



Infrastructure Design and Construction Standards



Water



Sewer



Surface Water



Streets

City of Tukwila - Department of Public Works

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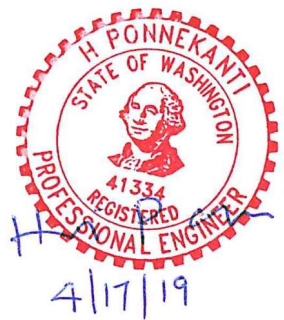


CITY OF TUKWILA
PUBLIC WORKS DEPARTMENT

**INFRASTRUCTURE DESIGN AND
CONSTRUCTION STANDARDS**

2019

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CHAPTER 1 INTRODUCTION

SECTION 1.0 PURPOSE

These standards are intended to ensure consistent design and construction requirements and adherence to the City's comprehensive plans.

It is this City's policy to maintain a high level of quality in the construction of public facilities. The standards detailed herein have been prepared to foster consistent requirements of quality and value for both public and private construction, and are to be applied to both.

The standards in this document set forth the minimum criteria and specifications for both public and private construction projects. In addition, these standards provide the minimum design and construction requirements for utility and street improvements to be accepted by the City of Tukwila. The Director may substitute more stringent design standards and specifications where special conditions warrant. The Director, or their Designee, may relax these standards upon approval of a variance.

These standards shall not substitute for engineering design, nor are these standards intended to limit innovative design where equal performance in value, safety, and maintenance economy can be demonstrated.

SECTION 1.1 AUTHORITY

Ordinance 1783, filed with the City Clerk, authorizes the Public Works Department to create and to amend these Standards.

SECTION 1.2 REVISIONS

The City periodically reviews and revises the Standards. Additionally, anyone may submit to the Director a written request for a revision to these standards. The request shall include a brief description of the revision, justification for the revision, and a copy of the proposed text or drawing. If the revision is accepted, the Director revises these standards at the periodic review. The revision request form is in Appendix D.

SECTION 1.3 REFERENCES, STANDARDS, AND CODES

The following lists of references, standards, and codes provide the basis for design and construction requirements for residential, commercial, or industrial development, or construction of public infrastructure within the

City. Where conflicts in design and construction requirements arise, these Development Guidelines and Design and Construction Standards (Standards) prevail.

1.3.1 ALL PROJECTS

The City of Tukwila recognizes and uses the most current edition of the following references, standards, and codes.

1. City of Tukwila Standards
2. City of Tukwila Municipal Code
3. City of Tukwila Comprehensive Plans, including Sewer, Water, Surface Water, Land Use
4. Standard Specifications for Road, Bridge, and Municipal Construction, prepared by the Washington State Chapter of the American Public Works Association and the Washington State Department of Transportation (Standard Specifications)
5. Local Agency General Special Provisions (GSP's) as part of the Standard Specifications
6. Standard Plans for Road, Bridge and Municipal Construction, prepared by the Washington State Department of Transportation
7. Washington State Department of Transportation Bridge Design Manual (LRFD)
8. Manual on Uniform Traffic Control Devices (MUTCD), U.S. Department of Transportation as amended and approved by Washington State Department of Transportation
9. King County Surface Water Design Manual (2016)
10. The City's NPDES Phase II permit and Construction Stormwater General Permit
11. Sensitive Areas Overlay (TMC 21)
12. State and National Environmental Policy Acts
13. Shoreline Management Act, State of Washington
14. Tukwila and King County Shoreline Master Plans
15. WISHA - Washington Industrial Safety & Health Administration
16. OSHA - Occupational Safety & Health Administration
17. All other federal, state, and local requirements including, but not limited to:
 - a. Right of Entry Agreements
 - b. Geotechnical Investigation
 - c. Utility coordination and Agreements
 - d. Applicable WSDOT and Railroad ROW work permits
 - e. Noise variance permits for contracts requiring night work

In cases where the above references, standards, and codes do not cover elements of the project design and construction, the City recognizes and uses the most current edition of the following:

1.3.2 STREETS

1. AASHTO, A Policy on Geometric Design of Highways and Streets
2. AASHTO Guide for the Development of Bicycle Facilities
3. AASHTO LRFD Bridge Design Specifications
4. AASHTO LRFD Bridge Construction Specifications
5. WSDOT Design Manual
6. WSDOT Construction Manual
7. WSDOT Highway Runoff Manual
8. WSDOT Pedestrian Facilities Guidebook
9. WSDOT Local Agency Guidelines
10. WSDOT Bridge Design Manual
11. NEC- National Electrical Code
12. IMSA - International Municipal Signal Association
13. City of Tukwila Walk and Roll Plan

1.3.3 SURFACE WATER

1. Washington State Department of Fish and Wildlife Requirements
2. King County Stormwater Pollution Prevention Manual
3. King County Surface Water Design Manual, current edition
4. Stormwater Management Manual for Western Washington, Department of Ecology (for WSDOT projects)

1.3.4 FLOOD ZONE CONTROL

1. Flood Insurance Study, current revision, Federal Emergency Management Agency
2. King County Flood Hazard Policy
3. King County Riverbank Stabilization Guidelines
4. Green River Management (A.G.#85-043)
5. City of Tukwila Allentown Policy #2000-01 Revision 1

1.3.5 WATER SUPPLY

1. American Water Works Association Standards, Accepted Procedure and Practice, AWWA
2. Manual of Cross-Connection Control, Foundation for Cross-Connection Control and Hydraulic Research

3. Backflow Prevention Assemblies Approved for Installation in Washington State, Washington State Department of Health
4. City of Tukwila Cross Connection Control Program Policy #99-01
5. Standards and specifications of all districts providing service within the City
6. Uniform Plumbing Code

1.3.6 SANITARY SEWER

1. Criteria for Sewerage Works Design, Washington State Department of Ecology
2. Uniform Plumbing Code
3. Standards and specifications of all sewer districts providing service within the City

CHAPTER 2 DEVELOPMENT GUIDELINES

SECTION 2.0 ERRORS AND OMISSIONS

At the Director's discretion, any significant error or omission in the approved plans, or information used as a basis for approval, will constitute grounds for withdrawal of any permit approvals and/or stoppage of any or all of the permitted work. The Permittee shall show cause why such work should continue and make such changes in plans as required by the Director.

SECTION 2.1 PERMITS

Prior to beginning multifamily-residential, commercial, or industrial development, or development requiring construction of public infrastructure within the City, the Applicant shall submit a permit application, plans, and specifications to the Permit Center for review and approval by the Public Works Department.

Development design and construction shall meet all of the applicable standards, codes, and recommendations in specific reports, such as the geotechnical report, the traffic impact analysis, and the surface water Technical Information Report.

Depending on particular project elements, the Director may require submittals in addition to those described in this chapter.

Any significant changes to the approved plans or specifications of a permitted project require a REVISION submittal to the City for approval.

Type A Short-term Nonprofit

Issued for 72 hours to nonprofit organizations for assemblies, bike races, block parties, parades, parking, processions, non-motorized vehicle races, street dances, street runs.

Type B Short-term Profit

Issued for 72 hours to for-profit entities for fairs, house moves, sales, street closure.

Type C Construction

Issued for 180 days for activities in the right-of-way and on private property. These activities include sewer, water, surface water, grading, street improvements, boring, culverts, curb cuts, paving, driveways, fences, landscaping, painting/stripping, sidewalks, trenching, utility installation/repair, traffic signals and illumination.

Type C Right-of-way

Issued for 180 days for activities that will disturb the right-of-way, including boring, installation of culverts, curb cuts, and public facilities, paving, landscaping, and trenching.

Type C Grading

Issued for 180 days for all grading activities occurring within the City limits except the following:

1. Excavation for construction of a structure permitted under the International Building Code;
2. Cemetery graves;
3. Refuse disposal sites controlled by other regulations;
4. Excavations for wells, or trenches for utilities;
5. Mining, quarrying, excavating, processing or stockpiling rock, sand, gravel, aggregate or clay controlled by other regulations, provided such operations do not affect the lateral support of, or significantly increase stresses in, soil on adjoining properties;
6. Exploratory excavations performed under the direction of a registered design professional, as long as this exploratory excavation does not constitute the beginning of construction of a building prior to obtaining a permit.

Type D Long-term

Issued for periods greater than 72 hours for activities which do not disturb the right-of-way including: air rights, bus shelters, access to construction sites, loading zones, newspaper sales, recycling facilities, sales structures, sidewalk cafes, awnings, benches etc, underground rights, utility facilities, waste facilities.

Type E Potential Disturbance

Issued for 180 days for activities having a potential to disturb the right-of-way, such as hauling 6 loaded vehicles/hr/8 hr day for 2 or more consecutive days, hauling hazardous waste as defined in the Revised

Code of Washington, or surveying (other than for a Tukwila capital improvement project).

Type F Blanket

Issued for 365 days to telecommunications and cable franchisee, and utilities for connections, repairs, and emergencies.

Flood Zone

Any construction or development within any special flood hazard area, including manufactured homes, watercourse alteration, excavation, fill, requires a Flood Zone Control permit (FZCP). An FZCP grants approval to construct or develop within a special hazard area, a flood-prone area or the shoreline, but does not replace the need for additional permits such as a building permit or a Type C Construction permit.

A permit shall be obtained before construction or development begins within any area of special flood hazard established in TMC 16.52.050. The permit shall be for all structures including manufactured homes, and for all development including fill and other activities.

Water Meter – Permanent

Issued for domestic water supply of all new or reestablished services when sewer discharge rates are calculated based on water usage. Each individual building requires a separate water main tap. The fee includes a City-provided water meter.

Water Meter – Water Only

Issued for a separate service from the main for water that will not discharge to the public sewer. The fee includes a City-provided water meter.

Water Meter – Deduct

Required to meter water that will not discharge to the public sewer. The Permittee provides, owns, installs, and maintains the meter. This meter is installed downstream of a permanent water meter. An example is landscape irrigation.

Water Meter – Temporary

Required for use of public water, on a short-term basis, where a metered supply does not already exist. The Permittee rents the meter from the City. Examples include dust suppression during construction or water supply during hydroseeding.

SECTION 2.2 FEES

2.2.1 PERMIT

Public Works establishes and collects fees as set forth in the fee schedule adopted by the City Council. Most of the permit fees are flat rates that are due when the permit is issued. Type C permit fees are based on the estimated construction value of the public works elements in a project. For Type C permits, Public Works collects an Application and Plan Review Fee when the application is submitted and a Permit Issuance and Inspection fee when the permit is issued.

After the permit is issued, Public Works may assess additional fees for revisions and inspections and may adjust pavement mitigation fees. Any additional fees must be paid before the PUBLIC WORKS Final Inspection occurs.

Public Works charges 25% of the Total Plan Review Fee for each additional review, which is attributable to the Applicant's action or inaction. Each revision to approved plans is charged 25% of the Issuance and Inspection fee. Each re-inspection after the first two inspections is charged \$60.00/inspection per inspection item.

Refer to Public Works Bulletin for permit fee estimates.

2.2.2 PAVEMENT MITIGATION

The City calculates the square footage used to determine a mitigation fee according to the following:

1. For repairs requiring an overlay, the City uses the total square feet of overlay.
2. For pavement repair, the City uses the cut area plus two feet on each side of the cut.
3. Public Works may adjust this fee when the actual field measurements differ from the proposed measurements shown on the permit application. Any adjustment to the mitigation fees must be completed before the Public Works Final Inspection. Refer to

Public Works Customer Assistance Bulletins for a more complete description of Pavement Mitigation fees.

2.2.3 TRANSPORTATION IMPACT FEES

Consistent with the Comprehensive Plan, the Six-year Transportation Plan and the Capital Improvement Plan, transportation impact fees help ensure that new development bears its proportionate fair share of transportation facilities necessitated by the new development. The fee applies to any construction, reconstruction, conversion, structural alteration, relocation or enlargement of any structure that requires a building permit and generates any new PM peak hour trips. The transportation impact fee is charged to each development according to an impact fee schedule based on defined zones. The fees are assessed as part of the building permit and are due and payable when the permit is issued (TMC 9.48 and Ordinance 211).

2.2.4 INDEPENDENT REVIEW

Depending on the site conditions and design complexity, reports submitted to the City may receive independent review. The Applicant pays the review fee.

2.2.5 CONNECTION CHARGES

Some City water and sewer services have special connection charges. When these charges apply, the Applicant shall provide a legal description of the property to aid in calculating the charges.

2.2.6 CAPACITY CHARGES

King County Metro determines the sanitary sewer capacity charge based on the information provided on the Sewer Use Certification form. For new construction within the City's service area and for all tenant improvements within the city limits, the Applicant submits a completed Sewer Use Certification form. This form is available in Public Works. Upon completion of the project work, Public Works forwards the completed form to Metro.

2.2.7 OVERTIME FEES

Inspections that occur during non-regular business hours are subject to "after hours" inspection fees. The Director determines when these

inspections are allowed. The fees are charged at the inspector's overtime-hourly rate and include vehicle, overhead, and expense charges.

2.2.8 SPECIAL BILLING FEES

The City shall charge for any work or services provided by Public Works, such as traffic control or utility relocation, which occurs under an Authorization for Special Billing or provided by Public Works as a response to infrastructure damage during construction.

SECTION 2.3 SUBMITTALS

2.3.1 PLANS

Plans submitted to Public Works for review and approval, except for single family residences that are not in or adjacent to a sensitive area and that do not trigger surface water drainage review, shall be prepared, signed, stamped, and dated by a Washington State registered Professional Engineer. These plans must be submitted to the City for plan review and approval prior to the commencement of any construction.

Public Works will review all submittals for compliance with these Standards. Plan approval does not relieve the Applicant, the Applicant's Engineer, or the Contractor from responsibility for ensuring that all facilities are safe and that calculations, plans, specifications, construction drawings, record drawings, and as-built information complies with normal engineering standards, these Standards, and applicable federal, state, and local laws and codes. Refer to Appendix C for a plan completeness checklist.

2.3.2 SPECIFICATIONS

Specifications shall be submitted with the plans, when the plans and notes do not adequately describe the proposed work and materials.

2.3.3 PLAN CHECKLIST

A completed Plan Checklist may be submitted with the plans. The engineer should use the Plan Checklist to ensure the plans meet the specific minimum requirements. A Plan Checklist is included as Appendix C.

2.3.4 EROSION PREVENTION AND SEDIMENT CONTROL PLAN

Any project that will clear, grade, or otherwise disturb a site must provide erosion prevention and sediment controls to prevent, as much as possible, sediment transportation offsite to downstream drainage facilities and water resources, or onto other properties.

The erosion prevention and sediment control plan shall meet or exceed the standards in the adopted King County Surface Water Design Manual.

2.3.5 POLLUTION PREVENTION PLAN

Any construction project that includes any of the following activities must provide best management practices to prevent pollution:

1. Dewatering
2. Paving
3. Structure construction and painting
4. Material delivery, use, or storage (soil, pesticides, herbicides, fertilizers, detergent, plaster, petroleum products, acids, lime, paints, solvents, curing compounds)
5. Solid waste
6. Hazardous waste
7. Contaminated soils
8. Concrete waste
9. Sanitary/septic waste
10. Vehicle or equipment cleaning, fueling, or maintenance

2.3.6 PROJECT SCHEDULE

The project schedule shall include the proposed sequence and expected start and end dates for all major activities. The schedule shall include installation of temporary and permanent erosion prevention and sediment control measures and schedules for monitoring, operation, and maintenance of these measures.

2.3.7 WORK IN RIGHT-OF-WAY

Required permit application submittals when proposing work within City right-of-way include the following (TMC 11.08):

- A. Applicant/Owner information

1. Applicant name, address, phone number, email address
2. Owner name, address, phone number (if not the Applicant)
- B. Activity Description
 1. Cut and fill volumes
 2. Location
 3. Proposed use
 4. Excavation method and areas, surface and subsurface
 5. Restoration method
 6. Start and end dates and expected duration
- C. Plans, profiles, cross sections
- D. Copy of franchise agreement, easement, encroachment permit, license or other legal authorization
- E. Document from Owner and Applicant saying they are in compliance
- F. Hold Harmless Agreement
- G. Traffic control plan
- H. City of Tukwila business license
- I. Copy of the contractor estimate or engineer estimate for the activity being permitted. Public Works will review and may adjust. Any fee adjustment will be made when the permit is issued
- J. Application fee
- K. Comprehensive general liability insurance with limits not less than \$2,000,000, naming City of Tukwila as additional insured
- L. Business automobile liability insurance with limits not less than \$1,000,000
- M. Contractor's pollution liability insurance, on an occurrence form, with limits not less than \$1,000,000 each occurrence and deductible not more than \$25,000
- N. Corporate surety bond, cash deposit or letter of credit for 150% of the value of the right-of-way work to be done, in order to guarantee faithful performance of the permitted work
- O. Maintenance Bond - Two years – minimum 10% of construction costs

2.3.8 TECHNICAL INFORMATION REPORT (SURFACE WATER)

The scope of drainage review varies with the project complexity and potential surface water impacts. Refer to the adopted King County Surface Water Design Manual to determine Technical Information Report and design requirements appropriate for the project.

2.3.9 GEOTECHNICAL REPORT

A geotechnical report helps determine if the proposal for a site is appropriate. A geotechnical report contains information used to design retaining walls, foundations, permeable pavements, hazardous waste facilities, and infiltration systems, such as trench drains, sand filters and septic drain fields. Geotechnical reports also supply information for settlement analysis, liquefaction, structural fill, and storm water design. The report shall meet the City's current sensitive area, Public Works, and Uniform Building Code requirements.

The City may require a geotechnical investigation and report based on the nature of the proposal. All of the following require a geotechnical investigation and report prepared by a Geotechnical Engineer.

- A. Unless waived by the Building Official:
 - 1. All new buildings except a residential structure that falls under the International Residential Code
 - 2. Any structure, including a rockery, that retains a surcharge
 - 3. Any retaining structure, including a rockery, that is over four feet above existing grade
 - 4. Grease interceptors that are 1000 gallons or larger
 - 5. Surface water retention/detention structures, including bioretention and permeable pavements
- B. Unless waived by the Department of Community Development Director:
 - 1. Any work on sites containing or adjacent to slopes that are 15% or steeper
 - 2. Grading that requires environmental review under the State Environmental Policy Act
- C. Unless waived by the Public Works Director:
 - 1. Surface water infiltration, including bioretention and permeable pavements
 - 2. Riverbank Stability (Ordinance 2038)
 - 3. Hazardous Waste Facility Design

The reporting requirements for single-family permits may be waived, if a report for the site meeting the City of Tukwila's criteria has been filed less than five years before the date of application and the Geotechnical Engineer who signed the report prepares a written letter

stating the report is still applicable to the site and currently proposed project. Similarly, reporting requirements may be waived for single-family permits if the applicant can demonstrate, to the City's satisfaction, that soil or groundwater conditions at or near the site pose little or no risk.

2.3.10 TRAFFIC CONTROL PLAN

Prior to beginning any activity which might affect City right-of-way, the Applicant/Permittee shall provide the City, for review and approval, a traffic control plan that meets MUTCD standards. The traffic control plan shall accurately reflect existing site conditions including accesses, channelization, sidewalks, bike/pedestrian paths, bus stops and such. The Applicant must provide the location, address and description of expected traffic flow during the proposed work. Refer to section 2.4.4-F for City Right-Of-Way work restrictions.

2.3.11 RIVERBANK STABILITY ANALYSIS

As part of the Flood Control Zone permit application, the Applicant must provide a riverbank stability analysis for projects adjacent to the Green/Duwamish River, whenever the natural riverbank is expected to provide bank protection for the life of the project. A geotechnical engineer must prepare the analysis. The geotechnical engineer must certify that the riverbank is stable for the lifetime of the proposed project.

The analysis scope will vary with the site conditions. All elevations shall use the same datum as the FZCP submittal. The analysis report shall include assessment of current conditions, conclusions, and construction recommendations. At a minimum, the report shall include:

- A. Site map showing location of riverbank cross-sections, structures, roads, drainage, wells, septic tanks, utilities, and other significant features at the project site.
- B. Riverbank cross-sections at intervals sufficient to provide accurate detail for analysis. Cross sections should show the top-of-bank, grade-breaks, toe-of-bank, and, whenever feasible, streambed geometry.
- C. Soil strength and erodibility parameters, current slope stability and expected slope stability during rapid drawdown, including factors of safety. Provide possible failure modes and failure causes.

- D. Discussion of risk and possible environmental effects, both locally and downstream.
- E. Prevention measures, repair and monitoring requirements.

2.3.12 SANITARY SEWER

Your project may require submittal of any of the following:

- A. King County Sewer Use Certification form for new or modified facilities,
- B. South King County Health Department septic system approval for construction on a site having a septic tank,
- C. Copy of King County Industrial Waste Discharge approval for gas stations and some industrial operations that discharge to a sanitary sewer,
- D. Septic tank abandonment documentation,
- E. Copy of King County Department of Natural Resources approval for direct side sewer connection to interceptor lines.

2.3.13 FINANCIAL GUARANTEE

- A. For work in the right-of-way Applicant shall provide:
 - 1. A corporate surety bond, cash deposit or letter of credit for 150% of the value of the proposed right-of-way work, in order to guarantee faithful performance of the permitted work.
 - 2. A corporate surety bond, cash deposit or letter of credit for 10% (minimum) of the value of the right-of-way work, to guarantee workmanship and materials for two years following completion of work.
- B. For hauling, the applicant shall provide a \$2,000 financial guarantee to assure clean up and repair of any damage.
- C. For moving an oversize load, the applicant shall provide a \$5,000 financial guarantee to assure repair of any damage.
- D. For the Public Works part of a subdivision, short plat, or projects containing or abutting sensitive areas, the Owner shall provide a corporate surety bond, cash deposit or letter of credit for 150% of the total cost of the proposed work to guarantee performance of proposed work.
- E. For street lighting as part of subdivision, the Owner shall provide financial guarantee according to TMC 11.12.110.
- F. The Director may require a financial guarantee for 10% of the project costs for erosion prevention and sediment control on projects which clear more than 6000 square feet or contain or abut sensitive areas

such as Class 2 or steeper slopes, wetlands, or critical drainage.

2.3.14 INSURANCE

- A. Permittee performing work within City right-of-way shall provide proof of the following insurance, showing the City as additional insured:
 - 1. Comprehensive general liability insurance with limits not less than \$2,000,000.
 - 2. Business automobile liability insurance with limits not less than \$1,000,000.
 - 3. Contractor's pollution liability insurance, on an occurrence form, with limits not less than \$1,000,000 each occurrence and deductible not more than \$25,000.
- B. If the Director determines the nature of any work is such that it may create a hazard to human life, endanger adjoining property, street, street improvement, or any other public property, the Director may require the applicant to file a certificate of insurance. The Director, based on the nature of the risks involved, shall determine the amount of insurance.

2.3.15 HOLD HARMLESS

The Applicant shall complete a hold harmless agreement for activities in the right-of-way, for activities in or near a sensitive area, and for major deviation from City standards. Hold harmless agreements are available in Public Works.

2.3.16 EASEMENT(S)

The City reviews and approves all easements prior to recording with King County Records.

For easements granted to the City, the legal description(s) and exhibit(s) shall be prepared and stamped by a land surveyor, or professional engineer registered in Washington State. The easement document shall include the easement legal description and a site plan showing the easement location, and shall specify maintenance responsibility, when applicable. (TMC 11.12.050)

- A. Utility
 - Water, sewer, drainage facilities, minimum 20 feet wide, generally, ten feet either side of the centerline of the facility. Additional width may be required to accommodate maintenance.

Utility easements adjacent to public right-of-way shall be ten feet wide.

B. Traffic

Where needed for purposes of traffic safety or access to schools, playgrounds, urban trails, shopping facilities, or other community facilities, public easements for bikeways or walkways, not less than ten feet in width, will be provided.

C. Levee access

All proposed development adjacent to the Green River shall, as part of their permit submittal, grant access and maintenance easements for existing or future dikes/levees and riverbanks along the Green River. The City, in cooperation with King County, shall determine these easement locations and widths.

D. Non-motorized easements

The easement shall be wide enough to include the trail plus at least two feet on each side.

2.3.17 PROPERTY DEDICATION

The City may require right-of-way dedication to incorporate necessary transportation improvements. Property shall be deeded to the City using a statutory warranty deed. The dedication must be accompanied by a Title report less than 6 months old and a completed excise tax affidavit.

2.3.18 MAINTENANCE AGREEMENT(S)

- A. Before Public Works final project approval, the Permittee/ Owner/ Contractor shall provide Maintenance Agreements, in recordable format, for common improvements such as access, utilities, surface water elements, and cul-de-sac landscape island.
- B. For street lighting as part of subdivision, the Owner shall provide financial guarantee according to TMC 11.12.110.

2.3.19 PERMITS FROM OTHER AGENCIES

It is the Applicant's responsibility to obtain permits from outside agencies such as WDFW, Department of Natural Resources, Corps of Engineers, Department of Ecology, Department of Health, WSDOT or FEMA. The Director requires proof of other required permits prior to issuing permit approval.

2.3.20 DEVELOPER AGREEMENT

The City and the Developer shall enter a Developer Agreement whenever required by the City. The Developer Agreement shall be written and signed before the permit is issued. The Developer Agreement should contain work descriptions and estimated costs. The Agreement should assign responsibilities for the work performance and shall provide an expiration date.

2.3.21 DEVELOPER REIMBURSEMENT AGREEMENT (LATECOMER AGREEMENT)

The City may enter into agreements with developers who have installed public improvements valued at \$50,000 or more, in order to provide for reimbursement of a fair prorated share by any real estate owners who have not contributed to the original cost of such facilities, and who subsequently connect to, or use the improvement. Such agreements shall be entered into at the time of, or prior to, issuance of a Certificate of Occupancy. The Public Works Department shall approve the prorated share based on construction cost provided by the Developer.

The developer is responsible for initiating, executing, and, after City approval, recording the latecomers agreement with the County. The agreement must include a list of those properties that will benefit from the improvement, a map outlining and designating these properties, legal descriptions as required by the City, backup data supporting the costs submitted, and an expiration date.

There are three acceptable methods for the determination of benefit: 1) gross parcel area, 2) property frontage, or 3) number of connections. The proponent will submit the format most appropriate to the nature of the project, as approved by the City. No credit will be given for open space, recreation areas, or undevelopable portions of the development proposal when calculating gross parcel area. The City will collect the latecomer's fee from property owners, which benefit from the improvements and will meet the Revised Code of Washington when disbursing payment to the developer.

SECTION 2.4 CONSTRUCTION

Contractor/Permittee shall perform all work in accordance with all federal, state, and local laws and shall be in accordance with

approved plans, specifications, and permit conditions. The Permittee/Contractor shall maintain a set of approved plans, specifications, and associated permits on the job site. Permittee shall apply for a revision for any work proposed that is not according to approved plans and specifications, and permit conditions.

2.4.1 MATERIALS

Materials proposed for use in construction of publicly owned or publicly maintained utilities must be in conformance to approved material standards. Unapproved materials cannot be adequately evaluated within the plan review period.

2.4.2 PRECONSTRUCTION CONFERENCE

Prior to beginning any work, Permittee/Contractor shall contact the City's Inspector to arrange a preconstruction conference.

2.4.3 CONSTRUCTION ON EASEMENT

Construction on easement(s) shall be performed strictly in accordance with the easement provisions. The Permittee/Contractor shall make himself aware of all conditions pertaining to the easement agreement. No work shall be permitted in easement areas where City utilities may be located until specifically authorized by the City.

2.4.4 RIGHT-OF-WAY

A. Access

1. During construction and until permanent access is installed and approved, provide pedestrian/ADA and emergency access to any abutting public school, public building, urban trail, transit stop, or business.
2. Provide temporary sidewalk, curb ramp, or bike path, meeting the Director's approval, when construction blocks existing.
3. Maintain access to fire stations, fire hydrants, fire escapes, and firefighting equipment. Do not place materials or obstructions within 15 feet of fire hydrants.

B. Monuments

1. Locate and protect survey monuments, property corners, bench marks, and other such.

2. All disturbed monuments shall be replaced by a Washington State licensed surveyor at the Owner's expense.

C. Drainage

1. Keep existing drainage features free of dirt and other debris.
2. Reroute flow when it is necessary to block or otherwise interrupt a drainage feature. (TMC11.08.220)

D. Cuts

1. Roadway crossings for utilities shall be by jacking, tunneling, or boring with "windows" or shafts 20 feet or more apart.
2. Crossing under State Highways and crossings involving railroads or other easements and rights-of-way will also require approval from the appropriate agency.
3. Newly constructed or recently overlaid streets shall not be open cut for three years. Open cuts are allowed on an exception basis and only when roadway conditions warrant or in cases of undue hardship.
4. All pavement cuts in right-of-way are subject to a pavement mitigation fee.
5. All pavement cuts in right-of-way must have a preapproved street and pavement restoration plan.

E. Restoration

Any disturbance of right-of-way or right-of-way facilities, including sidewalks and vegetation, shall be restored to current City standards. The City shall approve all backfill and pavement base. All damaged or broken pavement and other disturbed pavement shall be replaced with the same type and depth of pavement adjoining the disturbed area.

F. Restrictions

1. Any lane closure within the City of Tukwila shall have traffic control plans reviewed and approved by the City Engineer.
2. From the third Thursday in November through the following January 1st, the Director restricts lane closures in the Tukwila Urban Center. The Director will consider exceptions to these restrictions upon written request on a case by case basis.
3. Maintain emergency, pedestrian, and vehicular access to buildings, trails, and transit at all times.
4. Keep all roadways free of dirt and debris using street sweepers. Use of water trucks for cleaning roadways requires preapproval from the Director.
5. Install and secure non-skid steel plates over any trench at any time work has stopped and the trench is left open.

Place warning signs in locations adequate to warn drivers and bicyclists. Warning signs shall read "Motorcycles Use Extreme Caution" and "Caution Steel Plates Ahead".

2.4.5 TRENCH EXCAVATION

Construct per City of Tukwila standard detail G-1 and WISHA/OSHA requirements and meet the erosion prevention and sediment control requirements.

- A. All trench excavation operations shall meet or exceed all applicable shoring laws for trenches.
- B. During excavation, divert any surface water and pump the trench as needed to keep the trench free of water. Store pumping equipment near the trench excavation to ensure that these provisions are carried out.
- C. Completely excavate boulders, rocks, roots, and other obstructions or excavate to the width of the trench, and to a depth of 6 inches below the bottom pipe grade.
- D. Use hand tools to:
 - 1. Finish the trench bottom in such a manner that the pipe will have a uniform slope along the entire length of the pipe.
 - 2. Excavate the bell holes enough to make up the joint.
- E. Extend trenching operations a maximum of 100 feet in advance of the pipe laying operation. For excavation greater than 100 feet, the Permittee must obtain written approval from the Director.

2.4.6 STOP WORK ORDER

- A. Following written notice to the Permittee, the Director may suspend or revoke any permit for any of the following reasons:
 - 1. Changes in site runoff characteristics upon which the permit is granted.
 - 2. Construction not in accordance with the approved plans.
 - 3. Noncompliance with correction notice(s) or stop work order(s) issued for erosion or sediment controls.
 - 4. Immediate danger to a downstream area or adjacent property as determined by the Director.
- B. The Director may post a site with a "stop work" order directing that all construction activity cease immediately. The issuance of a "stop work" order may include any "discretionary conditions" or "standard requirements" which must be fulfilled before work under the Permit may continue.

- C. No person shall continue or permit the continuance of work in an area covered by a "stop work" order, except work required to correct an imminent safety hazard as prescribed by the Director.
- D. The cost of any corrective measures shall be borne by the Permittee.

2.4.7 INSPECTIONS

- A. All public infrastructure construction is to be done under the control and at the direction of the Public Works Director. Public Works supervises and inspects the design and installation of public improvements.
- B. For private development, Public Works approves permits and inspects the public works elements of the development.
- C. Field Inspections
 - 1. The Permittee shall schedule Public Works inspections at least 24-hours in advance. The inspections shall occur at completion of significant work segments, at intervals sufficient to confirm all work is performed in accordance with the plans and specifications, and at the project completion.
 - 2. Work covered prior to inspection will be uncovered at the expense of the Permittee.
 - 3. At a minimum, the Permittee shall request inspections for the following events:
 - a. Before backfilling, for compliance with all construction standards.
 - b. After placement of rock, for compaction and material quantity and quality verification.
 - c. Prior to the placement of any materials, which would preclude full and complete inspection of construction, which will be buried or covered.
 - d. At completion of sub-grade, for compaction and grade.
 - e. During and after placement of finish course for compaction and material (quantity and quality).
 - f. After placement of forms and before pouring for line, grade, and compaction.
 - g. All pressure testing, including air and water tests.
- D. Sampling and Testing
 - 1. Tests and material sampling for the purposes of determining compliance with the specifications shall be required at the Director's discretion. All costs incurred for testing or sampling, done at the Director's request, shall be the responsibility of the Permittee.

2. Determination of field density of compacted earth will be per ASTM D1557: "Modified Proctor."
- E. Video Pipe Inspection
1. Prior to inspection and acceptance of any sanitary sewer and storm drainage pipes, all pipes and structures shall be cleaned and flushed. Any obstructions to flow within the system, (such as rubble, mortar and wedged debris), shall be removed at the nearest structure.
 2. Cleaning and flushing of the pipes and structures shall be at the sole cost of the permittee.
 3. Video Inspection: The permittee shall perform a complete video inspection of all 8-inch and larger pipes and associated appurtenances. The contractor shall provide to the City a digital video disk (DVD) audio-visual recording of these inspections. The DVD shall be formatted to allow real time fast forward and reverse review of the inspections. Individual structure-to-structure pipe runs shall be saved as separate files on DVD with file names relating to structures identifications numbers and plan set, or as approved by the City. All equipment and materials shall be compatible with existing City-owned equipment. It shall be the permittee's responsibility to confirm equipment compatibility and DVD file formats with the City prior to inspection. A Pan-And-Tilt Camera with the proper sized light head for the size of pipe being inspected shall be utilized by the Contractor at all times for televised inspection. The finished product shall be clear and have the proper amount of lighting to see any and all defects encountered during the inspection. Camera shall be equipped with a 1" reference ball at all times to aid with inspection of 8-inch diameter pipe. Pipe of 12-inch diameter or larger will require a 2" reference ball to aid with the inspection.

At all times during the video inspection process, the City shall be present. The City shall be notified forty-eight (48) hours prior to any video inspection.

The Permittee shall bear all costs of video inspection and all costs incurred in correcting any deficiencies found during video inspection including the cost of additional television inspection that may be required by the City to verify the correction of said deficiency.

SECTION 2.5 FINAL PROJECT APPROVAL

2.5.1 WORK COMPLETION

Upon completion of all required project elements, the Permittee shall request a final inspection by contacting the Public Works Inspector. The permit process is complete upon sign-off of the issued permit(s) by the Director.

2.5.2 PERMANENT STABILIZATION

All disturbed areas must have permanent stabilization in place and functioning before the temporary erosion prevention and sediment control measures are removed.

2.5.3 FLOOD CERTIFICATE

Upon completion of construction and prior to Final Public Works Inspection, the Permittee shall provide Public Works with a completed Elevation Certificate for residential. For non-residential, Permittee shall provide a completed Flood-proof Certificate or Elevation Certificate.

2.5.4 FINANCIAL GUARANTEE

The owner/agent shall provide a two-year guarantee for the faithful performance of the operation and maintenance to improvements in the right-of-way or on City property. The guarantee shall be by a surety approved by the Director.

2.5.5 TURNOVER DOCUMENTS

The City requires Turnover Documents when a developer constructs public infrastructure as part of private development. The owner/agent shall provide a complete set of turnover documents before Final Public Works Inspection. The Mayor's Office or the City Council must accept constructed infrastructure, when the value exceeds \$25,000. If the City does not accept the constructed infrastructure, the ownership and maintenance of the facilities remains the sole responsibility of the Developer.

2.5.6 RECORD DRAWINGS

All projects, including most single-family residences with a constructed drainage facility, require Record Drawings. Projects will not receive

final approval from Public Works until a complete set of Record Drawings is submitted and approved. For public facilities and facilities installed in the right-of-way, the owner/agent shall provide record construction drawings at project closeout.

Record drawings shall accurately reflect design revisions that were made to the approved plans during construction. The record drawings shall locate all existing and abandoned utilities encountered during construction, but not shown on the approved plans.

A Washington State registered professional engineer of record shall approve the record drawings. As-built survey information provided on a record drawing shall be provided by a Professional Land Surveyor currently licensed in the State of Washington, who certifies that the as-built survey and revisions to the Record Drawings were performed under the surveyor's direction. Information from sources such as the contractor's red-lined drawings, for which the surveyor is not responsible, shall be clearly noted/identified on the face of the Record Drawings.

The owner/agent shall provide record drawings on 4.0 mil double matte mylar drafting film (24" by 36") and in AutoCAD format and PDF on CD (or DVD). Each drawing, except for the digital file, shall bear the engineer and the surveyor stamps, signed and dated.

2.5.7 SURVEY DATUM

The drawing and all utility features shall be accurately located in Washington State Plane (grid) Coordinates, North Zone, using NAD 83/91 survey control and tied to at least two City of Tukwila Horizontal Control Monuments. Elevations shall be NAVD 88.

CHAPTER 3 PLANS AND SPECIFICATIONS

SECTION 3.0 GENERAL

- A. Plans, as used herein, means the plans, profiles, and cross-sections showing all work related to a specific project. To ensure completeness and clarity and a timely response from the City, the Engineer should exercise particular care when preparing the plans.
- B. The plans shall clearly indicate the location, nature, and extent of the proposed work and shall provide sufficient detail to show that all provisions of the standards and codes are met. The Engineer/Applicant shall provide specifications along with the plans whenever the plans and notes do not adequately describe the proposed work and materials.
- C. A complete plan set includes:
 - 1. Cover sheet
 - 2. Survey sheet
 - 3. Plans, profiles, cross-sections
 - 4. Typical details
 - 5. Construction notes
 - 6. Specifications
- D. Refer to Appendix C for a Plan Review Checklist to help ensure completeness.

SECTION 3.1 RECORD DRAWINGS

Record drawings shall conform to these Standards (Chapter 2) and to the Plan Review Checklist (Appendix C) and shall accurately reflect all design revisions. As-built survey information provided on a record drawing shall be provided by a Washington licensed land-surveyor.

SECTION 3.2 DRAFTING STANDARDS

3.2.1 PROFESSIONAL ENGINEER

A professional engineer, registered in Washington State, shall prepare the plans, and stamp, date, and sign each sheet, except for a single family residence that is not in or adjacent to a sensitive area and does not trigger a Technical Information Report for the surface water.

3.2.2 SUBMITTAL OF PLANS

All plans submitted for either design approval or permanent record will be free of photographs, stick-ons, or shading. Hatching may be acceptable, if the pattern is not excessively dense.

3.2.3 SHEET SIZE

- A. Engineering Drawings: 11" X 17" (min), 24" X 36" (max)
- B. Survey Drawings: 18" x 24"

3.2.4 TEXT

Text - Prepare plans understanding that each sheet might be microfilmed. Use nominal text size 1/8" as a minimum.

3.2.5 LINE STYLE

- A. Provide plans in a clean, legible, blue or black line format.
- B. Produce all existing features with a small pen or half tones.
- C. Distinguish proposed features from existing features by using a larger or bolder line weight.
- D. Use different line types to distinguish different features. For example: centerline and right-of-way will have different line types.

3.2.6 MONUMENTS

- A. Show all existing and proposed monuments.
- B. Describe all monuments using current City of Tukwila coordinates.
- C. Reference roadway centerlines, easements (with type and dimensions), and other pertinent data to existing monuments.
- D. Show or describe protection of monuments, including property corners.

3.2.7 DATUM

- A. For public facilities, work in the right-of-way, and Capital Improvement Projects:
 - 1. Horizontal - Washington State Plane (grid) Coordinates, North Zone, using NAD 83/91 survey control and tied to any two City of Tukwila Horizontal Control Monuments
 - 2. Vertical - NAVD 1988
- B. For private property other than a single family residence:

1. Horizontal - Washington State Plane (grid) Coordinates, North Zone, using NAD 83/91 survey control and tied to any two City of Tukwila Horizontal Control Monuments
 2. Vertical - NAVD 1988
- C. For Flood Control Zones provide conversion calculations to NAVD 1929

3.2.8 TITLE BLOCK

- A. Title:
- B. Date:
- C. Design by:
- D. Drawn by:
- E. Checked by:
- F. Signature Approval block
- G. Sheet number of total sheets (e.g., 2 of 5)
- H. Revisions and revisions dates

3.2.9 SCALE

Scale - Scale the drawings using an engineer's scale. No engineering plans will be accepted with architect's scale.

- A. For site work:
 - 1" = 40' Horizontal
 - 1" = 4' Vertical
- B. For Public Facility:
 - 1" = 20' Horizontal
 - 1" = 2' Vertical
- C. For Signal Drawing Sheet:
 - 1" = 10'
- D. For Illumination:
 - 1" = 30'

3.2.10 LABELED RECORD DRAWING

Labeled as-built drawing, (minimum text height 1/4")

SECTION 3.3 DESIGN ELEMENTS

The plans shall show existing and proposed for all elements on and near the site, including the following:

- A. Topography - Existing and proposed topography (two-foot contours) for 15 feet outside the property lines. Projects within flood control zones and some storm drainage plans require 1-foot intervals.
- B. Easements – existing and proposed, type, and dimensions.
- C. Clearing limits.
- D. Construction limits.
- E. No work zones.
- F. Sensitive areas – Flood zone, shoreline, steep slopes, wetlands, streams.
- G. Buffers and set-backs.
- H. Finished floor elevation.
- I. Building footprints onsite and within 15' of the property lines.
- J. Rights-of-way accesses.
- K. Adjacent property lines and addresses.
- L. Street names with quadrant prefix or suffix.
- M. Existing and proposed pedestrian and bicycle facilities.
- N. Existing and proposed utilities and improvements (above and below ground). Show information and location of all existing and proposed utilities, above and below ground. Include Cable, conduit, telephone, gas, water, sewer, fire hydrants.
- O. Landscaping: trees, shrubs, ground cover.
- P. Onsite and offsite - Fire hydrants, mail boxes, street lights, traffic signals, meters, electrical cabinets, and other such.

SECTION 3.4 DESIGN CONSIDERATIONS

3.4.1 SENSITIVE AREAS

The plans must show location, type, and rating of all sensitive areas in and near the project site. The plans must show the buffers and building setbacks.

3.4.2 FLOOD ZONE

Show the nature, location, dimensions, and elevations of the area in question, including existing or proposed structures, proposed fill, materials storage, drainage facilities. Specifically, the following information is required:

- A. Elevation in relation to mean sea level, of the lowest floor of all structures,
- B. Elevation in relation to mean sea level to which any structure has been flood proofed.

3.4.3 SEWER SEPARATION

Install water lines at least 10 feet horizontally, measured edge to edge, from any existing or proposed sewer line. The Director may allow deviation, provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer, at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

3.4.4 SURFACE WATER

Public Works requires design to the most current King County Surface Water Design Manual. Public Works recommends referring to the City's latest Surface Water Comprehensive plan and contacting the City's Surface Water Engineer during the early design stages of surface water design.

3.4.5 STREAM CROSSING

All stream crossings require written hydraulic project approval from the WDFW. The Applicant shall provide the Director a copy of the WDFW approval prior to permit issuance. Refer to Section 5.6 for additional information.

3.4.6 WATER COURSE RELOCATION

If a watercourse will be relocated, provide description of the extent to which the watercourse will be altered or relocated because of proposed development. All work within the City shall conform to the requirements of the current NPDES (National Pollution Discharge and Elimination System) Western Washington Phase II Municipal Stormwater Permit, of which the City is a permittee. Refer to Sections 5.5 through 5.7 for additional requirements. The Director, acting for FEMA, will require:

- A. Notification to adjacent communities and the Department of Ecology (DOE) prior to any alteration or relocation of a watercourse, and evidence that notification was provided to the Federal Insurance Administration.
- B. Maintenance within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.

3.4.7 EROSION AND SEDIMENT CONTROL (ESC) PLAN

Plans for any activity that disturbs ground shall include an erosion prevention and sediment control plan designed in accordance with the current edition of the King County Surface Water Design Manual. The plan shall provide information for temporary erosion prevention and sediment control during all phases of construction and shall provide permanent stabilization for disturbed areas. Refer to Section 5.10 for additional ESC requirements.

3.4.8 POLLUTION PREVENTION PLAN

Refer to the King County Storm Water Pollution Prevention Manual, current edition, for best management practices for pollution prevention plan. Refer to Section 5.11 for specific Pollution Prevention Plan requirements.

3.4.9 LOW IMPACT DEVELOPMENT

Low impact development is the preferred approach to planning, design and construction where feasible. Refer to the following:

- A. King County Surface Water Design Manual, current edition
- B. Department of Ecology Stormwater Management Manual for Western Washington December, current edition
- C. Western Washington Low Impact Development (LID) Operations and Maintenance (O&M), by the Washington State Department of Ecology Water Quality Program, May 2013.
- D. Low Impact Development Technical Guidance Manual for Puget Sound (LID Technical Guidance Manual) by Puget Sound Partnership and WSU Extension Center, Puyallup, Washington, December 2012
- E. Rain Garden Handbook for Western Washington Homeowners (Rain Garden Handbook) by the Pierce County Extension of Washington State University, June 2013.

CHAPTER 4 STREETS

SECTION 4.0 GENERAL

4.0.1 TRANSPORTATION ELEMENT

All roadway design in the City shall meet the design guidelines and requirements in the Transportation Element of the Comprehensive Land Use Plan, other applicable subarea plans, and the Subdivision Code (TMC 17.20).

4.0.2 MANUFACTURING/INDUSTRIAL CENTER

For projects in the MIC/L or MIC/H according to the City of Tukwila Zoning Map and Sections 18.36 and 18.38 of the TMC, provide driveway design and location per RS-37.

4.0.3 DEVELOPMENT SITES

A paved street surface shall serve all development sites. This street surface shall connect to an existing paved street surface. (TMC 11.12.060)

4.0.4 FRONTAGE IMPROVEMENTS

- A. The installation of street frontage improvements is required prior to issuance of a certificate of occupancy for new construction, other than single-family homes, or prior to final approval for subdivisions and 5-9 lot short plats and Planned Residential Developments. For additions and remodels to existing buildings, see TMC 11.12.070.
- B. Complete street frontage improvements shall be installed along the entire frontage of the property at the sole cost of the permittee as directed by the Director. Street frontage improvements may include curb, gutter, sidewalk, storm drainage, street lighting, traffic signal equipment, utility installation or relocation, landscaping strip, street trees and landscaping, irrigation, street widening, and channelization. Beyond the property frontage, the Permittee shall provide ramps from the new sidewalk or walkway to the exiting shoulder, and pavement and channelization tapering back to the existing pavement and channelization as needed for safety.
- C. When (due to site topography, city plans for improvement projects, or other similar reasons) the Director determines that street frontage improvements cannot or should not be constructed at the time of

building construction, the property owner shall, prior to issuance of the building permit, at the direction of the Director:

1. Pay to the City an amount equal to the property owner's cost of installing the required improvements prior to issuance of a building permit. The property owner shall provide documentation satisfactory to the Director that establishes the cost of the materials, labor, quantities; or
 2. Record an agreement which provides for these improvements to be installed by the property owner by a date acceptable to the Director; or
 3. Record an agreement to not protest a local improvement district to improve the street frontage.
- D. If, at a time subsequent to the issuance of a building permit, a local improvement district is established that includes the property for which the building permit was issued, the property may be considered in the compilation of the local improvement district assessment with the appropriate amount of costs of construction expended by the developer.
- E. The Director under either of the following conditions may waive the requirement for installation of frontage improvements:
1. If the exact location of the adjacent street frontage improvements cannot be determined at this time; or
 2. If the installation of the required improvement would cause significant adverse environmental impacts.
- F. For additions, alterations, repairs adding square footage to existing structure, or new accessory building:
1. Street improvements shall be constructed and shall be determined by the Director.
 2. Property owner costs shall be 10% or less of the total improvement cost.
 3. Director may waive.
- G. For additional structure(s) on private campus
1. Street improvements shall be constructed and shall be determined by the Director.
 2. Property owner costs shall be 10% or less of the total improvement cost.
- H. For additional structure(s) on Public campus
1. Street improvements shall be installed along entire frontage.
 2. Corner lots, etc. when cost does not dictate all frontage be improved, Director will determine which frontage will be improved.
- I. For single Family Residence (TMC 11.12.080)
1. In all cases install surface water drainage on all frontage.

2. Abutting unpaved street, not a corner lot, requires a ½ street section of pavement or a No Protest LID for pavement and storm drainage.
 3. Abutting both paved and unpaved requires ½ street pavement and drainage on unpaved right-of-way.
 4. Contiguous to a parcel served by paved street requires ½ street and drainage frontage abutting existing paved right-of-way.
 5. Abutting a paved street surface requires complete minor pavement edge improvements.
- J. For landscaping, easement, access tracts (TMC 11.12.100) the following apply when there are frontage improvements:
1. Retain existing vegetation, and replace and replant existing vegetation that gets disturbed during development.
 2. Arterial street landscaping must include installation of ground cover in erosion areas and installation of trees per City standards.
 3. Abutting property owners maintain landscaping, unless City specifically accepts the responsibility.
 4. City may require removal of landscaping that encroaches on right-of-way.

4.0.5 RIGHTS-OF-WAY, EASEMENTS, AND IMPROVEMENTS

The developer shall dedicate right-of-way and grant easements for all public streets and non-motorized facilities needed to serve a proposed development. (TMC 11.12.050)

4.0.6 DEAD END STREET (TMC 17.20.030)

New public and private dead-end streets are not allowed, unless justification can be provided for their necessity. If new or necessary, they must terminate with a cul-de-sac and a landscaped island. The maximum cul-de-sac length allowed is 600', measured from the edge of curb or edge of pavement at the connection to the end of the right-of-way at the cul-de-sac.

A hammerhead is allowed when the road is less than 200 feet and serves less than six lots. A temporary dead end can terminate with barricade(s). (TMC 11.12.170) Refer to RS-02 for cul-de-sac and hammerhead dimensions.

4.0.7 GRADE

The maximum grade for all roadways and driveways shall be fifteen percent (15%). Grades over 15% require approval of the Director and the Fire Department. Streets with slopes greater than 15% shall be concrete.

4.0.8 PARKING LOTS

All permanent parking lots shall be paved. Temporary lots can be gravel with paved driveway aprons if lot is paved within three (3) years of operating temporary lot.

4.0.9 BUS

Provide bus pullouts as required on principal arterials. Bus pullouts shall be cement concrete pavement.

4.0.10 UTILITY RELOCATION

The developer shall relocate any utilities that must be relocated to accommodate street or other required improvements.

4.0.11 NON-MOTORIZED FACILITIES (TMC 11.12.150)

A. Pedestrian Systems

1. Internal pedestrian circulation systems shall be provided within and between existing, new and redeveloping commercial, multifamily and single family developments, activity centers, and existing frontage pedestrian systems.
2. Concrete sidewalks
 - a. Arterial street - on both sides.
 - b. Non-arterial street longer than 200 feet –both sides.
 - c. Non-arterial less than 200 feet – one side.
 - d. Public streets accessing existing or planned sidewalk, activity centers, parks, schools, neighborhoods, or public transit facilities – both sides.
 - e. Director may grant exception.
3. Pavement in lieu of concrete is acceptable when:
 - a. The facility is temporary.
 - b. Flexible pavement is required due to soils and topography.
 - c. The neighborhood character does not warrant concrete.

- B. Bikeways and Walkways
 - 1. Bikeways and walkways will be surfaced with asphalt concrete. Bikeways and walkways will be illuminated in accordance with the specifications set forth in this standard. Install posts or other facilities to prohibit the passage of motor vehicles through pedestrian easements.
- C. Non-motorized easements
 - 1. Following City approval, record with King County Records, an easement titled "City of Tukwila Non-motorized Public Easement".
 - 2. The easement shall be the trail width plus 2 feet on each side (can vary). A designated bicycle route may require additional paved right-of-way.
 - 3. The easement shall specify the maintenance requirements and designate responsible parties.

4.0.12 NEW STREETS

- A. Where a street is designated by the Land Use Comprehensive Plan and is within the boundaries of a development, the developer shall dedicate the entire right-of-way, and shall construct frontage improvement.
- B. Where a street designated in the Comprehensive Plan is adjacent to a boundary of a development, the developer shall dedicate the necessary right-of-way and shall construct frontage improvement.

4.0.13 HALF STREET

The construction of half-street improvements will be permitted only along the boundaries of a development. Pavement, at least twenty (20) feet in width or as required for that street classification (measured from curb face) will be provided, and an adequate right-of-way width may be dedicated.

4.0.14 ALLEYS

The Director may allow an alley at the rear of single-family residential, multifamily residential, commercial, or industrial property. An alley not required for fire suppression access, solid waste collection, or other public purposes may be privately owned. A private alley must conform to all improvement standards for public alleys, must be posted as a private alley and must meet all other provisions

applicable to private streets. A dead-end on a public alley is prohibited.

4.0.15 SIGHT DISTANCE

Sight distance at intersections and right-of-way access points shall meet the most current edition of AASHTO Policy on Geometric Design and shall be clear of sight obstructions.

4.0.16 PAVEMENTS AND PERMEABLE PAVEMENTS

Where the terms “asphalt” and “concrete” are used in these standards as general descriptors of surfacing materials, the terms shall be understood to include both the impermeable and the permeable versions of the pavement.

Where a permeable pavement is proposed on a fire lane, the surface must be capable of supporting a live load of HS-25 (AASHTO Load Factor Design) and an outrigger load of 45,000 lbs applied to an area of 2 feet x 2 feet on 16-foot centers.

SECTION 4.1 PRIVATE STREETS (TMC 17.20.030.C(5))

- A. The City allows private streets when the street:
 - 1. Serves four or fewer lots,
 - 2. Is part of a Planned Residential Development, or
 - 3. Serves commercial or industrial facilities where no circulation continuity is necessary.
- B. Owner(s) must provide:
 - 1. Recorded covenant granting the City the right to fully use the private street for emergency access and public service vehicles.
 - 2. Recorded provision for the ownership and maintenance of the private street by the owners within the development.
 - 3. Final site plans showing private streets must include an unconditional and irrevocable offer of dedication that may be accepted by the City Council at such time as the street is needed for development of contiguous property or for the protection of public health, safety and welfare. The design and improvement of any private street will be subject to all of the requirements prescribed by this document for public streets.
- C. Owner(s) must install and maintain a sign indicating the street is private.

SECTION 4.2 PUBLIC STREETS

Streets longer than 200 feet or streets that serve more than four lots shall be constructed to public street standards. See City of Tukwila standard detail RS-01.

4.2.1 GEOMETRIC DESIGN

On the plans, note the sight distance for horizontal and vertical curves, intersections, and access points. Setbacks shall meet the current edition of the AASHTO Policy on Geometric Design. (TMC 11.20.090)

4.2.2 ALIGNMENT AND CONNECTIONS

A. Alignment

1. Align proposed streets and other primary accesses with existing streets or accesses.
2. Relate alignments, where practical, to natural topography.
3. Select alignment to minimize grading and avoid excessive runoff.

B. Connections

1. Provide street connection to any existing public street or right-of-way "stub" abutting the proposed development.
2. Provide "stub" roads for connection to any adjacent undeveloped, or partially developed, contiguous land, and to any site officially designated for a public facility.
3. Locate a stub so that it allows for future block sizes consistent with the Land Use Comprehensive Plan.
4. Locate "stub" connections to other "stub" roads on adjacent and nearby property.
5. Install "Dead End" signage. Dead End Sign 30x30 W14-1 or W14-2 No Outlet installed per RS-23A.
6. Install "End of Sidewalk" sign where sidewalk ends abruptly.

4.2.3 STREET INTERSECTIONS

- A. Primary points of access or street intersections with centerline offsets of less than one hundred fifty (150) feet will not be allowed unless the Director finds special conditions requiring a reduction. The intersection spacing requirements will not be used as criteria/justification to close existing streets.
- B. Unless required by street spacing standards, intersections on curves will be avoided.

- C. Right-of-way and curb radii will be provided at all intersections in accordance with the Land Use Comprehensive Plan and the Transportation Element. Curb radii will be the smallest necessary to achieve the goals at each intersection.
- D. Turning lanes and acceleration/deceleration lanes will be provided as required by the current edition of the AASHTO Policy on Geometric Design.

4.2.4 UNDERGROUND UTILITIES

- A. Where several utilities are planned or required in the same right-of-way corridor, joint trenches shall be used whenever possible.
- B. Where underground utilities are planned in the right-of-way corridor, utilities shall be placed under the paved portions of the right-of-way whenever possible.
- C. Where underground utilities are planned under an existing permeable pavement or an existing bioretention facility, the utility shall take measures to protect the utility trench from infiltration of stormwater, without compromising the function of the permeable pavement of the bioretention facility.
- D. Where a permeable pavement or a bioretention facility is planned over an existing underground utility, the developer shall protect the utility trench from infiltration of stormwater.
- E. All new electrical and communication facilities shall be underground per TMC 11.28.
- F. Undergrounding requirements for new facilities or rebuild, replacements and additions are described in TMC 11.28.070 and TMC 11.28.080.

4.2.5 ACCESS

- A. Pedestrian/ADA and emergency vehicle access will be provided to any abutting public school, public building, trail, or transit stop. (TMC 11.12.150)
- B. Development
 - 1. All development sites shall be served by a paved street surface that connects to an existing paved street surface. (TMC 11.12.060)
 - 2. Applicant may provide an access lane rather than a private street if the access serves four or fewer lots and is 200' or shorter. The access lane may be on an easement, shall be 20 feet wide and paved the full 20' width and will be owned and maintained by the property owners served by the lane.

3. Provide more than one connection to the existing public street system for any development, or part thereof, of four acres or more. If not otherwise prohibited, each connection will be to a different collector or arterial street. Where the site includes only a single frontage of less than 400 feet, this requirement may be met by provision of one or more stub roads.

4.2.6 RIGHT-OF-WAY VEGETATION

- A. New vegetation must match or complement existing street vegetation or be approved by the Director (refer to TMC Title 11.20).
- B. New vegetation in the Tukwila Urban Center must meet the adopted plan (refer to TMC Title 18.28).
- C. Notify owners within 100 feet when removing or pruning vegetation that is 4-inch diameter or larger.
- D. No maple, Lombardy poplar, cottonwood, gum, or other trees with invasive root system. (TMC 11.20.070)
- E. Vegetation removed from right-of-way or damaged during construction shall be replaced with equivalent number, size, quality, and species. (TMC 11.20.110)
- F. The design shall include a plan for irrigation. Irrigation is required for two years following project acceptance.

SECTION 4.3 ILLUMINATION

4.3.1 GENERAL

- A. A licensed engineer experienced in illumination design shall prepare all contract documents for new installations and modifications to existing systems. The Director or designee shall approve all illumination system equipment submittals. The City shall be the sole judge of any materials to be considered equal or better.
- B. Required along all public streets, including new public streets in subdivisions and short subdivisions. (TMC 11.12.110)
- C. Required at the intersection of a public and a private street.
- D. Not required along a private street. (TMC 11.12.110)
- E. All wiring, conduit and power connections, new or relocated, shall be underground.
- F. For a new subdivision, Developer assumes maintenance and power cost until the development is 50% or more occupied. (TMC 11.12.010.c)

- G. Developer designs to City standards, installs new lighting, and relocates existing lighting along development frontage.
- H. Provide lighting calculations using illumination design software AGi32 by Lighting Analysts. For illumination design guidelines, see City of Tukwila standard details, sheet RS-24.

4.3.2 MATERIALS

- A. New installations shall use LED type luminaires. For roadway luminaire and pole details see City of Tukwila standard details, sheets RS-25 and RS-25a. For pedestrian luminaire and pole details see City of Tukwila standard details, sheet RS-26.
- B. Photocell shall be installed on the closest roadway luminaire located to the electrical service cabinet and shall be controlling all illumination circuits in the cabinet. The remaining luminaires shall be provided with a shorting cap.
- C. Junction Boxes shall be furnished and installed per the latest edition of WSDOT Standard Specifications, Section 8-20.3(6) and Standard Plans J-40.10 and J-40.30.
- D. For most applications, conduit shall be Schedule 80, polyvinyl chloride (PVC) with bell ends, unless capped for non-use. For additional conduit installation guidelines, see WSDOT Standard Specifications, Section 8-20.3(5).
- E. Circuit conductors, pole wiring, splice kits, quick disconnects and fuses shall be per City of Tukwila standard details, sheet RS-28. All conductors shall be stranded copper sized and shall conform to current NEC. All grounds will be green, stranded copper and shall match the largest conductor (minimum #8 AWG).
- F. Electrical service cabinets (with or without BBS) shall be furnished and installed per City of Tukwila standard details, sheet RS-29.
- G. Submit catalog cuts and material data sheets to the City for review and approval. The City will be the sole judge of a product being approved as equal or better.

4.3.3 INSTALLATION

- A. Installation method and materials for all illuminations systems equipment shall be compliant with the latest editions of WSDOT Standard Specifications and the City of Tukwila standard details.
- B. Junction boxes shall be installed so the top of the box is at grade and positioned so that all conduits are 4 inches from the inside walls. Fill with clean drainage gravel, leaving at least 6 inches of free space between the conduit and the top of the box.

- C. Illumination circuit splices shall be installed per WSDOT Standard Specifications, Section 9-29.12(1).

SECTION 4.4 TRAFFIC SIGNALS

4.4.1 GENERAL

- A. A licensed engineer experienced in traffic signal design shall prepare all traffic signal design and modifications. The Director or designee shall approve all traffic signal system equipment submittals. The City shall be the sole judge of any materials to be considered equal or better.
- B. When a proposed street or driveway design will interfere with existing traffic signal facilities, the developer shall modify or relocate the signal. (TMC 11.12.160)

4.4.2 MATERIALS

- A. All new or revised traffic signal systems shall include, but not be limited to the following minimum requirements:
 - 1. The Contractor shall coordinate installation of new "SP" Type signal controller cabinets with the City of Tukwila Traffic Operations and Maintenance Department. The fully populated cabinets, including controllers, shall be furnished, configured and tested by the City and installed by the Contractor. The Contractor shall contact the City of Tukwila Traffic Operations and Maintenance Department to coordinate the cabinet pickup and the construction details regarding cabinet foundation dimensions and anchor bolt configuration at least 12 (twelve) weeks prior to cabinet installation.
 - 2. The Contractor shall furnish and install PTZ traffic monitoring camera at each signal controlled intersection (coordinate with the City Engineer for exceptions).
 - 3. Electrical service cabinets at signal locations shall include BBS cabinets per City of Tukwila standards details, sheet RS-29.
 - 4. Foundations for traffic signal and electrical service cabinets shall be per WSDOT Standard Plan J-10.10.
 - 5. Traffic signal systems shall be interconnected to the City's traffic operations fiber-optic network.
 - 6. All signal heads and visors shall be powder-coated yellow. Back plates shall be louvered, powder coated black and shall include 2" wide yellow retroreflective tape. All vehicular signal indications will be 12" tinted LED modules meeting the current ITE specifications. Installation method and materials shall be

compliant with the latest editions of WSDOT Standard Specifications.

7. All pedestrian signal indications shall be LED, countdown type with solid symbols and equipped with "z" crate visors. Pedestrian signal heads shall be powder-coated yellow. Installation method and materials shall be compliant with the latest editions of WSDOT Standard Specifications.
8. Prior to design, preference for video or induction loop detection shall be determined by the City Engineer.
 - a. Video detection system shall be Vantage Vector Hybrid System by Iteris and shall include video detection equipment, auxiliary equipment, cameras, housings, and mounts, and all required mounting hardware, cables, connectors, and wiring. The video detection equipment shall be of the quantities shown in the Plans and Specifications.
 - b. Vehicle loop induction system shall be installed per the Plans and Specifications and shall conform to the latest edition of WSDOT Standard Specifications and Standard Details.
9. All pedestrian push button shall be APS type and shall comply with the latest ADA guidelines. Pedestrian push button stations shall be EZ Communicator Navigator 2 Wire Push Button Station (EN2-3-C-B-1-B) by Polara Engineering and shall include the following features:
 - a. Confirmation of button push via LED, sound and tactile bounce
 - b. Locating tone during Don't Walk
 - c. Vibrating button during Walk
 - d. Sounds adjust to ambient noise
 - e. Sounds synchronized across all push buttons
 - f. 9"x15" sign (per WSDOT Standard Plan J-20.26)
 - g. Braille on the Face Plate
 - h. Audible Message during the Walk phase (shall be approved by the Engineer)
 - i. Black Frame
 - j. One Central Control Unit (CCU2EN) by Polara Engineering shall be provided and installed in the traffic controller cabinet per intersection as an interface between the signal controller and the pedestrian push button stations. The Central Control Unit shall:
 - i. Accommodate up to 16 push button stations
 - ii. Include a built in conflict monitoring system that monitors pedestrian push button stations and pedestrian signal head lights and powers off in the

- event of a conflict
 - iii. Include an Ethernet port for communication
 - iv. Include the Interconnect Board for termination of field wiring
 - k. All emergency preemption devices and cabling will be current model "Opticom" brand.
 - l. All new or modified signal poles shall have aluminum terminal cabinets installed.
- B. Submit catalog cuts and material data sheets to the City for review and approval. The City will be the sole judge of a product being approved as equal or better.

4.4.3 INSTALLATION

Installation method and materials for all signal equipment shall be compliant with the latest editions of WSDOT Standard Specifications and the City of Tukwila standard details.

SECTION 4.5 SIGNS AND MARKINGS

The Director determines the type, size, and location of signs and markings in the right-of-way. Signs shall meet the URBAN AREAS criteria in the MUTCD and meet the criteria in TMC 11.24 Placement of Signs or Banners.

4.5.1 MATERIALS

A. Markings

1. All pavement markings shall comply with the MUTCD, Standard Plans and the Standard Specifications, unless otherwise specified herein, or if waived by the City Engineer.
2. Crosswalks shall be per RS-20.
3. All arrows shall be per RS-21 (WSDOT Standard Plan M-24.40-02).
4. Buttons only in areas with speed limit 35 and greater. Button layout per RS-17 through RS-19.
5. Residential roadway striping shall be low voc traffic paint.
6. Profiled and embossed plastic lines per RS-22 (WSDOT Standard Plan M-20.20-02).
7. All traffic signalized intersections that include bicycle lanes must include the bicycle detector pavement marking per the Guide for the Development of Bicycle Facilities, AASHTO, 1999. (<http://www.wsdot.wa.gov/bike/pdf/bikebook.pdf>)

8. All bike lane symbols shall be installed per WSDOT Standard Plan M-9.50-02.
 9. Bicycle lanes shall be 8" thermoplastic.
 10. If precast traffic curbing is used instead of markings, the curbing shall be installed with a two part epoxy, no mortar mix or cement.
- B. Street Signs
1. Refer to City of Tukwila standard detail RS-23A AND RS-23B for Street Name Signs. 2"x2" steel square channel post, steel anchor set in concrete, reflector shield may also be used or required.
- C. Other Signs
1. Posts:
 - a. Round posts are not allowed.
 2. Signs:
 - a. Street markers shall have white lettering and border on a green background. The sign shall be six inches high and shall have 4-inch letters. Street markers need to meet the new federal requirements. Upper case and lower case letters with white border. Also letter size.
 - b. Stop and regulatory signs shall be High Intensity Prismatic reflective sheeting, or City Engineer approved equivalent.
 - c. All signs shall be high intensity prismatic sheeting.
 - d. All signs shall have a border.

4.5.2 INSTALLATION

- A. Street Signs
- a. The Developer shall install all street signs on public right-of-way (including street name signs, warning signs, and regulatory signs) per RS-23A and RS-23B
- B. Other Signs
1. Posts: 2"x2" steel square channel post
 - a. In soil, dig hole at least 24" deep.
 - b. On a raised island or in asphalt or concrete, dig a hole that is at least two feet in diameter, and at least 30 inches deep.
 - c. For street markers, install at intersection.
 2. Mount:
 - a. Primary signs so that there are seven feet from the ground to the bottom of the sign.
 - b. Secondary signs on the same post so there is at least six feet from the ground to the bottom of the sign.

- c. Object markers and large single or double arrows so there is at least four to five feet from the ground to the bottom of the sign.
- d. Opposing chevrons or signs for both directions on same post, if they are clearly visible from both directions.
- e. Street markers on top of post using a metal bracket.
- f. On street light poles using stainless bands and mounting hardware.
- g. So that posts do not show above the sign, except when installing a street marker bracket.

CHAPTER 5 SURFACE WATER

SECTION 5.0 DESIGN STANDARDS

5.0.1 SURFACE WATER DESIGN MANUAL

Surface Water design shall meet the 2016 King County Surface Water Design Manual (KCSWDM). Exceptions, modifications, specifications, and additions to the items contained in the KCSWDM are listed below.

1. Flow Control

- a. Flow control standards within the City of Tukwila are basin specific and shown on Map 5.12.1. In addition to the flow control standards used in the KCSWDM, the City of Tukwila adds three additional flow control standards, referred to as a Basic Flow Control (FC), Conservation FC, and Flood FC. The flow control standards for the City of Tukwila Basins are defined below.

Table 5.0.1 –Flow Control Standard by Drainage Basin	
<u>Drainage Basin Name</u>	<u>Flow Control Standard</u>
Duwamish River Basin	Basic Flow Control (FC) Area ¹
Riverton Creek Basin	Conservation FC Area ² (Historic)
Southgate Creek Basin	Conservation FC Area ² (Historic)
Gilliam Creek Basin – West of Interstate 5	Conservation FC Area ² (Historic)
Gilliam Creek Basin – East of Interstate 5	Flood FC Area ⁴ (Existing)
Nelson Place Long Acres Basin	Flood FC Area ⁴ (Existing)
Strander Pump Station Basin	Flood FC Area ⁴ (Existing)
Southeast CBD Basin	Flood FC Area ⁴ (Existing)
P17 Basin	Flood FC Area ^{3,4} (Existing)
Lower Mill Creek Basin	Flood FC Area ⁴ (Existing)
Tukwila South Basin	Basin Specific Standard ⁵
Notes: (1) For the Duwamish River Basin projects that drain to the Duwamish River below River Mile 6 may be eligible for a lesser standard as follows: a) Projects that discharge directly to the Duwamish River via a manmade system having adequate capacity per Section 1.2.3.1 (under direct discharge exemption) of the KCSWDM may be exempt from flow control if all requirements are met. b) Projects that drain directly to the Duwamish River that do not have adequate capacity per Section 1.2.3.1 of the KCSWDM should provide flow control to the	

Basic Flow Control (FC) standard.

- (2) Areas within this basin that drain via a pipe system to a different basin may be allowed to apply the flow control requirements for the downstream basin is no possibility of erosion of natural or constructed systems.
- (3) A portion of this basin is within the "Tukwila South Project" and shall have flow control standards as approved by Dept. of Ecology.
- (4) This area is highly modified drainage systems that contains 40% total impervious area since 1985. Erosion is not expected or observed but downstream flooding problem must be mitigated through this standard.
- (5) Through project permitting for the "Tukwila South Project", the applicant obtained a basin specific standard which was approved by the Dept. of Ecology and the City.

Basic Flow Control (FC) and Flood Problem FC Areas:

Runoff from the developed site will be controlled and released at a rate per Table 1.2.3.A (Pg. 1-40) of the 2016 KCSWDM.

Background: These are areas that have been developed for years and drain to stream channels that have become stabilized to a new hydrologic regime. Ecology has proposed that the existing land cover can be used in basins that have had at least 40% total impervious surface area for the 20 years preceding Ecology's adoption of the 2005 Stormwater Management Manual for Western Washington (called the 40/20 criterion) and the stream channels receiving the runoff are considered stable from the standpoint of excessive erosion or sedimentation. In developing the areas for "40/20 criterion", the City of Tukwila conducted GIS analysis to confirm impervious percentages in 1985.

Flow control facilities designed to the 40/20 criterion will only have to mitigate for the added impervious surface. As a result, these flow control facilities will be smaller than those required to be designed to match runoff from a fully forested site.

Conservation FC Areas:

Runoff from the developed site will be controlled and released at a rate per Table 1.2.3.A (Pg. 1-40) of the 2016 KCSWDM using historic site conditions (forested).

Background: These are areas that have been developed for years and

drain to stream channels that have experienced severe erosion and must be protected by a higher detention standard.

SECTION 5.1 WATER QUALITY TREATMENT

- A. All surface water runoff created by a private development shall be accounted for by the private development, including surface water from public facilities constructed as part of the private development.
- B. Currently, the City is not requiring mitigation targeted to address a specific downstream water quality problem (i.e., listing as a 303d water quality problem), but mitigation requirements may be added in future modifications to these standards.

SECTION 5.2 STORMWATER FACILITY DESIGN AND CONSTRUCTION

- A. Specifications, materials, and testing are specified in Section 7-04 of the WSDOT Standard Specifications. Corrugated Steel Pipe or Spiral Rib Steel Pipe will not be permitted unless approved by the City Engineer.
- B. All surface water facilities constructed as part of a private development shall be owned by the private developer. All maintenance responsibilities remain with the private developer.
- C. The City will not approve installation of private surface water facilities in public right-of-way.
- D. Open pond side slopes shall be 3H:1V or flatter.
- E. All vaults shall be underground and covered. The City will not approve uncovered, above-ground retention/detention vaults.

SECTION 5.3 STORM COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

The City's Comprehensive Surface Water Management Plan indicates the general location and description of planned surface water improvement projects and spells out the intent of the City's surface water management plan. If a project is adjacent to or within a ¼ mile upstream of an improvement project in the City's Comprehensive Surface Water Plan, the permit application plan submittal shall consider the planned improvement in the Technical Information Report and, when required, shall include it in the project design.

The exact location or configuration of a proposed improvement may be modified or adjusted by the Developer if needed, provided the proposed

improvement remains consistent with the overall intent of the Plan. The Director must approve all modifications to the Comprehensive Plan requirements.

Public Works recommends referring to the City's latest Surface Water Comprehensive plan and contacting the City's Surface Water Engineer during the early stages of surface water design.

SECTION 5.4 OFFSITE DRAINAGE IMPROVEMENTS

With the City's approval, the Applicant may provide offsite improvements in the same drainage basin or threshold discharge area to mitigate water quality and flow control requirements associated with the project. These offsite improvements shall provide equivalent water quality and flow control.

SECTION 5.5 STREAMS (TMC 18.45.100)

Streams should be preserved in their existing channels. Any alteration to a stream channel requires approval by the Director, DOE, WDFW, and requires a U.S. Core of Engineers Section 404 permit.

SECTION 5.6 STREAM CROSSINGS

All stream crossings require written hydraulic project approval from the WDFW. The Applicant shall provide the Director a copy of the WDFW approval prior to permit issuance. Applicant shall design and install all stream crossing elements to withstand all anticipated loading, erosion impacts, hydraulic forces, and to remain water tight and free from changes in alignment or grade.

SECTION 5.7 NPDES

All work within the City shall conform to the requirements of the current NPDES (National Pollution Discharge and Elimination System) Western Washington Phase II Municipal Stormwater Permit, of which the City is a permittee.

Construction projects shall conform to the requirements of the current NPDES Construction Stormwater General Permit (CSWGP). Projects that disturb one or more acres, or meet other thresholds listed in Section S1.B of the CSWGP, must apply to the Department of Ecology for coverage under the CSWGP. Proof of coverage must be provided to the City prior to construction.

SECTION 5.8 STRUCTURES, LIDS, AND GRATES

All grates within sidewalks, walkways, crosswalks or other pedestrian areas must meet ADA requirements for slip resistance.

Grate inlets shall be standard Rectangular Vaned Grate type unless being used within a Sidewalks, walkways, crosswalks or other pedestrian areas where they shall meet ADA requirements.

Sand collars shall be used on pipe to structure connections for all smooth wall pipes with 12'' diameter or smaller, except ductile iron and concrete. Sand collars are not required for pipes larger than 12'' diameter.

The use of grate inlets or catch basins without sumps are only permitted in areas where underground conflicts prevent the use of a sump or where a sump is provided in an offset drainage structure.

SECTION 5.9 OUTFALLS

A. Hydraulics Project Approval

1. A new outfall or a modification to an existing outfall of a designated watercourse may require a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife (WDFW). When HPA is required, the Applicant must provide proof of HPA to receive a Public Works permit.

B. Maintenance Access

1. The Applicant must construct a maintenance access and provide the City a maintenance easement for all new or modified outfalls that the City will maintain.

SECTION 5.10 EROSION PREVENTION AND SEDIMENT CONTROL

- A. Plans for any activity that disturbs ground shall include an erosion prevention and sediment control plan (ESC) designed in accordance with the adopted King County Surface Water Design Manual. The plan shall provide information for temporary erosion prevention and sediment control during all phases of construction and shall provide permanent stabilization for disturbed areas. During construction, the Director may require additional measures as needed to prevent erosion and retain sediment.
- B. The plan shall emphasize erosion prevention rather than sediment control and shall minimize the extent and duration of soil exposure. In

addition, the plan shall minimize runoff velocities and retain sediment on-site.

- C. At a minimum, the ESC plan shall show clearing limits, sensitive area buffers, and shall provide temporary stabilization, sediment retention, and perimeter protection. In addition, some projects will require stabilized traffic areas and surface water controls, which shall be shown on the ESC plan. The plan shall also provide a description of final stabilization methods.
- D. The plan shall provide the seed mix for the temporary and permanent seeding.
- E. The plan shall require cover measures as follows:
 - 1. At all times, any disturbed areas left unworked for more than 30 days shall be seeded.
 - 2. May 1 through September 30, temporary cover measures shall be installed on ALL areas left undisturbed for more than seven days.
 - 3. October 1 through April 30, minimum wet season requirements:
 - a. Install temporary cover measures on all areas that will remain unworked for more than TWO DAYS and on stockpiles and steep cut and fill slopes.
 - b. Retain onsite a quantity of cover measures materials sufficient to cover all disturbed areas.
 - c. By October 8, temporarily seed and mulch all areas that will be unworked during the wet season.
 - d. Mulch all seeded areas.
 - e. Stabilize all construction traffic areas, unless already graveled.
- F. ESC Maintenance
 - 1. Failure to maintain ESC measures in accordance with the approved maintenance schedule may result in the work being performed at the direction of the Director and assessed as a lien against the property where such facilities are located.
 - 2. During the life of the project, the Permittee shall maintain in good condition and promptly repair, restore, or replace all grade surfaces; walls, drains, dams, structures, vegetation, erosion and sediment control measures, and other protective devices in accordance with approved plans.
 - 3. The Permittee shall monitor the downstream drainage features, and shall, with the Director's approval, remove all sediment deposition resulting from project-related work.
 - 4. The Director shall assume maintenance and operation responsibilities for all ESC measures located within public easements and rights-of-way following final acceptance of

such facilities by the Director.

5. All projects 1 acre or more require ESC supervisors to have a turbidity meter on site. Projects less than 1 acre will require ESC supervisors to have a turbidity meter on site on a case-by-case basis.

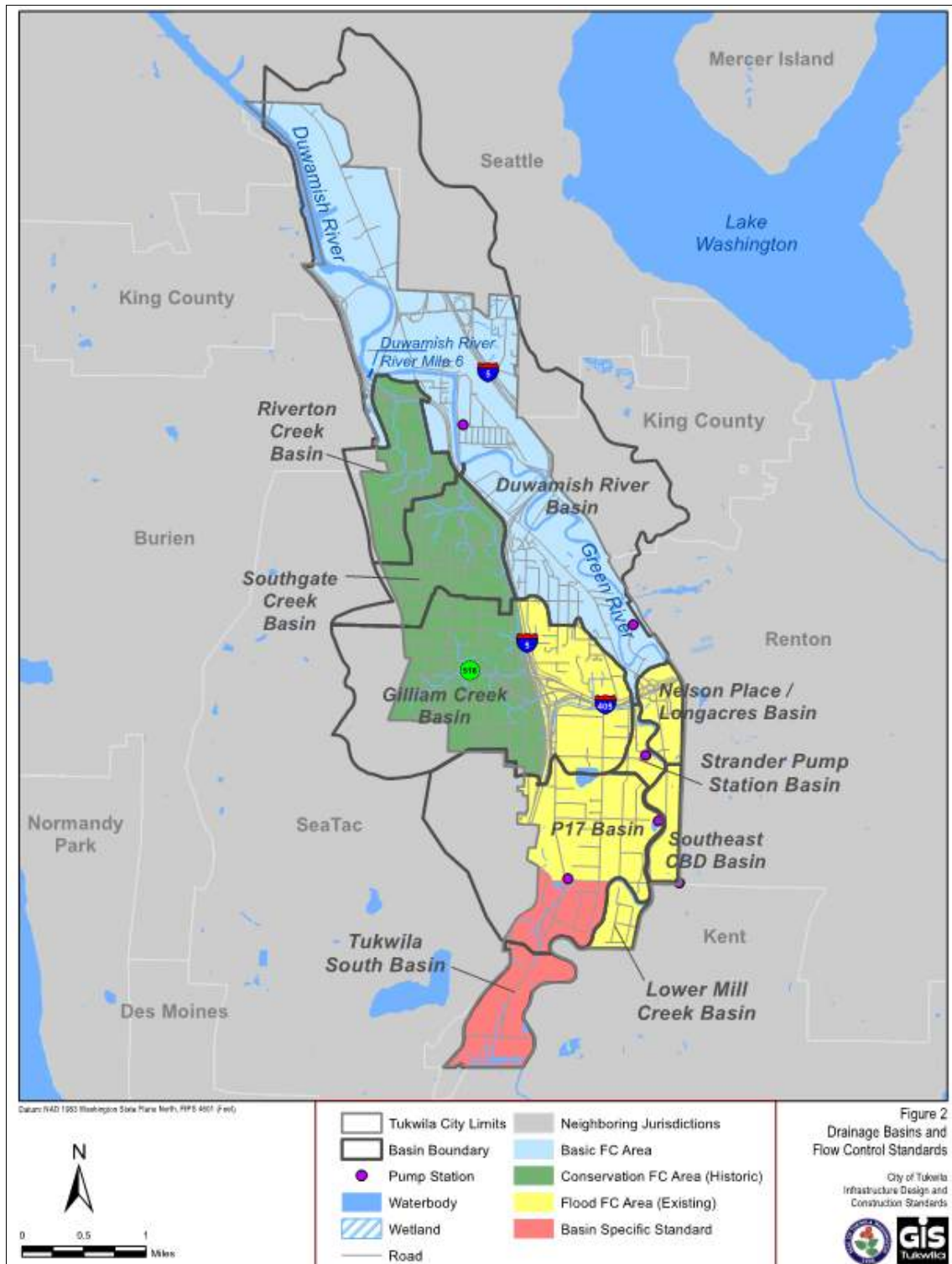
SECTION 5.11 POLLUTION PREVENTION PLAN

Any construction project that includes any of the following activities must provide best management practices to prevent surface water pollution:

- A. Dewatering
- B. Paving
- C. Structure construction and painting
- D. Material delivery, use, or storage (soil, pesticides, herbicides, fertilizers, detergent, plaster, petroleum products, acids, lime, paints, solvents, curing compounds)
- E. Solid waste
- F. Hazardous waste
- G. Contaminated soils
- H. Concrete waste
- I. Sanitary/septic waste
- J. Vehicle or equipment cleaning, fueling, or maintenance

SECTION 5.12 SURFACE WATER MAPS

5.12.1 MAP 1 – FLOW CONTROL DRAINAGE BASINS



CHAPTER 6 FLOOD ZONE

SECTION 6.0 GENERAL

This following applies to all special flood hazard areas within the City of Tukwila jurisdiction.

6.0.1 BASE FLOOD ELEVATION

- A. The basis for special flood hazard areas identified by the Federal Insurance Administration is a scientific and engineering report entitled "The Flood Insurance Study for King County, Washington dated December 6, 2001, and any revisions thereto, with an accompanying Flood Insurance Rate Map (FIRM), and any revisions thereto, hereby adopted by reference and declared to be a part of this ordinance. The Flood Insurance Study and the FIRM are on file at 6300 Southcenter Boulevard, Suite 100.
- B. Where flood elevation data is not available either through the Flood Insurance Study, FIRM, or from another authoritative source, the Director shall review applications for building permits to assure that proposed construction will be reasonably safe from flooding. The test of reasonableness is a local judgment and includes use of historical data, high water marks, photographs of past flooding, etc., where available. Failure to elevate at least two feet above the highest adjacent grade in these zones may result in higher insurance rates.
- C. When base flood elevation data has not been provided in A zones, the Director shall set the base flood elevation by using any base flood elevation and floodway data available from a Federal, State or other source.
- D. For subdivision proposals and other proposed developments that contain at least 50 lots or 5 acres, where base flood elevation data has not been provided or is not available from another authoritative source, the Developer shall generate base flood elevation data.

6.0.2 BOUNDARY INTERPRETATION

The Director shall determine special flood hazard area boundaries when there is a conflict between a mapped boundary and actual field conditions.

6.0.3 WATER COURSE RELOCATION

If a watercourse will be relocated, provide description of the extent to which the watercourse will be altered or relocated because of proposed development. The Director, acting for FEMA, will require:

- A. Notification to adjacent communities and the Department of Ecology (DOE) prior to any alteration or relocation of a watercourse, and evidence that notification was provided to the Federal Insurance Administration.
- B. Maintenance within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.

6.0.4 REQUIRED INFORMATION

- A. Elevation in relation to mean sea level, of the lowest floor (including basement) of all structures,
- B. Elevation in relation to mean sea level to which any structure has been flood proofed,
- C. Certification by a registered professional engineer or architect that the flood proofing methods for any nonresidential structure meet the flood proofing criteria in TMC 16.52, and,
- D. Description of the extent to which a watercourse will be altered or relocated as a result of proposed development.

SECTION 6.1 STANDARDS

6.1.1 GENERAL

- A. All plans shall show the nature, location, dimensions, and elevations of the area in question, including existing or proposed structures, fill, materials storage, drainage facilities. Specifically, the following information is required:
 - 1. Elevation in relation to mean sea level, of the lowest floor of all structures.
 - 2. Elevation in relation to mean sea level to which any structure has been flood proofed.
- B. In all special flood hazards where flood elevation data is not available, either through the FIRM or from another authoritative source, all new construction and substantial improvements shall be elevated at least two feet above the highest adjacent grade.

6.1.2 ANCHORING

- A. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.
- B. All manufactured homes must likewise be anchored to prevent flotation, collapse, or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques).

6.1.3 CONSTRUCTION MATERIALS AND METHODS

- A. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
- B. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.
- C. All new construction and substantial improvements on slopes shall have drainage paths to guide floodwaters around and away from proposed structures.
- D. Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

6.1.4 UTILITIES

- A. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems;
- B. A proposed water well shall be approved by the Department of Ecology (WAC 173-160-171);
- C. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters; and,
- D. Onsite waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

6.1.5 SUBDIVISIONS

- A. All subdivision proposals shall be consistent with the need to minimize flood damage;
- B. All subdivision proposals shall have public utilities and facilities, such as sewer, gas, electrical, and water systems located and constructed to minimize or eliminate flood damage;
- C. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and,
- D. Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments that contain at least 50 lots or 5 acres.

6.1.6 RESIDENTIAL CONSTRUCTION

- A. New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated one foot or more above the base flood elevation.
- B. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:
 - 1. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - 2. The bottom of all openings shall be no higher than one foot above grade.
 - 3. Openings may be equipped with screens, louvers, or other coverings or devices if they permit the automatic entry and exit of floodwaters.

6.1.7 NONRESIDENTIAL CONSTRUCTION

- A. New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated one foot or more above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

1. Be flood proofed so that below one foot or more above the base flood level the structure is watertight with walls substantially impermeable to the passage of water. City shall notify Applicants who propose to flood proof nonresidential buildings that flood insurance premiums will be based on rates that are one foot below the flood proofed level (e.g. a building flood proofed to the base flood level will be rated as one foot below).
 2. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;
 3. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on her development and/or review of the structural design, specifications, and plans.
- B. Nonresidential structures that are elevated, not flood proofed, must meet the same standards for space below the lowest floor as residential construction.

6.1.8 MANUFACTURED HOMES

- A. All manufactured homes to be placed or substantially improved on sites:
1. outside of a manufactured home park or subdivision,
 2. in a new manufactured home park or subdivision,
 3. in an expansion to an existing manufactured home park or subdivision, or
 4. in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood; shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated one foot or more above the base flood elevation and be securely anchored to an adequately designed foundation system to resist flotation, collapse and lateral movement.
- B. Manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision that are not subject to the above manufactured home provisions be elevated so that either:
1. The lowest floor of the manufactured home is elevated one foot or more above the base flood elevation, or
 2. The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be

securely anchored to an adequately designed foundation system to resist flotation, collapse, and lateral movement.

6.1.9 RECREATIONAL VEHICLES

Recreational vehicles placed on sites are required to either:

- A. Be on the site for fewer than 180 consecutive days,
- B. Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or
- C. Meet the requirements for manufactured homes, including the elevation and anchoring requirements for manufactured homes.

SECTION 6.2 FLOODWAYS

- A. Floodways are located within special flood hazard areas. Floodwaters within floodways are extremely hazardous due to high flow velocities. These waters carry debris and potential projectiles, and have a high potential for erosion.
- B. The following provisions apply to floodways within the City:
 - 1. Construction of new residential structures is prohibited.
 - 2. No construction within a designated floodway can increase base flood levels.
 - 3. No encroachment is allowed, including fill, new construction, substantial improvements, or other development, unless a registered professional engineer certifies through hydrologic and hydraulic analyses, performed in accordance with standard engineering practice, that the proposed encroachment would not result in any increase in flood levels during the occurrence of the base flood discharge.
 - 4. Repair, reconstruction, or improvement to a residential structure is allowed, as long as the structure's ground floor area does not increase and the cost of the work does not exceed 50 percent of the market value of the structure either, (A) before the repair, or reconstruction is started, or (B) before the damage occurred (if the structure has been damaged and is being restored). Any project to correct existing violations of state or local health, sanitary, or safety code specifications identified by the code enforcement official and which are the minimum necessary to assure safe living conditions or to structures identified as historic places shall not be included in the 50 percent.

- C. If approved, all new construction and substantial improvements shall comply with all applicable standards.

SECTION 6.3 CRITICAL FACILITY

- A. Construction of new critical facilities shall be, to the extent possible, located outside the limits of a special flood hazard area. The Director may permit construction of a new critical facility within a special flood hazard area if no feasible alternative is available.
- B. Critical facilities constructed within a special flood hazard area shall meet the following:
 - 1. Lowest floor elevated three feet above base flood elevation or elevated to the 500-year flood elevation, whichever is higher.
 - 2. Flood proofing and sealing measures ensure that toxic substances will not be displaced by or released into floodwaters.
 - 3. Access to and from the critical facility protected to three feet above base flood elevation or to the 500-year flood elevation.
 - 4. Access routes elevated to or above the level of the base flood elevation provided to all critical facilities to the extent possible.

CHAPTER 7 WATER SUPPLY

SECTION 7.0 GENERAL

7.0.1 COMPREHENSIVE WATER PLAN

The City of Tukwila has adopted a Comprehensive Water Plan to ensure the development of an efficient and adequate water supply system for the City. The current Comprehensive Water Plan can be found here: <http://www.tukwilawa.gov/wp-content/uploads/PW-Comprehensive-Water-Plan.pdf> . All extensions, additions, changes, or alterations to the City water system shall be consistent with the Comprehensive Plan. All planned main outages required to construct new water infrastructure shall be coordinated with the City Engineer to ensure adequate fire protection be maintained at all times.

The Comprehensive Plan indicates the general location and configuration of the proposed system supply mains, interties, and loops. The exact location or configuration of the system may be modified or adjusted by the Developer, provided the proposed system remains consistent with the overall concept of the Plan. All modifications to the Comprehensive Plan design requirements require written approval by the Director.

If the City's Comprehensive Water Plan anticipates or indicates the system may be expanded in the future, the permit application plan submittal shall include the expansion plan in the design.

Refer to Figure 7 for water district boundaries within Tukwila.

7.0.2 SYSTEM PRESSURE

Public or private systems shall be designed to maintain a minimum residual pressure not less than 20 psi at ground level at all points in the system, under maximum instantaneous fire flow demand.

7.0.3 METERING

All water used for any purpose other than fire protection service shall be metered. Each individual building requires a separate water meter and service line main tap.

7.0.4 WELLS

New private wells or sources of water will not be allowed. Existing facilities covered by a current water right permit from the State of Washington will be allowed if they conform to all local, state, and federal laws and regulations. The City does not allow connection between public and private systems. Such connections are unlawful.

7.0.5 COMBINATION SYSTEMS

Domestic water supply shall not be combined with any fire-only supply system for new construction. Existing combination systems are allowed only where the Permittee has City-approved fire line metering and has demonstrated to the Director that the private system complies with the most current cross connection control requirements.

Combination systems allowed for Single Family with approval from the Director. Pressure and flow calculations shall be provided during meter permit application.

7.0.6 FIRE AND LOOPED SYSTEM

If possible for purposes of meeting fire protection and water quality standards, water systems are to be looped in accordance with the City's Comprehensive Water Supply Plan and the Uniform Fire Code. Non-looped systems require the Director's approval.

7.0.7 RECLAIMED WATER

Where available, reclaimed water can be utilized for non-potable uses such as irrigation, cooling, and energy needs. Technical specifications (i.e. blocking, valves, etc.) as provided in these Standards for potable water systems are also applicable to reclaimed water systems. In addition, non-potable, reclaimed water systems must be clearly identified with signs and purple coloring in accordance with the Water Reclamation and Reuse Standards of the Washington DOE manual, Criteria for Sewage Works Design.

7.0.8 SYSTEM MODIFICATIONS

Modification to the water supply or plumbing on private property requires upgrade of the meter(s) and the cross connection control to current standards.

7.0.9 MAINTENANCE

The property owner owns and maintains the water service from the meter onto the property.

SECTION 7.1 METERED SERVICE

7.1.1 GENERAL

- A. All permanent meters for one project shall be located at the property line and within the right-of-way. Compression joints used in the public system will use only stainless steel gripper band compression sleeves. No pack joints will be allowed.
1. Residential - Connections shall be a minimum of $\frac{3}{4}$ inch and shall use one section of copper tubing type K continuous from the main to the meter, without any joints. Materials between the meter and the house must meet the current Uniform Plumbing code. For residential supply which include fire suppression, a 1" minimum service is required.
 2. Non-residential - Connections shall be a minimum of 1 inch and shall use one section of copper tubing type K continuous from the main to the meter, without any joints. Pipe and fittings shall be rated for pressure of twice the maximum working pressure of the 360-pressure zone.
 3. Deduct Meter - The meter shall read in cubic feet and shall have a TRPL register that is compatible to the Sensus automatic reading system. Install deduct meter for landscape irrigation next to the permanent water meter or within six feet of the permanent meter when located in a landscaped area. In order to connect the deduct meter to the permanent meter reading system, connect the two boxes using PVC conduit.
 4. All private service lines shall be backfilled with 1-1/4" minus crushed material (WSDOT Crush Surfacing Base Course 9-03.9(3), or approved equal) to within 18" of the surface. Top 18" section to match surrounding material (WSDOT CSTC 9-03.9(3) under roadway/pavement, Native/Topsoil in landscaped areas, or approved equal).
 5. Permanent Service Disconnection - When determined by the Director, Permittee shall remove the corporation stop at the main and pipes, meters, etc.

7.1.2 3/4" AND 1" SERVICE

1. Materials
 - A. Tapping Saddle: Single strap Romac 101U w/ AWWA I.P. thread tap or approved equal.
 - B. Corporation Stop: Mueller B-25028N or B-20013N.
 - C. Angle stop: Mueller B-24258N with H14210N or P-14206N tailpiece.
 - D. Meter Setter: No setters allowed.
 - E. Pipe: Type K copper tubing.
 - F. Meter Box:
 1. For 3/4" – Olympic Foundary SM-29 or Carson BCF Heavy Wall 1118 – 11"x18"x18" or equivalent plastic box with D.I. lid.
 2. For 1" - #2 Fogtite or Carson BCF Heavy Wall 1730 – 17"x30"x18" with D.I. lid.
 3. Plastic meter boxes allowed in landscape areas only. Solid steel 1/2" diamond plate lid in traffic areas. Boxes used in traffic areas require prior approval.
2. Installation
 - A. Per WS-01.

7.1.3 1-1/2" AND 2" SERVICE

1. Materials
 - A. Tapping Saddle: Double strap Romac 202S w/ AWWA I.P. thread tap or approved equal.
 - B. Corporation Stop: Mueller B-25028N or B-2969N w/ AWWA I.P. thread or approved equal.
 - C. Meter setter: Mueller B2423N-2N, or approved equal.
 - D. Bypass Assembly: 1" assembly with lockwing.
 - E. Pipe Material: Type K copper tubing or high molecular weight black polyethylene pipe, with tracing tape.
 - F. Meter Box:
 1. For 1-1/2" meter - Fogtite #2 with 1/4" diamond-plate, solid, steel lid or Carson 1730 plastic box with D.I. lid.
 2. For 2" meter - Fogtite #3 or a 2' x 4' meter box, with 1/4" diamond plate, solid steel, lid with three 12-inch minimum tiers or approved equal vault. Lids must have a hinged inspection plate, centered over meter. Plastic #3 in planter area is allowed when no traffic can reach the box.
2. Installation
 - A. Per WS-01 and WS-02.

7.1.4 3", 4", AND 6" SERVICES

1. Materials
 - A. Tapping Tee: Refer to Section 7.2.5.
 - B. Gate Valve: Refer to Section 7.2.5.
 - C. Meter Valve: Gate valve PER Section 7.2.5 with hand wheel.
 - D. Flange Coupling adapter
 - E. Pipe Material: Ductile iron, Class 52.
 - F. Concrete thrust blocks per WS-10
 - G. Steel tie rods with asphalt or epoxy coating.
 - H. Meter vault: Watertight 444-LA or 644-LA with spring assisted, galvanized-diamond plate cover with locking latch and recessed lift handle.
 - I. Not Used
 - J. Double strap service saddle with 2" IPS Tap
 - K. 2" Brass Nipple
 - L. Not Used
 - M. 2" Ball Valve
 - N. 90° Brass Elbow
 - O. 2" Compression Couple
2. Installation
 - A. Provide dual independent restraint on ductile iron service pipe from point of connection at the main to the first valve in meter vault. If rods and blocks are not feasible, allowable alternative restraint systems shall be designed by a professional engineer and approved by the City Engineer.
 - B. All service lines shall be backfilled with 1-1/4" minus crushed material (WSDOT Crush Surfacing Base Course 9-03.9(3), or approved equal) to within 18" of the surface. Top 18" section to match surrounding material (WSDOT CSTC 9-03.9(3) under roadway/pavement, Native/Topsoil in landscaped areas, or approved equal).
 - C. Install service with bypass assembly per WS-04.
 - D. Install flange coupling adapter on FLxPE spool between meter and downstream meter valve.

7.1.5 BRASS FITTING MATERIALS

- A. All materials for water services 3/4-inch to 2-inch shall conform to AWWA C800 and shall be new and undamaged. The same manufacturer of each item shall be used throughout the project.
- B. Brass products furnished under this specification which are not in contact with potable water shall have an alloy composition of

copper, tin, lead and zinc in accordance with ASTM B62. The material is to be copper alloy UNS C83600, commonly referred to as 85-5-5-5.

- C. All brass components that are designed to be in contact with potable water must be made from either CDA/UNS Brass Alloys C89520 or C89833 with a maximum lead content of 0.25% by weight and shall comply with ANSI/AWWA C800 and ANSI/NSF Standard 61 Annex G.
- D. Brass fittings shall comply with the Safe Drinking Water Act, as amended and the U.S. Environmental Protection Agency (EPA).
- E. Unless otherwise noted, all fittings and valves shall have a minimum working pressure of 150 psi and capable of withstanding a test pressure of 250 psi.
- F. All fittings shall either be stamped or embossed with the manufacturer's name or trademark.

7.1.6 TEMPORARY WATER METER

Permittee rents the temporary meter from the City for use with one designated project. The temporary water meter is installed on fire hydrants only. The rental is subject to the following conditions:

- A. Meter presented to Public Works Operation every 30 days for a meter reading and inspection.
- B. Permittee shall provide approved backflow device prior to temporary water meter use.
- C. Meter promptly returned following project completion or by the permit expiration, whichever comes first. Permittee receives a final bill when the meter is returned to Operations.
- D. Meter returned in the same condition as when rented. The Permittee is responsible for meter damage or loss and shall pay all costs related to repair or replacement.
- E. Permittee may move the meter(s) from one hydrant to another within the same project providing Permittee:
 - 1. Notifies and receives approval from the Water Department before the meter is moved, and,
 - 2. Uses hydrant wrenches when connecting or disconnecting the meter.

SECTION 7.2 WATER MAIN

7.2.1 GENERAL

7.2.1.1. WATER/SEWER SEPARATION

Install water mains at least 10 feet horizontally, measured edge to edge, from any existing or proposed sewer. The Director may allow deviation, provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer, at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

When a 12 inch vertical separation is not achievable between two utilities, provide a minimum 6 inch thick Ethafoam pad between utilities. In cases when the sewer main is crossing above the water

7.2.1.2. WATER/SEWER CROSSING

Install water mains crossing sewer lines so that the bottom of the water main is at least 18 inches above the top of the sewer. Locate full section of water pipe so that its midpoint is above the sewer pipe at the crossing. This installation may require special structural support for the water and sewer pipe and/or other methods to ensure proper support and isolation between the utilities. Refer to G-5.

7.2.1.3. NEW WATER MAINS

All new water mains within the City of Tukwila shall comply with the following:

- A. Water mains shall extend along the entire property frontage.
- B. Design velocities less than or equal to 10 feet per second, under maximum flow conditions.
- C. Pipe Installation:
 - 1. Provide at least 3' cover over main.
 - 2. Pipe deflection is generally not allowed. Follow manufacturer's recommendation if pipe deflection is required. Pipe deflection installation shall be approved by the City of Tukwila Water System Superintendent.
 - 3. Imbed pipe in 5/8" minus crushed gravel.
 - 4. According to Standard Specifications and the manufacturer's recommendation.

5. Backfill and perform compaction testing as soon as possible following installation and testing of pipe
6. Install permanent surface restoration as soon as possible after backfill is accepted.
7. Mark all new public water lines with 3M EMS 4" Extended Range Marker Balls. Refer to Markerball installation in section 7.2.6.

7.2.1.4. PIPE SIZE

- A. In residential zones, water mains shall be 8-inch diameter, unless the Director requires larger pipe.
- B. In non-residential zones, water mains shall be at least 12-inch diameter, or the size specified in the City's Comprehensive Water Plan, whichever is greater.

7.2.1.5. LOOP SYSTEMS

Wherever possible, close or loop the systems to avoid non-looped lines. Where non-looped mains are unavoidable, install a standard 2-inch blow-off assembly per WS-09, for flushing purposes. If the Director deems flows and pressure sufficient, a fire hydrant may be required in lieu of the blow-off assembly.

7.2.1.6. TRAFFIC AREAS

Air and vacuum release valves in traffic areas require approval from the Director.

7.2.2 MATERIAL

- A. All pipes, fittings, valves, hydrants, joints, and other components shall conform to AWWA, the Standard Specifications, and be acceptable for use by the City of Tukwila.
- B. Pipe - Ductile iron pipe, cement lined, standard thickness, Class 52 minimum, conforming to the standards of AWWA C-151.
- C. Fittings and Joints - Cast iron or ductile iron, with flanged or mechanical joint connections and the same thickness class as the pipe used. All fittings shall be cement mortar lined in accordance with AWWA C-104.
- D. Cast iron fittings - Long body for operating pressure rating of 150 psi, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of USA Standard A-

21.10, A-21.11, B-16.2, and B-16.4.

- E. Flanged Joint - Conforming to USA Standard B-16.1. Rubber gaskets for push-on-joint (Tyton) or mechanical joint (MJ) in accordance with AWWA C-1110. Gaskets shall be neoprene, chlorinated butyl, or cloth-inserted rubber. Type of connections shall be specified as push-on-joint (Tyton), mechanical joint (MJ), plain end (P.E.), flanges (FL) not threaded.

7.2.3 VALVES

- 1. Material
 - A. Resilient seat, opening counter-clockwise, non-rising stem type, with double O-ring seal equipped with standard 2-inch square stem nuts. Flanged valves or mechanical joint, suitable for installation with the type and class of pipe being used.
 - B. Gate Valves conforming to AWWA C-500.
 - C. Butterfly Valves conforming to AWWA Standard C-504, Class 150, cast iron short body and O ring stem seal. Butterfly valves in chambers shall have a manual crank operation. Buried butterfly valves shall have a standard 2-inch operating nut and suitable valve box. Direct buried valves shall be ground rated.
 - D. Check Valves - 150 psi working pressure
 - E. Air Release Valves per WS-07.
- 2. Installation
 - A. Install valves at intervals sufficient to minimize sanitary hazards during repairs, no farther than 500 feet apart in industrial and commercial zones, and no farther than one block or 800 feet apart in other zones.
 - B. Install a gate valve for 12-inch and smaller water mains.
 - C. Install a butterfly valve for water mains larger than 12-inch diameter.
 - D. Install at least two valves at all tee intersections.
 - E. Install at least three valves at water supply/sanitary sewer crossings.
 - F. Install a gate valve at all hydrants and fire line extensions per WS-13.

7.2.4 BLOCKING

- 1. Material
 - A. Cast in place with concrete originating from a commercial batch plant or commercial batch truck. The City does not allow hand mixing.

- B. Tie-rods shall be galvanized or painted with a bituminous coating.
- 2. Installation
 - A. Provide reaction blocking at all tees, plugs, bends, and hydrants per WS-10.
 - B. Cast in place so blocking bears against fittings only.
 - C. Allow room at joints to allow dismantling.
 - D. Wrap fittings with plastic sheeting.
 - E. Do not backfill until the concrete reaches 3000-psi strength.
 - F. Field conditions may require tie rods and/or restrained joints in addition to concrete thrust restraint blocking.

7.2.5 LINE TAPS

- 1. General
 - A. The Permittee shall give the Public Works Department at least **five working days notice** of intention to disrupt service.
 - B. Connection to an existing, in-service, water main shall be made by a wet tap. All new connections to the City of Tukwila water system shall be in strict accordance to the City of Tukwila Special Provisions.
 - C. The Director allows cut-ins as exception and may require the addition of in-line valve(s).
- 2. Material
 - A. Size on Size - Tapping Tee of cast iron or ductile iron, full encirclement mechanical joint style, Mueller.
 - B. Note: Other than size on size - Tapping sleeves of epoxy-coated fabricated steel.
 - C. Fabricated steel sleeves: ASTM 285 grade C or ASTM A.36 steel, with a fusion bonded epoxy coating to AWWA C213-79. Painted coatings are not acceptable.
- 3. Installation
 - A. A qualified tapping service approved by the Director must install the tap. Swab all fittings with a 5-6% chlorine solution, in accordance with AWWA Standard C-601.
 - B. For approved cut-ins, assemble pipe, fittings, and gate valves at the site. Complete all assembly and ready it for installation before the water in the main is shut-off. Once the water is shut-off, the cut-in shall proceed until the line is restored to service. Installation, once begun shall not halt until completed.

7.2.6 MARKERBALL INSTALLATION

A. General

1. EMS Marker installation on public water and sewer systems should conform to product standards contained in 3M™ Dynatel™ EMS-iD Locator 1420 Operator's Manual dated September 2015. Installation Locations should be selected and installed using Standard Details G3 and G-4 and reviewed and approved by project engineer/inspector prior to installation.

B. Installation

1. Depth of installation shall be no greater than 3' and generally be between 2' and 3' regardless of actual utility depth to accommodate signal transmission limitations of the product. Surface markers (Model 1434) shall be a nominal 1 foot below finish grade or 2" below depth of pavement whichever is greater.
2. Marker ball locations shall be shown on the record drawings with the unique ball ID tagged to each location. Provide completed Marker Ball Log with as built submittal.

C. Data Management

1. Data included on each EMS Marker should conform to product standards contained in 3M™ Dynatel™ EMS-iD Locator 1420 Operator's Manual dated September 2015 and include, at a minimum the following data (See Marker Ball Log sheet in Appendix F for further information):
2. Marker ID –10 digit number unique to each marker ball (affix bar code sticker to the tracking spreadsheet)
3. Facility Owner
 - a. City of Tukwila
 - b. Other Government Agency (Normally marker balls are not required on other agencies facilities but if used provide specific owner information in the comments field)
4. Utility Type
 - a. Water (Use Model 1423XR/iD - blue)
 - b. Sewer (Use Model 1424XR/iD or Model 1434 - green)

Note – Sewer markers are required only at side sewer connections to the main that do not connect at a manhole and where the side sewer crosses onto private property without any other form of surface feature (cleanout/inspection port).
5. Depth (Measure down from ball to top of utility in question).
6. Marker Description

- a. Straight Run markers (install a marker ball at least every 150' on straight runs – coordinate exact location with Engineer/Inspector).
 - b. Vertical Deflection in the utility (at the beginning, the end and the greatest point of deflection, or every 25' along the arc whichever is less)
 - c. Vertical Bends
 - i. 11.25
 - ii. 22.5
 - iii. 45
 - d. Lateral Deflection in the utility (at the beginning, the end and the greatest point of deflection, or every 25' along the arc whichever is less)
 - e. Horizontal Bends
 - i. 11.25
 - ii. 22.5
 - iii. 45
 - iv. 90
 - f. Repair/Rehab – (w/description of repair type or rehab method in comment field)
 - i. Repair Band
 - ii. Long pattern sleeve
 - iii. Slipline
 - iv. Other
 - g. Other Fitting - Saddles, Tees, Crosses, Taps, Stubs, End Cap
 - h. Side Sewer location (locate at property line if no cleanout/inspection port is present)
 - i. Roadway Crossing End Point
 - j. Casing End Point
 - k. Rail Crossing End Point
 - l. River/Stream Crossing End Point
 - m. Specialty Marker – (See Comments field below).
7. Nominal Pipe Size
8. Material
- a. CPE
 - b. AC
 - c. Concrete
 - d. HDPE
 - e. PVC
 - f. C-900/909
 - g. Other
9. Utility Restraint

- a. Physical Restraint (w/type recorded in comment field:
Flanged spool, RJ, Field Lock Gaskets, Rods/Megalugs, etc.)
 - b. Thrust Block (w/type/configuration/nominal size recorded in
comment field)
 - c. None (Default value)
10. Date of installation or repair
11. Project or Permit Number
12. Special Condition/Comment Field (could be used for various
information not already captured by the normal data
dictionary). Examples could be:
- a. Begin/End Cathodic Protection
 - b. Begin/End Plastic sleeve over pipe in poor soil conditions
 - c. Special Configuration information
 - i. Repair description
 - ii. Description of fitting (asymmetric cross w/cap on east leg)
 - iii. Up-and-Over centered around marker
 - iv. Down-and-Under centered around marker
 - v. Special Utility Crossing (w/Depth to top of multiple utilities
at crossing)

SECTION 7.3 FIRE LINE/HYDRANT

Applicant shall make written request for any exception to the following hydrant requirements.

- A. Size hydrant supply lines to provide the fire-flow required by; 1)
Appendix III-A of the Uniform Fire Code, Fire Flow Requirements for
buildings and 2) the City's Water System Comprehensive Plan.
- B. Install all fire hydrants, auxiliary gate valves, and supply lines per City
WS-13 and WS-14. Install fire hydrant feed lines at right angles to the
supply main in conformance with WS-13.
- C. Locate hydrants so they are in plain view, for a distance of 50 feet, in
the line of vehicular approach. The approach line-of-sight shall be
free of shrubs, trees, fences, landscaping, etc. All hydrants shall be
painted per the NFPA 291 color codes. For Class AA, rated at 1500
gpm or greater, the tops and nozzle caps shall be painted with
Farwest Paint Color Number 257 (Delphinium Blue) and all hydrant
barrels shall be painted Farwest Paint Color Number X-3472 (case
yellow – safety). For other capacity ratings of hydrants, refer to NFPA
291, or consult with the City.
- D. Locate hydrants within 150 feet of the building and no farther than 300
feet from any perimeter point of the building.

- E. Locate public fire hydrants at a maximum spacing of 300 feet along City water mains.
- F. Leads from the service main to the hydrant shall be at least 6-inch diameter and not over 50 feet long without written approval from the City Engineer

SECTION 7.4 CROSS CONNECTION CONTROL

7.4.1 GENERAL

In accordance with Washington State Department of Health guidelines for Group A Public Water Systems, WAC 246-290-490, the Director has implemented a cross-connection control program to protect the public water system from contamination via cross connection. The program requires elimination or control of any cross-connection between the distribution system and a consumer's water system by the installation of an approved backflow assembly. The owner of these assemblies must maintain and provide annual test results to the Department.

7.4.2 NEW CONNECTIONS

- A. Water Supply
 - 1. Every new, commercial residential connection to the City's water supply requires installation of an approved Reduced Pressure Backflow Assembly (an RP Device) immediately downstream of the permanent water meter as premises isolation per WS-21. Installation at another location requires the Director's approval.
- B. Fire System
 - 1. Every new or modified fire line connection to the City's water supply, shall include an approved double check detector valve assembly, installed per WS-15. The City does not require a double check valve detector assembly on a private fire system that is downstream of a connection protected by an RP Device.
- C. Irrigation System
 - 1. Every new or modified irrigation system shall incorporate a double check valve assembly for cross connection control. Install per WS-22 or WS-23 as applicable.
 - 2. All irrigation systems to be turned over to Tukwila for operation and maintenance require rain sensors. Controllers shall be Rain Bird ESP-ME or approved equal. 3 sets of irrigation as-builts will be provided to Street Maint. Dept. Street scape tree installations within sidewalks or pedestrian paths will use tree well grates

instead of pavers or concrete blocks. All tree pits shall have root barriers installed. Refer to LID-1

7.4.3 EXISTING CONNECTIONS

When reviewing a Development Permit, including a Tenant Improvement (TI) application, the Director evaluates the existing service connection(s) per the following criteria:

- A. If the project includes any alterations to the existing plumbing system, then the entire plumbing system must be brought up to the current standards as set forth in the Uniform Plumbing Code, including the installation of approved backflow prevention on the water supply, fire line and irrigation system.
- B. If the project does not include any changes to the existing plumbing system, then such systems lawfully in existence at the time of installation may have their use, maintenance or repair continued if the use, maintenance, or repair is in accordance with the original design and location and no hazard to life, health, or property has been created by such plumbing system. The Department requires high health cross-connection hazard premises as defined in WAC 246-290-490, Table 9, for premises isolation requiring either an Air Gap (AG) or Reduced Pressure Backflow Assembly (RPBA/RP Device).
- C. If any previously unapproved backflow prevention device cannot be upgraded in the same location with an approved backflow prevention device, such limitations must be evaluated by the Director.
- D. If a new device is installed at a location downstream from the original device, all pipe must first be approved for potable water use prior to reconnection. The pipe material must be specifically rated for potable water use (no black iron), and the entire length of main to be converted must be thoroughly scoured using a multi-staged pigging process acceptable to the Director.

7.4.4 FIRE PROTECTION SYSTEM

- A. Design
 - 1. The plans must be prepared, stamped, signed and dated by a Level III certificate of competency holder (NICET) or by a professional engineer registered in Washington State.
- B. Installation

1. When the backflow prevention device is installed outside the building and underground, the installer must have NICET Level III certificate of competency or a NICET Level U contractor's certificate of competency. If the installer is different from the designer, then the installer must stamp, sign and date the plans, in addition to the designer's stamp, signature and date.

SECTION 7.5 INSPECTION AND APPROVAL

7.5.1 WATER MAIN TESTING

- A. All water mains and appurtenances shall be pressure tested for leakage in accordance with City requirements, after flushing and disinfecting for new and reestablished systems. The water main and appurtenances shall be brought to a hydrostatic pressure of 250 psi, measured at the high point in the line. Water mains require a one-hour test and fire lines require a two-hour test, during which time there cannot be any loss in pressure.
- B. The main shall be tested between valves or at a maximum distance of 500 feet along the main. Any leaks or imperfections shall be corrected before final acceptance. No air will be allowed in the line.
- C. Insofar as 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 Permittee shall provide all necessary calibrated equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made, including all connections as shown on the plan. Insofar as is practical, tests shall be made with pipe joints, fittings and valves exposed for inspection. The owner shall perform the test 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.

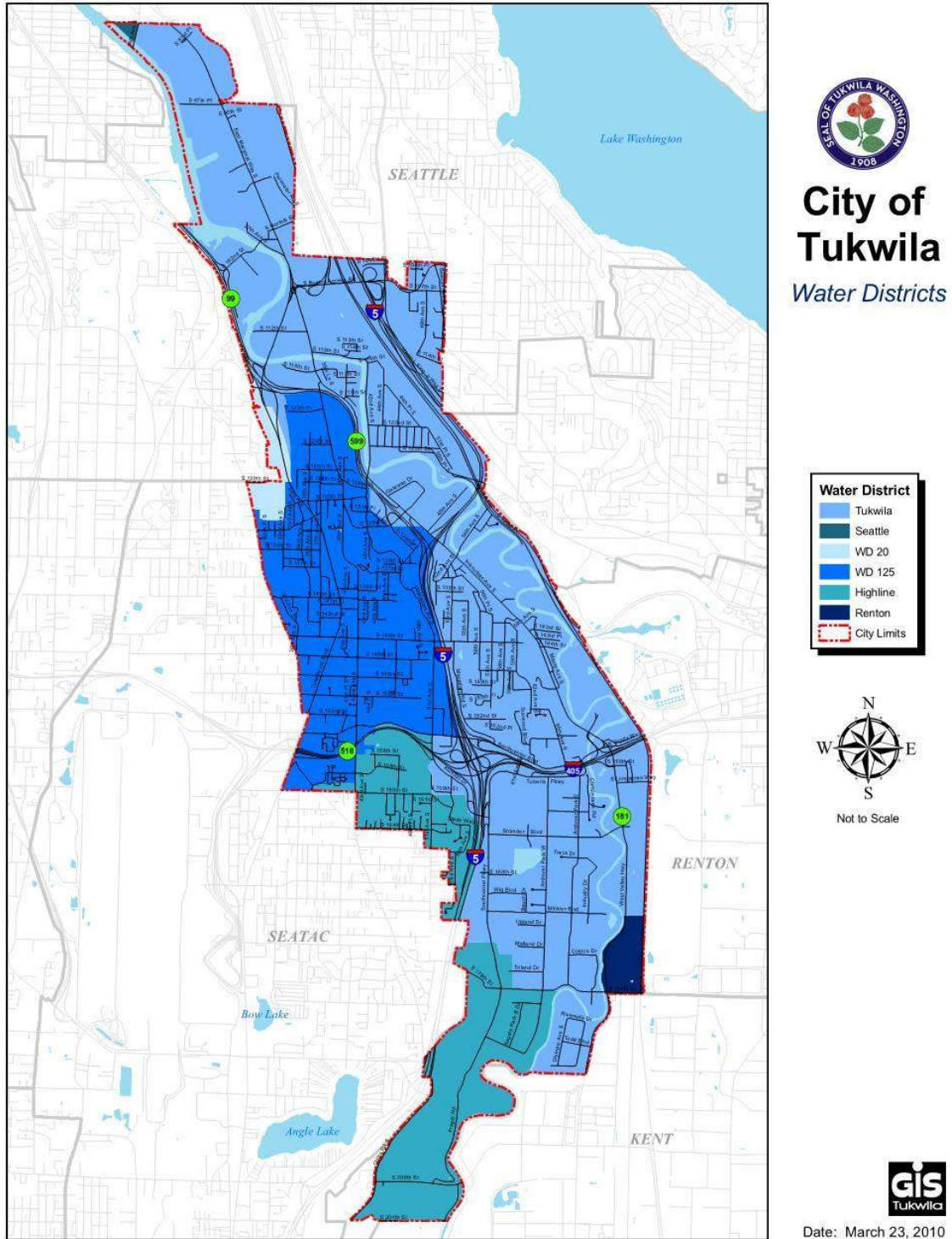
7.5.2 FLUSH AND DISINFECT

- A. All new, cleaned or repaired water mains and some backflow preventer installations require disinfecting and flushing per AWWA Standard C-651. The flushing and disinfecting shall include detailed procedures for the adequate flushing, disinfecting, and microbiological testing.
- B. At no time shall chlorinated water from a new main be flushed into a body of fresh water including lakes, rivers, streams, and any and

all other waters where fish or other natural water life can be expected.

- C. Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe.
- D. At least twelve (12) hours after the flushing procedure, the Permittee shall request that the City Inspector collect water samples from the new system. These samples shall be taken in sterilized bottles and tested by a DOH approved testing lab, as designated by the Water Department. All samples must meet the DOH quality standards prior to placing the lines into service.
- E. The Permittee shall dispose of treated water flushed from the lines. Prior approval from the Director is required for disposal to sanitary sewers or surface water systems.
- F. Bag test fire lines using two new burlap bags until bags show no sign of sand, rock or debris.

SECTION 7.6 WATER DISTRICT BOUNDARIES



CHAPTER 8 SANITARY SEWER

SECTION 8.0 GENERAL

8.0.1 COMPREHENSIVE SEWER PLAN

The City of Tukwila's Comprehensive Sewer Plan ensures orderly and cost effective development of existing and future sewerage facilities. All proposed sewer improvements and extensions shall be consistent with the Comprehensive Sewer Plan (<http://www.tukwilawa.gov/wp-content/uploads/PW-Comprehensive-Sanitary-Sewer-Plan.pdf>). All modifications to the Comprehensive Sewer Plan require written approval from the Director.

The Permittee shall extend the sanitary sewer improvements to the extreme boundary of the property in accordance with the comprehensive plans. If the plan does not require future extension at the Permittee's project, the Permittee shall extend the sewer to service the property.

Refer to Figure 9 for sewer district boundaries within Tukwila.

8.0.2 SANITARY SEWER EXTENSION

If the sewer extension provides benefit to other properties, the Permittee may arrange for partial reimbursement through a Developer Reimbursement agreement.

8.0.3 SEPTIC TANKS

The Director may allow a residential septic system, which meets the requirements of King County Health Department, when there is no sanitary sewer main or lateral within 250 feet of the building.

All septic tank removal or abandonment shall be accomplished in accordance with King County Board of Health Code 13.04.054, within thirty (30) days as follows:

1. Pump the tank dry, bleach, and pump again. The tank may be removed or abandoned in place by creating holes in the bottom to allow for drainage and filling it with sand or gravel; and,
2. Provide a receipt from a King County approved pumper documenting septage removal; and,
3. Remove or destroy lid; and,

4. Fill the septic tank with compacted sand or gravel; and,
5. Report the removal or abandonment to the King County Health officer.

8.0.4 CONNECTION TO METRO SEWER

Side sewer connections to King County Department of Natural Resources interceptor sewer lines shall be allowed only by written permission from King County. The City will be the agency through which permits will be obtained for such connections. The Permittee is responsible for all coordination with Metro for necessary inspections and approvals.

8.0.5 INDUSTRIAL SEWER CONNECTION

Special consideration must be given to sanitary sewer design and connection for industrial users. The Designer must consider the potential for pretreatment requirements, excessive sewage flows, special flow metering, or sampling requirements prior to industrial sewer collection/treatment system design. An industrial wastewater discharge permit may be required from King County Metro.

8.0.6 MATERIALS

All materials shall be new, undamaged, inspected and approved by the Director prior to installation. Acceptance of materials does not release the Permittee from the responsibility to guarantee materials and construction. The type, class and/or thickness shall be legibly and permanently marked on sanitary sewer pipe. The supplier shall provide the City with a certificate for materials, as requested.

8.0.7 SIZING

The sanitary side sewer shall be sized to carry all sanitary sewage and waste fluids of any kind from the buildings served. All toilets, sinks, stationary wash stands, floor drains, or any other piece of equipment having waste fluids shall be connected to the sanitary sewer system. Commercial minimum diameter is 6 inches.

New sewer systems, except one-lot, single family residences, shall be designed based on per capita flows or other methods as approved by the City and Department of Ecology. The City requires detailed design calculations and service area maps, stamped, signed, and

dated by a Washington State registered professional engineer, for the system design.

8.0.8 SEWER/WATER SEPARATION

Sewer mains shall be laid at least 10 feet horizontally, measured edge to edge, from any existing or proposed water supply line. The Director may allow a reduction to 5 feet of separation provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

Install all sanitary sewer crossings under water mains so that the top of the sewer pipe is at least 18 inches below the bottom of the water main. Locate 18 feet of sewer pipe at the crossing so the joints will be as far from the water supply line as possible. This installation may require special structural support for the water and sewer pipe and/or other methods to ensure proper support and isolation between the utilities.

When a 12 inch vertical separation is not achievable between two utilities, provide a minimum 6 inch thick Ethafoam pad between utilities. Refer to G-5. Water/sewer lines must be at least 18" apart with water over sewer at all times. If water is below sewer or at the same depth they need to be separated by at least 10' horizontally.

8.0.9 SEWER/WELL SEPARATION

No sanitary sewer shall be constructed within 100 feet of a well.

8.0.10 MINIMUM SEWER SLOPES

SEWER SIZE (INCHES)	MINIMUM SLOPE (FEET PER 100 FEET)
4	2.00 Side Sewer Only
6	2.00 Side Sewer Only
8	0.40
10	0.28
12	0.22
14	0.17

15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

SECTION 8.1 SIDE (LATERAL) SEWER

8.1.1 GENERAL

- A. A side sewer connection longer than 150' from the main is considered a sewer main extension and shall meet requirements of Section 8.2 Sewer Main. The side sewer connection(s) to building(s) shall be made from the sewer main extension and shall meet requirements of section 8.1.
- B. The property owner(s) maintains the sewer connection(s) from the right-of-way line to the building.
- C. Permittee shall:
 - 1. Connect:
 - a. Buildings within 250 feet of a sanitary sewer line.
 - b. One building per side sewer unless approved by the Director. More than one connection requires the Director's approval and recording with King County records a completed Joint Side Sewer Easement and Maintenance Agreement.
 - 2. Verify the location and depth of the stubs shown on as-builts.
 - 3. Assume all cost, including street repairs, tapping charges, and bonds for connection to sewer main.
 - 4. Repair street cuts per RS-03.
 - 5. Provide:
 - a. Minimum diameter of 6 inches within the City right-of-way. Residential side sewers may be reduced to a minimum diameter of 4 inches from the right-of-way to the house depending on number of homes connected to it.
 - b. Sewer clean-out and test-tee at property line.
 - c. Where clean-out is not installed at property line, a marker ball shall be installed per G-3 and G-4 at the property line.
 - d. Sewer clean-out at building with required bends totaling no more than 90°.
- D. Refer to SS-02 and SS-03.

8.1.2 MATERIAL

- A. Pipe - Ductile iron Class 50 minimum, PVC minimum SDR 35 (ASTM D3034) gasketed pipe, or welded HDPE where its use is justified due to scouring velocities or soil problems.
- B. Pipe Encasement – CDF, steel sleeve, PVC. Polyethylene for ductile iron pipe placed in peat areas or areas of potential corrosion.

8.1.3 INSTALLATION

- A. Install on not less than 2% grade, nor greater than 1V:2H.
- B. Install anchors for pipe having slopes over 15%.
- C. Encase ductile iron pipe placed in peat areas or areas of potential corrosion with polyethylene sleeve.
- D. Install the side sewer not less than 5 feet from any building, except where the sewer enters the building. If the sewer is below the building foundation, for every one foot of depth the side sewer shall be one foot or greater horizontally from the foundation.
- E. Provide clean outs, per SS-03, at 100 foot intervals along the sewer lines, at property lines, at the building, and at all vertical or horizontal bends totaling ninety degrees (90°) or greater from the nearest cleanout.
- F. Outside rights-of-way, the pipe shall have at least 2 feet of cover.

SECTION 8.2 SEWER MAIN

8.2.1 MATERIAL

- A. All sewer materials shall conform to the applicable Standard Specifications. The pipe shall be legibly and permanently marked with type, class and/or thickness. The Permittee shall provide the City with a certificate for materials when requested.
- B. Pipe – Ductile iron Class 50 minimum, PVC minimum SDR 35, or HDPE where its use is justified due to scouring velocities or soil problems.
- C. Pipe Size - at least 8 inch diameter. The Comprehensive Plan or design calculations may indicate larger diameter sewers.
- D. Fittings - same materials as the pipe or as specified by the pipe manufacturer.

8.2.2 INSTALLATION

- A. Refer to SS-09 and SS-10 for manhole drop connections.
- B. Uniform slope between manholes.

- C. Sewers with 20% or greater slope use concrete anchors approved by the Director.
- D. Straight alignment between manholes.
- E. Bury deep enough to provide adequate depth to service the lowest fixtures in the properties served.
- F. Minimum depth of cover for a sewer in street right-of-way is 4 feet.
- G. Sewer line will have a minimum of 12'' separation from other underground utility. A minimum of 18'' separation from any underground water utility is required.
- H. Markerballs shall be installed according to Section 7.2.6. and G-3 and G-4.

8.2.3 INSPECTION AND TESTING

TV Inspection per Chapter 2 General Design and Construction Standards.

Channel manholes prior to testing.

- A. Air Testing
 - 1. All sanitary sewer pipelines shall be air tested in accordance with the WSDOT Standard Specifications for air-permeable or non air-permeable pipe, as applicable. The Permittee shall furnish all materials and equipment necessary for conducting the tests and all testing shall be performed under the supervision of the City Inspector. The Permittee may desire to make an air test prior to backfilling for his own purposes. However, the air test for acceptance shall be made after backfilling has been completed and compacted.
- B. Water Testing
 - 1. Required on every sanitary side sewer installation. The side sewer must be water tight to 10 feet of head from the test-tee.

SECTION 8.3 MANHOLES

8.3.1 MATERIALS

Precast Concrete Structure meeting size and dimensions according to SS-04 through SS-08.

For manhole lid refer to SS-11.

For manhole steps and ladder refer to SS-12 and SS-13.

8.3.2 INSTALLATION

- A. Sanitary sewer manholes are required at the following locations:
 - 1. End of all sewer mains.
 - 2. Change in slope or alignment.
 - 3. Change in pipe diameter.
 - 4. Intersection of sewers 8 inch and larger (including side sewers).
 - 5. Intersection of sewer mains.
 - 6. Every 500 feet on sewer mains.
 - 7. On a side sewer 150' or longer.
- B. Install a spread foundation or other measure, when Director requires, to prevent differential settlement.
- C. Provide an outside drop connection for invert separation of 24 inches or more, measured at the manhole wall. Refer to SS-10. Inside drop connections require the Director's approval. Refer to SS-09.
- D. Fully channel to the sewer crown.
- E. Install manholes so that the invert of the downstream manhole is at least 0.1 foot below all incoming invert elevations. Approved manhole channels shall be a prefabricated fiberglass/PVC channel insert (GU Liner available from PREDL GU Liner Systems, 26020 31B Avenue, Aldergrove, B.C., Canada, V4W2Z6; Tel: 604-609-7755).
- F. Use a Kor-N-Seal flexible pipe connector when connecting new sewer pipes into existing structures and when connecting existing sewer pipe into new structures.
- G. All grout shall be "Fast Patch" as manufactured by Basalite with the use of clean potable water.
- H. Rubber gaskets between manhole section shall be according to WSDOT Standard Specification 9-04.4(1).
- I. Install 12 inch thick CSBC (WSDOT 9-03.9(3)) foundation pad beneath manhole.

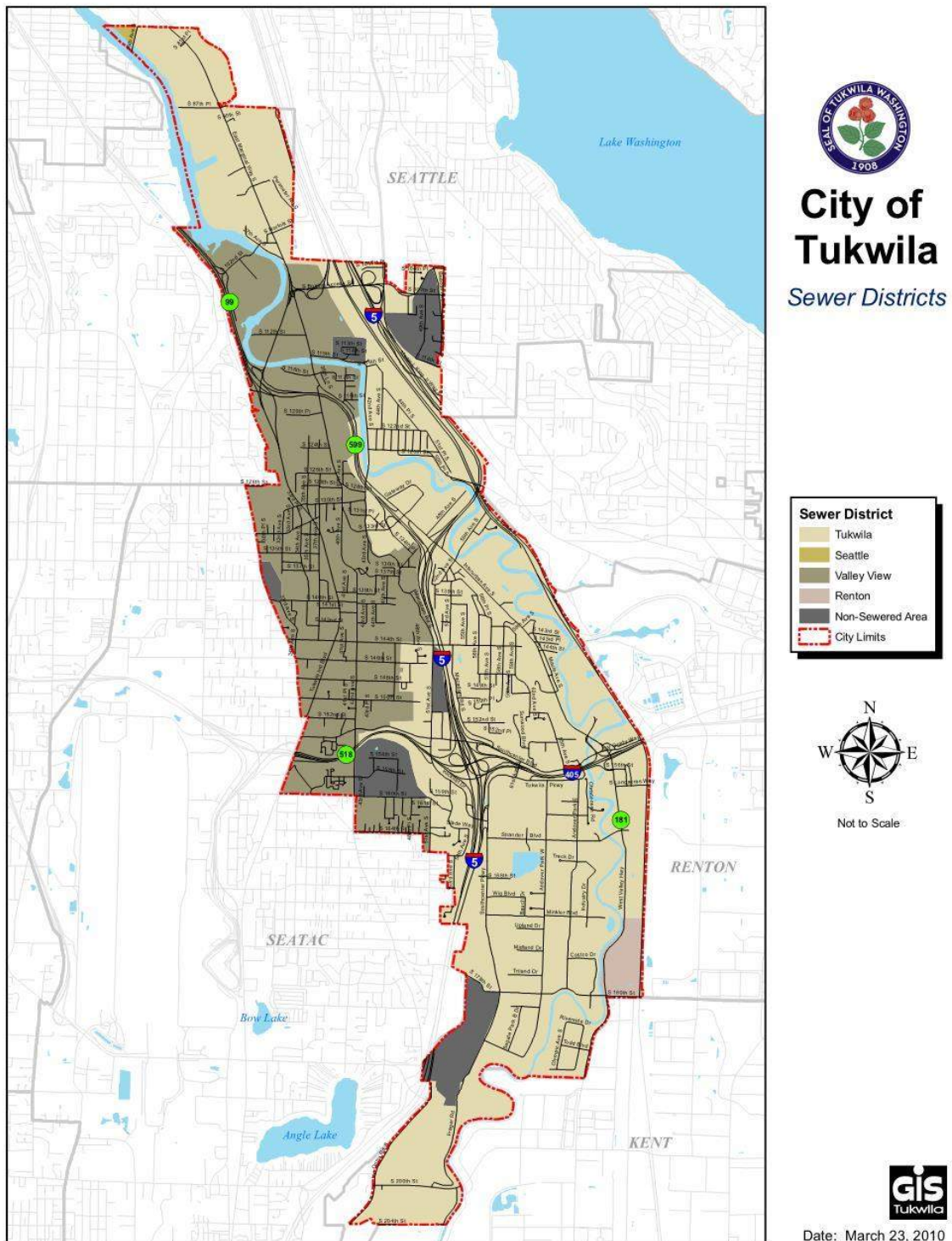
SECTION 8.4 GREASE INTERCEPTOR

The City requires grease interceptors on all buildings where food preparation occurs and at locations determined by the Director as necessary for the proper handling of liquid wastes. Grease interceptors shall comply with Appendix H of the Uniform Plumbing Code and the following:

- A. Refer to SS-14.
- B. Provide a double baffle type interceptor.
- C. Grease interceptor, 6" lines, and reference to related plumbing sheets.

- D. Size the tank per the Uniform Plumbing Code, Appendix H, and minimum 1,000 gallon capacity. For sizing, consider the meals per hour as equal to the restaurant's seating capacity.
- E. Locate the vault outside the building, between 5 feet and 25 feet from the building foundation.
- F. Install a minimum 2" vent from interceptor to the interior plumbing pipe for ventilation purpose.
- G. Install the interceptor so that gray water from sinks, floor drains, drains under garbage compactors, is routed through the interceptor. DO NOT route dishwashers through the grease interceptor. NOTE: Route ONLY gray water through the interceptor.
- H. Every three months the Owner shall completely pump out the interceptor. Businesses that generate small amounts of grease may, with the Director's approval, pump the interceptor on a 6-month schedule. At any time, the City may inspect the interceptor and require service that is more frequent.

SECTION 8.5 SEWER DISTRICT BOUNDARIES



STANDARD DETAILS

SECTION 9.0 STREET STANDARD DETAILS

- RS-01 Typical Roadway Section
- RS-02 Turn Around – Cul-de-sac and Hammerhead
- RS-03 Pavement Restoration
- RS-04 Cement Concrete Curb and Gutter
- RS-05 Residential Driveway (1 of 3)
- RS-06 Residential Driveway (2 of 3)
- RS-07 Residential Driveway (3 of 3)
- RS-08 Commercial Driveway
- RS-09 Sidewalk
- RS-10 Parallel Curb Ramp (WSDOT STD PLAN F-40.12-03)
- RS-11 Combination Curb Ramp (WSDOT STD PLAN F-40.14-03)
- RS-12 Perpendicular Curb Ramp (WSDOT STD PLAN F-40.15-03)
- RS-13 Single Direction Curb Ramp (WSDOT STD PLAN F-40.16-03)
- RS-14 Detectable Warning Surface (WSDOT STD PLAN F-45.10-02)
- RS-15 Curb and Gutter: Catch Basin Surround
- RS-16 Not In Use
- RS-17 Raised Pavement Marker
- RS-18 Left Turn: 2-Way Lane Typical
- RS-19 Left Turn: Noncontinuous
- RS-20 Crosswalk
- RS-21 Traffic Arrows – Low Speed (WSDOT STD PLAN M-24.40-02) (2 Sheets)

DEVELOPMENT GUIDELINES AND DESIGN AND CONSTRUCTION STANDARDS

RS-22 Profiled and Embossed Plastic Lines (WSDOT STD PLAN M-20.20-02)

RS-23A Sign Installation: Sign Post Foundation Installation

RS-23B Sign Installation: Street Name Sign Installation

RS-24 Illumination Design Guidelines: Roadway & Pedestrian Luminaires

RS-25 Roadway Light Pole

RS-25A Roadway Light Pole With 5G

RS-26 Pedestrian Light Pole and Foundation

RS-27 Spread Footing Luminaire Foundation: Sidewalk Application

RS-28 Uniform Luminaire Wiring

RS-29 Electrical Service Cabinet

RS-30 Typical Loop Detection Layout

RS-31 Not In Use

RS-32 Street Monument

RS-33 Bollard Type 1 (WSDOT STD PLAN H-60.10-01)

RS-34 Bollard Type 2 (WSDOT STD PLAN H-60.20-01)

RS-35 Metal Safety Railing (2 Sheets)

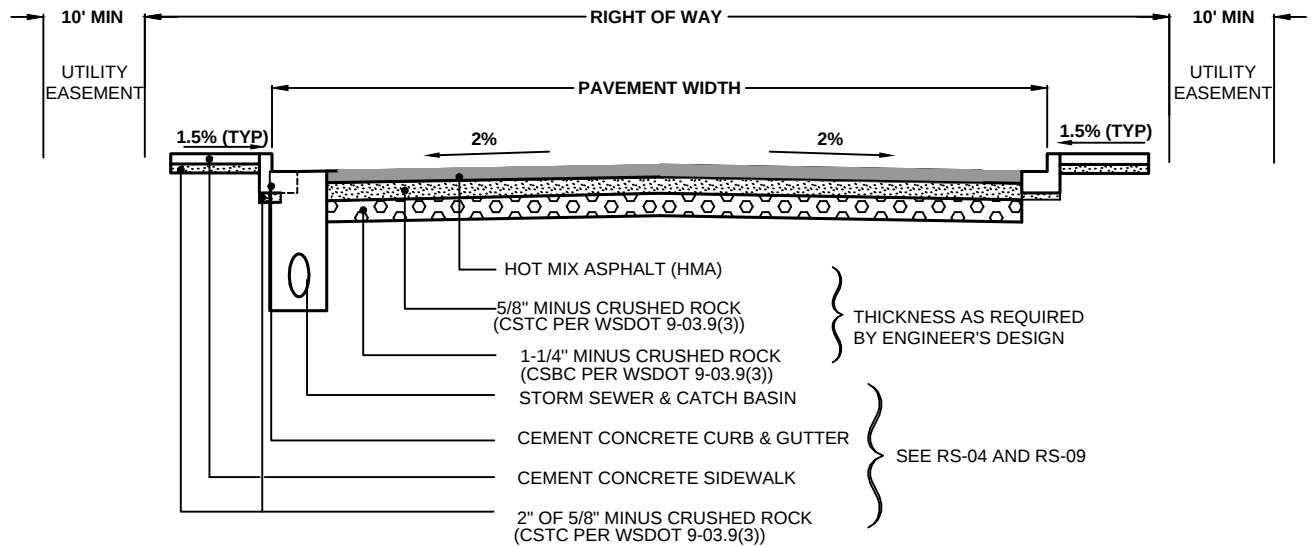
RS-36 Mailbox Installation

RS-37 MIC Driveway Design & Location

RS-38 Street Opening

RS-39 Work Zone Plan: Low Volume Road - Centerline

RS-40 Work Zone Plan: Low Volume Road - Surveying



TYPE OF STREET	RIGHT-OF-WAY (FEET)	PAVEMENT WIDTH (FEET)
<u>PUBLIC</u>		
ARTERIAL		
PRINCIPAL	80-100	48-84
MINOR	60-80	36-64
COLLECTOR		
COMMERCIAL	60	48
RESIDENTIAL	60	28-36
ACCESS		
COMMERCIAL	60	36
RESIDENTIAL	50	28
ALLEY	20	15
CUL-DE-SAC		
ROADWAY	40	28
TURNAROUND	92 (DIA)	81 (DIA)
<u>PRIVATE</u>		
COMMERCIAL	40	28
RESIDENTIAL	20	20

NOTES:

1. ALL SPECIFICATIONS SHALL MEET CURRENT WSDOT/APWA "STANDARD SPECIFICATIONS FOR ROADS, BRIDGE, AND MUNICIPAL CONSTRUCTION".
2. SEE DETAIL RS-09 FOR THE SIDEWALK WIDTH.
3. STREET CLASSIFICATIONS ARE DESIGNATED BY ORDINANCE.
4. PAVEMENT SECTION MUST BE DESIGNED PER AASHTO FOR A MINIMUM OF HS20 LOADING.
5. ROADWAY SECTIONS IN SOUTHCENTER SUB AREA SUBJECT TO ADDITIONAL REQUIREMENTS.

NOT TO SCALE



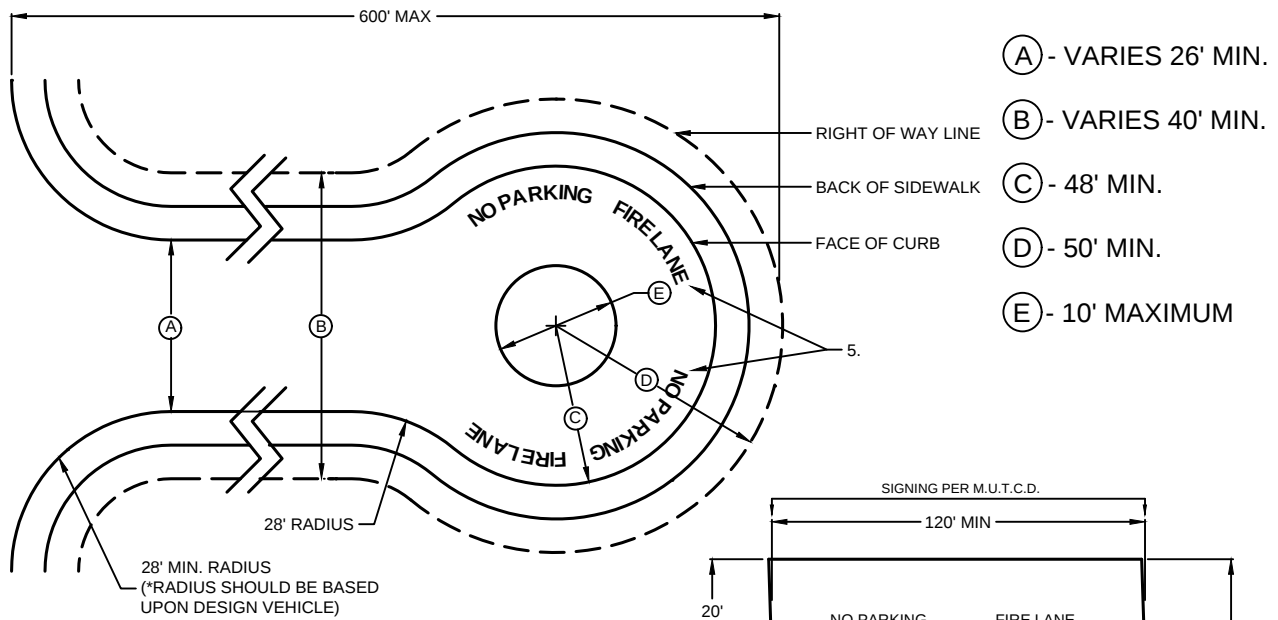
**City of
Tukwila**

TYPICAL ROADWAY SECTION

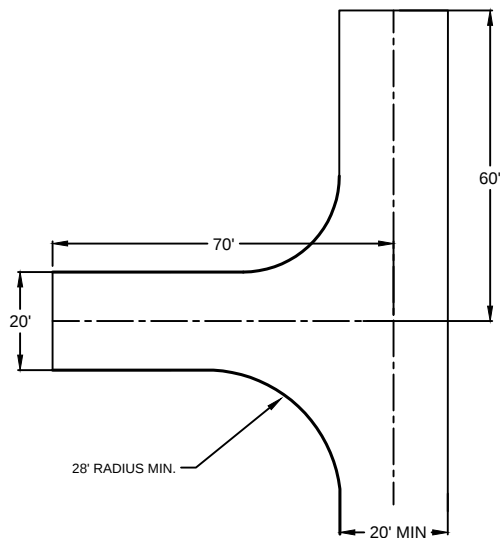
SHEET: **RS-01**

LAST REVISION: APRIL 2019

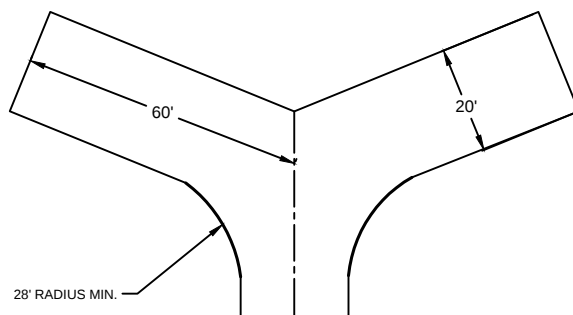
APPROVAL: H. PONNEKANTI



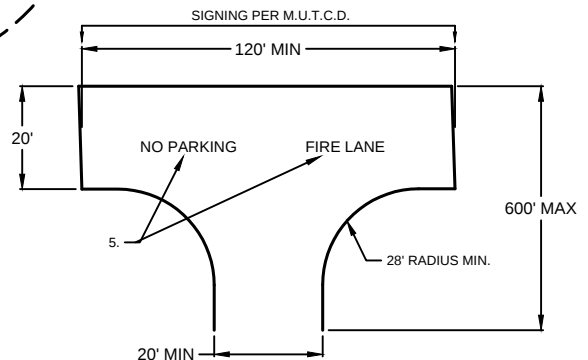
CUL-DE-SAC



OFFSET HAMMERHEAD



"Y" HAMMERHEAD



HAMMERHEAD

NOTES:

1. A CUL-DE-SAC IS REQUIRED FOR ALL DEAD END STREETS LONGER THAN 150' IN LENGTH.
2. CUL-DE-SAC LANDSCAPE ISLAND TO BE MAINTAINED BY PROPERTY OWNERS.
3. ALL SIGNS SHALL MEET CURRENT WSDOT/APWA "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION", AND CURRENT MUTCD.
4. A HAMMERHEAD REQUIRES PRIOR APPROVAL BY THE FIRE DEPARTMENT AND CITY ENGINEER.
5. PAINTED "NO PARKING FIRE LANE" STENCILS. 12" HEIGHT.

NOT TO SCALE



**City of
Tukwila**

TURN AROUND

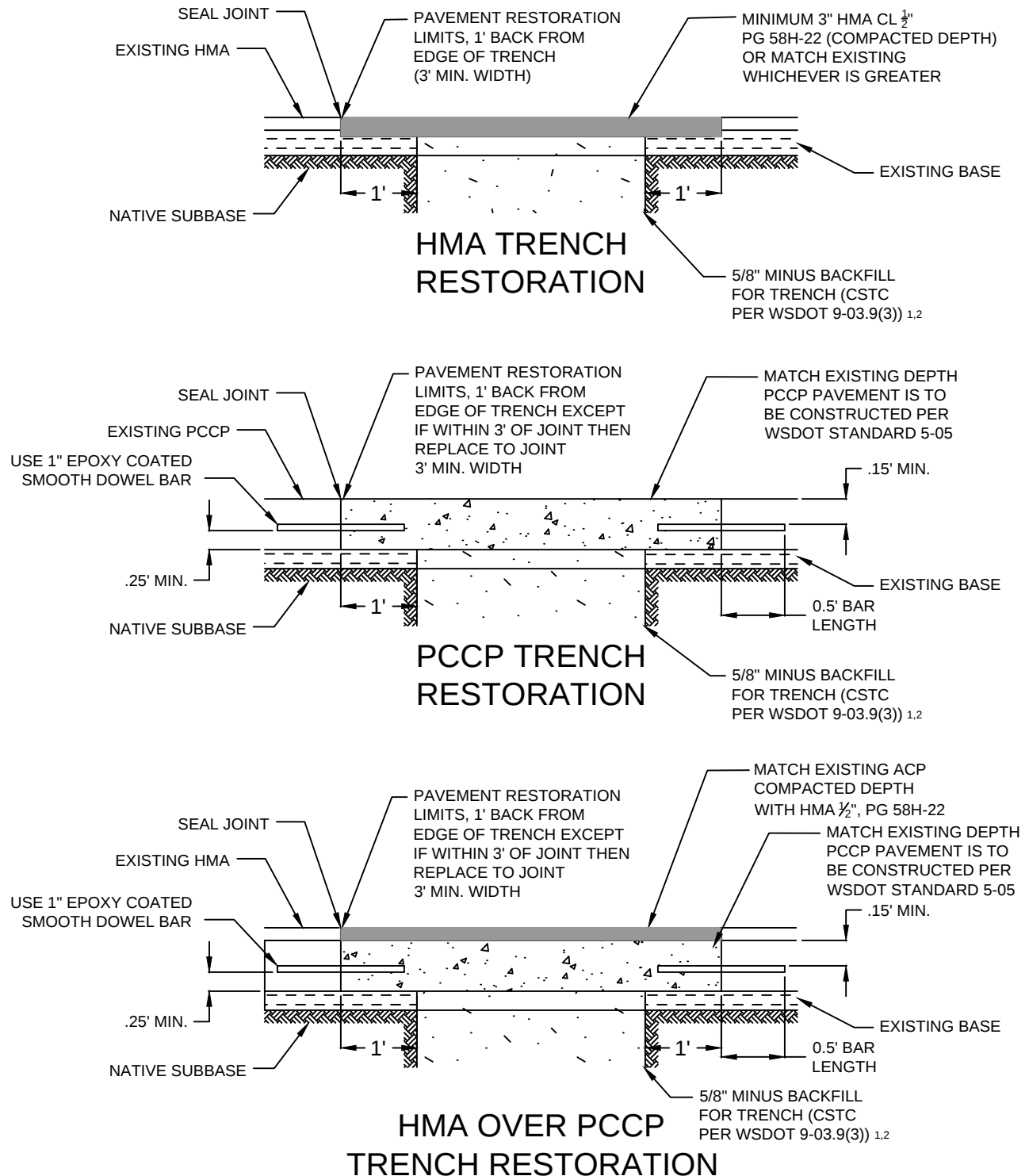
CUL DE SAC & HAMMERHEAD

SHEET:

RS-02

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. FOR TRENCHES LESS THAN 18" WIDE, USE 100% CDF FOR TRENCH BACKFILL.
2. FOR TRENCHES GREATER THAN 18" WIDE, ALL BACKFILL IN RIGHT-OF-WAY SHALL BE $\frac{5}{8}$ " MINUS CRUSHED ROCK (CSTC PER WSDOT 9-03.9(3)).
3. A MINIMUM OF A ONE YEAR GUARANTEE IS REQUIRED ON ALL PAVEMENT PATCHING AND OVERLAYS.

NOT TO SCALE



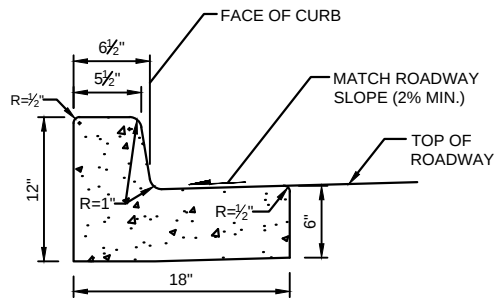
**City of
Tukwila**

PAVEMENT RESTORATION

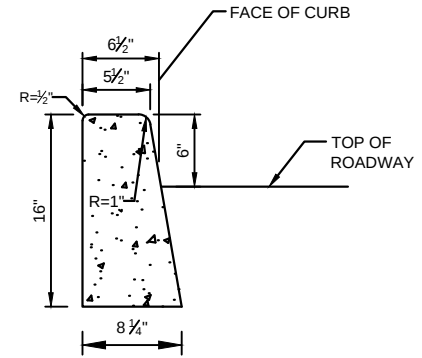
SHEET: **RS-03**

LAST REVISION: APRIL 2019

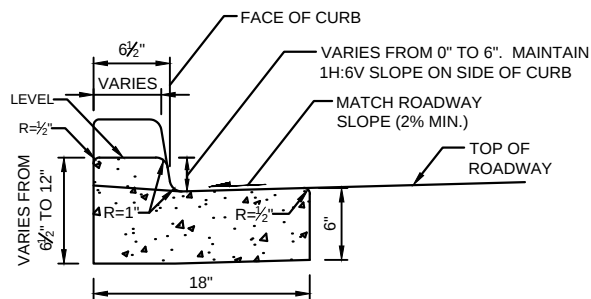
APPROVAL: H. PONNEKANTI



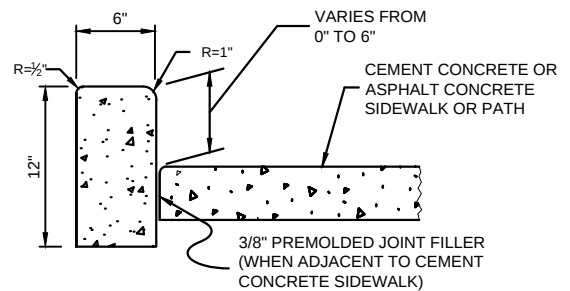
CEMENT CONCRETE
TRAFFIC CURB AND GUTTER



CEMENT CONCRETE TRAFFIC CURB



DEPRESSED CURB SECTION



CEMENT CONCRETE
PEDESTRIAN CURB

NOTES:

1. ALL CEMENT CONCRETE CURBS SHALL BE CONSTRUCTED WITH AIR ENTRAINED CONCRETE CLASS 3000 PSI CONFORMING TO WSDOT STD. SPEC. 6-02 EXCEPT AS SPECIFIED IN NOTE 2.
2. CEMENT CONCRETE CURB OR CURB AND GUTTER ALONG THE FULL WIDTH OF A DRIVEWAY ENTRANCE SHALL BE CONSTRUCTED WITH AIR ENTRAINED CONCRETE CLASS 4000 CONFORMING TO WSDOT STD. SPEC. 6-02.
3. CURB EXPANSION JOINT TO BE PLACED EVERY 15'.
4. REMOVAL/REPLACEMENT OF CEMENT CONCRETE CURB SHALL BE FROM EXPANSION JOINT TO EXPANSION JOINT UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. FOR CURB AND GUTTER CATCH BASIN SURROUND SEE RS-15.

NOT TO SCALE



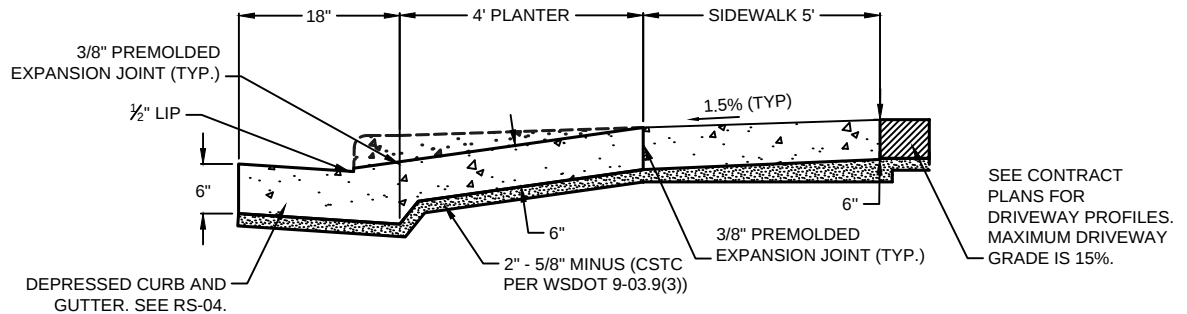
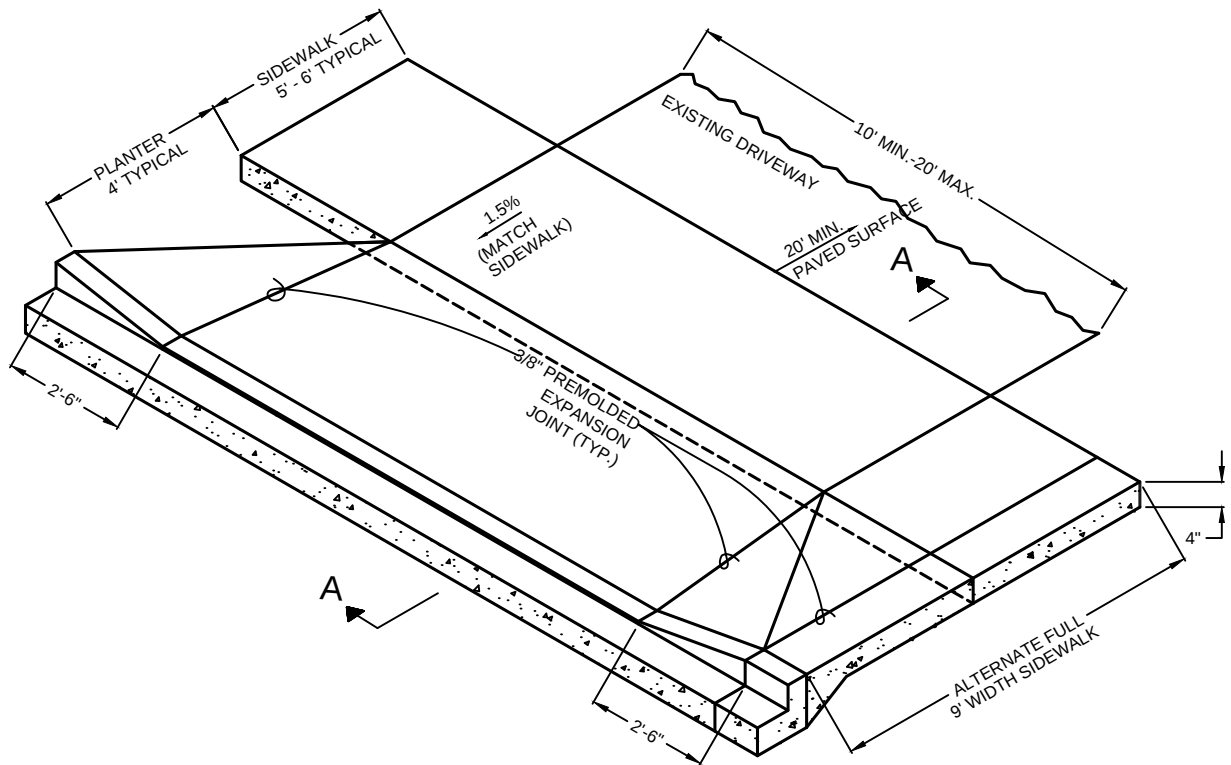
**City of
Tukwila**

CEMENT CONCRETE CURB DETAIL

SHEET: RS-04

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



SECTION A-A

NOTES:

1. THIS ALTERNATE SHOULD BE USED ONLY AFTER STUDYING CLOSENESS OF DRIVEWAYS, DRAINAGE, TOPOGRAPHY, DRIVEWAY GRADES, RIGHT OF WAY, ETC.
2. CONCRETE SHALL BE CLASS 4000 PSI.
3. INSPECTION REQUIRED BEFORE PLACING CONCRETE. AT LEAST 24 HOUR NOTICE MUST BE GIVEN TO TUKWILA PUBLIC WORKS DEPARTMENT.
4. ALL DRIVEWAY APRONS SHALL BE A MINIMUM OF 6" THICK.
5. WHERE DRIVEWAY WIDTHS EXCEED 15', A 3/8" X 5-1/2" EXPANSION JOINT SHALL BE PLACED LONGITUDINALLY ALONG THE CENTERLINE.
6. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APWA/WSDOT PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE CITY OF TUKWILA.
7. AN ASPHALT APRON MAY BE USED WITHIN THE ROW IN AREAS WHERE NO CURB EXISTS.
8. REMOVAL OF EXISTING CONCRETE CURB, GUTTER OR SIDEWALK SHALL BE SAW CUT TO THE NEXT JOINT.

NOT TO SCALE



**City of
Tukwila**

RESIDENTIAL DRIVEWAY

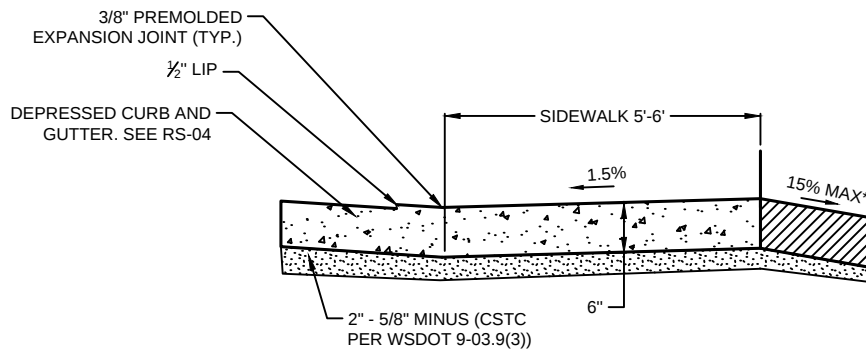
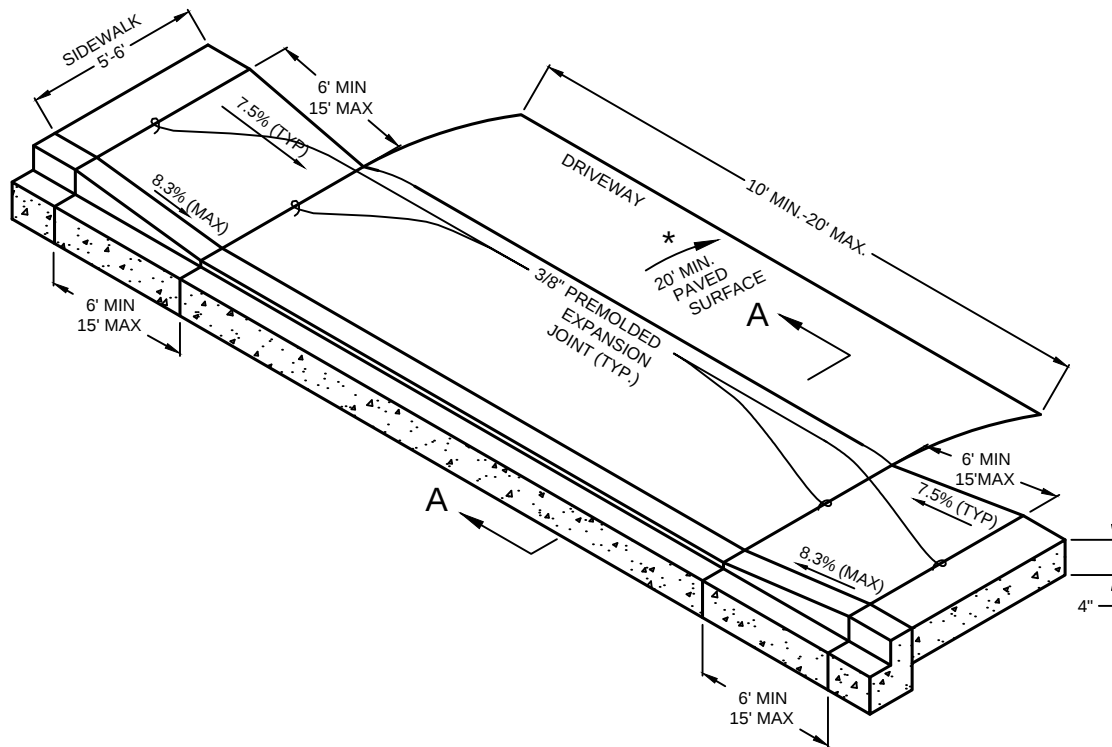
ALTERNATE 2 OF 3

SHEET:

RS-06

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



* SEE CONTRACT PLANS FOR DRIVEWAY PROFILE

SECTION A-A

NOTES:

1. THIS ALTERNATE SHOULD BE USED ONLY AFTER STUDYING CLOSENESS OF DRIVEWAYS, DRAINAGE, TOPOGRAPHY, DRIVEWAY GRADES, RIGHT OF WAY, ETC.
2. CONCRETE SHALL BE CLASS 4000 PSI.
3. INSPECTION REQUIRED BEFORE PLACING CONCRETE. AT LEAST 24 HOUR NOTICE MUST BE GIVEN TO TUKWILA PUBLIC WORKS DEPARTMENT.
4. ALL DRIVEWAY APRONS SHALL BE A MINIMUM OF 6" THICK.
5. WHERE DRIVEWAY WIDTHS EXCEED 15', A 3/8" X 5-1/2" EXPANSION JOINT SHALL BE PLACED LONGITUDINALLY ALONG THE CENTERLINE.
6. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APWA/WSDOT PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE CITY OF TUKWILA.
7. AN ASPHALT APRON MAY BE USED WITHIN THE ROW IN AREAS WHERE NO CURB EXISTS.
8. REMOVAL OF EXISTING CONCRETE CURB, GUTTER OR SIDEWALK SHALL BE SAW CUT TO THE NEXT CONSTRUCTION JOINT.

NOT TO SCALE



**City of
Tukwila**

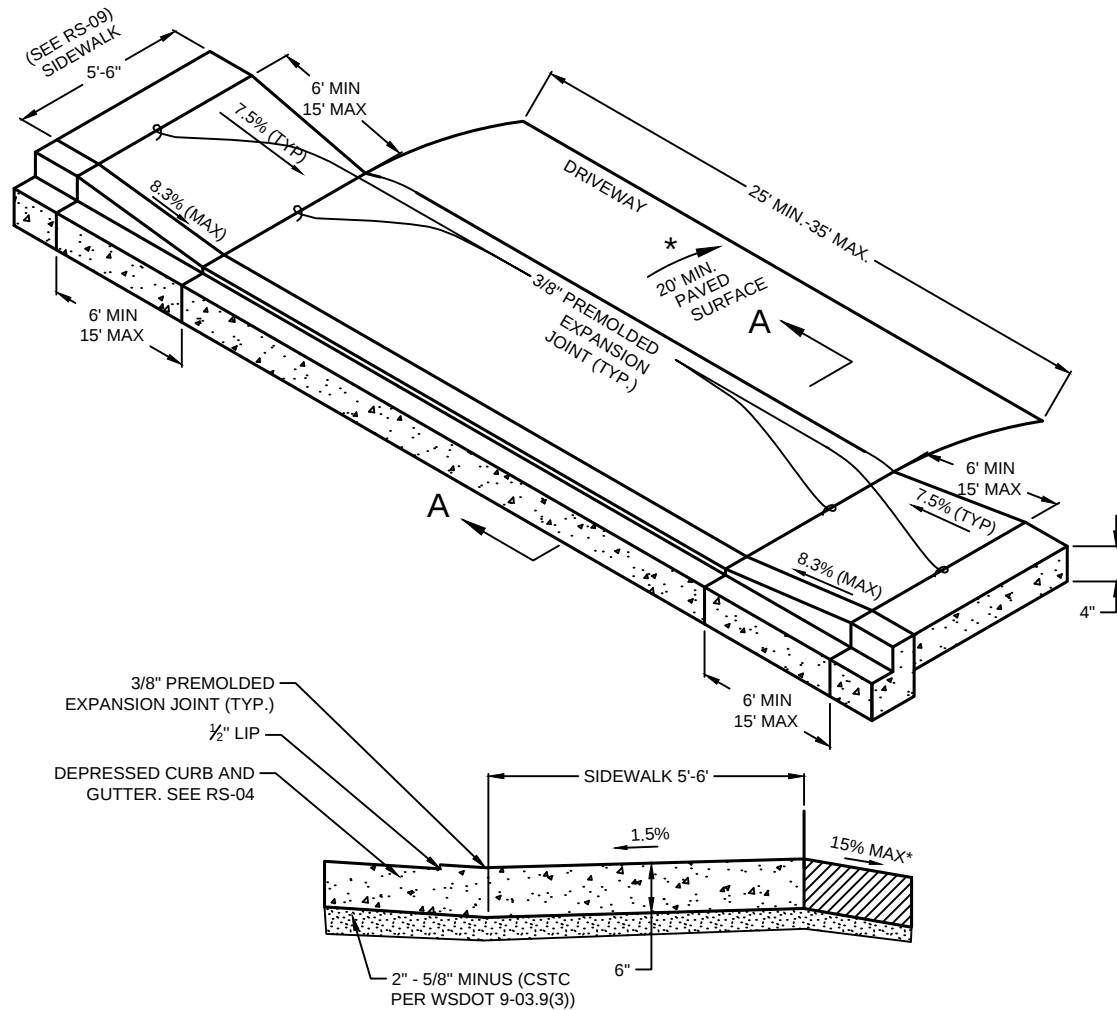
RESIDENTIAL DRIVEWAY

ALTERNATE 3 OF 3

SHEET: RS-07

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



* SEE CONTRACT PLANS FOR DRIVEWAY PROFILE

NOTES:

SECTION A-A

1. DRIVEWAY WIDTH: 25' MIN - 35' MAX.
2. THIS ALTERNATE SHOULD BE USED ONLY AFTER STUDYING CLOSENESS OF DRIVEWAYS, DRAINAGE, TOPOGRAPHY, DRIVEWAY GRADES, RIGHT OF WAY, ETC.
3. DRIVEWAYS WITH HIGH VOLUME (AS NOTED BY CITY ENGINEER) MAY BE APPROVED FOR INTERSECTION TYPE ACCESS.
4. TURNING RESTRICTIONS MAY BE APPLIED BY THE CITY ENGINEER.
5. CONCRETE SHALL BE CLASS 4000 PSI.
6. INSPECTION REQUIRED BEFORE PLACING CONCRETE. AT LEAST 24 HOUR NOTICE MUST BE GIVEN TO TUKWILA PUBLIC WORKS DEPARTMENT FOR INSPECTION.
7. ALL DRIVEWAY APRONS SHALL BE A MINIMUM OF 6" THICK.
8. WHERE DRIVEWAY WIDTHS EXCEED 15', A 3/8" X 5-1/2" EXPANSION JOINT SHALL BE PLACED LONGITUDINALLY ALONG THE CENTERLINE.
9. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APWA/WSDOT PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE CITY OF TUKWILA.
10. AN ASPHALT APRON MAY BE USED WITHIN THE ROW IN AREAS WHERE NO CURB EXISTS.
11. REMOVAL OF EXISTING CONCRETE CURB, GUTTER OR SIDEWALK SHALL BE TO THE NEXT EXPANSION JOINT; SCORE JOINTS MUST BE SAW CUT AND REPLACED WITH AN EXPANSION JOINT.

NOT TO SCALE



**City of
Tukwila**

COMMERCIAL DRIVEWAY

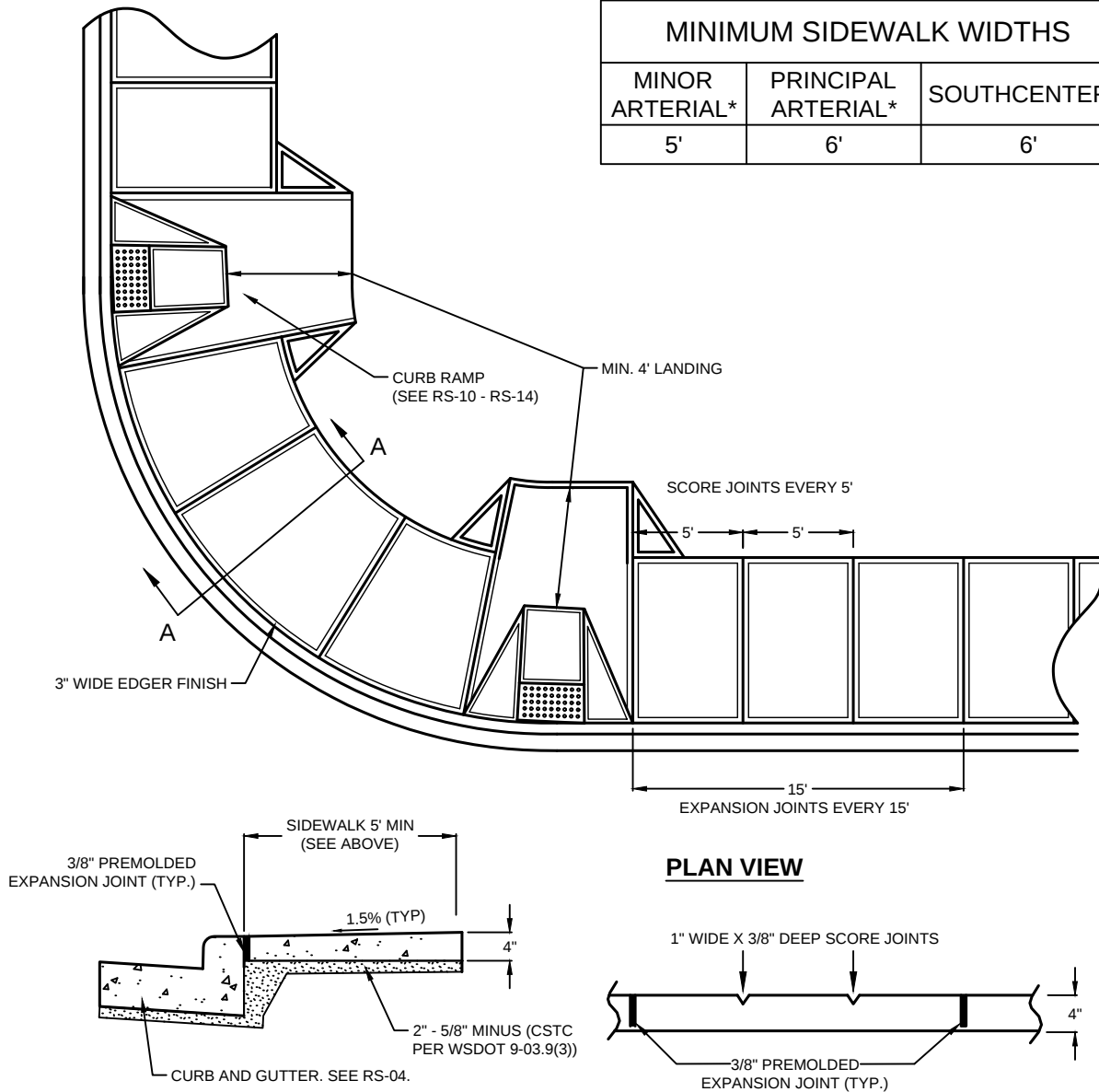
SHEET:

RS-08

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

MINIMUM SIDEWALK WIDTHS		
MINOR ARTERIAL*	PRINCIPAL ARTERIAL*	SOUTHCENTER**
5'	6'	6'



NOTES:

1. SIDEWALKS SHALL BE A MINIMUM OF 8 FEET WIDE AT BUS STOPS AND PULLOUTS, OR WHERE THE SPEED LIMIT IS OVER 35 MPH, OR WHERE A TRAIL AND SIDEWALK ARE COMBINED.
2. CONCRETE SHALL BE CLASS 4000 PSI.
3. PLACE CEMENT CONCRETE OVER 2" OF 5/8" MINUS CRUSHED ROCK (CSTC PER WSDOT 9-03.9(3)).
4. REMOVE EXISTING CONCRETE CURB, GUTTER OR SIDEWALK TO THE NEAREST JOINT; SCORE JOINTS MUST BE SAW CUT AND REPLACED WITH NEW.
5. SIDEWALKS CONSTRUCTED WITHIN SOUTHCENTER HAVE ADDITIONAL REQUIREMENTS.

* SEE TMC CHAPTER 9.48.040 FOR MORE INFORMATION

** SEE TMC CHAPTER 18.28 TUKWILA URBAN CENTER (TUC) FOR MORE INFORMATION

NOT TO SCALE



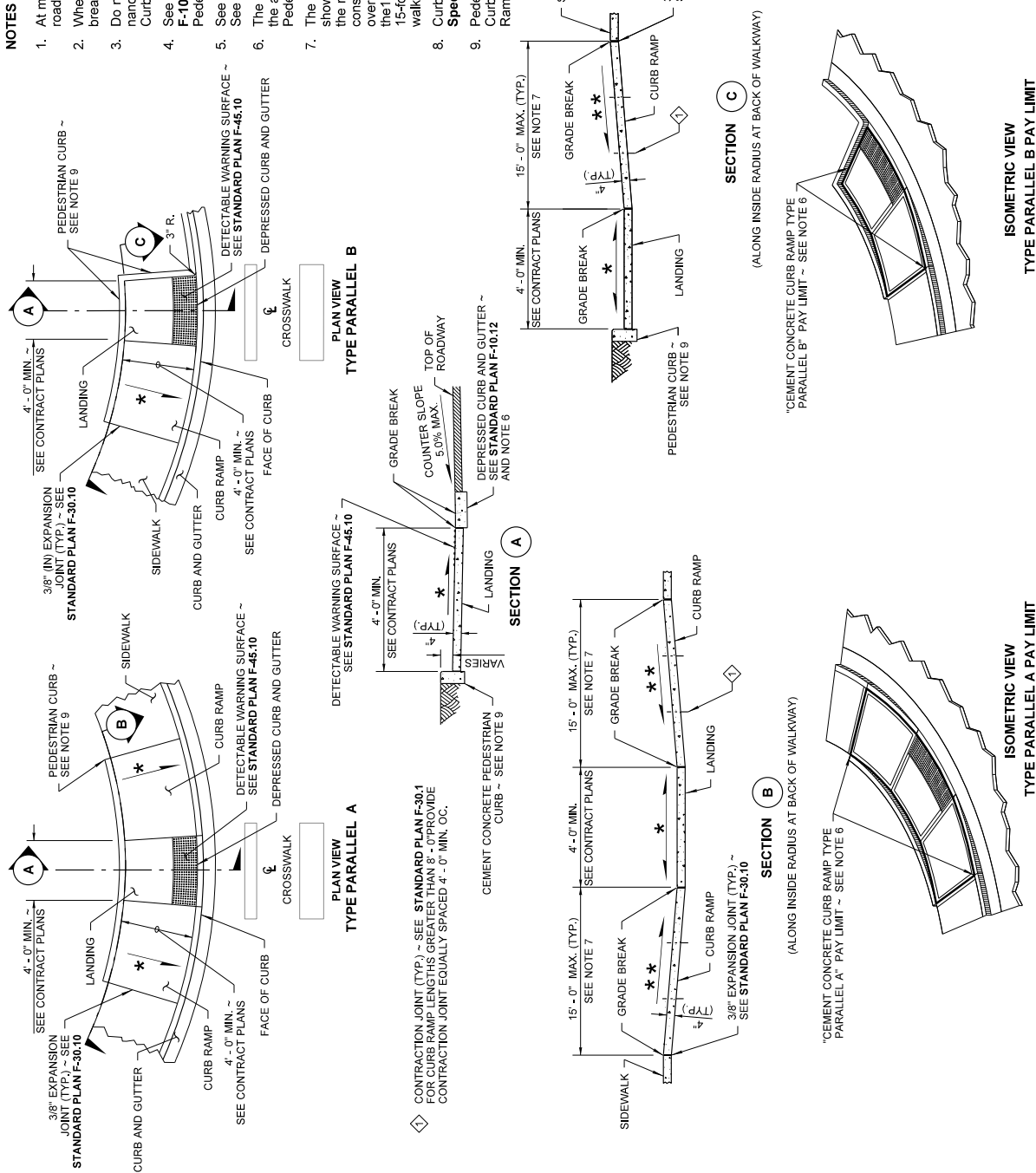
**City of
Tukwila**

SIDEWALK

SHEET: RS-09

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES

- At marked crosswalks, the connection between the landing and the roadway must be contained within the width of the crosswalk markings.
- Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
- Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in the Depressed Curb and Gutter where the Landing connects to the roadway.
- See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb and Gutter, and Pedestrian Curb details.
- See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
- The Bid Item "Cement Concrete Curb Ramp Type ____" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
- The Curb Ramp length is not required to exceed 15 feet (unless otherwise shown in the Contract Plans). When applying the 15-foot max. length, the running slope of the curb ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet. Do not include abutting landing(s) in the 15-foot max. measurement. When a ramp is constructed on a radius, the 15-foot max. length is measured on the inside radius along the back of the walkway.
- Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14**.
- Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will be no material to retain.

LEGEND

- SLOPE IN EITHER DIRECTION
- ★ 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)
 - ★★ 7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.) - SEE NOTE 7



PARALLEL CURB RAMP STANDARD PLAN F-40.12-03 SHEET 1 OF 1 SHEET

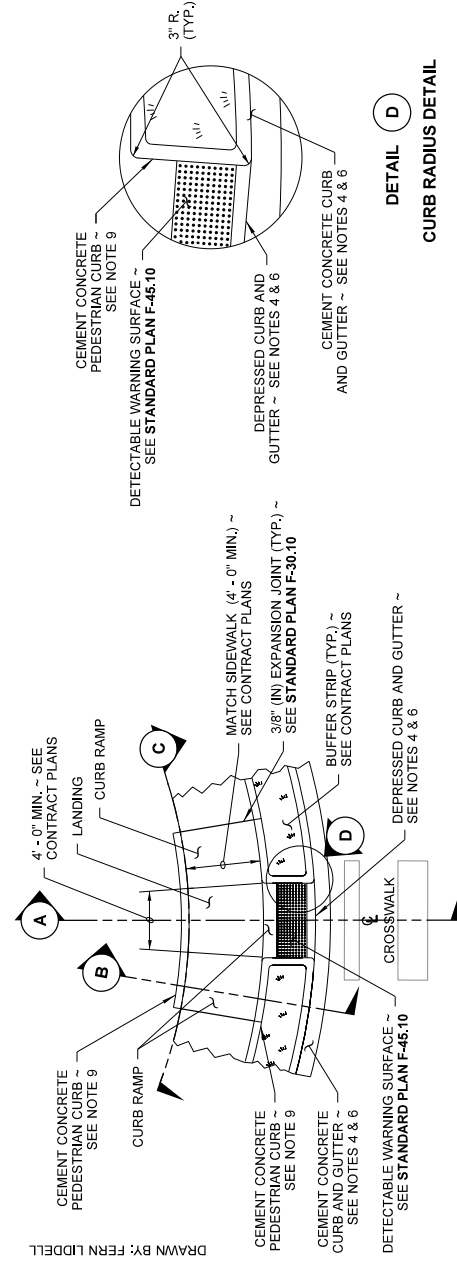
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STATE DESIGN ENGINEER
Washington State Department of Transportation

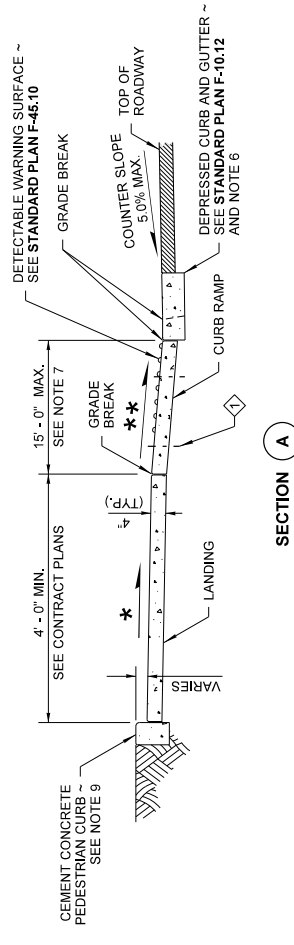
RS-10

NOTES

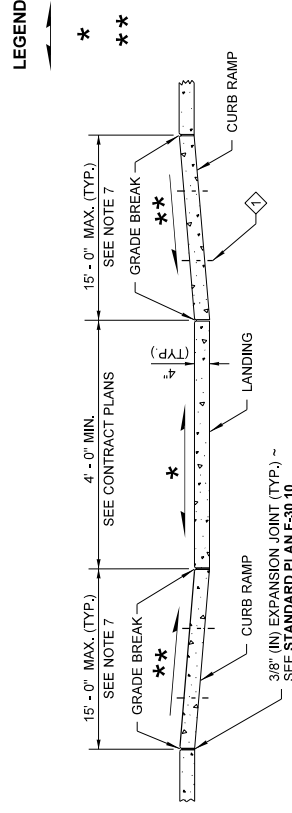
1. At marked crosswalks, the connection between the curb ramp and the roadway must be contained within the width of the crosswalk markings.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in the Depressed Curb and Gutter where the landing connects to the roadway.
4. See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb, Gutter and Pedestrian Curb details.
5. See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
6. The Bid Item "Cement Concrete Curb Ramp Type _____" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
7. The Curb Ramp length is not required to exceed 15 feet (unless otherwise shown in the Contract Plans). When applying the 15-foot max. length, the running slope of the curb ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet. Do not include the abutting landing in the 15-foot max. measurement. When a ramp is constructed on a radius, the 15-foot max. length is measured on the inside radius along the back of the walkway.
8. Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14**.
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.



PLAN VIEW
TYPE COMBINATION
WITH BUFFER



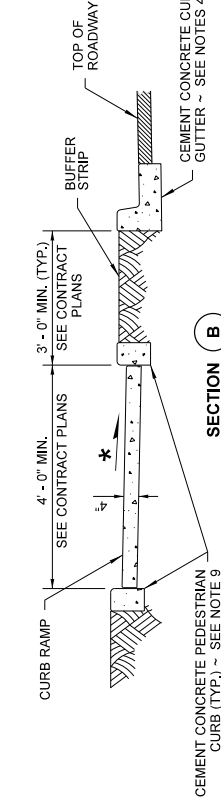
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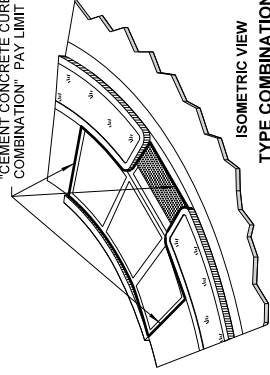
SECTION C

(ALONG INSIDE RADIUS AT BACK OF WALKWAY)

① CONTRACTION JOINT (TYP.) ~ SEE STANDARD PLAN F-30.10 FOR CURB RAMP LENGTHS GREATER THAN 8' - 0". PROVIDE CONTRACTION JOINT EQUALLY SPACED 4' - 0" MIN. OC.



SECTION B



ISOMETRIC VIEW
TYPE COMBINATION
PAY LIMIT



**COMBINATION CURB RAMP
STANDARD PLAN F-40.14-03**

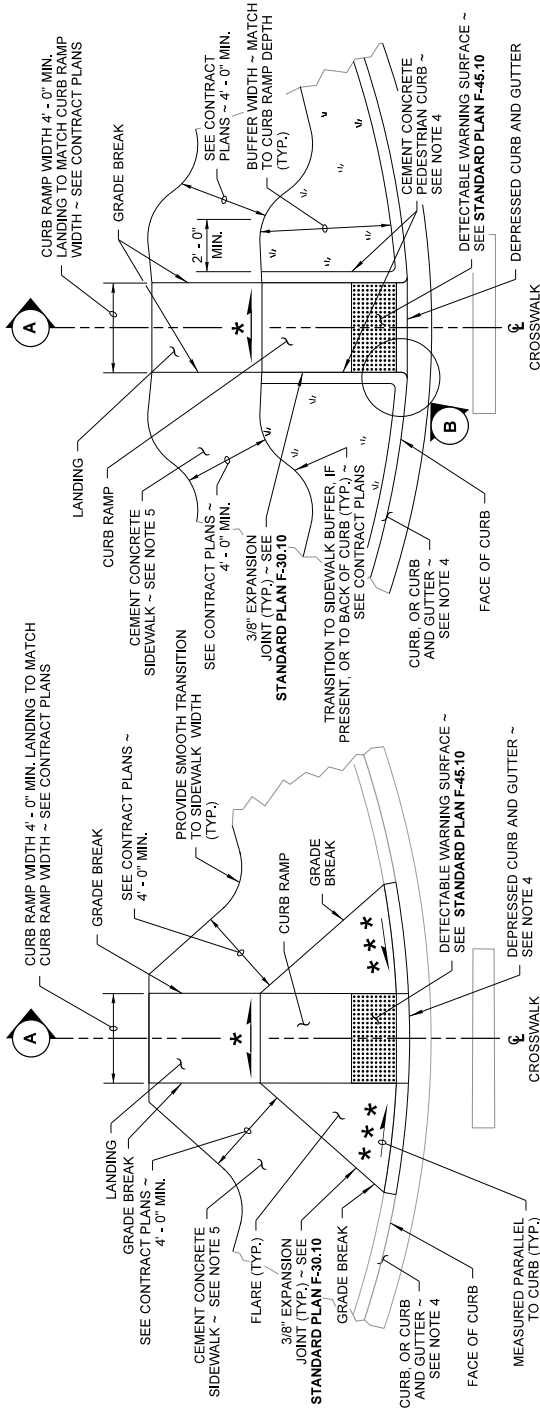
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER



Washington State Department of Transportation

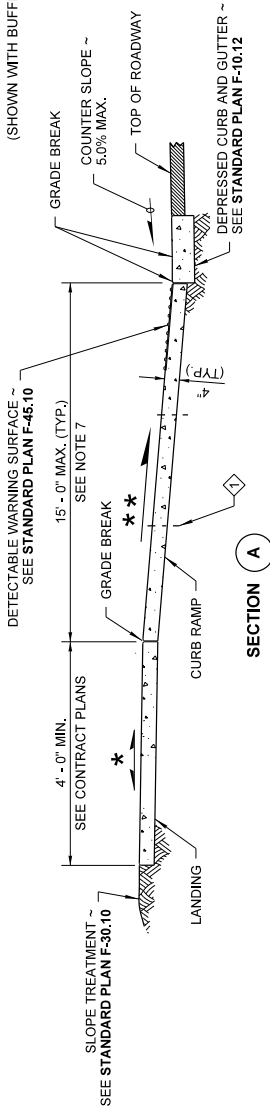


DRAWN BY: FERN LIDDELL

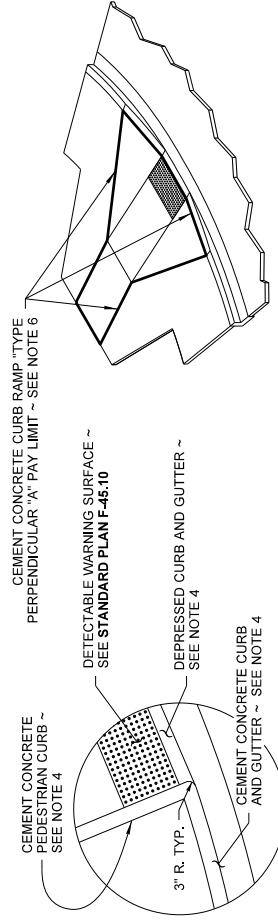
CONTRACTION JOINT (TYP.) ~ SEE STANDARD PLAN F-30.10 FOR CURB RAMP LENGTHS GREATER THAN 8' - 0" PROVIDE CONTRACTION JOINT EQUALLY SPACED 4' - 0" MIN. OC.

PLAN VIEW
TYPE PERPENDICULAR A

PLAN VIEW
TYPE PERPENDICULAR B
(SHOWN WITH BUFFER)

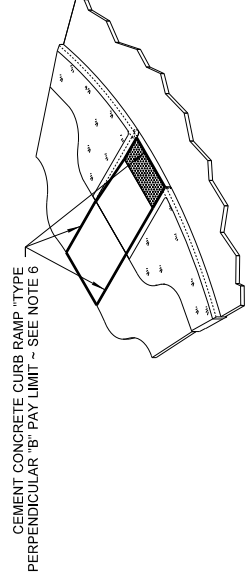


SECTION A



CURB RADIUS DETAIL B

ISOMETRIC VIEW
TYPE PERPENDICULAR A PAY LIMIT



ISOMETRIC VIEW
TYPE PERPENDICULAR B PAY LIMIT

NOTES

- At marked crosswalks, the connection between the curb ramp and the roadway must be contained within the width of the crosswalk markings.
- Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
- Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in front of the Curb Ramp where it connects to the roadway.
- See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb and Gutter, and Pedestrian Curb details.
- See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
- The Bid Item "Cement Concrete Curb Ramp Type " " does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
- The Curb Ramp length is not required to exceed 15 feet (unless shown otherwise in the Contract Plans). When applying the 15-foot max. length, the running slope of the Curb Ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the landing over a horizontal distance of 15 feet. Do not include the abutting landing in the 15-foot max. measurement.
- Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14**.
- Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.

LEGEND

- ★ SLOPE IN EITHER DIRECTION
- ★ 1.5 OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)
- ★ 7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.)
- ★ 9.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (10% MAX.)

RS-12



PERPENDICULAR CURB RAMP

STANDARD PLAN F-40.15-03

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

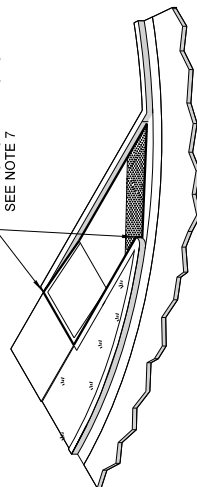


STATE DESIGN ENGINEER
Washington State Department of Transportation

1. This plan is to be used where pedestrian crossing in one direction is not permitted.
2. At marked crosswalks, the connection between the Landing and the roadway must be contained within the width of the crosswalk markings.
3. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.

1. This plan is to be used where pedestrian crossing in one direction is not permitted.
2. At marked crosswalks, the connection between the Landing and the roadway must be contained within the width of the crosswalk markings.
3. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
4. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing or in the Depressed Curb and Gutter where the Landing connects to the roadway.
5. See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb and Gutter, and Pedestrian Curb details.
6. See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
7. The Bid Item "Cement Concrete Curb Ramp Type _____" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
8. The Curb Ramp length is not required to exceed 15 feet (unless shown otherwise in the Contract Plans). When applying the 15-foot max. length (measured from back of sidewalk) the running slope of the curb ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet.
9. Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14**.
10. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.

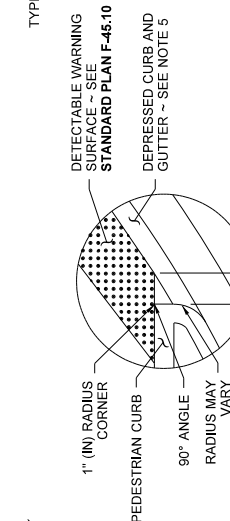
CEMENT CONCRETE CURB RAMP
TYPE SINGLE DIRECTION A" PAY LIMIT ~
SEE NOTE 7



ISOMETRIC VIEW
TYPE SINGLE DIRECTION B
PAY LIMIT

[illegible]

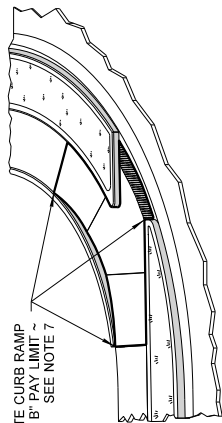
CONTRACTION JOINT (TYP.) ~ SEE STANDARD PLAN F-30.10
FOR CURB RAMP LENGTHS GREATER THAN 8' - 0" PROVIDE
CONTRACTION JOINT EQUALLY SPACED 4' - 0" MIN. OC.



DETAIL C

[illegible]

(ALONG INSIDE RADIUS AT BACK OF WALKWAY)



ISOMETRIC VIEW
TYPE SINGLE DIRECTION B
PAY LIMIT

DRAWN BY: FERN LIDDELL

RS-13



**SINGLE DIRECTION
CURB RAMP**

STANDARD PLAN F-40.16-03

SHEET 1 OF 1 SHEET

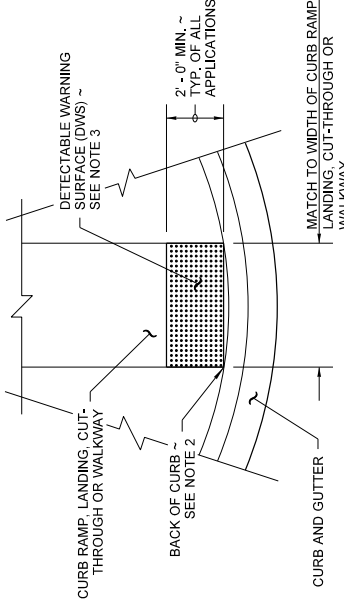
APPROVED FOR PUBLICATION



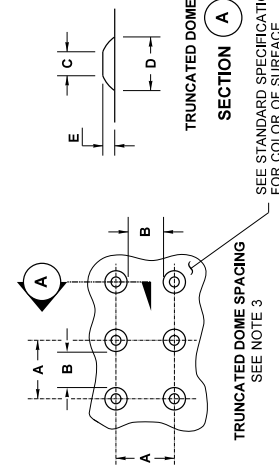
STATE DESIGN ENGINEER
Washington State Department of Transportation

NOTES

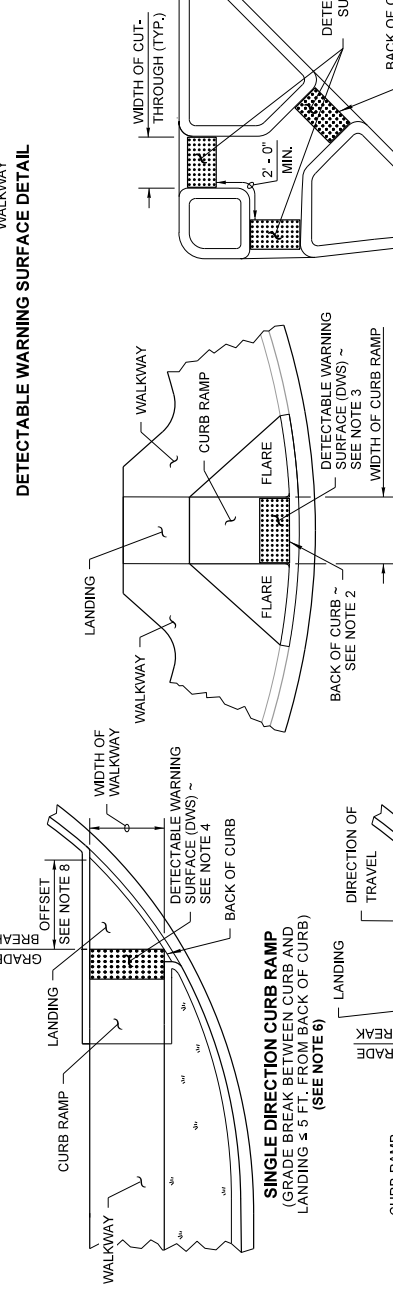
1. The Detectable Warning Surface (DWS) shall extend the full width of the curb ramp, landing, or other roadway entrance as applicable. Exception: If the Manufacturer of the DWS requires a concrete border around the DWS, a variance of up to 2 inches on each side of the DWS is permitted.
2. The Detectable Warning Surface (DWS) shall be placed at the back of curb, with the two leading corners of the DWS panel placed adjacent to the back of the curb, and with no more than a 2 inch gap between the DWS and the back of the curb measured at the center of the DWS panel. Exception: If the Manufacturer of the selected DWS requires a concrete border around the DWS, a variance of up to 2 inches from the back of the curb is permitted (measured at the leading corners of the DWS panel).
3. The rows of truncated domes shall be aligned to be perpendicular to the grade break at the back of curb.
4. The rows of truncated domes shall be aligned to be parallel to the direction of travel.
5. If curb and gutter are not present, such as a shared-use path connection, the Detectable Warning Surface shall be placed at the pavement edge.
6. See **Standard Plans** for sidewalk and curb ramp details.
7. If a curb ramp is required, the location of the Detectable Warning Surface must be at the bottom of the ramp and within the required distance from the rail.
8. When the grade break between the curb ramp and the landing is less than or equal to 5 ft. from the back of curb at all points, place the Detectable Warning Surface on the bottom of the curb ramp directly above the grade break.



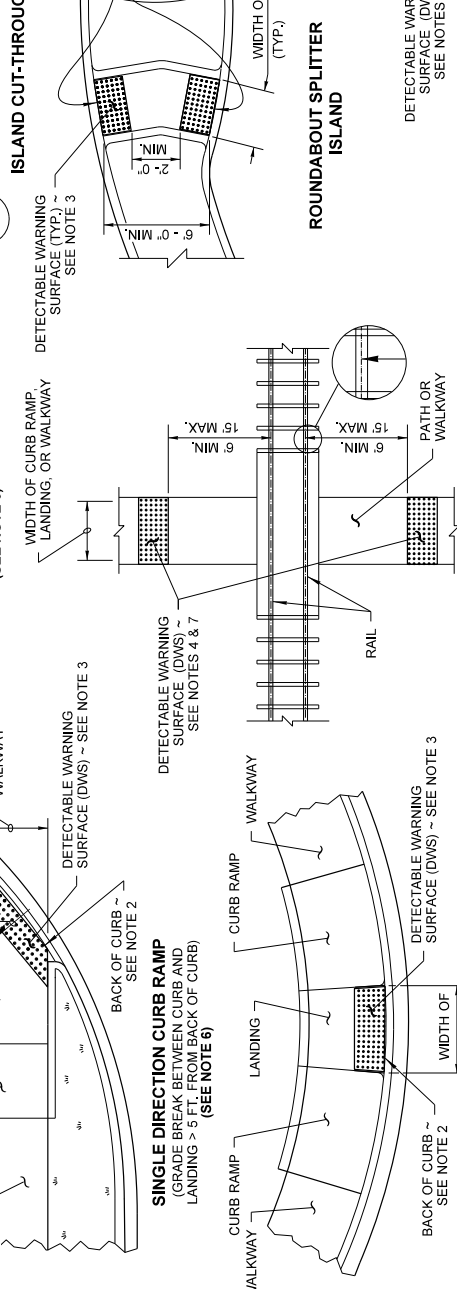
	MIN.	MAX.
A	1.60"	2.40"
B	0.65"	—
C	0.45"	0.90"
D	0.9"	1.40"
E	0.2"	0.2"



TRUNCATED DOME DETAILS



PERPENDICULAR CURB RAMP (SEE NOTE 6)



PARALLEL CURB RAMP (SEE NOTE 6)

PEDESTRIAN RAILROAD CROSSING

PLACEMENT GUIDELINES

SHARED-USE PATH CONNECTION

RS-14



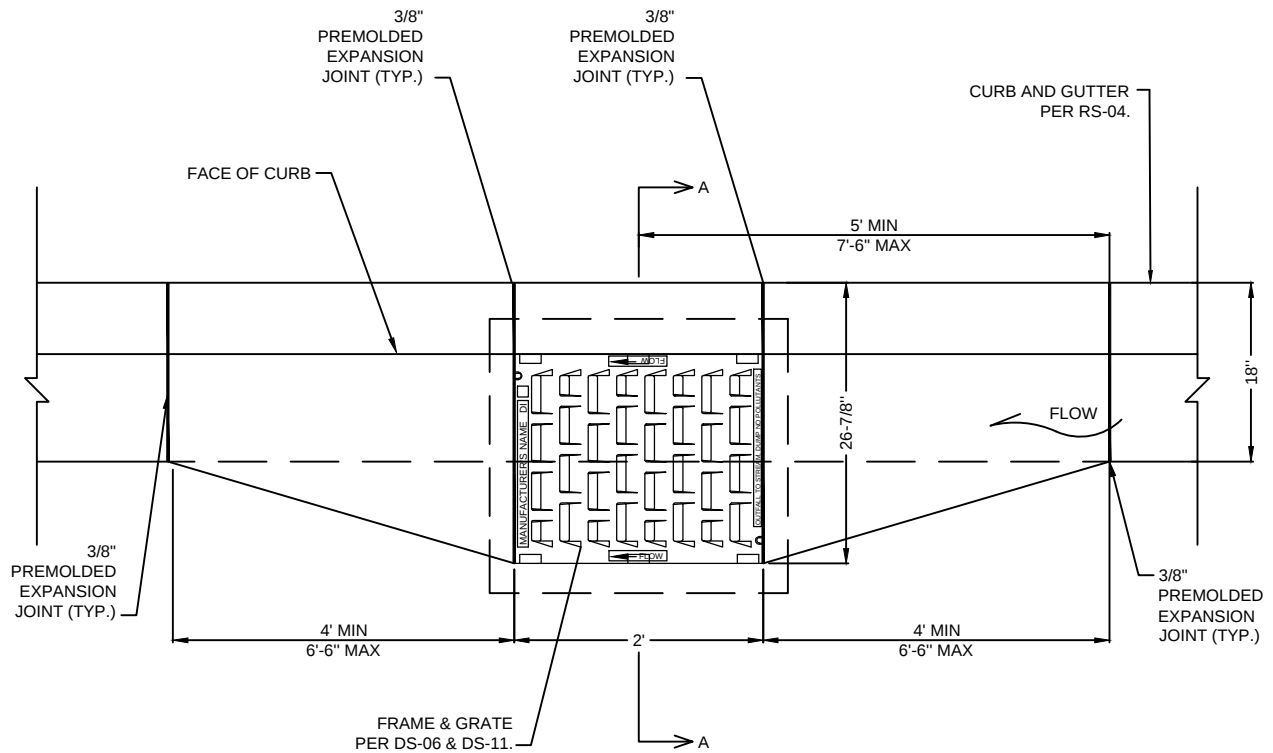
DETECTABLE WARNING SURFACE

STANDARD PLAN F-45.10-02

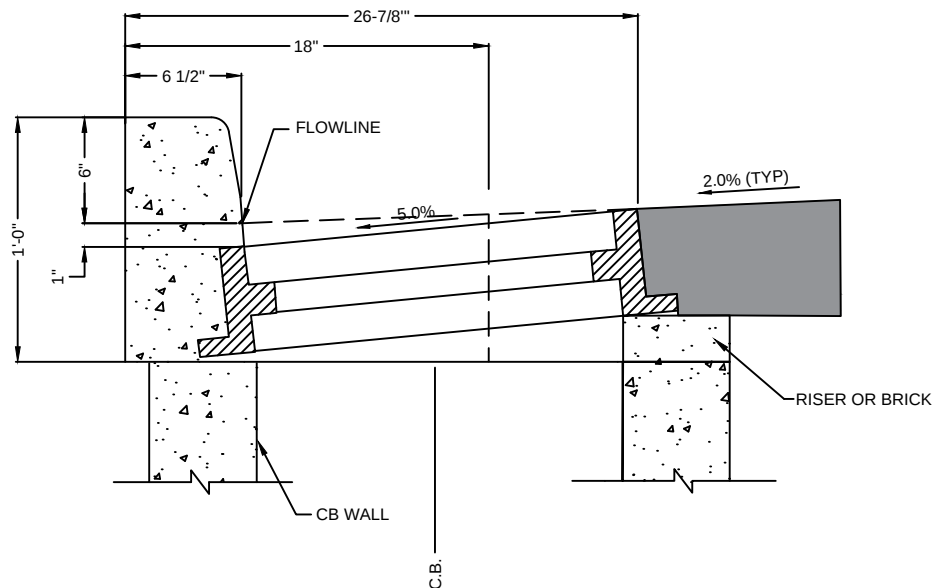
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION





INLET DETAIL



SECTION A-A

NOT TO SCALE



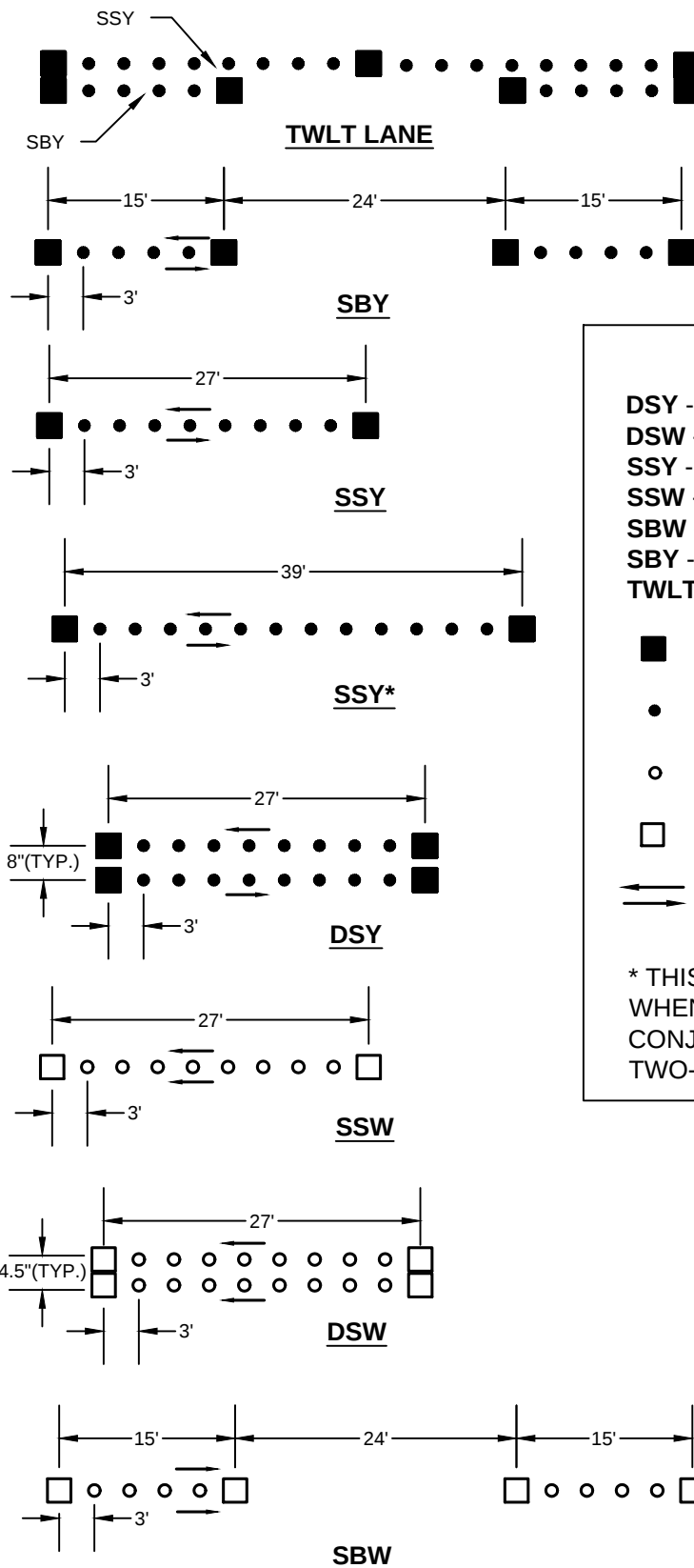
**City of
Tukwila**

**CURB AND GUTTER
CATCH BASIN SURROUND**

SHEET: **RS-15**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



LEGEND

DSY - DOUBLE SOLID YELLOW
DSW - DOUBLE SOLID WHITE
SSY - SINGLE SOLID YELLOW
SSW - SINGLE SOLID WHITE
SBW - SINGLE BROKEN WHITE
SBY - SINGLE BROKEN YELLOW
TWLT - TWO-WAY LEFT TURN LANES

- TYPE 2YY REFLECTOR
- TYPE #1 YELLOW TRAFFIC BUTTON
- TYPE #1 WHITE TRAFFIC BUTTON
- TYPE 2WW REFLECTOR
- ⇌ DIRECTION OF TRAVEL

* THIS SPACING SHALL BE USED ONLY WHEN THE (SSY) IS USED IN CONJUNCTION WITH THE (SBY) FOR TWO-WAY LEFT TURN LANES

NOTES:

- ALL PAVEMENT MARKINGS TYPE 1 AND TYPE 2 SHALL MEET THE REQUIREMENTS OF THE APWA/WSDOT STANDARD SPECIFICATIONS AND DETAILS.

NOT TO SCALE



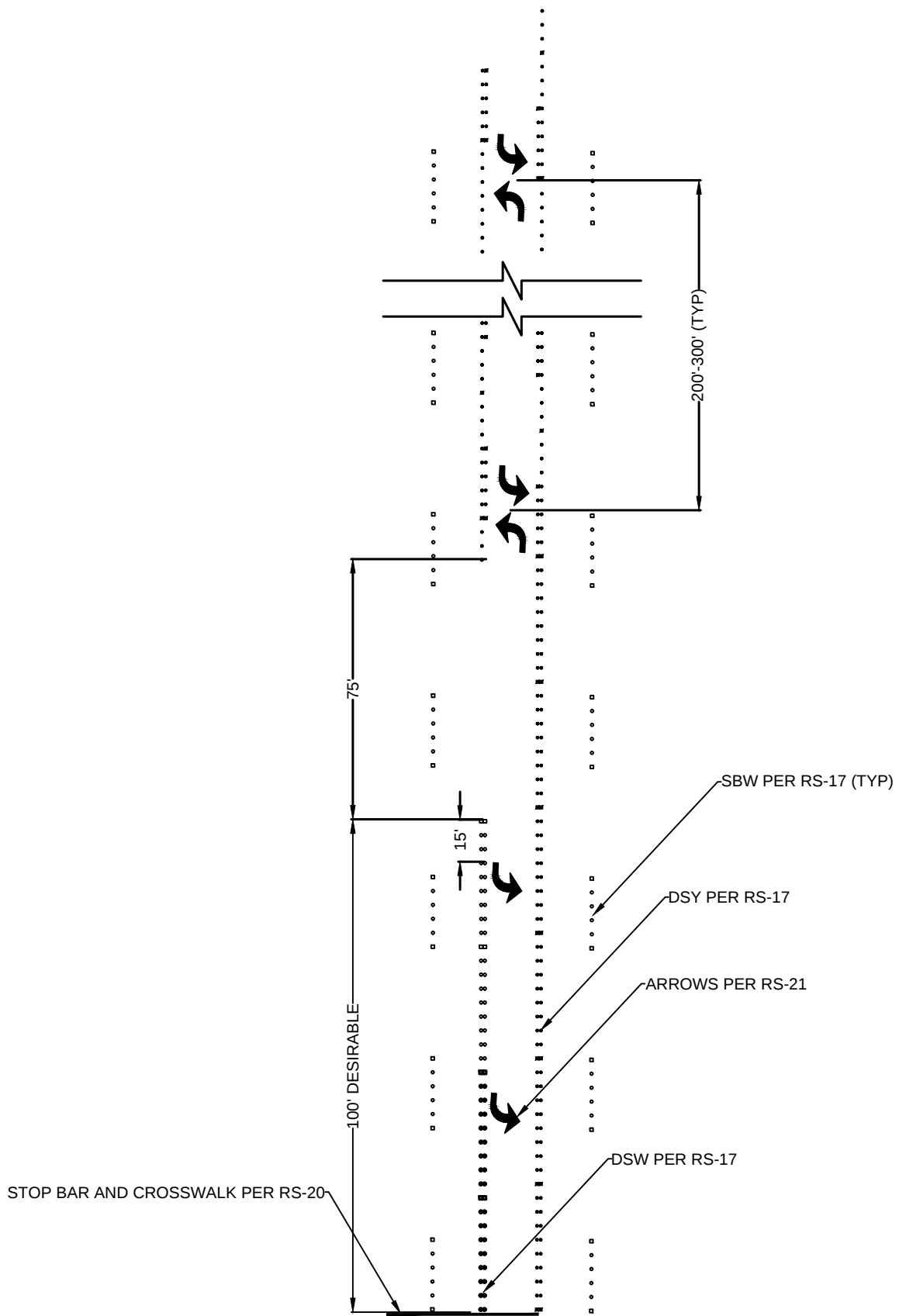
**City of
Tukwila**

RAISED PAVEMENT MARKER

SHEET: RS-17

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOT TO SCALE



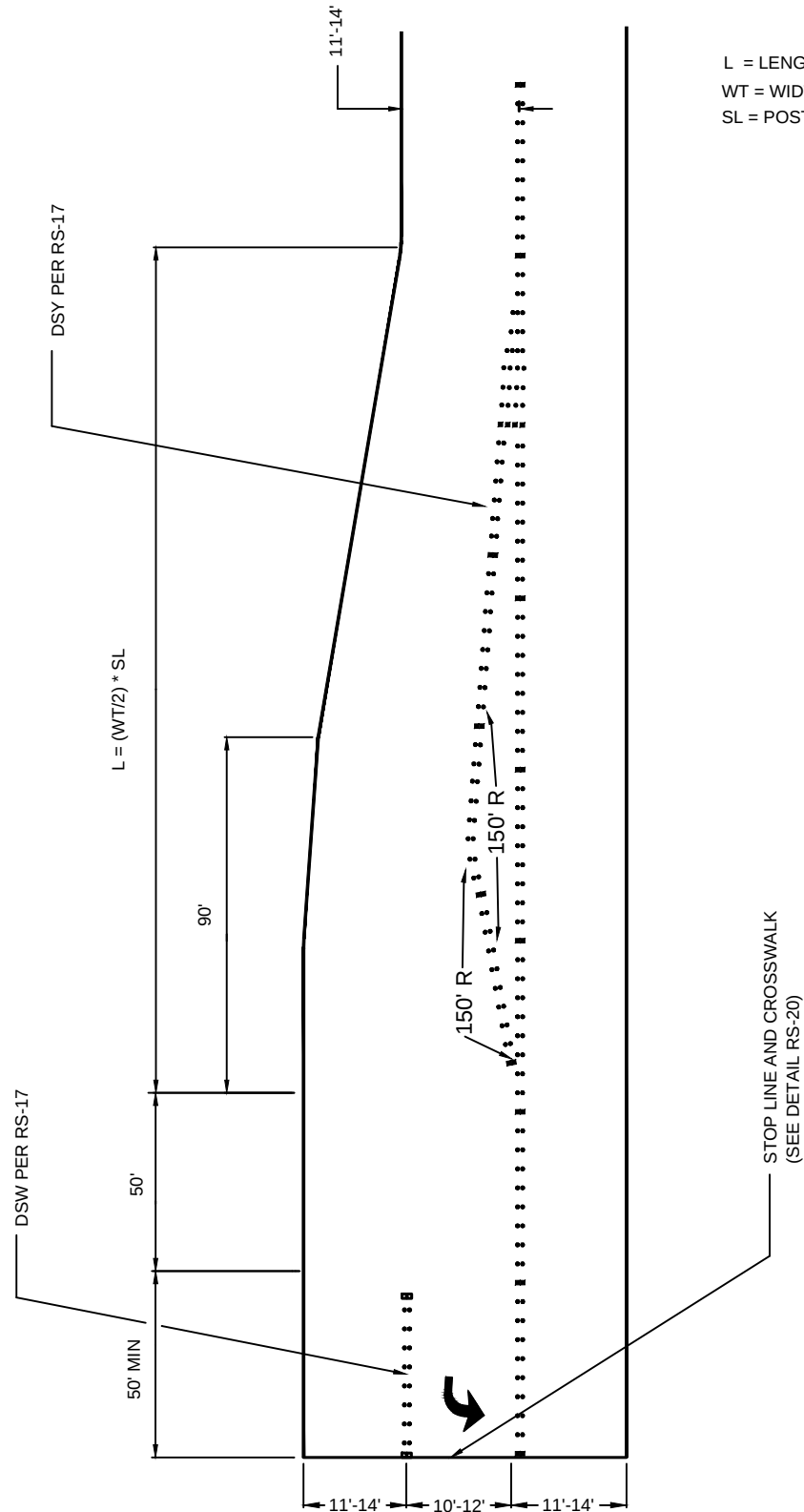
City of
Tukwila

LEFT TURN
2-WAY LANE TYPICAL

SHEET: **RS-18**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



L = LENGTH OF TRANSITION
WT = WIDTH OF TURN LANE
SL = POSTED SPEED LIMIT

NOT TO SCALE



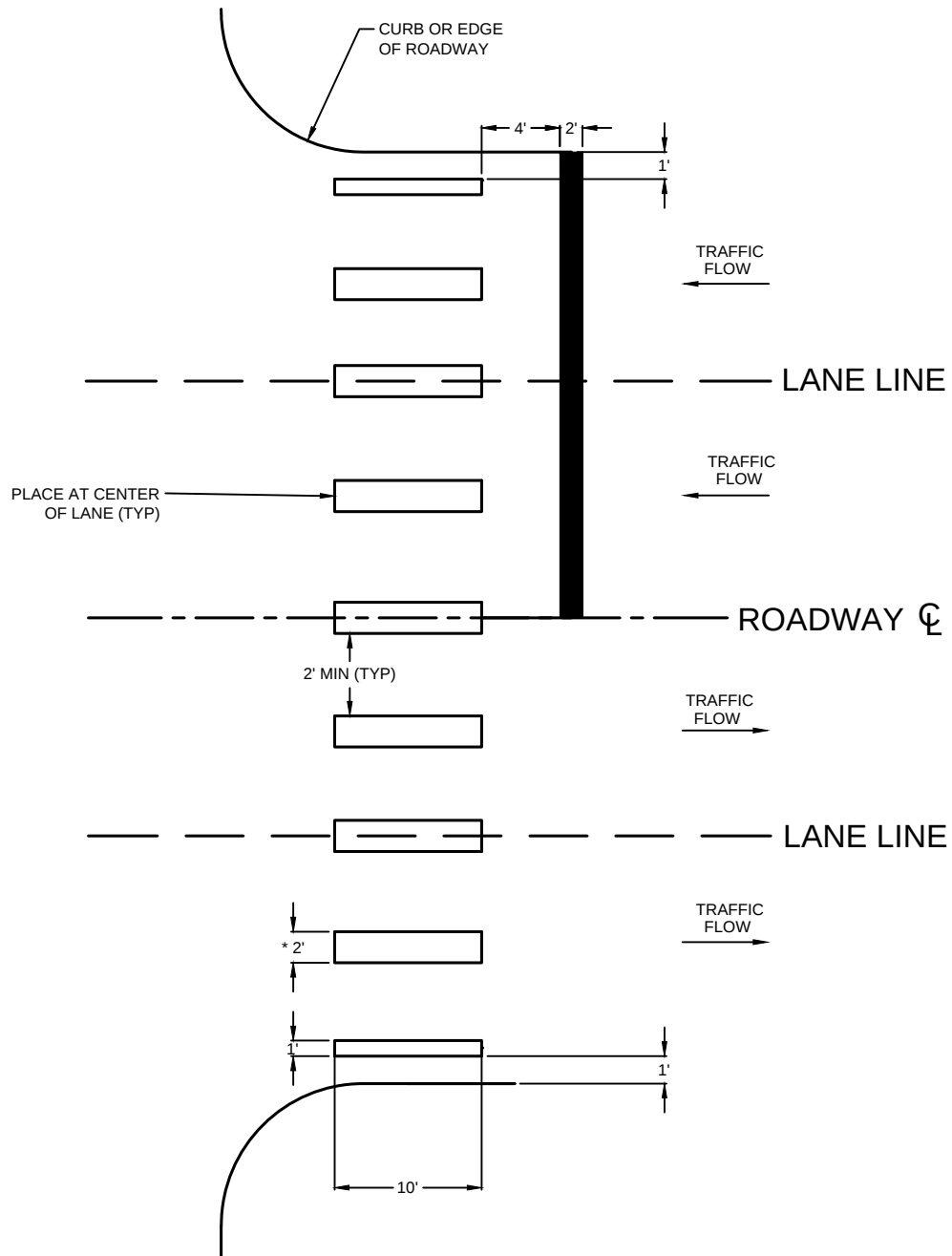
**City of
Tukwila**

LEFT TURN NONCONTINUOUS

SHEET: **RS-19**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



CROSSWALKS

NOTES:

1. CROSSWALK BARS SHALL NOT BE PLACED IN THE WHEEL PATHS AND EVENLY DISTRIBUTED.
2. USE 12" BAR IF SPEED LESS THAN 35 MPH.
3. USE 24" BAR IF SPEED IS GREATER OR EQUAL TO 35 MPH.
4. *2' CROSSWALK BARS TO BE CENTERED ON CENTERLINE, LANE LINES, AND TRAVEL LANES
5. ALL CROSSWALK CHANNELIZATION SHALL BE PLASTIC APPLICATION TYPE A PER WSDOT 9-34.

NOT TO SCALE



**City of
Tukwila**

CROSSWALK

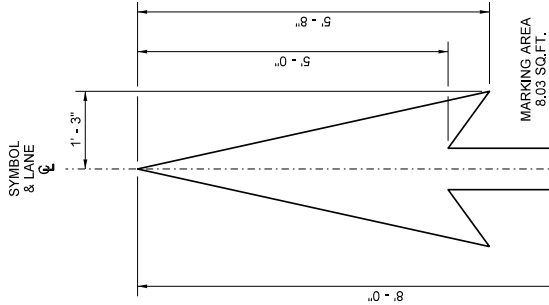
DESIGN AND PLACEMENT

SHEET:

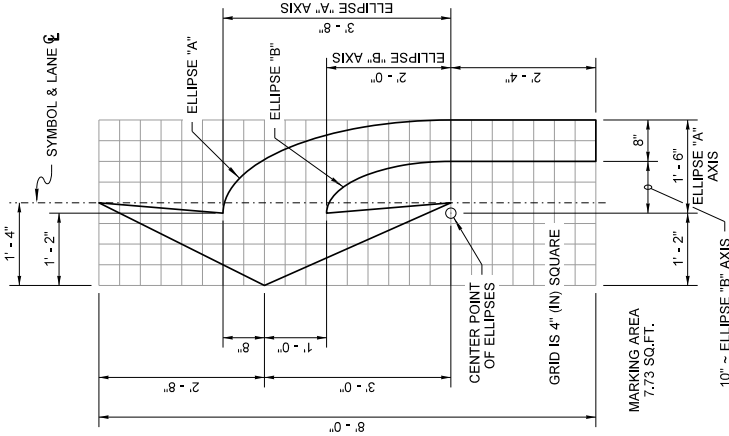
RS-20

LAST REVISION: APRIL 2019

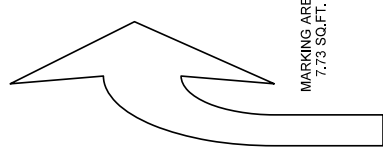
APPROVAL: H. PONNEKANTI

SYMBOL
& LANE

**TYPE 1S
TRAFFIC ARROW**

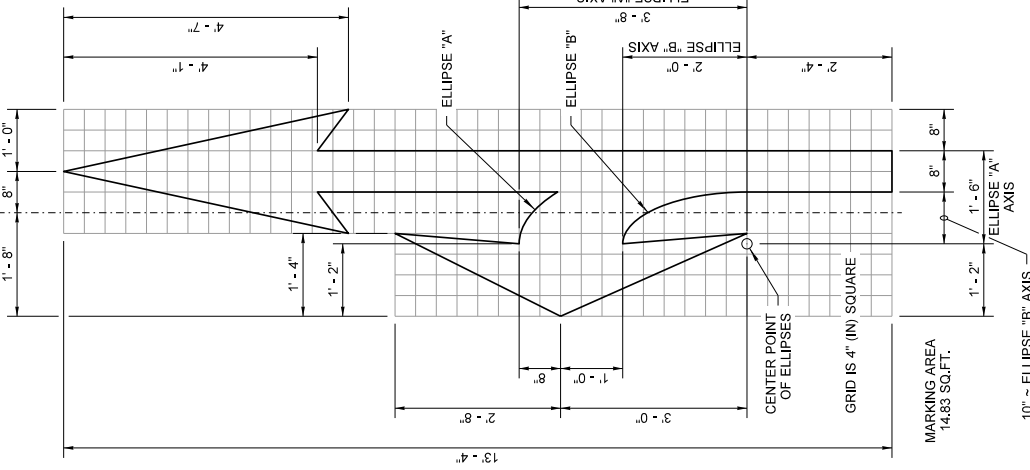


TYPE 2SL (LEFT) TRAFFIC ARROW

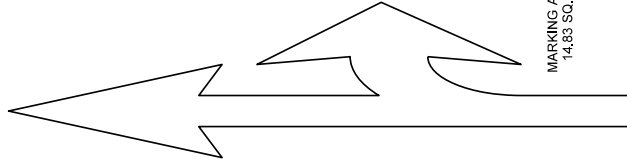


**TYPE 2SR (RIGHT)
TRAFFIC ARROW**

MIRROR IMAGE OF
TYPE 2SL TRAFFIC ARROW
(SHOWN AT REDUCED SCALE)



TYPE 3SL (LEFT) TRAFFIC ARROW

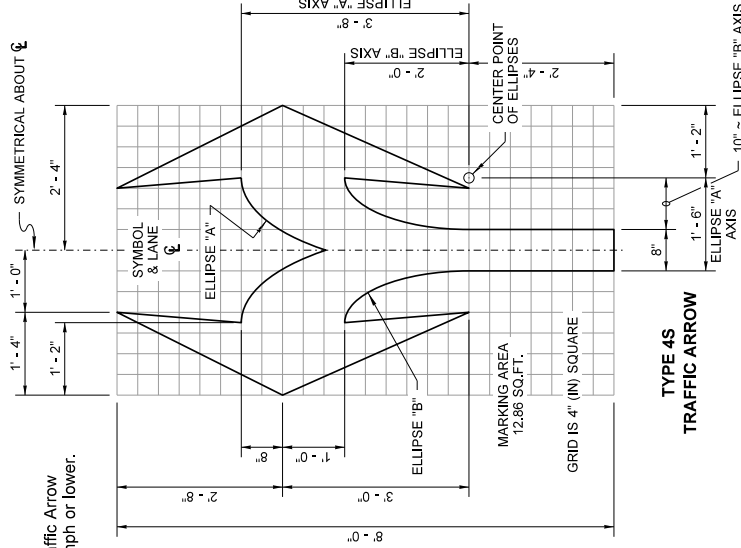


TYPE 3SR (RIGHT)
TRAFFIC ARROW

MIRROR IMAGE OF
TYPE 3SL TRAFFIC ARROW
(SHOWN AT REDUCED SCALE)

NOTE

Use the dimensions shown on this plan for each type of Traffic Arrow being placed on roadways with a posted speed limit of 40 mph or lower.



**TYPE 4S
TRAFFIC ARROW**



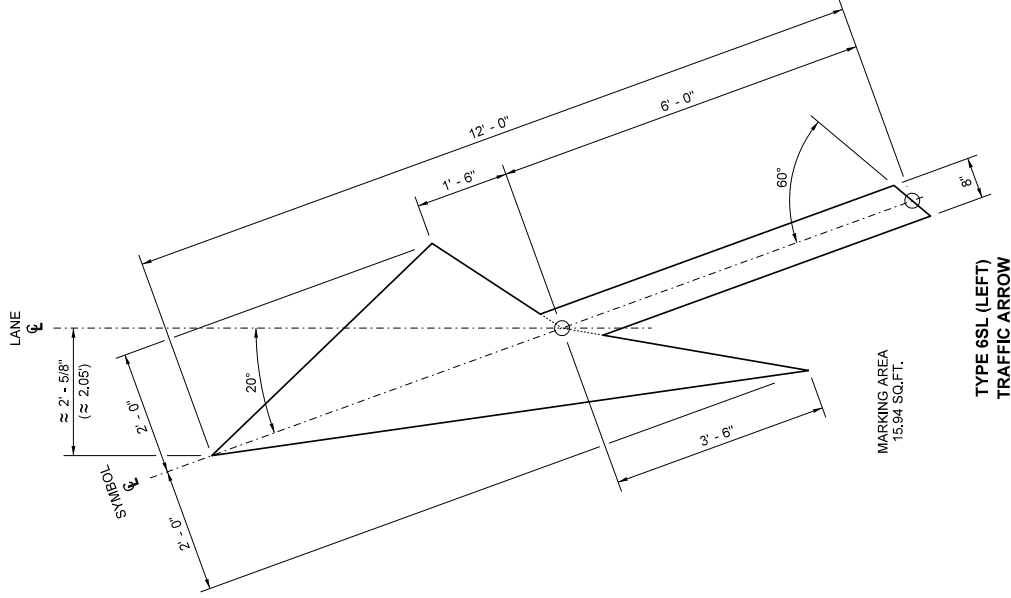
RS-21

**SYMBOL MARKINGS ~
TRAFFIC ARROWS FOR
LOW-SPEED ROADWAYS
STANDARD PLAN M-24.40-02**

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

 **Washington State Department of Transportation**
STATE DESIGN ENGINEER



MARKING AREA
19.58 SQ.FT.

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION



RS-21

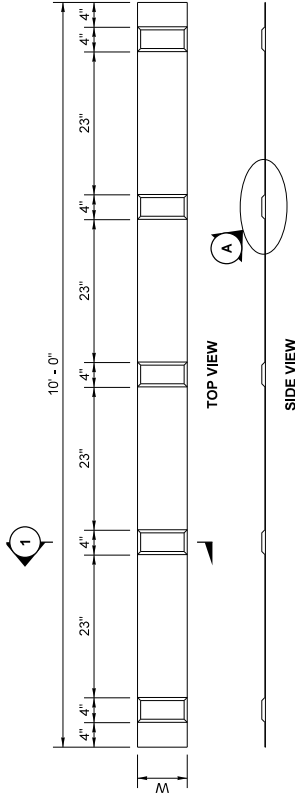
TYPE 6SR (RIGHT)
TRAFFIC ARROW

MIRROR IMAGE OF TYPE 6SL
(MIRRORED ABOUT LANE CENTERLINE)
(SHOWN AT REDUCED SCALE)

MARKING AREA
15.94 SQ.FT.

GENERAL NOTE

See Standard Plan M-20.10 for pattern and color requirements.

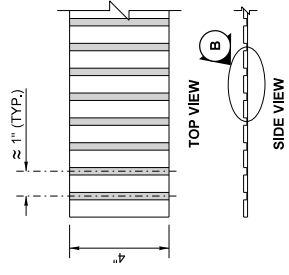


PROFILED PLASTIC
(BROKEN LINE)

FOR:
CENTERLINE & LANE LINE ~ W = 4"
NO-PASS LINE & TWO-WAY LEFT-TURN CENTERLINE ~ W = 4"
REVERSIBLE LANE LINE ~ W = 4"
WIDE BROKEN LANE LINE ~ W = 8"

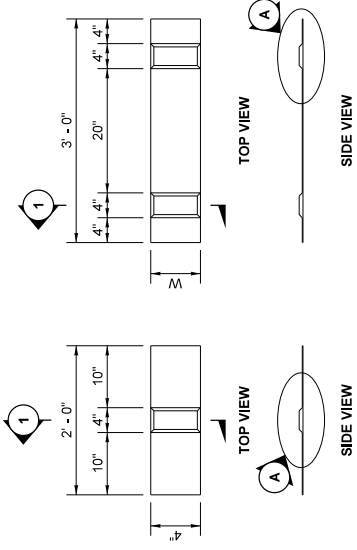
PROFILED PLASTIC
(SOLID LINE)

FOR:
NO-PASS LINE ~ W = 4"
TWO-WAY LEFT-TURN CENTERLINE ~ W = 4"
DOUBLE CENTERLINE & DOUBLE LANE LINE ~ W = 4"
EDGE LINE & SOLID LANE LINE ~ W = 4"
WIDE LANE LINE & WIDE LINE ~ W = 8"
DOUBLE WIDE LANE LINE ~ W = 8"
BARRIER CENTERLINE ~ W = 20"



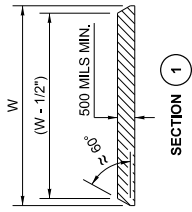
EMBOSSED PLASTIC
(SOLID OR BROKEN LINE)

FOR:
CENTERLINE & LANE LINE
NO-PASS LINE & TWO-WAY LEFT-TURN CENTERLINE
REVERSIBLE LANE LINE
DOUBLE CENTERLINE & DOUBLE LANE LINE
EDGE LINE & SOLID LANE LINE

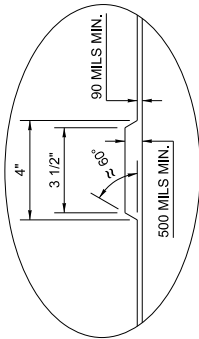


PROFILED PLASTIC
(BROKEN LINE)

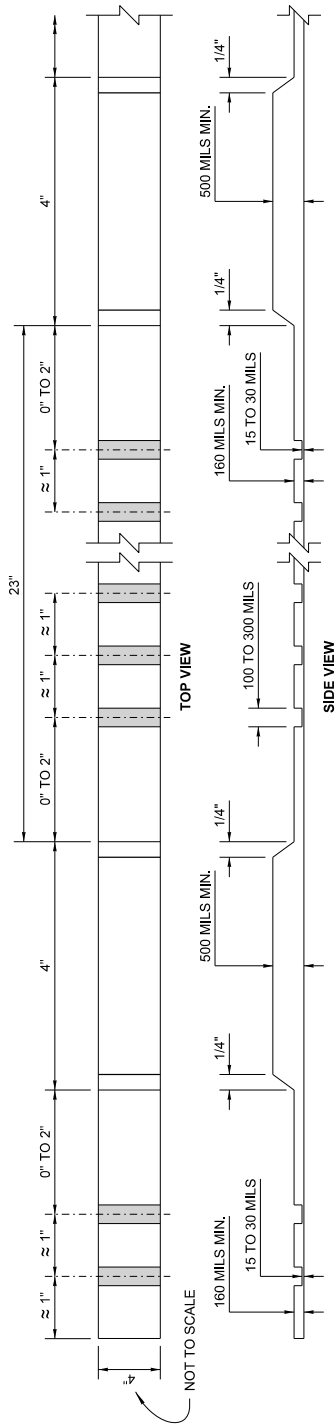
FOR:
DOTTED EXTENSION LINE
DOTTED LANE LINE ~ W = 4"
WIDE DOTTED LANE LINE ~ W = 8"



DETAIL A



DETAIL B



PROFILED EMBOSSED PLASTIC
(SOLID OR BROKEN LINE)

FOR:
CENTERLINE & LANE LINE
NO-PASS LINE
TWO-WAY LEFT-TURN CENTERLINE

FOR:
REVERSIBLE LANE LINE
DOUBLE CENTERLINE & DOUBLE LANE LINE
EDGE LINE & SOLID LANE LINE

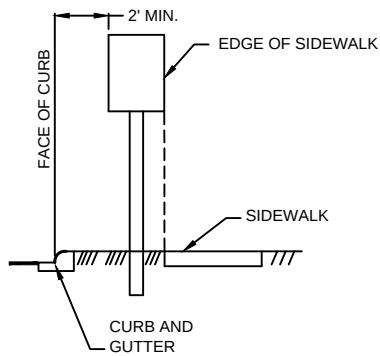
**PROFILED AND EMBOSSED
PLASTIC LINES**
STANDARD PLAN M-20.20-02

SHEET 1 OF 1 SHEET

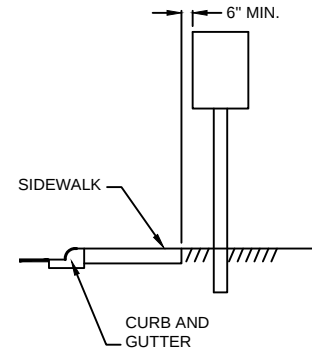
APPROVED FOR PUBLICATION

RS-22

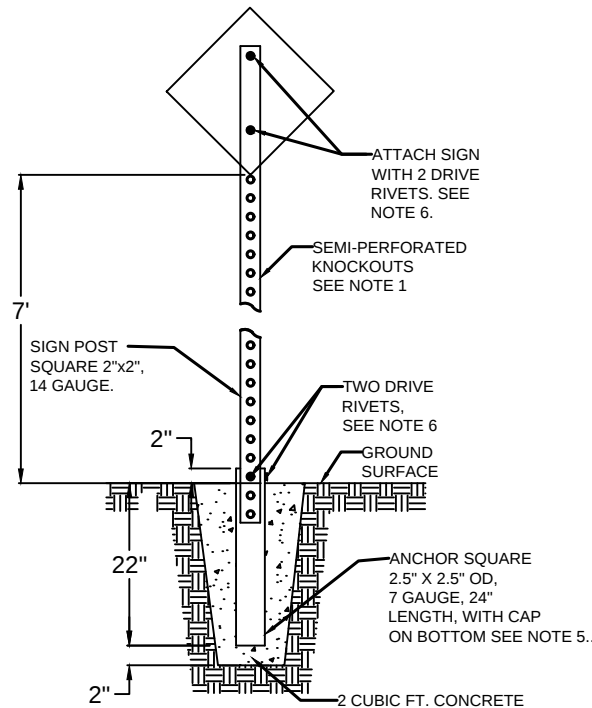




SIGN LOCATION A



SIGN LOCATION B



SIGN INSTALLATION

SIGN POST NOTES

1. SIGN POST SHALL BE 2"x2" SQUARE STEEL POSTS, MINIMUM 14 GAUGE, WITH $\frac{7}{16}$ " SEMI-PERFORATED KNOCKOUTS ON 1" CENTERS FULL LENGTH FOUR SIDES.
2. STOP AND YIELD SIGN POSTS SHALL HAVE 3M HIGH INTENSITY PRISMATIC REFLECTIVE SHEETING WRAPPED AROUND THE POST FOR THE ENTIRE HEIGHT OF THE POST.
3. FOR IN-SIDEWALK INSTALLATIONS, CORE 4" DIAM. HOLE. ANCHOR LENGTH MAY BE DECREASED TO 12". SURFACE ATTACHED SIGN POST MUST BE APPROVED BY ENGINEER.
4. POST SHALL BE ROLLED CARBON SHEET STEEL AND SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A653, G90, STRUCTURAL QUALITY GRADE 50.
5. ANCHOR SHALL HAVE FOUR $\frac{7}{16}$ " DIAM. HOLES, ONE EACH SIDE, 2" FROM TOP END. ANCHOR SHALL MEET THE REQUIREMENTS OF ASTM A500 GRADE B AND SHALL BE HOT DIPPED GALVANIZED.
6. INSTALL TWO DRIVE RIVETS AT 90 DEGREES TO EACH OTHER. DRIVE RIVETS TO BE $\frac{3}{8}$ " DIA., ZUMAR TL3806 OR DUNLAP INDUSTRIAL VCR221.

SIGN INSTALLATION NOTES

1. SIGN SHEETING REQUIREMENTS: STOP, YIELD, KEEP RT, TURN RESTRICTION, LARGE ARROW, CHEVRON, CURVE/TURN WARNING, PED & ADV PED CROSSING, SCHOOL AND ADV SCHOOL CROSSING, STOP/YIELD/SIGNAL AHEAD, OBJECT MARKERS, END OF ROAD MARKER, ALL STREET NAME SIGNS AND ALL MAST ARM OR OVERHEAD MOUNTED SIGNS SHALL BE 3M HIGH INTENSITY PRISMATIC SHEETING, OR APPROVED EQUAL.
2. SIGN HEIGHT SHALL BE 7' FROM BOTTOM OF SIGN TO STREET OR SIDEWALK OR 6.5' FROM BOTTOM OF LOWER SIGN FOR MULTIPLE SIGNS ON ONE POST. EXCEPTIONS ONLY AS SPECIFICALLY STATED ON PLANS OR APPROVED BY THE ENGINEER.
3. DESIRED SIGN LOCATION SHALL BE A MINIMUM OF 2' FROM FACE OF CURB OR 6" FROM BACK OF WALK

NOT TO SCALE



***City of
Tukwila***

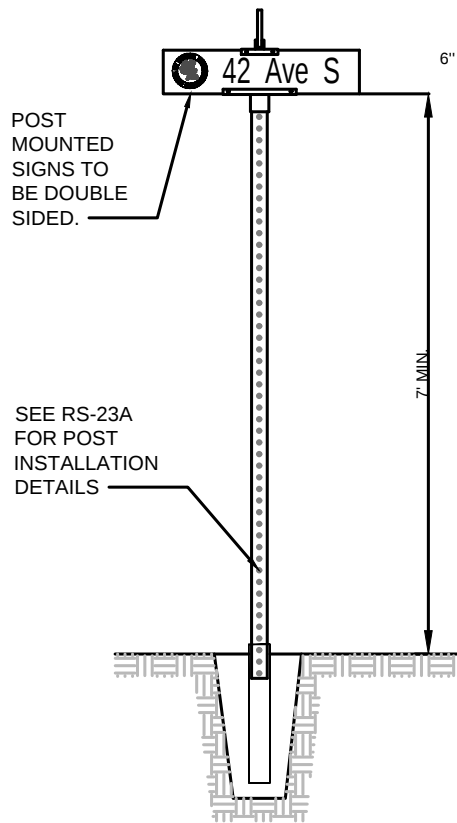
SIGN INSTALLATION

SIGN POST FOUNDATION INSTALLATION

SHEET: **RS-23A**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



SIGN:

SHEET ALUMINUM, .080 GAUGE, SIZED AS NEEDED WITH ROUNDED CORNERS.

BACKGROUND:

GREEN, 3M HIGH INTENSITY PRISMATIC SHEETING

LETTERS:

WHITE LETTERING FORMED USING 3M ELECTRO CUT FILM SERIES 1170, OR APPROVED EQUAL.

NON ARTERIAL INTERSECTION -

4" SERIES C WITH 2" LC SERIES C

ARTERIAL INTERSECTION -

6" SERIES C WITH 3" LC SERIES C

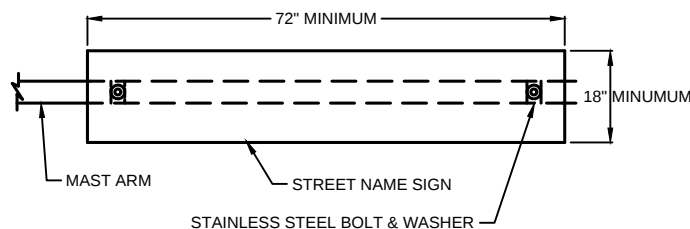
BORDER - SCREEN PRINT

5/16" WIDE WITH 3/4" RADIUS ON CORNERS.

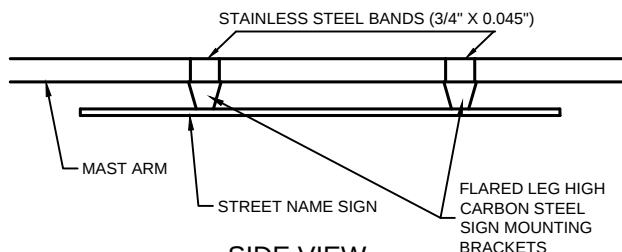
HARDWARE:

MOUNTING HARDWARE SHALL BE ZUMAR Z12RDSQ200EX CAP AND ZUMAR 812EX90X CROSSPIECE, OR APPROVED EQUAL.

POST MOUNT



FRONT VIEW



SIDE VIEW

SIGN:

SHEET ALUMINUM, 0.100, SIZED AS NEEDED WITH ROUNDED CORNERS.

BACKGROUND:

GREEN, 3M HIGH INTENSITY PRISMATIC, OR APPROVED EQUAL.

LETTERS:

WHITE LETTERING FORMED USING 3M ELECTRO CUT FILM SERIES 1170, OR APPROVED EQUAL.

12" C SERIES WITH 8" LC C SERIES

BORDER - SCREEN PRINT

5/8" WIDE WITH 3/4" RADIUS ON CORNERS.

HARDWARE:

SIGNS SHALL BE INSTALLED USING EITHER BANDING (TO HORIZONTAL SECTION OF MASTARM) OR PELCO ASTRO SIGN-BRAC (TO CURVED SECTION OF MASTARM OR VERTICAL SECTION OF POLE)

MAST ARM MOUNT

NOTE: SIGNING MATERIAL AND FABRICATION SHALL BE IN ACCORDANCE WITH THE SECTION 9-28 OF THE WSDOT STANDARD SPECIFICATION, CURRENT EDITION AND MUTCD, CURRENT EDITION.

NOT TO SCALE



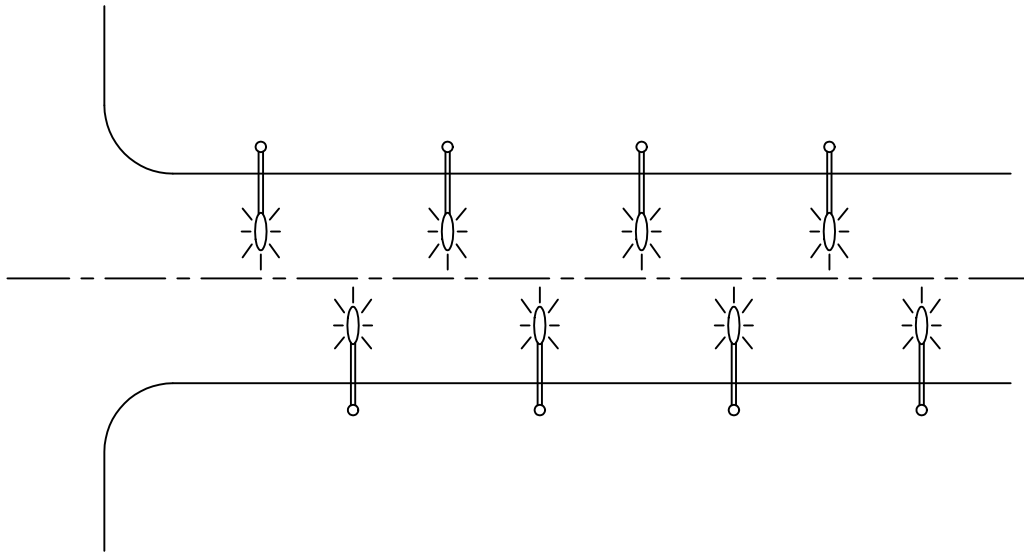
*City of
Tukwila*

**SIGN INSTALLATION
STREET NAME SIGN INSTALLATION**

SHEET: **RS-23B**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



ROADWAY CLASSIFICATION	ROADWAY WIDTH	LUMINAIRE WATTAGE	AVERAGE MAINTAINED FOOTCANDLE	MAXIMUM UNIFORMITY RATIO (AVG:MIN)	LUMINAIRE MOUNTING HEIGHT	LIGHT DISTRIBUTION PATTERN
MAJOR ARTERIAL	OVER 44'	*	1.5	3 TO 1	40'-6"	*
MAJOR ARTERIAL	≤ 44'	*	1.5	3 TO 1	40'-6"	*
COMMERCIAL / INDUSTRIAL	≤ 44'	*	0.8	3 TO 1	40'-6"	*
RESIDENTIAL ARTERIAL	≤ 44'	*	0.6	4 TO 1	30'-6"	*
RESIDENTIAL LOCAL	≤ 34'	*	0.4	6 TO 1	30'-6"	*

* TO BE DESIGNED TO MEET ROADWAY DESIGN CRITERIA

NOTES:

1. MAJOR ARTERIAL AND COMMERCIAL / INDUSTRIAL ROADWAY TYPE LUMINAIRES SHALL BE LED WITH CORRELATED COLOR TEMPERATURE (CCT) OF 4000K +/- 300K. RESIDENTIAL ROADWAY TYPE LUMINAIRES SHALL BE LED WITH CCT OF 3000K +/- 300K. CITY PRE-APPROVED ROADWAY LUMINAIRE FIXTURES SHALL BE "LEOTEK - GREEN COBRA, GS SERIES", "____ - ____" AND "GE - EVOLVE". FINISH COLOR SHALL BE GRAY.
2. ROADWAY LUMINAIRES (ALL CIRCUITS) SHALL BE CONTROLLED BY A SINGLE PHOTOCCELL LOCATED ON THE POLE NEAREST TO THE SERVICE CABINET. REMAINING LUMINAIRES SHALL HAVE SHORTING CAPS INSTALLED. LINE VOLTAGE SHALL BE 240V MULTI-VOLT.
3. INSTALLATION OF ROADWAY LIGHTS AND POLES SHALL BE PER CITY OF TUKWILA STANDARD DETAILS, SHEET RS-25/RS-25A AND SHALL CONFORM TO THE LATEST EDITION OF WSDOT STANDARD SPECIFICATIONS.
4. INSTALLATION OF PEDESTRIAN LIGHTS AND POLES SHALL BE PER CITY OF TUKWILA STANDARD DETAILS, SHEET RS-26 AND SHALL CONFORM TO THE LATEST EDITION OF WSDOT STANDARD SPECIFICATIONS.
5. ALL STREET LIGHTING DESIGN PLANS SHALL BE STAMPED BY A PROFESSIONAL ENGINEER, WITH PREVIOUS EXPERIENCE IN ILLUMINATION DESIGN, REGISTERED IN WASHINGTON STATE AND APPROVED BY CITY STAFF.
6. DEVELOPERS SHALL PROVIDE LIGHTING DESIGN FOR SUBDIVISIONS, INDUSTRIAL OR COMMERCIAL DEVELOPMENTS FOR CITY APPROVAL.

NOT TO SCALE



**City of
Tukwila**

ILLUMINATION DESIGN GUIDELINES

ROADWAY AND PEDESTRIAN LUMINAIRES

SHEET: **RS-24**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

POLE CAP ALLOY 43 WITH
STAINLESS STEEL SCREWS

(D) (POLE O.D. - TOP)

ALLOY 6063-T6 SATIN
GROUND FINISH TAPERED
ALUMINUM TUBE (E) WALL,
HEAT TREATED

POLE WALL

REINFORCING FRAME

1/2" - 13NC TAPPED
GROUNDING HOLE

HANDHOLE SECTION

A	B	C	D	E	F	G	H
30'-6"	2' TO 5'	8"	6"	0.188"	27'-2"	11.25"	11" TO 12"
	7'	8"	6"	0.188"	27'-2"	11.25"	11" TO 12"
	9'	8"	6"	0.188"	27'-2"	11.25"	11" TO 12"
	12'	8"	6"	0.188"	27'-2"	11.25"	11" TO 12"
40'-6"	2' TO 5'	8"	6"	0.250"	37'-2"	11.25"	11" TO 12"
	7'	8"	6"	0.250"	37'-2"	11.25"	11" TO 12"
	9'	8"	6"	0.250"	37'-2"	11.25"	11" TO 12"
	12'	8"	6"	0.250"	37'-2"	11.25"	11" TO 12"

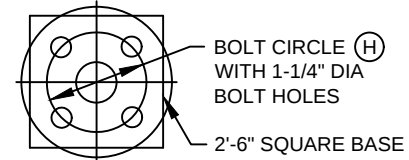
NOTES:

- ROADWAY LUMINAIRE POLE SHALL BE HAPCO, RTA TRUSS ARM SERIES, OR APPROVED EQUAL.
- TRUSS ARM SHALL BE SUPPLIED WITH 2" N.P.S. SLIPFITTER (SPECIFY MOD. 140 FOR 1.25" N.P.S. SLIPFITTER).
- TWIN TRUSS ARMS SHALL BE LOCATED 180° O.C.
- LOCATION OF ROADWAY LIGHT POLES SHALL BE PER PLANS.
- JUNCTION BOX, CONDUIT AND WIRING INSTALLATION SHALL BE CITY OF TUKWILA STANDARD DETAIL SHEET RS-28.
- POLE FOUNDATION SHALL BE PER WSDOT STANDARD PLAN J-28.30, EXCEPT 4-BOLT CONFIGURATION SHALL BE USED, PER BASE PLATE DETAIL, THIS SHEET.
- SECURE ANCHOR BOLTS IN PLACE BEFORE POURING CONCRETE. INSTALL BOLTS WITH A MINIMUM OF TWO (2) THREADS EXPOSED.
- ALL THIRD PARTY POLES SHALL USE THE 11.5" BOLT PATTERN.

3'-0" (B)
(MIN 2'-0")

LUMINAIRE PER CITY OF
TUKWILA STANDARD DETAIL
SHEET RS-24

TRUSS ARM (ALUMINUM ALLOY
AND STAINLESS STEEL
HARDWARE)



BASE PLATE DETAIL

DECAL NUMBERING SYSTEM

HAND HOLE (4"x6" NOMINAL) NON-FLUSH
TYPE, COMPLETE WITH REINFORCING
FRAME ALLOY 356-T6. COVER AND 5.5
HEX. HO. STAINLESS STEEL SCREWS.
(FACING DIRECTION OF TRAFFIC)

(C) (POLE O.D. - BOTTOM)

BASE FLANGE ALLOY 356-T6 W/ BOLT
COVERS AND STAINLESS STEEL SCREW

(G) (S.Q.)

POLE-SAFE OMNI-DIRECTIONAL
BREAKAWAY SUPPORT SYSTEM, MODEL #
4100, WITH SKIRT BY TRANSPOR
INDUSTRIES

TOP OF ROADWAY

ROADWAY LIGHT POLE DETAIL

NOT TO SCALE



**City of
Tukwila**

ROADWAY LIGHT POLE

SHEET:

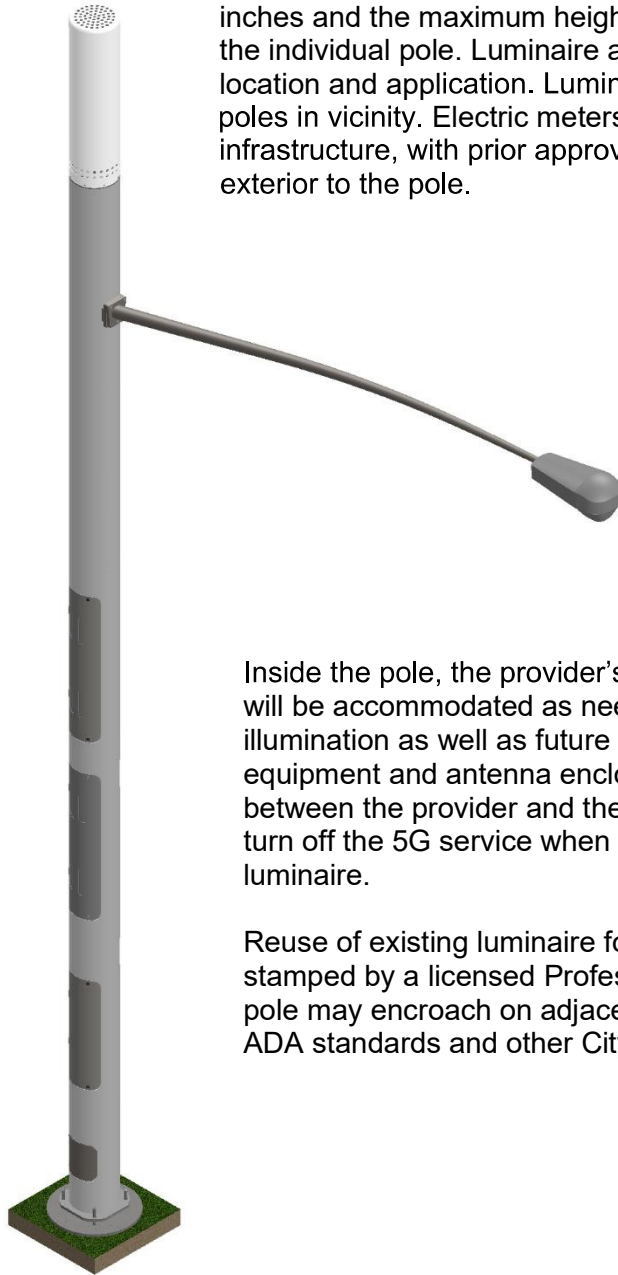
RS-25

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

Roadway Lightpole with 5G Pole Standard City of Tukwila

The City of Tukwila is in the process of developing a detailed pole standard for the roll-out of 5G cellular service using City-owned street light poles. The pole type that will be allowed use the “smart-stack” appearance with components enclosed inside the pole structure. Outside pole diameters will likely vary from 16-inches to 20-inches and the maximum height of the pole will vary depending on the location of the individual pole. Luminaire arms will also vary in length, depending on the location and application. Luminaire arm height and length should match existing poles in vicinity. Electric meters may be on a separate pedestal, or utilize City infrastructure, with prior approval. Meters are not permitted to be installed exterior to the pole.



The outside of the pole is intended to be visually similar to the existing street light poles within the City, which are typically made of spun aluminum, but the 5G poles are anticipated to be constructed of steel. Base plate and bolt placing will vary based on the final diameter of the individual poles, but the provider must provide an adaptor plate to the City to accommodate the City’s standard base for streetlights. The pole must have a full power-cut off in the case a pole is knocked over or damaged.

Inside the pole, the provider’s needs on where and how to place their equipment will be accommodated as needed, but the City requires space for the both the illumination as well as future technology expansions. The intent is to have all equipment and antenna enclosed in the pole. Access ports can be separated between the provider and the City, but the City must be provided the ability to turn off the 5G service when doing routine maintenance on the pole and luminaire.

Reuse of existing luminaire foundations is not allowed. New foundations must be stamped by a licensed Professional Engineer for each pole location. The new 5G pole may encroach on adjacent sidewalks but minimum sidewalk widths meeting ADA standards and other City standards will be required.

NOT TO SCALE



***City of
Tukwila***

ILLUMINATION DESIGN GUIDELINES

ROADWAY AND PEDESTRIAN LUMINAIRES WITH 5G

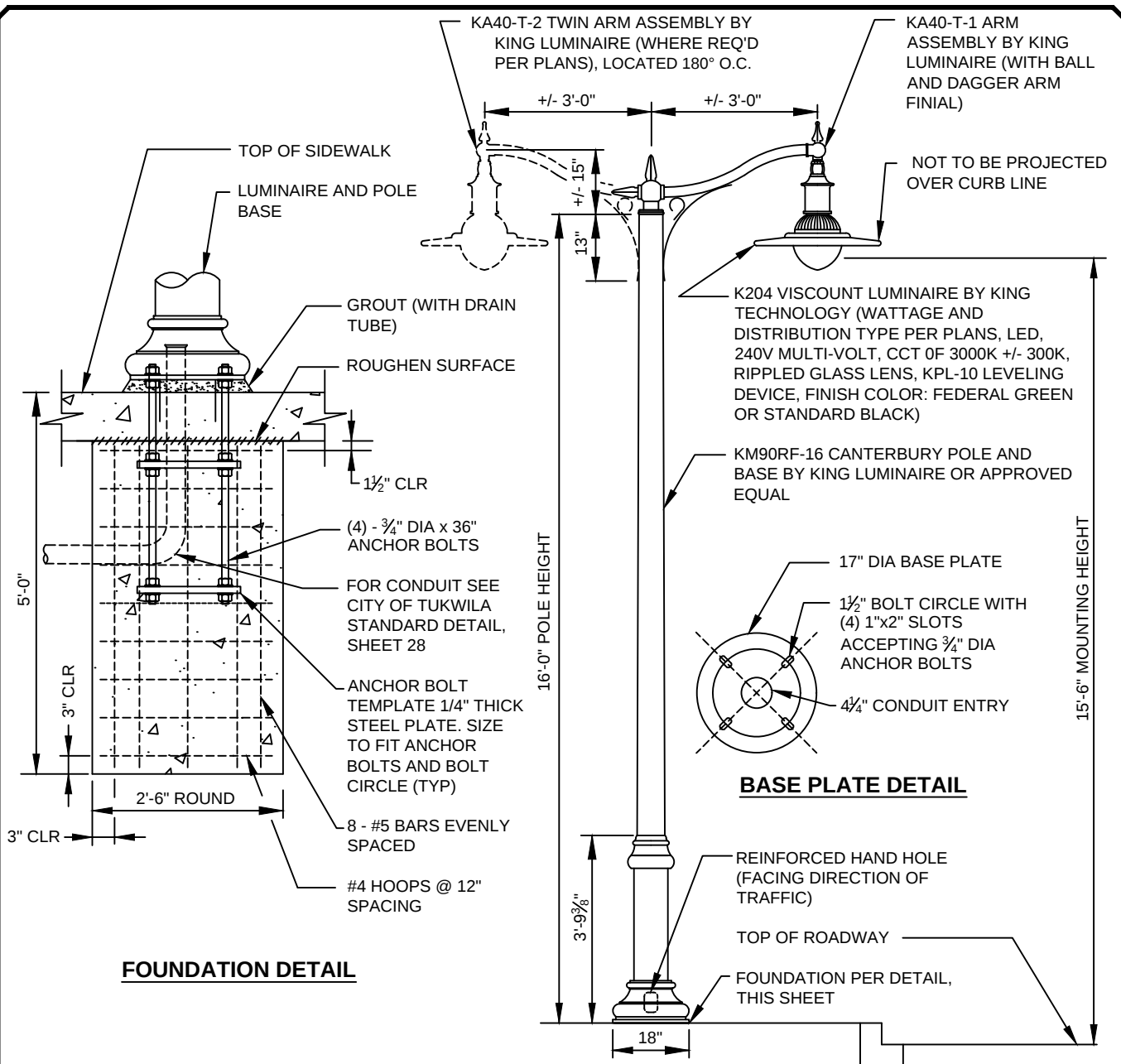
SHEET: **RS25-A**

LAST REVISION: **MAY 2021**

APPROVAL: **H. PONNEKANTI**

eSigned via SeemlessDoc.com

Key: b7b592d855c55a070e61f6d13802805c8b



NOTES:

1. POLE , BASE AND ARM ASSEMBLY SHALL BE TEXTURED FEDERAL GREEN OR STANDARD BLACK COLOR.
2. JUNCTION BOX, CONDUIT AND WIRING INSTALLATION SHALL BE CITY OF TUKWILA STANDARD DETAIL, SHEET RS-28.
3. WHEN INSTALLING FOUNDATION, CAST CONCRETE DIRECTLY AGAINST UNDISTURBED DRILLED SHAFT (CLASS 4000P).
4. FOUNDATION ANCHOR BOLTS SHALL BE HIGH-STRENGTH STEEL, MANUFACTURED FROM ASTM F1554 GRADE 105, WITH HEAVY HEX NUTS AND HARDENED WASHERS. GALVANIZE THE ANCHOR BOLTS ACCORDING TO ASTM F2329.
5. THE FOUNDATION SHALL BE GROUNDED IN ACCORDANCE WITH REQUIREMENTS OF WSDOT STANDARD SPECIFICATIONS 8-20.3(4).
6. SECURE ANCHOR BOLTS IN PLACE BEFORE POURING CONCRETE. INSTALL BOLTS WITH A MINIMUM OF TWO (2) THREADS EXPOSED.

NOT TO SCALE



**City of
Tukwila**

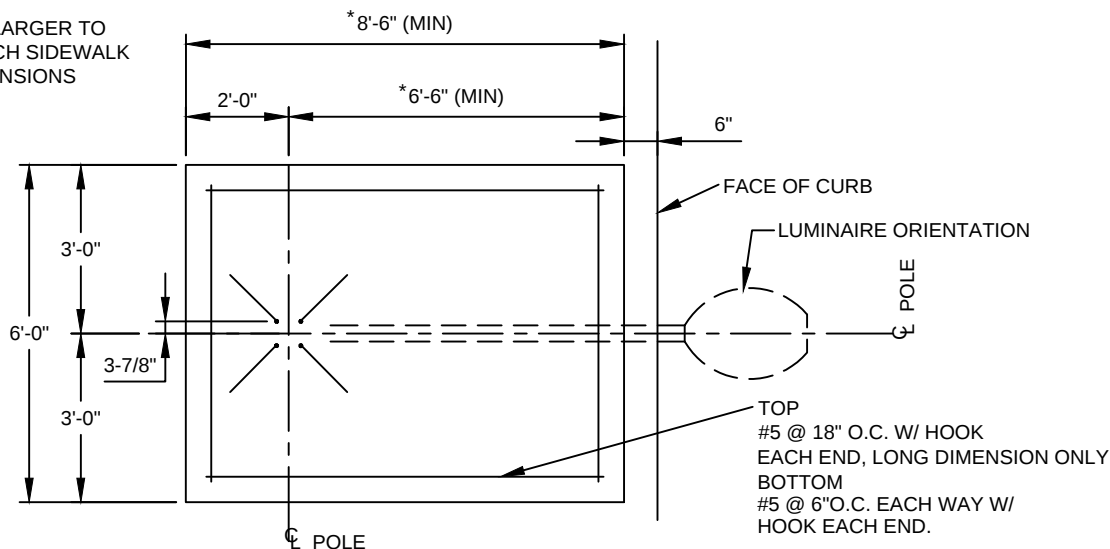
PEDESTRIAN LIGHT POLE AND FOUNDATION DETAIL

SHEET: **RS-26**

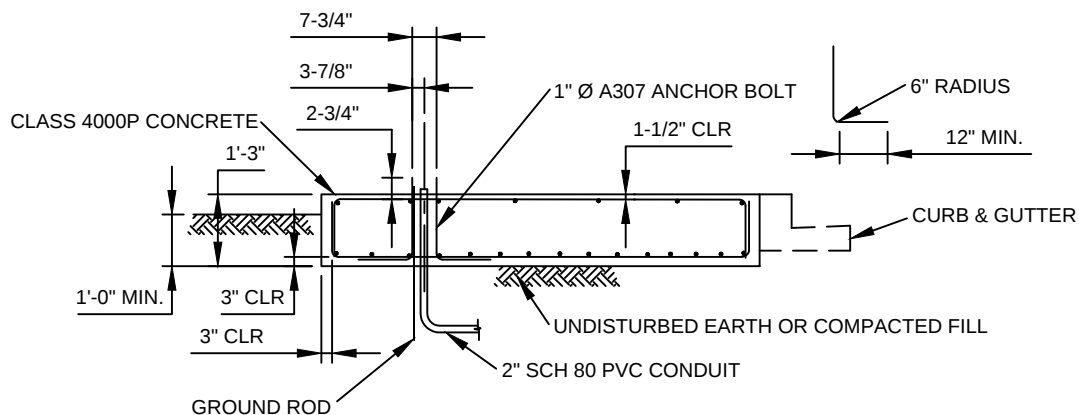
LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

* OR LARGER TO
MATCH SIDEWALK
DIMENSIONS



FOUNDATION PLAN



FOUNDATION SECTION

NOTES:

1. THE FOUNDATION SHOWN IS SPECIFICALLY DESIGNED FOR A "HAPCO TYPE" ALUMINUM POLE UP TO 30' MOUNTING HEIGHT AND 8' MAST ARM.
2. CONCRETE FOR FOUNDATION SHALL BE CLASS 4000P, COMPRESSIVE STRENGTH AT 28 DAYS. USE OF PERVIOUS CONCRETE IS PROHIBITED WITHIN FOUNDATION.
3. REINFORCING STEEL SHALL CONFORM TO MINIMUM REQUIREMENTS OF ASTM A615 GRADE 60.
4. ALL PERMANENT CONDUCTORS SHALL BE COPPER. ALL ELECTRICAL WORKMANSHIP AND MATERIALS SHALL CONFORM TO LATEST NATIONAL ELECTRICAL CODE (NEC) REQUIREMENTS.

NOT TO SCALE



**City of
Tukwila**

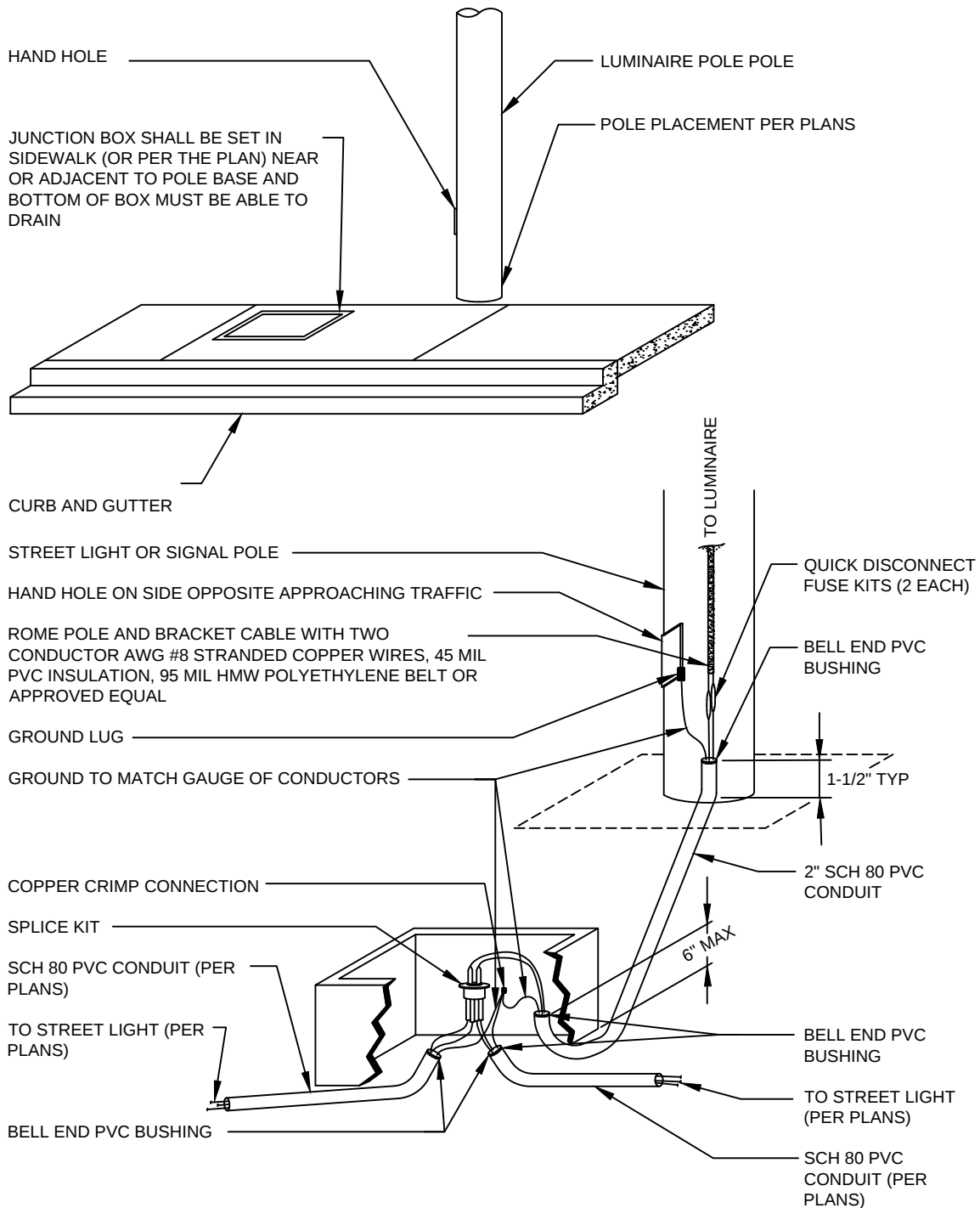
SPREAD FOOTING LUMINAIRE FOUNDATION

SIDEWALK APPLICATION

SHEET: **RS-27**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. JUNCTION BOXES SHALL BE INSTALLED PER WSDOT STANDARD PLANS J-40.10 AND J-40.30.
2. JUNCTION BOX GROUNDING SHALL BE INSTALLED PER WSDOT STANDARD PLAN J-60.5.
3. J-BOX LID TO BE WELDED SHUT AFTER FINAL INSPECTION WITH TWO 1" LONG WELDS AT OPPOSITE CORNERS.
4. EXCEPT AS NOTED, ALL WIRING METHODS SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (NEC) AND APPLICABLE SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS. ALUMINUM CONDUCTORS SHALL NOT BE ALLOWED.

NOT TO SCALE



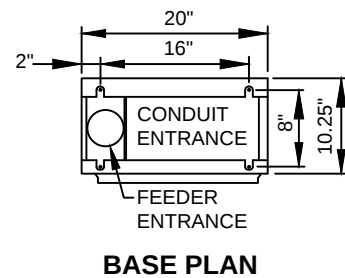
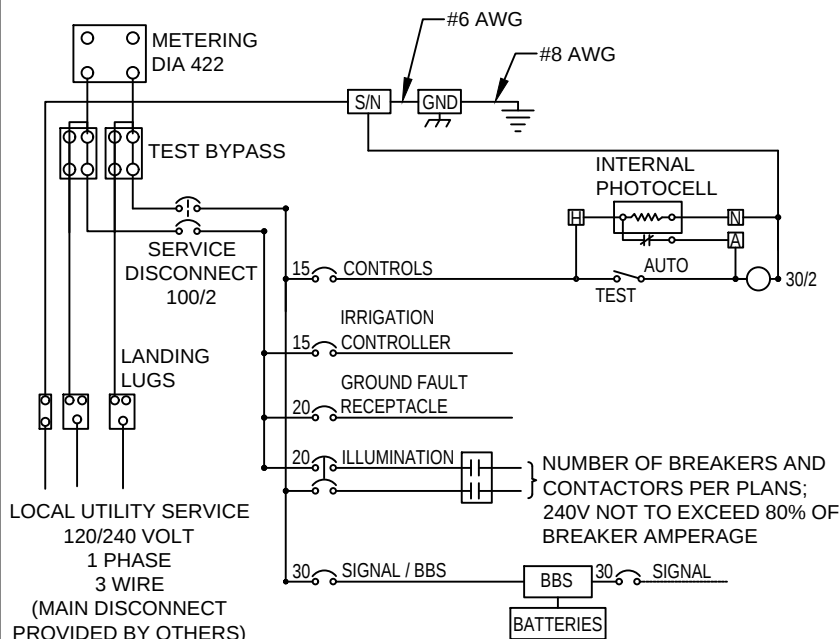
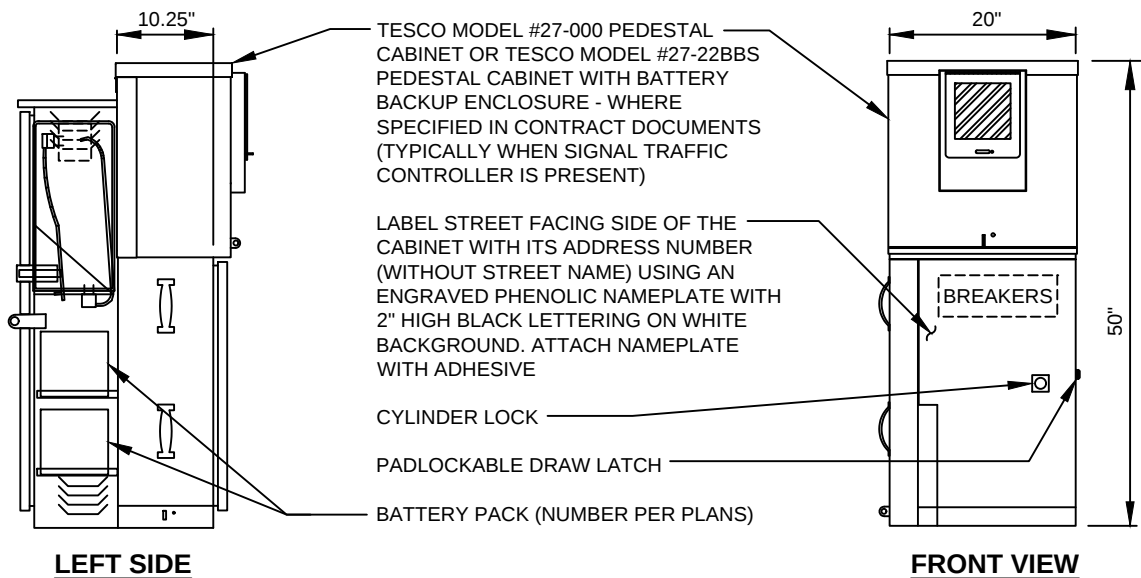
**City of
Tukwila**

UNIFORM LUMINAIRE WIRING

SHEET: **RS-28**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



WIRING DIAGRAM

NOTES:

- METER BASE: 200A, BYPASS TYPE, 5 JAW (5TH JAW @ 9:00), SINGLE PHASE, 3-WIRE.
- BREAKERS: 200A MAIN BREAKER, SEE PLANS FOR COMPLETE BREAKER SCHEDULE.
- CONTACTORS: LIGHTING RATED, 30A, 2-POLE, 120 VAC COIL.
- TERMINAL BLOCK: FOR FIELD WIRE CONNECTION TO REMOTE PHOTOCELL.
- PHOTOCELL BYPASS SWITCH: 20A, 277 VAC, 3-WAY SWITCH.
- CABINET: NEMA 3R PAD MOUNT, RAIN-TIGHT, EXTERIOR 1/8" ALUMINUM AND INTERIOR 14GA COLD ROLLED STEEL ELECTRICALLY WELDED AND REINFORCED, SCREENED AND GASKETED VENTS. ALL NUTS, BOLTS AND SCREWS SHALL BE STAINLESS STEEL. NUTS BOLTS AND SCREWS SHALL NOT BE VISIBLE FROM OUTSIDE OF ENCLOSURE. ENCLOSURE SHALL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARDS AND SHALL BEAR A UL 508A LABEL.
- DOORS: HEAVY DUTY WELDED HINGES (LIFT-OFF TYPE), STAINLESS STEEL VAULT HANDLES, PADLOCKABLE METER DOOR, BEST CX LOCK ON DISTRIBUTION DOOR, POLISHED WIRE GLASS WINDOW, CLOSED CELL NEPRENE GASKET AND CARD HOLDER.
- FINISH: BARE ALUMINUM (MILL FINISH) OUTSIDE AND WHITE INSIDE.
- FOUNDATION: PER WSDOT STANDARD PLAN J-10.10 (FOR ELECTRICAL SERVICE CABINET OR A COMBINATION ELECTRICAL SERVICE / TRAFFIC SIGNAL CONTROLLER CABINET). PLACE SILICONE SEAL BETWEEN BOTTOM OF CABINET AND FOUNDATION.

NOT TO SCALE



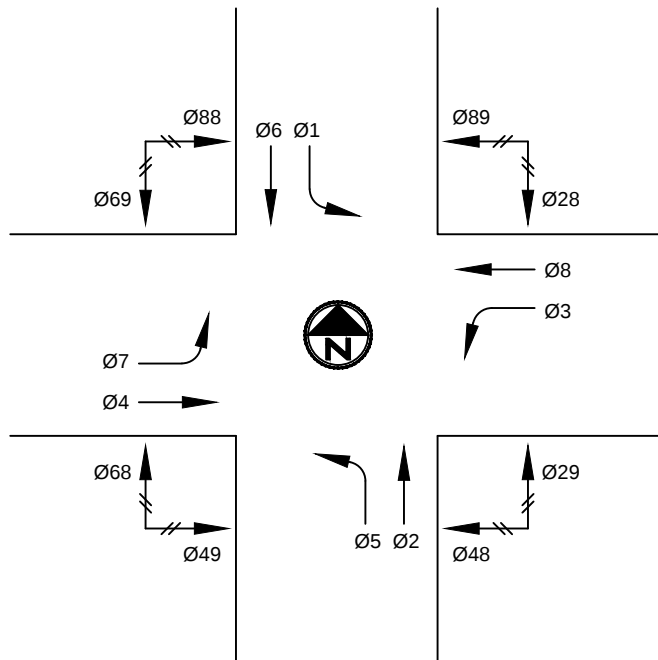
**City of
Tukwila**

ELECTRICAL SERVICE CABINET

SHEET: **RS-29**

LAST REVISION: APRIL 2019

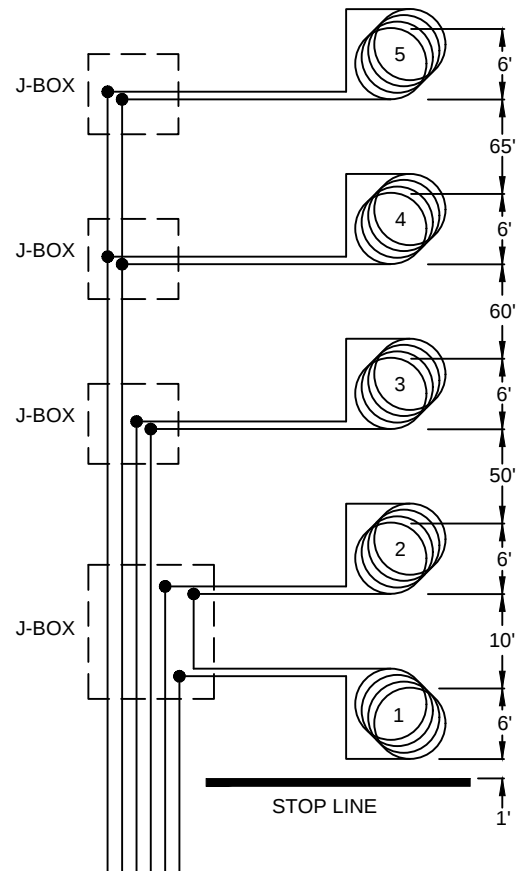
APPROVAL: H. PONNEKANTI



TYPICAL INTERSECTION MOVEMENTS
(PHASE 2 IS ALWAYS NORTHBOUND THRU DIRECTION)

NOTES:

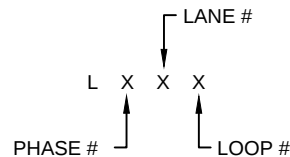
1. PRIOR TO DESIGN, THE PREFERENCE FOR VIDEO OR INDUCTION LOOP DETECTION SHALL BE DETERMINED BY THE CITY ENGINEER.
2. VEHICLE INDUCTION LOOP DETECTORS SHALL BE INSTALLED PER WSDOT STANDARD PLANS J-50.05, J-50.12 AND J-50.15, EXCEPT LOOP SPACINGS SHALL BE PER LOOP SCHEMATIC ABOVE. ALL LOOPS SHALL BE CIRCULAR.
3. LOOPS SHALL BE CENTERED IN THE LANES. LOOP LOCATIONS SHALL BE PRE-APPROVED BY THE ENGINEER IN THE FIELD, PRIOR TO SAWCUTTING.
4. LOOPS SHALL BE INSTALLED IN THE FINAL LIFT OF ASPHALT.
5. LOOP TESTING SHALL BE PERFORMED PER WSDOT STANDARD SPECIFICATIONS, SECTION 8-20.3(14)D, IN THE PRESENCE OF THE ENGINEER.
6. JUNCTION BOXES SHALL BE INSTALLED PER WSDOT STANDARD PLANS J-40.10 AND J-40.30.
7. JUNCTION BOX GROUNDING SHALL BE INSTALLED PER WSDOT STANDARD PLAN J-60.5.
8. BONDING AND GROUNDING WIRES SHALL BE INSTALLED AS DESCRIBED IN WSDOT STANDARD SPECIFICATIONS AND THE NATIONAL ELECTRIC CODE FOR ANY NEW METALLIC JUNCTION BOXES AND ANY MODIFIED EXISTING JUNCTION BOXES. JUNCTION BOX LIDS AND FRAMES SHALL BE GROUNDED SO THAT THE GROUND WILL NOT BREAK WHEN THE LID IS REMOVED AND LAID ON THE GROUND NEXT TO THE JUNCTION BOX. JUNCTION BOX SHALL BE CONSIDERED "MODIFIED" IF NEW CONDUITS AND/OR CURRENT-CARRYING CONDUCTORS ARE INSTALLED, INCLUDING LOW-VOLTAGE CONDUCTORS.



DETECTOR LEAD-INS

- 1, 2 - STOP BAR DETECTORS
- 3 - COUNT DETECTOR
- 4, 5 - ADVANCED DETECTORS (WHERE REQ'D)

LOOP SCHEMATIC



LOOP NUMBER MARKING DETAIL

NOT TO SCALE



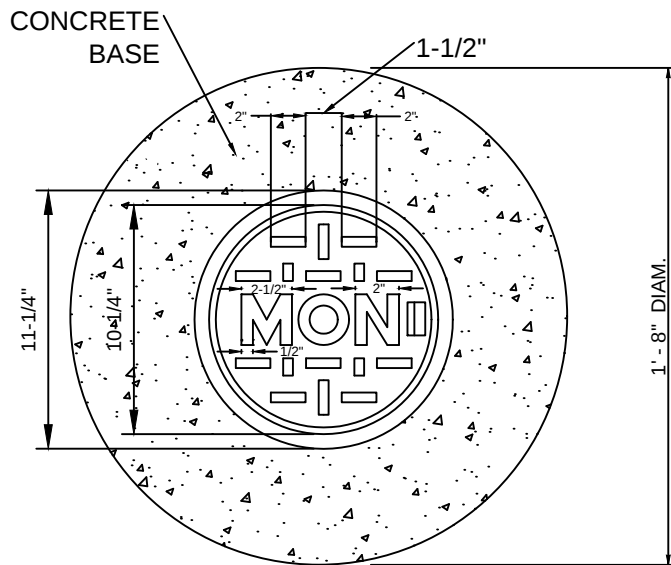
**City of
Tukwila**

TYPICAL LOOP DETECTION LAYOUT

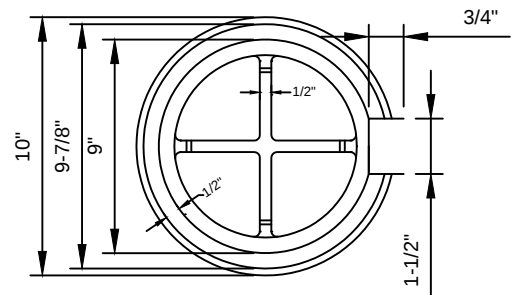
SHEET: **RS-30**

LAST REVISION: APRIL 2019

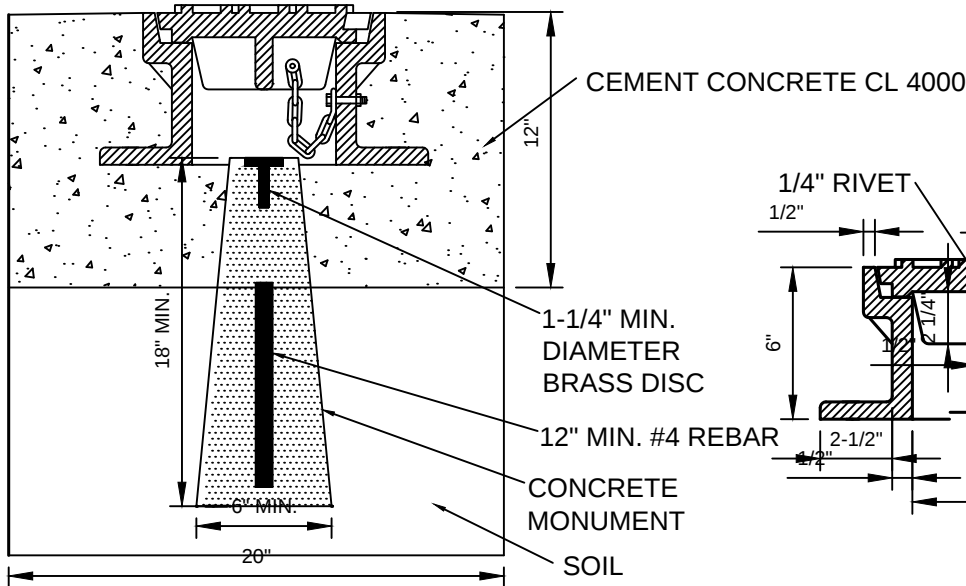
APPROVAL: H. PONNEKANTI



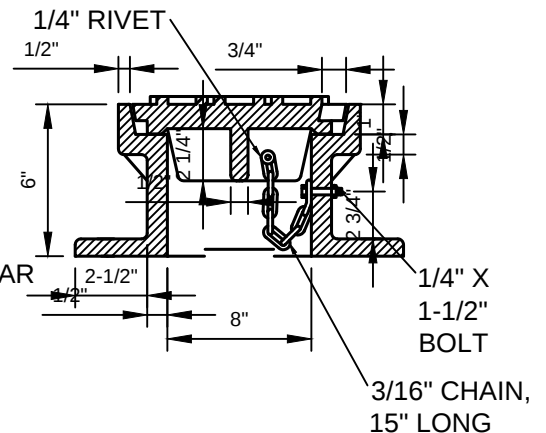
PLAN - FRAME & COVER



BOTTOM VIEW OF COVER



SECTION - INSTALLATION



SECTION - FRAME AND COVER

NOTES:

1. MACHINE BEARING FACES OF COVER AND CASE TO INSURE POSITIVE FIT.
2. CASTINGS SHALL BE GRAY IRON, A.S.T.M. DESIGNATION A-48, CLASS 40, AND SHALL CONFORM FURTHER TO APPLICABLE SECTION OF THESE SPECIFICATIONS.
3. MONUMENTS ARE REQUIRED AT STREET INTERSECTIONS AND MUST BE SET BY A SURVEYOR LICENSED TO PRACTICE AS SUCH BY THE STATE OF WASHINGTON.

NOT TO SCALE



**City of
Tukwila**

STREET MONUMENT

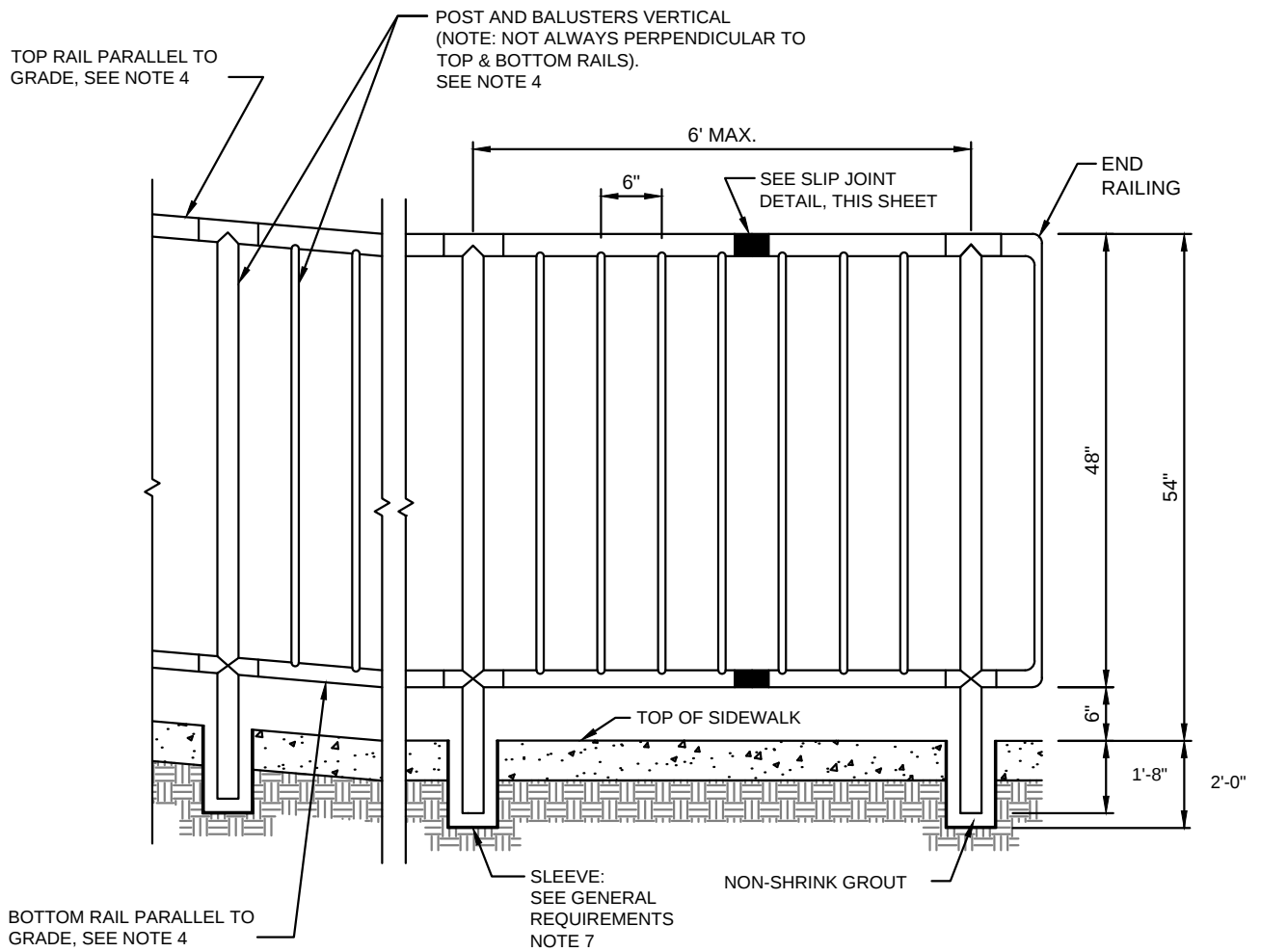
W/ FRAME & COVER

SHEET:

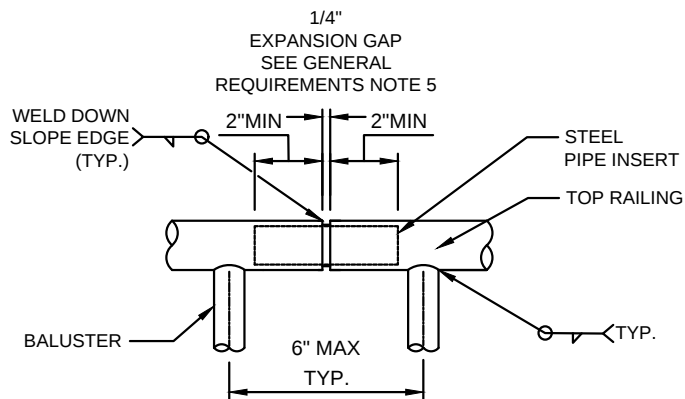
RS-32

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



METAL SAFETY RAILING DETAIL



SLIP JOINT DETAIL

MATERIAL DIMENSIONS

PANEL HEIGHT	48"
TOP RAIL/POST	2½" NOM.
BOTTOM RAIL	2" NOM.
BALUSTER	⅞" Ø BAR

NOTES REFERENCED ON THIS SHEET ARE LOCATED ON SHEET 2 OF 2.

NOT TO SCALE



**City of
Tukwila**

METAL SAFETY RAILING

SHEET: **RS-35 (1 OF 2)**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

METAL SAFETY RAILING NOTES:

MATERIAL REQUIREMENTS:

1. GALVANIZED STEEL OR ALUMINUM RAILING MAY BE USED.

GENERAL REQUIREMENTS:

1. SHOP DRAWINGS OF RAILING SHALL BE SUBMITTED FOR APPROVAL SHOWING COMPLETE DIMENSIONS AND DETAILS OF FABRICATION AND INCLUDING AN ERECTION DIAGRAM. MATERIALS BEING USED SHALL BE SPECIFIED IN THE SHOP DRAWINGS.
2. PIPE RAILING, PIPE BALUSTERS AND PIPE RAILING SPLICES SHALL BE ADEQUATELY WRAPPED TO ENSURE SURFACE PROTECTION DURING HANDLING AND TRANSPORTATION TO THE JOB SITE.
3. CUTTING SHALL BE DONE BY SAWING OR MILLING AND ALL CUTS SHALL BE TRUE AND SMOOTH. FLAME CUTTING WILL NOT BE PERMITTED.
4. TOP AND BOTTOM RAILS SHALL BE PARALLEL TO GRADE AND ALL POSTS AND BALUSTERS SHALL BE VERTICAL (NOTE: NOT ALWAYS PERPENDICULAR TO TOP AND BOTTOM RAILS).
5. PLACE EXPANSION GAP AT EVERY OTHER PANEL.
6. ONLY USE PANEL HEIGHT OF 36 INCHES AFTER APPROVAL OF THE TRAFFIC ENGINEER.
7. SLEEVES SHALL BE 6" SCHEDULE 40 PVC PIPE. IF RAILING IS TO BE INSTALLED IN EXISTING SIDEWALK, HOLES SHALL BE CORE DRILLED 2 INCHES LARGER THAN THE OUTSIDE DIAMETER OF THE POST, AND NO LESS THAN 6" FROM THE EDGE OF CONCRETE.
8. AVOID PLACING SAFETY RAIL IN SIGHT LINES.

STEEL RAILING REQUIREMENTS:

1. POST AND RAIL MATERIAL SHALL BE SCHEDULE 40 STEEL PIPE CONFORMING TO ASTM A 53, GRADE B. BALUSTERS SHALL BE SOLID STEEL BARS CONFORMING TO AASHTO M 183.
2. SPOT WELDING IS NOT ALLOWED. ALL WELDS SHALL ENCOMPASS THE ENTIRE JOINT.
3. SAFETY RAILING WILL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
4. ANY FIELD CUTTING OR WELDING AREAS SHALL BE GROUND SMOOTH AND COATED WITH AT LEAST 2 COATS OF COLD GALVANIZED PAINT

ALUMINUM RAILING REQUIREMENTS:

1. RAILING SHALL BE CV PIPE RAIL OR APPROVED EQUIVALENT. INSTALLATION PER MANUFACTURER'S RECOMMENDATIONS. BALUSTERS SHALL BE SOLID ALUMINUM FULL WELDED IN PLACE.
2. ALL ALUMINUM PARTS SHALL BE GIVEN A CLEAR ANODIC COATING AT LEAST 0.0006 INCH THICK AND BE HOT WATER SEALED AND SHALL HAVE A UNIFORM FINISH.
3. PIPE RAILING AND PIPE RAILING SPLICES MAY BE HEATED TO NOT MORE THAN 400°F FOR A PERIOD NOT TO EXCEED 30 MINUTES TO FACILITATE FORMING OR BENDING.
4. WELDING OF ALUMINUM SHALL BE IN ACCORDANCE WITH THE LATEST AASHTO STANDARD SPECIFICATION FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS.
5. RAILS, POSTS AND FORMED ELBOWS SHALL BE A.S.T.M. B— 241 OR B— 429 ALLOW 6063— T6 SCHEDULE 40 (STD PIPE). BRACKETS, END CAPS AND OTHER FITTINGS SHALL BE A.S.T.M. 6063— T5. SPLICES AND REINFORCING SLEEVES SHALL BE DRAWN ALUMINUM TUBING 6063— T832. SLEEVE I.D. SHALL BE 1" GREATER THAN POST O.D.

NOT TO SCALE



*City of
Tukwila*

METAL SAFETY RAILING

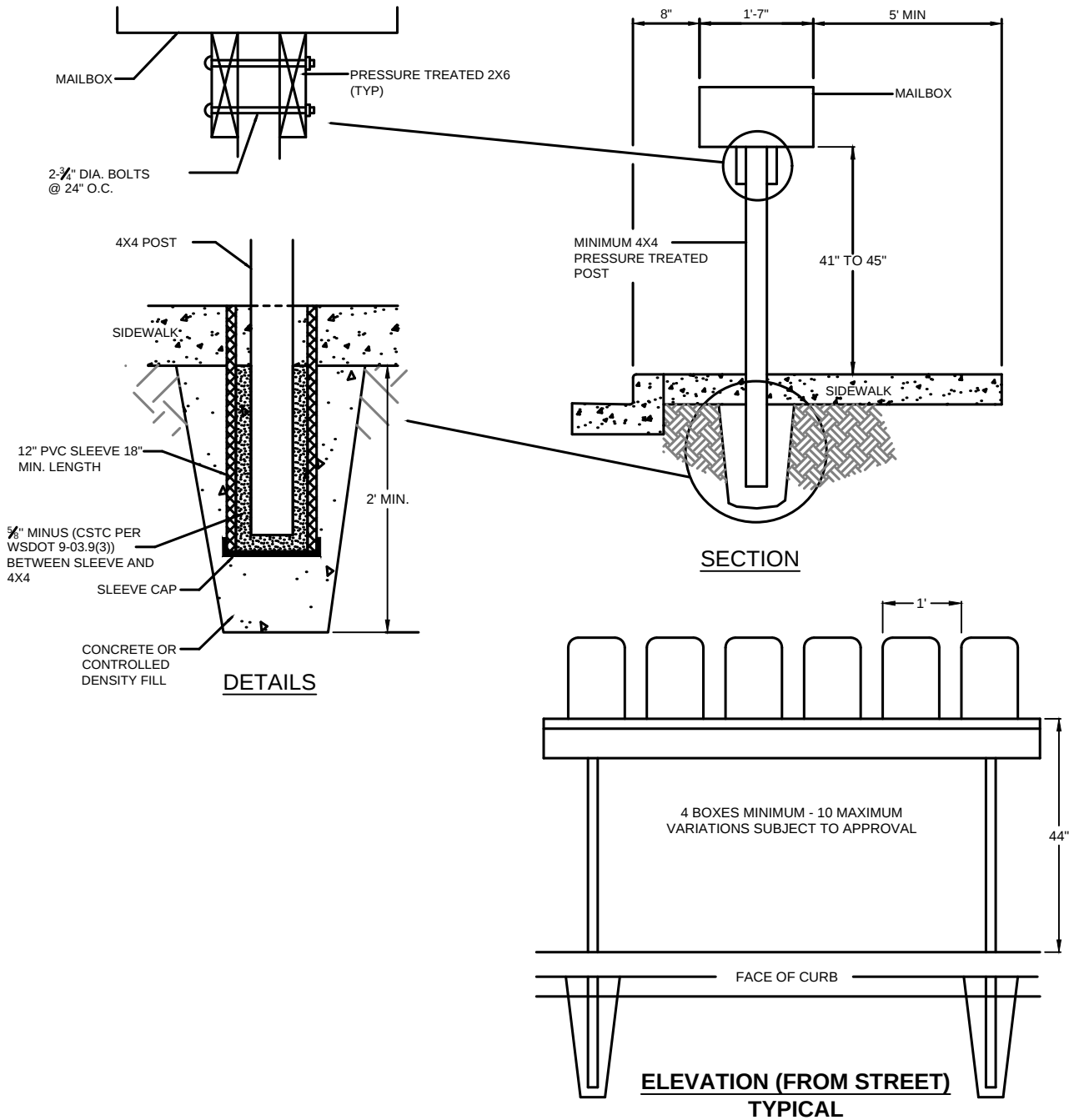
NOTES

SHEET:

RS-35 (2 OF 2)

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. MAILBOX MUST BE TYPE "APPROVED BY THE POSTMASTER GENERAL" WITH A UNIFORM BOX STYLE AND METHOD OF ADDRESS IDENTIFICATION PER EACH STANDARD.
2. LOCATION IS SUBJECT TO APPROVAL BY THE CITY FOR PROTECTION OF VIEWS AND ACCESS AND IS TO BE SHOWN ON THE STREET IMPROVEMENT PLANS.
3. THIS SKETCH DEPICTS A MINIMUM STRUCTURAL AND DIMENSIONAL STANDARD. INNOVATIVE DESIGNS MEETING THESE MINIMUMS MAY BE ACCEPTED.

NOT TO SCALE



**City of
Tukwila**

MAILBOX INSTALLATION

SHEET:

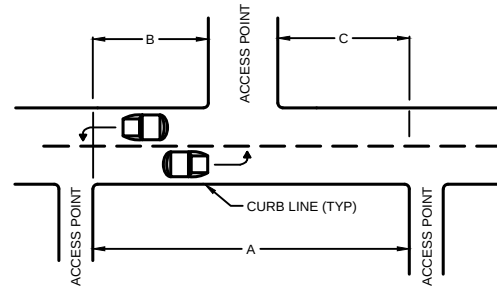
RS-36

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

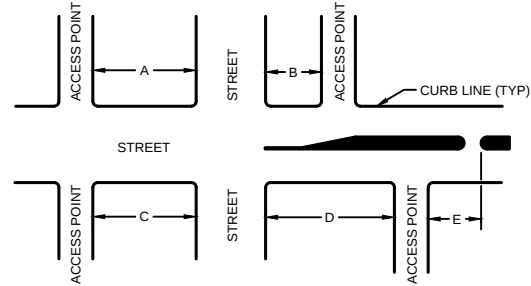
MINIMUM ACCESS POINT SPACING WHEN DIRECTLY OPPOSING DRIVEWAYS ARE NOT POSSIBLE

STREET SPEED ² (MPH)	DIMENSIONS		
	A ³	B ⁴	C ⁴
25	105	105	105
30	125	125	125
35	150	150	150
40	185	185	185
45	230	230	230



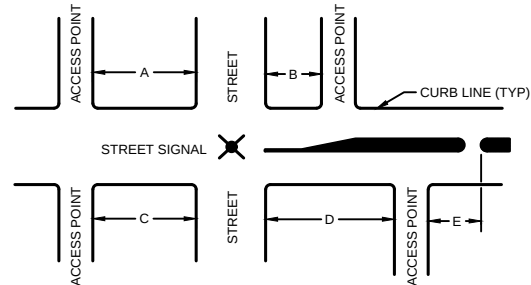
MINIMUM CORNER CLEARANCES FOR STOP SIGN INTERSECTION CONTROL (FEET)

DIM	OPERATION SPEED			
	30	35	40	45
A	115	135	150	180
B	85	105	120	140
C	115	135	160	180
D	115	135	160	180
E	105/0	135/0	160/0	180/0



MINIMUM CORNER CLEARANCES FOR SIGNALIZED INTERSECTION CONTROL (FEET)

DIM	OPERATION SPEED			
	30	35	40	45
A	230	275	320	365
B	115	135	160	180
C	230	275	320	365
D	230	275	320	365
E	115/0	135/0	160/0	180/0



NOTES:

1. ACCESS POINT SPACING ONLY FOR PUBLIC STREETS. THIS SHALL BE A GUIDELINE FOR PRIVATE STREETS.
2. REFERS TO POSTED SPEED OR OPERATING SPEED, WHICHEVER IS GREATEST.
3. BETWEEN THE NEAREST EDGES OF TWO-WAY ACCESS POINTS. DISTANCES BETWEEN ADJACENT, ONE-WAY ACCESS POINTS (WITH THE INBOUND ACCESS UPSTREAM) CAN BE ONE-HALF THE DISTANCES.
4. ACCESS POINTS DIRECTLY OPPOSITE FROM EACH OTHER WHEN POSSIBLE. WHERE IT IS NOT POSSIBLE, THESE DIMENSIONS WILL APPLY.
5. WHERE ACCESS POINTS ARE TO BE SIGNALIZED, A MINIMUM SPACING OF 600 FEET TO ANY OTHER SIGNALIZED INTERSECTION SHOULD BE MAINTAINED.
6. ACCESS POINT NEAR STOP OR SIGNAL CONTROLLED INTERSECTIONS SHOULD BE CHECKED TO DETERMINE WHETHER STOPPING QUEUES WILL BLOCK THE ACCESS POINT.
7. IN CASES WHERE ACCESS SPACING IS NOT ATTAINABLE BECAUSE EXISTING FRONTAGES ARE NARROW OR HAVE PHYSICAL CONSTRAINTS, ACCESS POINTS SHOULD BE LOCATED AS CLOSE TO THE TABULATED VALUES SHOWN ABOVE AS POSSIBLE. THE CITY ENGINEER SHALL BASE ALL SUCH DECISIONS ON MAINTAINING NEEDED CORRIDOR CAPACITY AND SAFETY.

NOT TO SCALE



**City of
Tukwila**

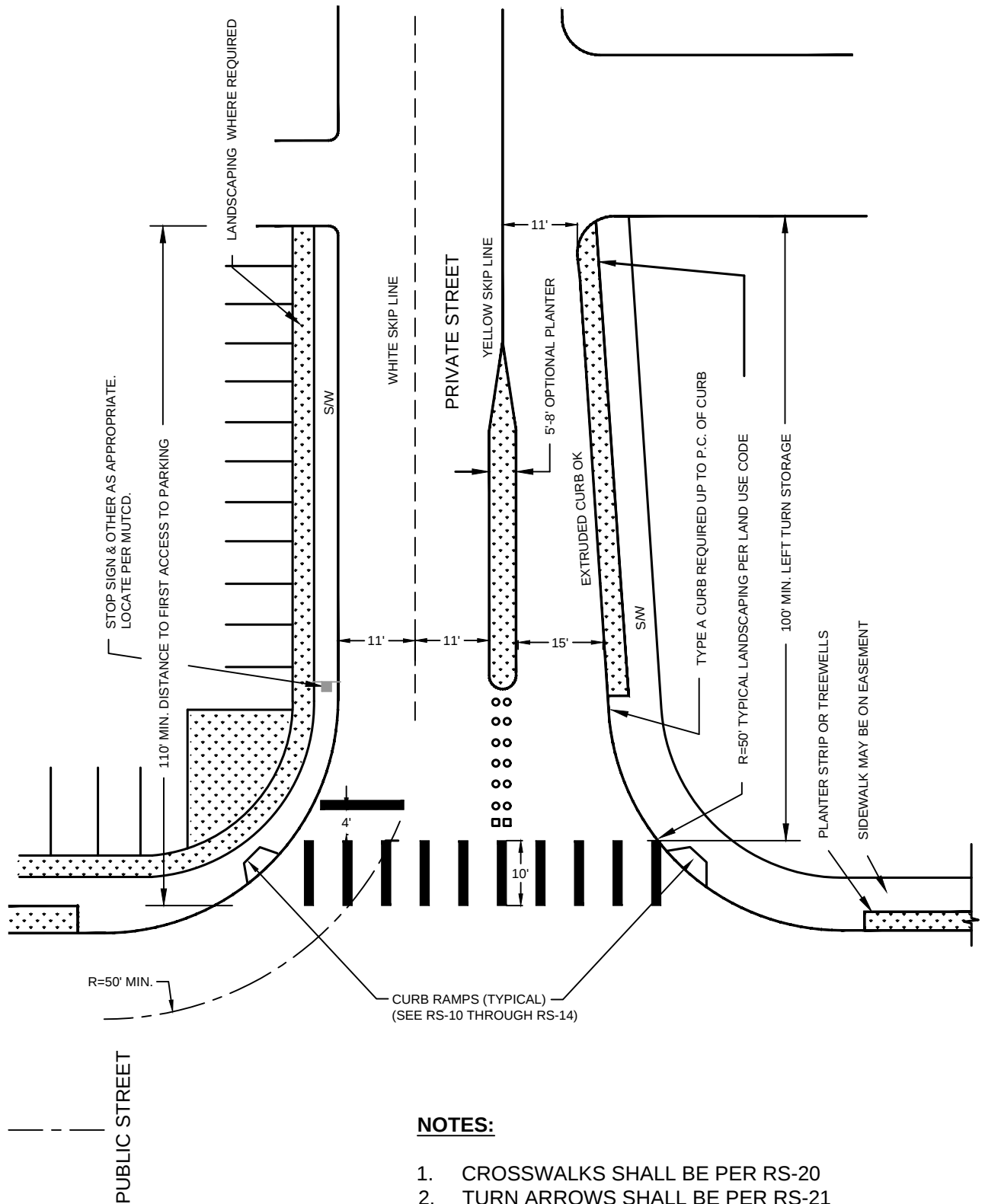
MIC DRIVEWAY DESIGN & LOCATION

ACCESS SPACING & CORNER CLEARANCES

SHEET: **RS-37**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. CROSSWALKS SHALL BE PER RS-20
2. TURN ARROWS SHALL BE PER RS-21

NOT TO SCALE



**City of
Tukwila**

STREET OPENING

PRIVATE/COMMERCIAL

SHEET:

RS-38

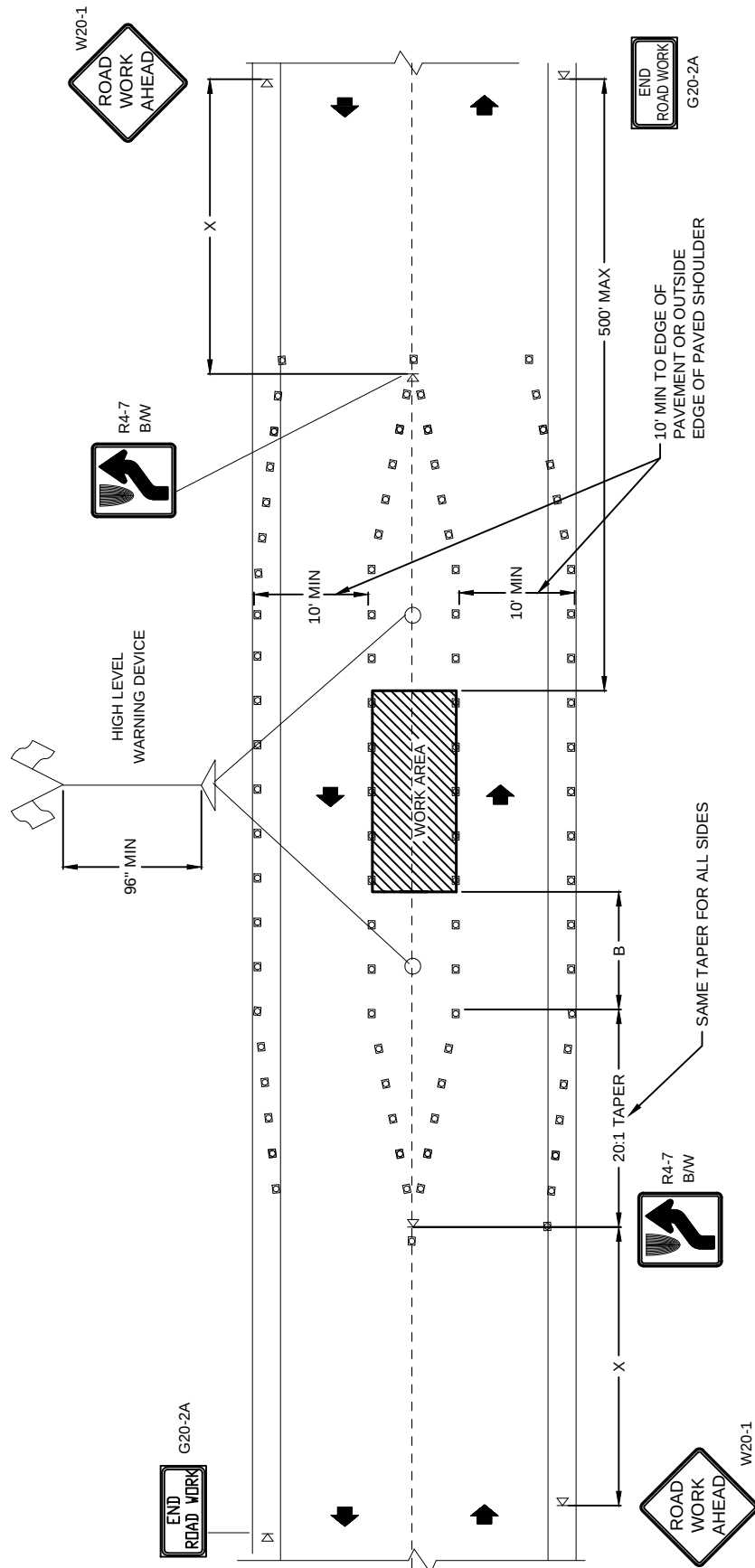
LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

SIGN SPACING = X (FEET)		
ARTERIALS	35/40 MPH	350'+-
RESIDENTIAL AREAS & BUSINESS DISTRICTS	25/30 MPH	200'+-
ALL SIGNS ARE BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	30	60
25/30	20	40

BUFFER DATA						
BUFFER SPACE = B						
SPEED (MPH)	25	30	35	40	45	
LENGTH (FEET)	55	85	120	170	220	



LEGEND

- △ SIGN LOCATION - TRIPOD MOUNT
- □ □ □ TEMPORARY TRAFFIC CONTROL DEVICES

NOT TO SCALE



**City of
Tukwila**

WORK ZONE PLAN

LOW VOLUME ROAD - CENTERLINE WORK

SHEET: **RS-39**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



**City of
Tukwila**

WORK ZONE PLAN

LOW VOLUME ROAD - SURVEYING

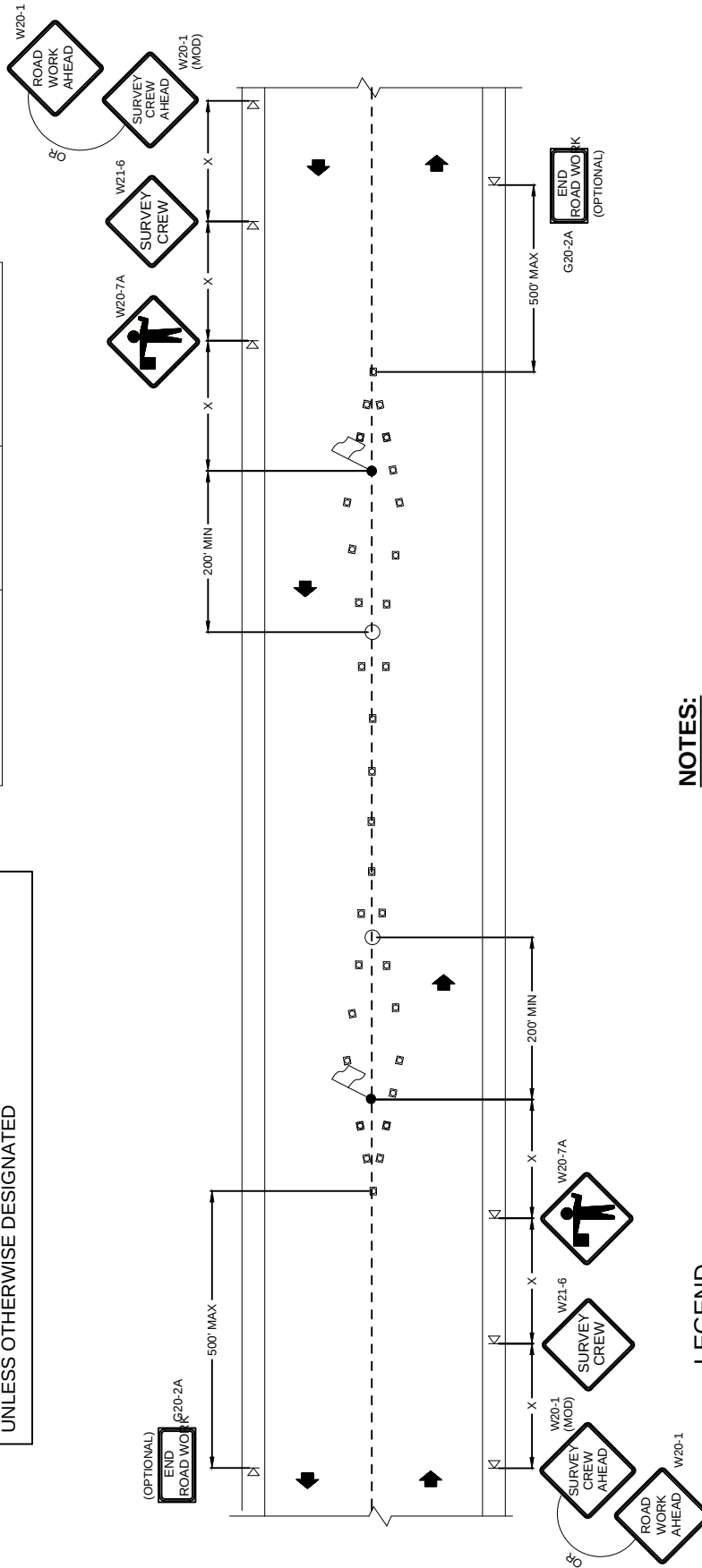
SHEET: **RS-40**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

SIGN SPACING = X (FEET)		
ARTERIALS	35/40 MPH	350'+-
RESIDENTIAL AREAS & BUSINESS DISTRICTS	25/30 MPH	200'+-
ALL SIGNS ARE BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED		

CHANNELIZING DEVICE SPACING (FEET)			
MPH	TAPER	TANGENT	
35/45	30	60	
25/30	20	40	



NOTES:

1. FOR USE WITH SPEEDS OF 45 MPH AND UNDER.
2. (3) ADVANCED WARNING SIGNS ARE REQUIRED FOR FLAGGING OPERATIONS. (L&I REQUIREMENTS)

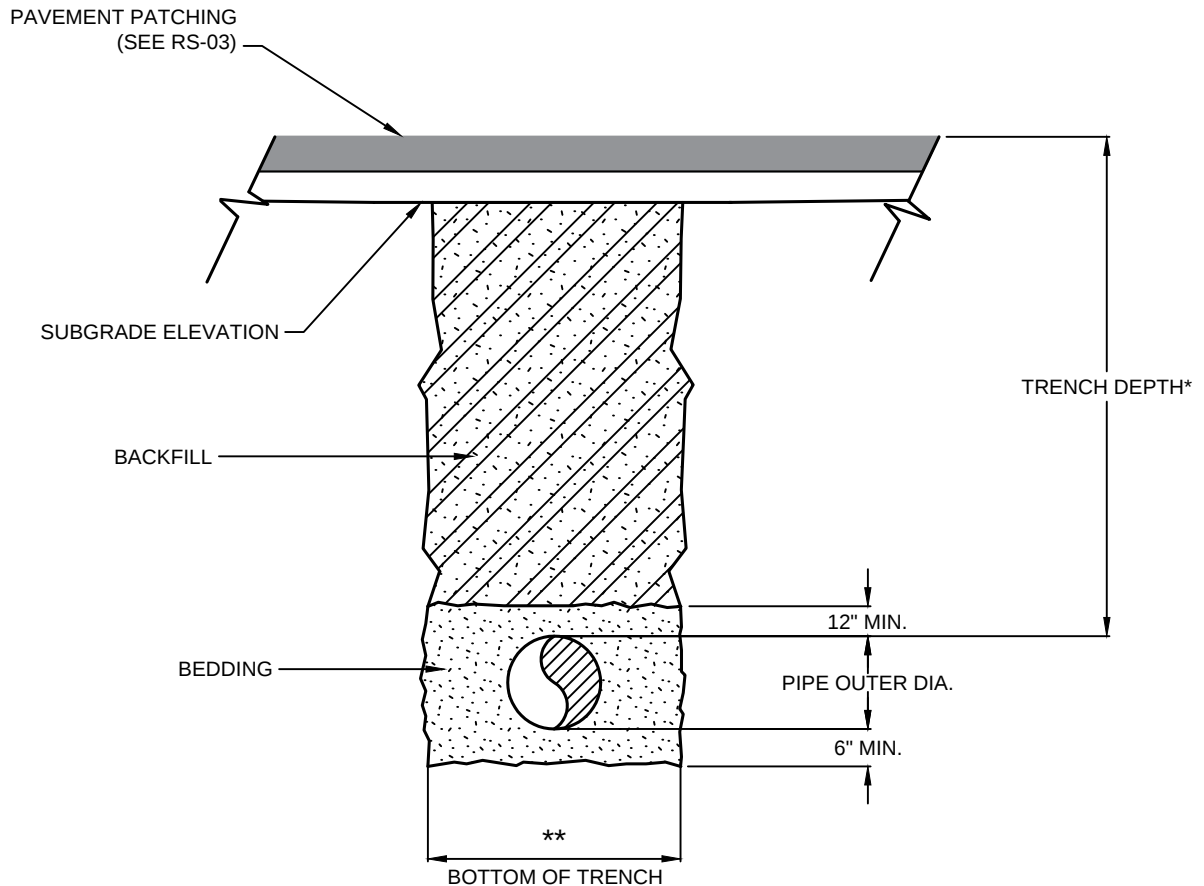
LEGEND

- ▤ SIGN LOCATION - TRIPOD MOUNT
- ▤▤▤ TEMPORARY TRAFFIC CONTROL DEVICES
- FLAGGING STATION
- SURVEYOR

NOT TO SCALE

SECTION 9.1 GENERAL UTILITY DETAILS

- G-1 Trench Section
- G-2 Utility Adjustment
- G-3 Markerball Placement Plan View
- G-4 Markerball Placement Section View
- G-5 Utility Trench – Separation and Crossing



- * **TRENCH DEPTHS**
 DRAINAGE SYSTEM:
 DIP: 18" MIN
 PLASTIC PIPE: 24" MIN
 WATER SYSTEM: 3' MIN, 6' MAX
 SEWER SYSTEM: 18" MIN BELOW BOTTOM OF WATERMAIN

- ** **TRENCH WIDTHS**
 DRAIN AND UNDERDRAIN: INSIDE DIAM + 12"
 PIPES 15" AND SMALLER: INSIDE DIAM + 30"
 PIPES 18" AND LARGER: (INSIDE DIAM * 1.5) + 18"

NOTE:

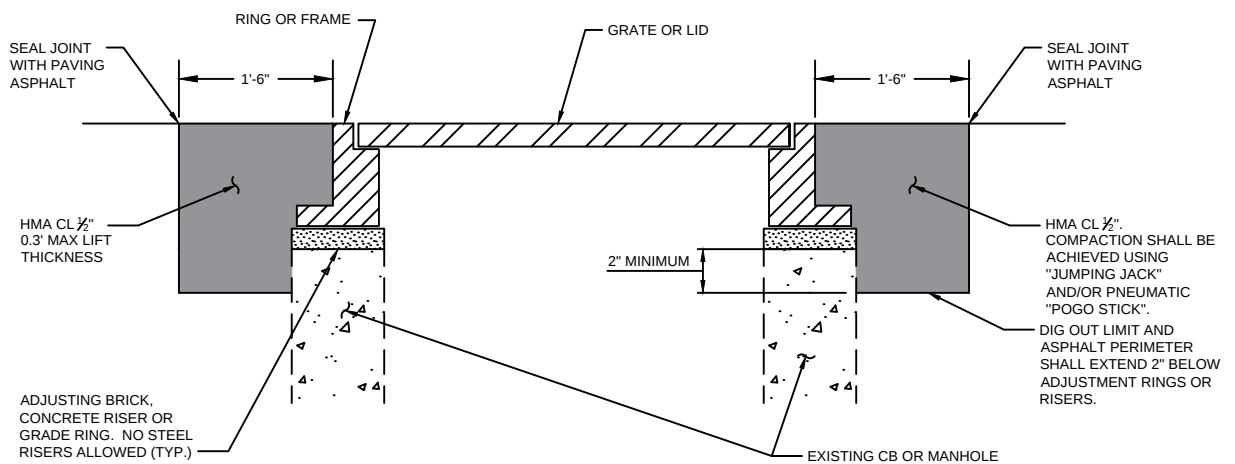
- FOR PUBLICLY OWNED UTILITIES BACKFILL COMPACTION SHALL ACHIEVE 95% MAXIMUM DENSITY IN ROADWAYS AND 85% MAXIMUM DENSITY IN NON-TRAFFIC AREAS.
- ALL BEDDING SHALL BE 5/8" MINUS CRUSHED ROCK (CSTC PER WSDOT 9-03.9(3)) COMPACTED TO 90% MAXIMUM DENSITY.
- REFER TO RS-03 FOR PAVEMENT PATCHING.
- PAVED AREAS: BACKFILL WITH 5/8" MINUS CRUSHED ROCK (CSTC PER WSDOT 9-03.9(3)).
- UNPAVED AREAS: BACKFILL WITH NATIVE MATERIAL APPROVED BY THE ENGINEER OR CRUSHED ROCK PER WSDOT 9-03.9.
- SEPARATION LESS THAN 18 INCHES SHALL BE APPROVED BY THE ENGINEER. 6 INCHES OF ETHAFOAM PAD SHALL BE INSTALLED BETWEEN UTILITIES.

NOT TO SCALE



*City of
Tukwila*

UTILITY TRENCH	
BEDDING AND BACKFILL	
SHEET:	G-1
LAST REVISION: APRIL 2019	
APPROVAL: H. PONNEKANTI	



SECTION DETAIL THROUGH STRUCTURE

NOTE:

1. COMPACTION METHODS SHALL BE USED UNTIL MATERIAL REACHES A FIRM AND UNYIELDING CONDITION
2. UNPAVED AREAS: BACKFILL WITH NATIVE MATERIAL APPROVED BY THE ENGINEER OR CRUSHED ROCK PER WSDOT 9-03.9.

NOT TO SCALE



***City of
Tukwila***

UTILITY ADJUSTMENT

SHEET:

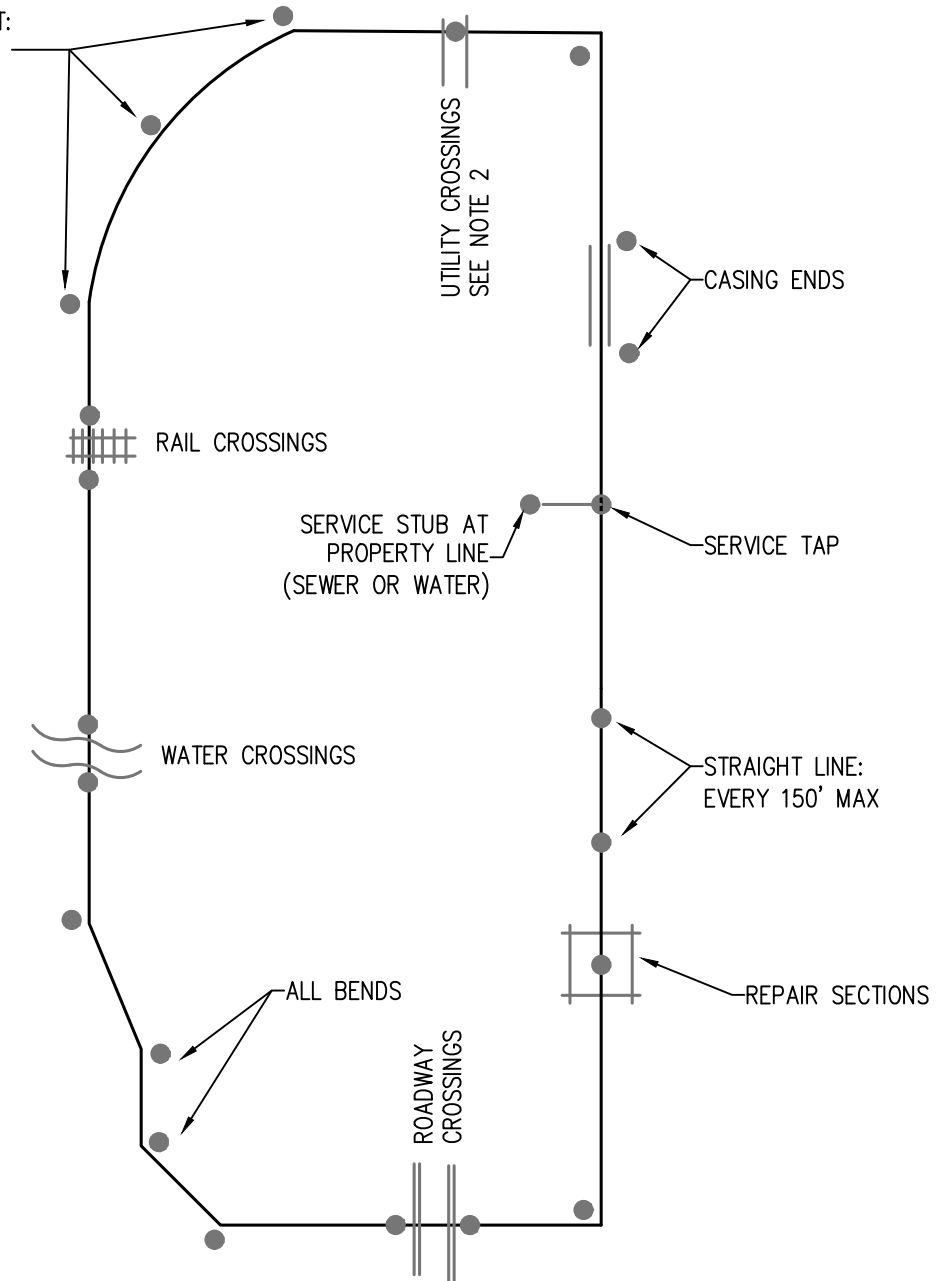
G-2

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

ARC PLACEMENT:

- ENDS
- MIDDLE



NOTES:

1. REFER TO SECTION 7.2.6 OF THE CITY OF TUKWILA INFRASTRUCTURE CONSTRUCTION AND DESIGN STANDARDS.
2. MARKER BALL SHALL BE PLACED WHERE THE NEW UTILITY LINE CROSSES UNDER A POWER, COMMUNICATION, GAS, FIBER OPTIC, DRAINAGE, SEWER, OR OTHER WATERLINE WITH 6" OR LESS SEPARATION.
3. FILL OUT MARKER BALL PLACEMENT LOG. TABLE CAN BE FOUND IN APPENDIX G OF THE CITY OF TUKWILA INFRASTRUCTURE CONSTRUCTION AND DESIGN STANDARDS.
4. SEE G-4 FOR VERTICAL PLACEMENT OF MARKERBALL.
5. FOR SIDE SEWER: PROVIDE MARKER BALL MODEL 1434 AT PROPERTY LINE IF NO CLEANOUT IS INSTALLED.

NOT TO SCALE



**City of
Tukwila**

MARKERBALL PLACEMENT

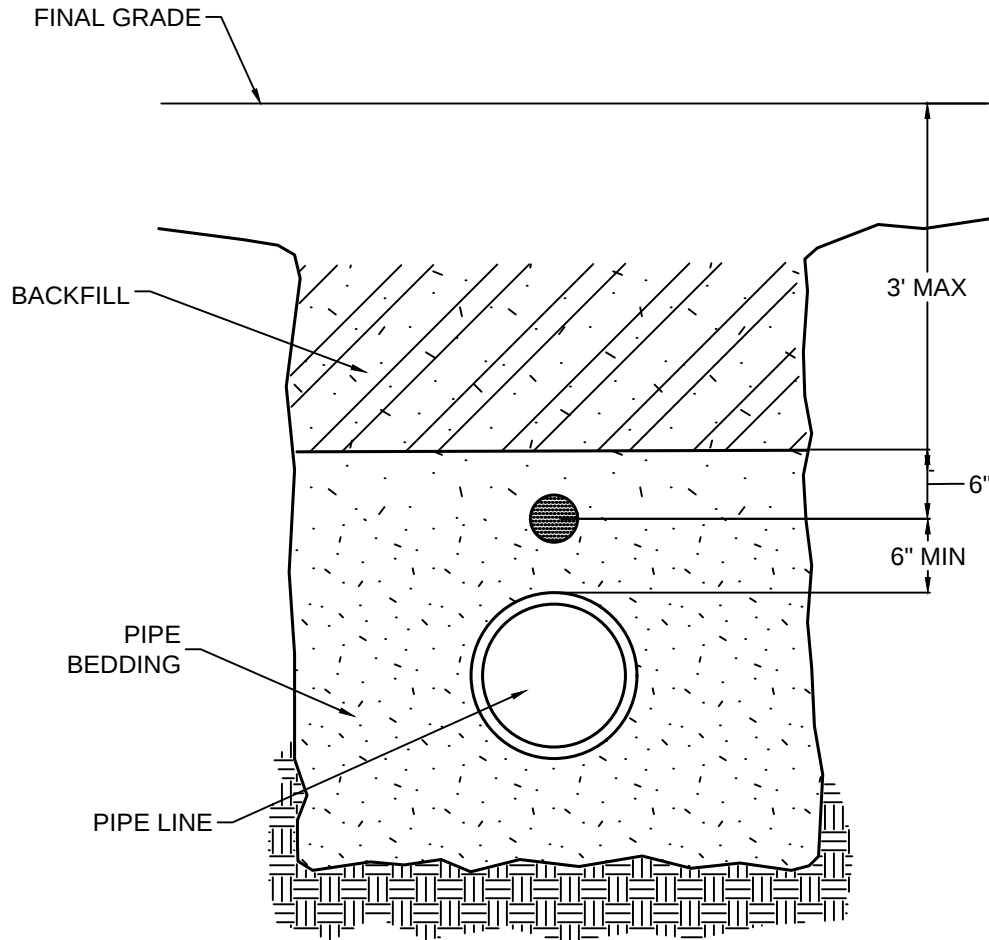
PLAN VIEW

SHEET:

G-3

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. FOLLOW MANUFACTURER'S GUIDELINES FOR PROGRAMMING THE MARKERBALLS AFTER THE MARKERBALL HAS BEEN INSTALLED.
2. INSTALL MARKERBALL A MINIMUM 6 INCHES BELOW BOTTOM OF PAVEMENT.

NOT TO SCALE



**City of
Tukwila**

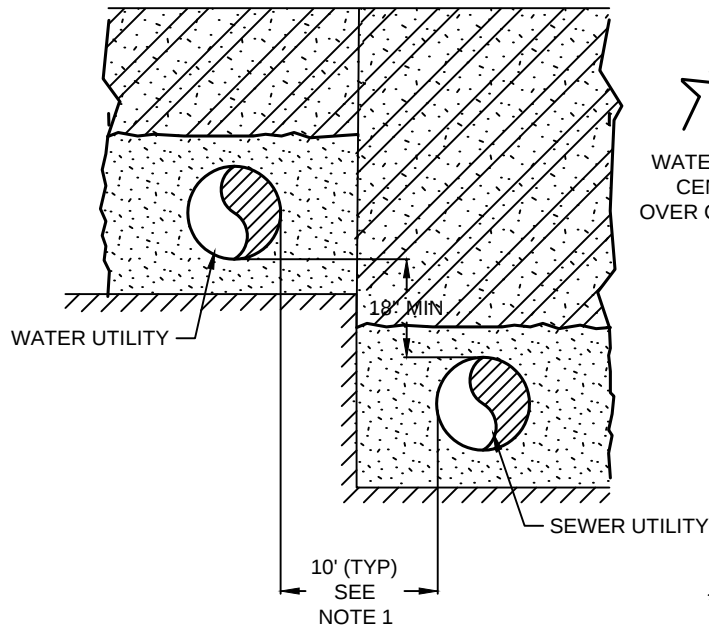
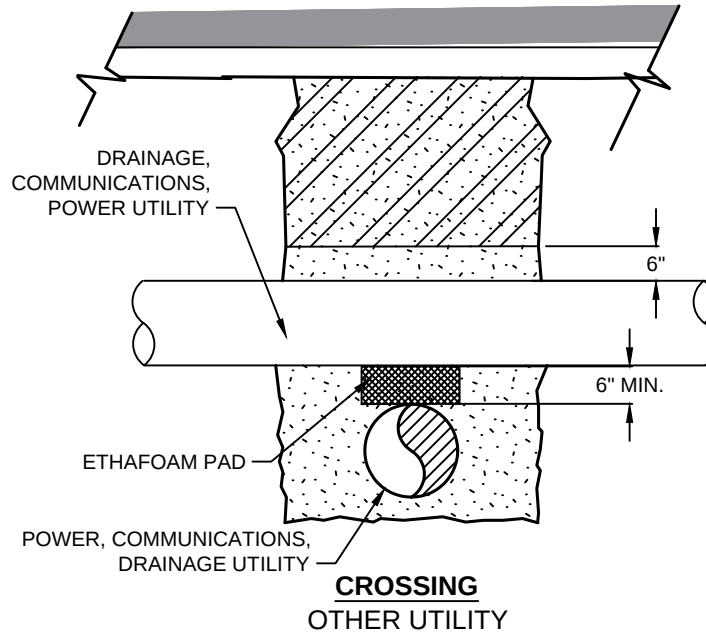
MARKERBALL PLACEMENT

SECTION VIEW

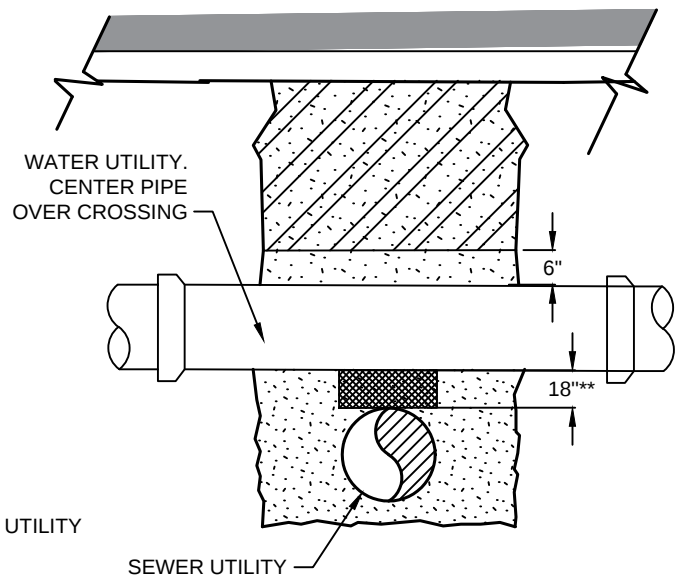
SHEET: **G-4**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



PARALLEL
WATER & SEWER



**IN NO CASE WILL WATER BE ALLOWED TO CROSS SEWER AT LESS THAN 18" SEPARATION WITHOUT ADDITIONAL ISOLATION MEASURES. (WATER MUST PASS OVER SEWER)

CROSSING
WATER & SEWER

NOTE:

1. REFER TO G-1 FOR BACKFILL AND BEDDING STANDARDS.
2. A MINIMUM OF 5' SHALL BE APPROVED BY THE ENGINEER. REFER TO CHAPTERS 7 AND 8 OF THE CITY OF TUKWILA INFRASTRUCTURE DESIGN AND CONSTRUCTION STANDARDS.
3. VERTICAL SEPARATION LESS THAN 12 INCHES SHALL BE APPROVED BY THE ENGINEER.
4. WHERE 12" VERTICAL SEPARATION IS NOT ACHIEVABLE, 6" OF ETHAFOAM PAD SHALL BE INSTALLED BETWEEN UTILITIES.

NOT TO SCALE



City of
Tukwila

UTILITY TRENCH	
SEPARATION AND CROSSING	
SHEET:	G-5
LAST REVISION: APRIL 2019	
APPROVAL: H. PONNEKANTI	

SECTION 9.2 SURFACE WATER STANDARD DETAILS

- DS-01 Catch Basin – Type 1 (WSDOT STD PLAN B-5.20-02)
- DS-01 Catch Basin – Type 1L (WSDOT STD PLAN B-5.40-02)
- DS-03 Catch Basin – Type 2 (WSDOT STD PLAN B-10.20-02)
- DS-04 Catch Basin – Yard Drain PVC (WSDOT STD PLAN B-10.70-00)
- DS-05 Catch Basin – Solid Metal Cover (WSDOT STD PLAN B-30.20-04)
- DS-06 Rectangular Frame (Reversible) (WSDOT STD PLAN B-30.10-03)
- DS-07 Circular Grate (WSDOT STD PLAN B-30.80-01)
- DS-08 Curb Inlet
- DS-09 Concrete Inlet (WSDOT STD PLAN B-25.60-02)
- DS-10 Combination Inlet (WSDOT STD PLAN B-25.20-02)
- DS-11 Rectangular Vaned Grate (WSDOT STD PLAN B-30.30-03)
- DS-12 Rectangular Bi-Directional Vaned Grate (WSDOT STD PLAN B-30.40-03)
- DS-13 Coupling Bands for Corrugated Metal Pipe (WSDOT STD PLAN B-60.40-03)
- DS-14 Connection Details for Dissimilar Culvert Pipe (WSDOT STD PLAN B-60.20-01)
- DS-15 Not In Use
- DS-16 Storm Manhole – 24" Frame with Cover (City owned facility)
- DS-17 Manhole – Polypropylene Safety Step
- DS-18 Manhole - Ladder

48"

24"

24" MIN.

76"

(SEE NOTE 8)

4 MIN. (TYP.)

#3 BAR EACH CORNER

#3 BAR EACH WAY

#3 BAR HOOP

#3 BAR (TYP.)

(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSPSP ★ (STD. SPEC. SECT. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

PIPE ALLOWANCES

PIPE MATERIAL

REINFORCED OR
PLAIN CONCRETE

ALL METAL PIPE

CPSSP *
(STD. SPEC. SECT. 9-05.20)

**SOLID WALL PVC
(STD. SPEC. SECT.**

PROFILE WALL PVC

*** CORRUGATED POLYETHYLENE
STORM SEWER PIPE**

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION** fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
2. The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the **Precast Base Section**.
7. All pickup holes shall be grouted full after the basin has been placed.

DS-01



CATCH BASIN TYPE 1

STANDARD PLAN B-5.20-02

SHEET 1 OF 1 SHEET

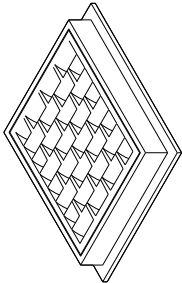
APPROVED FOR PUBLICATION

#3 BAR EACH WAY

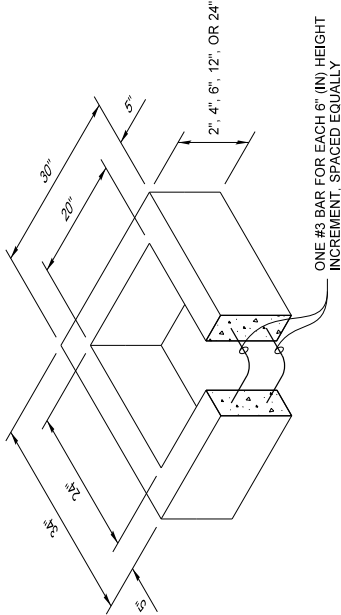
(SEE NOTE 1)

PRECAST BASE SECTION

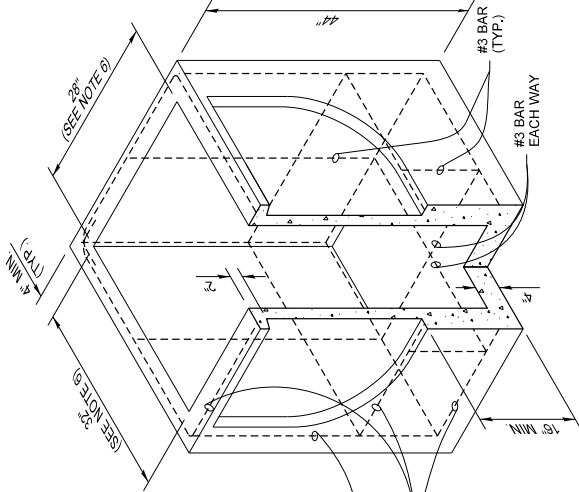
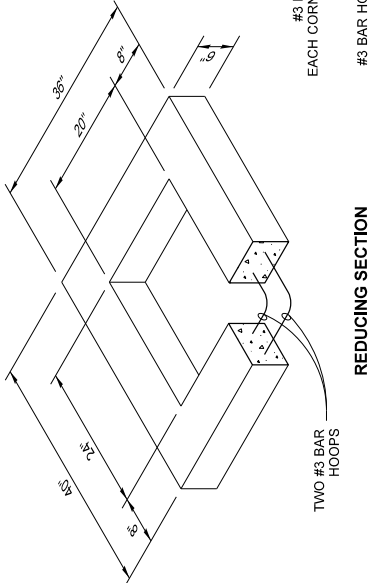
ALTERNATIVE PRECAST BASE SECTION



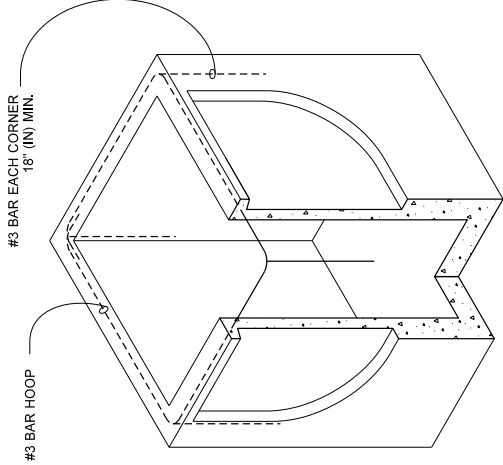
FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION



PRECAST BASE SECTION



(SEE NOTE 1)
ALTERNATIVE PRECAST BASE SECTION

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot, shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
2. The knockout shall not be greater than 26" (in), in any direction. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange down or integrally cast into the adjustment section with flange up.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the Precast Base Section.
7. All pickup holes shall be grouted full after the basin has been placed.

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	18"
ALL METAL PIPE	21"
CPSSP * (STD. SPEC. SECT. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	21"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	21"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

DS-02

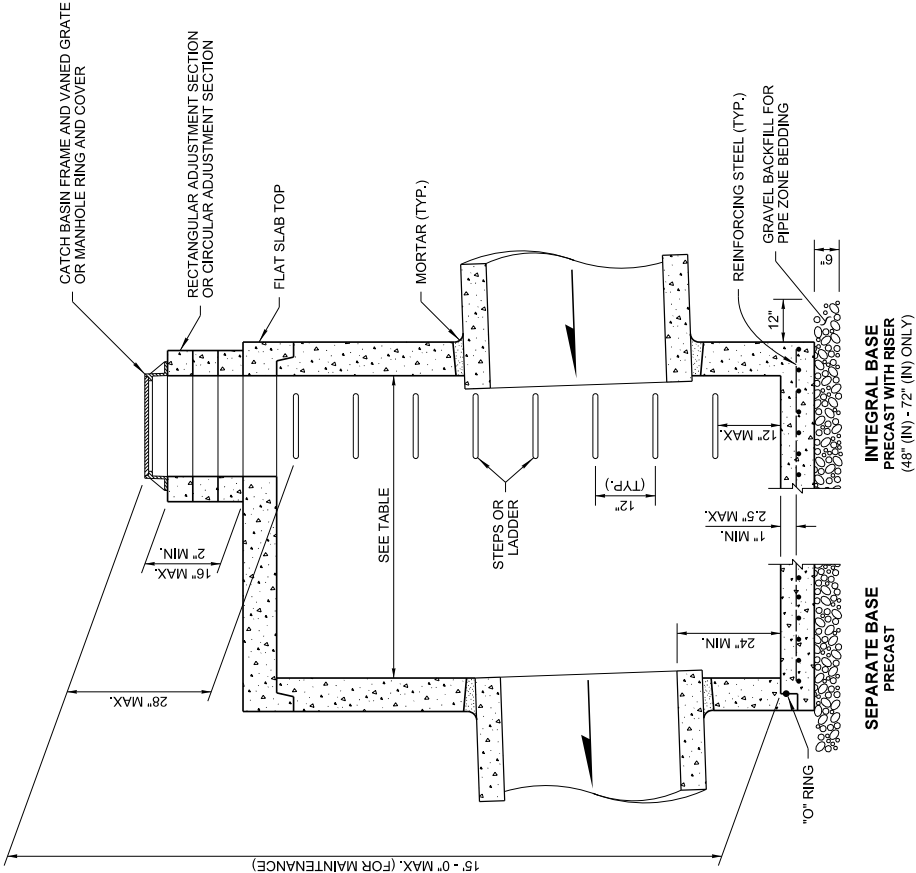


CATCH BASIN TYPE 1L
STANDARD PLAN B-5.40-02

SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION

NOTES

- 1. No steps are required when height is 4' or less.
- 2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
- 3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
- 4. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.



CATCH BASIN DIMENSIONS				
CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

PIPE ALLOWANCES				
CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER			PROFILE WALL PVC ③
	CONCRETE	ALL METAL	CPSSP ① PP ④	SOLID WALL PVC ②
48"	24"	30"	24"	30"
54"	30"	36"	30"	36"
60"	36"	42"	36"	42"
72"	42"	54"	42"	48"
84"	54"	60"	54"	48"
96"	60"	72"	60"	48"
120"	66"	84"	60"	48"
144"	78"	96"	60"	48"

- ① Corrugated Polyethylene Storm Sewer Pipe (See **Standard Specification Section 9-05.20**)
- ② (See **Standard Specification Section 9-05.12(1)**)
- ③ (See **Standard Specification Section 9-05.12(1)**)
- ④ Polypropylene Pipe (See **Standard Specification Section 9-05.24**)

DS-03



CATCH BASIN TYPE 2

STANDARD PLAN B-10-20-02

SHEET 1 OF 1 SHEET

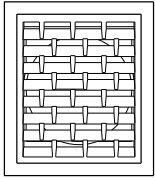
APPROVED FOR PUBLICATION



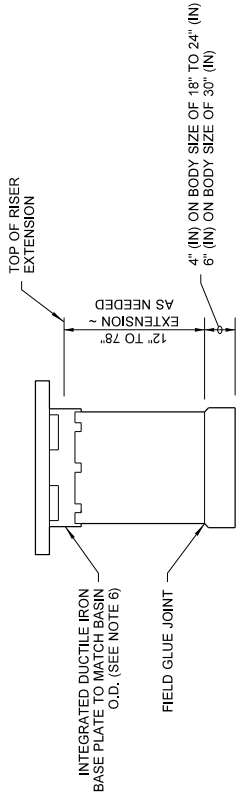
STATE DESIGN ENGINEER
Washington State Department of Transportation

NOTES

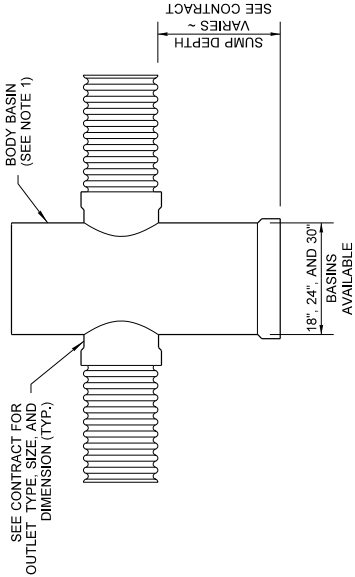
1. Drain basin to be custom manufactured according to plan details. Risers are needed for basins over 84" (in) due to shipping restrictions. The maximum depth from finished grade to the lowest invert shall be 8' (ft).
2. Drainage connections shall utilize flexible elastomeric seals conforming to **ASTM F477** and shall meet the requirements of **ASTM D3212**.
3. Risers can be trimmed down to 3" (in) extension without interfering with the installation of the frame.
4. These structures can be used for Type 1, Type 1L, and Type 2 structures. Usage for the Type 2 structures shall be limited to pipe size use only.
5. Basins shall be manufactured from PVC pipe stock meeting the requirements of **ASTM D1784**, cell classification **12454**.
6. Ductile iron castings for PVC catch basins shall conform to the requirements of **ASTM A536, grade 70-50-05**, and shall meet the proof load testing requirements of **AASHTO M 306**.
7. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.



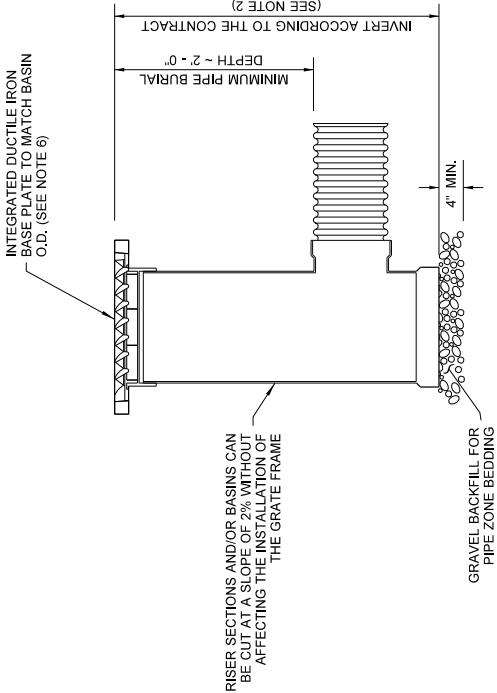
PLAN VIEW
FRAME AND VANED GRATE



RISER EXTENSION



BASIN BODY



ELEVATION VIEW

DS-04



CATCH BASIN - PVC

STANDARD PLAN B-10.70-00

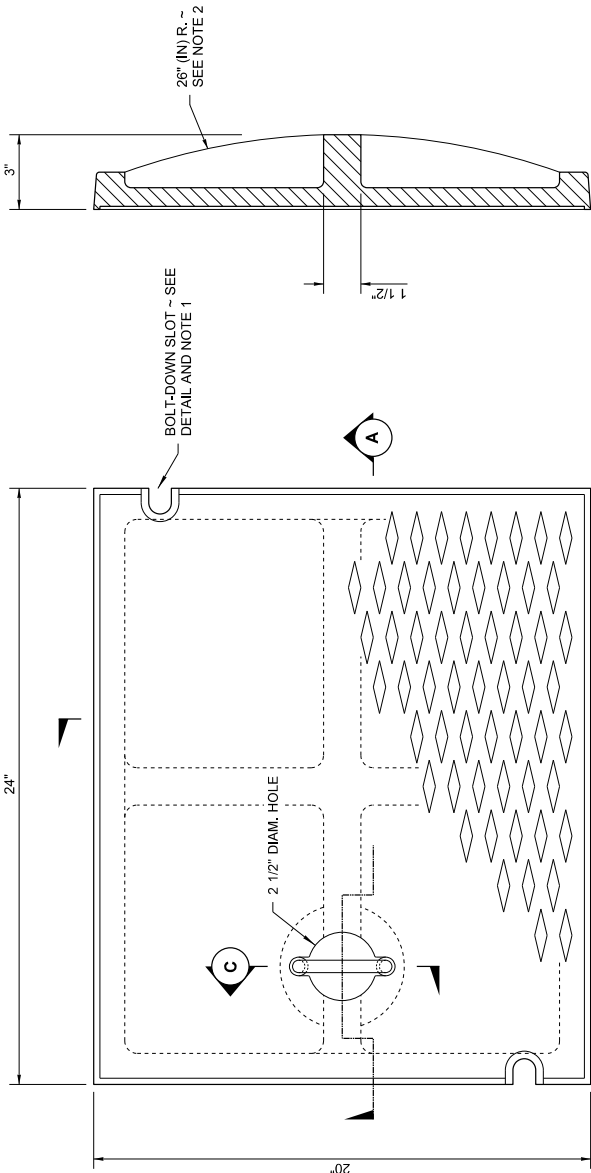
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

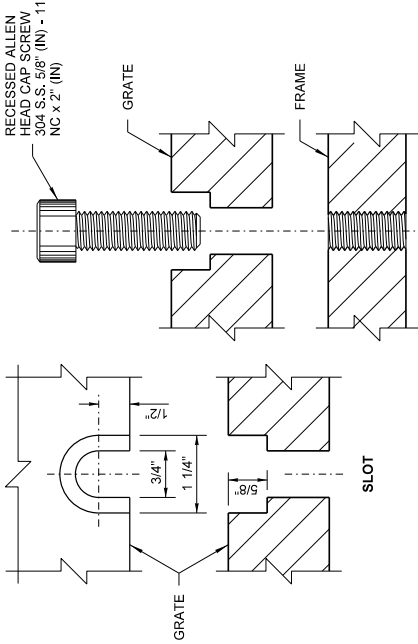
BASIN BODY

NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Alternative reinforcing designs are acceptable in lieu of the rib design.
3. Refer to **Standard Specification Section 9-05.15** and **9-05.15(2)** for additional requirements.
4. For frame details, see **Standard Plan B-30.10**.

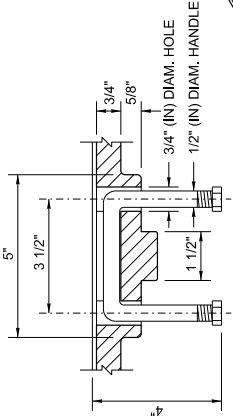


TOP
B



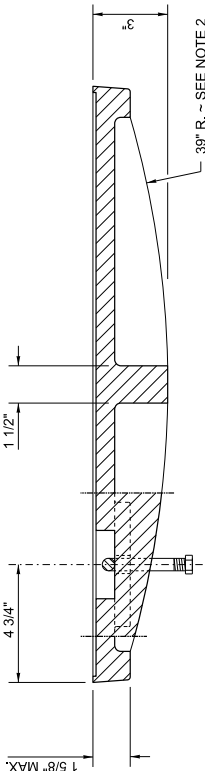
HOLE
BOLT-DOWN DETAILS
SEE NOTE 1

DS-05

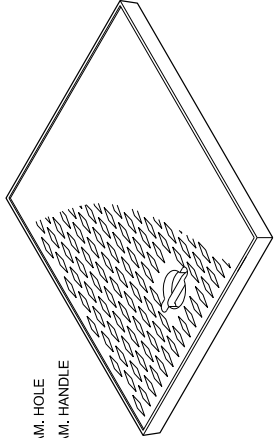


SECTION B

SECTION C



SECTION A



ISOMETRIC

RECTANGULAR SOLID
METAL COVER

STANDARD PLAN B-30.20-04

SHEET 1 OF 1 SHEET

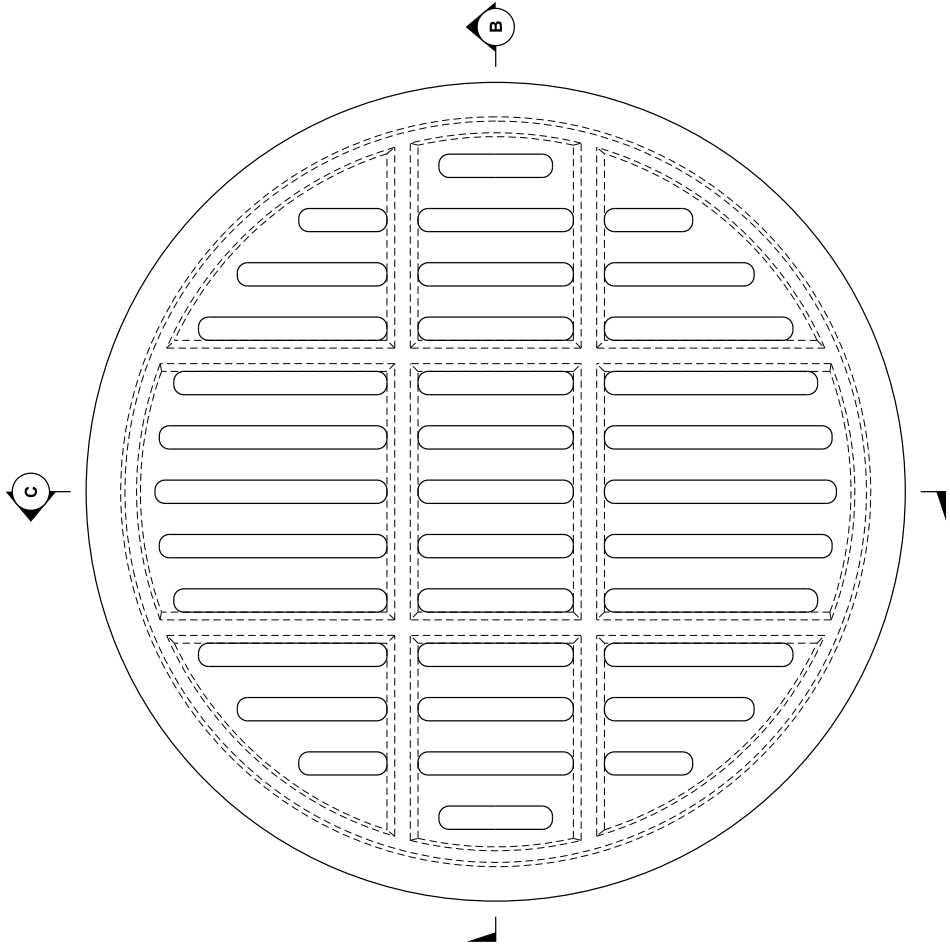
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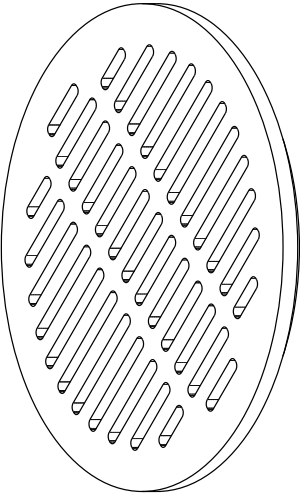
STATE DESIGN ENGINEER
Washington State Department of Transportation

NOTES

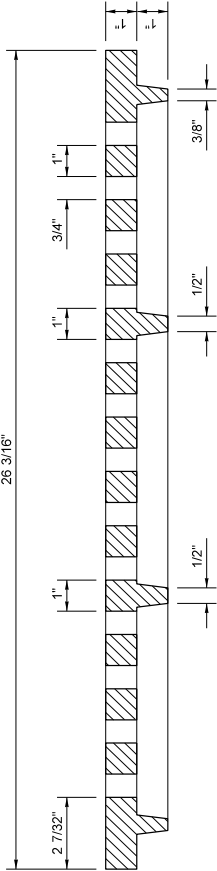
- 1. For use with Circular Frames (rings) detailed in **Standard Plan B-30.70**.
- 2. Slotted Manhole Covers are intended for use with Drywells only. See **Standard Plans B-20.20** and **B-20.80**.
- 3. See **Standard Specification Section 9-05.15** for additional requirements.



ISOMETRIC VIEW



DS-07



CIRCULAR GRATE

STANDARD PLAN B-30.80-01

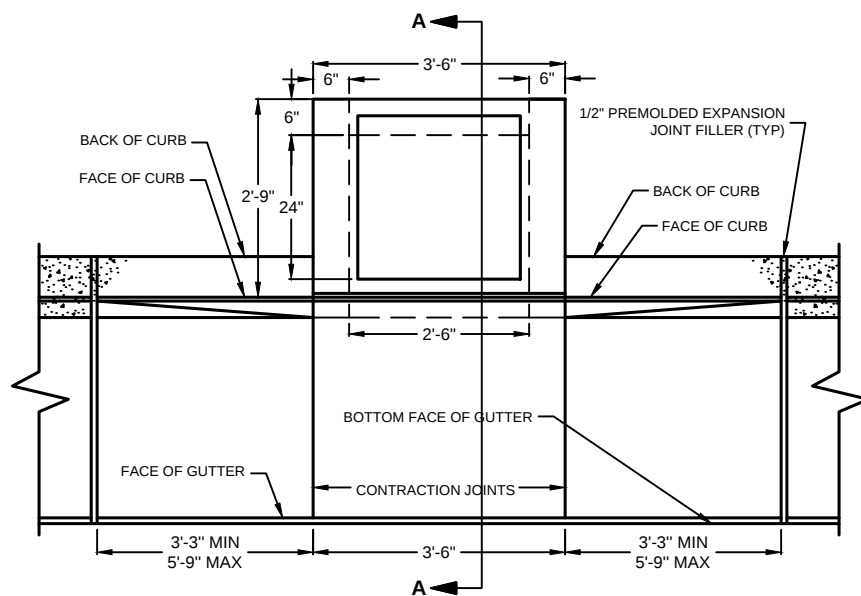
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

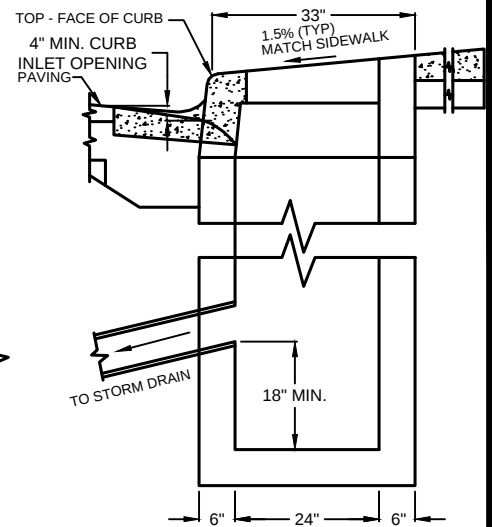
STATE DESIGN ENGINEER

Washington State Department of Transportation

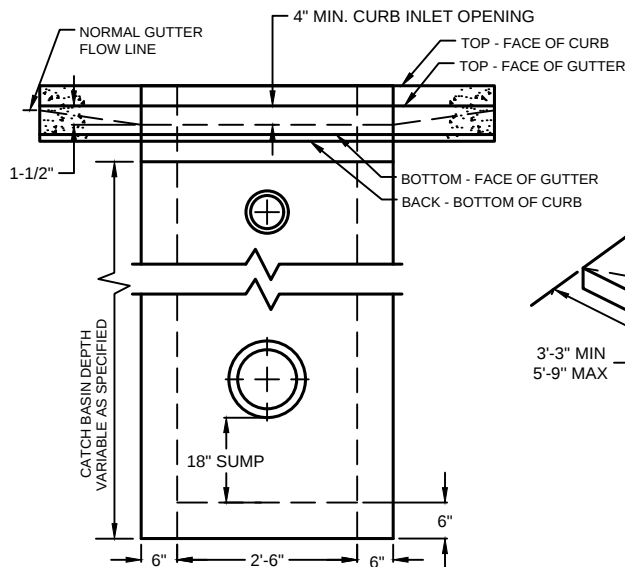
SECTION B



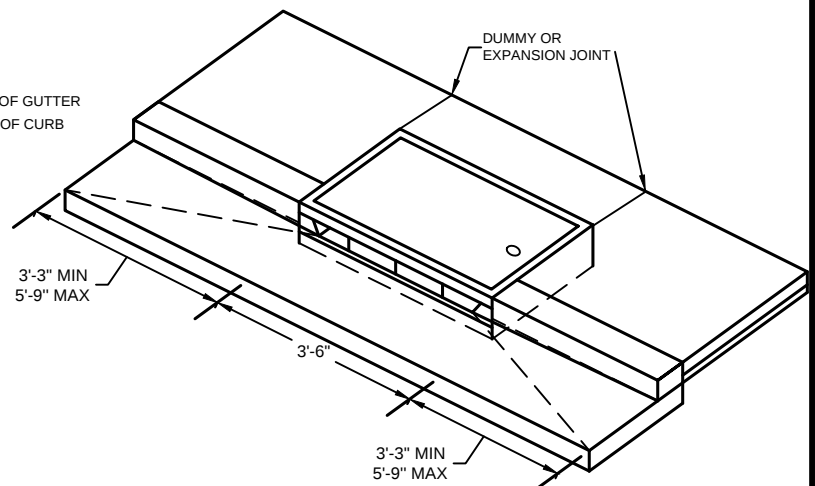
PLAN VIEW



SECTION A-A



FRONT VIEW



**PERSPECTIVE VIEW SHOWING
DEPRESSED GUTTER AT CURB
INLET**

NOTES:

1. USE FOR GRADES GREATER THAN 10% WITH PREAPPROVAL BY THE DIRECTOR.
2. ALL FABRICATED METAL PARTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
3. CONCRETE SHALL ATTAIN A MIN. COMPRESSIVE STRENGTH OF 4000 PSI IN 28 DAYS.
4. INSTALL STEPS WHEN DISTANCE FROM TOP OF GRATE TO FLOWLINE OF PIPE IS GREATER THAN 3.5 FEET.
5. PRECAST CURB INLET IS PATTERNED AFTER WALT'S CONCRETE SPRINGFIELD, OR CONCRETE CURB INLET PAT. NO. 4000953.

NOT TO SCALE



**City of
Tukwila**

CURB INLET

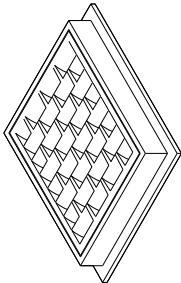
SHEET: **DS-08**
LAST REVISION: APRIL 2019
APPROVAL: H. PONNEKANTI

NOTES

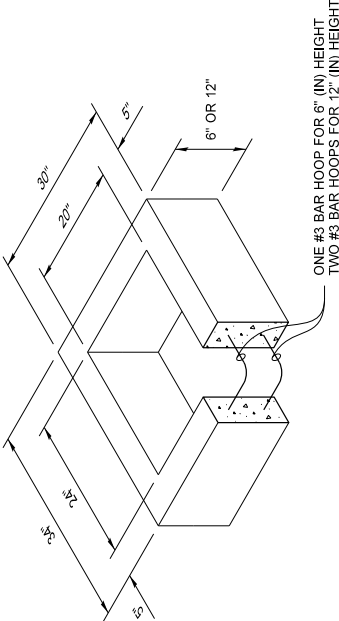
- As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
- The knockout diameter shall not be greater than 18" (in) . Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
- The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
- The frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
- The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
- The opening shall be measured at the top of the precast base section.
- All pickup holes shall be grouted full after the inlet has been placed.

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * (STD. SPEC. SECT. 9-05.20)	12"
POLYPROPYLENE (STD. SPEC. SECT. 9-05.24)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

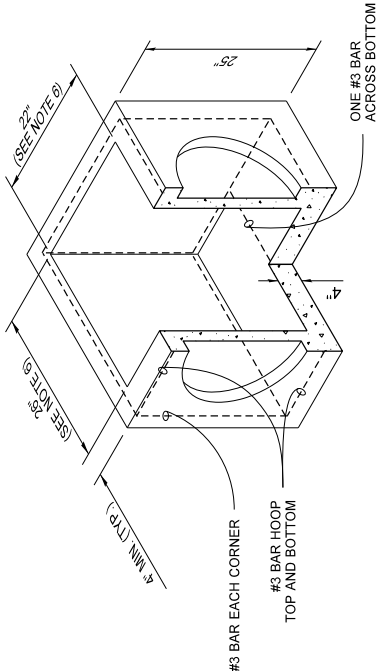
* CORRUGATED POLYETHYLENE
STORM SEWER PIPE



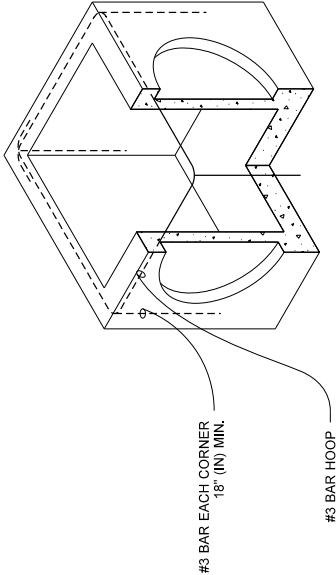
FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION



PRECAST BASE SECTION



SEE NOTE 1
ALTERNATIVE PRECAST BASE SECTION

DS-09



CONCRETE INLET

STANDARD PLAN B-25.60-02

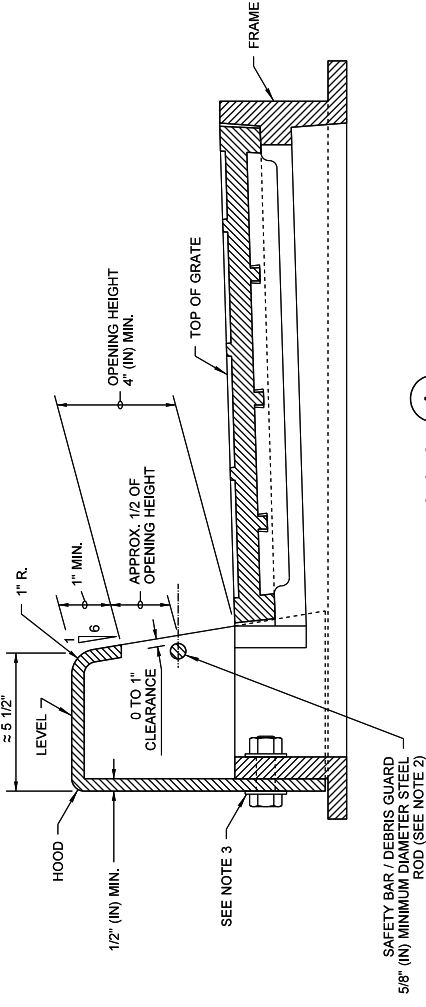
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

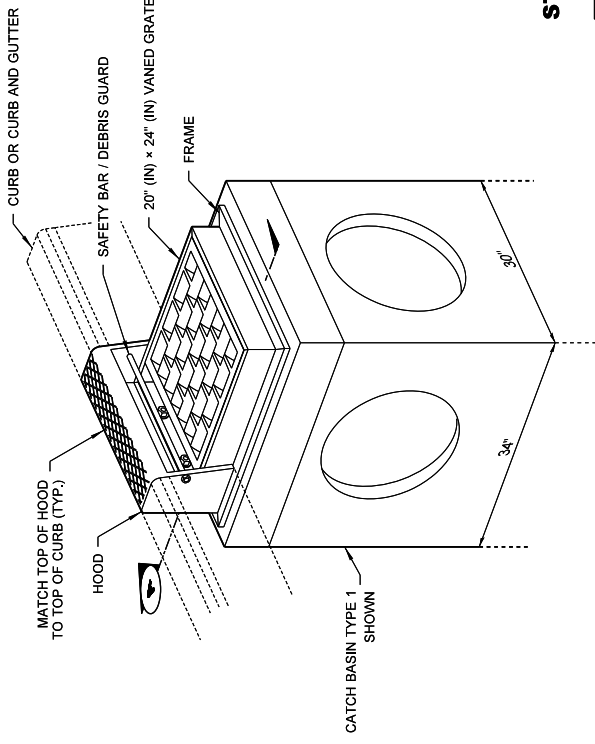


NOTES

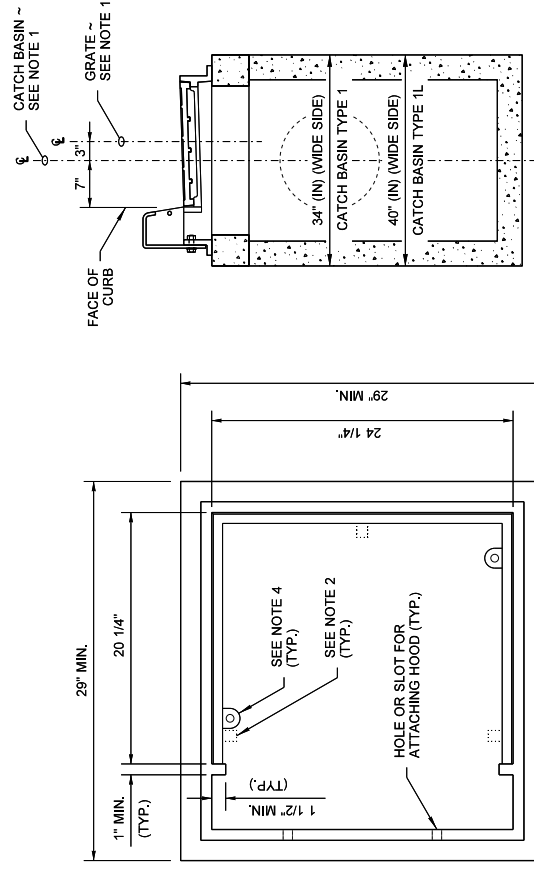
1. This inlet requires the precast catch basin unit to be rotated 90 degrees so that the narrow side is parallel to the curb line. When calculating offsets from curb to centerline (CL) of the precast catch basin, please note that the CL of the grate is not the CL of the precast catch basin. See **Section A**.
2. The dimensions of the frame and hood may vary slightly among different manufacturers. The Frame may have cast features intended to support a debris guard. Hood units may be mounted inside or outside of the frame. The methods for fastening the safety bar / debris guard rod to the hood may vary. The hood may include casting lugs. The top of the hood may be cast with a pattern.
3. Attach the hood to the frame with two 3/4" (in) $\times$ 2" (in) hex head bolts, nuts, and oversize washers. The washers shall have diameters adequate to ensure full bearing across the slots.
4. Bolt-down capability is required on all frames, grates and covers, unless specified otherwise in the Contract. Provide two holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC $\times$ 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer. See **BOLT-DOWN DETAIL, Standard Plan B-30.10**.
5. Only ductile iron Vaned Grates shall be used. See **Standard Plans B-30.30 and B-30.40** for grate details. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.
6. This plan is intended to show the installation details of a manufactured product. This plan is not intended to show the specific details necessary to fabricate the castings depicted in this drawing.



DETAIL SECTION A



ISOMETRIC VIEW
COMBINATION INLET
FRAME, HOOD, AND VANED GRATE



SECTION A

TOP VIEW
FRAME DETAIL

**COMBINATION INLET
STANDARD PLAN B-25.20-C**

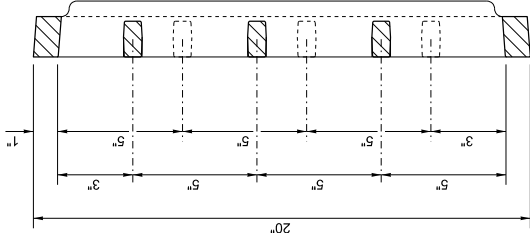
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION

 **Washington State Department of Transportation**
STATE DESIGN ENGINEER



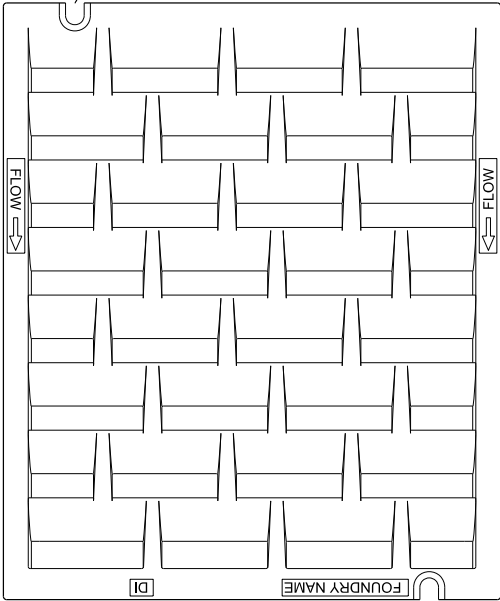
NOTES

- 1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
- 2. Refer to **Standard Specification Section 9-05.15** and **9-05.15(2)** for additional requirements.
- 3. For frame details, see **Standard Plan B-30.10**.

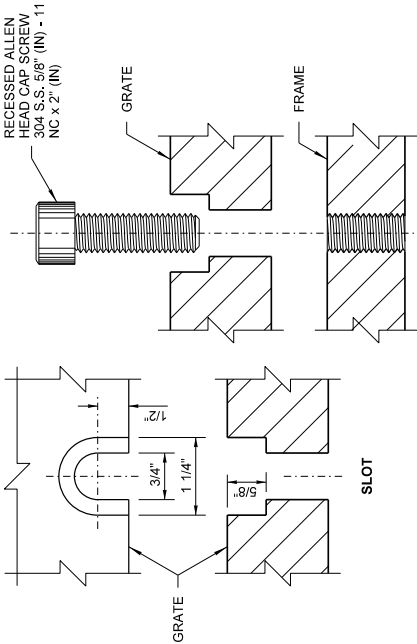


SECTION B

TOP



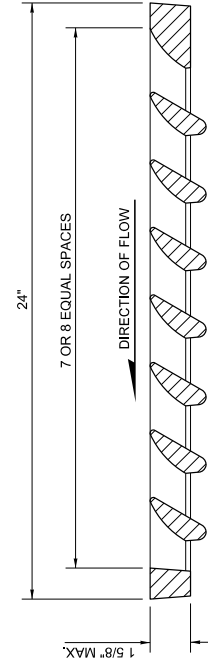
SLOT ~ SEE DETAIL AND NOTE 1



HOLE

BOLT-DOWN DETAILS
SEE NOTE 1

DS-11



SECTION A



RECTANGULAR
VANED GRATE

STANDARD PLAN B-30.30-03

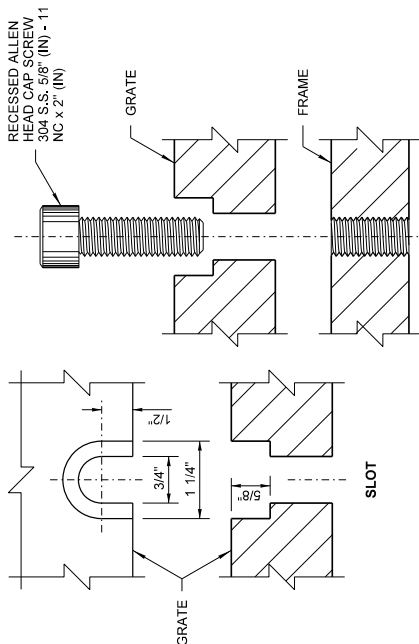
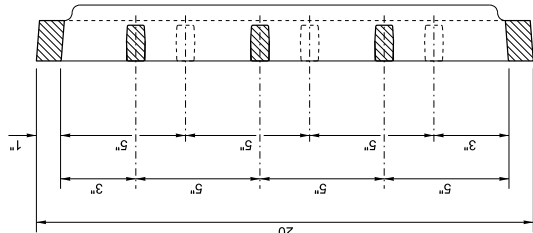
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

ISOMETRIC

NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in.) - 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification Section 9-05.15, and 9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10**.

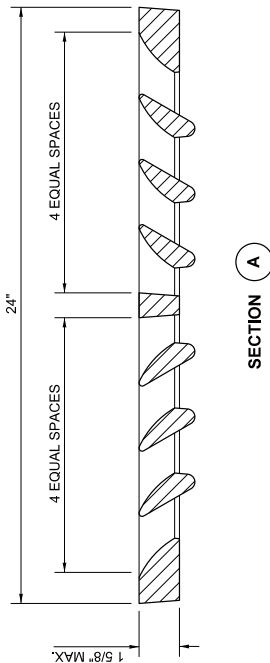
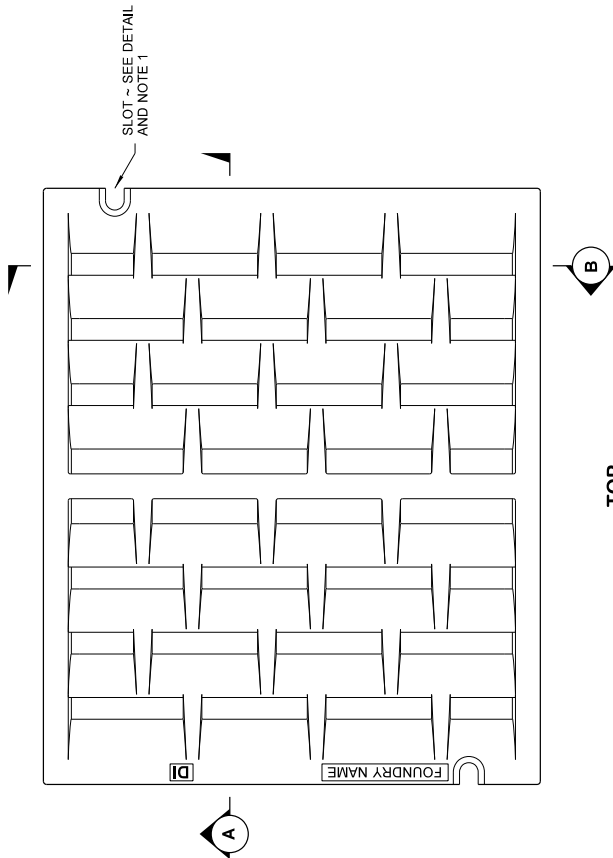


**RECTANGULAR
BI-DIRECTIONAL
VANED GRATE**
STANDARD PLAN B-30.40-03

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

ISOMETRIC

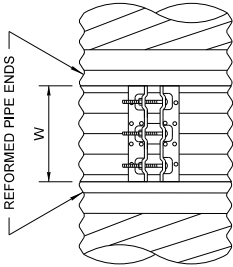
STATE DESIGN ENGINEER
State Department of Transportation

COUPLING BAND DIMENSION TABLE (ALL DIMENSIONS ARE IN INCHES)				
BAND TYPE	CORRUGATION PITCH x DEPTH	PIPE DIAM.	MIN. W	GASKET TYPE
D	2 2/3 x 1/2	12 ~ 84	12	SLEEVE
	OR			
	3 x 1			
	REFORMED TO 2 2/3 x 1/2			
F	3 x 1	90 ~ 144	24	SLEEVE
	REFORMED TO 2 2/3 x 1/2			
	OR			
	2 2/3 x 1/2			
K	3 x 1	12 ~ 84	10 1/2	SLEEVE OR O-RING
	REFORMED TO 2 2/3 x 1/2			
	OR			
	2 2/3 x 1/2			
D	2 2/3 x 1/2	12 ~ 48	12	SLEEVE
	OR			
	3 x 1			
	REFORMED TO 2 2/3 x 1/2			
F	3 x 1	12 ~ 48	10 1/2	SLEEVE OR O-RING
	REFORMED TO 2 2/3 x 1/2			
	OR			
	2 2/3 x 1/2			
K	3 x 1	12 ~ 48	12	SLEEVE
	REFORMED TO 2 2/3 x 1/2			
	OR			
	2 2/3 x 1/2			

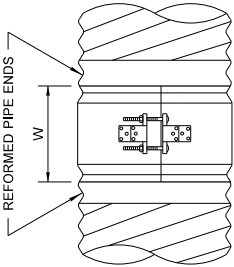
STEEL

ALUMINUM

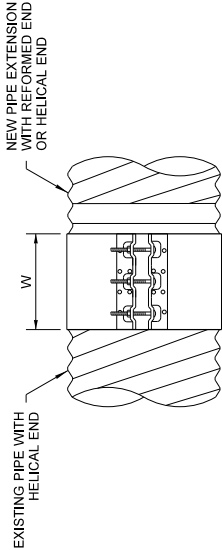
* PIPE ARCH ONLY



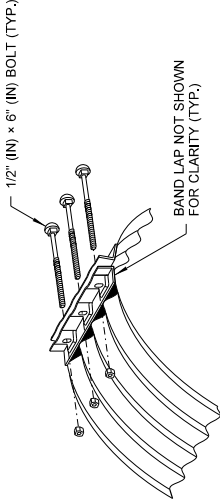
TYPE D
ANNULAR CORRUGATED BAND



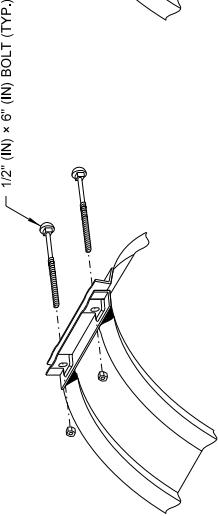
TYPE F
SEMI-CORRUGATED BAND



TYPE K
FLAT BAND OR DIMPLE BAND
(FOR PIPE EXTENSIONS ONLY)

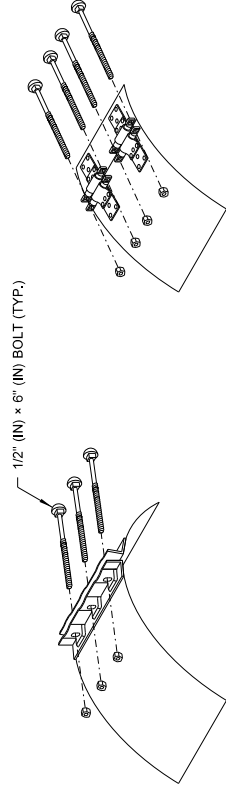


TYPE D
BAND ANGLE CONNECTOR DETAIL



TYPE F
BAND ANGLE CONNECTOR DETAIL

TYPE F
BAR & STRAP CONNECTOR DETAIL



TYPE K
DOUBLE BAR & STRAP CONNECTOR DETAIL

DS-13



**COUPLING BANDS FOR
CORRUGATED METAL PIPE
STANDARD PLAN B-60.40-01**

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

Washington State Department of Transportation



NOTES

1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12" (in). Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes. Concrete shall be Commercial Concrete in accordance with **Standard Specification Section 6-02.3(2)**.
2. Steel Welded Wire Fabric shall be in accordance with **Standard Specification Section 9-07.7**. Install two wraps for size 6 x 6 W1.4 x W1.4 (10 Gage) Steel Welded Wire Fabric or one wrap for any of the following sizes:

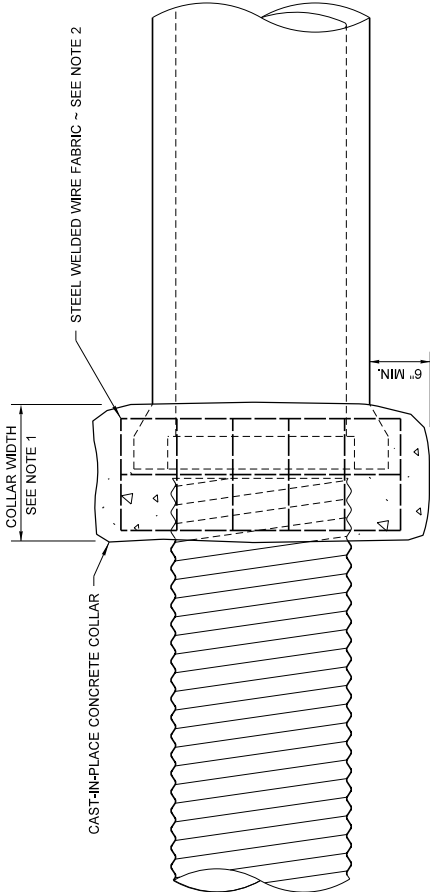
6 x 6 W2.1 x W2.1 (8 Gage)

6 x 6 W2.9 x W2.9 (6 Gage)

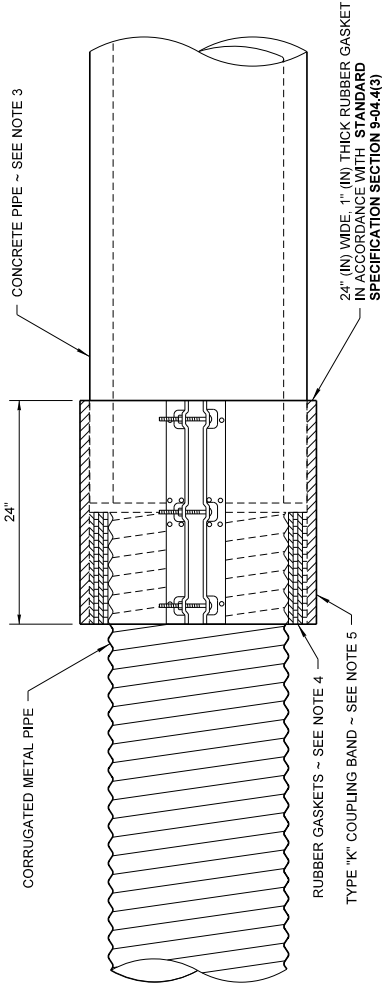
4 x 4 W2.9 x W2.9 (6 Gage)

4 x 4 W4.0 x W4.0 (4 Gage)

Provide 1 1/2" min. covering over wire fabric.
3. When a Coupling Band connection requires attachment to the bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.
4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" (in) wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with **Standard Specification Section 9-04.4(3)**.
5. Use a flat Type K Coupling Band. Type K Coupling Bands with dimples are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" (in) or less.



CONCRETE COLLAR OPTION



COUPLING BAND OPTION



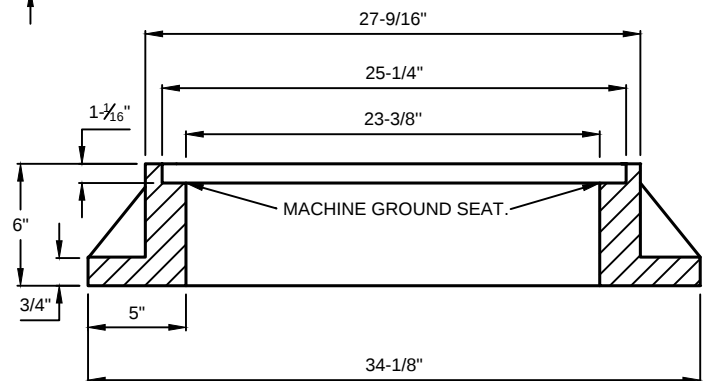
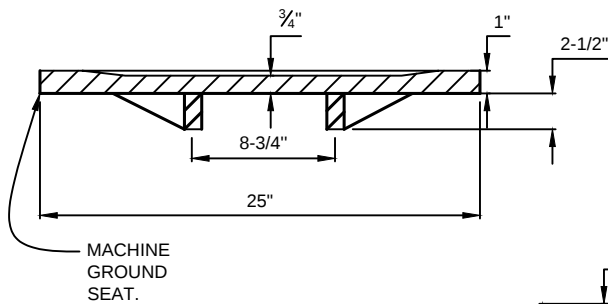
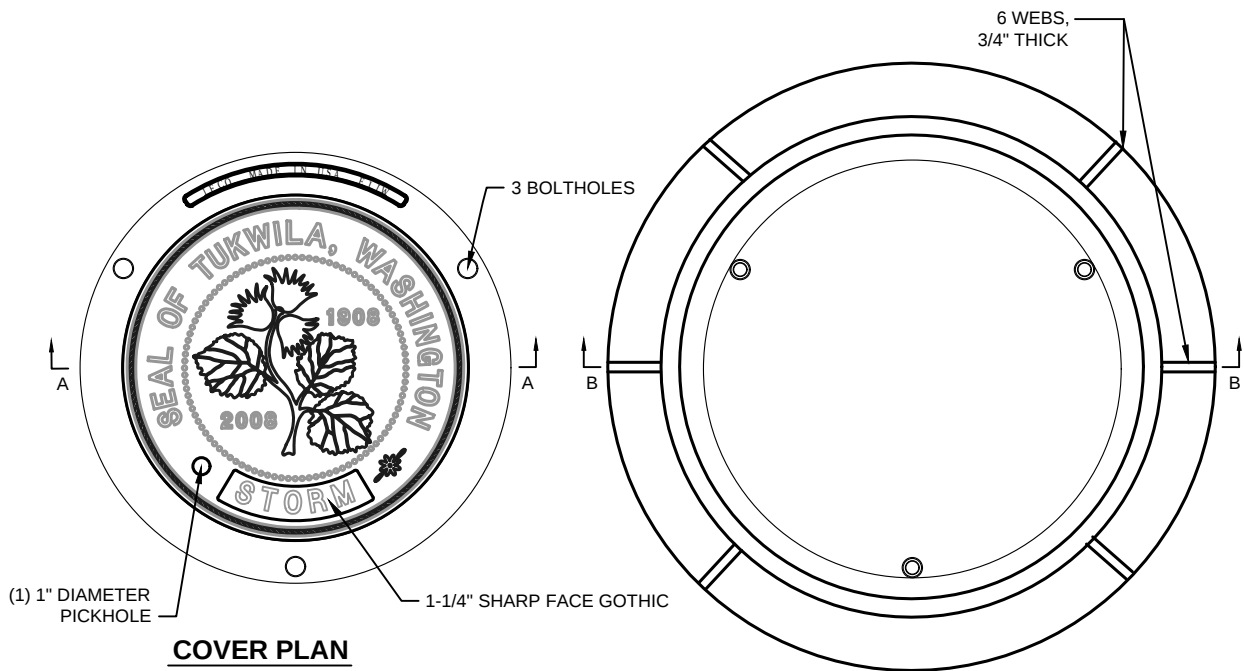
**CONNECTION DETAILS FOR
DISSIMILAR CULVERT PIPE
STANDARD PLAN B-60.20-01**

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION



STATE DESIGN ENGINEER
Washington State Department of Transportation



NOTES:

1. FRAME TO BE GROUTED
2. EJIW CATALOG NUMBER 3715Z(PT) 3717C1(PT) ASSEMBLY, WITH THE SEAL OF TUKWILA, AND LEGENDS 1908, 2008, AND STORM.
3. NON-LOCKING PRODUCT NO. 00371785A01
3. PRODUCT NO. 00371783A01 (LOCKING)
4. INSTALL SO THAT BOLT HOLES ALIGN WITH CENTER OF LADDER.

NOT TO SCALE



**City of
Tukwila**

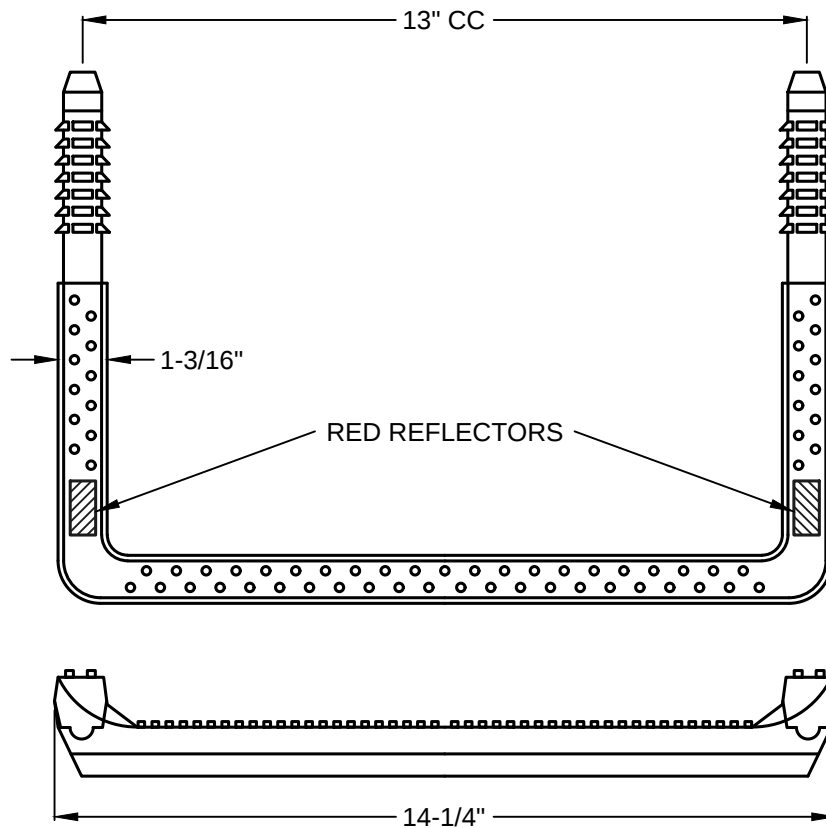
STORM MANHOLE

24" FRAME WITH COVER (CITY OWNED FACILITY)

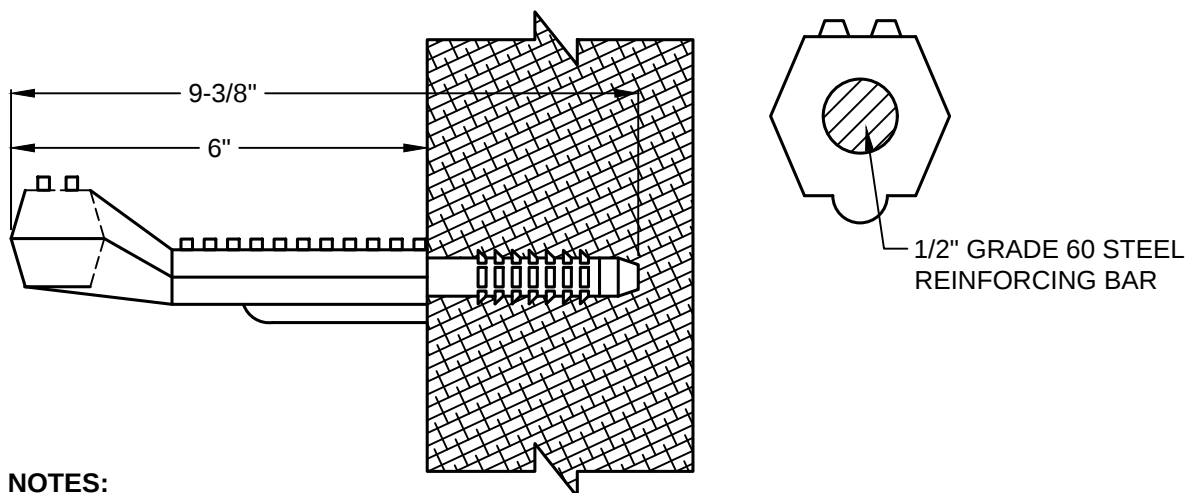
SHEET: **DS-16**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



PLAN



NOTES:

1. LANE P-14938 OR APPROVED EQUAL.

CUT OUT

NOT TO SCALE



**City of
Tukwila**

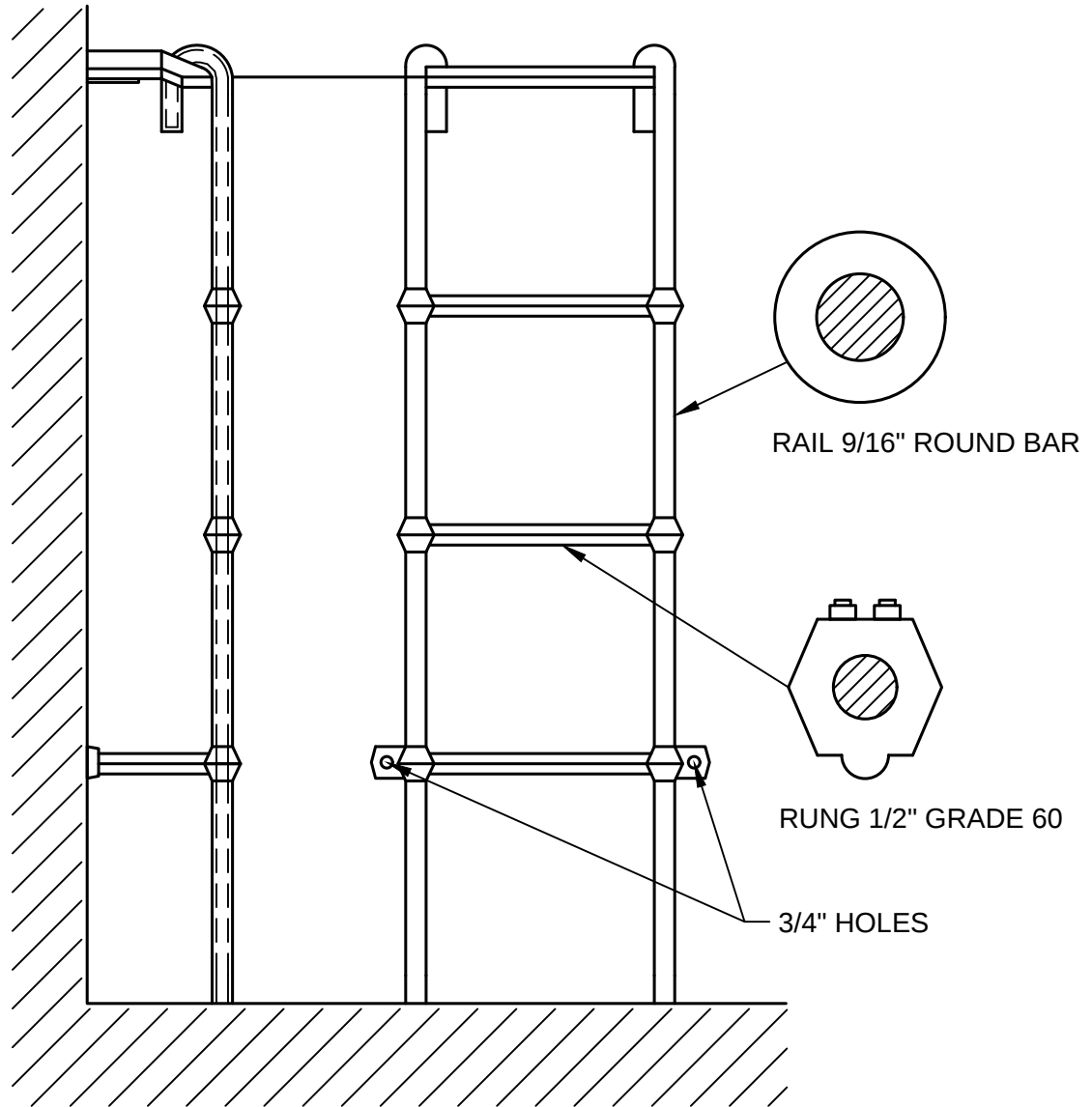
MANHOLE

POLYPROPYLENE SAFETY STEP

SHEET: **DS-17**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



POLYPROPYLENE HANGING LADDER

NOTES:

1. LANE POLYPROPYLENE LADDER
2. POLYPROPYLENE ASTM D4101
3. 1/2" GRADE 60 REINFORCING BAR A615
4. 9/16" COLD DRAWN BAR C1018
5. 3/8" DIA. BOLT 316-SS, 3-1/2" LONG
6. 316-SS TYP AT LADDER MOUNTS
7. REFER TO SS-13 FOR STEP DETAIL

NOT TO SCALE



**City of
Tukwila**

MANHOLE

LADDER

SHEET: **DS-18**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

SECTION 9.3 WATER SUPPLY STANDARD DETAILS

WS-01 Meter – $\frac{3}{4}$ ", 1", 1-1/2", & 2"

WS-02 Meter – 1-1/2" and 2" Meter Setter

WS-03 Not In Use

WS-04 Meter - 3" and 6"

WS-05 Not In Use

WS-06 Water Main – Valve Box Operating Nut Extension

WS-07 Water Main – Air and Vacuum Release (Non-Traffic Areas)

WS-08 Not In Use

WS-09 Water Main - Blow Off Assembly

WS-10 Blocking (Horizontal) (3 SHEETS)

WS-11 Not In Use

WS-12 Not In Use

WS-13 Fire Hydrant – Assembly and Setting

WS-14 Fire Hydrant – Guard Post

WS-15 Cross Connection Control (2 Sheets)

WS-16 Not In Use

WS-17 Not In Use

WS-18 Not In Use

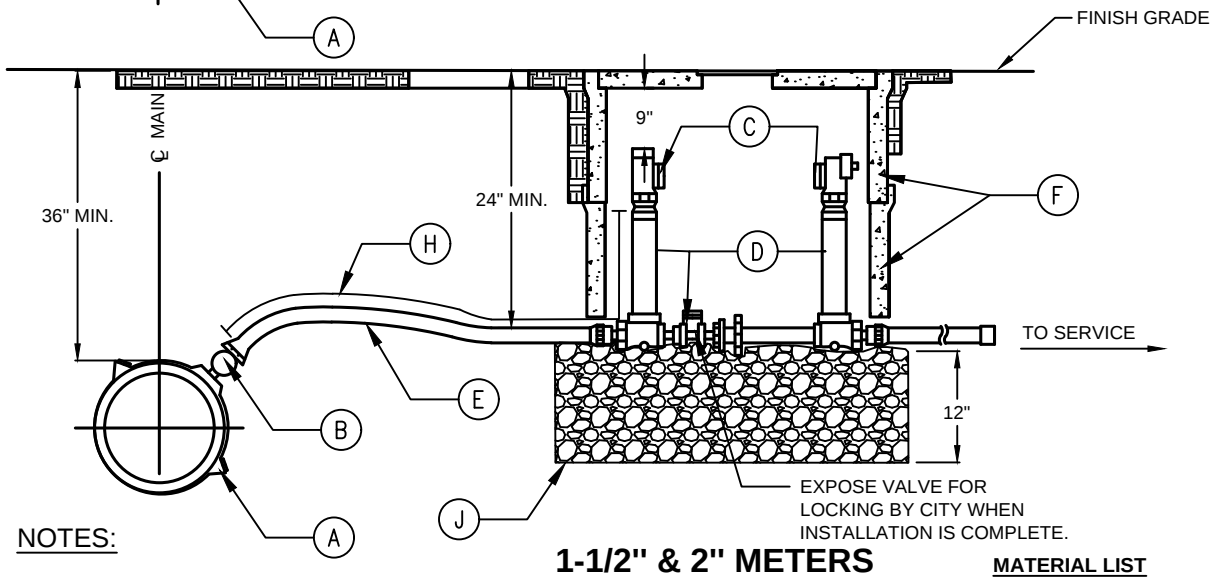
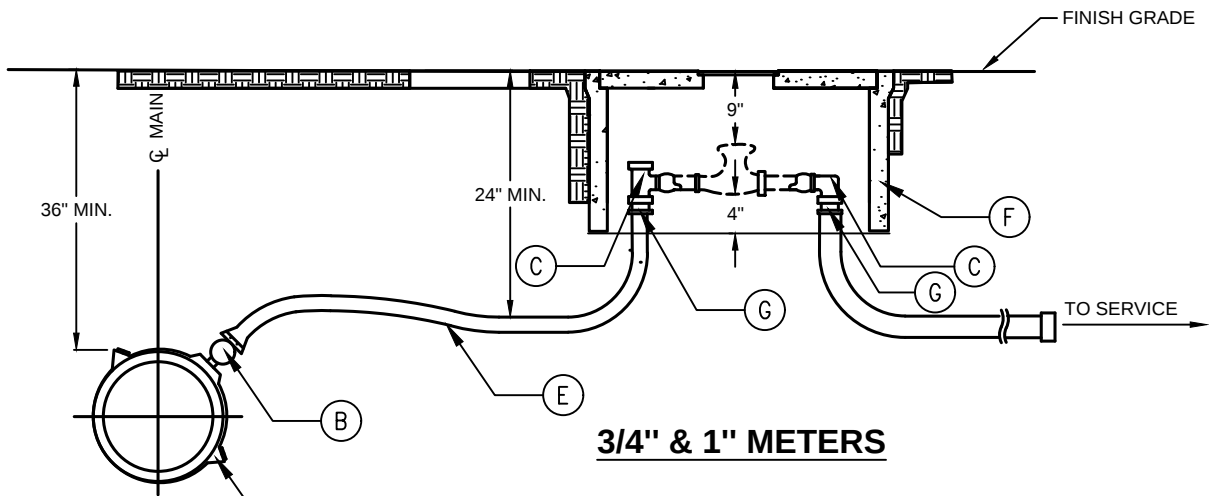
WS-19 Not In Use

WS-20 Not In Use

WS-21 Reduced Pressure Backflow Assembly Installation (2 Sheets)

WS-22 Irrigation System (City Owned): Double Check Valve Assembly (2 Sheets)

WS-23 2" & Smaller Double Check Valve for Private Use



NOTES:

1. FOR PARTS LIST REFER TO CHAPTER 7.1 - TUKWILA INFRASTRUCTURE DESIGN AND CONSTRUCTION STANDARDS.
2. SERVICE LINE SHALL BE PERPENDICULAR TO THE WATERMAIN UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. ENGINEER SHALL PROVIDE PRESSURE AND FLOW CALCULATIONS WHEN A SINGLE METER IS SERVING BOTH DOMESTIC SERVICE AND A FIRE SUPPRESSION SYSTEM.
4. NO METER BOXES IN SIDEWALKS AND DRIVEWAYS WHERE POSSIBLE. WHERE METERS CANNOT BE PROTECTED FROM TRAFFIC, A TRAFFIC RATED ENCLOSURE IS REQUIRED. METER BOXES IN PEDESTRIAN PATHS WITHIN THE RIGHT OF WAY ARE REQUIRED TO HAVE AN ADA COMPLIANT LID.
5. METER BOX AND SETTER (IF APPLICABLE) SHALL BE SUPPLIED BY PERMITTEE.
6. METER SUPPLIED AND INSTALLED BY CITY OF TUKWILA UPON APPROVED PERMIT AND FINAL SERVICE INSPECTION.
7. POSITION SERVICE PIPING TO CENTER METER BELOW INSPECTION LID AND PROVIDE ADEQUATE CLEARANCE BETWEEN SERVICE PIPING AND METER BOX TO ALLOW REPLACEMENT, TESTING, AND BYPASS OF METER.
8. BRASS FITTINGS SHALL BE LEAD FREE.
9. THE LID OF A METER BOX INSTALLED IN A PEDESTRIAN PATH SHALL HAVE A SKID RESISTANT LID PER ADA REQUIREMENTS.

MATERIAL LIST

- | | |
|-----|---|
| (A) | TAPPING SADDLE |
| (B) | CORPORATION STOP |
| (C) | ANGLE STOP OR TAIL PIECE |
| (D) | METER SETTER. SEE WS-02. |
| (E) | SERVICE PIPE |
| (F) | METER BOX |
| (G) | COMPRESSION FITTINGS OR COUPLINGS AS REQUIRED |
| (H) | TRACER TAPE OR WIRE FOR POLYETHYLENE PIPE (IS USED) |
| (J) | GRAVEL BACKFILL FOR DRAINS PER WSDOT 9-03.12(4). |

NOT TO SCALE



**City of
Tukwila**

METER

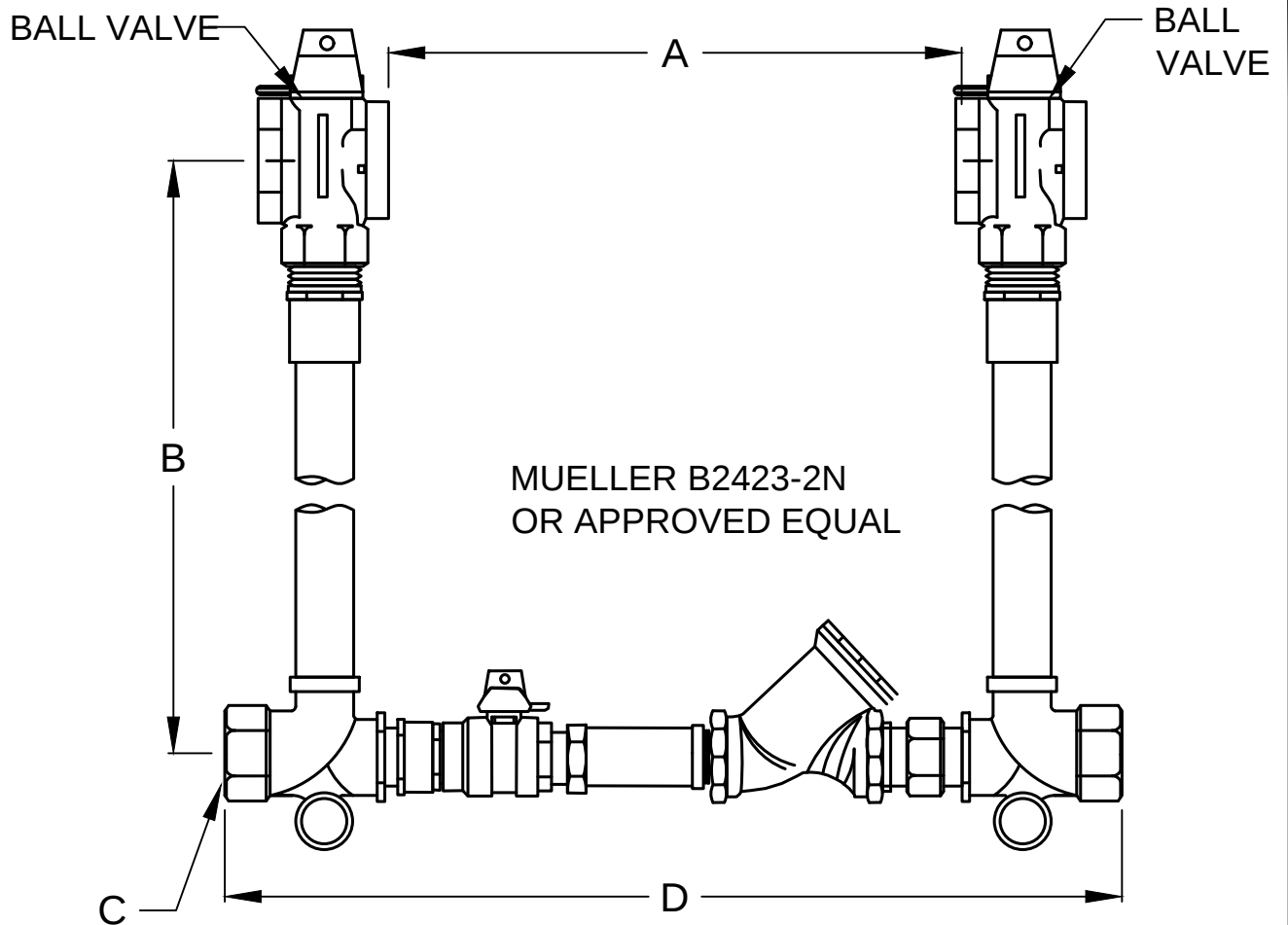
3/4", 1", 1-1/2", & 2"

SHEET:

WS-01

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



DIMENSIONS

METER SIZE	1-1/2"	2"
Dimension A	13.25"	17.25"
Dimension B - Riser Height	15", 18", 21", 24", 27"	15", 18", 21", 24", 27"
Dimension C - Nominal pipe size of inlet and outlet	1-1/2"	2"
Dimension D	21.50"	26.63"

NOTES:

1. COMPOUND METER SUPPLIED AND SET BY THE CITY. 2" SINGLE REGISTER METER REQUIRES PRE-APPROVAL.
2. BYPASS WILL BE LOCKED OFF BY CONSTRUCTION INSPECTOR WHEN METER SPREADER IS INSTALLED.

NOT TO SCALE



**City of
Tukwila**

METER

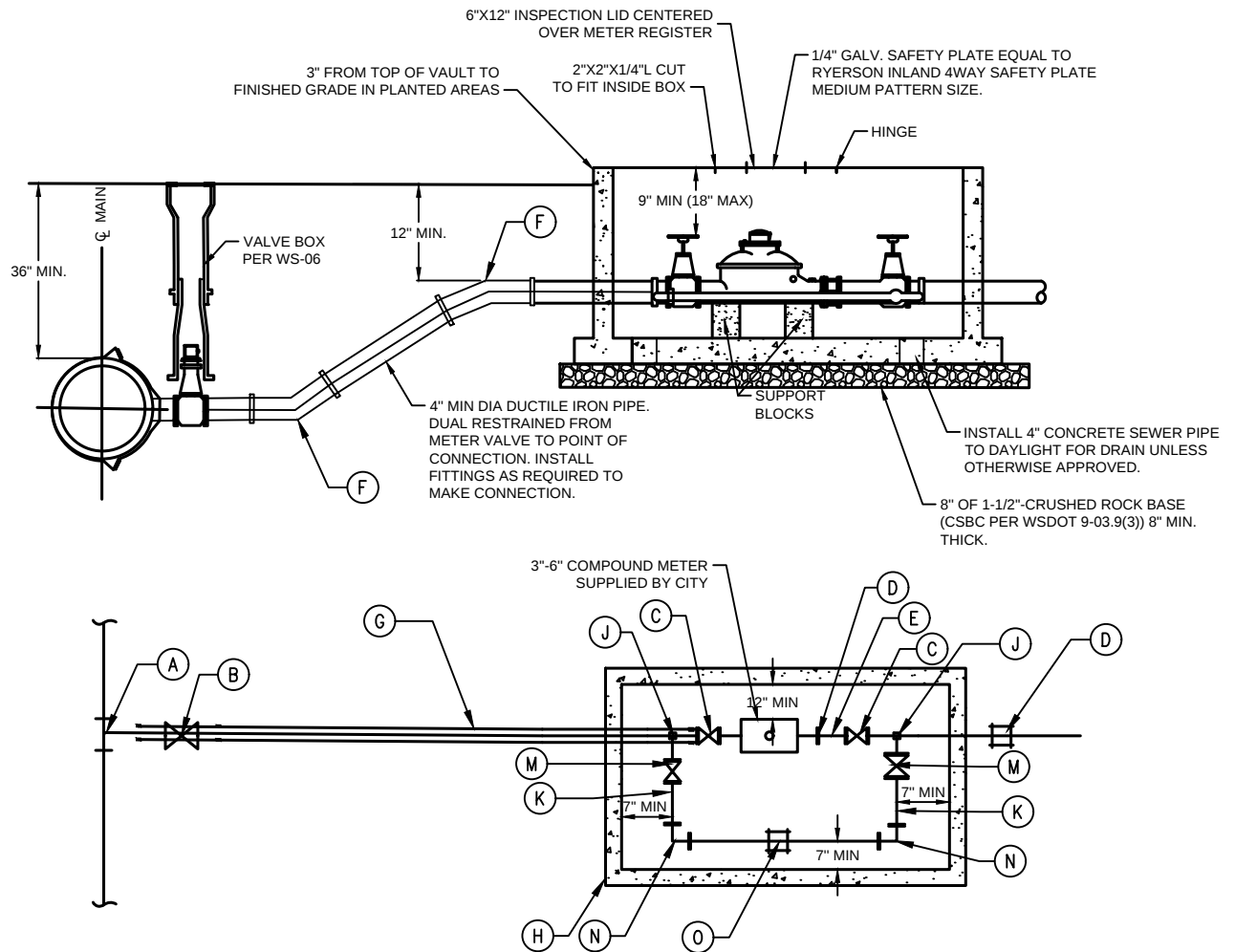
1-1/2" AND 2" METER SETTER

SHEET:

WS-02

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



MATERIAL LIST

- | | |
|---|---|
| (A) TAPPING TEE | (H) METER VAULT: 444-LA (3" & 4") 644-LA FOR 6" |
| (B) GATE VALVE | (J) DOUBLE STRAP SERVICE SADDLE WITH 2" IPS TAP |
| (C) METER VALVE | (K) 2" BRASS NIPPLE |
| (D) FLANGE COUPLING ADAPTER | (M) 2" BALL VALVE |
| (E) CL 52 DIP FLANGED BY PLAIN END SPOOL | (N) 90° BRASS ELBOW |
| (F) CONCRETE THRUST BLOCKS PER WS-10 | (O) 2" COMPRESSION COUPLER |
| (G) STEEL TIE RODS AND ROMAC DUCTILE LUGS | |

NOTES:

1. METERS 3"-6" SUPPLIED BY CITY.
2. VAULT SHALL BE PRECAST CONCRETE VAULT.
3. ALL PIPE & FITTINGS 4" AND LARGER SHALL BE CEMENT LINED, CL52.
4. PIPING FROM MAIN TO VAULT SHALL BE 4" ON 3" METER INSTALLATION, TEE WITH VALVE ON EXISTING MAIN REQUIRED.
5. BRASS FITTINGS 2" AND LESS SHALL BE LEAD FREE.
6. THE LID OF A VAULT INSTALLED IN A PEDESTRIAN PATH SHALL HAVE A SKID RESISTANT LID PER ADA REQUIREMENTS.

NOT TO SCALE



**City of
Tukwila**

METER

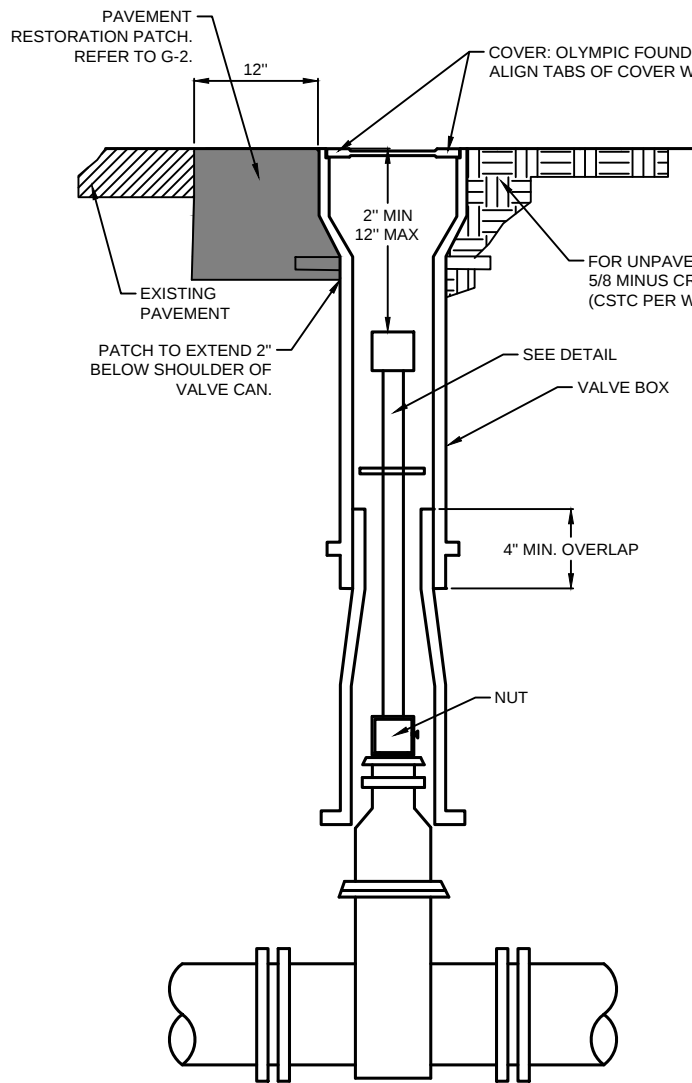
3" TO 6"

SHEET:

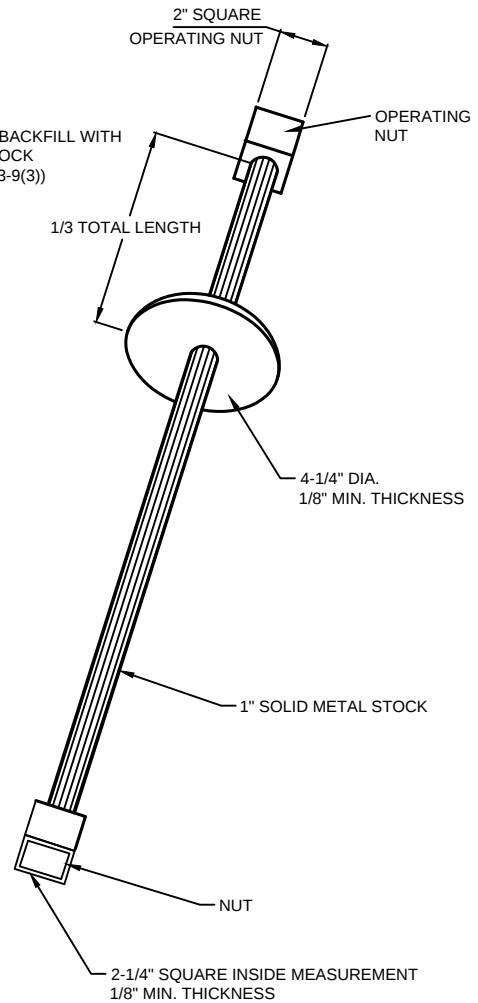
WS-04

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



ASSEMBLY



DETAIL

NOTES:

1. TWO PIECE CAST IRON VALVE BOX WITH STANDARD 24" BASE AND 18" TOP WITH 4" OVERLAP, OLYMPIC VALVE BOX OR EQUAL LIDS SHALL HAVE TAPS ALIGNED WITH PIPE LINE.
2. VALVE BOX COVER SHALL BE LABELED "WATER".
3. EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN 5 FEET BELOW FINISHED GRADE.
4. ONLY ONE EXTENSION, MINIMUM OF 4 FEET LONG, TO BE USED PER VALVE.
5. ALL EXTENSIONS ARE TO BE MADE OF STEEL AND PAINTED WITH TWO COATS OF METAL PAINT. NO FIELD-FABRICATED EXTENSIONS.

NOT TO SCALE



***City of
Tukwila***

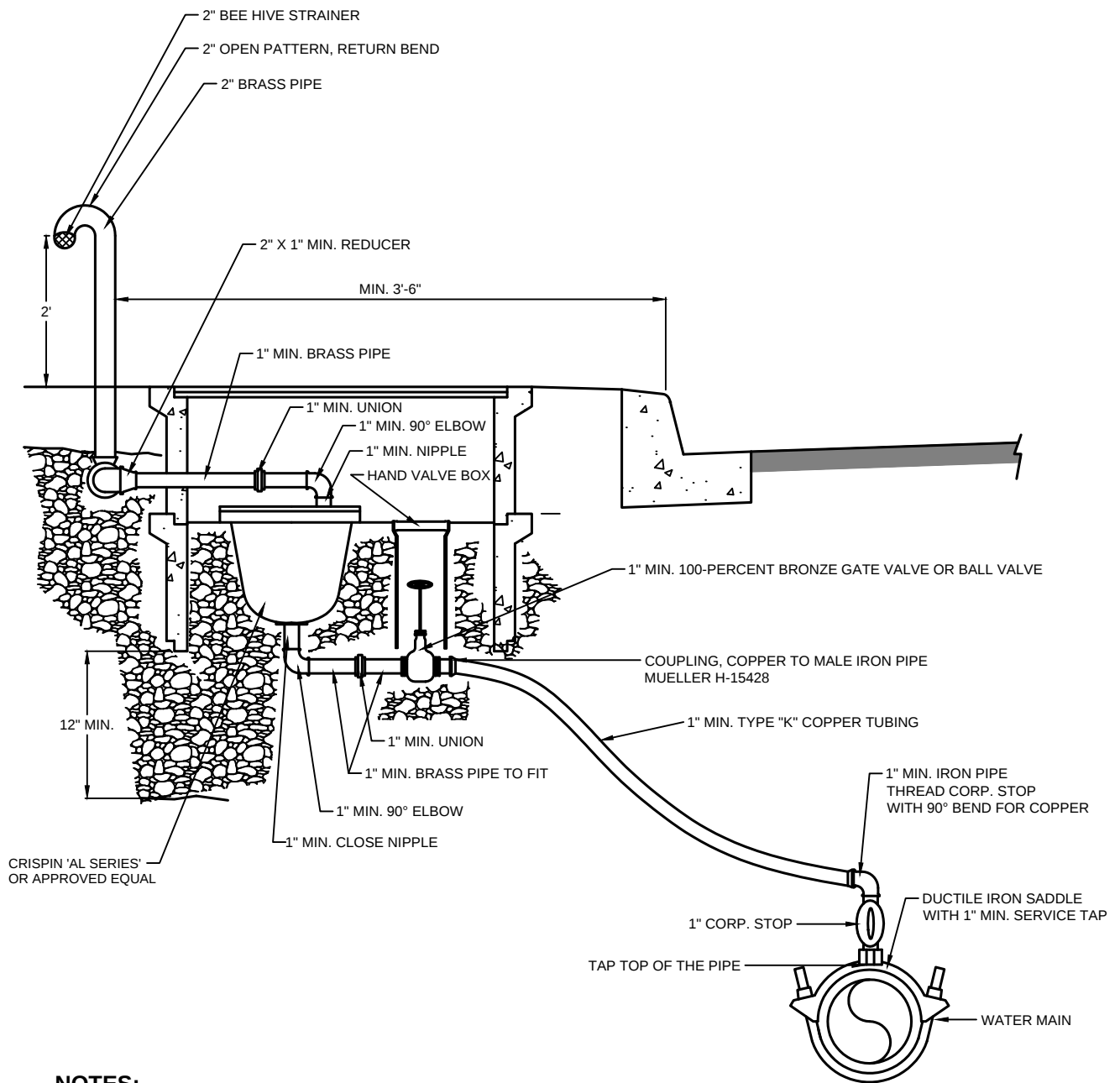
WATER MAIN

VALVE BOX WITH OPERATING NUT EXTENSION

SHEET: **WS-06**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. INSTALL AIR VALVE IN 17" X 28" CONCRETE METER BOX WITH 3/8" STEEL DIAMOND PLATE COVER, FOG-TITE METER SEAL CO. NO. 2 METER BOX OR EQUAL.
2. BED WITH GRAVEL BACKFILL FOR DRAINS (WSDOT 9-03.12(4))
3. INSTALL 10' MIN. DISTANCE FROM ANY VEHICULAR ACCESS OR PROTECT WITH BOLLARDS PER DIMENSIONS PROVIDED IN WS-14.
4. REFER TO CHAPTER 7 OF THE STANDARDS.
5. BRASS FITTINGS SHALL BE LEAD FREE.
6. THE LID OF A METER BOX INSTALLED IN A PEDESTRIAN PATH SHALL HAVE A SKID RESISTANT LID PER ADA REQUIREMENTS.

NOT TO SCALE



**City of
Tukwila**

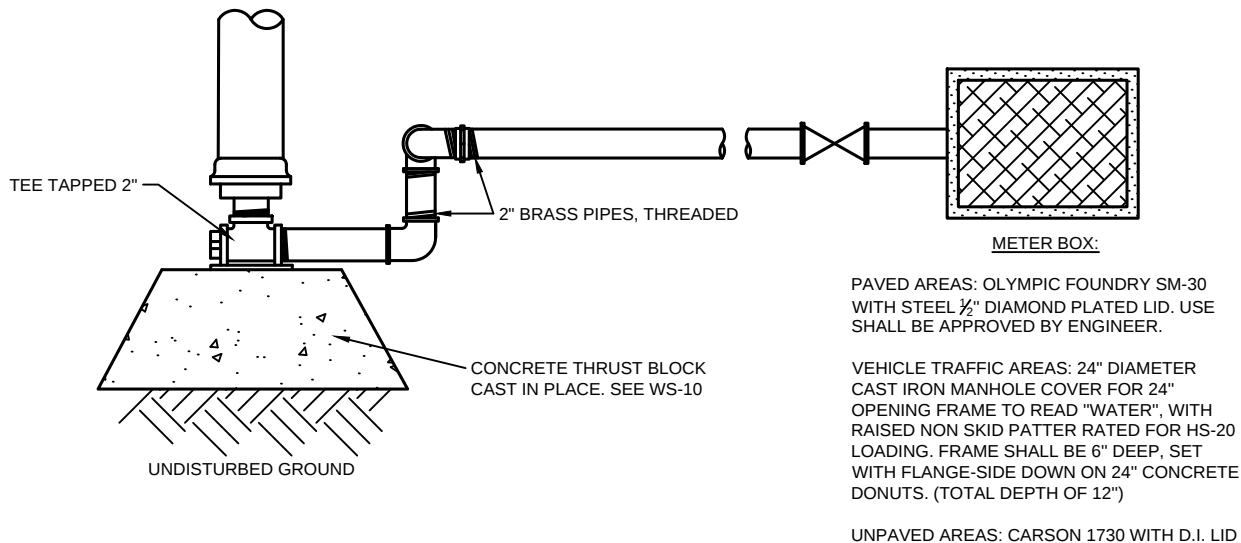
WATER MAIN

AIR AND VACUUM RELEASE (NON-TRAFFIC AREAS)

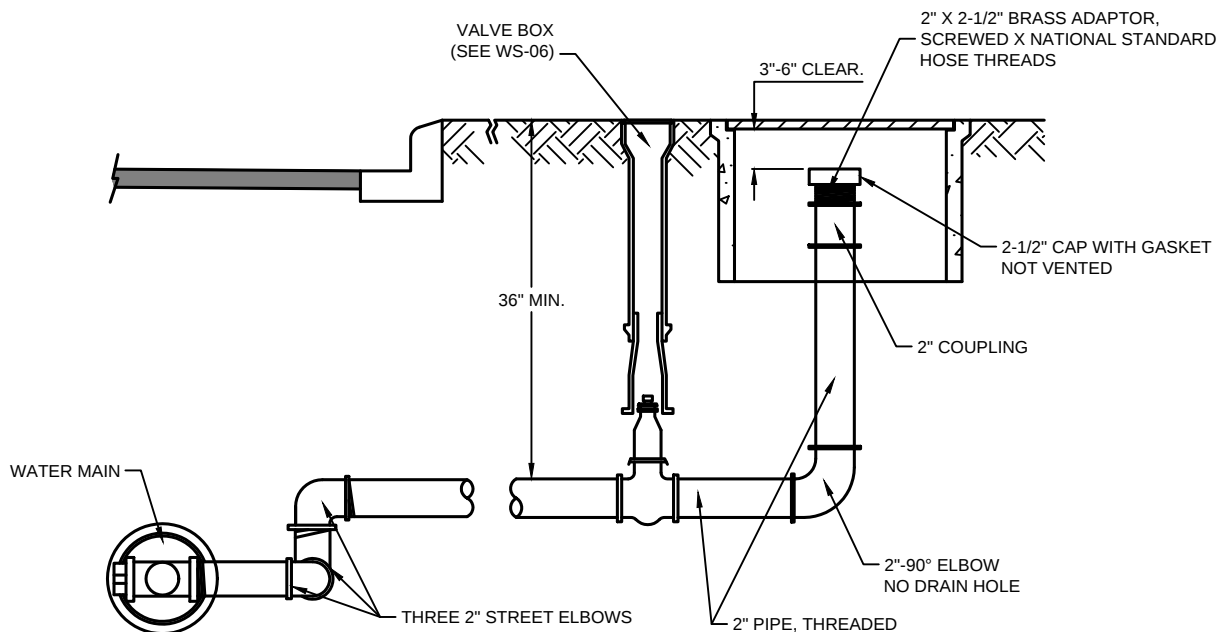
SHEET: WS-07

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



PLAN VIEW



ELEVATION VIEW

NOTES:

1. ALL PIPE BEYOND MAIN SHALL BE PAINTED BRASS
2. INSTALL CAST METAL VALVE MARKER POST AND EXTENSION PIPE ADJACENT TO METER BOX. PAINT WITH TWO COATS OF NON-CORROSIVE PROTECTIVE PAINT, PER A.W.W.A. STANDARDS.
3. REFER TO CHAPTER 7 OF THESE STANDARDS.
4. REFER TO WS-10 FOR BLOCKING, WS-06 FOR VALVE BOX.
5. BRASS FITTINGS SHALL BE LEAD FREE.
6. THE LID OF A METER BOX INSTALLED IN A PEDESTRIAN PATH SHALL HAVE A SKID RESISTANT LID PER ADA REQUIREMENTS.

NOT TO SCALE



*City of
Tukwila*

WATER MAIN

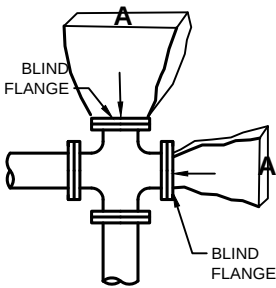
BLOW-OFF ASSEMBLY

SHEET:

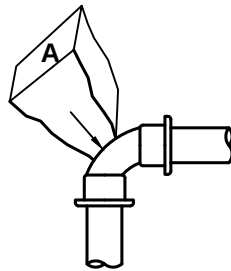
WS-09

LAST REVISION: APRIL 2019

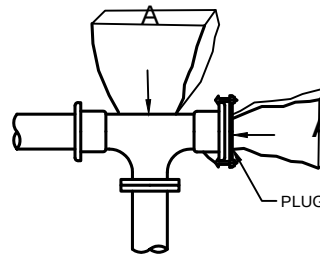
APPROVAL: H. PONNEKANTI



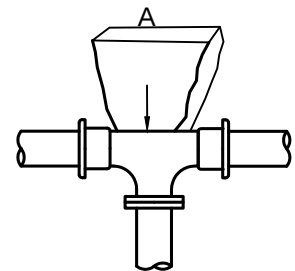
CAPPED CROSS



90° BEND



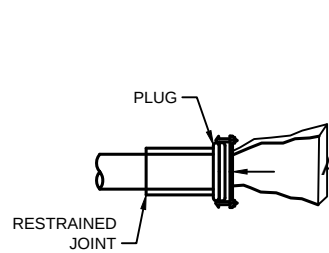
TEE W/ PLUG



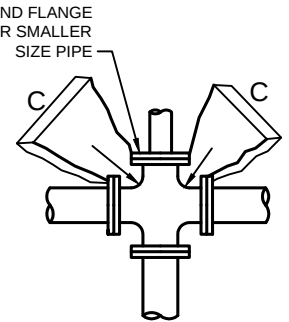
TEE W/O PLUG

THRUST BLOCKING SIZE
(SF AREA MEASURED AGAINST
NATIVE SOIL)

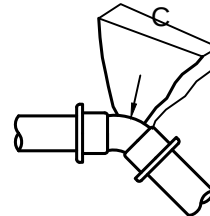
PIPE SIZE DIA	A (ft ²)	C (ft ²)	D (ft ²)	E (ft ²)
4"	4	2	1	1
6"	10	5	3	1
8"	18	10	5	2
10"	28	15	8	4
12"	40	22	11	6
14"	55	30	15	8
16"	71	39	20	10
18"	90	49	25	13
20"	111	60	31	15
22"	135	73	37	19
24"	160	87	44	22
28"	218	118	60	30
30"	251	136	69	35
36"	361	195	100	50
42"	491	266	135	68
48"	641	347	177	89



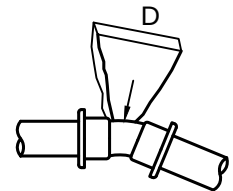
DEAD END



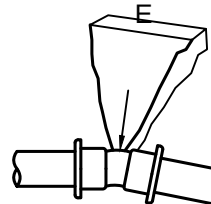
UNEQUAL CROSS



45° BEND



22-1/2° BEND



11-1/4° BEND

↖ = THRUST
DIRECTION

NOTES:

1. BEARING AREA OF CONCRETE THRUST-BLOCK BASED ON 250 PSI PRESSURE AND SAFE SOIL BEARING LOAD OF 1000 POUNDS PER SQUARE FOOT.
2. ADJUST BEARING AREA FOR OTHER PIPE SIZES, PRESSURES, AND SOIL CONDITIONS. SEE TABLE THIS SHEET FOR TYPE AND SAFE BEARING LOAD.
3. CONCRETE BLOCKING SHALL BE CAST IN PLACE AND HAVE A MINIMUM AREA OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING.
4. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATION PRESSURE UNDER ALL CONDITIONS OF SERVICE.
5. HEIGHT OF THRUST BLOCK MUST BE EQUAL TO OR LESS THAN 1/2 THE DEPTH FROM THE GROUND SURFACE TO THE BLOCK'S BASE.
7. REFER TO CHAPTER 7 OF THESE STANDARDS.

SOIL TYPE	SAFE BEARING LAOD (PSF)
MUCK, PEAT, ETC	0
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000
*VALUES BASED ON WSDOT STD PLAN B-90.40-01	

NOT TO SCALE



**City of
Tukwila**

BLOCKING (HORIZONTAL)

CONCRETE

SHEET: **WS-10 (1 OF 3)**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



**City of
Tukwila**

BLOCKING	
CONCRETE	
SHEET:	WS-10 (2 OF 3)
LAST REVISION: APRIL 2019	
APPROVAL: H. PONNEKANTI	

-THRUST BLOCKING SIZE
-ASSUMING 1000PSF SOIL PRESSURE
-DESIGN PRESSURE 250 PSI

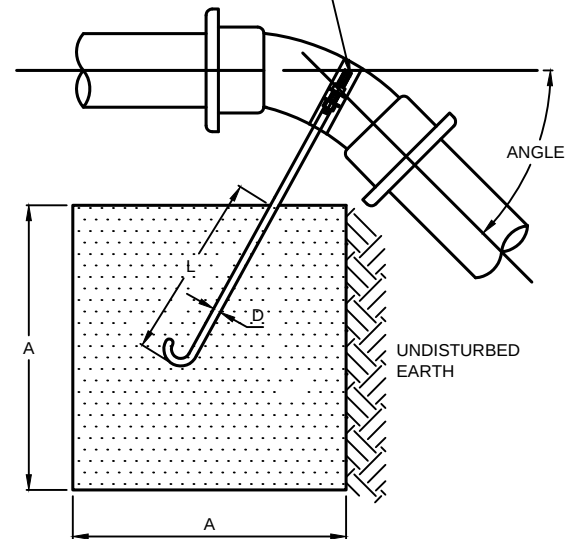
PIPE SIZE DIA	PIPE AREA SQ FT	PRESSURE (PSI)	HEAD (FT)	A 90° LOAD (LB)	A 90° AREA (SF)	C 45° LOAD (LD)	C 45° AREA (SF)	D 22.5° LOAD (LD)	D 22.5° AREA (SF)	E 11.25° LOAD (LD)	E 11.25° AREA (SF)
4	0.08727	250	577.5	4,454.46	4	2,410.74	2	1,228.96	1	617.62	1
6	0.19635	250	577.5	10,022.54	10	5,424.16	5	2,765.17	3	1,389.65	1
8	0.34907	250	577.5	17,817.85	18	9,642.95	10	4,915.86	5	2,470.49	2
10	0.54542	250	577.5	27,840.39	28	15,067.11	15	7,681.03	8	3,860.15	4
12	0.78540	250	577.5	40,090.16	40	21,696.64	22	11,060.68	11	5,558.61	6
14	1.06902	250	577.5	54,567.17	55	29,531.54	30	15,054.82	15	7,565.89	8
16	1.39627	250	577.5	71,271.40	71	38,571.80	39	19,663.44	20	9,881.97	10
18	1.76715	250	577.5	90,202.87	90	48,817.44	49	24,886.54	25	12,506.87	13
20	2.18167	250	577.5	111,361.57	111	60,268.44	60	30,724.12	31	15,440.58	15
22	2.63982	250	577.5	134,747.49	135	72,924.82	73	37,176.19	37	18,683.10	19
24	3.14160	250	577.5	160,360.65	160	86,786.56	87	44,242.74	44	22,234.44	22
28	4.27607	250	577.5	218,268.67	218	118,126.15	118	60,219.28	60	30,263.54	30
30	4.90875	250	577.5	250,563.52	251	135,604.00	136	69,129.27	69	34,741.31	35
36	7.06860	250	577.5	360,811.47	361	195,269.76	195	99,546.16	100	50,027.48	50
42	9.62115	250	577.5	491,104.51	491	265,783.83	266	135,493.38	135	68,092.97	68
48	12.56640	250	577.5	641,442.62	641	347,146.23	347	176,970.94	177	88,937.75	89

*FOR OTHER SOIL (BEARING) PRESSURE CONDITIONS, ADJUST BLOCK SIZING ACCORDINGLY.

NOT TO SCALE

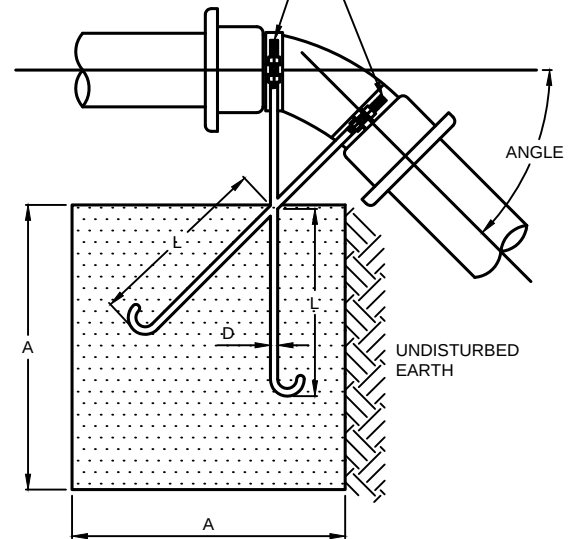
VERTICAL BLOCKING FOR 11 1/4°, 22 1/2°, 30° BENDS MINIMUM DIMENSIONS					
PIPE SIZE (INCHES)	V.B. (DEGREES)	CU. FT.	A (FEET)	D (INCHES)	L (FEET)
4	11 1/4	8	2.0	3/4	1.5
	22 1/2	11	2.2	3/4	2.0
	30	17	2.6	3/4	2.0
6	11 1/4	11	2.2	3/4	2.0
	22 1/2	25	2.9	3/4	2.0
	30	41	3.5	3/4	2.0
8	11 1/4	16	2.5	3/4	2.0
	22 1/2	47	3.6	3/4	2.0
	30	70	4.1	3/4	2.5
10-12	11 1/4	32	3.2	3/4	2.0
	22 1/2	88	4.5	7/8	3.0
	30	132	5.1	7/8	3.0
16	11 1/4	70	4.1	7/8	3.0
	22 1/2	184	5.7	1 1/8	4.0
	30	275	6.5	1 1/4	4.0
18-20	11 1/4	91	4.5	7/8	3.0
	22 1/2	225	6.1	1 1/4	4.0
	30	330	6.9	1 3/8	4.5
24	11 1/4	128	5.0	1	3.5
	22 1/2	320	6.8	1 3/8	4.5
	30	480	7.9	1 5/8	5.5
VERTICAL BLOCKING FOR 45° BENDS					
4	45	30	3.1	3/4	2.0
6		68	4.1	3/4	2.0
8		123	5.0	3/4	2.0
12		232	6.1	3/4	2.5
16		478	7.8	1 1/8	4.0
20		560	8.2	1 1/4	4.0
24		820	9.4	1 3/8	4.5

TWO EPOXY OR ASPHALT COATED STEEL
THREADED RODS AND ONE PIPE CLAMP.



- VERTICAL BLOCKING FOR
CONDITIONS IN SHADED AREA

FOUR EPOXY OR ASPHALT COATED STEEL
THREADED RODS AND TWO PIPE CLAMPS



- VERTICAL BLOCKING FOR
CONDITIONS IN UNSHADED AREA

NOT TO SCALE



**City of
Tukwila**

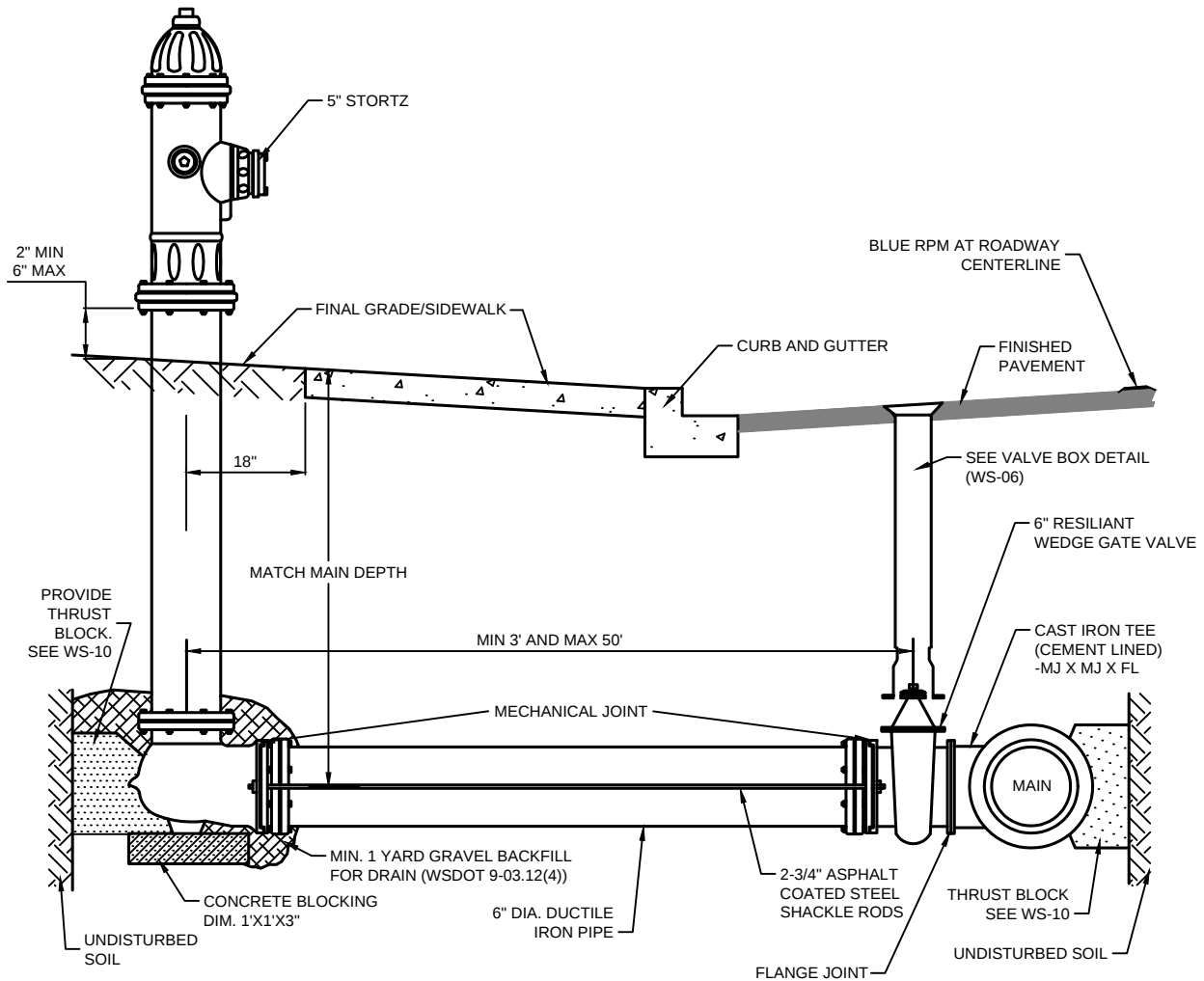
BLOCKING (VERTICAL)

CONCRETE

SHEET: WS-10 (3 OF 3)

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. REFER TO CHAPTER 7 OF THESE STANDARDS.
2. HYDRANTS EQUAL TO MUELLER SUPER CENTURION #A-423, CLOW MEDALLION #F-2545, M & H 929, OR EJIW # 5CD250 WATER MASTER.
3. HYDRANTS SHALL BE EQUIPPED WITH TWO 2-1/2" N.S.T. HOSE PORTS AND ONE 5" STORTZ PUMPER DISCHARGE PORT AND SHALL HAVE A 1-1/4" PENTAGON OPEN LIFT OPERATING NUT. HYDRANTS SHALL HAVE A 6" M.J. BOTTOM CONNECTION AND 5-1/4" MAIN VALVE OPENING.
4. HYDRANTS SHALL CONFORM TO A.W.W.A. SPECIFICATIONS C 502-54; SHALL BE COMPRESSION TYPE AND SHALL HAVE A TWO PIECE BREAKING FLANGE WITH BREAKING THIMBLE AT THE GROUND LINE OR STEM; SHALL HAVE A SELF-OILING DRY BONNET WITH FACTORY FILLED RESERVOIR HOLDING APPROXIMATELY 8 OUNCES OF OIL. OIL RESERVOIR SHALL BE SO DESIGNED AS TO GIVE A COMPLETE LUBRICATION OF STEMS EACH TIME THE HYDRANT IS OPERATED. THE UPPER STEM SHALL HAVE A BRASS SLEEVE.
5. SHACKLE RODS SHALL BE ASPHALT-COATED STEEL OR CORTEN STEEL.
6. CITY HYDRANTS BONNET AND PORT CAPS SHALL BE FARWEST COMPASS BLUE # 4602. BARREL SHALL BE FARWEST CASE YELLOW SAFETY X-3472.
7. PRIVATE HYDRANTS SHALL BE PAINTED WITH TWO COATS OF FARWEST CASE YELLOW (# X-3472).
8. WHERE NO CURB AND GUTTER IS INSTALLED, FIRE HYDRANT SHALL BE LOCATED CLOSE TO THE PROPERTY LINE AND INSIDE THE RIGHT OF WAY OR EASEMENT. INSTALL BOLLARD GUARD POST PER WS-14.
9. HYDRANTS INSTALLED, RELOCATED OR OTHERWISE WORKED UPON AS A RESULT OF A PROJECT SHALL BE FRESHLY PAINTED.
10. HYDRANT SHALL NOT BE CLOSER THAN 4' TO ANY FIXED OBJECT, WITH THE EXCEPTION OF HYDRANT GUARD POSTS, PER TMC 14.24.03.

NOT TO SCALE



**City of
Tukwila**

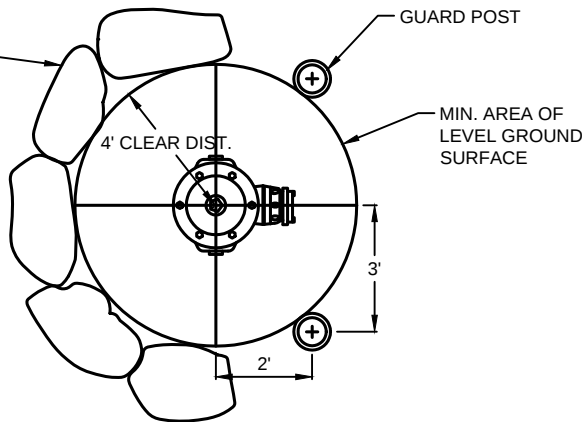
**FIRE HYDRANT
ASSEMBLY AND SETTING**

SHEET: **WS-13**

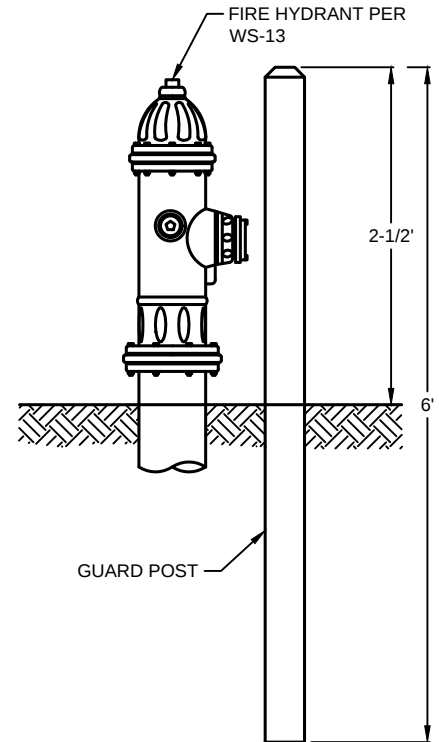
LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

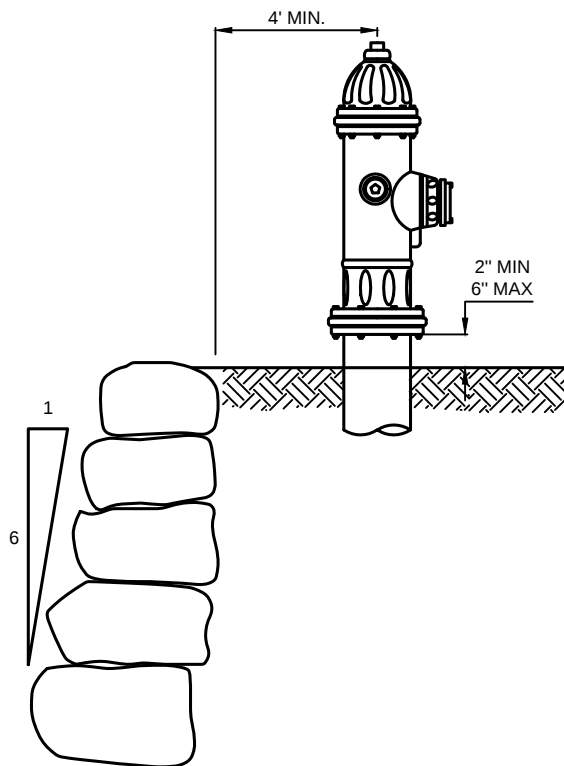
ROCK WALL,
PLANTINGS, OR
OTHER SURFACE
OBSTRUCTIONS



PLAN



**GUARD POST
ELEVATION**



NOTES:

1. GUARD POST SHALL BE EITHER CONCRETE FILLED STEEL PIPE (MIN. 4" DIA.) OR CONCRETE POST (MIN. 8" DIA.).
2. POSTS SHALL BE AT LEAST 3 FEET FROM THE CENTER OF THE HYDRANT AND SHALL NOT BE IN DIRECT LINE WITH ANY DISCHARGE PORTS.
3. POSTS SHALL BE 6 FEET LONG; 3-1/2 FEET SHALL BE BURIED.
4. PAINTED FINISH ON POSTS SHALL BE FARWEST CASE YELLOW #3472.

NOT TO SCALE



**City of
Tukwila**

FIRE HYDRANT

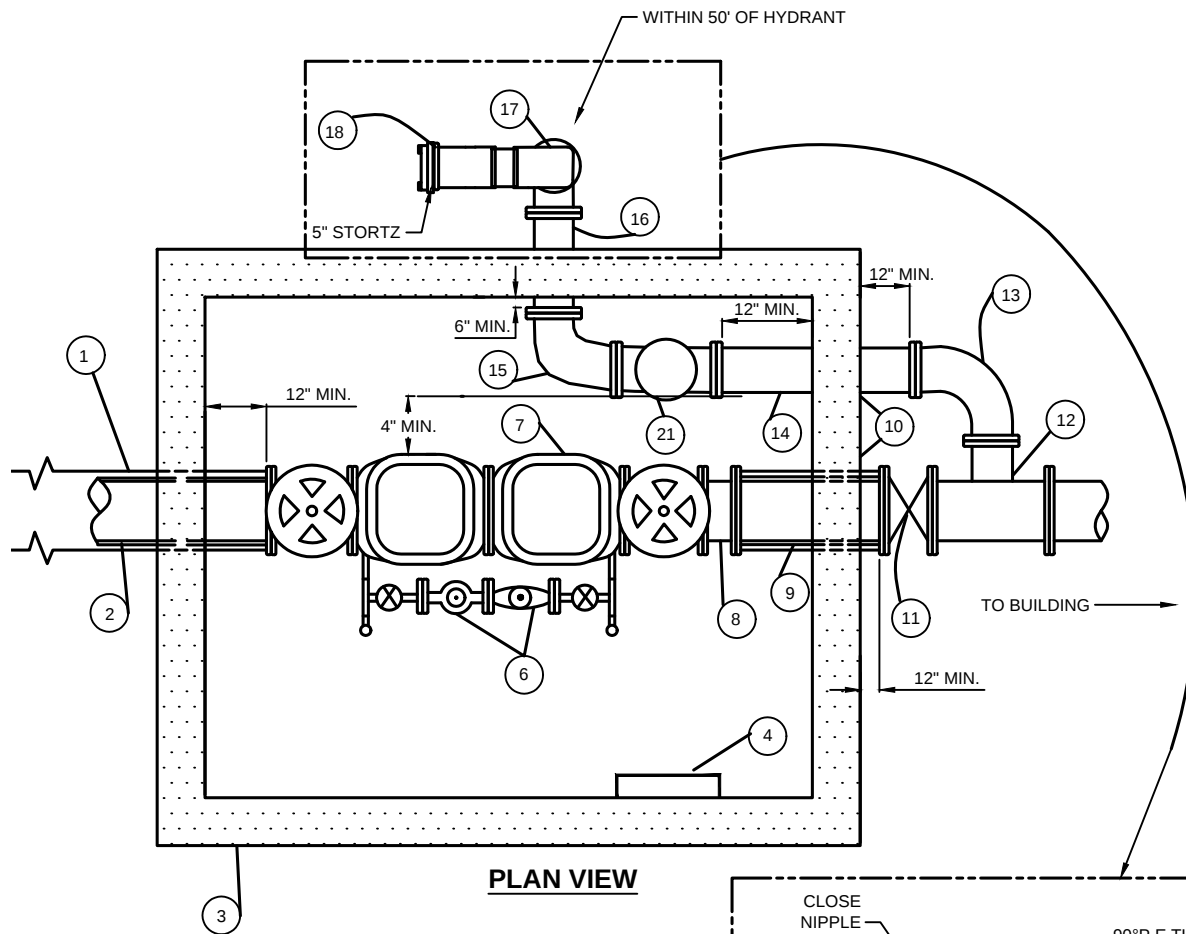
GUARD POST

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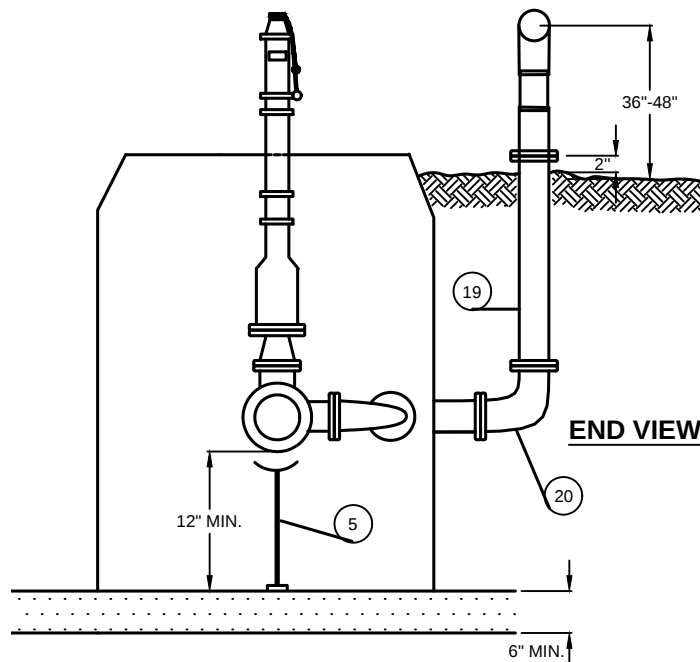
WS-14

LAST REVISION: APRIL 2019

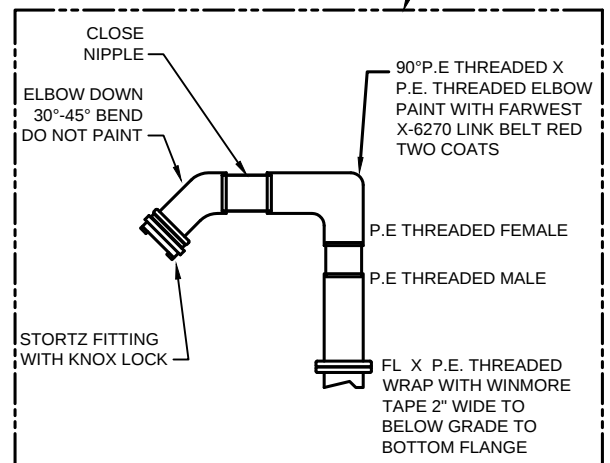
APPROVAL: H. PONNEKANTI



PLAN VIEW



END VIEW



SIDE VIEW

NOTES:

1. DESIGN FOR 4" THRU 10" DDCV.

**COMPACTED FOUNDATION
GRAVEL UNDER VAULT**

NOT TO SCALE



**City of
Tukwila**

**CROSS CONNECTION CONTROL
DETECTOR DOUBLE CHECK VALVE & VAULT**

SHEET: **WS-15 1 OF 2**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

MATERIAL LISTING:

1. 3/4" SHACKLE RODS WITH STAR BOLTS AND ASPHALT EMULSION COATING.
2. 4" MIN. D.I. CLASS 52 PIPE.
3. PRECAST CONCRETE VAULT WITH HINGED STEEL PLATE COVER, DIMENSION TO VARY WITH SIZE OF ASSEMBLY.
4. O.S.H.A. APPROVED LADDER IF OVER 30" DEEP.
5. PIPE SUPPORT STAND IN LOCATED INSIDE OF VAULT UNDER EACH CHECK VALVE.
6. COPPER OR BRONZE BYPASS WITH AN APPROVED DCVA AND 3/4" WATER METER.
7. APPROVED DCVA IN MAIN LINE WITH TWO RESILIENT SEATED SHUTOFF VALVES AND TEST COCKS.
8. 10", 8", 6" OR 4" COUPLING ADAPTER, FL.
9. 10", 8", 6" OR 4" FL*PE D.I. CLASS 52 PIPE LENGTH TO FIT.
10. GROUT INTERIOR AND EXTERIOR ALL AROUND PIPE USING NON-SHRINK GROUT.
11. 10", 8", 6" OR 4" GATE VALVE FL*MJ WITH POST INDICATOR VALVE.
12. FLANGE TEE ASSEMBLY SIZED ACCORDINGLY.
13. FLANGED 90 DEG BEND.
14. 4" OR 6" D.I. CLASS 52 PIPE FL*FL.
15. 4" OR 6" 90 DEG BEND FL.
16. 4" OR 6" D.I. CLASS 52 PIPE, FL*FL.
17. 4" OR 6" 90 DEG BEND, FL.
18. UL LISTED 5" STORTZ CONNECTION WITH KNOX LOCK WITH 30 DEG OR 45 DEG ELBOW.
19. 6" D.I. CLASS 52 PIPE LENGTH AS REQUIRED FLANGE * THREADED P.E.
20. 6" 90 DEG BEND FL.
21. SWING TYPE GRAVITY OPERATED CHECK VALVE WITH BALL DRIP VALVE TO BE INSTALLED HORIZONTALLY.

DETECTOR DOUBLE CHECK AND VAULT ASSEMBLY GENERAL NOTES:

1. BACKFLOW PREVENTORS SHALL BE ON WSDOH APPROVED LIST.
2. SIZE VAULT BASED ON SIZE OF APPARATUS AND MEETING MINIMUM CLEARANCES.
3. A SEPARATE DETAIL PLAN FOR VAULT INSTALLATION AND SPRINKLER LINE MUST BE SUBMITTED AND APPROVED BY THE FIRE MARSHALL PRIOR TO INSTALLATION.
4. MINIMUM APPARATUS SIZE SHALL BE 4".
5. VAULT SHALL BE SEALED TO PREVENT WATER LEAKAGE.
6. LADDERS SHALL BE REQUIRED WHEN DEPTH FROM TOP OF LID TO FLOOR OF VAULT EXCEEDS 30". INSTALLATION OF ALL LADDERS SHALL BE IN COMPLIANCE TO O.S.H.A.
7. LOCATE VAULT IN PLANTING AREA AND NOT IN PAVING AREA, UNLESS APPROVED BY THE ENGINEER.
8. FITTINGS SHALL BE IN ACCORDANCE WITH ALL APPLICABLE REQUIREMENTS OF ANSI/AWWA C110/A21.10 AND CEMENT LINED (SEE APWA & AWWA).
9. PIPE SHALL BE DUCTILE IRON MEETING ANSI A21.51, CL52 & CEMENT LINED.
10. TEMPORARY SUPPORT SHALL BE PROVIDED UNDER VALVES AT THE TIME OF INSTALLATION. AFTER COMPLETE INSTALLATION INSTALL PERMANENT PIPE SUPPORT STAND.
11. PROVIDE BALL DRIP VALVES ON F.D.C. CHECK VALVE ASSEMBLY OR AT BOTTOM OF F.D.C. RISER.
12. FIRE DEPARTMENT CONNECTION TO BE PROVIDED WITH ONE (1) 5" STORTZ CONNECTIONS WITH KNOX LOCK AND TWO 30 DEG OR 45 DEG ELBOWS.
13. ALL UNDERGROUND PIPING TO BE INSPECTED, FLUSHED, AND PRESSURE TESTED IN THE PRESENCE OF AN INSPECTOR PRIOR TO COVER AND CONNECTION TO THE OVERHEAD SYSTEM.
14. UPON INSTALLATION, BACKFLOW PREVENTION ASSEMBLIES ARE TO BE TESTED BY A CERTIFIED TESTER AND ALL TEST-COCKS ARE TO BE PLUGGED AFTER THE TEST. THEREAFTER, ANNUAL TESTS SHALL BE PERFORMED AT OWNER'S EXPENSE, AND COPIES OF TEST RESULTS SHALL BE PROVIDED.
15. CONCRETE VAULT SHALL HAVE ONE 4' X 4' OR TWO 3' X 3' STEEL HINGED DOORS.
16. BACKFLOW PREVENTION VALVES AND POST OR WALL INDICATING VALVES SHALL BE PROVIDED WITH UL CENTRAL STATION TAMPER SUPERVISION.

NOT TO SCALE



*City of
Tukwila*

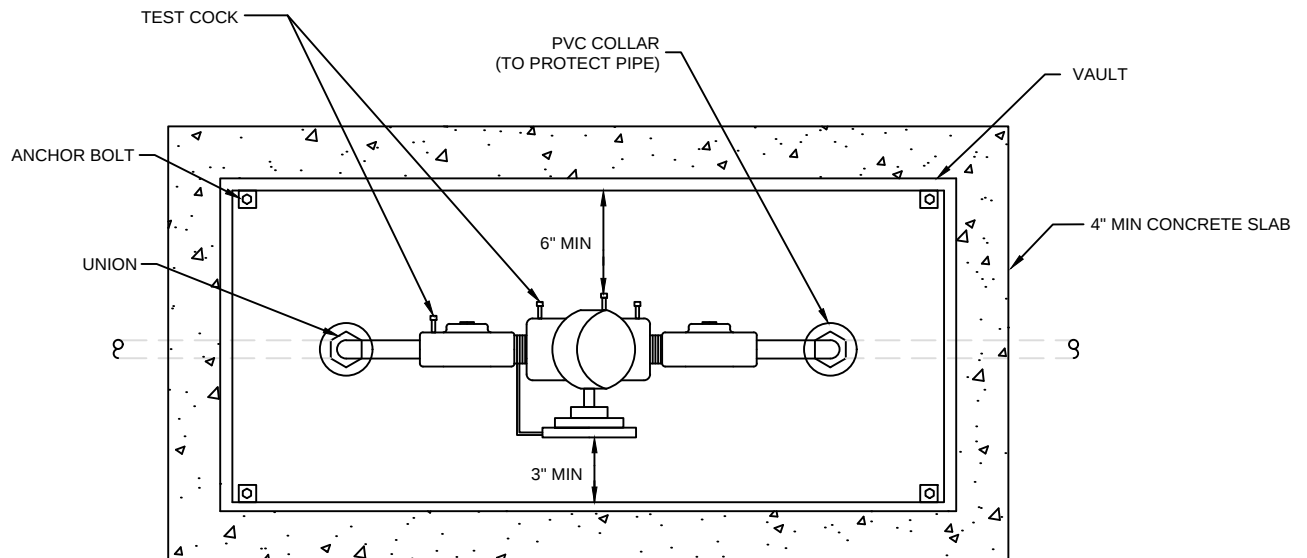
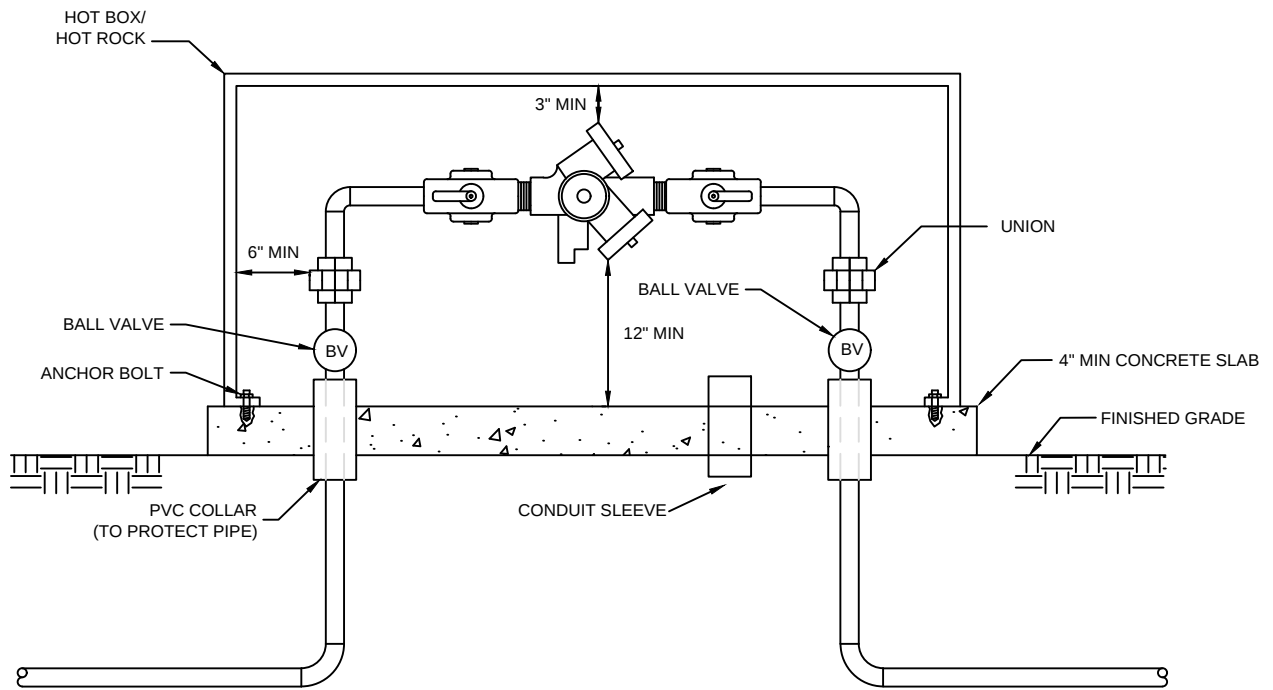
CROSS CONNECTION CONTROL

DETECTOR DOUBLE CHECK VALVE AND VAULT

SHEET: **WS-15 2 OF 2**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOT TO SCALE



**City of
Tukwila**

**2" AND SMALLER REDUCED PRESSURE
BACKFLOW ASSEMBLY INSTALLATION**

SHEET: **WS-21 (1 OF 2)**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

NOTES;

1. THE RPBA SHALL BE SELECTED FROM WSDOH APPROVED LIST.
2. THE RPBA SHALL BE INSTALLED WITH ADEQUATE SPACE TO FACILITATE MAINTENANCE AND TESTING. IT SHALL BE TESTED AFTER INSTALLATION, BY A WASHINGTON STATE CERTIFIED BACK-FLOW ASSEMBLY. TESTER, TO INSURE ITS SATISFACTORY OPERATION BEFORE OCCUPANCY AND ANNUALLY THEREAFTER. A COPY OF THE TEST RESULTS SHALL BE GIVEN TO THE PUBLIC WORKS INSPECTOR.
3. AN RPBA SHALL NOT BE INSTALLED IN A PIT BELOW GROUND LEVEL.
4. THE FREEZE PROTECTION ENCLOSURE FOR THE RPBA MUST INCLUDE A DAYLIGHT DRAIN. THE DRAIN MUST BE ABLE TO BE BORE SIGHTED. IT MUST BE INSTALLED ABOVE GROUND LEVEL. THE DRAIN MUST ALSO BE ABLE TO HANDLE THE VOLUME OF WATER THAT POTENTIALLY COULD BE DISCHARGED FROM THE RELIEF PORT.
5. THE FREEZE PROTECTION ENCLOSURE SHALL BE SUPPORTED BY A MIN. FOUR (4) INCH CONCRETE SLAB WITH FOUR (4) ANCHOR BOLTS ATTACHING THE COVERING TO THE SLAB.
6. RPBA MUST BE PROTECTED FROM FREEZING.
7. AN RPBA INSTALLED MORE THAN FIVE (5) FEET ABOVE FLOOR LEVEL MUST HAVE A PLATFORM UNDER IT FOR THE TESTER OR MAINTENANCE PERSON TO STAND ON. THE PLATFORM MUST BE OSHA APPROVED AND MEET ALL APPLICABLE SAFETY STANDARDS AND CODES.
8. WHEN THE RPBA IS LOCATED INSIDE A BUILDING IT SHALL BE INSTALLED IN A LOCATION WHERE BOTH THE OCCASIONAL SPITTING FROM THE RELIEF PORT AND THE POSSIBLE CONSTANT DISCHARGE DURING A FOULED CHECK VALVE SITUATION WILL NOT BE OBJECTIONABLE. AN APPROVED AIR GAP FUNNEL ASSEMBLY, EITHER PROVIDED BY THE MANUFACTURER OF FABRICATED FOR SPECIFIC INSTALLATION, MAY BE INSTALLED TO HANDLE THE OCCASIONAL SPITTING OF THE RELIEF VALVE DUE TO PRESSURE FLUCTUATIONS. A LINE FROM THIS FUNNEL ASSEMBLY MAY THEN BE RUN TO AN ADEQUATELY SIZED FLOOR DRAIN OF EQUAL OR GREATER SIZE. IT MUST BE EMPHASIZED THAT THE AIR GAP FUNNEL ASSEMBLY WILL HANDLE ONLY THE OCCASIONAL SPITTING AND WILL NOT CONTROL FLOW IN A CONTINUOUS RELIEF SITUATION.
9. A PVC COLLAR SHALL BE INSTALLED BETWEEN THE PIPE AND CONCRETE SLAB.
10. A UNION SHALL BE INSTALLED ON THE RISERS TO AID IN REMOVAL OF THE ASSEMBLY.
11. BALL VALVES WILL BE INSTALLED ON THE RISERS TO AID IN THE TESTING AND MAINTENANCE OF THE ASSEMBLY.
12. ALL BRASS FITTINGS SHALL BE LEAD FREE.

NOT TO SCALE



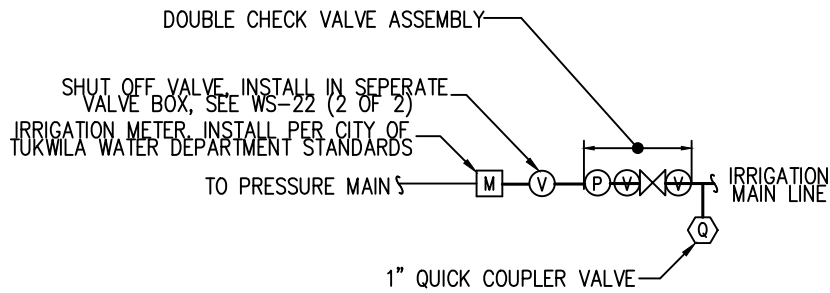
***City of
Tukwila***

**2" AND SMALLER REDUCED PRESSURE
BACKFLOW ASSEMBLY INSTALLATION**

SHEET: **WS-21 (2 OF 2)**

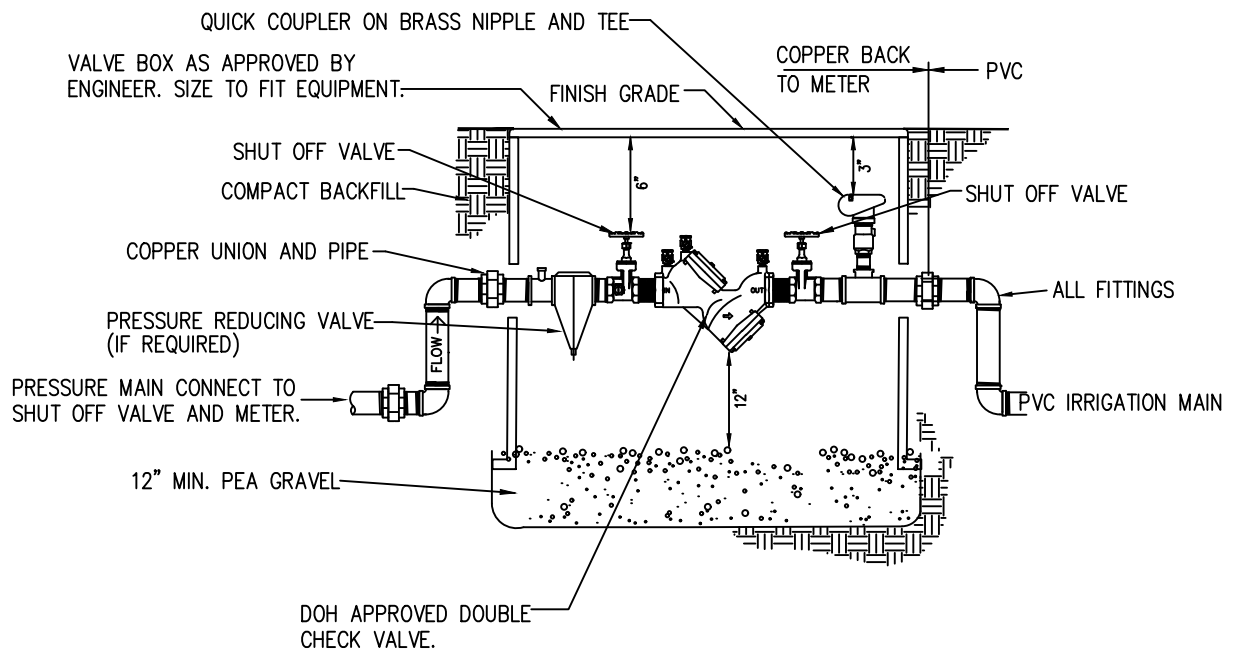
LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTE:
CONNECTION TO PRESSURE MAIN SHALL NOT BE MADE UNTIL IRRIGATION MAIN LINE IS PRESSURE TESTED. SEE INSTALLATION DETAIL THIS SHEET.

TYPICAL POINT OF CONNECTION ASSEMBLY
NTS



DETAIL DOUBLE CHECK VALVE ASSEMBLY
NTS

NOTES;

1. ALL INSTALLATIONS MUST MEET MINIMUM STANDARDS OF THE UNIFORM PLUMBING CODE AND WSDOH APPROVED INSTALLATIONS LIST.
2. TESTING IS REQUIRED BY A WSDOH CERTIFIED BACKFLOW ASSEMBLY TESTER UPON INSTALLATION AND ANNUALLY THEREAFTER. ASSEMBLY TO BE MAINTAINED BY THE OWNER.

NOT TO SCALE



**City of
Tukwila**

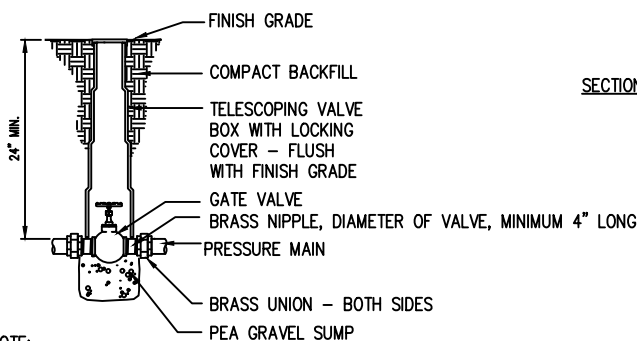
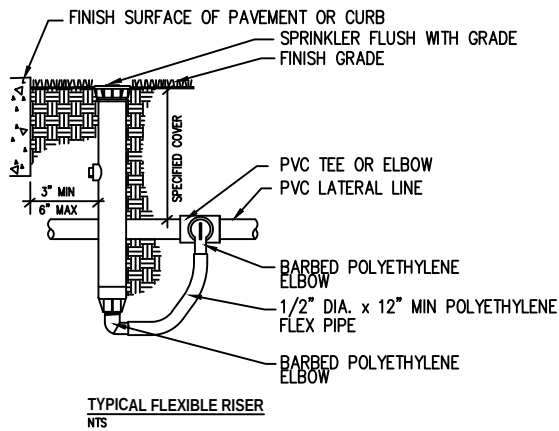
IRRIGATION SYSTEM (CITY OWNED)

DOUBLE CHECK VALVE ASSEMBLY

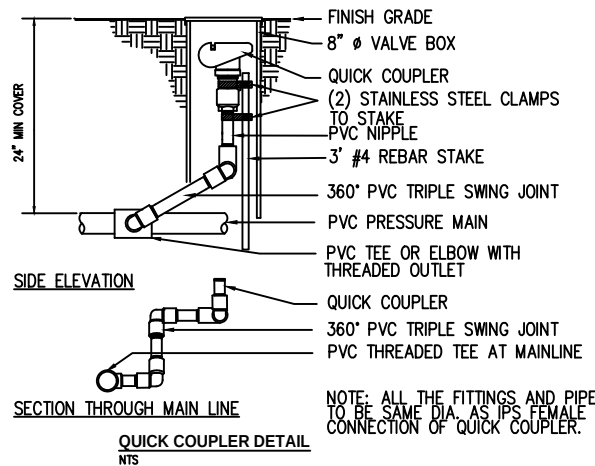
SHEET: **WS-22 (1 OF 2)**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTE:
ONLY ONE VALVE PER VALVE BOX.
SEAL ALL THREADED JOINTS WITH
TEFLON TAPE ON MALE THREADS
ONLY



NOTES;

1. ALL INSTALLATIONS MUST MEET MINIMUM STANDARDS OF THE UNIFORM PLUMBING CODE AND WSDOH APPROVED INSTALLATIONS LIST.

NOT TO SCALE



**City of
Tukwila**

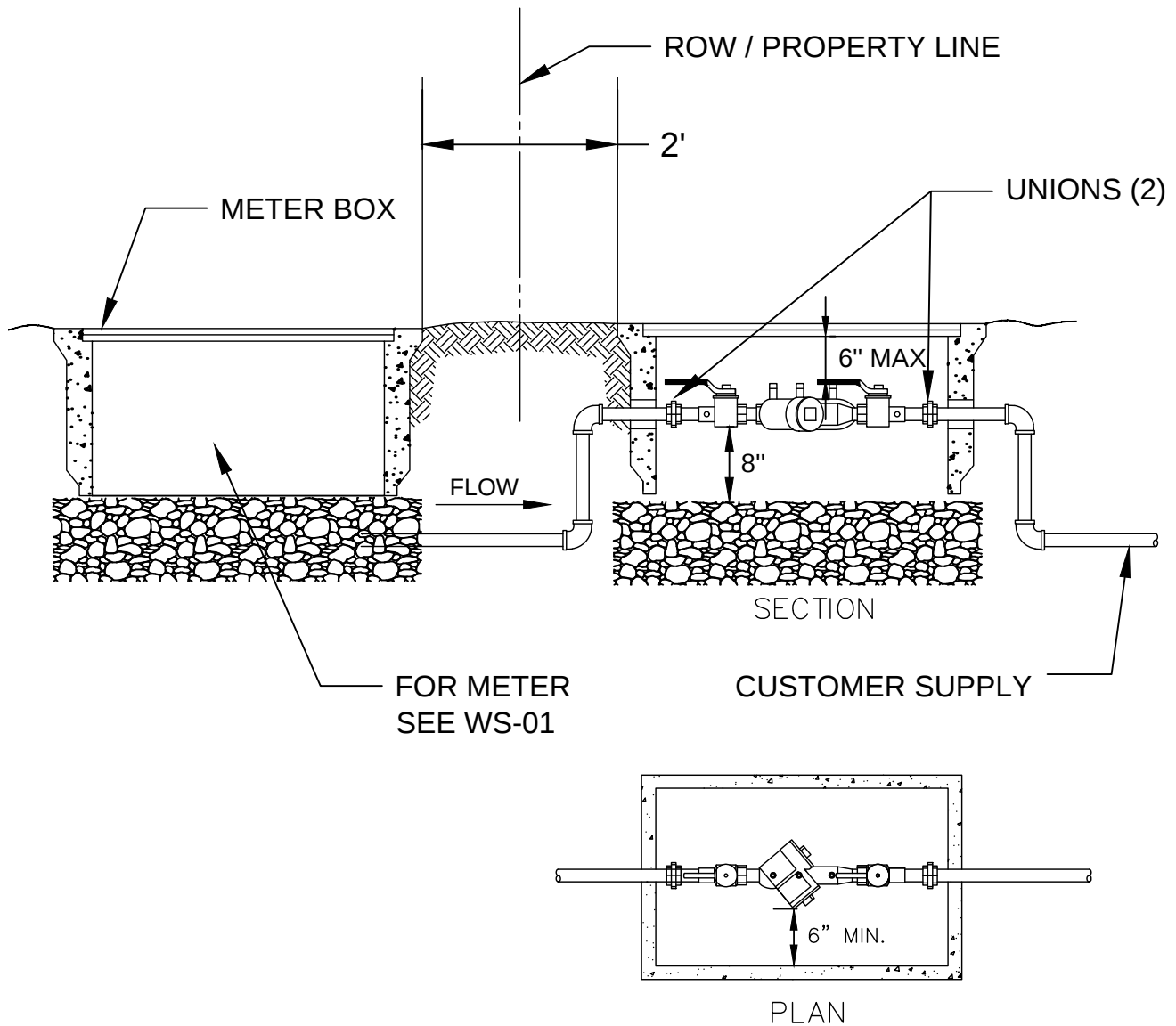
IRRIGATION SYSTEM (CITY OWNED)

SYSTEM COMPONENTS

SHEET: WS-22 (2 OF2)

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. DCVA MUST BE SELECTED FROM WSDOH APPROVED INSTALLATIONS LIST, MUST BE TESTED UPON INSTALLATION BY A WSDOH CERTIFIED BACKFLOW ASSEMBLY TESTER, AND MUST BE TESTED ANNUALLY THEREAFTER BY THE OWNER.
2. THE BACKFLOW ASSEMBLY BOX/ENCLOSURE WILL BE SET AT THE SAME GRADE AS THE METER BOX UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. ADDITIONAL ROOM MAY BE REQUIRED FOR TESTING AND MAINTENANCE.
4. WHEN TEST COCKS ARE FACING SIDWAYS THERE MUST BE A MIN. OF 6" CLEARANCE FROM THE SIDE OF THE VAULT.
5. TEST COCKS MUST BE PLUGGED.
6. FOR VEHICLE TRAVEL AREA, USE TRAFFIC RATED BOX AS APPROVED BY THE ENGINEER.

NOT TO SCALE



**City of
Tukwila**

2" & SMALLER DOUBLE CHECK VALVE

DCVA FOR PRIVATE USE

SHEET:

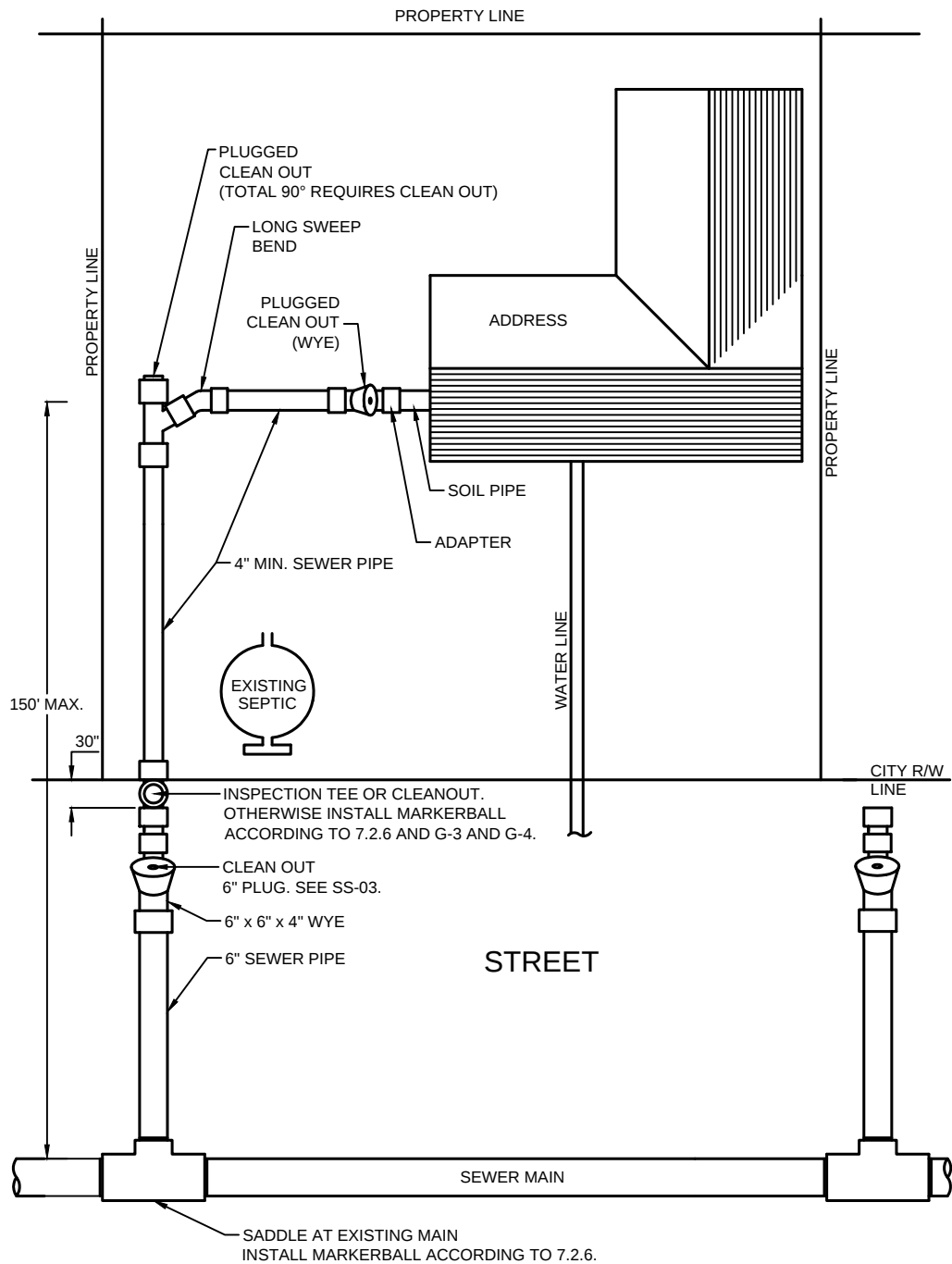
WS-23

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

SECTION 9.4 SANITARY SEWER STANDARD DETAILS

- SS-01 Not In Use
- SS-02 Sanitary Side Sewer - Residential
- SS-03 Sanitary Side Sewer – Clean Out
- SS-04 Manhole - 48" and 54"
- SS-05 Manhole - 48" and 54" (shallow)
- SS-06 Manhole – 72" (Type 1A4 and 1B4)
- SS-07 Manhole – 72" and 96" (shallow)
- SS-08 Manhole – Access and Channelization
- SS-09 Manhole – Inside Drop
- SS-10 Manhole – Drop Connection
- SS-11 Manhole – 24" Frame with Cover
- SS-12 Manhole – Hanging Ladder
- SS-13 Manhole – Polypropylene Safety Step
- SS-14 Grease Interceptor – Single Vault with Double Baffle



NOTES:

1. MATERIALS AND INSTALLATION CHAPTER 8 OF THESE STANDARDS.
2. DECOMMISSION SEPTIC TANK PER CHAPTER 8 OF THESE STANDARDS AND KING COUNTY HEALTH DEPARTMENT.
3. WATER AND SEWER LINE SEPARATION 10' HORIZONTALLY. IF WATER AND SEWER LINES CROSS, SEWER SHALL BE AT LEAST 18" BELOW THE WATER LINE.
4. STANDARDS FOR SEWER MAIN APPLY TO CONNECTIONS LONGER THAN 150' FROM THE MAIN. SEE CHAPTER 8.

NOT TO SCALE



**City of
Tukwila**

SANITARY SIDE SEWER

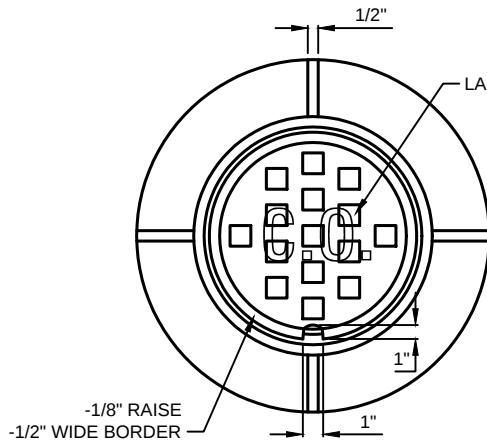
RESIDENTIAL

SHEET:

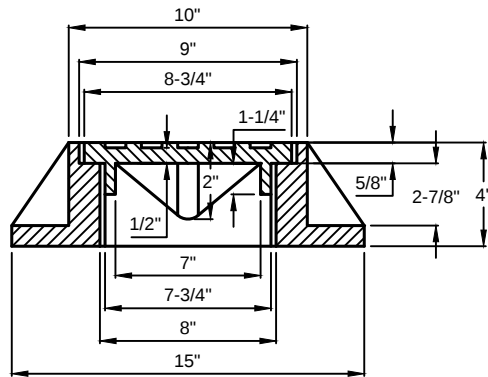
SS-02

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

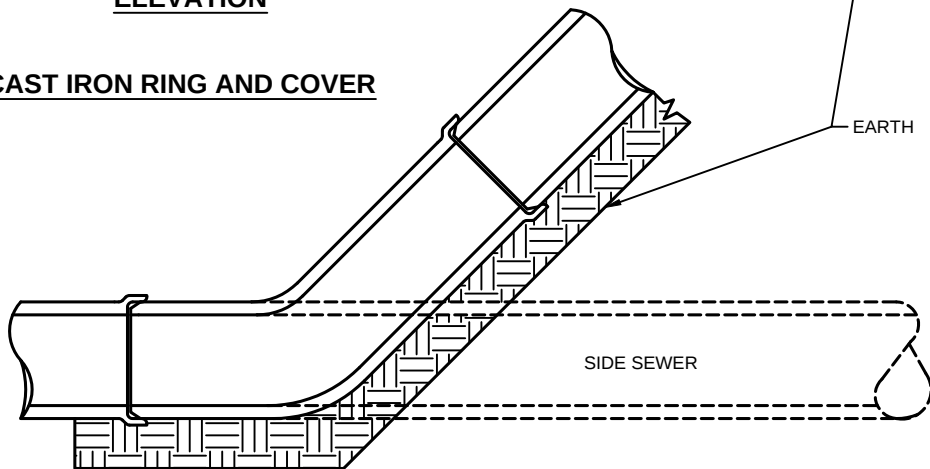


PLAN VIEW

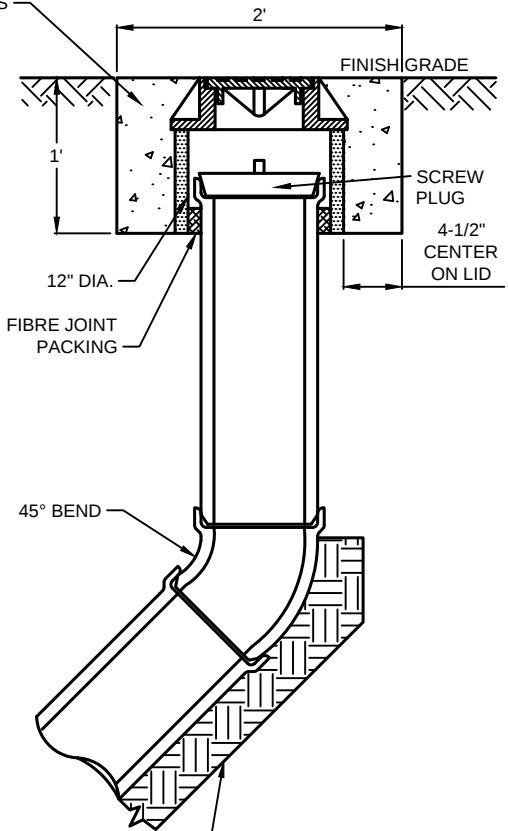


ELEVATION

CAST IRON RING AND COVER



CONCRETE
COLLAR IN
PAVED AREAS.
CSTC COLLAR IN
NONPAVED
AREAS



NOT TO SCALE



**City of
Tukwila**

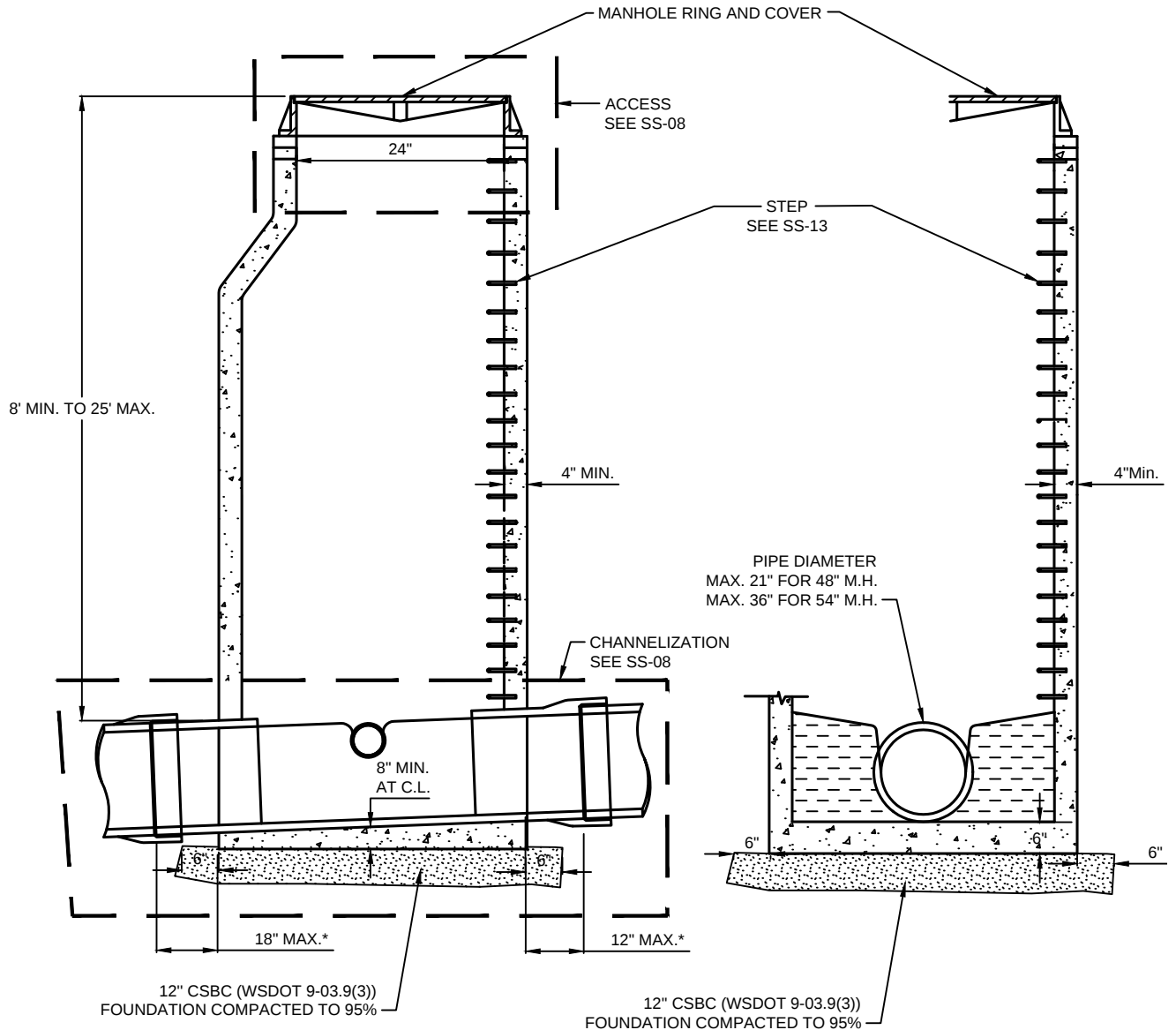
SANITARY SIDE SEWER

CLEAN-OUT

SHEET: **SS-03**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. MAX. PIPE DIAMETER MAY BE LIMITED BY PIPE CONFIGURATION OR AS DETERMINED BY ENGINEER.
2. RUBBER GASKET AND GROUT AT ALL JOINTS IN MANHOLE SECTIONS.
3. GROUT ALL LIFTING EYE HOLES.
4. SEE SS-13 FOR STEP DETAIL OR SS-12 FOR LADDER DETAILS.
5. INSTALL PER CHAPTER 8 OF THESE STANDARDS.

* APPLIES TO 24" OR SMALLER DIAMETER PIPES.

NOT TO SCALE



**City of
Tukwila**

MANHOLE

48" AND 54"

SHEET:

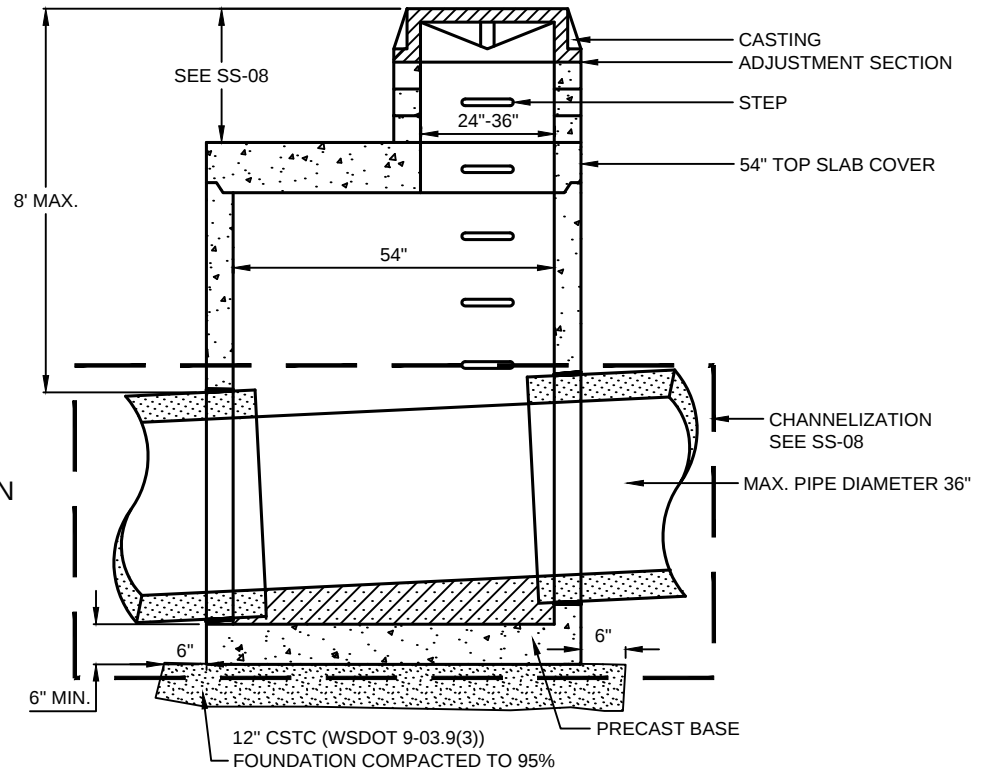
SS-04

LAST REVISION: APRIL 2019

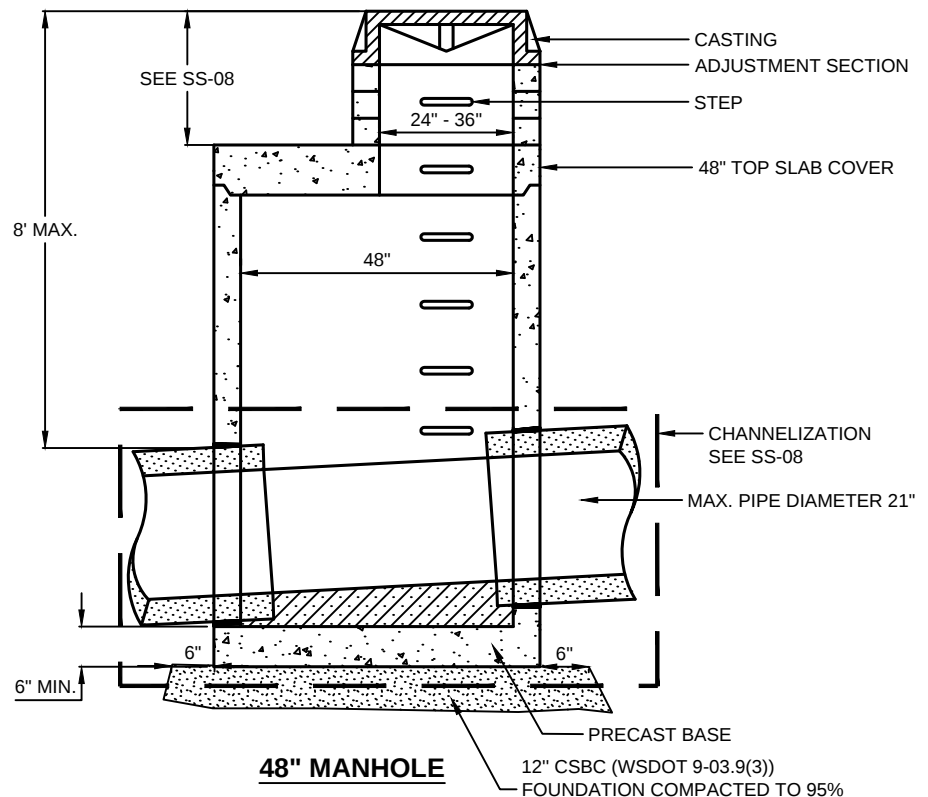
APPROVAL: H. PONNEKANTI

NOTES:

1. 36" ACCESS OPENING REQUIRED WHEN INVERT ELEVATION TO RIM IS LESS THAN 4'. EJIW PRODUCT NO. 41600540A01 OR APPROVED EQUAL.
2. MAX. PIPE DIAMETER MAY BE LIMITED BY PIPE CONFIGURATION.
3. RUBBER GASKET AND GROUT ALL JOINTS IN MANHOLE SECTIONS.
4. SEE SS-13 FOR STEP DETAIL OR SS-12 FOR LADDER DETAILS.
5. SEE SS-11 FOR CASTING.
6. INSTALL PER CHAPTER 8 OF THESE STANDARDS.



54" MANHOLE



48" MANHOLE

NOT TO SCALE



**City of
Tukwila**

MANHOLE

48" AND 54" (SHALLOW)

SHEET:

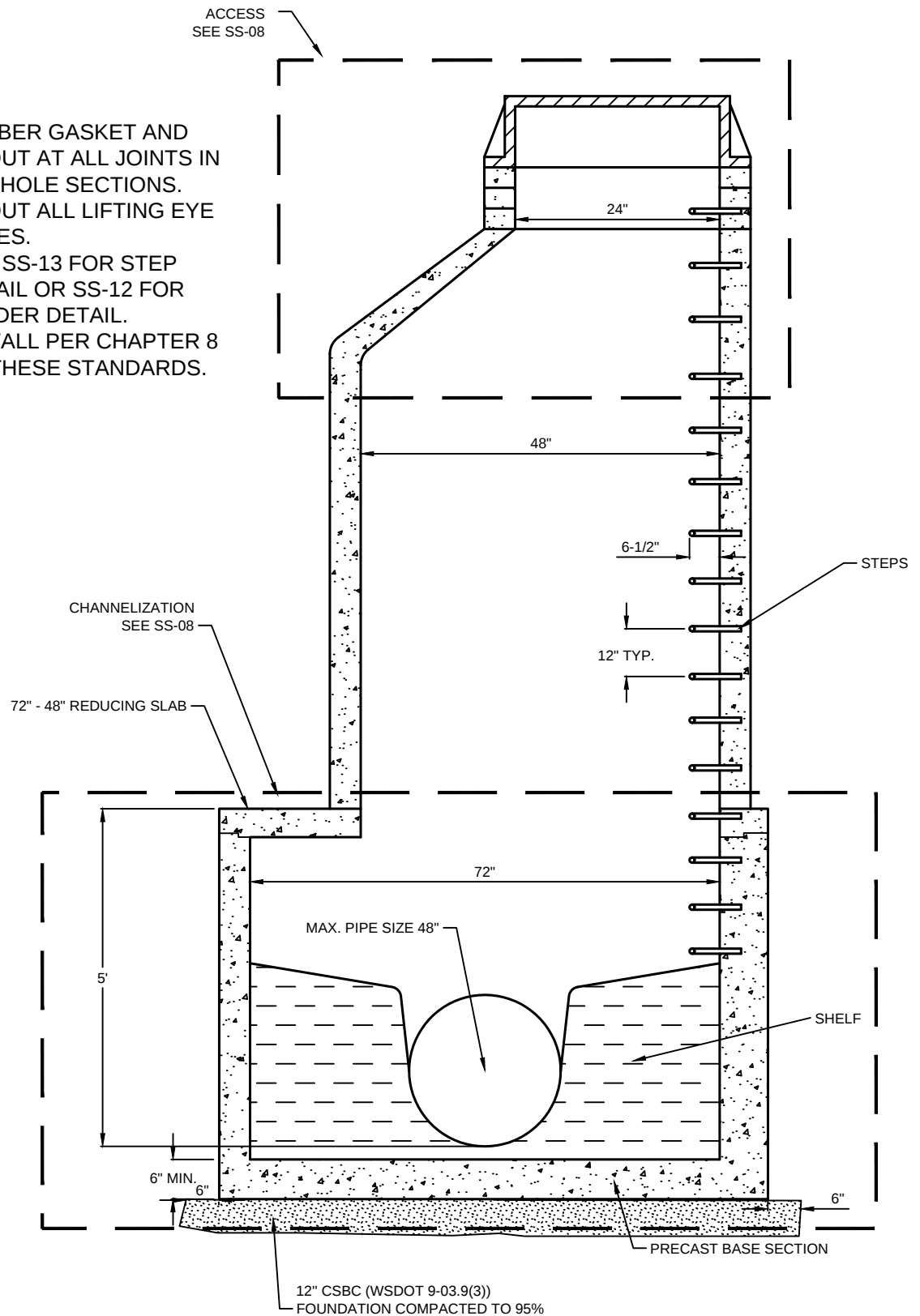
SS-05

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

NOTES:

1. RUBBER GASKET AND GROUT AT ALL JOINTS IN MANHOLE SECTIONS.
2. GROUT ALL LIFTING EYE HOLES.
3. SEE SS-13 FOR STEP DETAIL OR SS-12 FOR LADDER DETAIL.
4. INSTALL PER CHAPTER 8 OF THESE STANDARDS.



NOT TO SCALE



**City of
Tukwila**

MANHOLE

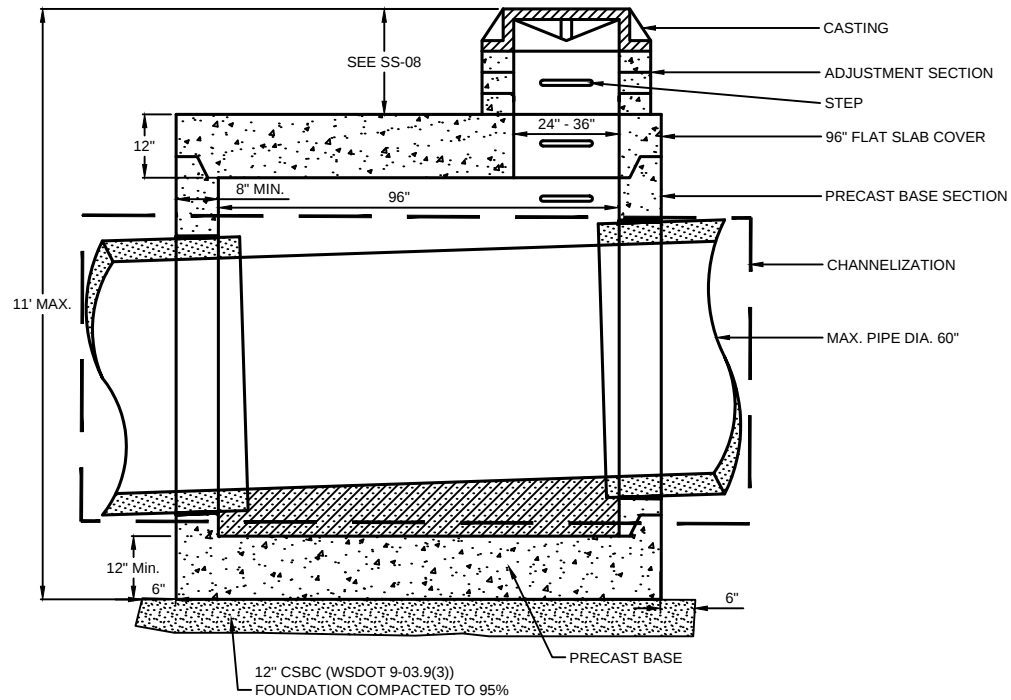
72"

SHEET:

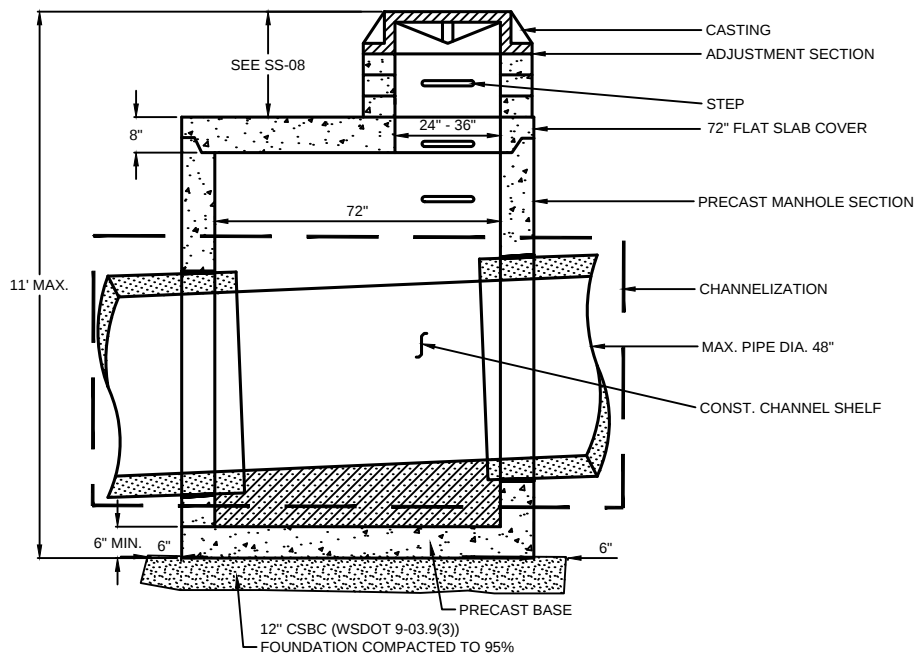
SS-06

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



96" MANHOLE



72" MANHOLE

NOTES:

1. LOCATE ACCESS OVER CHANNEL.
2. MAX. PIPE DIAMETER MAY BE LIMITED BY PIPE CONFIGURATION OR AS DETERMINED BY ENGINEER.
3. RUBBER GASKET AND GROUT AT ALL JOINTS IN MANHOLE SECTIONS.
4. GROUT ALL LIFTING EYE HOLES.
5. SEE SS-12 AND SS-13 FOR LADDER AND STEP DETAIL.
6. INSTALL PER CHAPTER 8 OF THESE STANDARDS.

NOT TO SCALE



**City of
Tukwila**

MANHOLE

72" AND 96" (SHALLOW)

SHEET:

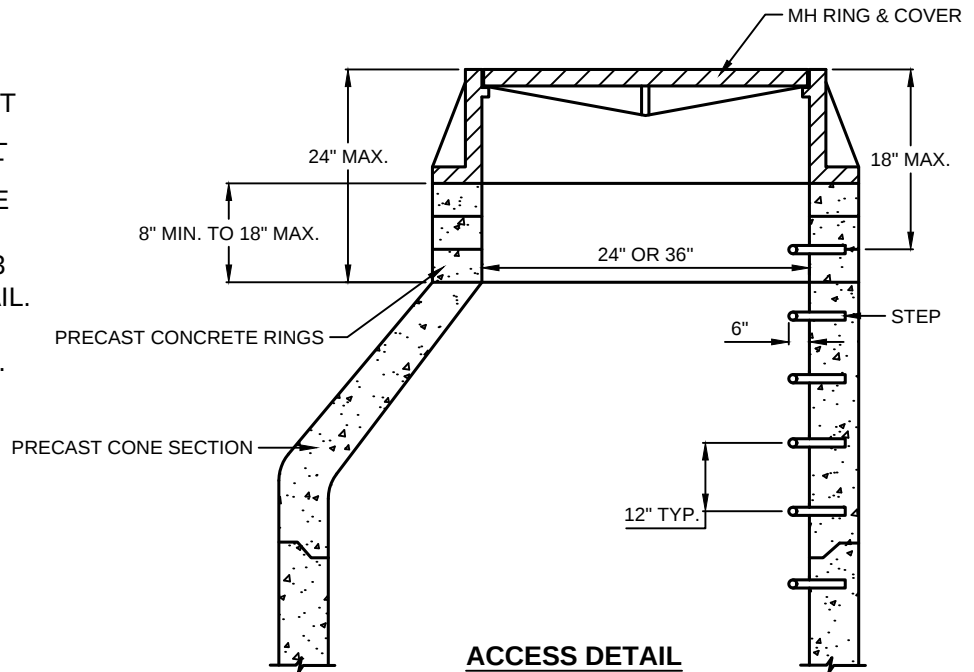
SS-07

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

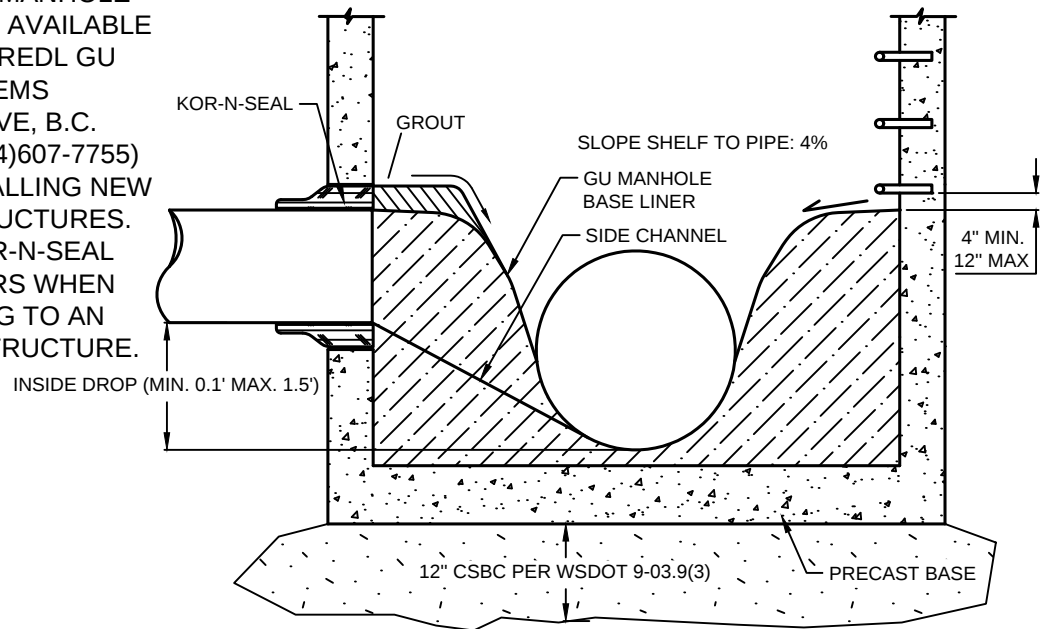
NOTES:

1. RUBBER GASKET & GROUT AT ALL JOINTS. GROUT ALL LIFTING EYE HOLES.
2. REFER TO SS-13 FOR STEP DETAIL.
3. SEE SS-12 FOR LADDER DETAIL.



NOTES:

1. INSTALL GU MANHOLE BASE LINER, AVAILABLE THROUGH PREDL GU LINER SYSTEMS (ALDERGROVE, B.C. CANADA (604)607-7755) WHEN INSTALLING NEW SEWER STRUCTURES.
2. INSTALL KOR-N-SEAL CONNECTORS WHEN CONNECTING TO AN EXISTING STRUCTURE.



NOT TO SCALE



**City of
Tukwila**

MANHOLE

ACCESS AND CHANNELIZATION

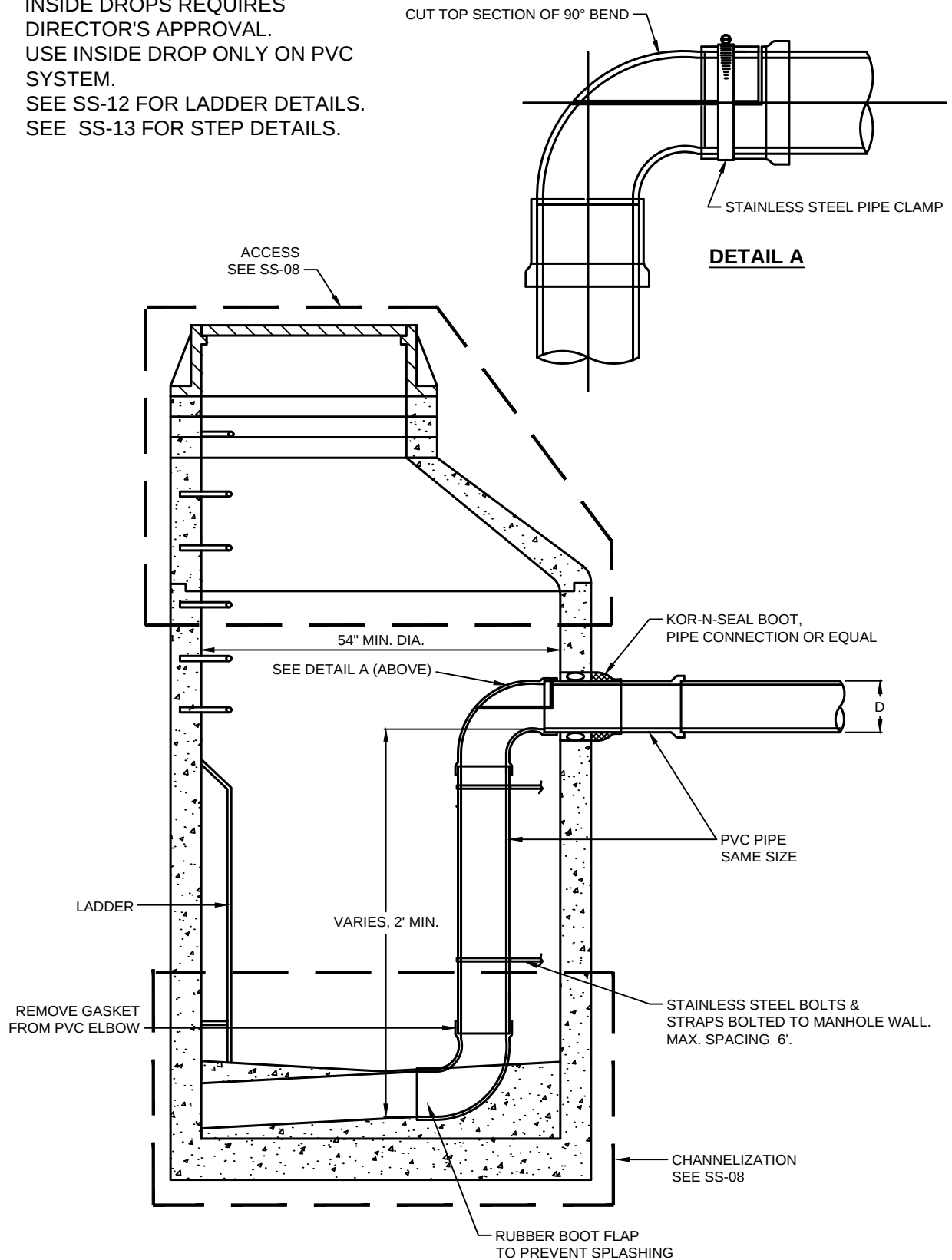
SHEET: SS-08

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

NOTES:

1. INSIDE DROPS REQUIRES DIRECTOR'S APPROVAL.
2. USE INSIDE DROP ONLY ON PVC SYSTEM.
3. SEE SS-12 FOR LADDER DETAILS.
4. SEE SS-13 FOR STEP DETAILS.



NOT TO SCALE



**City of
Tukwila**

**MANHOLE
INSIDE DROP**

SHEET: **SS-09**

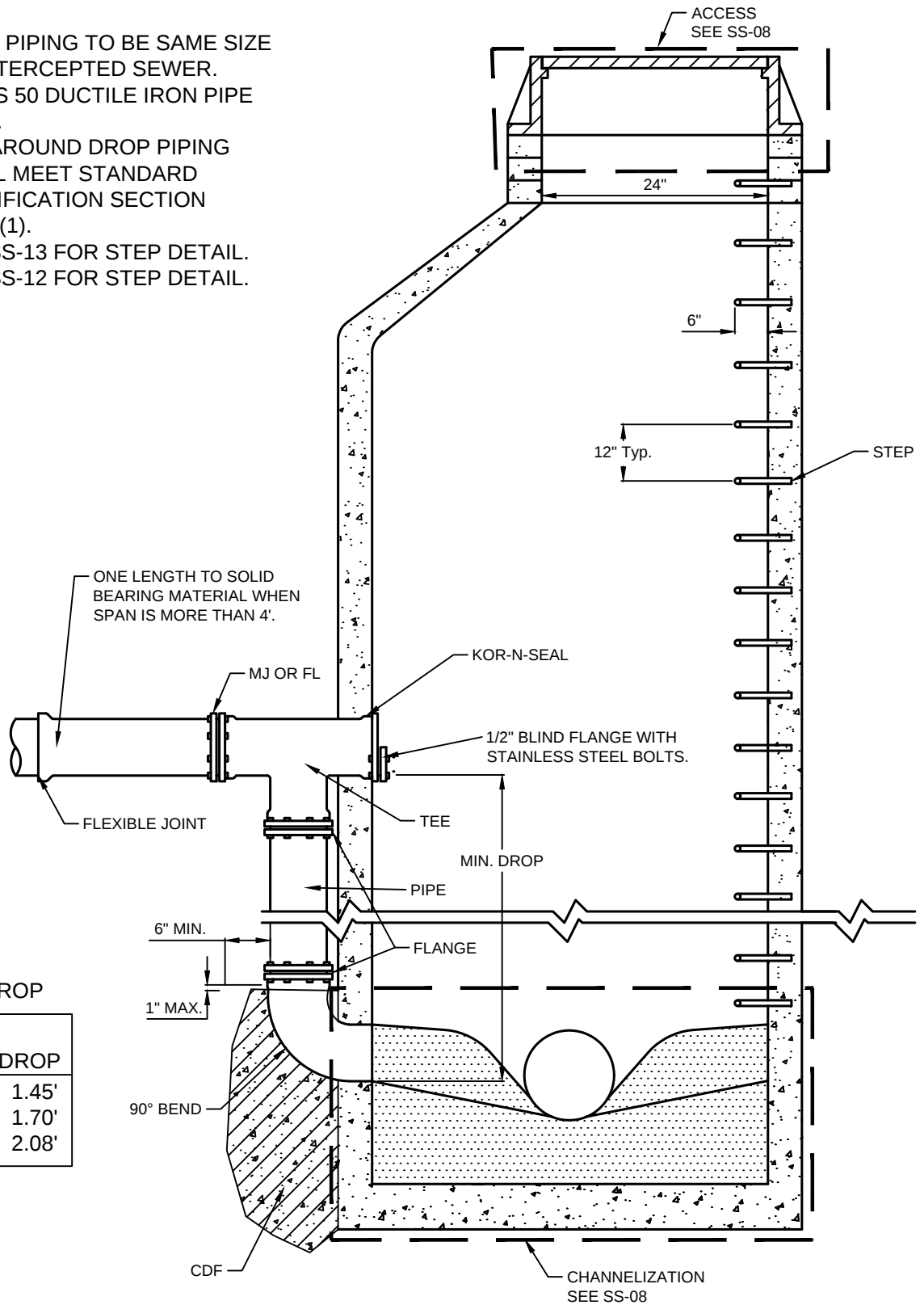
LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

NOTES:

1. DROP PIPING TO BE SAME SIZE AS INTERCEPTED SEWER.
2. CLASS 50 DUCTILE IRON PIPE ONLY.
3. CDF AROUND DROP PIPING SHALL MEET STANDARD SPECIFICATION SECTION 2-09.3(1).
4. SEE SS-13 FOR STEP DETAIL.
5. SEE SS-12 FOR STEP DETAIL.

MIN DROP	
PIPE SIZE	DROP
8"	1.45'
10"	1.70'
12"	2.08'



NOT TO SCALE



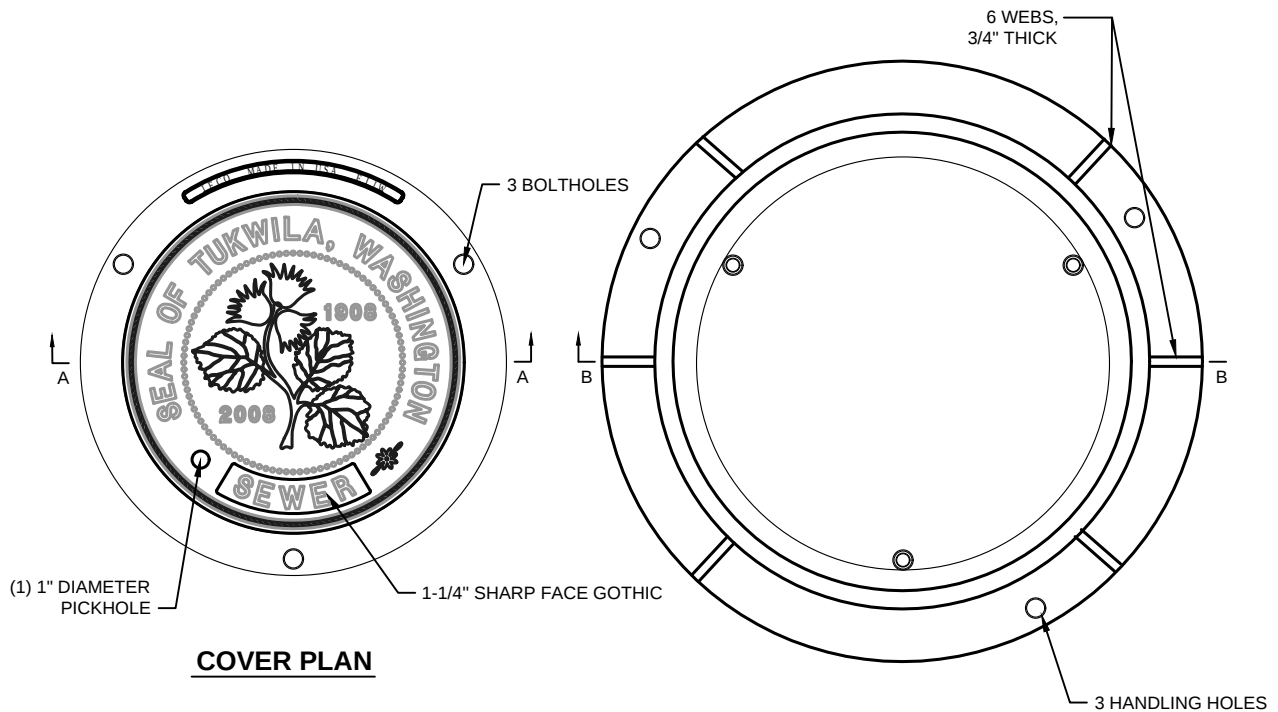
**City of
Tukwila**

MANHOLE DROP CONNECTION

SHEET: **SS-10**

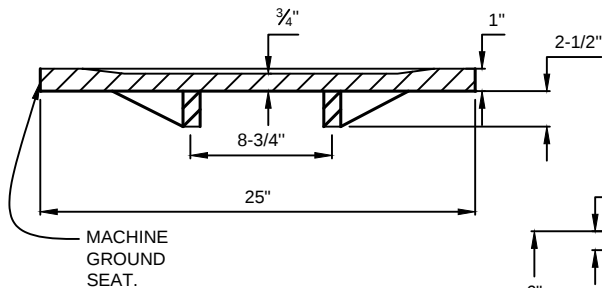
LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

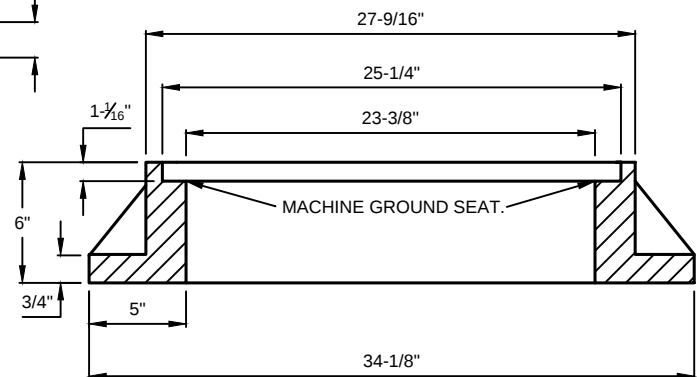


COVER PLAN

FRAME PLAN



**SECTION A-A
GRAY IRON LOCKING
COVER**



**SECTION B-B
GRAY IRON FRAME**

NOTES:

1. FRAME TO BE GROUTED
2. EJIW CATALOG NUMBER 3715Z(PT) 3717C1(PT) ASSEMBLY, WITH THE SEAL OF TUKWILA, AND LEGENDS 1908, 2008, AND SEWER.
4. NON-LOCKING PRODUCT NO. 00371786A01
5. PRODUCT NO. 00371784A01 (LOCKING)
6. INSTALL SO THAT BOLT HOLES ALIGN WITH CENTER OF LADDER.

NOT TO SCALE



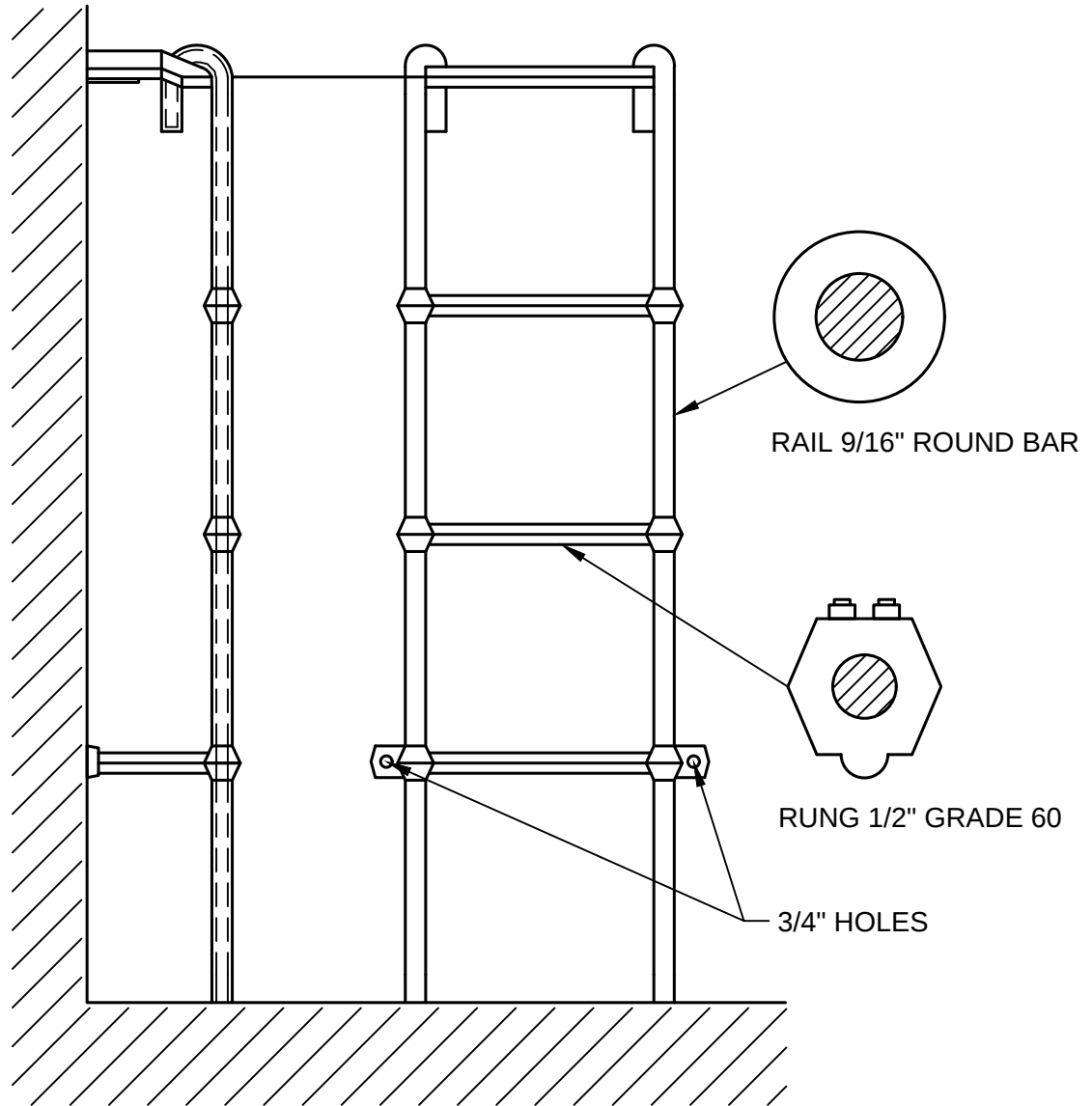
**City of
Tukwila**

**SEWER MANHOLE
24" FRAME WITH COVER**

SHEET: **SS-11**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



POLYPROPYLENE HANGING LADDER

NOTES:

1. LANE POLYPROPYLENE LADDER
2. POLYPROPYLENE ASTM D4101
3. 1/2" GRADE 60 REINFORCING BAR A615
4. 9/16" COLD DRAWN BAR C1018
5. 3/8" DIA. BOLT 316-SS, 3-1/2" LONG
6. 316-SS TYP AT LADDER MOUNTS
7. REFER TO SS-13 FOR STEP DETAIL

NOT TO SCALE



**City of
Tukwila**

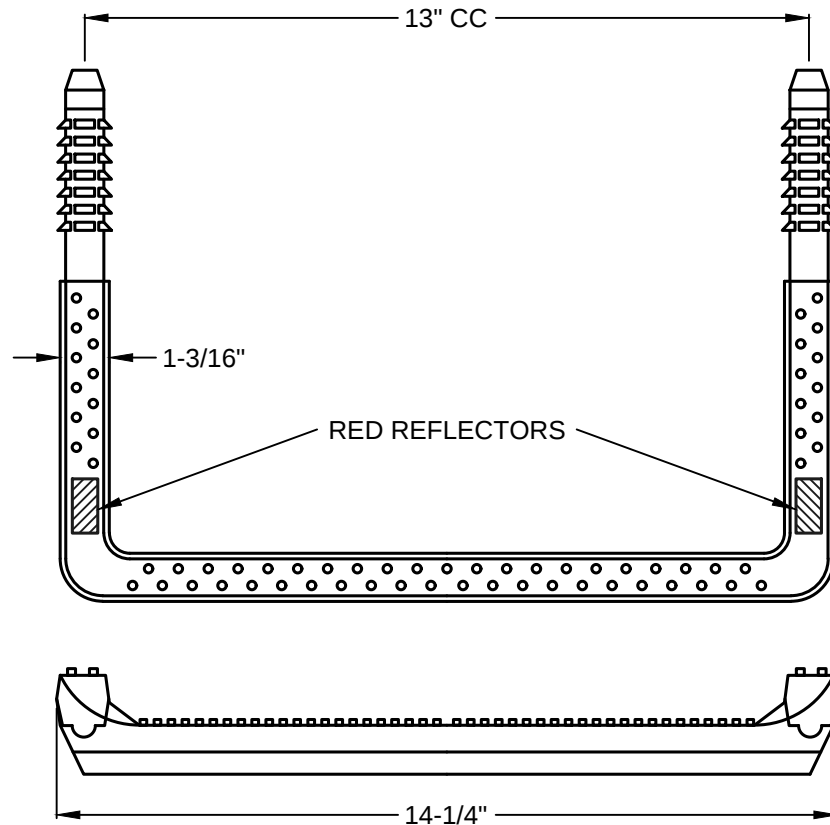
MANHOLE

HANGING LADDER

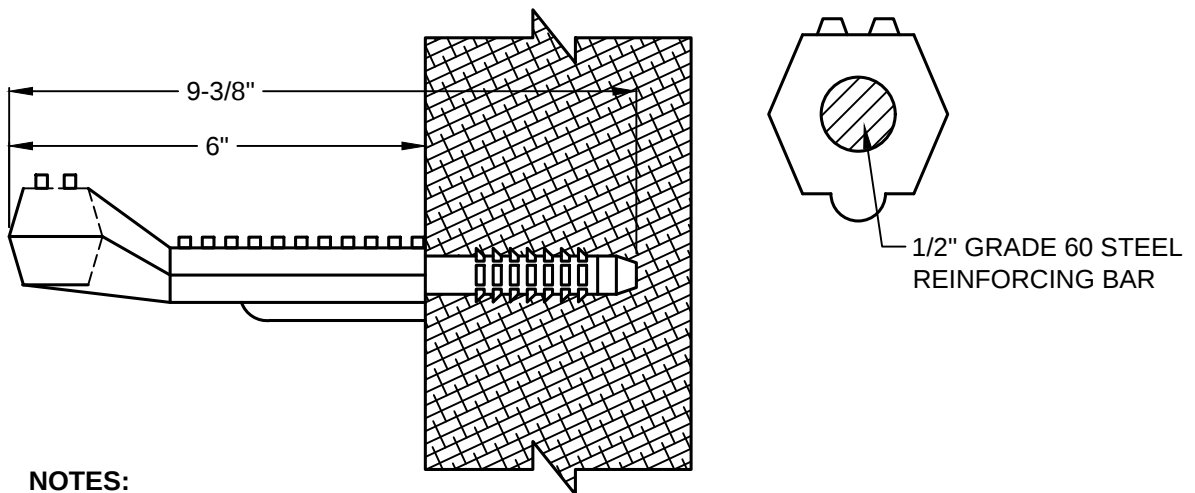
SHEET: **SS-12**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



PLAN



NOTES:

1. LANE P-14938 OR APPROVED EQUAL.

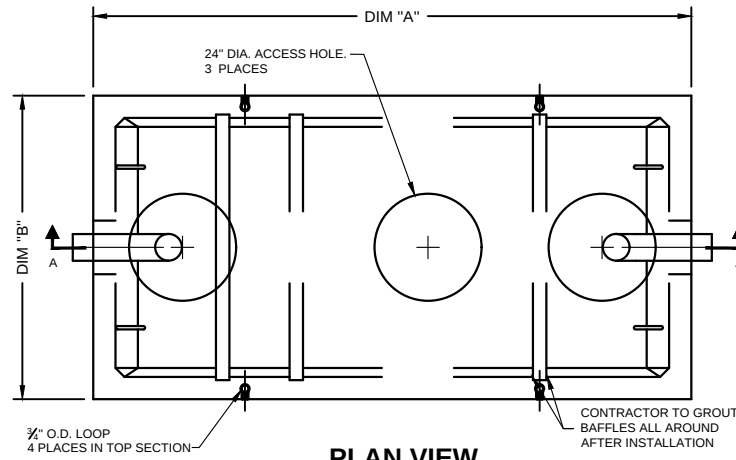
CUT OUT

NOT TO SCALE

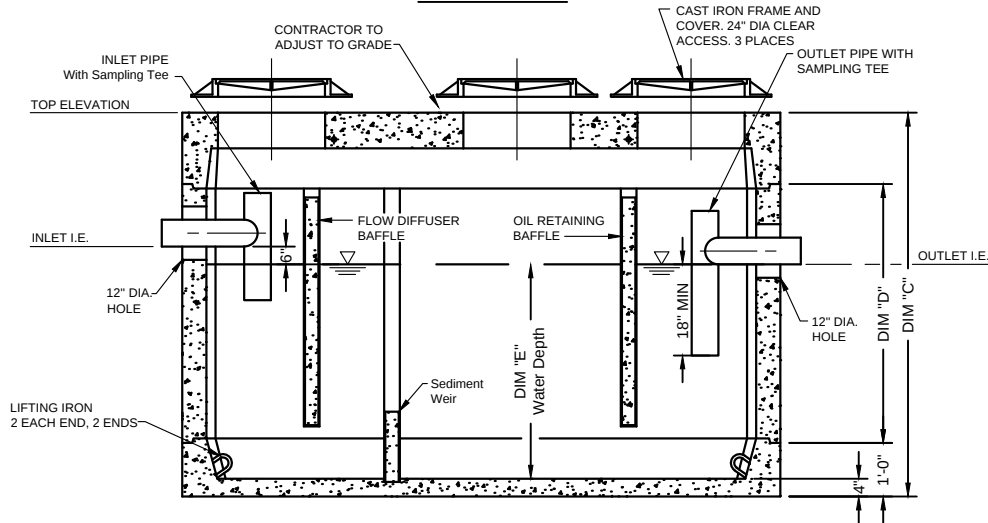


**City of
Tukwila**

MANHOLE	
POLYPROPYLENE SAFETY STEP	
SHEET:	SS-13
LAST REVISION: APRIL 2019	
APPROVAL: H. PONNEKANTI	



PLAN VIEW



NOTES:

SECTION A-A

1. REFER TO CHAPTER 8 OF THESE STANDARDS.
2. CONCRETE: 28 DAY COMPRESSIVE STRENGTH $f'_c = 4500$ PSI
3. REBAR: ASTM A-615 GRADE 60.
4. MESH: ASTM A-185 GRADE 65.
5. DESIGN: ACI-318-83 BUILDING CODE
6. ASTM C-857 "MINIMUM STRUCTURAL DESIGN LOADING FOR MONOLITHIC OR SECTIONAL PRECAST CONCRETE WATER AND WASTEWATER STRUCTURES".
7. LOADS: H-20 TRUCK WHEEL WITH 30% IMPACT PER AASHTO.
8. FILL WITH CLEAN WATER PRIOR TO START UP OF SYSTEM.
9. CONTRACTOR TO SUPPLY & INSTALL ALL PIPING & SAMPLING TEES.
10. ONLY GRAY WATER, EXCEPT DISHWASHERS. BLACK WATER SHALL BE CARRIED BY SEPARATE SIDE SEWER.

SIZING CHART

DESIGN FORMULA:	Number Of Meals Per Peak Hours			Waste Flow Rate		Retention Time		Storage Factor		Capacity In Gallons	
GALLON CAPACITY	1000	1250	1500	1750	2000	2500	2750	3000	4000	5000	6000
OLDCASTLE MODEL #	4484-SA	4484-SA	5106-SA	5106-SA	612-SA	612-SA	712-SA	712-SA	712-SA	814-SA	818-SA
DIM "A"	9'-0"	9'-0"	11'-2"	11'-2"	12'-8"	12'-8"	12'-8"	13'-1"	13'-1"	19'-11"	19'-11"
DIM "B"	5'-0"	5'-0"	5'-8"	5'-8"	6'-8"	6'-8"	6'-8"	8'-0"	8'-0"	9'-11"	9'-11"
DIM "C"	7'-2"	7'-2"	7'-2"	7'-2"	8'-0"	8'-0"	8'-0"	8'-7"	8'-7"	8'-11"	10'-5"
DIM "D"	4'-2"	5'-2"	4'-4"	4'-11"	4'-7"	5'-6"	6'-0"	5'-0"	6'-6"	6'-2"	7'-2"
WATER DEPTH DIM "E"	3'-10"	4'-10"	4'-0"	4'-7"	3'-10"	4'-9"	5'-3"	4'-7"	6'-1"	4'-9"	5'-9"

NOT TO SCALE



**City of
Tukwila**

GREASE INTERCEPTOR

SINGLE VAULT WITH DOUBLE BAFFLE

SHEET:

SS-14

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

SECTION 9.5 LID STANDARD DETAILS

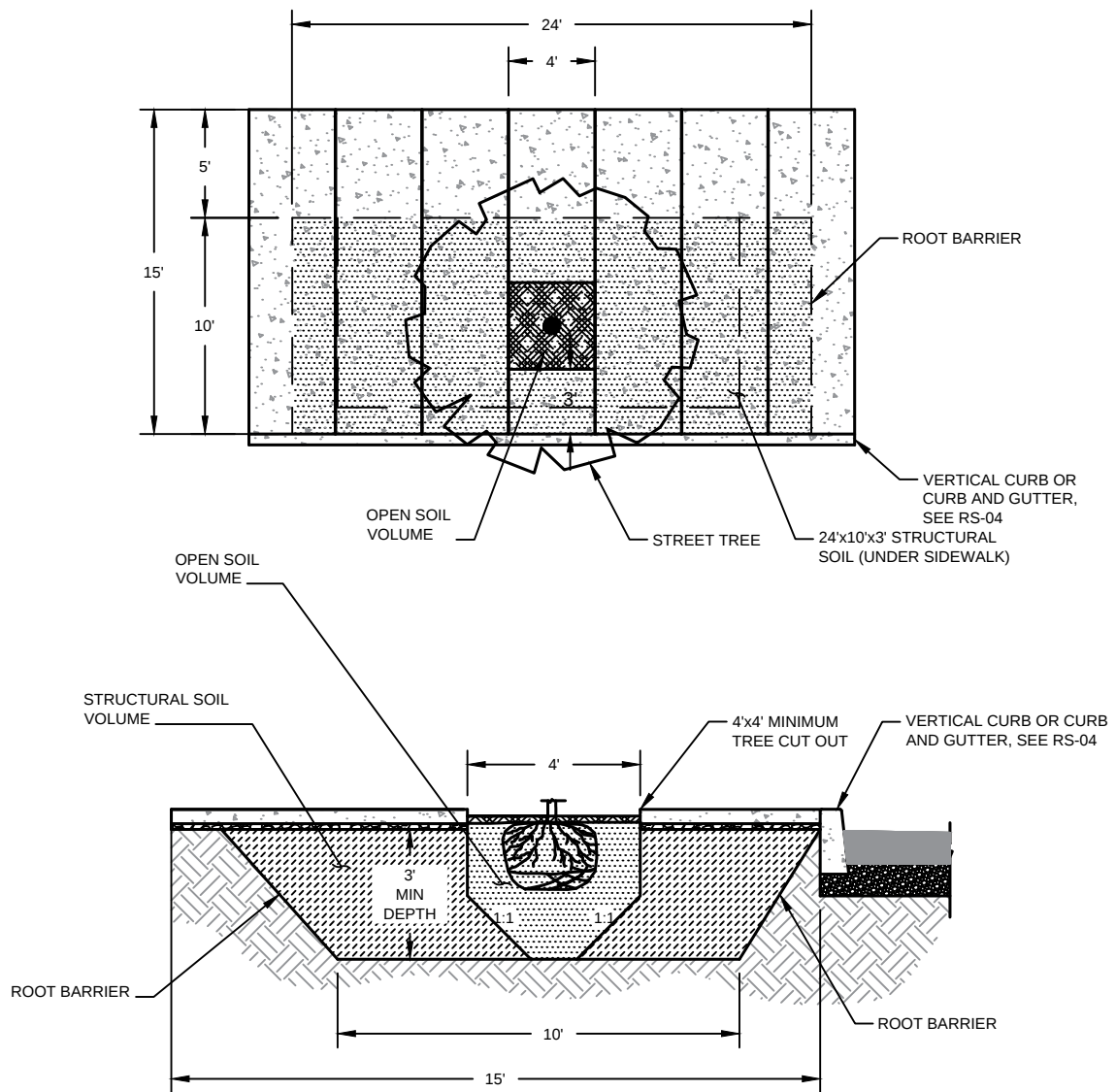
LID-1 Tree Pit Volume

LID-2 Curb Cut Inlet

LID-3 Curb Cut Outlet

LID-4 Reverse Slope Sidewalk

LID-5 Residential Driveway - Ribbon



TOTAL SOIL VOLUME CALCULATION FOR TYPICAL STREET TREE:

OPEN SOIL VOLUME = 4'x4'x3' = 48 CF

STRUCTURAL SOIL VOLUME = 24'x10' x3' - OPEN SOIL VOLUME= 672 CF

TOTAL SOIL VOLUME = 720 CF (MINIMUM REQUIRED)

NOT TO SCALE



**City of
Tukwila**

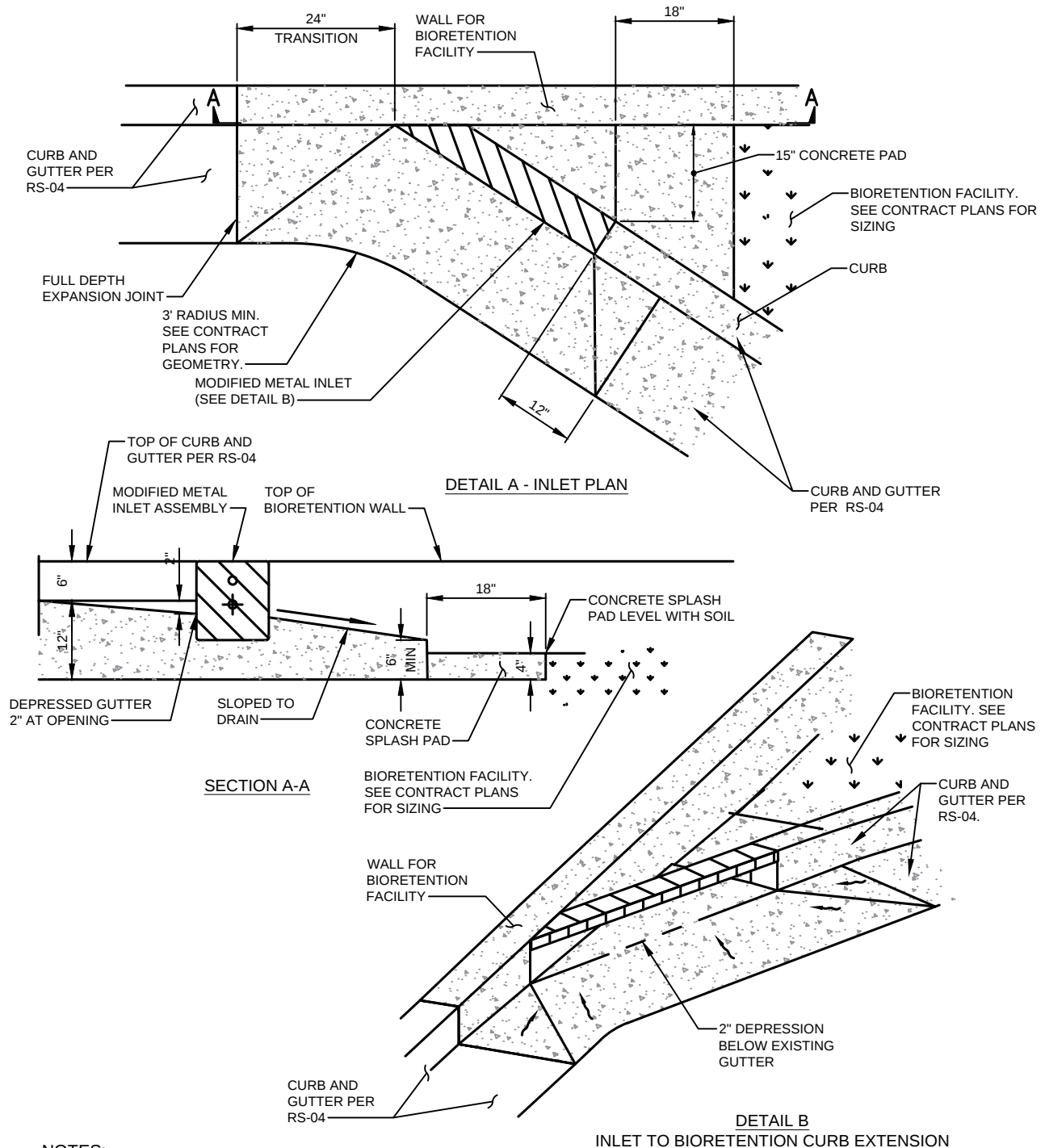
TREE PIT VOLUME

SHEET:

LID - 1

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. ADDITIONAL CONCRETE INLETS, CAN BE ADDED IF NECESSARY (PREFERABLY IMMEDIATELY DOWNSTREAM OF EACH CHECK DAM TO MINIMIZE POTENTIAL BACKFLOW).
2. SAWCUT BEYOND FACILITY AND TRANSITION EXISTING CURB TO NEW CURB AND GUTTER AT 1" PER FOOT AS NECESSARY.
3. INLET MAY BE MODIFIED TO MAXIMIZE FLOW ENTRY TO STORMWATER FACILITY.
4. MODIFY INLET AND OUTLET DESIGN AS NEEDED FOR SITE.
5. ENSURE OUTLET NOTCH ELEVATION IS 2" BELOW LOWEST INLETS AND SIDEWALK NOTCHES.
6. CONCRETE SPLASH PAD REQUIRED AT ALL INLETS.

NOT TO SCALE



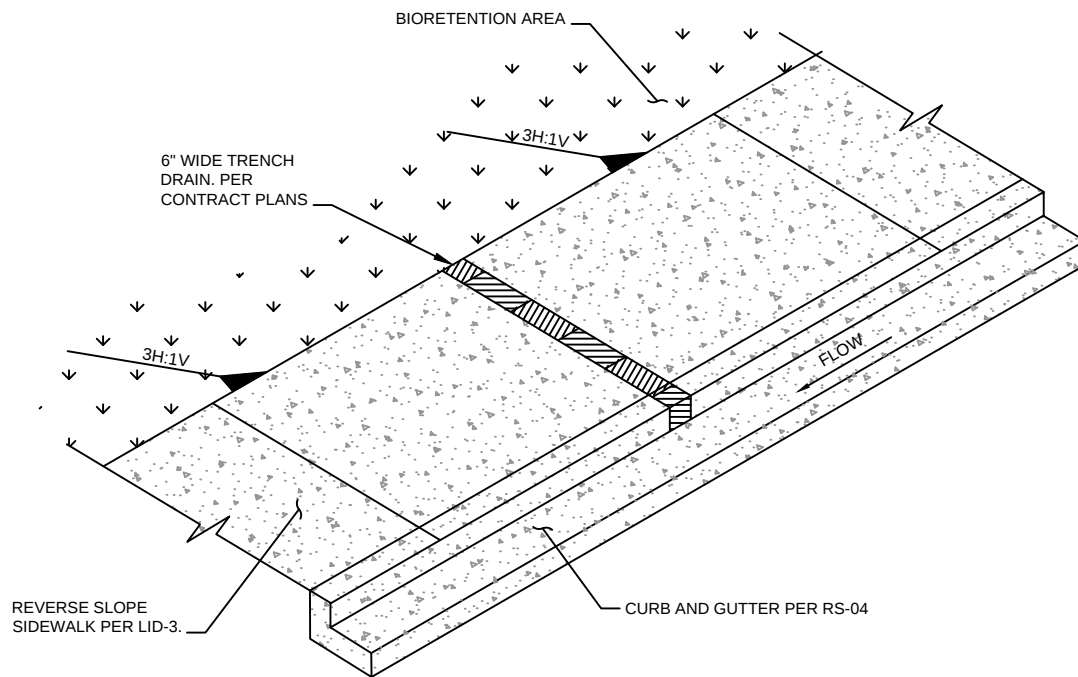
**City of
Tukwila**

CURB CUT INLET

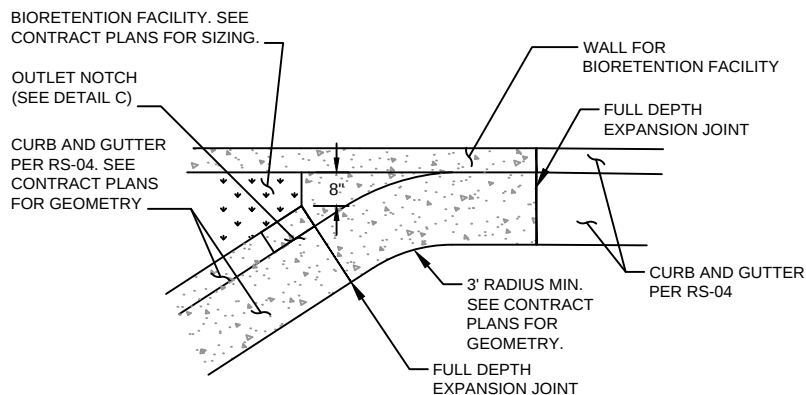
SHEET: **LID - 2**

LAST REVISION: APRIL 2019

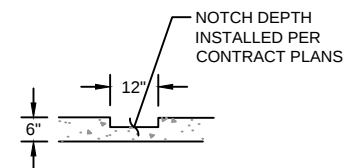
APPROVAL: H. PONNEKANTI



DETAIL A - BIORETENTION TRENCH DRAIN DETAIL



DETAIL B - OUTLET FROM BIORETENTION CURB EXTENSION



DETAIL C - OUTLET NOTCH SECTION VIEW

NOTES:

1. TO MATCH TO EXISTING SIDEWALK, SAWCUT BEYOND FACILITY AND TRANSITION EXISTING CURB TO NEW CURB AND GUTTER PER CONTRACT GEOMETRY.
2. MODIFY INLET AND OUTLET DESIGN AS NEEDED FOR SITE.
3. ENSURE OUTLET NOTCH ELEVATION IS 2" BELOW LOWEST INLETS AND SIDEWALK NOTCHES.

NOT TO SCALE



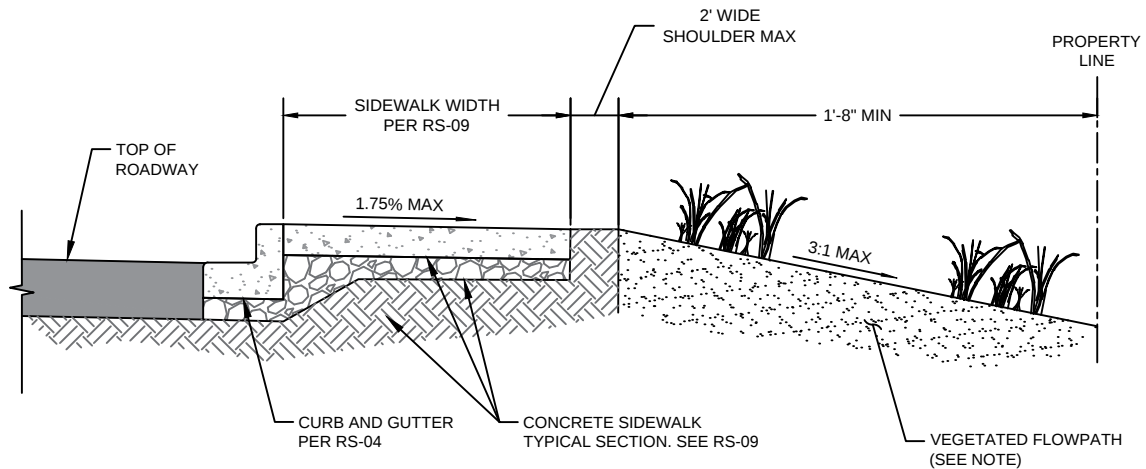
**City of
Tukwila**

CURB CUT OUTLET

SHEET: **LID - 3**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. THE EDGE OF THE SIDEWALK AND THE GROUND ADJACENT TO OR IMMEDIATELY BELOW THE EDGE MUST BE EITHER LEVEL OR SLOPED SUCH THAT THE DIRECTION OF SHEET FLOW IS PERPENDICULAR TO THE EDGE OR NO MORE THAN 45 DEGREES FROM PERPENDICULAR.
2. A "VEGETATED FLOWPATH SEGMENT" OF AT LEAST 10 FEET IN LENGTH MUST BE AVAILABLE ALONG THE FLOWPATH THAT RUNOFF WOULD FOLLOW UPON DISCHARGE FROM THE SIDEWALK. VEGETATED FLOW PATH MUST MEET CRITERIA OF 2016 KING COUNTY SWDM C.2.41.
3. SIDEWALK LONGITUDINAL SLOPE SHALL BE 10% MAXIMUM.

NOT TO SCALE



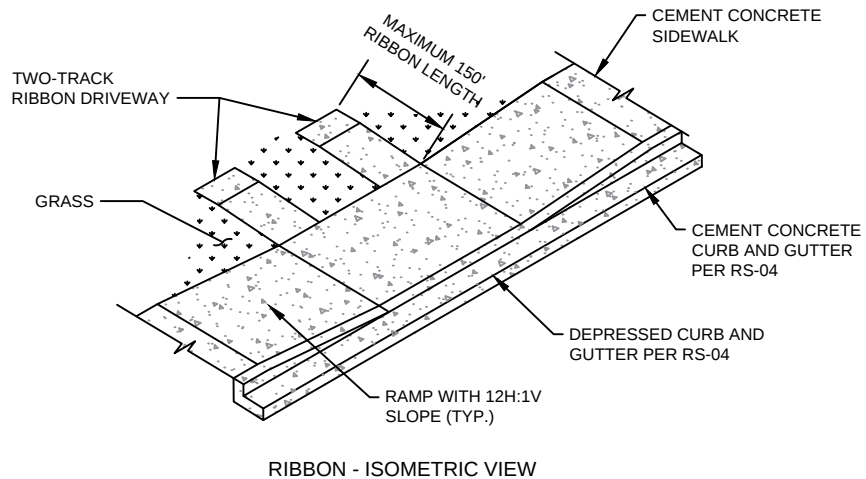
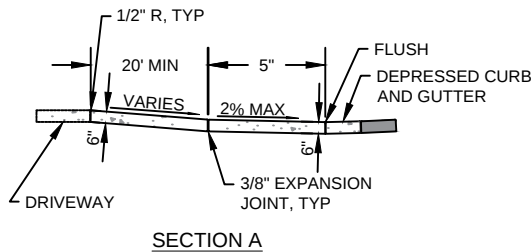
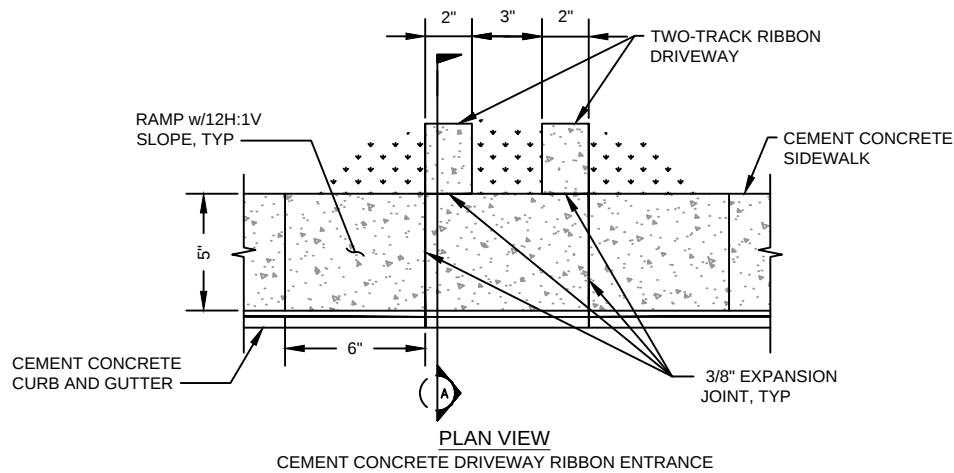
**City of
Tukwila**

REVERSE SLOPE SIDEWALK

SHEET: **LID - 4**

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI



NOTES:

1. THIS ALTERNATE SHOULD BE USED ONLY AFTER STUDYING CLOSENESS OF DRIVEWAYS, DRAINAGE, TOPOGRAPHY, DRIVEWAY GRADES, ETC.
2. CONCRETE SHALL BE CLASS 4000.
3. INSPECTION REQUIRED BEFORE PLACING CONCRETE. AT LEAST 24 HOUR NOTICE MUST BE GIVEN TO TUKWILA PUBLIC WORKS DEPARTMENT.
4. ALL DRIVEWAY APRONS SHALL BE A MINIMUM OF 6" THICK.
5. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APWA/WSDOT PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE CITY OF TUKWILA.
6. AN ASPHALT APRON MAY BE USED WITHIN THE ROW IN AREAS WHERE NO CURB EXISTS.
7. REMOVAL OF EXISTING CONCRETE CURB, GUTTER OR SIDEWALK SHALL BE SAW CUT TO THE NEXT CONSTRUCTION JOINT.

NOT TO SCALE



**City of
Tukwila**

RESIDENTIAL DRIVEWAY - RIBBON

SHEET: LID - 5

LAST REVISION: APRIL 2019

APPROVAL: H. PONNEKANTI

APPENDIX A DEFINITIONS

DEFINITIONS AND ACRONYMS

These definitions are for use with these Standards. Unless specifically defined below, words or phrases used in this ordinance shall be interpreted to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

AASHTO - American Association of State Highway and Transportation Officials.

ACCESS - means the safe, adequate, and usable ingress/egress (entrance/exit) to a property or use.

ACTUAL ELEVATION - means the elevation in relationship to mean sea level.

ADVERSE IMPACT - means any deleterious effect on waters or wetlands, including their quality, quantity, surface area, species composition, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interferes with the enjoyment of life or property, including outdoor recreation.

AGRICULTURAL LAND MANAGEMENT PRACTICES - means those methods and procedures used in the cultivation of land in order to further crop production and conservation of related soil and water resources.

AIA - American Institute of Architecture.

ANNUAL AVERAGE DAILY TRAFFIC (AADT) - means daily traffic that is averaged over one calendar year.

APPLICANT - means any person, governmental agency, or other entity that executes the necessary forms to procure official approval of a project or a permit to carry out construction of a project.

STANDARD SPECIFICATIONS - means the current edition of the standard specifications for municipal public works construction prepared by the Washington State Chapter of the American Public Works Association and the Washington State Department of Transportation, as adopted by the City of Tukwila.

ASTM - American Standards for Testing Materials.

AVERAGE DAILY TRAFFIC (ADT) - means the average number of vehicles passing a specified point during a 24-hour period.

AWWA - American Water Works Association.

BACKFLOW - means a flow of water or other liquids, gases or solids from any source back into the customer's plumbing system or the water purveyor's distribution system.

BACKFLOW PREVENTION DEVICE - means a device, approved by the State Department of Health and by the American Water Works Association, used to counteract back pressure or prevent back-siphoning into the distribution system of a public water supply.

BASE FLOOD ELEVATION - means the flood having a one-percent chance of being equaled or exceeded in any given year. Also referred to as the 100-year flood.

BASEMENT - means any area of the building having its floor subgrade (below ground) on all sides.

BEST AVAILABLE INFORMATION - means in the absence of official flood insurance rate map data, the City can use data from federal, state, or other sources provided this data has either been generated using technically defensible methods or is based on reasonable historical analysis and experience.

BIORETENTION – means a stormwater best management practice consisting of a shallow landscaped depression designed to temporarily store and promote infiltration of stormwater runoff. Bioretention may take the form of a cell, swale or planter.

BOLLARD - means a post used to prevent vehicle access.

BOND/SURETY - means a surety bond, cash deposit, escrow account, any assignment of funds, irrevocable letter of credit, or other means acceptable to the Director to guarantee acceptable performance, execution, and completion of the work, in accordance with the project's approved plans and in accordance with all applicable governmental requirements.

CBD - Central Business District.

CDF - Controlled density fill.

CFR -Code of Federal Regulations.

CITY - means the City of Tukwila or the City Council of Tukwila.

CLEARING - means the removal of vegetation from a site by physical, mechanical, chemical, or other means. This does not mean landscape maintenance or pruning consistent with accepted horticultural practices that do not impair the health or survival of trees and vegetation.

COMPREHENSIVE PLAN - means a plan adopted by the City Council to guide the physical growth and improvement of the City and urban growth management area, including any future amendments and revision.

CONVEYANCE SYSTEM - means natural and man-made drainage features that collect, contain, and convey surface water. Natural drainage features include swales, streams, rivers, lakes, and wetlands. Man-made features include gutters, ditches, pipes, and detention/retention facilities.

CRITICAL DRAINAGE AREA - means any drainage basin having erosion, flooding or water quality issues as documented in the Comprehensive Surface Water Management Plan or drainage basin studies.

CRITICAL FACILITY - means any structure for which even a slight chance of flooding is too great, such as schools, nursing homes, hospitals, police, fire and emergency response installations, and installations which produce, use, or store hazardous materials or hazardous waste.

CROSS-CONNECTION - means any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewage, or other wastes or liquids of unknown or unsafe quality, which may be capable of imparting contamination to a public water supply.

DEDICATION - means the deliberate appropriating of land by an owner(s) for any general and public uses, reserving to themselves no other rights than such as are compatible with the full exercise and enjoyment of the public uses to which the property is to be devoted. The intent to dedicate will be evidenced presentation of a deed.

DETENTION STRUCTURE - means a permanent structure designed to store runoff and discharge storage at controlled rates.

DEVELOP LAND - means to change the runoff characteristics of a parcel of land.

DEVELOPER - means the applicant for a development permit, their successors, and/or assignees.

DEVELOPER AGREEMENT - means an agreement between the City and the Developer, which contains work descriptions, estimated costs, responsibilities for the work performance and an expiration date.

DEVELOPER REIMBURSEMENT AGREEMENT - means an agreement between the City and a developer, who installed public improvements. The agreement provides for reimbursement of a fair prorated share by any real estate owners who have not contributed to the original cost of such facilities, and who subsequently connect to, or use the improvement.

DEVELOPMENT - means any man-made change of improved or unimproved real estate,; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill, clearing, or land disturbance; or any use or extension of the use of land.

DIRECTOR - means the Director of the Public Works Department or designee, including the City Engineer and City inspectors.

DNR - Department of Natural Resources.

DOE - State Department of Ecology.

DOH - State Department of Health.

EASEMENT - means interest in land which does not include any rights of possession. A right of one owner of land to make lawful and beneficial use of the land of another created by an express or implied agreement.

ELEVATED BUILDING - means for flood insurance purposes, a non-basement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, post, piers, pilings, or columns.

ENGINEER, GEOTECHNICAL - means a practicing, professional civil engineer registered with the State of Washington, who has knowledge and practice of geotechnical engineering.

ENGINEER, PROFESSIONAL - means an engineer, registered in Washington State.

ENGINEER, SOILS - means Geotechnical Engineer.

ENGINEERING GEOLOGIST - means a geologist certified by the State as experienced and knowledgeable in engineering geology.

ENGINEERING GEOLOGY - means the application of geologic knowledge in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works.

ENGINEERING, GEOTECHNICAL - means the application of soil mechanics in the investigation, evaluation, and design of civil works involving the use of earth materials and the inspection or testing of the construction thereof.

ESC - Erosion prevention and sediment control.

FBFM - Flood boundary/floodway map.

FEMA - Federal Emergency Management Agency.

FIRE MAIN - means a water line, at least 6 inch diameter, serving fire hydrants or fire protection systems.

FIRM - Flood Insurance Rate Map.

FLOOD INSURANCE RATE MAP (FIRM) - means the official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the City.

FLOOD INSURANCE STUDY - means the official report and documents provided by the Federal Insurance Administration that includes flood profiles, the flood boundary-floodway map, and the water surface elevation of the base flood.

FLOOD OR FLOODING - means a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters, and/or the unusual and rapid accumulation of runoff of surface waters from any source.

FLOOD PLAIN - means any land area susceptible to flooding from any source.

FLOOD PRONE - means any land area susceptible to flooding, not shown on FIRMs, designated as flood-prone by the Director, using best available information.

FLOOD PROOFING - means any combination of structural and non-structural additions, changes, or adjustments to nonresidential structures, which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures, or their contents. For flood proofed nonresidential buildings, FEMA bases flood insurance premiums on rates that are one foot below the flood-proofed level. For example, a building flood proofed to the base flood level will be rated as one foot below that level.

FLOOD ZONE - means any area designated as special flood hazard or flood prone, or any area within the shoreline per Tukwila Municipal Code.

FLOODWAY - means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

FLOW ATTENUATION - means detaining or retaining runoff to reduce the peak discharge.

FRONTAGE IMPROVEMENTS - means all of the street pavement, curb, gutter, sidewalk, transit bus shelters, bus pullouts, storm drainage, water and sewer utilities, power and communications cable undergrounding, street trees and street lighting, located within any public right-of-way abutting the property boundary of a development.

FZCP - Flood Zone Control Permit.

GRADING - means any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled, or any combination thereof.

HALF STREET - means a street constructed utilizing at least half the regular width of the right-of-way and permitted as an interim facility pending construction of the other half.

HDPE - high-density polyethylene.

HEALTH OFFICER - means the Director of the South King County Department of Public Health or the duly authorized representative.

HIGH USE SITE - means a commercial or industrial site that (1) has an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area, (2) is subject to petroleum storage or transfer in excess of 1,500 gallon per year, not including delivered heating oil, or (3) is subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (trucks, buses, trains, heavy equipment). Also included is any road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

IMPERVIOUS SURFACE - means any surface that cannot be effectively and easily penetrated by water; a hard surface that either prevents or restricts the entry of water into the soil mantle or causes water to run off the surface in greater quantities or at an increased flow rate compared to natural conditions prior to development. Impervious surfaces include roof tops, paved areas, gravel roads, packed earthen surfaces, oiled surfaces, and macadam. Open, uncovered flood control, or water quality facilities are not considered impervious surfaces.

IMPROVEMENTS - means any improvement to public, real, or personal property, including but not limited to, installation of streets, roads, pedestrian/bike facilities, streetlights; landscape features; sewer and waterlines; bridge structures; storm drainage facilities; and traffic control devices.

INFILTRATION - means the passage or movement of water into the soil subsurface.

INTERCEPTOR - means a sewer that receives flow from a number of main or trunk sewers, force mains, etc.

KCSWDM - the adopted King County Surface Water Design Manual.

LEEVE - means a man-made structure, designed and constructed in accordance with sound engineering practices to contain, control, or divert water flow for protection from flooding.

LEVEL III CERTIFICATION - means a National Institute For Certification in Engineering Technologies, fire protection engineering technology certificate of competency, to design and install fire protection systems including underground backflow prevention devices and associated thrust blocking.

LOCAL IMPROVEMENT - means a public improvement provided to a specific area benefiting that area and usually paid for by a special assessment for the benefit of property owners.

LOWEST FLOOR (flood control definition) - means the lowest floor of the lowest enclosed area (including basement). If an unfinished or flood resistant enclosure is used solely for vehicle parking, building access, or storage, if this enclosure is in an area other than a basement, and if this enclosure is built so that the structure meets the applicable non-elevation design requirements for nonresidential construction, the enclosure is not considered the structure's lowest floor.

Low Impact Development (LID) – Means a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

MANUFACTURED HOME (flood control definition) - means a structure, transportable in one or more sections, built on a permanent chassis and designed for use with or without a permanent foundation when attached to the required utilities. The term “manufactured home” does not include a “recreational vehicle.”

MANUFACTURED HOME PARK OR SUBDIVISION (flood control definition) - means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

MANUFACTURED HOME PARK OR SUBDIVISION, EXISTING - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before 1981, the effective date of the Tukwila's original floodplain management regulations.

MANUFACTURED HOME PARK OR SUBDIVISION, EXPANSION TO AN EXISTING - means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed, including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads.

MEAN SEA LEVEL (flood control definition) - means the National Geodetic Vertical Datum (NGVD) of 1929 to which the base flood elevations shown on the Flood Insurance Rate Map are referenced.

METER - means a water measuring device approved by the Director.

METER, DEDUCT - means a meter for water supply that does not discharge to the public sewer. The Permittee provides, owns, installs, and maintains the meter. This meter is installed downstream of a permanent water meter. An example is landscape irrigation.

METER, PERMANENT - means meter for domestic water supply of all new or reestablished services when sewer discharge rates are calculated based on water usage. Each individual building requires a separate water main tap. The Permittee pays for a City-provided water meter.

METER, TEMPORARY - means a water meter rented from the City for use of public water, on a short term basis, where a metered supply does not already exist. The Permittee rents the meter from the City. Examples include dust suppression during construction or water supply during hydroseeding.

METER, WATER ONLY - Required for a separate service from the main that will not discharge to the public sewer. The Permittee pays for a City-provided water meter.

MIC - MANUFACTURING/INDUSTRIAL CENTER – This area is defined by Tukwila zoning codes and can be referenced through zoning maps available on the City's website or TMC 18.36 (MIC/L) and 18.38 (MIC/H).

MULTIFAMILY - means, in reference to development, the construction of a building or buildings to house two or more families living independently of each other.

MUTCD - Manual on Uniform Traffic Control Devices.

NAD - means North American Datum, horizontal, of 1983/1991.

NAVD - means North American Vertical Datum.

NEW CONSTRUCTION (flood control definition) - means structures for which the "start of construction" commenced on or after 1981, the effective date of Tukwila's original floodplain management regulations.

NEW MANUFACTURED HOME PARK OR SUBDIVISION - means a manufactured home park or subdivision for which the construction of facilities, including streets, utilities, concrete pads, is completed on or after 1988, the effective date of Tukwila's original floodplain management regulations.

NFIP - National Flood Insurance Program.

NGVD - National Geodetic Vertical Datum of 1929.

NICET - National Institute for Certification in Engineering Fundamentals.

NPDES - National Pollutant Discharge Elimination System.

OSHA - Occupational Safety and Health Administration.

PERFORMANCE GUARANTEE - means a financial guarantee in a form acceptable to the City Attorney, ensuring all improvements, facilities, or work will be completed in compliance with regulations, and approved plans and specifications.

PERMEABLE PAVEMENT – means a pervious concrete, porous asphalt, permeable pavers lor other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir.

PERMITTEE - means any person, governmental agency, or other entity that is performing, or plans to perform, permitted work within the City.

PLANS - means the plans, profiles, cross sections, elevations, details, and supplementary specifications, signed by a licensed professional engineer and approved by the Director, showing the location, character, dimensions, and details of the work to be performed.

POLLUTION - means contamination or other alteration of the physical, chemical, or biological properties of waters of the state that will or is likely to create a nuisance or render waters harmful, detrimental, or injurious 1) to public health, safety, or welfare, or 2) to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or 3) to livestock, wild animals, birds, fish, or other aquatic life. Contamination includes discharge of any liquid, gas, or solid, radioactive or other substance. Alteration includes temperature, taste, color, turbidity, or odor.

PROJECT - means activity encompassing all phases of the work to be performed and is synonymous to the term "improvement" or "work."

PW - means Public Works Department.

RECREATIONAL VEHICLE - means a vehicle which is:

Built on a single chassis;

400 square feet or less when measured at the largest horizontal projections;

Designed to be self-propelled or permanently towable by a light duty truck; and,

Designed primarily for use as temporary living quarters for recreational, camping, travel, or seasonal use.

REDEVELOPMENT PROJECT - means a project that adds, replaces, or alters exterior impervious surface on a site that already has 35% or impervious surface.

RETENTION STRUCTURE - means a permanent structure that provides for the storage of runoff by means of a permanent pool of water.

RIGHT-OF-WAY - means (1) a strip of land acquired by reservation, dedication, forced dedication, prescription, or condemnation and intended to be occupied by a road, crosswalk, railroad, electric transmission lines, oil or gas pipeline, water line, sanitary sewer, storm sewer, or other similar public accesses or public uses; and (2) the right of one to pass over the property of another.

ROAD - means street.

RPPA – Reduced pressure principle assembly (formerly Reduced Pressure Backflow Assembly).

SAO - Sensitive Areas Overlay.

SEDIMENT - means soils or other materials transported or deposited by the action of wind, water, ice, or gravity.

SENSITIVE AREA - means wetland, watercourse, landslide hazard area, or abandoned coal mine as designated or defined by the City's Sensitive Areas Ordinance.

SENSITIVE AREA, CLASS 2 - means an area where landslide potential is moderate, including areas sloping between 20% and 40%, and which are underlain by relatively permeable soils.

SENSITIVE AREA, CLASS 3 - means an area where landslide potential is high, including areas sloping between 20% and 40%, and which are underlain by relatively impermeable soils or by bedrock, and which also include all areas sloping more steeply than 40%.

SENSITIVE AREA, CLASS 4 - means areas, where landslide potential is very high, which include sloping areas with mapable zones of groundwater seepage, and which also include existing mapable landslide deposits regardless of slope.

SEPA - State Environmental Policy Act.

SEWER, LATERAL - means the portion of the sewer line extending from the City's main to the building, having no other common sewers discharging into it. A lateral sewer is operated and maintained by the property owner. Sometimes called a side sewer.

SEWER, MAIN or TRUNK - means a sewer that receives flow from one or more mains.

SEWER, MAIN EXTENSION - means the portion of the sewer line extending for more than 150 feet from the City's main. Lateral sewer connections are made to the sewer main extension.

SEWER, PRIVATE - means that portion of the system located on private property where no easements are granted to the City. Private sewers include gravity laterals, building sewers, and sewer collection systems internal to developments; such as, apartment complexes, condominiums, townhouses, shopping centers, commercial office parks, mobile home parks, etc. A private sewer includes the portion of the lateral between the property line and sewer main. Maintenance of a private sewer will be the responsibility of the property owner(s).

SEWER, PUBLIC - means that portion of the system located within rights-of-way or easements (excluding laterals) and is operated and maintained by the City.

SEWER, STUB - means sewer, lateral.

SHALLOW FLOODING AREA - means a designated AO, or AH zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and, velocity flow may be evident. AO is characterized as sheet flow and AH indicates ponding.

SIDEWALK - a paved, surfaced, or leveled area, paralleling and usually separated from the street and normally used as a pedestrian walkway.

SITE - means any tract, lot, or parcel of land, or combination of tracts, lots, or parcels of land which are in one ownership, or are contiguous and in diverse ownership, where development is to be performed as a part of a unit, subdivision, or project.

SITE PLAN - means the development plan for one or more lots on which is shown the existing and proposed conditions of the lot, topography, vegetation, drainage, flood plains, walkways; means of ingress and egress; circulation; utility services; structures and buildings; signs and lighting; berms, buffers, and screening devices; surrounding development; and any other information that reasonably may be required in order that an informed decision can be made by the reviewing authority.

SPECIAL FLOOD HAZARD AREA - means the land in the flood plain subject to a one- percent or greater chance of flooding in any given year. Also called the 100-year flood elevation or the base flood elevation. These areas are designated on Flood Insurance Rate Maps (FIRMs) using the letters A or V. Special flood hazard areas include flood prone areas designated by the City.

STABILIZATION - means the prevention of soil movement by any various vegetative and/or structural means.

STANDARDS - means the City of Tukwila Development Guidelines and Design and Construction Standards.

START OF CONSTRUCTION - includes, for flood insurance purposes, substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement occurred within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading

and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

STORM DRAINAGE PLAN - means a set of drawings and documents submitted as a prerequisite to obtaining a development permit. The plan contains all of the information and specifications pertaining to surface water management onsite and offsite.

STREET, ARTERIAL - means a street that connects access streets to higher classifications.

STREET, CUL-DE-SAC - means a street with a single common ingress and egress and with a circular turnaround at the end.

STREET FRONTAGE - means either the area between any lot lines that intersect, and the area of a lot that directly abuts the boundary of a public or private street right-of-way.

STREET, PRIVATE - means a street, built to City standards, but is not owned, nor maintained by the City. A private street is a street the City or other governmental entity has not accepted for ownership or maintenance. This does not include private access road as defined in the Subdivision code.

STREET, PUBLIC - means a public right-of-way, usually containing improved facilities for transportation and utilities. A public street is a publicly owned and maintained street that serves more than four lots or is longer than 200 feet.

STRUCTURE (flood control definition) - means, for flood plain management, a manufactured home or a walled and roofed building, including a gas or liquid storage tank, that is principally above ground. Structure, for insurance purposes, means a manufactured home, or a walled and roofed building, except a gas or liquid storage tank, that is principally above ground. (CFR 59.1)

SUBSTANTIAL DAMAGE - means damage of any origin sustained by a structure whereby the cost of restoring the structure to it's before damaged

condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT (flood control definition) - means any repair, reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the assessed value of the structure either:

Before the improvement or repair is started, or

Before damage occurred, if the structure is being restored.

For the purposes of this definition, "substantial improvement" occurs when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

"Substantial improvement" does not include:

Any improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which is solely necessary to assure safe living conditions, nor

Any alteration of a structure listed on the national Registry of Historic Places or a state inventory of historic places.

SURVEYOR - means any Washington State licensed professional land surveyor.

TMC - Tukwila Municipal Code.

TRAFFIC IMPACT ANALYSIS - means a report analyzing anticipated roadway conditions with and without proposed development, including an analysis of mitigation measure and a calculation of fair share financial contributions.

TUKWILA URBAN CENTER – The TUC is defined by Tukwila zoning codes and can be referenced through zoning maps available on the City's website or TMC 18.28. The specific area map is defined by code but can generally be described as that area bounded by I-405 on the north, S180th on the south, I-5 to the West and the UP/BNSF railroad tracks to the east (just east of West Valley Highway).

TYPICAL - means the guidelines that shall be followed unless the Director approves a variation.

UTILITY - means a company providing public service including, but not limited to, gas, oil, electric power, street lighting, telephone, telegraph, water, sanitary sewer, storm drainage, solid waste, or cable television, whether or not such company is privately owned or owned by a governmental entity.

VACATION - means the process by which public right-of-way becomes private property.

VARIANCE - means a grant of relief by the City for activities that would otherwise be prohibited by the TMC.

WAC - Washington Administrative Code.

WDFW - Washington Department of Fish and Wildlife

WISHA - Washington Industrial Safety and Health Administration.

WSDOT - Washington State Department of Transportation.

ZONE "A" - means a zone on the Flood Insurance Rate Map (FIRM) where flooding is known to occur, but no flood elevation has been determined.

ZONE "AH" - means a zone on the Flood Insurance Rate Map (FIRM) characterized by base flood depths from one to three feet; having no clearly defined channel or having an unpredictable and indeterminate channel, where velocity flow may be evident. AH indicates ponding.

ZONE "AE" - means a zone on the Flood Insurance Rate Map (FIRM) where base flood elevations are determined and are shown on the map.

APPENDIX B STANDARD CONSTRUCTION PLAN NOTES

STANDARD CONSTRUCTION NOTES

Prior to starting construction, contact **ONE-CALL (1-800-424-5555)**, or **811**, for utility locations.

CONTACTS

Project Manager: Provide Name and Contact Number

Design Engineer: Provide Name and Contact Number

Owner: Provide Name and Contact Number

Other: Provide Name and Contact Number

GENERAL

1. Locations shown for existing utilities are approximate.
2. At least 48 hours before starting project site work, notify the Utilities Inspector at 206-433-0179.
3. Request a Public Works utility inspection at least 24 hours in advance by calling 206-433-0179. The IVR Inspection line at 206-438-9350 or Online Portal <https://permitting.tukwila.gov/>
4. The Contractor assumes sole responsibility for worker safety, and damage to structures and improvements resulting from construction operations.
5. The Contractor shall have the permit(s) and conditions, the approved plans, and a current copy of City of Tukwila Development Guidelines and Design and Construction Standards available at the job site.
6. All work shall conform to these approved drawings. Any changes from the approved plans require pre-approval from the owner, the engineer, and the City of Tukwila.
7. All methods and materials shall meet City of Tukwila Development Guidelines and Design and Construction Standards, unless otherwise approved by the Public Works Director.
8. Contractor shall maintain a current set of record drawings on-site.
9. Contractor shall provide record drawings prior to project final approval.
10. Provide traffic control and street maintenance plan for Public Works approval before implementation.

11. All surveying for public facilities shall be done under the direction of a Washington licensed land surveyor. Vertical datum shall be NAVD 1988. Horizontal datum shall be Washington State (grid) Coordinates, North Zone, using NAD 83/91 survey control and tied to any two City of Tukwila Horizontal Control Monuments. For projects within a flood control zone, the Permittee shall provide conversion calculations to NGVD 1929.
12. Replace or relocate all signs damaged or removed due to construction.
13. Retain, replace or restore existing vegetation in rights-of-way, easements, and Access Tracts.

CONSTRUCTION

1. All work performed shall be per approved plans and specifications only. The Permittee is required to maintain a set of approved plans, specifications, and associated permits on the job site. Work shall be performed in accordance with all federal, state, and local laws. Permittee shall apply for a Revision for any work not according to the approved plans.
2. Permittee/Contractor shall arrange a preconstruction conference with the City's Inspector(s) prior to beginning any work.
3. Work in Roadways
 - a. All work in roadways shall meet TMC 11 and the following:
 - b. Prior to any activity in City right-of-way, the Permittee shall provide the City a traffic control plan for review and approval. The traffic control plan shall include the location, address and description of traffic flow during the work and shall meet MUTCD requirements.
 - c. All work requiring lane closures must be by permit only. From the third Thursday in November to the following January 2nd, the Director does not allow lane closures in the Tukwila Urban Center.
 - d. Fire, pedestrian, and vehicular access to buildings shall be maintained at all times, except when Permittee has permission from the building owner and the Director to close an access.
 - e. All roadways shall be kept free of dirt and debris using street sweepers. Use of water trucks for cleaning roadways requires preapproval from the Director.
 - f. Install steel plates over any trench, at any time work is stopped and the trench is left open.

GRADING AND EROSION CONTROL NOTES

1. The erosion prevention and sediment control (ESC) measures on the approved plans are minimum requirements.

2. Before beginning any construction activities, establish the clearing limits, install construction entrance, and install erosion prevention and sediment control measures.
3. Before any ground disturbance occurs, all downstream erosion prevention and sediment control measures (ESC) must be constructed and in operation. Install and maintain all ESC measures according to the ESC plan.
4. ESC measures, including all perimeter controls, shall remain in place until final site construction is completed and permanent stabilization is established.
5. From **May 1 through September 30**, provide temporary and permanent cover measures to protect disturbed areas that will remain unworked for seven days or more.
6. From **October 1 through April 30**, provide temporary and permanent cover measures to protect disturbed areas that will remain unworked for **two days** or more. In addition to cover measures, the Contractor shall:
 - a. Protect stockpiles and steep cut and fill slopes if unworked for more than **12 hours**.
 - b. Stockpile, on site, enough cover materials to cover all disturbed areas.
 - c. By **October 8**, seed all areas that will remain unworked during the wet season (October 1 through April 30). Mulch all seeded areas.
7. Failure to maintain ESC measures in accordance with the approved maintenance schedule may result in the work being performed at the direction of the Director and assessed as a lien against the property where such facilities are located.
8. During the life of the project, the Permittee shall maintain in good condition and promptly repair, restore, or replace all grade surfaces; walls, drains, dams, structures, vegetation, erosion and sediment control measures, and other protective devices in accordance with approved plans.
9. The Permittee shall monitor the downstream drainage features, and shall, with the Director's approval, remove all sediment deposition resulting from project-related work.

10. All work performed shall be per approved plans and specifications only. The Permittee is required to maintain a set of approved plans and specifications and associated permits on the job site. Work shall be performed in accordance with all federal, state, and local laws.
11. As the first order of business, the Permittee shall install erosion prevention and sediment control measures per the ESC and shall install the downstream temporary ESC measures before any site disturbance occurs. Before the temporary measures are removed, install and establish the upstream permanent ESC measures.
12. The Permittee shall at all times protect sensitive areas, their buffers, and adjacent private properties and public rights-of-way or easements from damage during grading operations. The Permittee shall restore, to the standards in effect at the time of the issuance of the permit, sensitive areas, their buffers, and public and private properties and improvements damaged by the Permittee's operations.
13. Permittee shall arrange for and comply with the following:
14. Notify the Public Works Department within 48 hours following installation of ESC measures.
15. Obtain permission in writing from the Public Works Department prior to modifying the ESC plan.
16. Maintain all road drainage systems, storm water drainage systems, control measures and other facilities as identified in the ESC plan.
17. Repair any siltation or erosion damages to adjoining properties and drainage facilities.
18. Inspect according to the approved ESC inspection schedule and make needed repairs immediately.

UTILITY NOTES

1. All trench excavation operations shall meet or exceed all applicable shoring laws for trenches over 4-feet deep. All trench safety systems shall meet WISHA requirements.
2. Power, cable, fiber optics, and telephone lines shall be in a trench with a 5' minimum horizontal separation from other underground utilities.
3. Adjust all manholes, catch basins, and valves to finish grade in public rights-of-way or easements after asphalt paving.

STORM DRAINAGE NOTES

1. All methods and materials shall meet City of Tukwila Development Guidelines and Design and Construction Standards, and the adopted King County Surface Water Design Manual, unless otherwise approved.

2. Mark all storm drain inlets with "Dump No Waste" and either "Drains to Streams", "Drains to Wetlands", or "Drains to Groundwater", as applicable. Install 4 inch raised pavement storm drain markers at all catch basin inlets.
3. Driveway culverts shall be of sufficient length to provide a minimum 3:1 slope from the edge of the driveway to the bottom of the ditch. Culverts shall have beveled end sections that match the side slope.

GEOTECHNICAL NOTE

TO DESIGNER: COMPLETE THE FOLLOWING NOTE or DELETE WHEN NOT APPLICABLE:

I, _____, the
architect/structural engineer, reviewed the geotechnical report,
titled _____,
prepared by _____ and dated
_____. I understand the report's recommendations, I explained
to the Owner the risks due to slides and I incorporated the
recommendations into the design. I established measures to reduce
potential risk of injury or damage that might be caused by any earth
movement predicted in the report.

Signature _____ Date ____ - __ - ____

APPENDIX C PLAN REVIEW CHECKLIST FOR COMPLETENESS

TUKWILA PUBLIC WORKS DEPARTMENT

PLAN REVIEW CHECKLIST

*This checklist is provided to aid the Engineer's completeness review before submittal to the City and is **not** intended as a full and complete list of requirements for submittals.*

PROJECT DESCRIPTION

Check All that apply to the Project

☐ Development – Private	☐ Development – Single Family	☐ Public Infrastructure
☐ Public road	☐ Sensitive Area(s)	☐ Flood Zone
Onsite Work Includes:		
☐ Clearing, Grading	☐ Paving	☐ Dead End & Landscape Island
☐ Utility Undergrounding	☐ Driveway	☐ Hammerhead
	☐ Private road	
☐ Infiltration ☐ Retention ☐ Detention ☐ Low Impact Development ☐ Habitat Improvement ☐ Other	☐ Looped Fire line ☐ Water Main Extension ☐ Permanent Meter ☐ Deduct Meter ☐ Water Only Meter ☐ Backflow Prevention ☐ Fire ☐ Irrigation ☐ Water Service	☐ Sewer Main Extension ☐ Sanitary Side Sewer ☐ Abandon Septic Tank ☐ Grease Interceptor ☐ Cap or Remove Utilities
Work in Right-of-way Includes:		
☐ Existing Access ☐ New Access ☐ Traffic signal ☐ Channelization ☐ Curb/gutter ☐ Sidewalk ☐ Signs ☐ Mailboxes ☐ Cable, conduit or other such ☐ Dead end ☐ Utility Undergrounding	☐ Trench Excavation ☐ Boring ☐ Pavement cut ☐ Pavement repair ☐ Pavement overlay ☐ Landscaping ☐ Water Supply ☐ Sewer ☐ Surface Water ☐ Sewer ☐ Traffic Control ☐ Low Impact Development	

PROJECT SUBMITTALS

Check All That Apply to the Project	Required For Work In Right-of-way
☐ Engineer estimate ☐ Geotechnical Report ☐ Traffic Impact Analysis ☐ Technical Information Report (Storm Drainage) ☐ King County Sewer Use Certificate ☐ Water Availability Certificate ☐ Sewer Availability Certificate ☐ South King County Department of Health approval if there is a septic tank onsite ☐ Proof that the Washington State code and the Uniform Plumbing Code were followed when septic tank abandoned ☐ State of Washington current water right permit for wells ☐ King County Industrial Waste Discharge approval ☐ King County DNR approval for connection to interceptor line ☐ Easement(s) ☐ Maintenance Agreement(s) ☐ Hold Harmless – Sensitive Area ☐ Street lighting calculations ☐ Waivers ☐ Recorded Landscape Island Maintenance Agreement ☐ Low Impact Development ☐ Other	☐ Engineer estimate ☐ Activity Description ☐ Plan ☐ Profile ☐ Cross-section ☐ Traffic control plan ☐ Applicant/Owner information ☐ Owner and Applicant in compliance statement ☐ City of Tukwila business license ☐ Copy of legal authorization ☐ Hold Harmless Agreement – right-of-way ☐ Comprehensive general liability insurance ☐ Business automobile liability insurance ☐ Contractor's pollution liability insurance ☐ Security - corporate surety bond, cash deposit or letter of credit ☐ Maintenance Bond ☐ Low Impact Development ☐ Street and pavement restoration plan

PLANS - ALL PROJECTS	
Drafting Standards	Plan Elements
☐ Engineering Drawings: Sheets Max: 24" x 36" Min. 11" X 17" ☐ Survey Drawings: Sheets 18" x 24" ☐ Minimum text size 1/8" ☐ Clean, legible, blue or black line format. ☐ Existing features with a small pen or half tones. ☐ Proposed features with a larger or bolder line weight. ☐ Different line types distinguish different features ☐ No photographs, stick-ons, or shading. ☐ NAD 83/91, Washington State grid Coordinates, North Zone, tied to any two City of Tukwila Horizontal Control Monuments NAVD 1988 Vertical ☐ Conversion calculations to NAVD 1929 for flood zone ☐ Engineer scale. No engineering plans will be accepted with architect's scale. • Site work – 1" = 40' Horizontal, 1" = 4' Vertical • Public Facility – 1" = 20' Horizontal, 1" = 2' Vertical • Signal Drawing Sheet - 1" = 10' • Illumination - 1" = 30' ☐ Title block: • Title: • Date: • Design by:	☐ North arrow on each sheet ☐ Labeled Record Drawing ☐ Labeled as-built drawing, (minimum text height 1/4") ☐ "Call 1-800-424-5555 411 Before You Dig" note on sheets showing excavation activity ☐ Engineer stamped, signed, and dated each sheet ☐ Project Schedule ☐ Applicable City's standard details ☐ Applicable City's standard notes ☐ Survey monument protection ☐ Surveyed corner marker protection ☐ Topography - Existing and proposed topography contours for 15 feet outside the property lines. Projects within flood control zones and some storm drainage plans require 1-foot intervals. ☐ Easements ☐ Clearing limits ☐ Construction limits ☐ No work zones ☐ Sensitive areas ☐ Buffers and set-backs ☐ Finished floor elevation ☐ Building footprints onsite and within 15' of the property lines ☐ Rights-of-way dimensioned and labeled ☐ Adjacent property lines and addresses ☐ Street names with quadrant prefix or suffix ☐ Existing and proposed pedestrian and bicycle facilities ☐ <u>Existing</u> and <u>proposed</u> utilities and improvements (above and below ground), ☐ Trees within or adjacent to the public ways – location and dimension ☐ Tree protection

PLANS - ALL PROJECTS	
• Drawn by: • Checked by: • Signature Approval block • Sheet number of total sheets (e.g., 2 of 5) ☐ Revisions and revisions dates ☐ Existing and proposed monuments. ☐ Monuments described using current City of Tukwila coordinates. ☐ Features referenced to monuments	☐ Protection of existing structures, fixtures, and facilities within or adjacent to the public ways
ESC Plan	Pollution Prevention Plan
☐ Stockpile locations ☐ Erosion prevention ☐ Runoff velocities minimized ☐ Sediment retention onsite ☐ Clearing limits ☐ Sensitive area buffers ☐ Temporary stabilization ☐ Perimeter protection ☐ Stabilized traffic areas ☐ Surface water controls ☐ Final stabilization methods ☐ Wet season requirements (October 1 through April 30) ☐ ESC Maintenance ☐ Downstream drainage features monitoring ☐ Removal of sediment deposition resulting from project-related work ☐ Post Construction Plans	Does the plan include BMPs for the following activities? ☐ Dewatering ☐ Paving ☐ Structure construction and painting ☐ Material delivery, use, or storage (soil, pesticides, herbicides, fertilizers, detergent, plaster, petroleum products, acids, lime, paints, solvents, curing compounds) ☐ Solid waste ☐ Hazardous waste ☐ Contaminated soils ☐ Concrete waste ☐ Sanitary/septic waste ☐ Vehicle or equipment cleaning, fueling, or maintenance

PLANS - ALL PROJECTS	
Street and Pavement Restoration Plan	Traffic Control Plan
☐ Plan and cross section ☐ Meets geotechnical recommendations ☐ Describes materials and thickness ☐ Matches existing conditions ☐ Shows channelization and other pavement markings ☐ Restores vehicle detector loop ☐ Replaces signs, mailboxes ☐ Restores Bike/pedestrian paths ☐ Includes landscape restoration ☐ Cleaning storm drain system ☐ ADA amenities	☐ Property lines ☐ Right-of-way lines ☐ Sidewalks ☐ Street lights ☐ Signs ☐ Mailboxes ☐ Landscaping and trees ☐ Channelization ☐ Cross walks ☐ Bus stops ☐ Accesses ☐ Bike/Pedestrian paths ☐ Traffic control devices ☐ Pedestrian and emergency access to any abutting public school, public building, urban trail, or transit stop

PLANS - ALL PROJECTS	
Streets Plan View	Streets Profile View
☐ Spot elevations on curb returns (PC, PT, $\Delta/2$) ☐ PI, PC, PT, stationing of horizontal curves ☐ Curve information delta, radius, and length for all curves ☐ Horizontal angle points and curb return elevations ☐ Identify field design situations by notes ☐ Match existing features by station with elevation ☐ Typical roadway sections and pavement types ☐ Pavement markings noted by station and offset ☐ Sidewalks ☐ Driveway entrances ☐ Width, type (AC, PCC) note applicable City standard plan ☐ Station at center ☐ Sight distance for horizontal and vertical curves, intersections and access points ☐ Curb access ramps – per City standard plan ☐ Intersection detail ☐ Street trees with stations ☐ Existing and proposed transit stops and shelters ☐ Existing and proposed traffic signs ☐ Existing and proposed mail boxes ☐ Existing and proposed street lights and vaults ☐ Pedestrian and emergency access to any abutting public school, public building, urban trail, or transit stop ☐ ADA amenities	☐ Vertical information PVC, PVI, PVT, AP ☐ Show grades in decimal (FT/FT) form with (+ and -) slope ☐ Super elevated roadway segments ☐ Detail (length of transition in, length of full super, length of transition out) ☐ New and existing centerline profile ☐ Pavement cross section supported by pavement design ☐ New gutter edge of pavement profile* ☐ Existing edge of pavement profile* *Not required for new standard street section construction. Required for Retrofit and Variable Gutter
	Street Ends ☐ Cul-de-sac ☐ Landscape island at dead end ☐ Hammerhead ☐ Barricade temporary dead-end ☐ Property lines and addresses

PLANS - ALL PROJECTS	
Surface Water	
Plan View ☐ Utility crossings ☐ Station and offset at each manhole catch basin ☐ Manholes/catch basins numbered sequentially ☐ Manholes/catch basin type designation ☐ Manholes/catch basin rim elevation ☐ Flow direction (with arrow on pipe) ☐ Pipe material, sizes and lengths ☐ Stormwater detention facility (pond dimensions with elevations) ☐ Stormwater treatment facility (dimensions with elevations) ☐ Control structure with orifice size and elevation ☐ Emergency overflow location and elevation ☐ Design high water elevation ☐ Outfall locations and treatment	Profile View ☐ Elevations of each utility at utility crossings ☐ Station and offset at each manhole/catch basin ☐ Invert elevations on manholes/catch basins showing direction of flow ☐ Manhole/catch basin type designation ☐ Rim elevation ☐ Pipe materials and sizes ☐ Length of pipe (shown in L.F.) center structure to center structure ☐ Grades shown (decimal from FT./FT.) ☐ Stormwater detention facility ☐ Stormwater treatment facility ☐ Control structure ☐ Outfall locations and elevations

PLANS - ALL PROJECTS	
Water Supply	Sanitary Sewer
Plan View ☐ Elevations of each utility at utility crossings ☐ Show fixtures with stations ☐ Fire hydrants ☐ Blow-off (at dead end of line) ☐ Vacuum and air release valves ☐ Tees, crosses, elbows, adapters, and valves, meter station and offset ☐ Size of pipe ☐ Type and brand of fixtures ☐ Length of water main in L.F. between fixtures ☐ Distance from sanitary or storm sewer ☐ Meters located in ROW at property line ☐ Meters grouped Profile View ☐ Elevations of each utility at utility crossings ☐ Show fixtures with stations and elevations ☐ Show valves and stations and elevations ☐ Size and material of water main ☐ Length of water main in L.F. ☐ Grades	Plan View ☐ Elevations of each utility at utility crossings ☐ Station and offset shown at each proposed manhole ☐ Manholes numbered sequentially ☐ Manhole type designation ☐ Flow direction (with arrow on pipe) ☐ Invert elevations ☐ Distance from water lines ☐ Pipe material and sizes ☐ Length of pipe from center of manhole to center of manhole ☐ Depth at property line ☐ Station for sewer laterals at property line ☐ Stub (s) for laterals ☐ On as-builts, laterals will be related to property corners measured along the right-of-way line ☐ Force main and appurtenances with station and offset Profile View ☐ Elevations of each utility at utility crossings ☐ Station and offset shown at each manhole ☐ Manholes numbered sequentially ☐ Invert elevation showing direction, in and out ☐ Rim elevation ☐ Grades shown (decimal form FT./FT.) ☐ Type of pipe ☐ Size of pipe ☐ Length of pipe from center of manhole to center of manhole (in L.F.) ☐ Existing utilities crossings ☐ Force main and appurtenances with stations and offsets

PLANS - ALL PROJECTS	
DEVELOPMENT – Private Property	
Plans ☐ Design meets City's <i>Development Guidelines and Design and Construction Manual</i> ☐ All applicable requirements under the previous checklists ☐ Cut and fill volumes ☐ Impervious surface calculation – existing and proposed ☐ Access provided to easement(s) or right(s)-of-way ☐ Access width at property line is 25' to 35' ☐ Access aligned with accesses opposite ☐ Access sight distance shown	Profile ☐ Location, route, and configuration of all facilities to be located underground, including the line and grade proposed for the burial at all points along the route that are within the public ways ☐ Location of all existing underground utilities, conduits, ducts, pipes, mains, and installations that are within the public ways along the underground route proposed by the applicant ☐ Cross section showing pavement and subgrade, existing and proposed utilities ☐ Trench cross-section(s) showing materials, depth, coverage and utilities
Utilities ☐ Location and route of all facilities to be installed on existing utility poles ☐ Proposed above ground utilities ☐ Location, route, and configuration of all facilities to be located underground, including the line and grade proposed for the burial ☐ Existing underground utilities, conduits, ducts, pipes, mains, and installations that are within the public right of ways ☐ Proposed underground utilities, conduits, ducts, pipes, mains, and installations	Streets ☐ Frontage improvements in right-of-way ☐ Access – 25' to 35' at right-of-way ☐ Meets private road standards ☐ Meets public road standards
	Surface Water ☐ Meets Technical Information Report ☐ Meets geotechnical report recommendations ☐ Meets applicable requirements under the "Surface Water – All Projects" checklist
Sewer ☐ All applicable requirements under the "Sewer – All Projects" checklist ☐ Minimum 6" lateral ☐ Sewer clean-out and test –tee at property line ☐ Sewer clean-out at building ☐ Grease interceptor, 6" lines, and reference to related plumbing sheets	Water ☐ All applicable requirements under the "Water Supply – All Projects" checklist ☐ Water meter(s) in right-of-way at the property line ☐ Looped water system ☐ Backflow assembly on water supply, include protection from freezing ☐ Backflow assembly on fire line, make, model, location

DEVELOPMENT GUIDELINES AND DESIGN AND CONSTRUCTION STANDARDS

PLANS - ALL PROJECTS	
	☐ Backflow protection on irrigation line, make, model, location

DEVELOPMENT – Single Family Residence

The City may accept non-engineered plans for single-lot, single-family residence. The City requires engineered plans for all public infrastructure, work in the right-of-way, all surface water other than Small Site Drainage Review (KCSWDM), and development in a sensitive area.

DEVELOPMENT – Single Family Residence	
Submittals	Plans
☐ Water Availability Certificate ☐ Sewer Availability Certificate ☐ Utility/Grading/Drainage Plan(s) ☐ Erosion Prevention and Sediment Control Plan ☐ Feasibility Evaluation per King County Surface Water Design Manual ☐ Geotechnical Report ☐ King County Department of Health approval if there is a septic tank onsite ☐ Proof that the Washington State code and the Uniform Plumbing Code were followed when septic tank abandoned ☐ State of Washington current water right permit for wells	☐ Drafting standards ☐ Plan elements ☐ Scale (usually 1"=20' horizontal) ☐ Existing and proposed contours at 2' intervals ☐ Easements - Width, location, purpose - existing and proposed ☐ Property lines and dimensions ☐ 100-year flood plain delineation ☐ Shoreline limits ☐ Sensitive areas and associated buffers ☐ Footprints of all existing and proposed structures ☐ Structures outside the property boundaries and within 15' of the property lines ☐ Retaining walls, rockeries and other structures of that sort, existing and proposed ☐ Surface and subsurface utility locations, including power poles, light poles, underground cable ☐ Sensitive areas, water courses, lakes, wetlands, etc. within ¼ mile downstream of the property boundaries ☐ Cross sections for trenches, drainage pits, trench drains, etc. ☐ Fill material description and quantity ☐ Proposed location of stockpiles and material description ☐ Pavement cross-section showing subgrade depth, surfacing material depth, and material descriptions for subgrade and surface ☐ Locations, specifications and cross-sections of temporary erosion control ☐ Permanent stabilization of exposed ground ☐ Abandon or remove existing utilities – capped at the main

DEVELOPMENT GUIDELINES AND DESIGN AND CONSTRUCTION STANDARDS

DEVELOPMENT – Single Family Residence	
Access	Surface Water
☐ One access ☐ 10' to 20' wide at right-of-way ☐ Turning radii at property line is 5' ☐ Maximum 15% grade ☐ Paved connection from access to right-of-way pavement ☐ Driveway paved from property line onto property for at least 20' ☐ Access provided to easement(s) or right(s)-of-way	☐ Existing and proposed onsite drainage ☐ Roof downspout controls ☐ Locations, materials, sizes, slopes, and lengths for proposed storm drainage ☐ Pipes with slopes over 15% must be anchored
Water	Sewer
☐ Location of wells within 100' of the site ☐ Abandoned wells ☐ Existing water meter and lines, locations, sizes ☐ Water meter reused ☐ Water connection reused ☐ Abandoned water capped at the main ☐ Size and location of the water main (minimum 8") ☐ Correct stub location ☐ Engineered plans for water main extension ☐ Nearest fire hydrant location ☐ 1" pipe for sprinkled house ☐ Pipe locations, sizes, and materials ☐ Water meter size ☐ Water meter located at property line within City ROW ☐ Water meter located on property – easement to City ☐ Meter in access has reinforced box ☐ Water and sewer lines 10' horizontal separation ☐ Water line at least 18" above sanitary sewer line	☐ Existing septic tank location ☐ Abandon septic system ☐ Existing lateral ☐ Existing connection reused ☐ Abandoned pipes capped at main ☐ Size and location of the water main ☐ Correct stub location ☐ Engineered plans for sewer main extension ☐ Lateral location, size (minimum 4"), and materials ☐ Lateral length 150' or shorter ☐ Lateral length greater than 150 – sewer main extension and manhole ☐ Slope 2% to 50% ☐ Anchored pipes on slopes over 15% ☐ Pipe 5' or more from building, except at entrance to building ☐ One foot cover ☐ Clean out at building ☐ Clean outs at 100' intervals – property line to building ☐ Test tee at property line ☐ Water and sewer lines 10' horizontal separation ☐ Water line at least 18" above sanitary sewer line ☐ Sewer line sleeved

APPENDIX D REVISION REQUEST FORM



PUBLIC WORKS DEPARTMENT

DEVELOPMENT GUIDELINES

AND

DESIGN AND CONSTRUCTION STANDARDS

REVISION REQUEST FORM

DATE

MANUAL VERSION

DESCRIBE REQUESTED REVISION:

Include Chapter, page number, section heading, reason, and, when applicable, supporting documentation. Attach supporting information.

YOUR NAME

ADDRESS

BUSINESS OR FIRM

PHONE

FAX

E-MAIL

OTHER

APPENDIX E PREFERRED BIORETENTION PLANTS

Large Street Trees

Large Street Trees - Name	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Acer freemanii</i> var. 'Autumn Blaze' Autumn Blaze Maple	2	3	50'	40'	20'-40'	6'	<i>Fast-growing; dense, oval crown; excellent autumn colors</i>
<i>Acer nigrum</i> var. 'Green Column' Green Column Sugar Maple	2	3	65'	25'	12'-25'	6'	<i>Similar to A. saccharum, but more resistant to heat and drought</i>
<i>Acer rubrum</i> Red Maple	2	3	60'	40'	20'-40'	6'	<i>Red twigs and branchlets; does not tolerate excessive pollution</i>
<i>Acer pseudoplatanus</i> Sycamore Maple	2	3	40'	40'	20'-40'	6'	<i>Autumn color dependent on variant; moderate growth rate</i>
<i>Acer saccharum</i> var. 'Bonfire' Bonfire Sugar Maple	2	3	50'	40'	20'-40'	6'	<i>Fast growing; stout branches form a dense canopy</i>
<i>Acer saccharum</i> 'Commemoration' Commemoration Sugar Maple	2	3	50'	35'	17'-35'	6'	<i>Fast growing; stout branches form a dense canopy</i>
<i>Acer saccharum</i> 'Green Mountain' Mountain Sugar Maple	2	3	45'	35'	17'-35'	6'	<i>Fast growing; stout branches form a dense canopy; tolerant of heat and drought</i>

Large Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Aesculus x carnea</i> var. 'Briotti' Red Horse-chestnut		2	3	40'	30'	15'-30'	6'	<i>Crimson spring-time blossoms; rounded crown with dark green leaves; mature trees cast dense shade</i>
<i>Alnus rubra</i> Red Alder	1	2	3	45'-50'	20'-30'	10'-30'	6'	<i>Attractive light gray bark; dark green leaves with rust-colored underside; most common alder of the Pacific Northwest</i>
<i>Cercidiphyllum</i> <i>japonicum</i> Katsura		2	3	40'	25'	12'-25'	6'	<i>Pyramidal in shape; heart shaped leaves; to enhance fall color, water less in the late summer months; leaves smell like brown sugar in the fall</i>
<i>Fraxinus americana</i> Autumn Applause Ash		2	3	80'	50'	25'-50'	6'	<i>Fast-growing; useful as a shade tree; oval-shaped crown</i>
<i>Fraxinus latifolia</i> Oregon Ash		2	3	60'	35'	17'-35'	6'	<i>Tolerant of wet conditions</i>
<i>Fraxinus</i> <i>pennsylvanica</i> 'Patmore' Patmore Ash			3	30'- 50'	30'-50'	15'-30'	6'	<i>Compact, oval crown; dense; strong resistance to disease and pests</i>
<i>Fraxinus</i> <i>pennsylvanica</i> 'Urbanite' Urbanite Ash			3	30'-50'	30'-50'	15'-50'	6'	<i>Pyramidal in shape; dense</i>
<i>Ginkgo biloba</i> 'Princeton Sentry' Princeton Sentry Ginkgo		2	3	35'- 50'	15'-20'	8'-20'	6'	<i>Pollution and heat tolerant; pyramidal in shape; autumn leaves fall to form a beautiful groundcover blanket</i>

Large Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Ginkgo biloba</i> 'Magyar' Magyar Ginkgo		2	3	50'	25'	12'-25'	6'	<i>Pollution and heat tolerant; upright and narrow in shape; autumn leaves fall to form a beautiful groundcover blanket</i>
<i>Gleditsia triacanthos inermis</i> Honeylocust		2	3	70'	25'-35'	12'-35' (varies)	8'	<i>Thornless variety; green, fernlike leaves; tolerant of acidic soils, salt, drought, cold, heat, wind, and pollution</i>
<i>Liriodendron tulipifera</i> Tulip Tree			3	60'-80'	40'	20'-40'	8'	<i>Fast-growing; straight trunk with pyramidal crown; thrives in rich, well-drained soil</i>
<i>Liquidambar styraciflua</i> var. 'Rotundiloba' Fruitless Gum Tree	1	2		60'	30'	15'-30'		<i>Aggressive root structure that requires a large planting strip; mixed autumn color of purple, yellow and red; resistant to oak root fungus</i>
<i>Nyssa sylvatica</i> Tupelo		2	3	30'-50'	15'-25'	8'-25' (varies)	6'	<i>Crooked branches with a reddish bark; produces excellent shade; tolerant of poor draining soils</i>
<i>Quercus coccinea</i> Scarlet Oak			3	60'-80'	40'-60'	20'-60' (varies)	6'	<i>Pyramidal when young, but round when mature; gray-brown bark</i>
<i>Quercus frainetto</i> Italian Oak			3	100'	70'	35'-70'	6'	<i>Fast-growing; dark gray bark; glossy deep green leaves; symmetrical</i>
<i>Quercus garryana</i> Oregon Oak			3	40'-90'	30'-60'	15'-60' (varies)	8'	<i>Gray, scaly bark; leathery and glossy green leaves</i>
<i>Quercus imbricaria</i> Shingle Oak			3	50'	40'	20'-40' (varies)	6'	<i>Grows roughly 1' per year; gray brown bark; lance-shaped leaves</i>

Large Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Quercus macrocarpa</i> Bur Oak			3	60'-75'	30'-40'	15'-40' (varies)		<i>Flaky, grayish brown bark; acorns have a fringed cap</i>
<i>Quercus phellos</i> Willow Oak			3	50'-90'	30'-50'	15'-50' (varies)		<i>Pyramidal in shape; smooth gray bark</i>
<i>Quercus robur</i> English Oak			3	50'-60'	30'	15'-30'		<i>No significant fall color; fast growing tree; short trunk with wide, sprawling crown</i>
<i>Quercus rubra</i> Red Oak	2		3	60'-75'	50'	25'-50'	8'	<i>Fast-growing; round canopy; requires fertile soil and regular moisture</i>
<i>Quercus velutina</i> Black Oak			3	50'	45'	22'-45'		<i>Tolerant of many soils; acorns have a fringed cap; black bark in maturity that produces a yellow dye</i>
<i>Tilia americana</i> var. 'Redmond' Redmond Linden	2			40'-60'	20'-25'	10'-25' (varies)		<i>Straight-trunked tree with a narrow crown</i>
<i>Tilia cordata</i> 'Degroot' Degroot Littleleaf Linden	2			30'-50'	15'-30'	8'-30' (varies)	5'	<i>Very tolerant of urban conditions; excellent shade tree when given room to grow</i>
<i>Tilia cordata</i> 'Chancole' Chancellor Linden	2			30'-50'	15'-30'	8'-30' (varies)	6'	<i>Very tolerant of urban conditions; excellent shade tree when given room to grow</i>

Large Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Tilia tomentosa</i> var. 'Sashazam' Satin Shadow Silver Linden		2		40'- 50'	20'-30'	10'-30' (varies)		Light green leaves that are silvery on the underside; tolerant of heat and drought
<i>Tilia petiolaris</i> Pendant Silver Linden		2	3	70'	40'	20'-40'		Weeping branches; dark green leaves have a fuzzy underside that give the tree a silvery appearance in the wind
<i>Zelkova serrata</i> 'Greenvase' Green Vase Zelkova			3	45'	40'	20'-40'	6'	Attractive bark; tolerant of drought and wind; good shade tree; vase-shaped
<i>Zelkova serrata</i> 'Village Green' Village Green Zelkova			3	45'	40'	20'-40'	6'	Attractive bark; tolerant of drought and wind; good shade tree; vase-shaped

Medium Street Trees

Medium Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Acer campestre</i> Hedge Maple		2	3	30'	30'	15'-30'	5'	Dense, rounded crown; many cultivars of similar growth; grows well in the Pacific Northwest
<i>Acer truncatum</i> x <i>A. platanoides</i> 'Warrens Red' Pacific Sunset Maple		2	3	30'-35'	25'	12'-25'	5'	Fast-growing; tolerant of heat and drought; dark green, glossy leaves

Medium Street Trees - Name	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Betula albosinensis</i> var. <i>septentrionalis</i> Chinese Red Birch	2	3	40'	35'	18'-35'	5'	<i>Flaking orange to orange-brown bark</i>
<i>Betula papyfera</i> Paper Birch	2	3	50'-60'	25'	12'-25'	6'	<i>Attractive, creamy-white bark</i>
<i>Carpinus caroliniana</i> American Hornbeam	2	3	25'	25'	12'-25'	5'	<i>Attractive, smooth blue-gray bark; can be single or multi-trunked</i>
<i>Cladrastis kentukea</i> Yellow wood	2		30'-50'	30'-50'	15'-50' (varies)		<i>Gray bark; beautiful fall color; deep rooting, so it is possible to plant beneath the tree</i>
<i>Cornus controversa</i> 'June Snow' Giant Dogwood	2	3	40'-60'	40'-60'	20'-60' (varies)	5'	<i>Fast-growing; picturesque branches; full sun is necessary for best bloom</i>
<i>Cornus florida x nuttallii</i> Eddie's White Wonder Dogwood	2	3	30'	20'	10'-20'	5'	<i>Clusters of tiny flowers in mid-spring</i>
<i>Corylus cornuta</i> Beaked Hazelnut	2	3	20'	10'	5'-10'	5'	<i>Vase-like shape; needs adequate space to grow; catkins add winter interest</i>

Medium Street Trees - Name	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Crataegus crus-</i> <i>galli</i> var. 'Inermis' Thornless Cockspur Hawthorne		3	20'-30'	20'-35'	10'-35' (varies)	5'	Smooth, glossy green leaves; clusters of white flowers in the spring months; tiny fruits attractive to bees and birds
<i>Crataegus x lavalii</i> Lavalle Hawthorne		3	25'	20'	10'-20'	5'	Dark green leathery leaves; clusters of red fruits add winter color
<i>Fagus sylvatica</i> var. 'Dawyck' Beech Tree	2	3	35'	8'	4'-8'		Cone-like shape; smooth gray bark; roots near the surface, which inhibits lawn or plant growth
<i>Ginkgo biloba</i> 'Autumn Gold' Autumn Gold Ginkgo	2	3	35'-50'	15'-20'	8'-20' (varies)	6'	Pollution and heat tolerant; pyramidal in shape; autumn leaves fall to form a beautiful groundcover blanket
<i>Halesia monticola</i> Mountain Silverbell	2		60'	40'	20'-40'		Bell-shaped flowers; attractive when planted with rhododendrons
<i>Magnolia</i> <i>grandiflora</i> var. 'Victoria' Southern Magnolia	2	3	20'	15'	8'-15'		Evergreen; broad, dark green leaves; large white, fragrant flowers; unpredictable in form

Medium Street Trees - Name	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Magnolia x kewensis</i> var. 'Wada's Memory' Wada's Memory Magnolia	2	3	30'	20'	10'-20'		<i>Deciduous; new leaves are copper in color; casts dense shade</i>
<i>Oxydendrum arboretum</i> Sourwood	2	3	15'-30'	20'	10'-20'	5'	<i>Pyramidal shape; fragrant summer flowers; requires well-drained soils</i>
<i>Prunus cerasifera</i> var. 'Krauter Vesuvius' Cherry Plum	2	3	20'	20'	10'-20'	5'	<i>Dense, upright crown; blooms best and retains purple-leafed color in full sun; tolerant of moist well-drained soils</i>
<i>Pyrus calleryana</i> Ornamental Pear		3	50'	50'	25'-50'		<i>Horizontal branching pattern; fall color depends on variant</i>
<i>Quercus ilex</i> Holly Oak	2	3	30' - 60'	30' - 60'	15'-60' (varies)		<i>Evergreen; dense, rounded crown; tolerant of salt air; susceptible to sudden oak death</i>
<i>Rhamnus purshiana</i> Cascara	2	3	20'-40'	10'-30'	5'-30' (varies)	5'	<i>Smooth gray bark; picturesque branches; dark green leaves</i>
<i>Sophora japonica</i> 'Regent' Japanese Pagoda Tree		3	45'	40'	20'-40'	6'	<i>Fast-growing; dark green leaflets; tolerant of urban conditions; great shade tree</i>

Medium Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Sorbus aucuparis</i> 'Mitchred' Cardinal Royal Mountain Ash	2	3		20'-40'	15'-25'	8'-25' (varies)	5'	Dense oval-to-round crown
<i>Sorbus x hybridia</i> Oakleaf Royal Mountain Ash	2	3		20'-30'	20'-30'	10'-30' (varies)	5'	Blue-green foliage
<i>Styrax japonicus</i> Japanese Snowbell	2			30'	30'	15'-30'	5'	Slender trunk; strong horizontal branches; beautiful flowers warrant it being planted in a highly-visited area
<i>Ulmus parvifolia</i> 'Emer I' Athena Classic Elm	2			35'	50'	25'-50'	5'	Fast-growing; long, weeping branches; excellent street tree or screening tree
<i>Ulmus parvifolia</i> 'Emer II' Allee Elm	2			70'	60'	30'-60'	5'	Long, weeping branches; excellent street tree or screening tree

Small Trees

Small Street Trees - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Acer buergeranum</i> Trident Maple	2	3		20'-25'	20'-25'	10'-25' (varies)	5'	Round crown with glossy green leaves; low and spreading growth; stake and prune to make tree branch high
<i>Acer circinatum</i> Vine Maple	2	3		30'	30'	15'-30'	5'	Small, nearly symmetrical tree; multiple trunks

<i>Small Street Trees - Name</i>	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Acer grandidentum</i> <i>var. 'Schmidt'</i> Rocky Mountain Glow Maple	2	3	20'-25'	15'	8'-15'	5'	<i>Very hardy tree; tolerant of most soil conditions; oval crown</i>
<i>Acer ginnala</i> Amur Maple	2	3	25'	25'	12'-25'	5'	<i>Showy, red-twiggged seeds in the summer months</i>
<i>Acer miyabei</i> <i>var. 'Morton'</i> State Street Maple	2	3	40'	30'	15'-30'	6'	<i>Fast-growing; attractive autumn color</i>
<i>Acer palmatum</i> Japanese Maple	2	3	20'	20'	10'-20'	5'	<i>Fast-growing; the most delicate of maple trees; many branches; young spring foliage is red, turning to green in the summer; fall colors vary</i>
<i>Acer rubrum</i> <i>var. 'Bowhall'</i> Bowhall Maple	2	3	45'	40'	20'-40'	6'	<i>Fast-growing, tolerates most soils; performs best in native, low-traffic areas</i>
<i>Acer rubrum</i> <i>var. 'Doric'</i> Doric Maple	2	3	45'	40'	20'-40'	6'	<i>Fast-growing, tolerates most soils; performs best in native, low-traffic areas</i>
<i>Acer triflorum</i> <i>Three-Flower Maple</i>	2	3	25'	20'	10'-20'	5'	<i>Multi-season interest; beautiful autumn color; tan bark</i>

<i>Small Street Trees - Name</i>	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Amelanchier grandiflora</i> <i>Autumn Brilliance</i> <i>Serviceberry</i>	2	3	20'	15'	8'-15'	4'	<i>Strong stems; blue-green foliage; drooping clusters of white flowers</i>
<i>Betula albosinensis</i> <i>var.</i> <i>'Septentrionalis'</i> <i>Chinese Red Birch</i>	2	3	40'	35'	18'-35'	5'	<i>Flaking orange to orange-brown bark</i>
<i>Cercis canadensis</i> <i>Eastern Redbud</i>	2	3	25'-35'	25'-35'	12'-35' (varies)	5'	<i>The fastest growing redbud; horizontally tiered branches; needs adequately drained soils</i>
<i>Cornus mas</i> <i>Cornelian</i> <i>Cherry Dogwood</i>	2	3	15'-20'	15'-20'	8'-20' (varies)	5'	<i>The earliest dogwood to bloom; gray and tan bark provides winter interest</i>
<i>Cornus rutgersensis</i> <i>var. 'Aurora'</i> <i>Aurora Stellar Dogwood</i>	2	3	20'	25'-30'	12'-30' (varies)	5'	<i>Disease resistant hybrid of C. florida and C. kousa; single trunked; beautiful autumn color</i>
<i>Cornus rutgersensis</i> <i>var. 'Celestial'</i> <i>Celestial Stellar Dogwood</i>	2	3	20'	25'-30'	12'-30' (varies)	5'	<i>Disease resistant hybrid of C. florida and C. kousa; single trunked; beautiful autumn color</i>

<i>Small Street Trees - Name</i>	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Cornus rutgersensis var. 'Stellar Pink' Stellar Pink Dogwood</i>	2	3	20'	25'-30'	12'-30' (varies)	5'	<i>Disease resistant hybrid of C. florida and C. kousa; single trunked; beautiful autumn color</i>
<i>Cotinus obovatus American Smoke Tree</i>		3	25'	25'	12'-25'	5'	<i>Unusual and colorful; excellent screening tree; ; blue-green foliage</i>
<i>Crataegus phaenopyrum Washington Hawthorn</i>		3	25'	20'	10'-20'	5'	<i>Open limb structure; shiny red winter fruits</i>
<i>Lagerstoemia hybrids Crape Myrtle</i>		3	10'-30' (varies)	10'-30' (varies)	5'-30' (varies)	5'	<i>Fall color depends on species, typically yellow, red, or orange; showy summer flowers</i>
<i>Hamamelis mollis Chinese Witch Hazel</i>	2	3	30'	30'	15'-30'	5'	<i>Round, dark green leaves; fragrant winter flowers</i>
<i>Koelreuteria paniculata Goldenrain Tree</i>	2	3	20'-35'	25'-40'	12'-40' (varies)	5'	<i>Tolerant of urban conditions; open branches provide shade; spring leaves are purple, maturing to green in the summer</i>
<i>Magnolia 'Galaxy' Galaxy Magnolia</i>	2	3	25'	25'	12'-25'	5'	<i>Fast-growing; conical shape; showy flowers</i>

<i>Small Street Trees - Name</i>	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Magnolia grandiflora</i> var. 'Little Gem' <i>Dwarf Southern Magnolia</i>	2	3	20'-25'	10'-15'	5'-15' (varies)	5'	<i>Evergreen; branches to the ground; less hardy than other Magnolia species</i>
<i>Magnolia x loebneri</i> <i>Loebner Magnolia</i>	2	3	12'-15'	12'-15'	6'-15' (varies)	5'	<i>Deciduous; blooms appear before leaves in the spring</i>
<i>Malus</i> var. 'Golden Raindrops' <i>Golden Raindrops Crabapple</i>	2	3	20'	15'	8'-25'	5'	<i>Disease resistant; tolerant of many soil types; elegant, horizontally spreading limbs</i>
<i>Malus</i> var. 'Lancelot' <i>Lancelot Crabapple</i>		3	8'	8'	4'-8'	5'	<i>Beautiful spring-time white flowers; golden fruit in the autumn months</i>
<i>Parrotia persica</i> <i>Persian Parrotia</i>	2	3	15'-30'	20'	10'-20'	5'	<i>Smooth gray bark with white patches; colorful tree year-round</i>
<i>Prunus yedoensis</i> var. 'Akebono' <i>Akebono Flowering Cherry</i>	2	3	25'	25'	12'-25'	6'	<i>Most common cherry tree in the Pacific Northwest; disease resistant</i>

Small Street Trees - Name	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Quercus shumardii</i> Shumard Oak	2	3	40'	35'	18'-35'	6'	Pyramidal when young, grows to a open crown in maturity; similar in appearance to the Scarlet Oak; tolerates most soil conditions
<i>Sorbus americana</i> var. 'Dwarfcrowne' Red Cascade Mountain Ash	2	3	16'	8'	4'-8'	5'	Very hardy and tolerant of wet soils; compact growth; orange red fruits
<i>Styrax obassia</i> Fragrant Snowbell	2		20'-30'	25'	12'-25'	5'	Oval-to-round crown; flowers in drooping clusters
<i>Syringa reticulata</i> Japanese Tree Lilac	2		30'	20'	10'-20'		Can be grown as a shrub or single stemmed tree; useful as a small shade tree; smooth red bark

Conifers for Special Sites

Conifers for Special Sites - Name	Zone		Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Calocedrus decurrens</i> California Incense Cedar		3	75'-90'	15'	8'-15'	10'	Produces a sweet fragrance in the summer; can grow up to 2' per year once established
<i>Cedrus deodara</i> Deodar Cedar	2	3	80'	40'	20'-40'	10'	Fast growing tree; branches to ground, with bottom branches sweeping upward; many cultivars with a variety of needle colors

Conifers for Special Sites - Name	Zone			Height	Spread	On Center Spacing	Plant Strip Width	Characteristics
<i>Chamaecyparis nootkatensis</i> Alaskan Yellow Cedar		2	3	80'	25'	12'-25'	10'	<i>Tiny, scale-like leaves of blue-green; branches to ground in drooping pattern</i>
<i>Metasequoia glyptostroboides</i> Dawn Redwood			3	90'	60'	30'-60'	8'	<i>Fast-growing tree; pyramidal in shape with soft, pale green needles and small cones; thrives in well- drained soil</i>
<i>Picea omorika</i> Serbian Spruce			3	50'-60'	6'-10'	3'-10' (varies)	6'	<i>Conical in shape; shiny green needles with white underside; branches to ground; slow-growing</i>
<i>Taxodium distichum</i> Bald Cypress		2	3	50'-70'	20'-30'	10'-30' (varies)	8'	<i>Pyramidal in shape; feathery, delicate foliage; resistant to disease and pests</i>
<i>Thuja plicata</i> Western Red Cedar			3	50'- 100'	25'-60'	12'-60' (varies)	12'	<i>Many cultivars; slender, drooping branches with dark green leaves; requires adequate space to grow</i>
<i>Umbellularia californica</i> California Bay Laurel	1	2	3	up to 75'	up to 100'	50'-100'	12'	<i>Huge, gumdrop shaped shrub or tree. depending on how it is grown; leaves can be used as a sweet bay substitute in cooking; fruiting in summer months</i>

Bioretention Plants – Sedges and Rushes

Bioretention Plants – Sedges and Rushes Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Carex obnupta</i> Slough sedge	1	2		12" - 36"	up to 48"	36"	<i>Spreads quickly; excellent soil binder</i>
<i>Carex oshimensis</i> <i>'Evergold'</i> Variegated Japanese Sedge		2	3	12" - 24"	24" - 36"	28"	<i>Variegated leaves with white band; great for planting along sidewalk edges</i>
<i>Carex stipata</i> Sawbeak Sedge	1			24"-36"	24"-36"	28"	<i>Spreads quickly; long, tapered foliage</i>
<i>Juncus acuminatus</i> Taper-tipped Rush	1			6" - 18"	12" - 24"	18"	<i>Red-brown flowers; delicate</i>
<i>Juncus ensifolius</i> Dagger-leaf Rush	1			6" - 15"	6" - 9"	6"	<i>Pom-pom like flowers; adds interest to landscape</i>
<i>Juncus tenuis</i> Slender Rush	1	2		6" - 20"	6" - 30"	22"	<i>Bright green foliage</i>
<i>Scirpus acutus</i> Hardstem Bulrush	1			10'	6'	4'	<i>Gray-green to dark green foliage; dense</i>
<i>Scirpus microcarpus</i> Small-fruited Bulrush	1			24" - 36"	12" -24"	18"	<i>Spreads quickly; excellent soil binder</i>

Bioretention – Ornamental Plants

Bioretention Ornamental Plants Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Aster chilensis</i> California Aster		2	3	24"- 36"	18"-36"	18"-28"	Low-growing plant; shear when blooming ceases in the autumn, returns in the spring
<i>Aquilegia formosa</i> Western Columbine		2	3	12"- 36"	12"-36"	18"-28"	Excellent in woodland areas; attracts pollinators; tolerant of shallow flooding
<i>Arctostaphylos uva-ursi</i> Kinnikinnick or Bearberry		2	3	6" - 12"	24" - 36"	18"-28"	Glossy, leathery leaves; low- growing ground cover; easy-care once established; bell-shaped flowers; red berries
<i>Asarum caudatum</i> Wild ginger		2	3	4"-6"	36"	18"-28"	Glossy leaves that exude the fragrance of ginger when crushed
<i>Athyrium filix-femina</i> Lady fern	1	2	3	36"- 60"	24"	12"-18"	Fast-growing; tolerant of shallow flooding
<i>Blechnum spicant</i> Deer fern	1	2	3	12"- 36"	24"	12"-18"	Dark, glossy leaves with a crinkled texture; tolerant of shallow flooding
<i>Camassia leichtlinii</i> Leichtlin's camass		2	3	36"- 48"	12"-24"	12"-18"	Linear foliage; flowers range in color from white, cream, blue or purple; excellent fresh- cut flower
<i>Camassia quamash</i> Common camass		2	3	18"	12"	6"-9"	Distinct clusters of flowers make this plant attractive in mass plantings; best when planted in the autumn after weather cools
<i>Cornus canadensis</i> Bunchberry		2	3	6"-9"	6"-9"	4.5"-7"	Performs best in full shade; excellent complement to rhododendrons or ferns

Bioretention Ornamental Plants Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Dicentra formosa</i> <i>Pacific Bleeding Heart</i>		2	3	12"	24"	12"-18"	<i>Delicate foliage; distinct spring-time flowers</i>
<i>Deschampsia cespitosa</i> <i>Tufted hair grass</i>		2	3	6" - 12"	24"	12"-18"	<i>Stunning grassy foliage with creamy white variegation that turns pink in winter; spring-time inflorescence can make plant 4'-tall</i>
<i>Fragaria chiloensis</i> <i>Beach Strawberry</i>		2	3	10"	36"	18"-28"	<i>Forms a lush, compact groundcover; cut back in the early spring to prompt new growth and prevent stem build-up; ornamental berries</i>
<i>Fragaria vesca</i> <i>Alpine Strawberry</i>		2	3	10"	36"	18"-28"	<i>Bears tiny, fragrant (and edible) berries in the summer months; attracts butterflies; likes some afternoon shade</i>
<i>Festuca idahoensis</i> <i>Idaho Fescue</i>			3	24"	24"	12"-18"	<i>Dense plant; gray-green foliage; excellent when planted alongside sidewalks or used as a groundcover</i>
<i>Hemerocallis</i> <i>Daylily</i>		2	2	24"-48"	24"	12"-18"	<i>Attracts pollinators; flower color dependent on cultivar (pink, red, orange, purple, yellow)</i>
<i>Heuchera</i> varieties <i>Alumroot</i>		2	3	24"-36"	18"	9"-14"	<i>Many cultivars available; distinct foliage and flower colors of chartreuse, white, and scarlet</i>
<i>Iris douglasiana</i> <i>Douglas Iris</i>	1	2	3	24"	24"	12"- 18"	<i>Clumping foliage; beautiful purple flowers are nice color addition to planting scheme</i>
<i>Iris tenax</i> <i>Oregon Iris</i>	1	2	3	18"	12"	6"-9"	<i>Beautiful blue and purple flowers; nice color addition to any planting scheme</i>

Bioretention Ornamental Plants Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Lillium columbianum</i> Tiger Lily		2	3	5'-6'	36"	18"-28"	Produces one to six unscented blooms per stem; attracts butterflies
<i>Lupinus varieties</i> Lupine			3	18"-48"	24"-30"	15"-22"	Attracts butterflies and caterpillars; many cultivars available
<i>Nothochelone nemorosa</i> Turtlehead			3	up to 40"	up to 40"	20"-30"	Flowers continuously throughout the summer
<i>Ophiopogon planiscarpus</i> Black Mondo grass			3	12"	12"	6"-9"	Black foliage makes this an excellent accent when used with brightly flowering plants; maintains color
<i>Penstemon varieties</i> Pemstemon			3	4"-24" (varies)	12"-24" (varies)	12"-18" (Varies)	Beautiful blue and purple flowers, depending on variant; nice color addition to planting scheme; attracts hummingbirds
<i>Polystichum munitum</i> Western Sword Fern		2	3	36"-48"	36"-60"	30"-45"	Beautiful foliage and size allows this plant to stand out in planting schemes
<i>Sedum varieties</i> Sedum			3	4"-6" (varies)	8"-12" (varies)	6"-9" (varies)	Spoon-shaped blue-green foliage, depending on variant; trailing stems; excellent as a groundcover
<i>Sidalcea varieties</i> Checkermallows, Cherckerblooms	1			36"-48" (varies)	24"-36" (varies)	18"-28" (varies)	Fast-growing; many cultivars are appropriate for biortention cells, including <i>S. hendersonii</i>

Bioretention Ornamental Plants Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Smilacina racemosa</i> Solomon's Plume		2	3	12"- 36"	12"-36"	18"-28"	<i>Creamy spring-time blossoms are followed by yellow-green berries that turn to red; attracts birds; fragrant flowers</i>
<i>Solidago canadensis</i> Goldenrod		2	3	36"	24"	12"-18"	<i>Small bright-yellow flowers make a lively addition to any planting scheme; narrow lance-shaped leaves</i>
<i>Tellima grandiflora</i> Fringecup		2	3	12"	12"	6"-9"	<i>Foliage maintains appearance throughout the winter</i>
<i>Tiarella trifoliata</i> Western Foamflower		2	3	12"	12"	6"-9"	<i>Dense; foliage maintains appearance throughout the winter</i>
<i>Trillium ovatum</i> Western Trillium		2	3	18"	12"	6"-9"	<i>Unique flower to add to any planting scheme</i>
<i>Vancouveria hexandra</i> Duck's Foot		2	3	12"	12"-36"	18"-28"	<i>Foliage maintains appearance throughout the winter</i>

Bioretention – Small to Medium Shrubs

Bioretention – Small to Medium Shrubs Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Cistus salvifolius</i> 'Prostratus' Sageleaf Rockrose			3	2'	6'	3'-4.5'	Evergreen; excellent for erosion control on banks; light gray-green leaves
<i>Cornus sanguinea</i> Bloodtwig Dogwood	1	2	3	6'	6'	3'-4.5'	Stunning red stems in the winter months; beautiful addition to bioretention cell for winter interest
<i>Cornus sericea</i> Dogwood	1	2	3	3'-8'	3'-5'	2.5'-4'	Many cultivars available, including 'Flavimera' and 'Kelsey'; stunning colored stems in the winter months
<i>Gaultheria shallon</i> Salal		2	3	5'	5'	2.5'-4'	Fast-growing when planted in shaded areas, otherwise difficult to establish
<i>Holodiscus discolor</i> Cream Bush			3	8'	15'	7.5'-12'	Attracts pollinators; excellent soil binder
<i>Mahonia aquifolium</i> Oregon Grape		2	3	6'-10'	5'	2.5'-4'	Attracts pollinators; blue and black berries
<i>Osmanthus burkwoodii</i> Hybrid Sweet Olive		2	3	6'-10'	8'-12'	6'-9'	Leathery, glossy dark-green foliage; excellent when used as a hedge; tolerant of many soils
<i>Osmanthus delavayi</i> Sweet Olive			3	5'-20'	7'-20'	10'-15'	Evergreen; dark green leaves with tubular flowers; year-round interest
<i>Philadelphus lewisii</i> Mock-Orange		2	3	5'-10'	5'-10'	5'-7.5'	Fountain-shaped plant; aromatic flowers
<i>Physocarpus capitatus</i> Pacific Ninebark	1	2	3	5'-10'	5'-10'	5'-7.5'	Dense clusters of flowers; plants resemble spirea; rejuvenate old plantings by cutting to ground

Bioretention – Small to Medium Shrubs Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Physocarpus opulifolius</i> Common Ninebark		2	3	5'-10'	3'-6'	3'-4.5'	Dense clusters of flowers; plants resemble spirea; rejuvenate old plantings by cutting to ground
<i>Pinus mugo-mugo</i> Dwarf Mugo Pine			3	4'	5'	2.5'-4'	Low-growing; performs well, but variable in growing habit; great as an anchor plant
<i>Rhododendron</i> varieties <i>Rhododendron</i>		2	3	10' (varies)	10' (varies)	5'-7.5' (varies)	Many cultivars that vary in bloomtime, size, and color; leathery leafed with stunning flowers
<i>Ribes sanguineum</i> Red-Flowering Currant		2	3	5'-12'	10'	5'-7.5'	Produces drooping clusters of flowers
<i>Rosa gymnocarpa</i> Baldhip Rose		2	3	5'	1'-2'	1'-1.5'	Fast-growing to 3'; slender; small rose with delicate stems and flowers; stems are bristled
<i>Rosa pisocarpa</i> Swamp Rose	1	2	3	10'	3'-6'	3'-4.5'	Unique among roses given its preference for wet, almost swampy conditions; stems have thorns
<i>Rosa nutkana</i> Nootka Rose		2	3	6'	4'	2'-3'	Arching stems with gray-green leaves
<i>Rubus spectabilis</i> Salmonberry	1	2	3	10'	10'	5'-7.5'	Fast-growing; excellent soil binder
<i>Salix purpurea</i> Purple Osier	1	2	3	15'	15'	7.5'-12'	Dark green leaves with blue underside; striking purple branches; cut to ground if overgrown
<i>Sambucus nigra</i> Elderberry	1	2	3	8'	8'	4'-6'	Dramatic accent plant; fragrant white flowers

Bioretention – Small to Medium Shrubs Name	Zone			Height	Spread	On Center Spacing	Characteristics
<i>Symphoricarpos albus</i> Snowberry		2	3	6'	6'	3'-4.5'	<i>Pink spring-time flowers are followed by white berries that last through the winter; great for erosion control</i>
<i>Thuja plicata</i> 'Whipcord' Dwarf Red Cedar		2	3	4'	4'	2'-3'	<i>Unusual and unique planting; cascading branches form a nice mound; bronze winter color</i>
<i>Vaccinium parvifolium</i> Red Huckleberry		2	3	4'-12'	6'	3'-4.5'	<i>Thin branches with cascading habit create a beautiful silhouette</i>

Bioretention – Large Shrubs and Trees

Bioretention – Large Shrubs and Trees Name	Zone			Height	Spread	Plant Strip Width	On Center Spacing	Characteristics
<i>Acer circinatum</i> Vine Maple		2	3	30'	30'	5'	15'	<i>Small, nearly symmetrical tree; multiple trunks</i>
<i>Alnus rubra</i> Red Alder	1	2	3	45'-50'	20'-30'	6'	15'	<i>Attractive light gray bark; dark green leaves with rust-colored underside; most common alder of the Pacific Northwest</i>
<i>Betula papyfera</i> Paper Birch		2	3	50'-60'	25'	6'	12.5'	<i>Attractive, creamy-white bark</i>
<i>Cornus varieties</i> Cherry Tree			3	20' (varies)	20' (varies)	5'	10' (varies)	<i>Highly adaptable to environment; many appropriate cultivars available</i>

Bioretention – Large Shrubs and Trees Name	Zone			Height	Spread	Plant Strip Width	On Center Spacing	Characteristics
<i>Corylus cornuta</i> Beaked Hazlenut	2	3		20'	10'	5'	5'	Vase-like shape; needs adequate space to grow; catkins add winter interest
<i>Crataegus x lavalii</i> Lavalle Hawthorne		3		25'	20'	5'	10'	Dark green leathery leaves; clusters of red fruits add winter color
<i>Fraxinus latifolia</i> Oregon Ash	1	2		60'	35'	6'	18'	Tolerant of wet conditions
<i>Lonicera involucrata</i> Black Twinberry	1	2		9'	10'		5'	Attractive to hummingbirds
<i>Malus fusca</i> Pacific Crabapple	1	2		10'-30'	10'-30'		15'	Requires adequate room to grow; fragrant apple blossoms of white or pink; bears fruit
<i>Myrica californica</i> Pacific Wax Myrtle	1	2		15'	15'	5'	7.5'	Many upright trunks; branches are densely covered in foliage; purple nutlets attract birds; useful in screening
<i>Parrotia persica</i> Persian Parrotia	2	3		15'-30'	20'	5'	10'	Smooth gray bark with white patches; colorful tree year-round
<i>Rhamnus purshiana</i> Cascara	2	3		20'-40'	10'-30'	5'	15'	Smooth gray bark; picturesque branches; dark green leaves
<i>Salix lucida</i> Pacific Willow	2			15'-45'	30'		15'	Useful as a screening plant or windbreaker; aggressive roots are excellent for stabilizing banks

Bioretention – Large Shrubs and Trees Name	Zone			Height	Spread	Plant Strip Width	On Center Spacing	Characteristics
<i>Salix sitchensis</i> Sitka Willow	1	2		25'	15'		7.5'	<i>Multi-stemmed; gray-brown bark; useful in screening</i>
<i>Sambucus caerulea</i> Blue Elderberry		2	3	10'-30'	8'-20'		10'	<i>Clusters of summertime blue or black berries follow spring-time flowers</i>
<i>Thuja plicata</i> Western Red Cedar		2	3	50'- 100'	25'-60'	12'	30'	<i>Many cultivars; slender, drooping branches with dark green leaves; requires adequate space to grow</i>

APPENDIX F MARKERBALL INSTALLATION LOG

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