satisfied based on City review and approval:

   a. Sufficient tract and pavement width is provided to allow the required designated 0.5 visitor parking spaces per dwelling unit.

   b. Sidewalks shall be required unless otherwise approved by the Planning and Public Works Directors.

   c. Landscape strips shall be required unless otherwise approved by the Planning and Public Works Directors.

   d. Access tract surface may be designed as ACP surface with a standard crown, curb line drainage, and pavement differentiation to delineate pathway and parking with a minimum integrated 4-foot wide dedicated walk zone surfaced with concrete within, and along the edge, of the 20-foot wide access tract surface.

   e. Alternatively, the 20-foot wide access tract may be surfaced entirely with concrete with either standard crown and curb line drainage or an inverted crown with centerline drainage.

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

3-2.07 Half Streets

See Drawing No. 3-1-010

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

1. Such street shall not serve as primary access to more than 35 dwelling units or tax lots; and

2. Such alignment is consistent with or will establish a reasonable circulation pattern; and

3. There is reasonable assurance of obtaining the prescribed additional right-of-way from the adjoining property with topography suitable for completion of a full-section road.

B. A half street shall meet the following requirements:

1. Right-of-way width of the half street shall equal at least 30 feet; and

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

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

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

5. For existing right-of-way 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 right-of-way and a five-foot-wide shoulder on the side of the right-of-way opposite the subject property or as required by the City Engineer, and

6. 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 type; and

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

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

C. When a 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 right-of-way 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 Drawing No. 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:

1. Minimum right-of-way 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 right-of-way provided as temporary easement pending forward extension of the street. Right-of-way may be reduced, provided utilities and necessary drainage are accommodated on permanent easements within the development. See Section 3-2.19.

2. 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 eight-foot shoulders with compacted crushed surfacing material.

3. 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 provided, island shall have full-depth vertical curb. Minimum diameter shall be 20 feet and there shall be 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 Home Owners Association shall maintain the landscape island.

B. A permanent cul-de-sac shall not be longer than 600 feet 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 80 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 Drawing No. 3-1-008.

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 Drawing No. 3-1-009. 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, subaccess streets, for horizontal curvature and stopping sight distance, apply.

1. Serves a maximum of 30 lots, with a maximum length of 400 feet, no dead ends, curves, cul-de-sacs, or intersections with adjacent alleys unless otherwise approved by the City Engineer. A maximum of 45 lots may be served with a maximum length of 600 feet provided that a mid-block pedestrian corridor is provided and upon approval by the City Engineer.

2. Minimum tract width 18 feet with a pavement surface of 17 feet (3 feet concrete, 11 feet of ACP, and 3 feet of concrete per Drawing 3-01-011) unless otherwise approved by the City Engineer. For differing structure setback requirements, alley configuration shall be designated to provide for safe turning access to properties.

3. Paved surface shall provide drainage along a minimum of one side of the alley per Drawing No. 3-1-011. Drainage provided by a thickened edge on one side and cross slope in one direction shall be allowed only upon approval of the City Engineer.

4. 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. Horizontal curves shall not be allowed if slope exceeds 7 percent and all alleys shall be straight unless otherwise approved by the City Engineer. Alley entries shall be provided by a standard driveway type cut through the curb & gutter and sidewalk section.

5. 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

A. Intersections

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

B. Spacing between adjacent intersecting streets, whether crossing or T-connecting, shall be as follows:

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

C. 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 right-of-way line (extended) of intersecting street as provided in Section 3-2.02, 3-2.03 or 2,04. See Drawing No, 3-05-002.

D. Entering Sight Distance, See Sections 3-2.02, 3-2.03, 3-2.04 and 3-2.12 for design requirements. See Tables 2.1 or 2.2 for specific entering sight distance values based on required design speed.

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

	Up to 75°	75° & Over
1. Minimum centerline radius (2-lane)	100 feet	55 feet
2. Minimum curb radius	80 feet	35 feet
3. 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 fifteen percent (15%) require verification by the Fire Chief that additional fire protection requirements will be met. Grades exceeding twelve percent (12%) shall be paved with ACP or Portland cement concrete (PCC) at the City Engineer discretion, and any grade over 15 percent must be PCC. No roadways over twenty percent (20%) are allowed except with approval of the City Engineer and only for short distances and 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 (SSD)

Stopping Sight Distance applies to street classifications as shown in Sections 3-2.02, 3-2.03 and 3-2.04. See Tables 3-2.1 and 3-2.2 for specific SSD values based on required design speed.

A. Height of eye is 3.5’ and height of object is 0.5.

B. Minimum SSD for any downgrade averaging three percent or steeper as provided in Section 3-2.05, Tables 3-2.1 and 3-2.2 shall be

increased by the values shown below for any downgrade averaging three percent or steeper (Source: AASHTO Policy on Geometric Design, Table III-2). Interpolate values for other design speeds and grades.

SSD ADJUSTMENT VALUES (FT)

DESIGN SPEED (MPH)	DOWNGRADE	3 Percent	6 Percent	9 Percent
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 stopping sight distance 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 Stopping Sight Distance.

1. Stopping sight distances for the design speeds of proposed commercial access streets, neighborhood collector streets and arterials must be met when intersecting arterials.

2. The minimum stopping sight distance on proposed intersection approaches for all other classifications of intersecting roadways shall be 125 feet.

3-2.13 Entering Sight Distance (ESD)

Entering sight distance applies on driveways and on streets approaching intersections as set forth in Sections 3-2.02, 3-2.03, and 3-2.04. Entering sight distance 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 3-2.1 and 3-2.2.

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

B. Requirements in Section 3-2.05, Tables 3-2.1 and 3-2.2 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 percent for single-unit trucks and 70 percent 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 (16') of ACP or PCC surface on either side of the median or as approved by the City Engineer. Median 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 right-of-way for an arterial 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 median subject to approval by the City Engineer.

3-2.15 One-Way Streets

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

3-2.16 Bus Zones and Turn-Outs

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 to determine bus zone (stop) locations and other bus operation needs. The road project shall provide wheel chair accessible landing pads at designated bus zones as per Section 3-3.02 of the Standards and where required shall include turn-outs and shelter pads. Pedestrian and handicapped access improvements within the right-of-way 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. Surfacing requirements may also be affected, particularly on shoulders. See Section 3-4.01B of the Standards, 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, entering sight distance 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, County, State, or Federal 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 right-of-way line. Such easements may be required by the City Engineer in conjunction with dedication or acquisition of right-of-way.

B. Right-of-way reduction on subcollectors, local access (residential) and minor access (commercial)

In proposed developments served by underground utilities within easements, the right-of-way 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 right-of-way to a minimum width, the right-of-way, 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 four inches in diameter within four feet of back of sidewalk shall not be permitted.

3-2.19 Access and Circulation Requirements

In order to provide a second access to a residential subdivision, short plat subdivision, or planned unit development, 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.

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

1. No other practical alternative exists, or
2. Existing street was previously stubbed indicating intent for future access, or
3. An easement has been recorded specifically for said purpose,

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

1. A more practical alternative exists, or
2. Existing streets do not meet Section 3-2.03.

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

B. 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 3-2.20 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 1500 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:

1. 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 where:

   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.

2. 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:

1. 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.

2. 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.

3. Turning Radius:

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

4. 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”.

5. 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 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.

6. Grade:

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

E. Marking:

Where required by the Fire Chief or 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 be maintained in a clean and legible condition at all times and be replaced or repaired when necessary to provide adequate visibility.

F. 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” per City of Duvall Standards, with no parking on either side.

G. Required Gates and Barricades:

The Fire Chief or 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 be secured in an approved manner.

H. Security Gates:

The installation of security gates across a fire apparatus access road shall be approved by the Fire Chief or designee. Where security gates are installed, they shall have an approved means of emergency

operation. The security gates and the emergency operation shall be maintained operational at all times.

3-2.22 Curb Extensions

A. Curb extensions to reduce pavement width shall be allowed provided that emergency access, essential services, roadside parking, pedestrian and bicycle use, and other facilities and uses can be adequately served.

B. Curb extensions shall be designed and constructed to increase traffic calming, increase safety, and reduce pedestrian exposure at crosswalks and intersections. Curb extensions shall adequately delineate dedicated parking within the right-of-way.

C. Curb extensions shall be designed and constructed to prohibit parking within 30 feet of an intersection.

D. Curb extensions shall provide a minimum 20-foot pavement width and shall be required unless approved by the City Engineer.

SECTION 3:
3-3.00 DRIVEWAYS, WALKS, & TRAILS

3-3.01 Driveways

A. Dimensions, slope, and detail shall be as indicated in Drawings No. 3-03-001, 3-03-003, 3-03-004, 3-03-005 and 3-03-006, as further specified in the following subsections. See Section 3-2.13 for entering sight distance requirements.

B. Conditions for Approval of New Driveways:

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

2. 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.

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

4. 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 the adjacent structure or other structures or facilities.

C. Location and Width of New Driveways. Refer to Drawing No. 3-3-006.

1. 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 3.a. and 3.b. below. Shared type driveways are allowed with approval from the City Engineer.

2. 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.

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

a. A joint use driveway tract may be used to serve two parcels:

(1) Minimum tract width shall be 25 feet, cross slope in one direction and curb or thickened edge on one side. Minimum tract length shall be 20 feet from right-of-way 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.

4. 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 Drawings 3-3-003 and 3-3-004. The maximum change in driveway grade, within the right-of-way, shall be 8% within any 10 feet of distance on a crest and 12% within any 10 feet of distance in a sag vertical curve. Driveway shall be graded to match into possible future widened road section without encroachment into graded shoulder or sidewalk. Reverse slope driveways shall include drainage (strip drain) at the structure or inflection point. 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 driveway slope from the right of way to the house shall not exceed 12%; only the City Engineer may authorize a steeper slope if no other alternative exists.

5. 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 traffic engineering analysis 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 Concrete Sidewalks

A. Shall be required as follows:

1. On all arterials, neighborhood collectors, subcollectors, multiple-dwelling and business access streets, both sides.

2. On subaccess streets and industrial access streets, both sides unless the City Engineer reduces sidewalk to one side because of excessive topography making construction impractical.

3. On minor access streets (commercial), both sides unless the City Engineer reduces sidewalk to one side because of excessive topography making construction impractical.

4. On minor access streets (residential) and on any cul-de-sacs with off-street walkways extending from their termini to other streets, parks, schools, bus stops, or other pedestrian traffic generators, both sides unless otherwise approved by the Planning Department 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. Shall be constructed:

1. 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;

2. Outside of a 5' planting strip unless excessive topography warrants the City Engineer to reduce landscape strip to 3' or entirely for all roadways other than arterials;

3. At least five feet wide on residential and commercial access streets. This means five feet clear of mailboxes or other obstructions, except where approved as a variance. Width shall

be minimum six and one-half feet on arterials if curb is next to traveled lane (but not necessary next to designated parking or bike lanes). The additional width, one and one-half 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;

4. 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 right-of-way.

   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 wheel chair access to transit services.

5. With specified width greater than eight feet where City Engineer determines this is warranted by expected pedestrian traffic volume;

6. With Portland cement concrete surfacing as provided in Sections 3-3.03 and 3-4.01. See specifications for joints in Section 3-3.04 and Drawing No. 3-3-001.

3-3.03 <u>Curbs, Gutters and Sidewalks</u>

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

B. Concrete for curbs, gutters, and sidewalks shall be Class 3000, furnished and placed 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 Sections 5-05.3(14) and 6-02.3(6)A shall apply. The City Engineer may reject any of the curb, gutter & sidewalk based on installation

means & methods, performance or aesthetics (true vertically, i.e. no ponding and true horizontally, i.e. not choppy and/or wavy).

C. Extruded cement concrete curb shall be anchored to existing pavement by either steel tie bars or adhesive in conformance with WSDOT/APWA Standard Specification Section 8-04.

D. Extruded ACP curbs shall be anchored by means of a tack coat of asphalt in accordance with WSDOT/APWA Standard Specification Section 8-04.

E. 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" or 1/4" x full depth of premolded 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).

B. A dummy joint consisting of 3/8" or 1/4" x 2" of premolded 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 premolded strip up to 1/2" 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" V-grooves shall be made in sidewalk at five-foot intervals, intermediate to the dummy joints.

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

F. Interface between curb and adjacent sidewalk on integral pour construction shall be formed with 1/4" radius edging tool. On separate pour construction an expansion joint consisting of 3/8" or 1/4" x full depth of premolded 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, ramped sections to facilitate passage of handicapped persons shall be constructed through curb and sidewalk at street intersections and other crosswalk locations. See Drawings No. 3-4-002 and 3-4-003. Where a ramp is constructed on one side of the street, a ramp shall also be provided on the opposite side of the street. Deficient on-site and off-site ramps and sidewalk approaches shall be improved to current standards or as required by the City Engineer. Curb ramps shall single direction (two separate ramps per intersection corner) and be positioned so that a ramp opening is situated within the marked crosswalk or crossing area if unmarked.

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

A. Steps shall only be used where acceptable alternative access is available for handicapped access and there is a need for a separate stairway. Where used, concrete steps shall be constructed in accordance with Drawing No. 3-5-008 or other design acceptable to the City Engineer and consistent with the WSDOT/APWA Standard Specifications. Handrails, whether for steps or other applications, shall be provided consistent with Drawing No. 3-5-008 and the WSDOT/APWA Standard Specifications.

B. Ramps used to provide handicapped access shall have a maximum slope of 12:1 with a maximum rise of 30 inches between landings. Landings shall have a minimum length of five feet and should be of sufficient width to allow wheelchairs to pass, generally five feet minimum width for two-way traffic meeting all current ADA standards.

3-3.07 ACP Shoulders

A. ACP shoulders may be used where approved by the City Engineer on existing roads to provide for bicycle and pedestrian use as specified in Section 3-1.03B and to provide continuity of design. When allowed, paved shoulders shall be placed in conformance with Sections 3-2.02 and 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, bicycle and equestrian trails shall be provided where designated in Duvall's Comprehensive Plan or where required by the Development Review Committee because of anticipated significant public usage. Separated facilities are typically located on an easement or within the right-of-way when separated from the roadway by a drainage ditch or barrier. Where separate walkways, bikeways, or equestrian trails intersect with motorized traffic, sight distance, marking and signalization (if warranted) shall be as provided in MUTCD. Facilities shall be designed as follows:

A. Separated walkways are designed primarily for pedestrians and are typically located within the right-of-way or easement. Minimum width shall be five feet.

B. Neighborhood pathways are soft surface facilities designed for pedestrians and equestrians. Such pathways shall be a minimum four feet wide with at least one and one-half foot clearance to obstructions on both sides and 10 foot vertical clearance. Pathways shall be designed and located so as to avoid drainage and erosion problems. Pathways shall be constructed of a minimum 6-inches of crushed surfacing top course with a manufactured border strip over an approved geotextile fabric upon firm and unyielding subgrade as approved by the City Engineer.

C. Multi-purpose trails are typically designated for bicycle and pedestrian use and in general follow a right-of-way independent from any road. Multi.-purpose trails shall be designed to bicycle path standards as described in Section 3-3.10.

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 Bikeways

A. Bikeways are generally shared with other transportation modes, although they may be provided exclusively for bicycle use. Bikeways are categorized below based on degree of separation from motor vehicles and other transportation modes. This classification does not denote preference of one type over another. Bikeways are categorized 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. 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.

B. A bikeway shall be provided:

1. Wherever called for in the Comprehensive Plan or Capital Improvement Program.

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

C. Striping and signing shall be implemented as follows:

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

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

D. The planning and design of bikeways in any category shall be in accordance with Section 1020 of the WSDOT Design Manual and the AASHTO Guide for the Development of Bicycle Facilities, current edition.

3-3.11 Equestrian Facilities

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

1. Shoulders adjacent to the traveled way intended for equestrian use shall be surfaced full-width, minimum four feet with eight feet desirable, Surface shall be two and one-half inches of crushed surfacing base course and one and one-half inches of crushed surfacing top course.

2. A separated equestrian trail shall be constructed with an 18 percent maximum grade, 10-foot vertical clearance and a five-foot wide pathway zone. The trail shall be constructed of native soil or, where drainage or erosion problems are present, a minimum of two and one-half 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:
3-4.00 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 on 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 per the City Engineer upon review of an engineered pavement evaluation. All expenses for determining revised materials shall be borne by the Developer.

TYPE OF FACILITIES	ACP TOP LIFT	ACP BASE LIFT	PORTLAND CEMENT CONCRETE	CRUSHED SURF. TOP COURSE	CRUSHED SURF. BASE COURSE
A. Residential Access Streets (in both cut or fill section) Portland Cement type *On neighborhood collectors **Arterials	2" (*3", **4")	4" (**6")	5" Class 4000	4" (**6")	8" (**12")
B. Shoulders *On bus routes	2" (3"*)	4"		4"	8"
C. Sidewalks			5" Class 3000	6"	
D. Walkways & Bikeways Alternative I	2"			2"	4"
Alternative II			5", Class 3000	2"	4"

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).

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

1. On curbed streets with sidewalks, driveway shall be paved with Portland cement concrete Class 4000 from curb to back edge of sidewalk. See Drawings No., 3-3-004 and 3-3-005.

2. On shoulder and ditch section, driveway between edge of pavement and right-of-way line shall be surfaced as required by Drawing No. 3-3-003.

3. On thickened edge roadways with underground utilities, Portland cement concrete may be used for driveways between the thickened edge and the right-of-way line provided that a construction joint is installed at the right-of-way line.

F. STREET WIDENING/ADDING TRAVELED WAY TO EXISTING ROADS

1. 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 1.5-inches, plus a pre-level course, full width 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.

2. 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.

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

4. 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 <u>Requirements for Residential Streets on Poor Subgrade</u>

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 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 & Lay-Down Procedures

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

A. All pavement shall be ½" HMA unless otherwise required or approved by the City Enginereer.

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

C. ½" HMA shall be used for the pavement base layer, and 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:

1. pavement widths less than eight feet; and

2. 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

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.

Channelization shall be required when through traffic is diverted around a lane or obstacle; and when connecting full width streets with different cross sections; and when extending an existing street with a new cross section different than the existing one. 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.

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

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 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.

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

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” H-5d. 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.

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.

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 eight-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.

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:
3-5.00 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 four feet above the keyway in stable soil conditions, which will result in no significant foundation settlement or outward thrust upon the walls. The Duvall Municipal Code 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 Drawing Nos. 3-05-004 through 3-05-006. For heights over four 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). The placement of any rockery type wall is subject to approval by the City Engineer.

B. Materials

1. Size categories shall include:

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

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

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

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

2. 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 percent 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 Drawing No. 3-05-004.

D. Underdrains

1. A minimum six-inch diameter perforated or slotted drainpipe shall be placed in a shallow excavated trench located along the inside edge of the keyway. 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 Drawing Nos. 3-05-004 through 3-05-006.

2. The perforated pipe shall be connected to the storm drain system or to an acceptable outfall.

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 six 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 two-inch square probe. See Drawing Nos. 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 four inches and a minimum size of two 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 six 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 a qualified City Engineer, See Drawing No. 3-05-007.

H. Sidewalks Above Rockery Facings: When a sidewalk is to be built over a rock facing, 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 two inches. See Drawing No. 3-05-006.

I. Fences and Handrails

A chain link fence or metal handrail shall be installed when rockery is three feet or greater in height. (See Drawing Nos. 3-05-004 through 3-05-006 and 3-05-008).

3-5.02 Side Slopes

A. Side slopes shall generally be constructed no steeper than 3:1 on both fill slopes 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. Side slopes on projects funded by federal grants shall be constructed in conformance with Local Agency Guidelines.

B. Side slopes shall be stabilized by grass sod or seeding or by other planting or surfacing materials acceptable to the City Engineer.

3-5.03 Street Trees & 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 City of Duvall Code.

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 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. In particular, 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 standards in Drawing No. 3-05-009.

E. New trees shall not include poplar, cottonwood, soft maples, gum, any fruit bearing trees or any other tree or shrub whose roots are likely to obstruct sanitary or storm sewers. New street trees shall not be allowed to obstruct entering sight distance for intersection or driveways. Specific trees to avoid include bigleaf maple, box elder, silver maple, catalpa, London plane, cottonwoods, weeping willows, Douglas fir, western red cedar, western hemlock, deodara cedar, spruces, and pines. See City of Duvall Code.

F. Street tree plans on bus routes shall be reviewed by Metro Service Planning, phone 684-1622 (or current phone number)i.

3-5.04 <u>Mail Boxes</u>

A. The responsibilities for location and installation of mailboxes in connection with the construction or reconstruction of City streets are as follows:

1. City Engineer or his representative will:

a. Require street improvement plans, whether for construction by the City or by a private builder, to show clearly the

designated location or relocation of mailboxes, whether single or in clusters.

b. Require with this information any necessary widening or reconfiguration of sidewalks with suitable knock-outs or open strips for mailbox posts or pedestal.

c. Require these 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. This will be a prerequisite to plan approval.

d. Require construction of mailbox locations in accordance with these plans, through usual inspection and enforcement procedures.

2. Duvall Post Office will:

a. Designate location and manner of grouping of mailboxes when so requested by the City. Note on the plans the type of mailbox delivery: NDCBU (Neighborhood Delivery and Collection Box 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 NDCBU's is the responsibility of the owner.

3. Owners or residents served by mailboxes, at time of original installation, will:

a. If using individual mailboxes, clustered or separate, install and thereafter maintain their own mailboxes as instructed by the Post Office.

b. If NDCBU delivery, rely on Post Office to provide and maintain NDCBU'S.

4. Builders or their contractors shall:

   a. Where there are existing mailboxes and no plans to replace them with NDCBU'S:

      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 plans or as directed by the City Engineer. Use only existing posts or materials except that any damage caused by the builder or his contractor is to be repaired at the expense of the builder.

   b. Where there are existing NDCBU's or plans to install NDCBU'S:

      Call Duvall Post Office to locate or relocate NDCBU's and make the necessary installation.

B. Installation methods are as follows:

   1. NDCBU's shall be installed for the Postal Service generally in accordance with Drawing No. 3-05-012.

   2. Mailboxes, in the general case, shall be set in accordance with Drawing No. 3-05-010 or 3-05-011. Boxes shall be clustered together when practical and when reasonably convenient to the houses served.

3-5.05 Street Illumination

Illumination will be required on all new roadway construction.

Widening of arterials with existing illumination will require maintaining the illumination. Widening to the ultimate roadway width will require illumination designed to current construction practices.

Installation of cut-off luminaires are required.

Street lighting systems design shall 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. The following are standards for lighting levels and only the City Engineer may approve a deviation from these Standards.

		Street Illumination Levels
a.	All Intersection	.6 to .8 Foot Candles
b.	Cul De Sac's	.4 Foot Candles
c.	Curves	.4 Foot Candles
d.	Hills	.4 Foot Candles
e.	Parks	.8 to 1.6 Foot Candles
f.	Retention Ponds	.4 Foot Candles
g.	Depression in Roadway (Sag Curves)	.6 to .8 Foot Candles
h.	Crosswalks	.6 to .8 Foot Candles
i.	Mail Boxes (Ganged)	.4 Foot Candles
j.	Bus Stops	.6 to .8 Foot Candles
k.	Frontages: School, Shopping centers, etc.	.8 to 1.6 Foot Candles

Puget Sound Energy (PSE) provides, installs, owns and maintains the street illumination system for the City of Duvall.

A. Streetlights shall be provided with the development of all-new subdivisions and short plats, and for other commercial, industrial or institutional property development.

B. 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 development permit.

C. Light Standards:

1. 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.
2. 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.
3. In areas where the street width differs from the City standard, or there are other factors influencing the location of the street lights, the City Engineer will provide input to the applicant on acceptable options.

D. Recommended Mounting Heights

Type of Road	Wattage	Mounting Height
Arterial	150 to 200	25 to 30 feet
Residential, Private	100 to 150	13 to 15 feet

1. Street light poles shall be direct buried as specified by PSE.
2. Line loss calculations shall show that no more than a 5 percent voltage drop occur in any circuits. Branch circuits shall serve a minimum of four luminaires.
3. For Conductors, the minimum wire size for any illumination circuit shall be No. 6 Aluminum. No. 10 wire will be acceptable for the pole and bracket cable within the light standard only.
4. Area classification: The area classifications “commercial”, “industrial”, “intermediate” and “residential” shall mean the following:
    a. Commercial: That portion of a business development where ordinarily there are large numbers of pedestrians and a heavy demand for parking space during periods of peak traffic or a sustained high pedestrian volume and a continuously heavy demand for off-street parking space during business hours. This definition

applies to densely developed business areas outside of, as well as those that are within, the central part of the City.

b. Industrial: The portion of a City in a business development, normally manufacturing, warehousing or wholesale oriented, where ordinarily there are few pedestrians and a low parking turnover, but there is a large amount of truck, multiple axle truck, and trailer traffic.

c. Intermediate: That portion of the City which is outside a downtown area but generally within the zone of a business or industrial development, often characterized by moderately heavy nighttime pedestrian traffic and a somewhat lower parking turnover than is found in a commercial area. This definition encompasses densely developed apartment areas, hospitals, public libraries, and neighborhood recreational centers.

d. Residential: A residential development or a mixture of residential and commercial establishments characterized by few pedestrians and a low parking demand for turnover at night. This definition includes areas with single-family homes, townhouses, and/or small apartments. Regional parks and vacant lands are also included.

*The area classification for specific areas shall be determined by the City of Duvall.

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 builder or developer.

B. Survey monuments shall be placed or replaced in accordance with recognized good practice in land surveying, and in conformance with Drawings No. 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 Drawing No. 3-05-003.

A. Type I or Type II barricades may be used when traffic is maintained through the area being constructed/reconstructed.

B. Type III barricades may be used when roadways and/or proposed future roadways are closed to traffic. Type III barricades may extend completely across a roadway (as a fence) or from curb to curb. Where provision must be made for access of equipment and authorized vehicles, the Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where job site access is provided through the Type III barricades, the developer/contractor shall assure proper closure at the end of each working day.

C. In the general case, Type III permanent barricades shall be installed to close arterials or other through streets hazardous to traffic. They shall also be used to close off lanes where tapers are not sufficiently delineated.

D. Type III barricades shall be used 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. Bollard design shall be in accordance with Drawing No. 3-05-013 or other design acceptable to the City Engineer or City Engineer. No fire apparatus access roads shall be blocked in this manner without the concurrence of the Fire Chief. Bollards shall be located at least 10 feet laterally from the paved edge of roadway.

3-5.09 Guardrail/Embankment Heights

Guardrail installations shall conform to WSDOT/APWA Standard Plan C-1, Beam Guardrail Type 1 and C-2, Guardrail Placement. End anchors shall conform to WSDOT/APWA Standard Plan C-6, Beam Guardrail Anchor Type 1.

Evaluation of embankments for guardrail installations shall be in accordance with Figure 710-6 of the WSDOT Design Manual.

3-5.10 Off-Street Parking Spaces

The number of off-street parking spaces required shall conform to City of Duvall Code. The specifications for off-street parking spaces shall be as provided in City of Duvall Code.

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 right-of-way 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 eight and one-half feet from the face of the curb in business areas or five and one-

half feet from face of curb in residential areas. Signage, fire hydrants, street lights, 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, to include constraints on placement of poles on the outside of curves.

SECTION 6:
3-6.00 BRIDGES

3-6.01 Principal References

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. All new bridges shall be designed to carry an AASHTO HS 20-44 live load or greater. 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 in Section 3-6.01 above.

D. Overhead vertical clearances for motor traffic on the traveled way or under overpasses shall be 16.5 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 Surface Water Design Manual.

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 U. S. Coast Guard permits.

B. Bridges involving deposition of material in waters of the United States or their adjacent wetlands require a U. S. 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 from the State Department of Fisheries or the State Department of Wildlife.

D. Any work within waters of the State requires a Water Quality Certification Waiver from the State Department of Ecology.

E. Where bridge structures lie on or over submerged lands a lease from the Washington State Department of Natural Resources may be necessary.

F. Structures located on shoreline zones as defined in City of Duvall Code require a substantial development 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:
3-7.00 DRAINAGE

3-7.01 General

A. Designs: Drainage facilities shall be designed consistent with City of Duvall Storm Drainage Design Standards and the latest edition of the King County Surface Water Design Manual. Structures shall be placed

and constructed as shown in the Standard Drawings.

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 Drawings.

C. Conflicts: Where technical conflicts may occur between this document and the Storm Drainage Design Standards, 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 Storm Drainage Design Standards.

A. On grades up to 12 percent, grass lined ditches with grasses as specified in 3-7.02D shall be used for the drainage requirement. These ditches shall be designed and constructed in accordance with Drawings No. 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, additional methods including jute-matting may be required in certain areas and shall be used as determined by the City Engineer. For grades between 0 and 3 percent, grass lining is all that is required. For slopes between 3 and 6 percent, 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.

B. Alternatively; Where the grade is over 6 percent and not over 9 percent, 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 percent 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 percent
Passing 3-inch square sieve	40 percent max,
Passing 3/4-inch square sieve	10 percent max.

2. Rocks shall be placed so as to form a firm, dense, protective mat consistent with examples in Drawing No. 3-02-024 and conforming to the design surface of the ditch. Individual rocks shall not protrude more than three inches from that surface.

C. Where the grade exceeds 9 percent 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.

D. Grass seed mixture by weight may be 10 percent Highland Colonial Bentgrass, 50 percent Perennial Rye, 40 percent Pennlawn Red fescue, hydroseed at 150 lbs./acre, handseed at 3 lbs./1,000 square feet. Where there is high groundwater, the following species may be substituted or added: Meadow or Pacific foxtail, Timothy, or Redtop.

3-7.03 <u>Storm Sewers and Culverts</u>

A. Minimum pipe size shall be 12-inch diameter. Minimum 2-foot thick cover over top of pipe unless otherwise approved. Eight-inch diameter may be permitted on cross street laterals less than 70 feet long to avoid utility conflict or meet shallow gradient.

B Minimum pipe slope shall be 1 percent unless otherwise approved by the City Engineer. No partially or fully submerged outfalls or pipe systems shall be approved.

C. 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.

D. Driveway culverts shall conform to Drawing No. 3-03-003.

E. The following pipes are allowed for use within the City of Duvall's storm drainage system; Profile Wall PVC, Ductile Iron or reinforced concrete pipe for shallow or excessively deep situations and high density polyethylene (HDPE) pipe.

F. Pipe shall be bedded on gravel backfill for pipe bedding as specified in the general notes for storm drainage. Temporary above ground installation of SWPE does not require pipe bedding.

G. PVC, LCPE and SWPE may be used for temporary situations but not for permanent ones.

H. Concrete pipe shall be rubber gasketed and securely banded. Leak testing shall be conducted if required by the City Engineer.

I. Bevel the projecting ends of culverts within the right-of-way.

3-7.04 <u>Catch Basins and Junctions</u>

A. Catch basins shall be spaced no greater than 150 feet for road grades less than one percent, 200 feet for grades between one and three percent; and 300 feet for grades three percent and greater, Where the width of the tributary road surface exceeds 35 feet, the cross slope exceeds four percent, or the 10-year, 24-hour rainfall exceeds three and one-half 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 five feet into the traveled way for the 10-year storm event, using flows generated by the rational formula.

B. Use catch basin to collect water from road surfaces.

C. Connections to pipe systems may be made without placing a catch basin or manhole on the mainline by meeting all of the following conditions:

1. The mainline pipe is 48 inches or greater and at least two times the size of the connecting pipe.

2. Make connections in accordance with the manufacturer's recommendations. Standard shop fabricated tees, wyes and saddles shall be used, except for concrete pipe connections constructed in accordance with Drawing No. 3-02-002.

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. See Drawing No. 3-02-002.

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 quality/quantity control facilities. Receiving systems may have separate conveyance facilities: one connecting to quality/quantity 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 five feet.

F. Manholes may be used in lieu of catch basins if they do not collect surface water.

G. Roof and yard drains, or other concentrated flow from adjacent property shall not discharge over the surface of roadways or sidewalks.

H. Catch basins or manholes 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 cross walks.

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 manhole covers. See Drawing No. 3-02-022. Existing catch basins which no longer collect runoff shall have their frame and grates replaced with solid covers (See Drawing No. 3-02-015).

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 slit drains 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 the Storm 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 lbs grab tensile strength per ASTM D-1682, minimum 40 lbs puncture strength per ASTM D-751 Modified, and 20-100 Equivalent Opening Size (EOS) based on U.S. standard sieves.

3-7.07 Trenches

See Section 3-8.03.

SECTION 8:
3-8.00 UTILITIES

3-8.01 Franchising Policy and Permit Procedure

A. Utilities to be located within existing and proposed City road right-of-way shall be constructed in accordance with current franchise and/or permit procedure and in compliance with these Standards. In their use of the right-of-way, 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 in Old Town Duvall if approved by the City Engineer. Also, utilities are subject to City policies relating to drainage, erosion/sedimentation control and sensitive areas as set forth in City Codes and the Storm Drainage Design Standards.

B. 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 utility to certify that the installations conform to these Standards and that the proposed work is in conformity with sound engineering principles relating to highway safety.

C. Requests for exceptions to these Standards will be processed in accordance with variance procedure as referenced in Section 3-1.08.

3-8.02 Standard Utility Locations Within the Right-of-Way

Utilities within the right-of-way 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, Drawings No. 3-01-001 through 3-01-006, and as indicated below. 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 so 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 three feet from edge of traveled lane.

2. Curb and Gutter Section:

   Preferable: One and one-half feet 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 minimum cover from finished grade, ditch bottom or natural ground.

B. Individual water service lines shall:

1. Be placed with minimum 36-inch cover from finished grade, ditch bottom or natural ground.

2. Use road right-of-way only as necessary to make side connections.

3. For any one connection, not extend more than 60 feet along or through the right-of-way, or the minimum width of the existing right-of-way.

4. Water meter boxes, when placed or re-placed, shall be located on the right-of-way line immediately adjacent to the property being served, unless otherwise approved by the City Engineer. Meter box locations within the right-of-way may be approved by the City Engineer based on site conditions which make routine service access difficult or impractical.

C. Sanitary Sewers: In the general case, five feet south and west of centerline; depth 36-inch minimum cover from finished grade, ditch bottom or natural ground.

D. In the case of individual sanitary sewer service lines which are force mains the pipe shall:

1. Be minimum two inches I.D., or as required by the utility to maintain internal scouring velocity.

2. If nonmetallic, contain wire or other acceptable proximity detection features; or be placed in a cast iron or other acceptable metal casing.

3. 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 right-of-way line.

4. Be jacked or bored under road unless otherwise approved by the City Engineer.

E. Sanitary and water lines shall be separated in accordance with good engineering practice such as the Criteria for Sewage Work Design, Washington Department of Ecology, latest edition.

F. 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.

G. 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 right-of-way 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 Drawing No. 3-05-001 unless protected by concrete barrier, suitable impact attenuating device or placed more than three and one-half feet behind face of guardrail, or as allowed by an approved variance.

   b. On vertical curb type roads with a speed limit less than 40 miles per hour, poles or obstacles shall be placed clear of sidewalks and at least eight and one-half feet from face of curb in business areas and five and one-half feet from curb face in residential areas. On urban roads with a speed limit of 40 miles per hour or greater, poles and obstacles shall be placed in accordance with Drawing No. 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” x 4” wood post or a 1-1/2-inch standard (hollow) iron pipe or to

"breakaway" fire hydrants installed to manufacturer's specifications.

3. Deviations from these pole and obstacle clearance criteria may be allowed by an approved variance when justified by suitable engineering study considering traffic safety. Only the 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 of Duvall.

H. 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

A. General: The WSDOT/APWA Standard Specifications, particularly Section 7-17.3(3) will generally apply unless otherwise stated below.

B. Utility Cuts On Existing Traveled Roads

1. In trenching through existing pavement, the open cut shall be a neat-line cut made by either saw cutting or jackhammering a continuous line. Trench sides shall be kept as nearly vertical as possible. Compaction and restoration must be done as detailed below and immediately after the trench is backfilled, so as to cause least disruption to traffic, Cement concrete pavement shall be cut one foot outside the edge of the trench on each side.

2. In cuts parallel to road alignment:

   a. All trench backfill under roadway shall be mechanically compacted to 95 percent of maximum density (modified proctor) except for trenches over eight feet in depth. Throughout the length of any pipe run, manhole to manhole, in which any part is over eight feet deep, backfill at depths over four feet shall be compacted to 90 percent maximum density by mechanical compaction. The top four feet of the trench line shall then be mechanically compacted to 95 percent. 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 percent density (modified proctor) cannot be achieved with existing backfill, the top four 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 percent density (modified proctor).

c. Restoration of a trench within pavement shall include a minimum of six inches of crushed surfacing material and ACP the same thickness as the existing pavement plus 1" or a minimum of three inches, whichever is the greater. Pavement shall then be overlaid full width with a minimum of 1.5 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.

3. 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. 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. Backfill shall be placed and compacted mechanically in six inch lifts with a City inspector present. If the capability can be demonstrated, based on compaction equipment or quality of backfill to achieve 95 percent density (modified proctor) in thicker lifts, the depth of backfill lifts may be increased up to one foot. After backfill and compaction, an immediate 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 the 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.

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, either by mechanical compaction as described in B.2 above.

D. Controlled Density Backfill:

As an alternative to mechanical compaction, trench backfill above the bedding and below the base course and pavement may be accomplished by use of controlled density backfill (CDF) in a design mixture approved by the City Engineer. On crossings required to be opened to traffic prior to final trench restoration, steel plates may be used-as approved by the City Engineer.

E. Testing:

1. Consistent with the above and prior to placing any surface materials on the roadway, it shall be the responsibility of the developer to provide density test reports certified by a professional Engineer. A minimum of one test shall be taken within every 500 feet of trench length and at depths up to 50 percent of trench depth, or as directed by the City Engineer. Compaction of laterals or service line trenches shall be tested where directed by the City Engineer. Testing of CDF shall be in accordance with ASTM D4832.

2. Whichever compaction method the installer elects, the backfill below four feet must test to be not less than 90 percent maximum density (modified proctor) and the upper four feet of backfill must test not less than 95 percent 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 percent as in B.2 above.

F. 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 traveled City streets shall notify City of Duvall Public Works Inspection office not less than one working day prior to doing the work. This notification shall include:

   a. Location of the work,

   b. Method of compaction to be used,

   c. Day and hour when compaction is to be done,

   d. Day and hour when testing is to be done.

2. As set forth in Section 3-9.03 of these Standards, failure to notify may necessitate testing or retesting by City of Duvall at the expense of the Developer or Utility. Furthermore, the work may be suspended pending satisfactory test results.

3-8.04 <u>Final Utility Adjustment (To Finish Grade)</u>

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 bricks; replacing frame and cover no higher than finished

grade of pavement and no lower than one-half inch below the pavement.

3. Filling and mechanically compacting around the structure and frame with crushed surfacing material or ACP, or pouring in five inch minimum thickness of cement concrete Class 3000 to within two inches of the top.

4. Filling the remaining two inches with ACP, 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 utility shall care for adjacent areas in compliance with Sections 1-04.11 "Final Cleanup" and 8-01 "Roadside Seeding" in the WSDOT/APWA Standard Specifications. In particular:

A. Streets and roads shall be cleaned and swept both during and after the installation work.

B. Disturbed soils shall be final graded, seeded and mulched after installation of 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 utility installation shall be cleaned out and the work site restored to a stable condition as part of site cleanup.

SECTION 9:

3-9.00 CONSTRUCTION CONTROL AND INSPECTION

3-9.01 Basis for Control of the Work

A. Work performed in the construction or improvement of City streets, whether by or for a private developer or by City contractor, shall be done in accordance with these Standards and approved plans and specifications (Section 3-1.07). It is emphasized that no work may be started until such plans are approved. Any revision to such plans shall be approved by the City Engineer before being implemented.

B. The City Engineer will have authority to enforce the Standards as well as other referenced or pertinent specifications. The City Engineer 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.

Provisions of Section 1-05 of the WSDOT/APWA Standard Specifications shall apply, with the term "City Engineer" therein construed to be the City Engineer as defined in Section 3-1.10.

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 right-of-way 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 by Public Works are identified as follows, with prior notification to Public Works (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 and permits must be in hand prior to the conference.

B. Clearing and Temporary Erosion/Sedimentation Control: One working day notice prior to initial site work involving drainage and installation of temporary water retention/detention and siltation control. Such work to be in accordance with Section 3-7.06 and the approved plans.

C. Utility and Storm-Drainage Installation: One working day notice prior to trenching and placing of storm sewers and underground utilities such as sanitary, water, gas, power, telephone, and TV lines. See Section 3-8.03F Notification and Inspection for additional information.

D. Utility and Storm Drainage Backfill and Compaction: One working day notice before backfill and compaction of storm sewers and 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 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 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 submit corrected plans (as-built) reflecting all minor and design plan changes of the road 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/or other electronic format as required by the City Engineer.

L. Final Maintenance Inspection: 30 days prior to the end of the maintenance period, Prior to release of the maintenance guarantee, there shall be successful completion of the maintenance period as described in Section 3-1.09, 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 the standard. 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 the municipal code.

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:

Compaction of the top four feet of fill subgrade and top six inches of cut subgrade shall meet a minimum 95 percent of maximum density in accordance with WSDOT/APWA Standard Specifications Section 2-03.3(14)C - Method B. Subgrade fill below the top two feet shall be compacted to 90 percent of maximum density.

B. Testing for Density:

1. Prior to placing any surfacing material on the roadway, it will be the responsibility of the developer/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:

After the subgrade preparation has been completed, it shall be thoroughly checked by the developer/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 in Development Construction

A. Interim Traffic Control:

The developer/contractor shall be responsible for interim traffic control during construction on or along traveled City roads. 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 the work. Traffic control shall follow the guidelines of Section 1-07.23 of the WSDOT/APWA Standard Specifications. All barricades, signs and flagging shall conform to the requirements of the MUTCD Manual. For more specific requirements for barricades, see Section 3-5.07 and Drawing No. 3-05-003. Signs must be legible and visible and should be removed at the end of each work day if not applicable after construction hours.

B. Temporary Road Closures and Detours:

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.

C. Haul Routes:

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.

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.

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.

D. Haul Road Agreement:

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.

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

Builders are responsible for timely notification of utilities in advance of any construction in right-of-way or utility easements. The utility One-Call Center phone number 1-800-424-5555 or 811 should be prominently displayed on the work site.

Please see Appendix G for Road Construction Notes to be incorporated into Engineering Plan Sets.

CHAPTER 4
DRAINAGE DESIGN STANDARDS

CHAPTER 4
STORM DRAINAGE

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CHAPTER 4
STORM DRAINAGE

SECTION 1:
4-1.00 STORM DRAINAGE

4-1.01 Purpose

It is the purpose of this chapter to implement the City Storm Drainage Utility (Duvall Municipal Code Section 9.06) City of Duvall Storm Drainage Ordinance #730, and NPDES Illicit Discharge and Compliance Ordinance 1090

It is expressly the purpose of this chapter to 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; to minimize water quality degradation and control of sedimentation of creeks, streams, ponds, lakes, and other water bodies; to preserve and enhance the suitability of waters for contact recreation and fish habitat; to preserve and enhance the aesthetic quality of the waters; to maintain and protect valuable groundwater quantities, locations, and flow patterns; to ensure the safety of City roads and rights-of-way; and to 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 L.I.D. (Low Impact Design) 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 King County's design standards.

4-1.02 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 approval;
5. Short subdivision approval;
6. Commercial, industrial, or multifamily site plan approval;
7. Planned unit development or Master Plan Development;
8. Conditional use permits;
9. Substantial development permit required under RCW 90.58 (Shoreline Management Act);
10. Right-of-Way use;
11. Logging, clearing, and other land disturbing activities;
12. Contain, or be adjacent to, a floodplain, stream, lake, wetland or closed depression, or a sensitive area as defined by the Sensitive Areas Ordinance #652, 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 of Duvall 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 King County Surface Water Design Manual.

2. Site evaluations and requirements per the King County Surface Water Design Manual.

C. Guidance on preparing a Stormwater Plan is contained in the King County manual.

D. Other agencies such as those listed below may require drainage review for a proposed project's impact on surface and storm 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.

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

4-1.03 Incorporation of King County Manual

The current edition of the King County Surface Water Design Manual, including any subsequent amendments thereto, is hereby adopted by

reference and is hereinafter referred to as the "Manual". All developments shall be designed per this manual and the small and large minimum requirements for all sites.

4-1.04 Illicit Discharges

Illicit discharges to stormwater drainage systems are prohibited.

4-1.05 Storm Drainage Standards and Plan Review Procedures

Storm Water Plan Submittals: The initial submittal of any type of permit application shall be completed per the requirements in the adopted stormwater manual and shall include:

A. Documentation on how the Core and Special Requirements apply to the project, and

B. A downstream analysis (Core Requirement #2: Off-Site Analysis); and

C. A Low Impact Design (LID) Feasibility Evaluation

D. An environmental checklist; and

E. Additional 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 submitted must be signed and dated by the professional civil engineer approving the design.

B. All land boundary surveys used, and legal descriptions prepared, for preparing preliminary and 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 shall be analyzed using hydrograph methods and routing procedures included in the King County Surface Water Design Manual, or as approved by the Engineer.

D. Open retention/detention ponds and infiltration facilities shall not be located in dedicated public road right-of-way areas unless specifically approved by the City Engineer. Vaults, pipes, and other underground facilities shall not be located within the road travel way 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 take into account 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 King County Surface Water Design Manual 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 provide for adequate maintenance and accessibility at all times. 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 Low Impact Design 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 risk of 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 be connected to the storm drainage system and never to the sanitary sewer system.

Q. 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 Intentionally Left Vacant

4-1.08 Intentionally Left Vacant

4-1.09 Intentionally Left 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 approved drainage plans, a revised copy of which shall be provided to the Engineer for filing.

4-1.11 Operation and Maintenance Requirements

Operation and Maintenance shall be completed per the requirements in the adopted stormwater manual and the City of Duvall Drainage Ordinance. 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 an inspection program for stormwater facilities in the City of Duvall. Persons or occupants of the site shall allow the Engineer or his designee access at all reasonable times to all parts of the premises for the purpose of inspection, sampling, and record examinations. The 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 BMP to bring it in compliance with this chapter, and/or other applicable City 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 4.19.

4-1.13 Inspections

A. Construction Inspections

The holder of any permit that requires a drainage 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 them burial 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 Utilities Superintendent shall inspect the work and shall either approve the same or notify the applicant in what respects there has been failure to comply with the requirements of this ordinance. Any portion of the work which does not comply shall be promptly corrected by the 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 and Procedure

Whenever implementing the provisions of the inspection program or whenever there is cause to believe that a violation of this ordinance 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 this ordinance.

Procedures: Prior to making any inspections, the inspector shall present identification credentials, 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.

2. 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.

3. 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

A. Stormwater facilities owned and maintained by the Washington State Department of Transportation in state highway rights-of-way 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

A. A person requesting a variance from the standards of this chapter shall file an application with the City Engineer setting forth the location of the development, the owner of the property, the nature of the variance request, and the reason for the variance. A filing fee determined at time of application, unless otherwise established by resolution of the City Council, 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. The City Engineer may place any conditions on the variance deemed necessary to achieve the goals of this chapter.

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

E. 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.

4-1.16 Establishment of Regional Facilities

A. In the event that public benefits would accrue due to modification of the stormwater plan for the subject property to better implement the recommendations of the City's future master drainage plans, the Engineer may recommend that the City should assume some responsibility for the further design, construction, operation, and maintenance of drainage facilities receiving runoff from the subject property. Such 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 Engineer to aid in determination by the City. Guidelines for implementing this section will be defined by the Engineer.

4-1.17 Bonds Required

A. The City is authorized to require all persons constructing retention/detention or other drainage treatment/abatement facilities to post surety and cash bonds.

B. Where such persons have previously posted or are required to post other such bonds on the facility itself or on other construction related to the facility, such persons may, with the permission of the Engineer and to the extent allowable by law, combine all such bonds into a single bond; provided, that at no time shall be amount thus bonded by less than the total amount which would have been required in the form of separate bonds; and provided, further, that such a bond shall on its face clearly delineate those separate bonds which it is intended to replace.

1. Construction Bond. Prior to commencing construction, the person constructing the facility shall post a construction bond in an amount sufficient to cover the cost of performing the construction per the approved drainage plans. After determination by the Engineer that all facilities are constructed in compliance with the approved plans, the construction bond shall be released. Alternatively, an equivalent cash deposit to an escrow account administered by a local bank designated by the City could be required at City option.

2. Maintenance Bond. After satisfactory completion of the facilities and release of the construction bond by the City, the person constructing the facility shall commence a two-year period of satisfactory maintenance of the facility. A cash bond to be used at the discretion of the City to correct deficiencies in said maintenance affecting public health, safety and welfare must be posted and maintained throughout the two-year maintenance period. The amount of the cash bond shall be determined by the City Engineer. In addition to the cash maintenance bond a surety bond to cover the cost of defects or failures of the facilities may be required by the City to be posted and maintained through the two-year maintenance period.

3. Liability Bond. At the discretion of the 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 three hundred thousand dollars per individual, five hundred thousand dollars per occurrence and three hundred thousand 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.

4. City Assumption of Maintenance. The City may assume the maintenance of retention/detention facilities after the expiration of the two year maintenance period in connection with the subdivision of land if:

a. All of the requirements of this chapter have been fully complied with;

b. The facilities have been inspected and approved by the City after their second year of operation; and

c. All necessary easements entitling the City to properly maintain the facility have been conveyed to the City.

4-1.18 Plan Review Fees

A. Plan Checking 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 $5,000.00 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 registered professional engineer and any other cost that the City may incur in checking the drainage plan. 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 do 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 registered professional engineer and any other costs that the City may incur in inspecting for drainage 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 do 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.

C. Storm Drainage Construction Fund. There is hereby established a "Storm Drainage Construction Fund" into which shall be paid all acreage charges collected under this ordinance, together with contributions made by the City from other sources. This fund shall be used to pay the cost and expense of constructing and installing general facilities for storm drainage and flood control.

D. Storm Drainage Acreage Charge

1. No building permit shall be issued on any property within the City unless the owner pays to the City an acreage charge per acre or fraction thereof. Minor construction of accessory buildings, fences, and the like, and remodeling of existing structures shall not trigger payment of this charge. This charge shall constitute a proportionate share of the property's contribution to the capital costs of storm drainage and flood control throughout the City. This capital improvement charge for storm drainage and flood control shall be collected only once for any property, provided, however, that this limitation shall not effect any other charges the City may assess relative to storm drainage, flood control, or other matters. All properties assessed at the time of subdivision approval shall not be required to pay a second charge for each individual lot at the time a building permit is requested.

2. No short or long subdivision shall receive final approval by the Planning Commission or City Council until the owner pays to the City an acreage charge, determined by City personnel, per acre or fraction thereof. This charge shall constitute a proportionate share of the property's contribution to the capital costs of storm drainage and flood control throughout the City. Such fee shall only be collected once from any property, provided, however, that

this limitation shall not affect any other charges the City may assess relative to storm drainage, flood control, or other matters.

4-1.19 Enforcement and Penalties

A. Criminal Penalty

Any person, firm, corporation or other entity who violates any of the provisions of this chapter, any lawful order issued by the City Engineer under this chapter, or any permit conditions established by this chapter, shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00) or by imprisonment in the county jail for a term not to exceed ninety days (90) or by both fine and imprisonment. Each separate day of violation shall be a separate crime.

B. Civil Penalty

Any person, firm or corporation or other entity who violates any of the provisions of this chapter, any lawful order issued by the City Engineer under this chapter, or any permit conditions established by this chapter, shall also commit a civil infraction punishable by fine of not more than $125.00 for a first offense, and not more than $500.00 for second and subsequent offenses. Each day of non-compliance shall be deemed a separate violation. The civil infraction shall be processed through the King County District Court as provided in RCW 7.80. A person who fails to sign a notice of civil infraction or who willfully violates his or her written and signed promise to appear in court or his or her written and signed promise to respond to a notice of civil infraction is guilty of a misdemeanor regardless of the disposition of the notice of civil infraction; Provided, that a promise to appear in court or a written promise to respond to a notice of civil infraction may be complied with by an appearance by counsel. A person who willfully fails to pay a monetary penalty as required by a court under this sub-section may be found in civil contempt of court after notice and hearing.

C. Civil Relief

The City shall also have the right to abate any violations of this chapter, or order or conditions set forth pursuant to this chapter, by seeking injunctive relief in the King County Superior Court. The individual, firm, corporation and/or other entity responsible for the violations shall be required to pay all the City's legal costs including reasonable attorney's fees.

Please see Appendix G for Storm Drainage & Erosion Control Construction Notes to be incorporated into Engineering Plan Sets.

SECTION 2:
4-2.00 DEFINITIONS

Words and phrases used in this Ordinance have the meaning set forth in this section:

"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.

"Best Management Practices" (BMP) 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.

"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.

"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 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.

“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.

“Developer” means the individual(s) or corporation(s) or governmental agency(ies) applying for the permits or approvals described in Section .030 of this chapter.

“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.

“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.

“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"

“Engineer (City)” means City of Duvall Engineer.

“Environmentally Sensitive Areas” means areas defined as such by Ordinance No. 652 - Sensitive Areas Regulations Ordinance.

“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.

“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).

“King County Manual” refers to most recently adopted version of the King County Surface Water Design Manual.

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

“Large Parcel Stormwater Plan (LPSP)” means a plan to implement BMPs to control pollution generated during land-disturbing activity pursuant to Section 4-1.08.

“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.

“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).

“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.

“Planner” means City of Duvall Planning Director or designee.

“Permanent Stormwater Quality Control Plan (PSQCP)” 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.

“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 #730 (November 17, 1994).

“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.

“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.

“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 waters are: 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.

“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.

“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.

"Technical Information Report (TIR)" 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.

“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.

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

CHAPTER 5
SANITARY SEWER DESIGN STANDARDS

CHAPTER 5
SANITARY SEWER
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CHAPTER 5
SANITARY SEWER

SECTION 1:
5-1.00: GENERAL CONSIDERATIONS

5-1.01 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 Duvall's sanitary sewer system must be approved by the Department of Public Works and must conform to the City of Duvall's Comprehensive Sanitary Sewer Plan.

Within the corporate City limits where a public sewer is available it must be used (D.M.C. 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 right-of-way 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. Washington State Department of 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 Department of Public Works for a sewer extension/connection fee estimate of the costs due the City for a sewer extension or connection. A copy of the 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.

5-1.02 Design Standards

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 and follow current design practice. All sewers shall be designed as a gravity sewer whenever physically and/or economically feasible or as outlined in the Comprehensive Sanitary Sewer Plan.

A. Detailed engineering plans shall be submitted for the City's review which provide the location, size, and pipe material type for the proposed sewers and the connection with existing sewers. These plans shall be separate from water plans.

B. Plans and profiles shall show:

Location of streets, right-of-ways, existing utilities, and sewers.

Ground surface, pipe type, class and size, manhole stationing, invert and surface elevation at each manhole, and grade of sewer between adjacent manholes. All manholes shall be numbered on the plans and correspondingly numbered on the profile. 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.

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 lines, telephone lines, and television cables.

All utility easements, including County recording numbers.

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 is capable of supporting the added hydraulic load. 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 sewers shall be designed and constructed for the ultimate development of the tributary areas.

E. 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. The sewage facilities shall be constructed in conformance with the most recent edition of the Standard Specifications for Road, Bridge, and Municipal Construction, and current amendments thereto, State of Washington, revised as to form to make reference to Local Governments, and as modified by any special City requirements and standards.

H. 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 ovalation of the pipe, nor impair flow capacity.

I. 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 used.

J. 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 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.

5-1.03 Gravity Sewer Design Standards

The design of any sewer extension/connection shall conform to City Standards, Department of Ecology's "Criteria of Sewage Works Design", and any applicable standards as set forth herein.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City.

New gravity sewer systems shall be designed on the basis of an average daily per capita (per person, typically 2.5 people per household) flow of

sewage of not less than 100 gallons per day. ***Please refer to the October 2001 City of Duvall's Wastewater Facility plan and the 2011 Comprehensive Water System plan or their most current versions for capacity and sizing requirements.*** Generally, laterals and submain sewers should be designed with a peaking factor of 4 to be applied to the average daily per capita flow rate. Therefore, laterals and submain sewers 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 Department of Public Works for review and approval.

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.

The minimum size for submains 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.

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. 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.

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 City inspector shall be notified 48 hours prior to any tap of a City sewer. A City Inspector shall be present to witness the tap.

5-1.06 Manholes

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 Type 1, 48-inch diameter minimum for depths 8 feet and over and type 3, 48-inch diameter for depths under 8 feet. The minimum clear opening in the manhole frame shall be 24 inches. Joints

shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole.

Eccentric manhole cone shall be offset so as not to be located in the tire track of a traveled lane.

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. 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. 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.

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. Manholes located in areas subject to inflow shall be equipped with a PRECOR sewer guard watertight manhole insert or approved equal.

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.

All castings shall be coated with bituminous coating prior to delivery to the job site.

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 on 12-inch centers.

Gravity sewers shall be designed with straight alignment between manholes.

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.

Minimum drop through the manhole shall be 1/10th of one foot from invert in to invert out.

Manhole sizing shall be determined by the following criteria:

A. 48” Manhole

1. 2 connecting pipes, 8 inch to 12-inch diameter
2. 3 connecting pipes, 8 inch to 10-inch diameter, perpendicular
3. 4 connecting pipes, 8-inch diameter, perpendicular
4. Piping networks less than or equal to 10-feet deep

B. 54” Manhole

1. 2 connecting pipes, 8 inch to 12-inch with more than 45° deflection
2. 3 connecting pipes, 10 inch to 12-inch diameter, perpendicular
3. 4 connecting pipes, 10 inch to 12-inch diameter, perpendicular
4. Piping networks greater than 10-feet deep but less than or equal to 20-feet deep.

C. 72” Manhole

1. 2 connecting pipes, 15-inch to 18-inch diameter with less than 45° deflection
2. 3 connecting pipes, 15-inch diameter, perpendicular
3. 4 connecting pipes, 15-inch diameter, perpendicular

4. Piping networks greater than 20-feet deep.

In the above criteria “deflection” refers to the angle between any two-pipe channels in the manhole.

For other pipe configurations, the size of the manhole shall be approved by the City Engineer.

The above configurations will provide adequate shelves and room for maintenance and performing T.V. inspections.

5-1.07 Slope

All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Mannings 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. The following minimum slopes should be provided; however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope % (Feet per 100’)
8” – 24”	0.5% or (0.005 ft/ft)
24” – 36”	0.4% or (0.004 ft/ft)

Under special conditions, slopes slightly less than those required by the 2.0 feet per second 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. Whenever such decreased slopes are proposed, the design engineer shall furnish with the plans his 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.

Sewers shall be laid with uniform slope between manholes.

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 feet per second are expected, special provisions such as thrust blocking and piping materials shall be made to protect against displacement by erosion and shock.

5-1.10 Drops

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.

An outside drop connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall have a fillet to prevent solids deposition.

An inside drop connection will not be allowed by the City unless otherwise approved by the City Engineer.

Outside drop structures shall be constructed per drawing number 5-140-002.

5-1.11 Cleanouts

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.

Location of cleanout for building sewer is governed by the Uniform Plumbing Code.

All cleanouts in City right-of-way shall be extended to grade and a 3-foot square by 4-inch concrete pad shall be installed around all cleanouts that are not in a pavement area. See detail 5-145-001.

5-1.12 Building Sewer

A building or side sewer refers to the extension from a building sewer beginning two feet outside the outer foundation wall at the structure to the sanitary sewer main. Building sewers from the main to the right-of-way line shall be minimum 4-inch diameter. Maintenance of the building sewer is the responsibility of the property owner. Prior to connection of a building sewer to the public sewer a connection permit must be obtained from the City. Materials and design criteria for a building sewer are covered by the Uniform Plumbing Code. Inspection of the building sewer is the responsibility of the Building Department.

Shared sewer laterals or Multi-family type dwellings shall connect to the main or submain line with a minimum 6-inch diameter pipe (from the building to the main or submain line).

5-1.13 Marking Side Sewers

The location of all side sewers shall be marked with a twelve (12) foot long 2” x 4” 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” high.

5-1.14 Sanitary Sewer/Water Main Crossings

See Chapter 2, Section 2-160 for requirements regarding sewer and water separation and/or Washington State Department of Health standards.

5-1.15 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 tee location.

5-1.16 Trench Excavation

See Chapter 2, Section 2-1.71 for requirements regarding trench excavation.

5-1.17 Backfilling

See Chapter 2, Section 2-1.80 for requirements regarding backfilling. Tracer tape shall be installed one foot above the sewer line.

5-1.18 Street Patching and Restoration

See Chapter 2, Sections 2-1.82 and 2-1.83 for requirements regarding street patching and trench restoration.

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. Prior to acceptance of the project, the gravity sewer pipe shall be subject to a low-pressure air test per WSDOT/APWA Standards. 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.

   The Contractor shall make an air test for his 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.

   All wyes, tees, 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.

   Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air.

2. Testing of the sewer main shall include a television inspection by the Contractor. Television inspection shall be done after the air test has passed and before the roadway is paved. Immediately prior to a television inspection, enough water with “RED” testing Dye shall be run down the line so it comes out the lower manhole. A copy of the video and written report shall be submitted to the City. Acceptance of the line will be made after the video recording has been reviewed and approved by the Inspector. Any tap to an existing system needs to be televised as well.

Low spots in the flow line are not allowed. All pipes shall be laid in straight lines and at a uniform rate of grade between manholes. Variance from established line and grade shall not be greater than one-half inch (1/2”), provided that such variation does not result in a level or reverse sloping invert; provided, 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 one-sixty-forth inch per inch of pipe (8” pipe = max standing water of 8/64” or 1/8”). No pipe shall have more than 3/8” 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 made at the expense of the Developer and/or Contractor.

Prior to final acceptance and maintenance bond release, the contractor / owner will have the sewer lines video inspected and recorded again to ensure no settling has occurred or any other installation related deficiency.

3. A water test of all manholes may also be required. The water test shall be made by the Contractor first by filling the manhole up with water and letting it sit for 24 hours to allow the water to saturate the concrete. After 24 hours the manhole shall be filled to the top of the cone. The water cannot drop more than 0.05 gallons in 15 minutes per foot of head above invert to pass. Upon completion of the water test, the water shall be pumped out of the manhole and not allowed to be released to the system.

4. A mandrel test in accordance with Section 7-17.3(4)H of the Standard Specifications shall be required on all sewers except laterals (side sewers).

SECTION 2:
5-2.00: SEWAGE LIFT STATIONS

This chapter covers the design and construction of sewage pump stations and force mains.

5-2.01 Location and Flood Protection

Sewage pump 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 stations shall be of sufficient size for future expansion or addition, if applicable.

The station's 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. The stations shall be designed to remain fully operational during the 100-year flood event.

All lift stations will be designed to serve the appropriate basin as identified in the Duvall "Comprehensive Sanitary Sewer Plan".

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.

5-2.02 Design Standards

The design of any lift station shall conform to City Standards, Department of Ecology's "Criteria of Sewage Works Design" and 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 pump station;

C. A list of specific materials used including 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 per drawing number 5-120-001.

I. Pump operation, alarms, and electrical inspection of all lift stations is required.

5-2.03 Pumping Rate and Number of Units

At least two pump units shall be provided, each capable of handling the expected maximum flow.

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 sewage flow.

When the station is expected to operate at a flow rate less than 0.5 times the average design flow for an extended period of time, the design shall address measures taken to prevent septicity due to long holding times in the wet well.

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

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.

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 belowground, 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/cavitations near the intake.

D. Controls

Control float cages should be so located as not to by affected by the flows entering the wet well or by the suction of the pumps. Pressure tranducer 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 manually operated valve or plate covering the bypass discharge, and 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 pumping 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.

Alarms for high wet well, low wet well, high temperature, control failure, and power failure shall be provided, as a minimum, for all pump 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 D.O.H. 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. It shall have a working pressure of 150 psi. Valves shall be designed for use with corrosive fluids. A 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 Pigging Ports

A pipeline pig is a projectile that is forced through the inside of a pipe to clean pressure pipelines. A pigging port is used as a point to send or retrieve the pig.

Pigging ports may be required:

A. At every change in pipeline size

B. At bends in the line

C. No farther than every 1000 feet

These locations are subject to review and approval by the City.

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 so as to independently ventilate the dry well. If screens or mechanical equipment, which might require periodic maintenance and inspection, are located 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:
5-3.00: 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.

SECTION 4:
5-4.00: 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 1-1/4 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:
5-5.00: 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:
5-6.00: 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 in accordance with Section 1-110.

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.

5-6.07 Force Mains

5-6.07.1 Size

Minimum size force mains should be not less than 4 inches in diameter.

5-6.07.2 Velocity

At pumping capacity, a minimum self-scouring velocity of 2 feet per second (fps) should be maintained unless flushing facilities are provided. Velocity should not exceed 8 feet per second.

5-6.07.3 Air Relief Valve

Air relief valve should be placed at the necessary high points in the force main to relieve air locking.

5-6.07.3 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 s result of hydrogen sulfide or other chemicals where such chemicals are present or suspected to be present because of long force mains.

5-6.07.4 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 ovalation 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.

5-6.07.5 Force Main

A. Material. 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.

B. Depth. Force mains shall have a minimum 36 inches of cover to top of pipe. See Chapter 2, Section 2-160 for sanitary sewer/water main crossing requirements.

C. Velocity. The minimum velocity allowed is 2 feet per second (fps) at average Dry Weather Flow. 2 fps is required to maintain solids in suspension although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.

5-6.07.6 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.

5-6.07.7 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.

5-6.07.8 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 number 2-130-001, 2-130-002, and 2-130-003 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.

5-6.07.9 Pressure Tests

All force mains shall be tested at a minimum pressure of at least 50 percent 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:

$$L = \frac{ND\sqrt{P}}{7400}$$

WhereL 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.

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 any and 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.

A water test for all wet wells in accordance with the manhole water test for gravity sewer shall be required.

A mandrill test in accordance with Section 7-17.3(4)H of the WSDOT/APWA Standard Specifications is required.

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.