

# ENGINEERING DESIGN and DEVELOPMENT STANDARDS



**Public Works Department  
May 2009**

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## FOREWORD

This 1st Edition of the Engineering Design and Development Standards has been prepared to provide clear and consistent design standards for public and private construction of transportation and stormwater-related facilities in the City of Lake Stevens. These standards have been developed to provide our community with levels of service that are safe and of a quality and nature that best represents the City of Lake Stevens. They shall apply whenever any development occurs, including work performed by private parties at their own expense under authority granted by ordinance of the City Council or permit process. These Standards are the administrative guidelines by which the City of Lake Stevens Public Works Director or designee implements the authority of Sections 14.04.021 of the City of Lake Stevens Municipal Code. The Engineering Design and Development Standards (EDDS) fit within a larger framework of federal, state and city policies, regulations, and standards for the accomplishment of construction and reconstruction projects.

These EDDS supersedes any previous engineering standards and references, or adoptions of other standards. Compliance with these standards will be mandatory as of May 11<sup>th</sup>, 2009 for all new development and land use applications.

Efforts have been made to make the EDDS as complete as possible. However, it is understood that unique situations and aspects of development will occur that are not covered in this document. It is expected that design and construction professionals will use sound engineering judgment in all situations.

The EDDS, including all standard drawings, are available at the City of Lake Stevens Public Works Department. Future revisions will be issued on a regular basis to respond to changing requirements. The City of Lake Stevens Public Works Department hopes that you find these standards informative and useful. Please contact the Public Works Department with any questions or concerns regarding these standards.

A handwritten signature in black ink, reading "David V. Ostergaard". The signature is written in a cursive, flowing style.

Dave Ostergaard, P.E.

City of Lake Stevens Public Works Director/City Engineer

05/2009





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## **SECTION 1**

### **GENERAL CONSIDERATIONS**

#### ***1-100 Shortened Designation***

These City of Lake Stevens Engineering Design and Development Standards will be cited routinely in the text as the “EDDS.” The City of Lake Stevens Municipal Code will be cited routinely in the text as the “LSMC”.

#### ***1-101 Authority***

The EDDS, 1st Edition, replaces all previous editions or references to any other design standards. Section 14.04.021 of the LSMC, authorizes the City of Lake Stevens Public Works Director or designee to amend or revise the EDDS in accordance with sound engineering practices and the policies.

#### ***1-102 Purpose***

The purpose of these EDDS is to ensure that transportation-related facilities constructed in the City of Lake Stevens meet appropriate standards for safety, constructability, durability, and maintainability. These Standards are published in accordance with the applicable codes and standards and accomplish the following:

- Provide clear and consistent design standards for construction or modification of transportation-related facilities by public or private entities.
- Implement and administer the general development regulations contained in the City of Lake Stevens Land Use Codes.
- Ensure the design and construction of facilities in the City’s right-of-way comply with all applicable laws, regulations and standards of good engineering practice.
- Ensure that transportation-related projects incorporate non-motorized facilities as appropriate.

#### ***1-103 Applicability***

These EDDS shall apply prospectively to all new developments and redevelopments that incorporate transportation facilities and storm drainage facilities both public and private, whether

occurring under permit or franchise, and other transportation-related improvements mandated by the City Land Use Code. In the event of conflict with any other City Standards, the Public Works Director or designee shall determine which standard shall control. Situations may arise where the application of individual standards from this document will not ensure the protection of public health, safety and welfare. Accordingly, the Public Works Director or designee may impose additional or more stringent standards than those contained in this document, or require the modification of plans, specifications or operations to achieve the necessary public health, safety and welfare. Modifications may include, but are not limited to, scheduling, phasing or timing restrictions.

In addition, the EDDS apply to modifications of roadway features of existing facilities which are within the scope of reconstruction, required off-site road improvements for land developments, or capital improvement projects when so required by the City, or to the extent they are expressly referred to in project plans and specifications. These EDDS are not intended to apply to “resurfacing, restoration, and rehabilitation” projects as those terms are defined in the WSDOT, Local Agency Guidelines, as amended; however, the Public Works Director or designee may, at their discretion, consider these EDDS as optional goals.

These EDDS shall also apply to every new placement and every planned, non-emergency replacement of existing utility poles and other utility structures and services within the City’s right-of-way.

#### ***1-104 Administrative Interpretations and Revisions***

It is recognized that administrative interpretation of these EDDS will be required from time to time. Such interpretations are refinements or explanations of meaning or intent issued by the Public Works Director or designee. Requests for administrative interpretations must be submitted in writing to the Public Works Director or designee.

LSMC 14.04.021(2)(c) authorizes the Public Works Director or designee to revise these EDDS in accordance with sound engineering practices. Such revisions will be issued at regular intervals to keep the document current and reduce the scope of subsequent changes. Each EDDS revision will incorporate the administrative interpretations that have been issued since the last revision. Suggestions for future revisions may be submitted in writing to the Public Works Director or designee.

## **1-105 Deviations and Variances**

These EDDS represent appropriate practices under most conditions, based on past experience in the City of Lake Stevens and other jurisdictions. They are intended to provide facilities that are safe and appropriate for use within the City.

Engineering design is an endeavor that examines alternative solutions to real world situations. These Standards are not intended to limit the introduction of new ideas. Situations will arise where alternatives to these EDDS may better accommodate existing conditions, overcome adverse topography, are more sustainable and have less of an impact on the watershed or environment, or allow for more cost-effective solutions without adversely affecting safety, operations, maintenance or aesthetics. Accordingly, requests for deviations from these EDDS will be considered by the Public Works Director or designee. Such requests must be submitted in writing, using the Deviation Request Form provided in Appendix D, and include supporting information demonstrating compliance with the following criteria:

- The deviation will achieve the intended result with a comparable or superior design and quality of improvement; and
- The deviation will not adversely affect safety or operations; and
- The deviation will not adversely affect maintenance and its associated cost; and
- The deviation will not adversely affect aesthetic appearance.

It is recognized that the need for and timing of a deviation request may not be predictable. Requests should be submitted as soon as the need becomes known. No request will be considered until an application for a permit or other approval has been submitted. Known deviation requests that affect lot yield or scope of development must be decided prior to any public hearing or official decision on the application. This is important for public notice and participation in the decision process. Deviations that affect engineering design, to the extent they are known, must be decided prior to submittal of construction plans. This will prevent wasted effort in the preparation of plans with non-standard features that cannot be approved.

Any deviation request concerning a provision of the Uniform Fire Code requires concurrence by the City of Lake Stevens Fire Marshal. Documentation of concurrence by the Fire Marshal is acquired during the review process.

The Public Works Director or designee is the final authority on all deviation requests. In the interest of public health, safety and welfare, the Public Works Director or designee reserves the right to direct or deny a deviation from these EDDS at any time. Questions regarding interpretation of these EDDS may be directed to the Public Works Director or designee. Variance approval will be subject to other jurisdiction requirements where applicable.

### ***1-106 Responsibility to Provide Improvements***

- A.** Any land development which will impact the service level, safety, or operational efficiency of serving roads or is required by other LSMC or ordinance to improve such roads shall improve those roads in accordance with these EDDS. The Public Works Director or designee shall base the extent of off-site improvements to serving roads on an assessment of the impacts of the proposed land development.
- B.** Any development of land or development as described in Section 14 of LSMC abutting and impacting existing roads shall improve the frontage of those roads in accordance with these EDDS. The Public Works Director or designee shall base the extent of on and offsite improvements on an assessment of the impacts of the proposed land development activity.
- C.** Any land development that contains internal roads shall construct or improve those roadways to these EDDS.
- D.** It is the City's practice to not allow subdivisions to be recorded unless there exists a recorded continuous public access, i.e., right-of-way or easement to the subdivision except as provided for in Section 2-106(Private Access Tracts) of this document, nor will the City accept a road for maintenance until the road is directly connected to a City or other publicly maintained road.
- E.** Road improvement and development projects shall include pedestrian access as a part of the design. Where existing roadways are to be modified, pedestrian facilities shall be as described in Section 6 of this document.

### ***1-107 General References***

The EDDS implement and are intended to be consistent with:

- City of Lake Stevens Municipal Code
- City of Lake Stevens Comprehensive Plans



### ***1-108 WSDOT/APWA Documents as Primary Design and Construction References***

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

- WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, as adopted by the City of Lake Stevens, current edition as amended. These will be referred to as the “WSDOT Standard Specifications.”
- The WSDOT/APWA Standard Plans for Road and Bridge Construction, to be referred to as the “WSDOT/APWA Standard Plans,” current edition as amended.
- WSDOT Design Manual, current edition as amended.
- City Design Standards for the Construction of Urban and Rural Arterial and Collector Roads adopted per RCW 35.78.039 and RCW 43.32.020, May 24, 1989, current edition as amended.

### ***1-109 Other Specifications***

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

- Development drainage shall be in accordance with the City of Lake Stevens Surface Water Design Standards and most recently adopted Stormwater Management Manual for Western Washington.
- Development drainage shall be in accordance with the City of Lake Stevens Surface Water Design Standards and most recently adopted Low Impact Development Technical Guidance Manual for Puget Sound.
- WSDOT Local Agency Guidelines, as amended.
- WSDOT Guidelines for Urban Arterial Program, as amended.
- Design criteria of federal agencies including the Federal Housing Administration, Department of Housing and Urban Development; and the Federal Highway Administration, Department of Transportation,
- A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials (AASHTO), or current edition when adopted by WSDOT.

- Standard Specifications for Highway Bridges, adopted by AASHTO, current edition.
- U.S. Department of Transportation Manual on Uniform Traffic Control Devices, “MUTCD”, as amended and approved by Washington State Department of Transportation, current edition.
- Guide for the Development of Bicycle Facilities, adopted by AASHTO, current edition,
- American Society for Testing and Materials (ASTM).
- City of Lake Stevens Municipal Code

### ***1-110 Permits***

Other permits, approvals or agreements may be required by the City or other jurisdictions prior to initiating any activities subject to these EDDS. Questions regarding such permits, approvals or agreements should be directed to the City Departments of Planning and Community Development or Public Works, as appropriate.

### ***1-111 Professional Qualifications***

Professionals in the fields of engineering, architecture or surveying who prepare or are responsible for the preparation of plans, drawings, specifications, calculations, technical reports, etc., for the purpose of obtaining City permits or approvals, shall be registered or authorized to practice in the State of Washington in accordance with Title 18 RCW. Professionals shall be competent in the fields of experience they are designing. Registration or authorization to practice shall be in the specific technical area pertinent to the documents being prepared. Exceptions to this requirement are specified in Section 18.43.130 RCW.

These requirements shall apply to public or private developments whether constructed by private party or public agency. Appendix A contains a Plan Preparation checklist of construction plan requirements.

### ***1-112 Inspection***

The Public Works Director or designee shall have authority to enforce these EDDS as well as other referenced or pertinent specifications. They shall appoint personnel as appropriate to inspect work completed pursuant to these EDDS; they shall exercise such authority as they may delegate.

Work performed within the public right-of-way, or outside the public right-of-way as mandated by City land use codes, shall comply with the approved plans, specifications and these EDDS. The

Public Works Director or designee must approve any revision to construction plans before implementation.

It is the responsibility of the developer, contractor or their agents to have an approved set of plans, permits. It is recommended that a copy of these EDDS be on the job site wherever work is being accomplished.

It is the responsibility of the developer, contractor or their agents to notify the City in advance of the commencement of any authorized work, in accordance with permit requirements. A pre construction conference and/or field review will be required by Planning and Development Services before the commencement of any work on significant projects.

If requested by the County, the applicant/developer may be required to provide tests to substantiate the adequacy and/or placement of construction materials.

### ***1-113 Securities***

Per LSMC Section 14.12, securities can be required by the Public Works Director or designee to guarantee the performance of, or to correct, permitted work. The type and amount of security shall be per City Code or, if not specified, at the discretion of the Public Works Director or designee.

Types of securities include, but are not limited to, cash deposits, assigned savings, and bonds. The Engineer shall release securities upon satisfactory completion of the required work or any previously specified stipulations related to the required work.

### ***1-114 Penalties and Financial Guarantees***

Failure to comply with these EDDS may result in denial of plan or development permit approval, revocation of prior approvals, legal action for forfeiture of financial guarantee, code enforcement, and/or other penalties as provided by law and in LSMC 14.28.

### ***1-115 Severability***

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

## **1-116 Meaning of Terms**

“Access Easement”: An easement dedicated primarily for ingress/egress to one or more lots.

“ACP Cl. B” Asphalt Concrete Pavement Class B.

“ATB” Asphalt Treated Base.

“Alley”: A thoroughfare or right-of-way, usually narrower than a street, which provides access to the rear boundary of two or more residential or commercial properties and is not intended for general traffic circulation. Alleys are only permitted for properties fronting a public road.

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

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

“CSBC” Crushed Surfacing Base Course.

“CSTC” Crushed Surfacing Top Course.

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

“Design Speed”: The speed approved by the Public Works Director or designee for the design of the physical features of a road as established by Sections 3-201, 3-202 and 3-203 for residential and commercial access streets or equal to 5 miles per hour above the current, or expected posted speed limit for arterials. In certain situations the Public Works Director or designee may consider 5 miles per hour above the 85-percentile speed.

“Developer”: A person, firm or corporation applying for or receiving a permit or approval for a development.

“Driveway”: That portion of the vehicle accommodation area that consists of a travel lane bounded on either side by an area that is not part of the vehicle accommodation area.

“Engineer”: City of Lake Stevens Public Works Director or designee or designee, having authorities specified in RCW 36.75.050 and 36.80, or his/her authorized representative.

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

“GB”: Gravel Borrow.

“HMA – Hot Mix Asphalt.

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

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

“LID”: Low Impact Development or Local Improvement District.

“Landing”: A relatively level area at the approach of a road or driveway for vehicles to stop prior to entering the major road.

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

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

“PRD”: Planned Residential Development.

“Pavement Width”: Paved area on shoulder-type roads or paved surface between curb, thickened edge or gutter flow line on all other roads as depicted in the Standard Plans.

“Pan Handle”: A strip of land having a width narrower than that of the lot or parcel to be served and is designed for providing access to that lot or parcel.

“Private Access Tract”: A privately-owned tract of land primarily for ingress/egress to one or more lots.

“Private Road”: means a privately maintained easement or parcel created to provide vehicle access from a public road to one or more lots.

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

“Record Drawings”: The original construction drawings revised to incorporate information pertaining to the street and/or utility improvements as they were constructed.

“Right-of-Way”: Land dedicated primarily to the movement of vehicles and pedestrians and providing primary access to adjacent parcels. Secondly, the land provides space for utility lines and appurtenances and similar components.

“Road”: An open way for vehicles. All public and private ways used to provide motor vehicles access to and from a destination

“Road” and “Street” will be considered interchangeable terms for the purpose of these Standards. They are defined as an open way for vehicles. All public and private ways used to provide motor vehicles access to and from a destination.

“Roadway”: Pavement width plus any non-paved shoulders.

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

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

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

“Standard Plan”: WSDOT Standard Plans for Road, Bridge, and Municipal Construction or Standard Plans included in this document as referenced.

### **1-117 General Notes**

- 1.** All work and materials shall be in accordance with current City of Lake Stevens Engineering Design and Development Standards; the current edition of the Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction; and the current adopted edition of the Washington State Department of Ecology Stormwater Management Manual for Western Washington.
- 2.** All work within the plat and City right-of-way shall be subject to the inspection of the Public Works Director, designee, or designated representative.
- 3.** Prior to any site construction, including clearing/logging or grading, the site clearing limits shall be located and field identified by the project surveyor (or project engineer) as required by these plans. The project surveyor's name and phone number is \_\_\_\_\_.
- 4.** The developer, contractor and project engineer are responsible for water quality as determined by the monitoring program established by the project engineer. The project engineer's name and phone number is \_\_\_\_\_.
- 5.** Prior to any site work, the contractor shall contact the Department of Public Works at 425-377-3222 to schedule a preconstruction conference. Engineered as-built drawings in accordance with the current adopted International Building Code shall be required prior to site approval.
- 6.** The contractor shall be responsible for obtaining all permits for utility, road, and right-of-way construction, and stormwater. The contractor for this project is \_\_\_\_\_.  
Contact person is \_\_\_\_\_. Phone \_\_\_\_\_, Mobile phone \_\_\_\_\_, emergency phone \_\_\_\_\_.
- 7.** The Construction Stormwater Pollution Prevention (SWPPP) facilities shall be constructed in accordance with the approved SWPPP prior to any grading or extensive land clearing. These facilities must be satisfactorily maintained until construction and landscaping is completed and the potential for on-site erosion has passed. Sediment laden waters shall not enter the natural drainage system.
- 8.** Non compliance with the requirements for; erosion controls, water quality and clearing limits may result in revocation of project permits, plan approval and bond foreclosures.
- 9.** Trench backfill of new utilities and storm drainage facilities shall be compacted to 95% maximum density (modified proctor) under roadways and 90% maximum density (modified proctor) off roadways. Compaction shall be performed in accordance with Sections 7-08.3(3)

and 2-03.3(14)C - Method B as defined in the current edition of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction.

- 10.** The owner and contractor shall be responsible for locating and protecting all existing utilities prior to beginning construction. Location of utilities shown on construction plans are based on best records available and are subject to variation. For assistance in utility location, call 1-800-424-5555.
- 11.** Prior to construction, the owner and/or contractor shall notify the project engineer and the Public Works Director or designee when conflicts exist between the plans and field conditions. Conflicts shall be resolved (including plan and profile revisions) and resubmitted for approval prior to proceeding with construction.
- 12.** The contractor shall keep two sets of plans on site at all times for recording as-built information; one set shall be submitted to the project engineer, and one set shall be submitted to the Public Works Director or designee at completion of construction and prior to final acceptance of work.
- 13.** A grading permit issued pursuant to the current adopted International Building Code, and approval of the temporary erosion and sedimentation control plan shall be obtained from the Planning and Land Use Department prior to any on-site grading work not expressly exempt by the current adopted International Building Code.
- 14.** Prior to commencement of framing, final drainage inspection and approval of the roof leader and positive footing systems shall be completed by the Building Department. Call 425-377-3223 to schedule the inspection.





## **SECTION 2**

### **ROAD DESIGN**

#### ***2-100 Road Circulation***

##### **A. General**

Road circulation is important in road system design for the following reasons:

- Operation of the arterial road system is improved by dispersing local traffic onto multiple roads and access points;
- Response time for emergency services is reduced;
- Time and mileage traveled by individuals and service providers, including school bus transportation, mail delivery, utilities, etc. is reduced; and
- Use of transit systems, and pedestrian and bicycle facilities, is promoted.

##### **B. Layout and Design**

The following criteria for road circulation shall be used in the layout and design of new road systems:

1. Road systems internal to developments shall be designed to promote the convenient circulation of traffic without reliance on the arterial road system. Circulation shall be provided in a manner, where possible, that will allow subsequent developments to meet these standards.
2. Road systems shall be designed with intersecting roads so that the distance between intersections (measured from centerline to centerline), or between an intersection and a road end, is a minimum of 150 feet.
3. Road stubs shall be constructed to the boundary of adjacent parcels to create an interconnected road system, unless topography, critical areas or other factors make road construction impractical. A road stub proposal shall include information to demonstrate that the off-site road connection is constructible. That is, the location is such that an off-site road connection could be made that would avoid sensitive areas or topographical constraints, and be a feasible road location for adjacent land development.
4. A road serving more than 250 ADT shall be connected in at least two locations with another road or roads that meet the applicable standard(s) for the resulting traffic volume.

5. Block lengths in urban areas should range between 500 feet and 700 feet per LSMC 14.56.090. The roads defining a block shall comply with the minimum centerline offset standards of Section 2-111. Access points within a block shall comply with the separation and corner clearance requirements of Sections 3-101 and 3-102.
6. A road connection shall be made to any road stub on an adjacent parcel that has been constructed to the shared boundary. This requirement may be waived by deviation where it can be shown that topography, critical areas or other factors make the connection impractical. However, a road connection shall be provided elsewhere to achieve the 800-foot road length criteria in Section 3-01.B.2 above.
7. Where a road stub on an adjacent parcel has been established by right-of-way or easement, but is not yet constructed to the shared boundary, then the road connection shall be constructed to meet the existing road on the adjacent parcel. This requirement may be waived by deviation where it can be shown that topography, critical areas or other factors make the connection impractical. However, a road connection shall be provided elsewhere to achieve the 800- foot criteria above.
8. The Public Works Director or designee may determine that a non-motorized connection (shared use path or bikeway) between developments is appropriate in place of a roadway, through the deviation process.

## ***2-101 Road Classification***

Functional classifications are used for planning and designing roadway facilities. A functional classification system provides a framework for defining the uses of roadways. For example, roadways may be designed to emphasize through-traffic movement, access to adjacent properties, or some combination of these functions. General definitions of functional classification are presented in the following Table. These definitions will serve as a guide in classifying streets.

**Table 2-1 Functional Classification Definitions**

|                            |                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Freeway/Expressway:</b> | Inter-regional divided highways connecting major centers. Typically, freeways have two or more lanes for traffic in each direction; access is limited to interchanges designed for higher speed merging/diverging traffic.                                                                                                                                                            |
| <b>Major Arterial:</b>     | Inter-community roadways connecting community centers or major facilities. Principal arterials are generally intended to serve predominantly “through” traffic. Direct access to abutting property will be discouraged. Spacing between parallel principal arterials is generally two miles or greater.                                                                               |
| <b>Minor Arterials:</b>    | Provides for intra-community travel for areas bounded by the principal arterial system. Minor arterials serve trips of moderate length. Direct access to abutting property will be discouraged. Spacing of minor arterials is typically less than two miles.                                                                                                                          |
| <b>Collector:</b>          | Provides for movement within a community, including connecting neighborhoods with smaller community centers. Collector arterials also provide connections to minor and principal arterials. Property access is generally a higher priority for collector arterials with a lower priority for through traffic movements. Spacing of collector arterials is generally one mile or less. |
| <b>Local Access:</b>       | Provides connections to arterial system for individual neighborhoods and provides circulation within and/or between neighborhoods. Spacing of neighborhood collectors is typically one-half mile or less.                                                                                                                                                                             |

## **2-102 Right-of-Way Width**

### **A. Standards**

Standard right-of-way widths for road classifications shall be in conformance with LSMC 14.56.080 and shown in Table 2-2. These right-of-way widths and pavement surface widths shall apply for road design, except where these Standards specify other requirements.

1. Any new road to be constructed as part of a land development proposal shall be classified in the development proposal and designed with a right-of-way width conforming to the standards below, unless otherwise approved.
2. Where right-of-way is to be deeded or dedicated from a parcel under development, the right-of-way shall be a uniform width across the parcel and not tapered. Exceptions to this requirement may be allowed where off-site right-of-way is to be acquired for a clear sight triangle (refer to Section 2-104.E).

**Table 2-2 Standard Widths**

| <b>Classification</b>                  | <b>ROW Width or Width (ft)</b> | <b>Pavement Width (ft)</b> | <b>Standard Plan</b> |
|----------------------------------------|--------------------------------|----------------------------|----------------------|
| <b>Freeway/Expressway</b>              | [1]                            | [1]                        | -                    |
| <b>Major Arterial</b>                  | [1]                            | [1]                        | -                    |
| <b>Minor Arterial</b>                  | 70                             | 48                         | 2-010                |
| <b>Reduced Standard Minor Arterial</b> | 60                             | 42                         | 2-010                |
| <b>Collector</b>                       | 60                             | 36                         | 2-020                |
| <b>Reduced Standard Collector</b>      | 50                             | 32                         | 2-020                |
| <b>Local Access</b>                    | 50                             | 28                         | 2-030                |
| <b>Reduced Standard Local Access</b>   | 40                             | 24                         | 2-040                |
| <b>Private Access Tract</b>            | 25 minimum                     | 20                         | 2-050                |
| <b>Access Easement</b>                 | 20 minimum                     | 10 [2]                     | 2-051                |
| <b>Alley</b>                           | 20                             | 16                         | 2-090                |
| <b>Cul-de-sac</b>                      | 50 radius                      | 40 radius                  | 2-120                |

NOTES:

1. Determined by the Director of Public Works, designee, or WSDOT.
2. A minimum of 10' of pavement width, 20' max, shall be provided per dwelling unit.

#### **B. Right-of-Way Width Evaluation**

Right-of-way widths that are wider or narrower than the standard may be required as determined by the Public Works Director or designee. Right-of-way width must accommodate the road

section applicable for the particular road classification, as described further in this chapter. Any change to the applicable road section must be approved by deviation.

### **C. Separate Tracts**

Under certain circumstances, it may be desirable to reduce right-of-way width and locate facilities, such as sidewalks, walkways or trails, in separate tracts of land outside the right-of-way. Such tracts shall be owned and maintained by a homeowners association and guaranteed by covenants recorded with the plat. The recorded covenants shall be referenced on the approved final plat document.

## **2-103 Road Standards for Arterial and Non-Arterial Roads**

Detailed road standards for arterial and non-arterial roads are provided in the referenced standard drawings. The number of lanes, type of frontage improvements, and other elements to be constructed for a particular road section shall be identified in the Transportation Element of the Comprehensive Plan or determined by the Public Works Director or designee and per Tables 2-3 below.

**Table 2-3 Arterial and Collector Road Specifications**

| <b>CLASSIFICATION</b>                 | <b>PRINCIPAL<br/>ARTERIALS</b> | <b>MINOR<br/>ARTERIALS</b> | <b>COLLECTORS</b> |
|---------------------------------------|--------------------------------|----------------------------|-------------------|
| <b>Design Speed (MPH)</b>             | Varies 30-40                   | Varies 30-40               | Varies 30-40      |
| <b>Maximum Grade (%) [3]</b>          | 15                             | 15                         | 15                |
| <b>Min. Half St. Paved Width (ft)</b> | [1]                            | 24                         | 22                |

**NOTES:**

1. Within the above parameters, geometric design requirements shall be determined for specific arterial roads consistent with the WSDOT Design Manual.
2. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed. Curves shall be designed within parameters of this Section.
3. Maximum grade may be exceeded for short distances. (See Section 2-112).
4. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the Engineer (See Section 2-104).
5. Standard Entering Sight Distance (ESD) shall apply at intersections and driveways unless otherwise approved by the Engineer (See Section 2-105).
6. Criteria for state and federal funding may require greater width. For guardrail installations, shoulders shall be two feet wider.

**Table 2-4 Residential Access Streets**

| CLASSIFICATION                                                  | LOCAL ACCESS<br>STREETS | REDUCED<br>STANDARD LOCAL<br>ACCESS<br>STREETS | PRIVATE ACCESS<br>TRACT (13) | ACCESS EASEMENT       |
|-----------------------------------------------------------------|-------------------------|------------------------------------------------|------------------------------|-----------------------|
| <b>Serving Potential Number of Single-Family Dwelling Units</b> | 250 Max.                | 4 Max. [11]                                    | 1 to 4 Dwelling Units        | 1 To 2 Dwelling Units |
| <b>Design Speed (MPH) [5]</b>                                   | 25                      | 25                                             | 20                           | 20                    |
| <b>Horizontal Curvature<br/>Min. Radius (Ft.) [12]</b>          | 300                     | 165                                            | 90                           | 90                    |
| <b>Max. Grade [6]</b>                                           | 15                      | 15                                             | 15                           | 15                    |
| <b>Standard Stopping Sight<br/>Distance (Ft.) [7]</b>           | 200                     | 155                                            | 115                          | 115                   |
| <b>Standard Entering Sight<br/>Distance (Ft.) [8]</b>           | 250                     | 200                                            | 150                          | 150                   |
| <b>Min. Half St. Paved Width<br/>(Ft.)</b>                      | 20                      | 20                                             | None                         | None                  |

**NOTES:**

1. Within the above parameters, geometric design for specific streets shall be consistent with AASHTO Policy on Geometric Design of Highways and Streets.
2. See Section 2-113 for one-way loops.
3. See Section 2-115 for residential access connection requirements.
4. See Section 2-116 for urban exception criteria.
5. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed.
6. Maximum grade may be exceeded for short distances. (See Section 2-112).
7. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the Engineer. (See Section 2-112).
8. Standard Entering Sight Distance (ESD) shall be determined at intersections and driveways unless otherwise approved by the Engineer (See Section 2-105).
9. For guardrail installation, shoulders shall be two feet wider.
10. For Local Access Streets only an elbow intersection may be constructed in accordance with Standard Drawing 2-160.
11. To be used primarily for short plats.

The design values shown in Tables 3-2.1 are minimum values necessary to meet the requirements of Sections 2-103 for a selected design speed and road classification. Superelevation on horizontal curves shall not be used unless approved by the Public Works Director or designee.

**Table 2-5: Arterial Streets and Commercial Access Streets Design Values**

| Design Speed (mph)                                | 30    | 35    | 40    |
|---------------------------------------------------|-------|-------|-------|
| Horizontal Curvature (Ft.)                        | 300   | 454   | 667   |
| Stopping Sight Distance (Ft.)                     | 200   | 250   | 305   |
| Entering Sight Distance (Ft.)                     | 375   | 470   | 575   |
| Passing Sight Distance (Ft.) for a<br>2-Lane Road | 1,100 | 1,300 | 1,500 |

### **2-104 Stopping Sight Distance (SSD)**

Stopping Sight Distance (SSD) is the distance needed for a vehicle traveling at or near design speed to stop before reaching a stationary object in its path. The provision of stopping sight distance at all locations along each highway or street, including intersection approaches, is fundamental to intersection operation. SSD applies to street classifications as shown in Section 2-104. See Table 2-5 for specific SSD values for arterial streets based on required design speed. See Standard Plans 2-180 and 2-190.

- A. Height of eye is 3.5 feet and height of object is 4.5 feet.
- B. Minimum SSD for any downgrade averaging three percent or steeper as provided in Section 2-103 shall be as shown below (Source AASHTO Policy on Geometric Design, 2004, Exhibit 3-2)

**Table 2-6: Stopping Sight Distance on Grades**

| DESIGN SPEED<br>(MPH) | Downgrades |     |     | Upgrades |     |     |
|-----------------------|------------|-----|-----|----------|-----|-----|
|                       | 3 %        | 6 % | 9 % | 3 %      | 6 % | 9 % |
| 15                    | 80         | 82  | 85  | 75       | 74  | 73  |
| 20                    | 116        | 120 | 126 | 109      | 107 | 104 |
| 25                    | 158        | 165 | 173 | 147      | 143 | 140 |
| 30                    | 205        | 215 | 227 | 200      | 184 | 179 |
| 35                    | 257        | 271 | 287 | 237      | 229 | 222 |
| 40                    | 315        | 333 | 354 | 289      | 278 | 269 |

- C. Sag vertical curves on neighborhood collectors and local access streets with stopping sight distance less than that called for in Section 2-103 may be approved by the Public Works



Director or designee if no practical design exists and if road lighting consistent with current design standards is provided throughout the curve.

### **2-105 Entering Sight Distance (ESD)**

Entering sight distance applies on driveways and on streets intersections as set forth in Sections 2-103. Specific ESD values for required design speeds are also listed. See Standard Plan 2-200.

1. Entering vehicle eye height is 3.5 feet, measured from 15 to 20 feet back from edge of face of curb or from the travel lane on a ditch section roadway. Approaching vehicle height is 4.25 feet.
2. Requirements in Section 2-103 apply to an intersection or driveway approach to a typical road under average conditions. The Public Works Director or designee may authorize a reduction in the ESD based on factors mitigating the a hazardous condition. Such factors may include an anticipated posted or average running speed less than the design or posted speed or the provision of acceleration lanes and/or a median space allowing an intermediate stop by an approaching vehicle making a left turn.
3. Where a significant number of trucks will be using the approach road, the Public Works Director or designee may increase the entering sight distance requirements by up to 30 percent for single-unit trucks and 70 percent for semi-trailer combinations.
4. On low volume driveways, the ESD may be reduced by the Public Works Director or designee to the SSD per Standard Plan 2-210.

### **2-106 Private Access Tracts**

- A. While Community Street requirements are usually best served by public streets, owned and maintained by the City, private access tracts may be appropriate for some local access streets.

- B. Usually these are minor access streets, either residential or commercial.

Private access tracts may be approved only when they are:

1. Permanently established by tract providing legal access to each affected lot, dwelling unit, or business and sufficient to accommodate required improvements, to include provision for future use by adjacent property owners when applicable; and
2. Built to these Standards as set forth herein; Standard Plan 2-050; and
3. Accessible at all times for emergency and public service vehicle use; and
4. Not obstructing, or part of, the present or future public neighborhood circulation plan developed in the Lake Stevens Comprehensive Plan.

5. Not going to result in land locking of present or future parcels; and
  6. Not needed as public roads to meet the minimum road spacing requirements of these Standards; and
  7. At least one of the following conditions exists:
    - a. The private access tract is located within a short subdivision that has a total of four (4) or fewer dwelling units.
    - b. The roadways serve commercial or industrial facilities where no circulation continuity is necessary.
    - c. The Public Works Director or designee and Fire Marshal determine that no other access is available and the private tract is adequate.
  8. Maintained by a capable and legally responsible owner or homeowners' association or responsible entity or parties including all benefited property owners; and
  9. Clearly described on the face of the plat, short plat, or other development authorization and clearly signed at street location as a private street, for the maintenance of which City of Lake Stevens is not responsible.
- C.** The City of Lake Stevens will not accept private access tracts for maintenance as public streets until such streets are brought into conformance with current City road standards.
- D.** The City of Lake Stevens will not accept private access tracts within short plats when the roads providing access to the short plat are private and already have the potential to serve more than the number of lots specified in Section 2-103. Short plats proposed on properties to which the access is over private access tracts that do not meet the standards in this section shall be denied.
- E.** Private access shall conform to Standard Plan 2-050 subject to:
1. A maximum of four (4) units.
  2. Minimum tract width of 20 feet for up to two (2) units, and 30 feet for more than two (2) units.
  3. Private access tract length shall not exceed 300 feet without the permission of the Public Works Director or designee.
  4. Private access tracts exceeding 150' shall construct a turn-a-round consistent with Standard Plan 2-150.

## ***2-107 Half Streets***

- A.** A half street per Standard Plan 2-100 may be permitted as an interim facility when:

1. Such street shall not serve as primary access to more than 10 dwelling units or tax lots for residential or 240 ADT for commercial/industrial; and
  2. Such alignment is consistent with or will establish a reasonable circulation pattern; and
  3. There is reasonable assurance of obtaining the prescribed additional right-of-way from the adjoining property with topography suitable for completion of a full-section road.
  4. To provide access to an existing Standard City Street.
- B.** A half street shall meet the following requirements:
1. Right-of-way width of the half street shall equal at least  $\frac{3}{4}$  of ultimate road section; and
  2. If feasible the half street shall be graded consistent with locating centerline of the ultimate road section on the property line; and
  3. Traveled way shall be surfaced the same as the designated road type to a width not less than 20 feet, sidewalk shall be constructed as required for the designated road type; and
  4. Property line edge of street shall be finished with temporary curbing, shoulders, ditches, and/or side slopes so as to assure proper drainage, bank stability, and traffic safety; and
  5. Half streets shall not intersect other half streets unless so approved by the Public Works Director or designee.
- C.** When a half street is eventually completed to a whole street, the completing builder shall reconstruct the original half street as necessary to produce a proper full-width street of designated section.
- D.** The obtaining of any right-of-way or easements needed to accomplish the above shall be the responsibility of the owning builder or developer.

## **2-108 Cul-de-sacs and Eyebrows**

See Standard Plans 2-120 through 2-140.

- A.** Whenever a dead end public street serves 4 or more units, or a private/public road/tract extends more than 150 feet from edge of the intersecting right of way to farthest extent of the road an approved turn-a-round shall be constructed as follows:
1. Minimum right-of-way diameter across bulb section: 100 feet in a permanent cul-de-sac for all public roads; and 84 feet in a temporary cul-de-sac, with bulb area lying outside straight-street right-of-way provided as temporary easement pending forward extension of the street.
  2. Minimum diameter of surfacing across bulb: 80 feet of paving in curb, gutter, and sidewalk roadway section; 80 feet total in shoulder type or thickened edge cul-de-sacs to include

64 feet of paving and eight-foot shoulders with compacted crushed surfacing material.

See Standard Plan 2-120.

- 3.** Private tracts shall construct a turn-a-round consistent with Standard Plan 2-150.
- B.** A permanent cul-de-sac shall not be longer than 500 feet measured from the edge of intersecting street right of way to the geometric center monument of the cul-de-sac. The Public Works Director or designee based on pertinent traffic planning factors such as topography; sensitive areas and existing development will consider exceptions to this rule.
- C.** The Public Works Director or designee may require an emergency vehicle access to connect a cul-de-sac at its terminus with other streets.
- D.** If a temporary cul-de-sac exists, removal of the temporary cul-de-sac, re-grading/restoration of disturbed area, and extension of the sidewalk shall be the responsibility of the developer who extends the road. See Standard Plan 2-130.
- E.** The maximum cross slope in a bulb shall not exceed 6 percent. Partial bulbs or eyebrows shall have a minimum paved radius and an island configuration as shown on Standard Plan 2-140. Island shall be offset two feet from edge of traveled way.
- F.** Pedestrian walkways shall be provided on all permanent cul-de-sacs to abutting property see Standard Plan 2-120.
- G.** A drop-curb cul-de-sac is a design option that may be used where multiple driveways around a cul-de-sac bulb will reduce the functionality of vertical curbs, planter strips and sidewalks. Vertical curb may be eliminated and a drop-curb (1-inch lip, see Standard Drawing 2-120) or rolled curb installed around the cul-de-sac bulb.

## **2-109 Alleys**

An alley is considered a public road. Requirements of Section 2-109, local access streets, for horizontal curvature and stopping sight distance, apply.

- 1.** New alleys serve a maximum of 30 lots, with a maximum length of 400 feet, no dead ends or cul-de-sacs.
- 2.** Minimum right-of-way width 20 feet with a pavement surface of 16 feet. For differing structure setback requirements, alley configuration shall be designated to provide for safe turning access to properties.
- 3.** Paved surface shall be in accordance with Standard Plan 2-090.
- 4.** Modifications to existing alleys serving commercial or industrial properties, in accordance with the above, will be determined on a case-by-case basis subject to approval by the Public Works Director or designee.

5. Additional right of way and/or pavement width for parking and/or pedestrian facilities may be required by the Public Works Director / Community Development Director or designee.
6. Existing substandard alleys are required to be improved to meet the current standards upon development / re-development of an adjoining parcel.

### ***2-110 Auxiliary Lanes and Transition Tapers***

The design of road width transition tapers, speed change lanes, left turn or right turn lanes will be evaluated on a case-by-case basis using the WSDOT Design Manual as a guide. Refer to Standard Drawing 4-020 for channelization requirements.

### ***2-111 Intersections***

#### **A. Angle of Intersections**

New road intersections shall be designed so that roads intersect at a 90-degree angle, plus or minus 5 degrees. Under no circumstances shall the angle of intersection be less than 75 degrees.

#### **B. Grades at Intersections**

Road grade transitions at intersections shall be designed using vertical curves wherever the grade change exceeds 1%. This includes the transition from the slope of the intersecting road to the cross-slope of the road being intersected. Vertical curve standards are provided in Standard Drawings 3-110 or 3-120. For safety reasons, a landing or safe stopping area must be provided before the intersection. The landing may be part of the vertical curve transition between the slope of the intersecting road and the cross-slope of the road being intersected. The standard to be met for an acceptable landing is no more than one foot of elevation change for a distance of 30 feet from an arterial road or 20 feet from a non-arterial road, measured from the ultimate right-of-way line of the road being intersected. For low-volume roads (<1000 ADT) approaching a stop sign controlled intersection, a 20 mph design speed with a minimum vertical curve length of 60 feet may be used for the final curve at the intersection. This applies to urban residential roads and rural sub-collector and local access roads.

#### **C. Radius Returns**

The minimum radius returns to be installed at road intersections are specified in Table 2-7 below. The angle of intersection (measured at 10 feet beyond road classification right-of-way) is to be a minimum of 85 degrees and a maximum of 95 degrees.

**Table 2-7 Minimum Radius Returns**

| Road Type or Feature         | Intersecting Road | Minimum Radius (ft.) |
|------------------------------|-------------------|----------------------|
| Centerline Radius (2 lanes)  | -                 | 55                   |
| Curb Radius for Local Street | Local Street      | 20                   |
| Curb Radius for Local Street | Collector         | 25                   |
| Curb Radius for Any Street   | Arterial          | 35                   |

Note: Truck route, commercial, and industrial use curb radii may be increased to 50 feet as determined by the Public Works Director or designee.

**D. Centerline Offsets**

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

**Table 2-8 Minimum Centerline Offsets**

| When Highest Road Classification Involved Is: | Minimum Centerline Offset Shall Be: |
|-----------------------------------------------|-------------------------------------|
| Principal Arterial                            | 1000 feet                           |
| Minor Arterial                                | 500 feet                            |
| Collector                                     | 300 feet                            |
| Access Street                                 | 150 feet                            |

- E.** On sloping approaches at an intersection, landings shall be provided with grade not to exceed one-foot difference in elevation for a distance of 30 feet approaching an arterial or 20 feet approaching a residential or commercial street. The distance shall be measured from future right-of-way line (extended) of intersecting street. See Standard Plan 2-170.
- F.** Entering Sight Distance, See Sections 2-105 for design requirements.
- G.** Elbow Intersections per Standard Plan 2-160 are allowable on local access streets only and are subject to intersection spacing requirements established under this section.

### **2-112 Grade and Grade Transitions**

- A.** Road grades shall be 0.5% or greater to provide proper drainage. The maximum grade on any new or reconstructed road shall not exceed the limits in Section 2-103. Grade transitions shall be constructed as vertical curves except at new intersections where the difference in grade is one percent or less.
- B.** Maximum grade as shown in Section 2-103 may be exceeded for short distances of 300 feet or less, upon showing that no practical alternative exists. Exceptions that exceed 15% will require approval by the Public Works Director or designee and the Fire Marshal. Grades exceeding 15 percent shall be paved with Portland cement concrete (PCC).
- C.** Grade transitions shall be constructed as smooth vertical curves except in intersections where the difference in grade is one percent or less and upon approval of the Public Works Director or designee.

### **2-113 One-Way Streets**

Local access streets, including loops, may be designated one-way upon a finding by the Public Works Director or designee that topography or other site features make two-way traffic impractical.

### **2-114 Intersections with State or Federal Highways**

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

### **2-115 Residential Access and Circulation Requirements**

In order to provide a second access to a residential subdivision, short subdivision, or planned unit development, no residential street shall serve more than 100 lots or dwelling units unless the street is connected in at least two locations with another street that functions at a level consistent with Section 2-103.

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

1. No other practical alternative exists, or
2. Existing street was previously stubbed indicating intent for future access, or

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

1. A more practical alternative exists, or
2. Existing streets do not meet Section 2-103, or
3. A portion of the existing roadway network providing secondary access consists of a private road.

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

- B. Multi-family or commercial projects gaining access through a residential development is discouraged and requires Public Works Director or designee or designee approval on a case by case basis for special circumstances. Traffic impacts for such projects will be analyzed during the SEPA process.

### ***2-116 Exception for Maximum Dwelling Units on Neighborhood Collector***

Proposed collectors serving developments with an average density of seven to eight dwelling units per acre and which meet the access requirements of Section 2-115 may serve up to 300 single family dwelling units, if approved by the Public Works Director or designee. Prior to approval, the Public Works Director or designee may require a traffic circulation study showing a balanced traffic flow of less than 1500 vehicles per day past any access point. Street trees shall be mandatory along neighborhood collectors serving higher densities of eight to eighteen dwelling units per acre and shall be in conformance with Section 3-104.

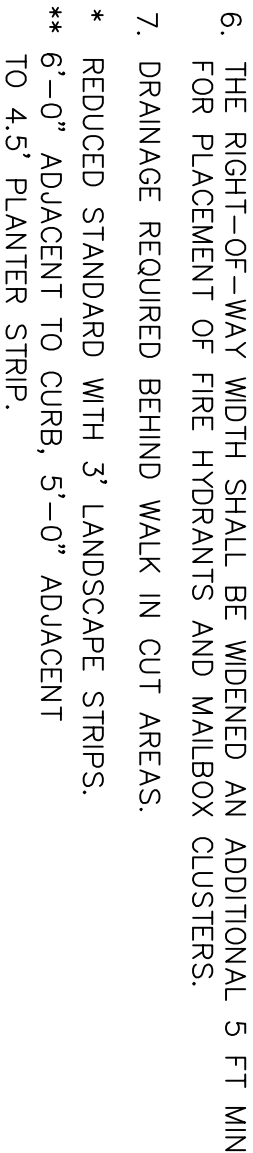
### ***2-117 Channelization Plan***

The Public Works Director or designee shall approve a channelization and signing plan. The plan shall comply with the current version of the Manual on Uniform Traffic Control Devices (MUTCD) and Section 4-105.



***Section 2 drawing index:***

**Standard Drawing 2-010: Minor Arterial 60'-70' Right-of-way**  
**Standard Drawing 2-011: LID Minor Arterial**  
**Standard Drawing 2-020: Collector and Reduced Standard Collector**  
**Standard Drawing 2-021: LID Collector**  
**Standard Drawing 2-030: Local Access**  
**Standard Drawing 2-031: LID Local Access**  
**Standard Drawing 2-040: Reduced Standard Local Access**  
**Standard Drawing 2-041: LID Typical Road Section**  
**Standard Drawing 2-050: Private Access Tract/Access Easement**  
**Standard Drawing 2-090: Alley Section**  
**Standard Drawing 2-100: Half-Street**  
**Standard Drawing 2-110: Alternate Shoulder Section**  
**Standard Drawing 2-120: Cul-de-Sac**  
**Standard Drawing 2-021: LID Cul-de-Sac 50' Radius**  
**Standard Drawing 2-022: LID Cul-de-Sac 60' Radius**  
**Standard Drawing 2-130: Temporary Cul-de-sac**  
**Standard Drawing 2-140: Typical Island Section**  
**Standard Drawing 2-140: LID Island Section**  
**Standard Drawing 2-150: Alternative Turnaround Private Tract/Easement**  
**Standard Drawing 2-160: 90 Degree Intersection Elbow**  
**Standard Drawing 2-170: Intersection Landing**  
**Standard Drawing 2-180: Stopping Sight Distance for Vertical Curve**  
**Standard Drawing 2-190: Stopping Sight Distance For SAG Vertical Curve**  
**Standard Drawing 2-200: Entering Sight Distance**  
**Standard Drawing 2-210: Entering Sight Distance Table**



STANDARD PLAN 2-010

APPROVED BY

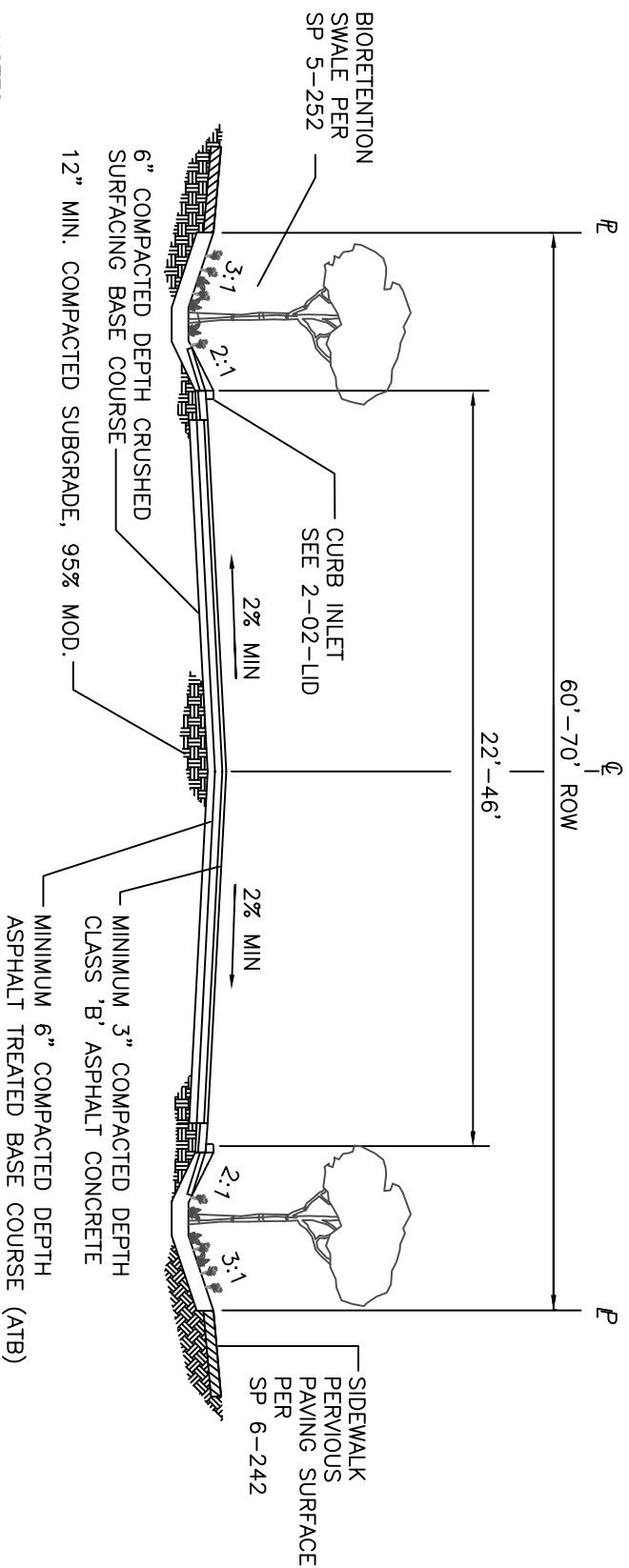
David D. Chetwood

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE \_\_\_\_\_



#### NOTES

1. CURB & GUTTER SHALL BE CEMENT CONCRETE BARRIER CURB & GUTTER PER MARYSVILLE SECTION 6-113.
2. CURB AND SIDEWALK JOINTS AS PER MARYSVILLE SECTION 6-114.
3. REFER TO SECTION 3-103 FOR DRIVEWAY DETAILS.
4. CURB RAMP DETAILS AS PER MARYSVILLE SECTION 6-115.
5. THIS DRAWING ILLUSTRATES A MINIMUM ASPHALT CONCRETE ROAD SECTION. ACTUAL SURFACING DESIGN FOR ARTERIALS AND COMMERCIAL ACCESS STREETS SHALL BE BASED ON SOILS AND TRAFFIC ANALYSIS.
6. DRAINAGE REQUIRED BEHIND WALK IN CUT AREAS.
7. SIDEWALKS MAY BE PERVIOUS WHERE SITE AND SOIL CONDITIONS MAKE LID FEASIBLE. SIDEWALKS SHALL BE A MIN. OF 5'-0" IN WIDTH. SEE 2-04-LID FOR PERVIOUS PAVING DETAILS.
8. USE OF ALL LID PRACTICES ARE DEPENDANT OF SITE CONDITIONS AND REQUIRE THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR DESIGNEE.



LID MINOR ARTERIAL  
60'-70' RIGHT-OF-WAY

STANDARD PLAN 2-011

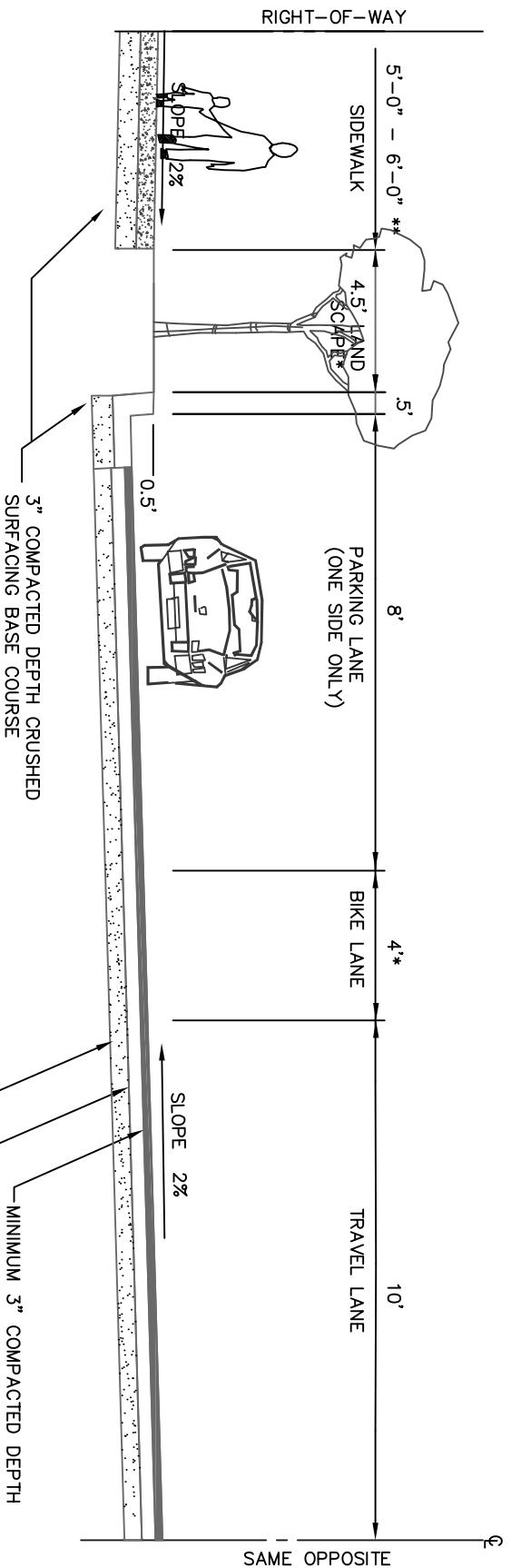
APPROVED BY

*David M. City Engineer*

LAKE STEVENS CITY ENGINEER

05/09

DATE

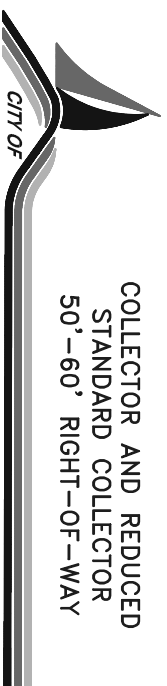


#### NOTES:

1. CURB & GUTTER SHALL BE CEMENT CONCRETE BARRIER CURB & GUTTER PER SECTION 6-113.
2. CURB AND SIDEWALK JOINTS AS PER SECTION 6-114.
3. REFER TO SECTION 3-103 FOR DRIVEWAY DETAILS.
4. CURB RAMP DETAILS AS PER SECTION 6-115.
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6. THE RIGHT-OF-WAY WIDTH SHALL BE WIDENED AN ADDITIONAL 5 FT MIN FOR PLACEMENT OF FIRE HYDRANTS AND MAILBOX CLUSTERS.
7. DRAINAGE REQUIRED BEHIND WALK IN CUT AREAS.
- \* REDUCED STANDARD WITH ONE BIKE LANE AND 3' LANDSCAPE STRIPS.

\*\* 6'-0" ADJACENT TO CURB, 5'-0" ADJACENT TO 4.5' PLANTER STRIP.



COLLECTOR AND REDUCED  
STANDARD COLLECTOR  
50'-60' RIGHT-OF-WAY

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 2-020

APPROVED BY

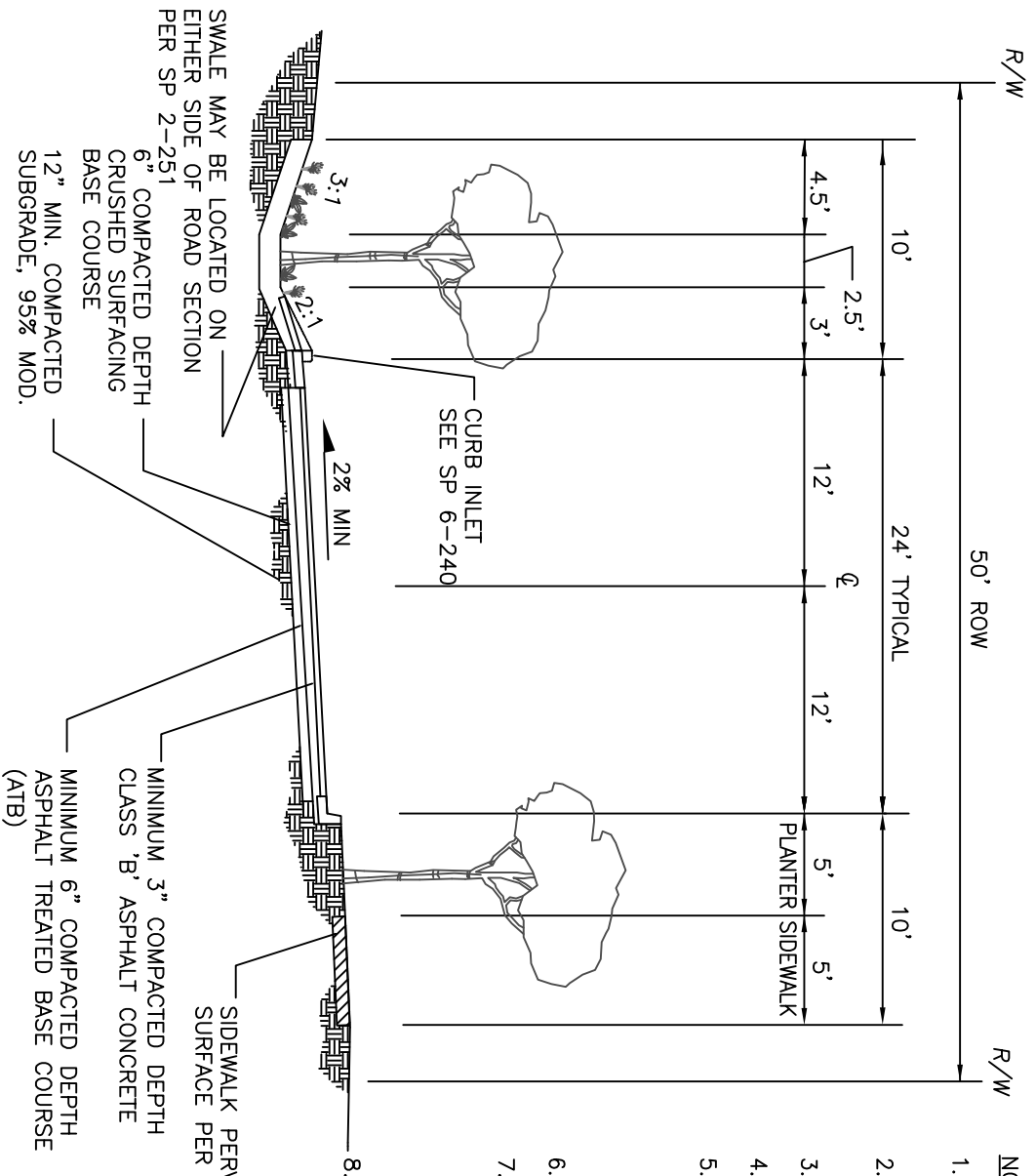
*Daniel M. City Engineer*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE



**NOTES**

1. CURB & GUTTER SHALL BE CEMENT CONCRETE BARRIER CURB & GUTTER PER SECTION 6-113.
2. CURB AND SIDEWALK JOINTS AS PER SECTION 6-114.
3. REFER TO SECTION 3-103 FOR DRIVEWAY DETAILS.
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6. DRAINAGE REQUIRED BEHIND WALK IN CUT AREAS.
7. SIDEWALKS MAY BE PERVIOUS WHERE SITE AND SOIL CONDITIONS MAKE LID FEASIBLE. SIDEWALKS SHALL BE A MIN. OF 5'-0" IN WIDTH. SEE SP 6-242 FOR PERVIOUS PAVING DETAILS.

8. USE OF ALL LID PRACTICES ARE DEPENDANT OF SITE CONDITIONS AND REQUIRE THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR DESIGNEE.



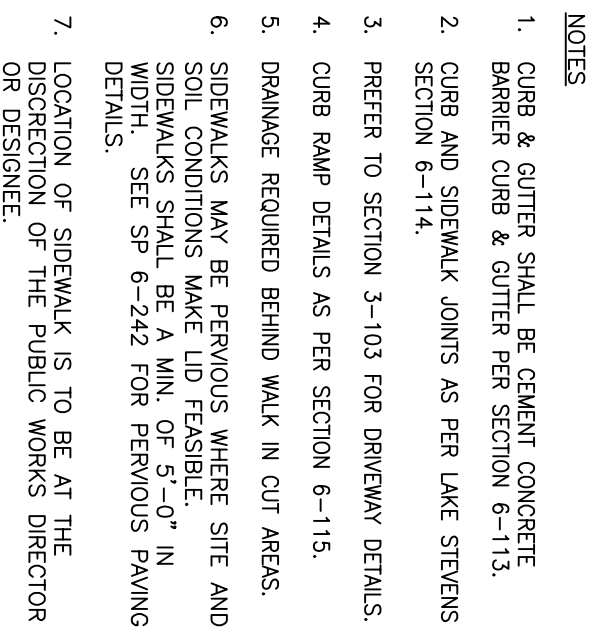
**LID COLLECTOR**  
**50' RIGHT-OF-WAY**

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**LAKE STEVENS**  
**PUBLIC WORKS**

STANDARD PLAN 2-021

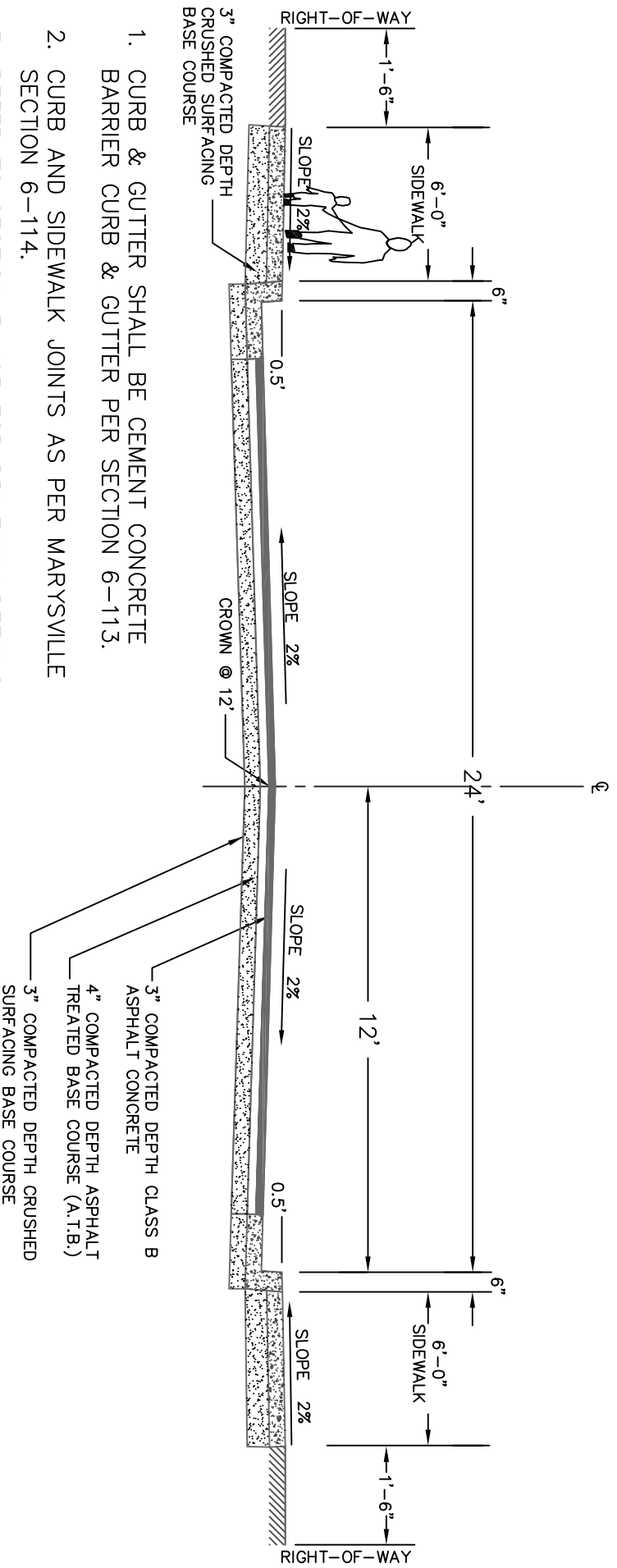




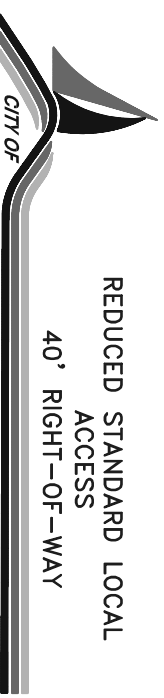
David D. Chetani

05/09

LAKE STEVENS CITY ENGINEER DATE

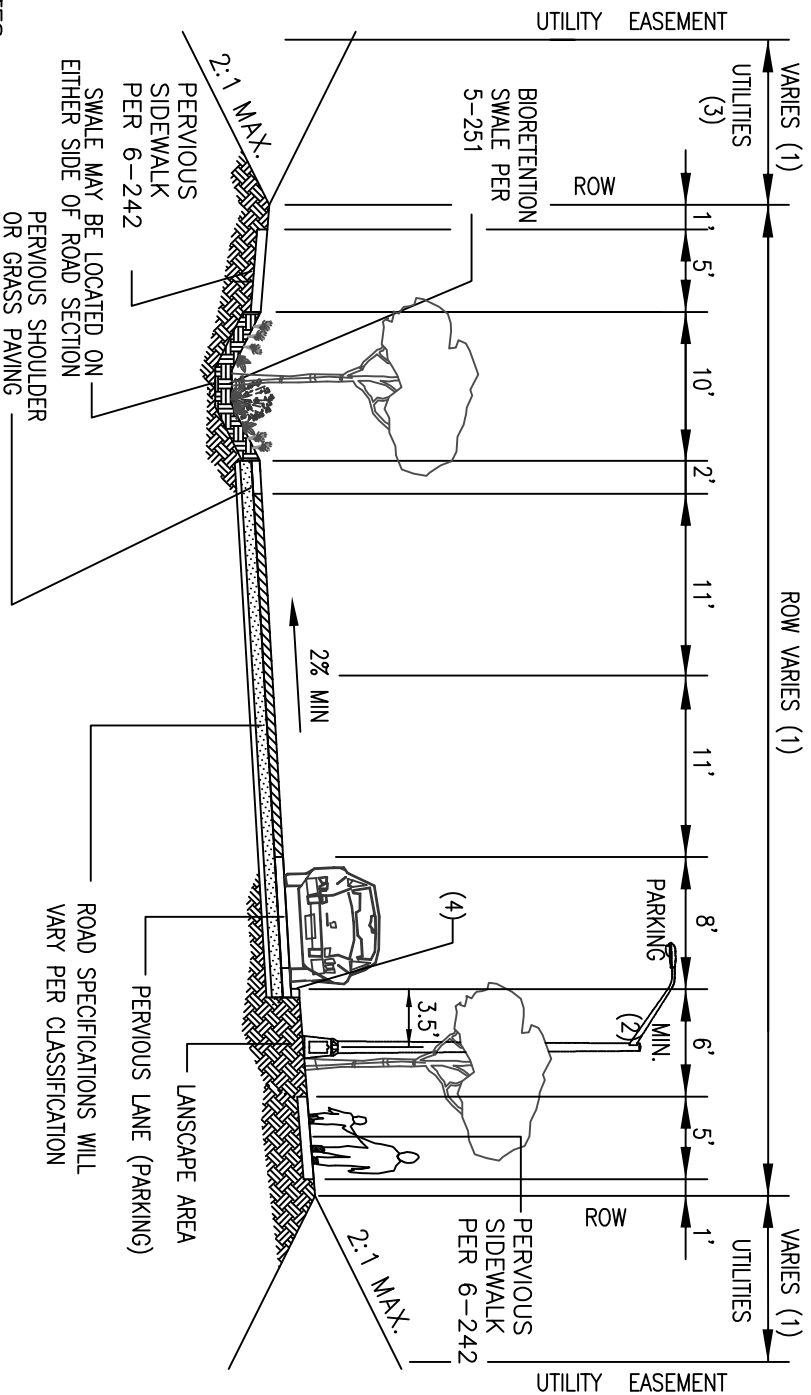


1. CURB & GUTTER SHALL BE CEMENT CONCRETE BARRIER CURB & GUTTER PER SECTION 6-113.
2. CURB AND SIDEWALK JOINTS AS PER MARYSVILLE SECTION 6-114.
3. REFER TO SECTION 3-103 FOR DRIVEWAY DETAILS.
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6. THE RIGHT-OF-WAY WIDTH SHALL BE WIDENED AN ADDITIONAL 5 FT MIN FOR PLACEMENT OF FIRE HYDRANTS AND MAILBOX CLUSTERS.
7. DRAINAGE REQUIRED BEHIND WALK IN CUT AREAS.



**LAKE STEVENS**  
**PUBLIC WORKS**  
 STANDARD PLAN 2-040





#### NOTES

1. CURB & GUTTER SHALL BE CEMENT CONCRETE BARRIER CURB & GUTTER PER SECTION 6-113.
2. CURB AND SIDEWALK JOINTS AS PER SECTION 6-114.
3. REFER TO SECTION 3-103 FOR DRIVEWAY DETAILS.
4. CURB RAMP DETAILS AS PER SECTION 6-115.
5. THIS DRAWING ILLUSTRATES A MINIMUM ASPHALT CONCRETE ROAD SECTION. ACTUAL SURFACING DESIGN FOR ARTERIALS AND ACCESS STREETS SHALL BE BASED ON SOILS AND TRAFFIC ANALYSIS.
6. DRAINAGE REQUIRED BEHIND WALK IN CUT AREAS.
7. SIDEWALKS MAY BE PERVIOUS WHERE SITE AND SOIL CONDITIONS MAKE LID FEASIBLE. SIDEWALKS SHALL BE A MIN. OF 5'-0" IN WIDTH. SEE SP 6-242 FOR PERVIOUS PAVING DETAILS.
8. USE OF ALL LID PRACTICES ARE DEPENDANT OF SITE CONDITIONS AND REQUIRE THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR DESIGNEE.



**LAKE STEVENS  
PUBLIC WORKS**

LID TYPICAL ROAD  
SECTION

STANDARD PLAN 2-041

APPROVED BY \_\_\_\_\_

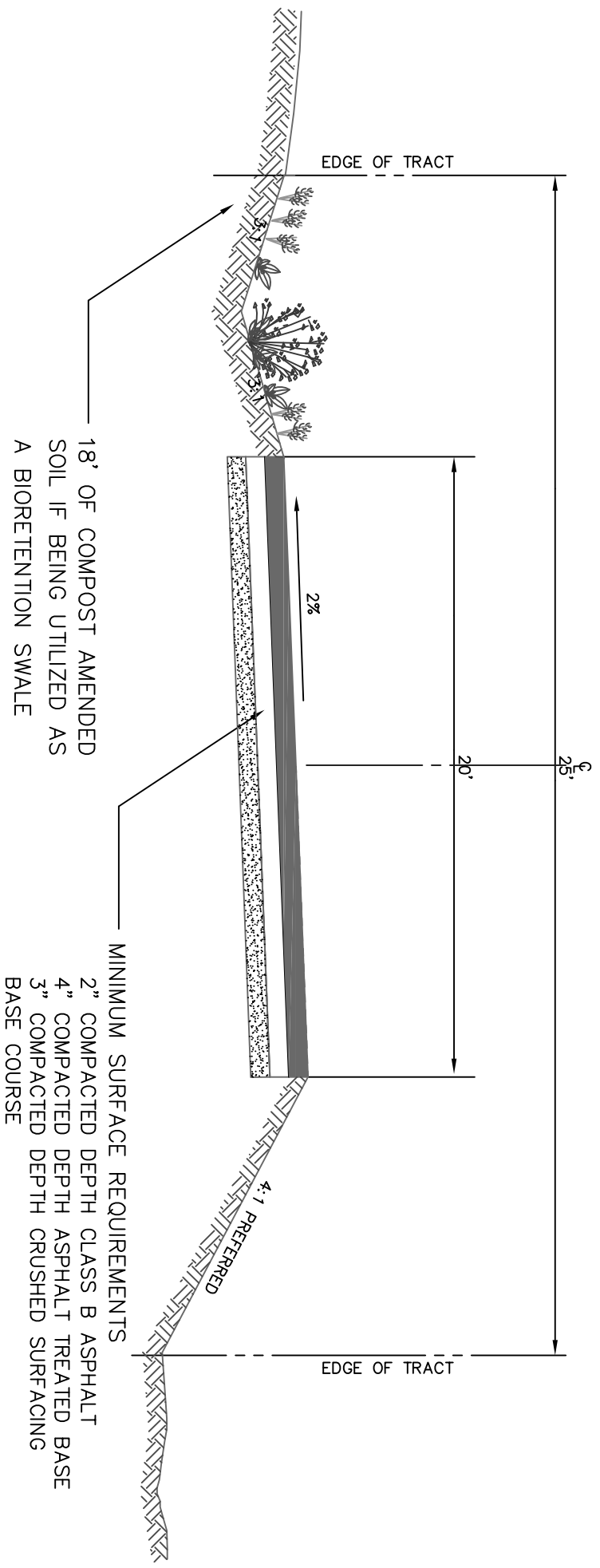
*Daniel M. Fitzgerald*

05/09

LAST REVISED 05/09

CITY LAKE STEVENS ENGINEER

DATE



**NOTES:**

1. NO ON STREET PARKING SHALL BE PERMITTED WHICH SHALL BE INDICATED BY NO PARKING SIGNS POSTED ON THE PRIVATE ACCESS TRACT.
2. ALL PRIVATE ACCESS TRACTS SHALL BE SIGNED "PRIVATE ROAD."

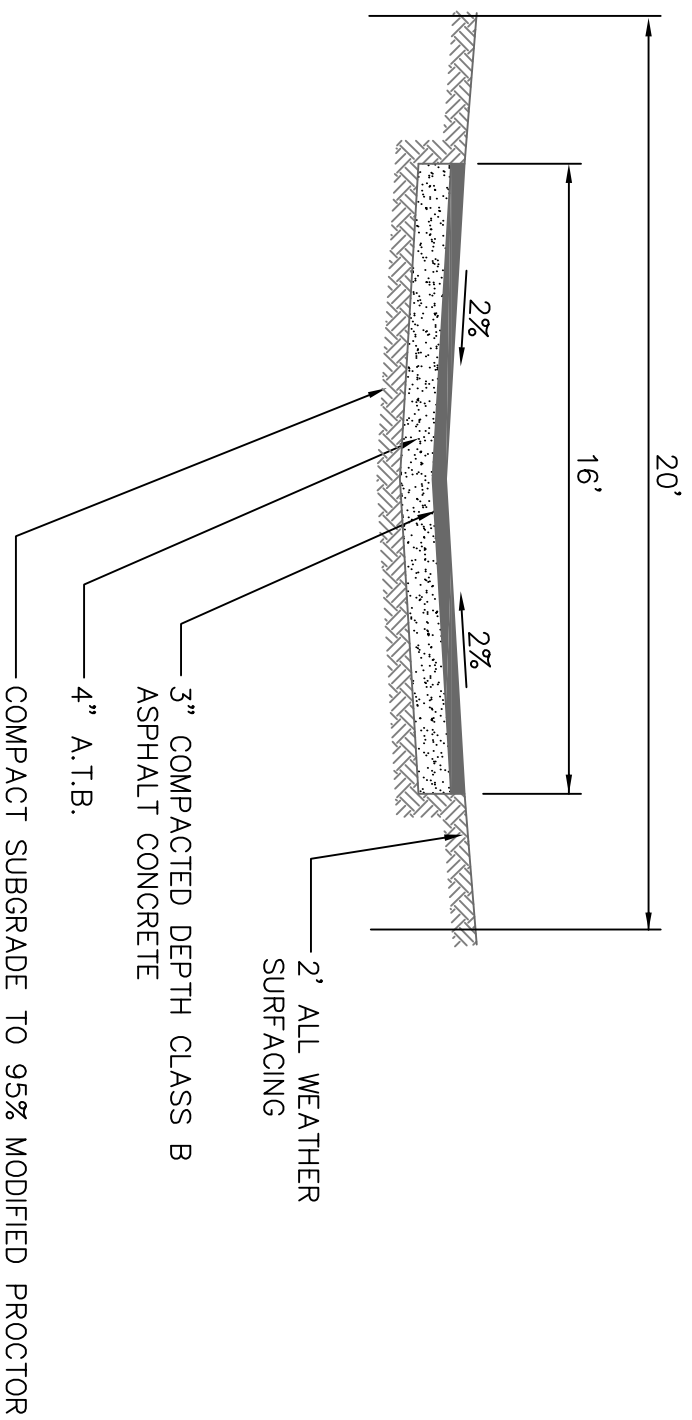


**PRIVATE ACCESS TRACT**

**CITY OF LAKE STEVENS**

**PUBLIC WORKS**

STANDARD PLAN 2-050



# ALLEY SECTION

## LAKE STEVENS PUBLIC WORKS

STANDARD PLAN 2-090

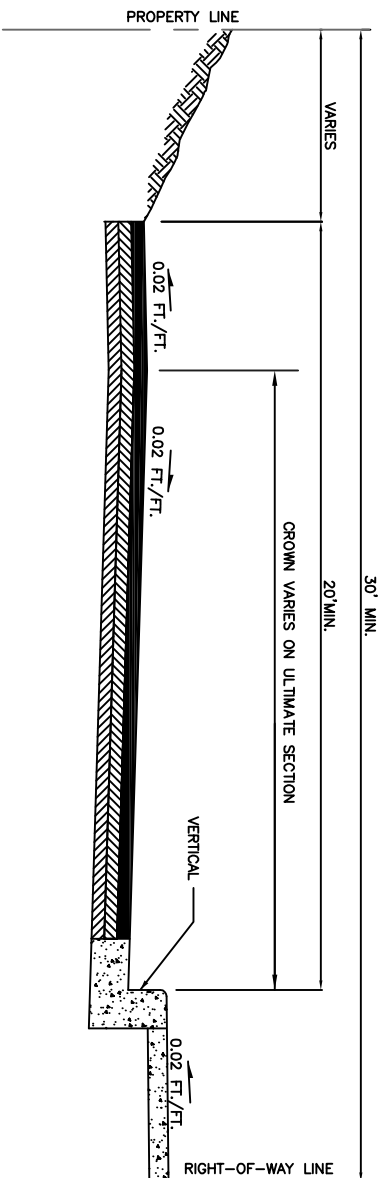
APPROVED BY

*Daniel M. Christy*

05/09

LAKE STEVENS CITY ENGINEER

DATE



NOTE:

1. FOR ACTUAL ROADWAY SECTION SEE APPLICABLE STANDARD PLAN. SEE SECTION 2-107.



HALF-STREET

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-100

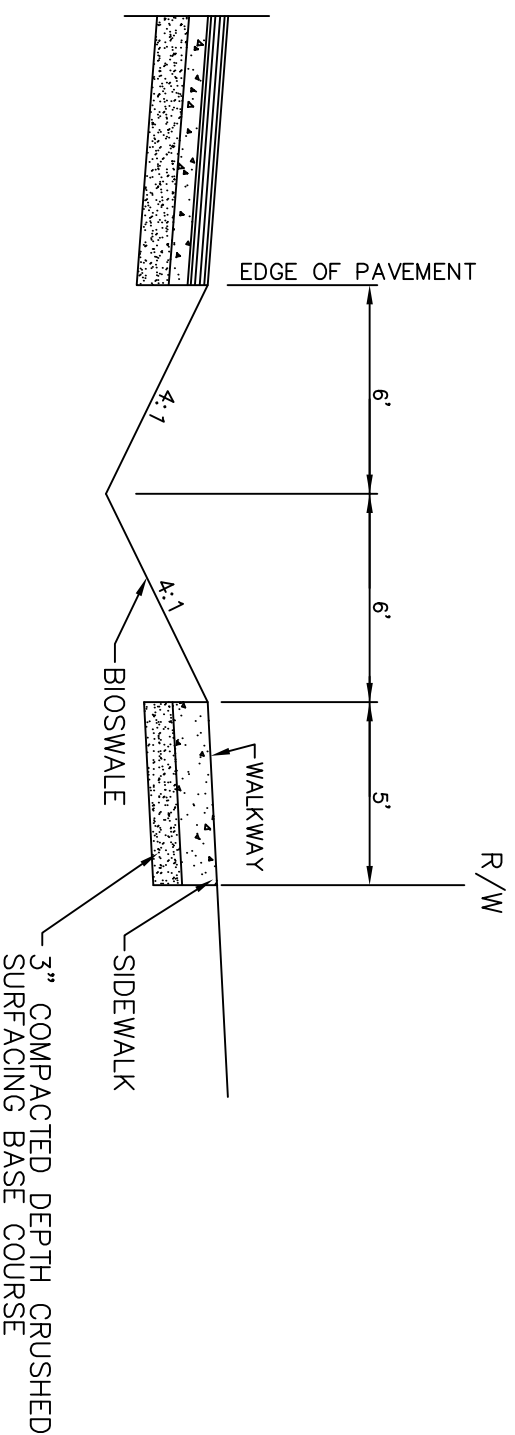
APPROVED BY

*David M. Christy*

CITY LAKE STEVENS ENGINEER

05/09

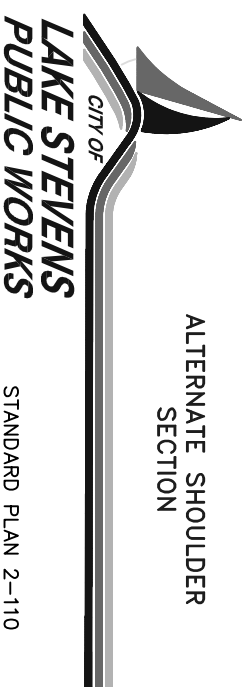
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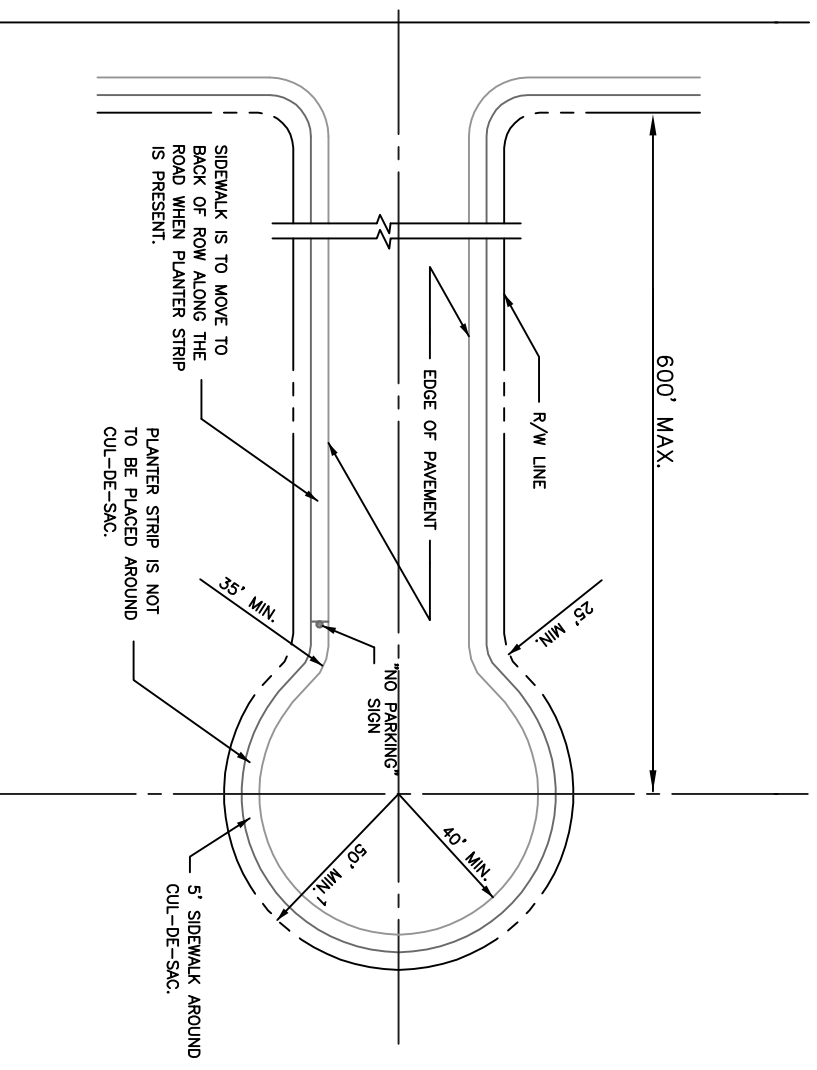
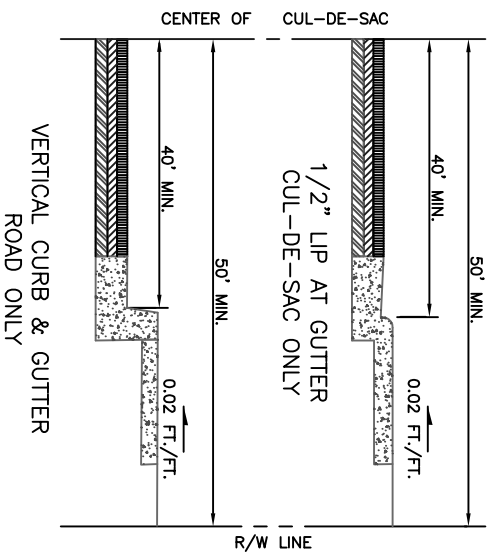
# NOTES:

1. BIOSWALE SHALL BE DESIGNED PER THE WASHINGTON STATE DEPARTMENT OF ECOLOGY REQUIREMENTS AND THE CITY OF LAKE STEVENS DRAINAGE STANDARDS.
2. SEE APPLICABLE ROADWAY SECTION FOR PAVEMENT THICKNESSES. DESIGN OF THE ROADWAY SHALL BE IN ACCORDANCE WITH SECTIONS 2-102 AND 2-103. ADDITIONAL SUBGRADE TREATMENT MAY BE REQUIRED DEPENDING ON SOIL CONDITIONS.
3. SEE SECTION 6-118 FOR SEPARATED WALKWAY

\* USE OF THIS SECTION SHALL BE APPROVED BY THE PUBLIC WORKS DIRECTOR OR DESIGNEE

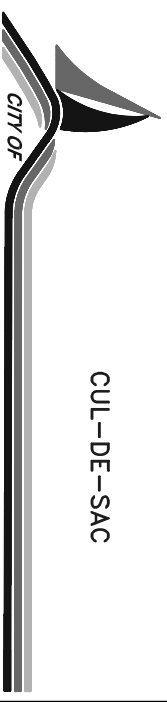


ALTERNATE SHOULDER SECTION



# NOTES:

1. ALL PERMANENT CUL-DE-SACS SHALL BE CONSTRUCTED WITH A VERTICAL CURB AND GUTTER SECTION ALONG THE ROAD. A 1/2" LIP WILL BE MAINTAINED AT THE GUTTER WITHIN THE CUL-DE-SAC.
2. SEE SECTION 2-108 FOR CUL-DE-SAC LENGTH EXCEPTION.
3. SEE STANDARD PLAN 3-020 FOR TRANSITION FROM VERTICAL CURB IN ROAD WAY TO A 1/2" LIP AT GUTTER AROUND THE CUL-DE-SAC.
4. A "NO PARKING IN CUL-DE-SAC" SIGN IS REQUIRED.



CUL-DE-SAC

STANDARD PLAN 2-120

APPROVED BY

*Daniel M. Christensen*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE

[illegible]

1) ADDITIONAL DETENTION MAY BE DESIGNED INTO BIOTRETENTION AREA BY USING A DOWN TURNED ELBOW WITH ORIFICE. MAXIMUM WATER DEPTH FOR THIS DESIGN IS 1.5- FEET FROM GROUND SURFACE TO DESIGNATED OVERFLOW ELEVATION. OVERFLOW DEVICE CAN BE SECOND CATCH BASIN WITH NO ELBOW OR ORIFICE.

2) TOPOGRAPHY WILL VARY GRADING PATTERN BUT EVERY ATTEMPT SHOULD BE MADE TO SLOPE IMPERVIOUS AREA TOWARDS BIORETENTION AREA.

3) TRANSITION TO THROAT AREA IS SHOWN AS AN EXAMPLE AND WILL VARY DEPENDING ON THROAT CROSS-SECTION.

4) BOLLARDS ON EITHER SIDE OF CENTERLINE AT ENTRANCE TO CUL-DE-SAC WILL HAVE VERTICAL PANELS WITH REFLECTIVE ORANGE AND WHITE STRIPES.

5) USE OF ALL LID PRACTICES ARE DEPENDANT OF SITE CONDITIONS AND REQUIRE THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR DESIGNEE.

6) BIORETENTION SWALE TO BE PER SP 5-252



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-121

APPROVED BY

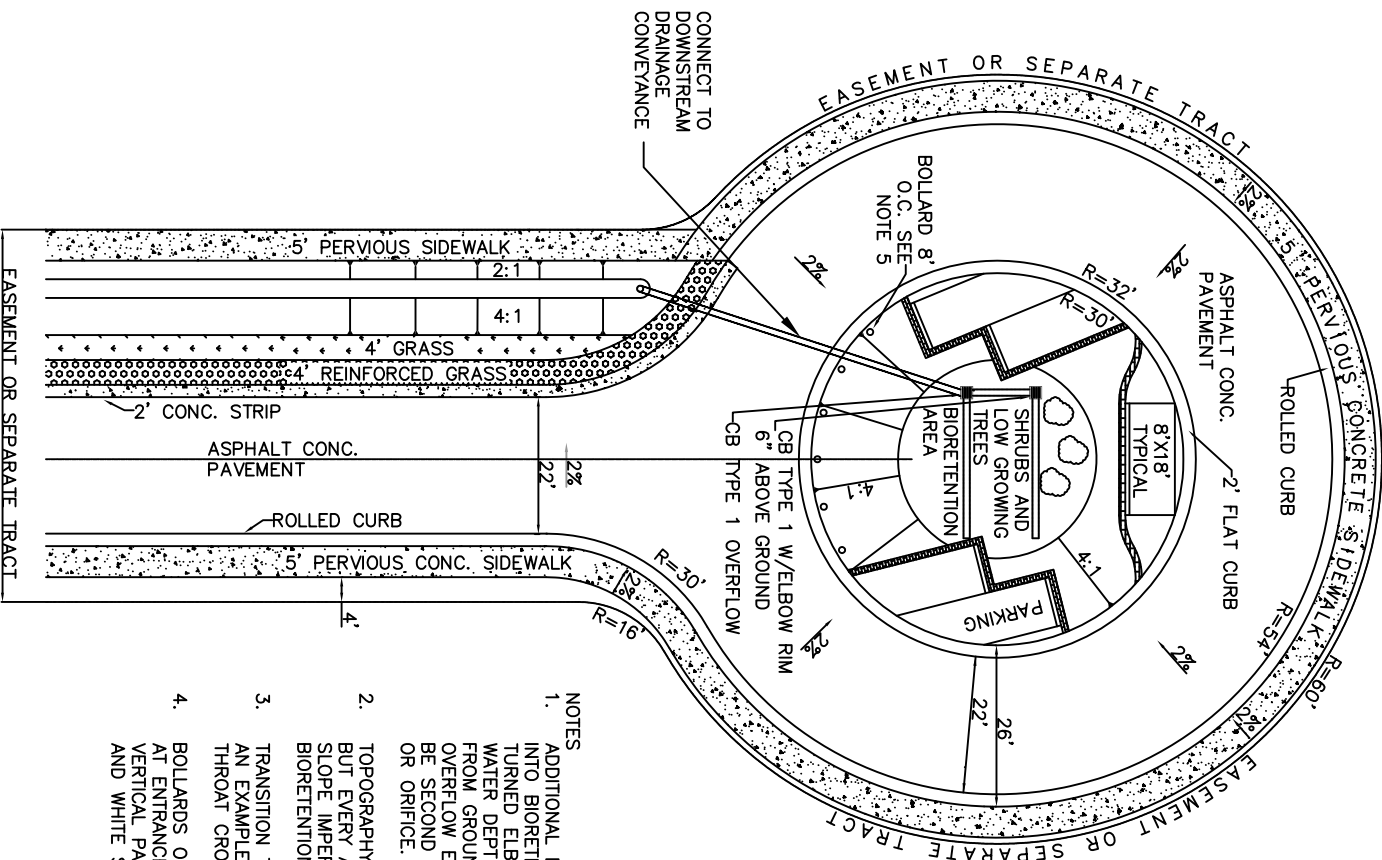
David D. Chetwood

05/09

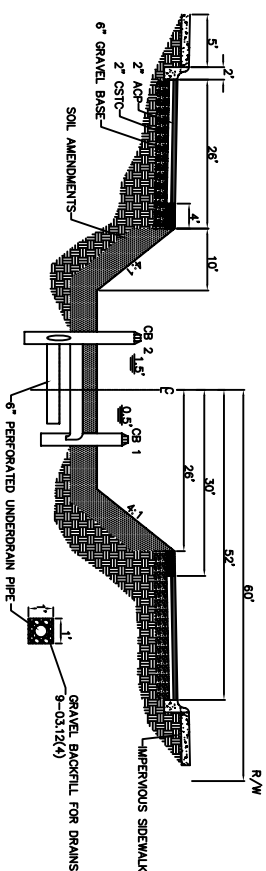
LAST REVISED 05/09

CITY LAKE STEVENS ENGINEER

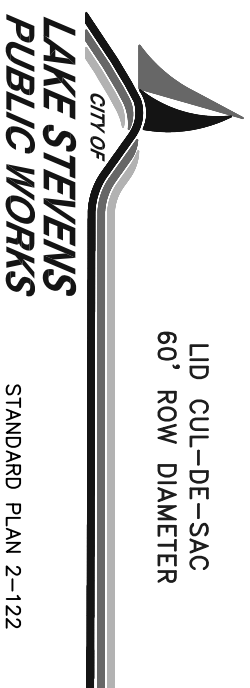
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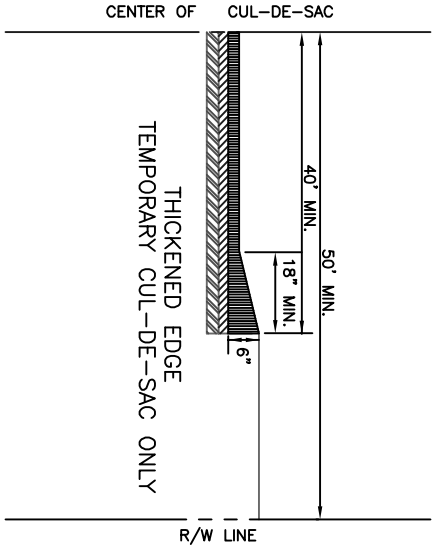
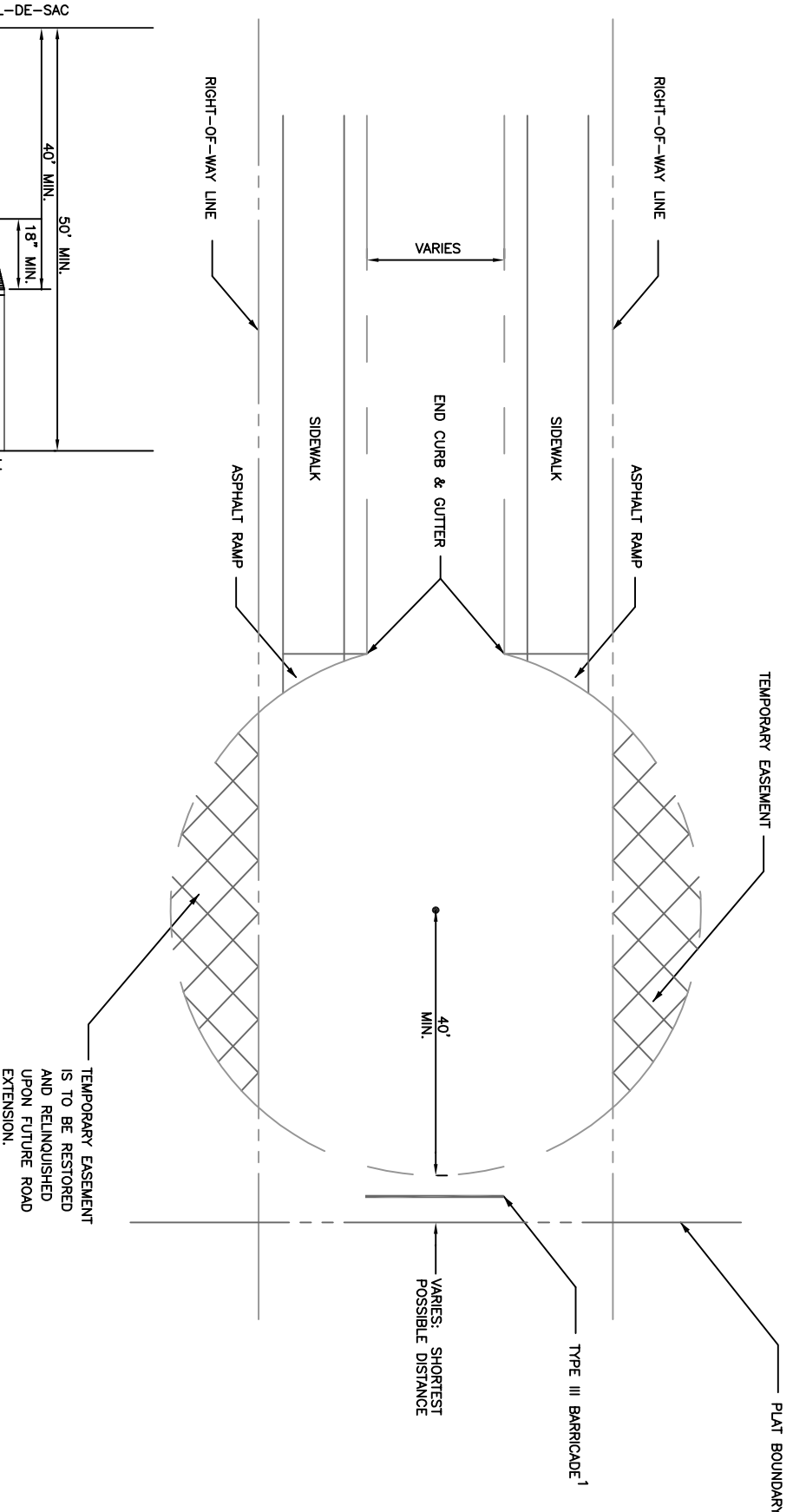
- NOTES**
1. ADDITIONAL DETENTION MAY BE DESIGNED INTO BIORETENTION AREA BY USING A DOWN TURNED ELBOW WITH ORIFICE. MAXIMUM WATER DEPTH FOR THIS DESIGN IS 1.5- FEET FROM GROUND SURFACE TO DESIGNATED OVERFLOW ELEVATION. OVERFLOW DEVICE CAN BE SECOND CATCH BASIN WITH NO ELBOW OR ORIFICE.
  2. TOPOGRAPHY WILL VARY GRADING PATTERN BUT EVERY ATTEMPT SHOULD BE MADE TO SLOPE IMPERVIOUS AREA TOWARDS BIORETENTION AREA.
  3. TRANSITION TO THROAT AREA IS SHOWN AS AN EXAMPLE AND WILL VARY DEPENDING ON THROAT CROSS-SECTION.
  4. BOLLARDS ON EITHER SIDE OF CENTERLINE AT ENTRANCE TO CUL-DE-SAC WILL HAVE VERTICAL PANELS WITH REFLECTIVE ORANGE AND WHITE STRIPES.



- Notes**
- 1) In bioretention area compost should be amended to a 13 inch depth (about 3 inches of compost to 8 inches of soil). Compact substrate must be scarified at least 4 inches below the 13 inch deep layer, with an organic matter content of 10 to 20%, and no more than 20% clay.
  - 2) Bioretention area shall be vegetated with native trees and shrubs however vegetation within 6 feet of the inside radius edge of the reinforced grass shall not be over 18 inches in height.
- CB 1 - Detention CB**  
Rim Elev. set 6 inches above finished grade. Should be CB Type 1 or equivalent 18" x ADS type.  
Outlet: is downturned elbow with orifice. Connect outlet to CB 2.
- CB 2 - Overflow CB**  
Rim Elev. set 18 inches above finished grade. Connect perforated underdrain pipes to CB. Outlet to conveyance channel within the development or to dispersion trench adjacent to Natural Resource Protection Area.







NOTES:

1. BARRICADE REQUIRED AT END OF BULB. SEE SECTION 6-107. BARRICADE SHALL HAVE 30"x36" SIGN STATING "FUTURE ROAD EXTENSION".
2. A "NO PARKING IN CUL-DE-SAC" SIGN IS REQUIRED.



**CITY OF  
LAKE STEVENS  
PUBLIC WORKS**

TEMPORARY  
CUL-DE-SAC

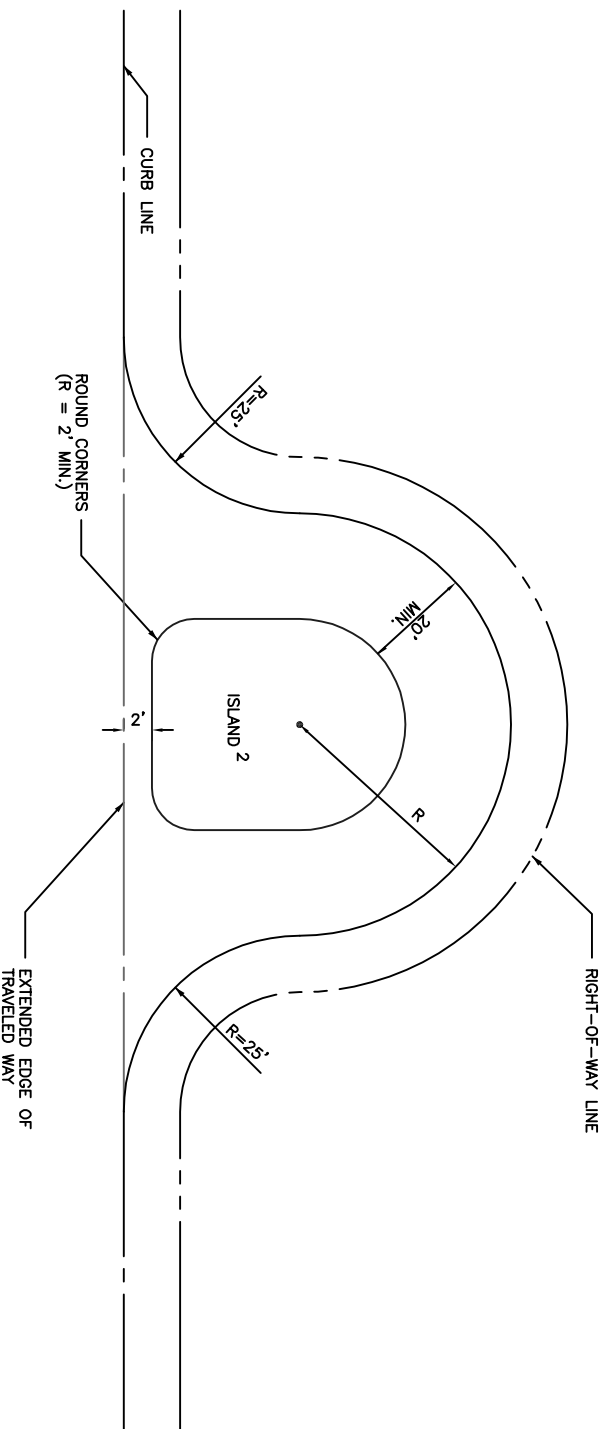
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APPROVED BY *Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

STANDARD PLAN 2-130

- NOTES:
1. ISLAND REQUIRED ON EYEBROWS WITH R GREATER THAN 25 FEET.
  2. MIN. ISLAND DIAM. SHALL BE 10 FEET.
  3. LARGER RADII THAN SHOWN MAY BE REQUIRED FOR TURNING MOVEMENTS



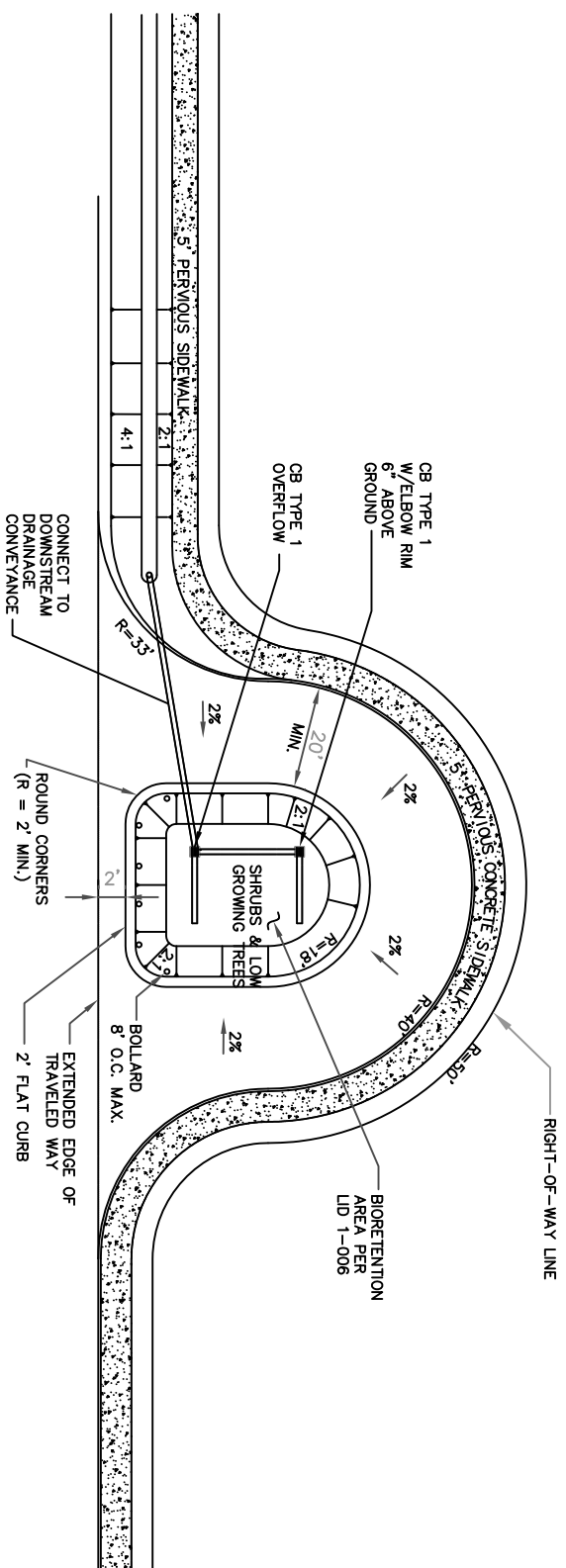
**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-140

APPROVED BY

David D. Chetani

05/09

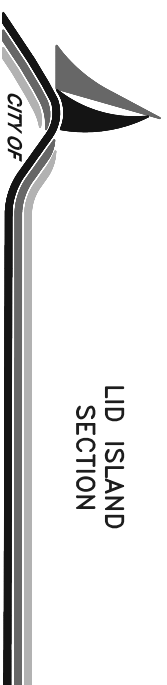
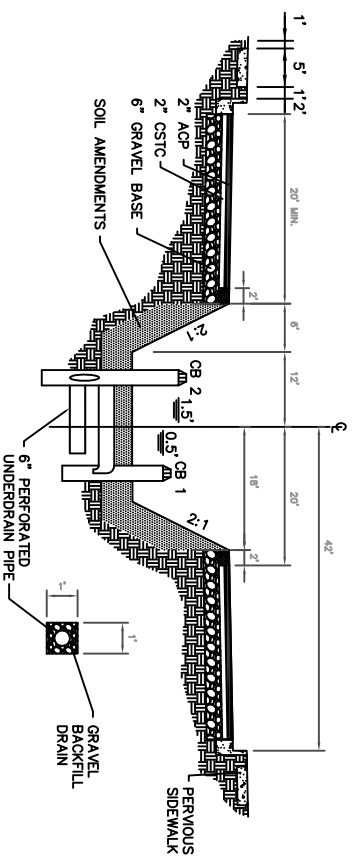


CB 1 - DETENTION CB  
RIM ELEV. SET 6 INCHES ABOVE FINISHED GRADE.  
SHOULD BE CB TYPE 1 OR EQUIVALENT 18" DIA. ADS TYPE.  
OUTLET IS DOWN TURNED ELBOW WITH ORIFICE. CONNECT OUTLET TO CB 2.

CB 2 - OVERFLOW CB  
RIM ELEV. SET 18 INCHES ABOVE FINISHED GRADE. CONNECT PERFORATED UNDERDRAIN PIPES TO CB. OUTLET TO CONVEYANCE CHANNEL WITHIN THE DEVELOPMENT OR TO DISPERSION TRENCH ADJACENT TO NATURAL RESOURCE PROTECTION AREA.

#### NOTES

1. IN BIORETENTION AREA COMPOST SHOULD BE AMENDED TO A 13 INCH DEPTH (ABOUT 5 INCHES OF COMPOST TO 8 INCHES OF SOIL). COMPACT SHRUBS MUST BE SCARPED AT LEAST 4 INCHES BELOW THE 13 INCH DEEP AMENDED LAYER. BIORETENTION SOIL COMPOSITION AND pH LEVELS SHALL MEET THE STANDARDS SET FORTH IN THE LID TECHNICAL GUIDANCE MANUAL FOR PUGET SOUND (CURRENT EDITION).
2. BIORETENTION AREA SHALL BE VEGETATED WITH NATIVE TREES AND SHRUBS HOWEVER VEGETATION WITHIN 6 FEET OF THE INSIDE RADIUS EDGE OF THE REINFORCED GRASS SHALL NOT BE OVER 18 INCHES IN HEIGHT.
3. MINIMUM ISLAND DIAMETER SHALL BE 10 FEET.
4. ISLAND SHALL HAVE A FLAT CURB.



#### LID ISLAND SECTION

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-141

APPROVED BY

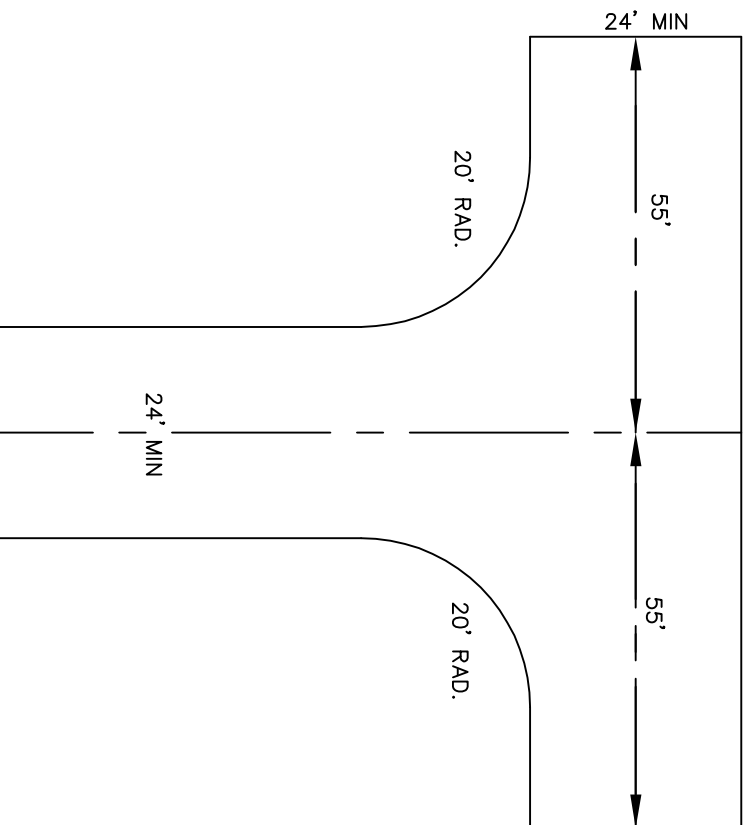
*Daniel A. Berglund*

05/09

LAST REVISED 05/09

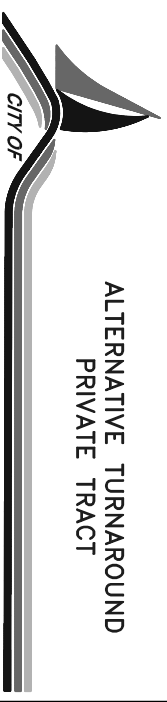
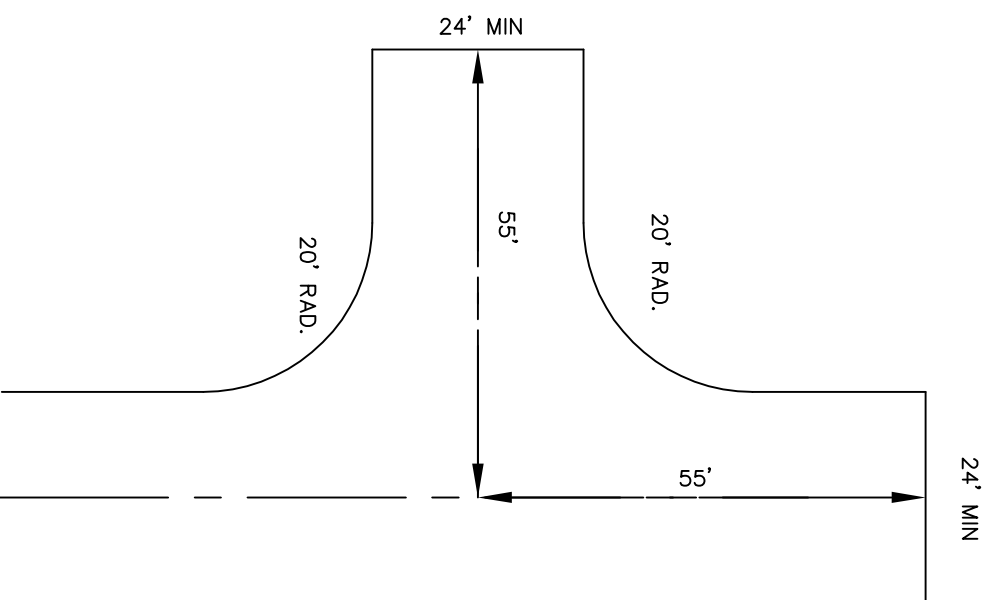
LAKE STEVENS CITY ENGINEER

DATE



# NOTES:

1. THIS STANDARD SHALL BE USED FOR PRIVATE TRACTS WHEN THEY EXCEED 150' IN LENGTH. (NOTE: THE LENGTH OF A PRIVATE TRACT SHALL BE MEASURED FROM THE EDGE OF THE INTERSECTING ROW TO THE END OF THE PRIVATE TRACT.)
2. ALL DIMENSIONS ARE MINIMUM PAVEMENT REQUIREMENTS.
3. THE TURNAROUND SHALL BE MARKED AS A FIRE LANE AND POSTED WITH NO PARKING SIGNS.
4. ALTERNATIVE TURNAROUNDS ARE NOT PERMITTED FOR PUBLIC ROADS.



ALTERNATIVE TURNAROUND  
PRIVATE TRACT

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 2-150

APPROVED BY

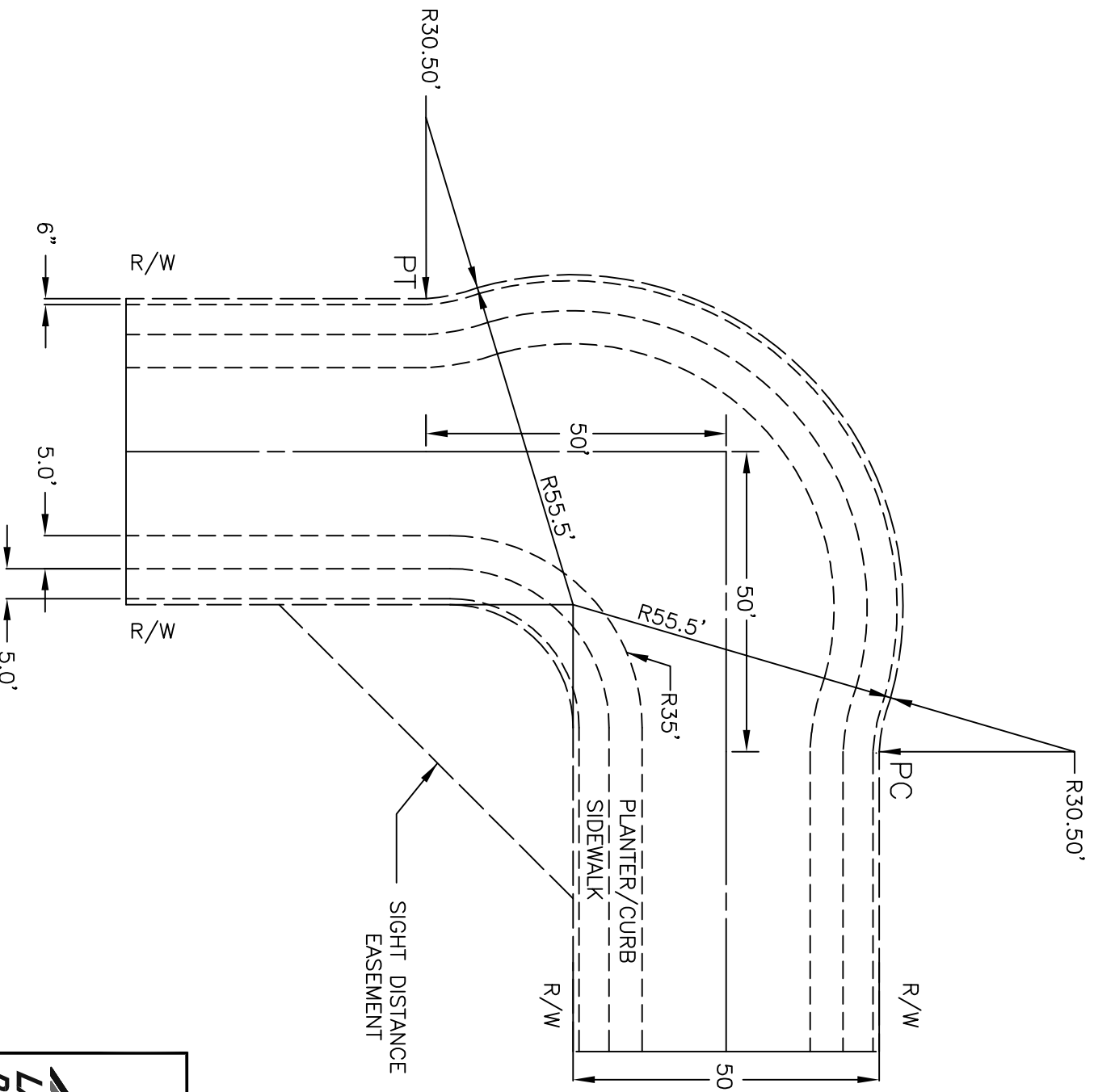
*David M. Berglund*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE



NOTES:

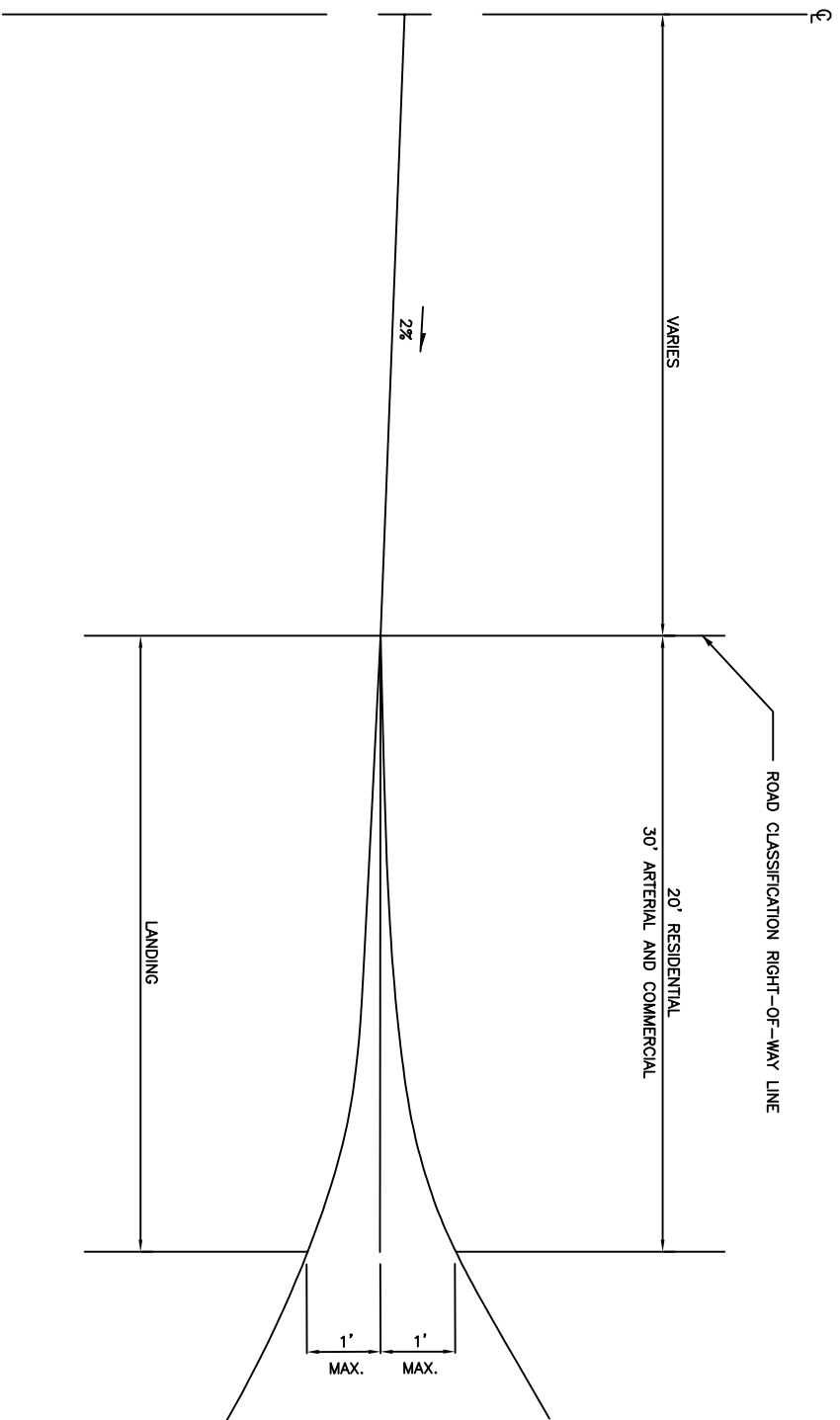
1. INTERSECTION ELBOWS MAY BE USED IN LIEU OF HORIZONTAL CURVES FOR CERTAIN LOW-SPEED DESIGNS IN SPECIAL CIRCUMSTANCES ONLY, REQUIRING CITY ENGINEER APPROVAL.
2. A MINIMUM 50' TANGENT IS REQUIRED FROM THE POINT OF INTERSECTION OF THE CENTERLINES.
3. INTERSECTION ANGLE SHALL BE 90 DEGREES  $\pm$  10 DEGREES.
4. RADII SHOWN APPLY FOR A 50-FOOT NEIGHBORHOOD ACCESS STREET.
5. A SIGHT DISTANCE EASEMENT SHALL BE GRANTED ACROSS THE CORNER PROPERTY.
6. RAISED PAVEMENT MARKERS REQUIRED ALONG CENTERLINE THROUGHOUT CURVE.



**90 DEGREE  
INTERSECTION ELBOW**

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-160



INTERSECTION  
LANDING

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-170

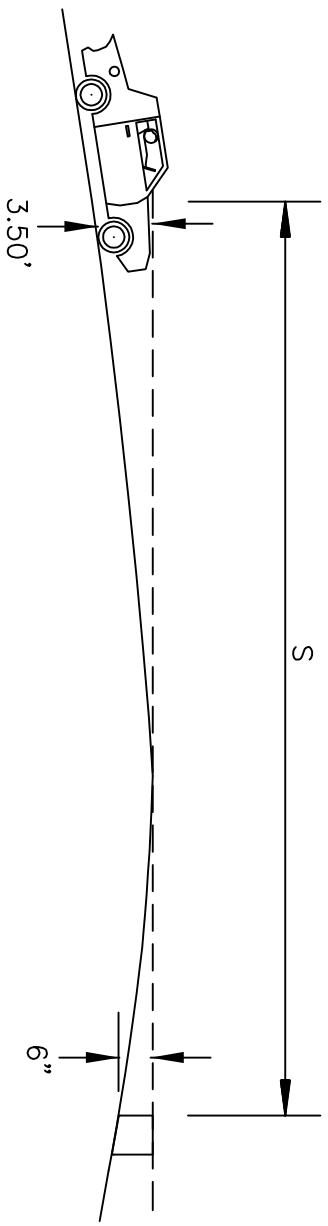
APPROVED BY

*David M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE

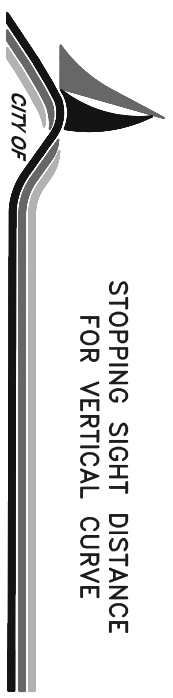
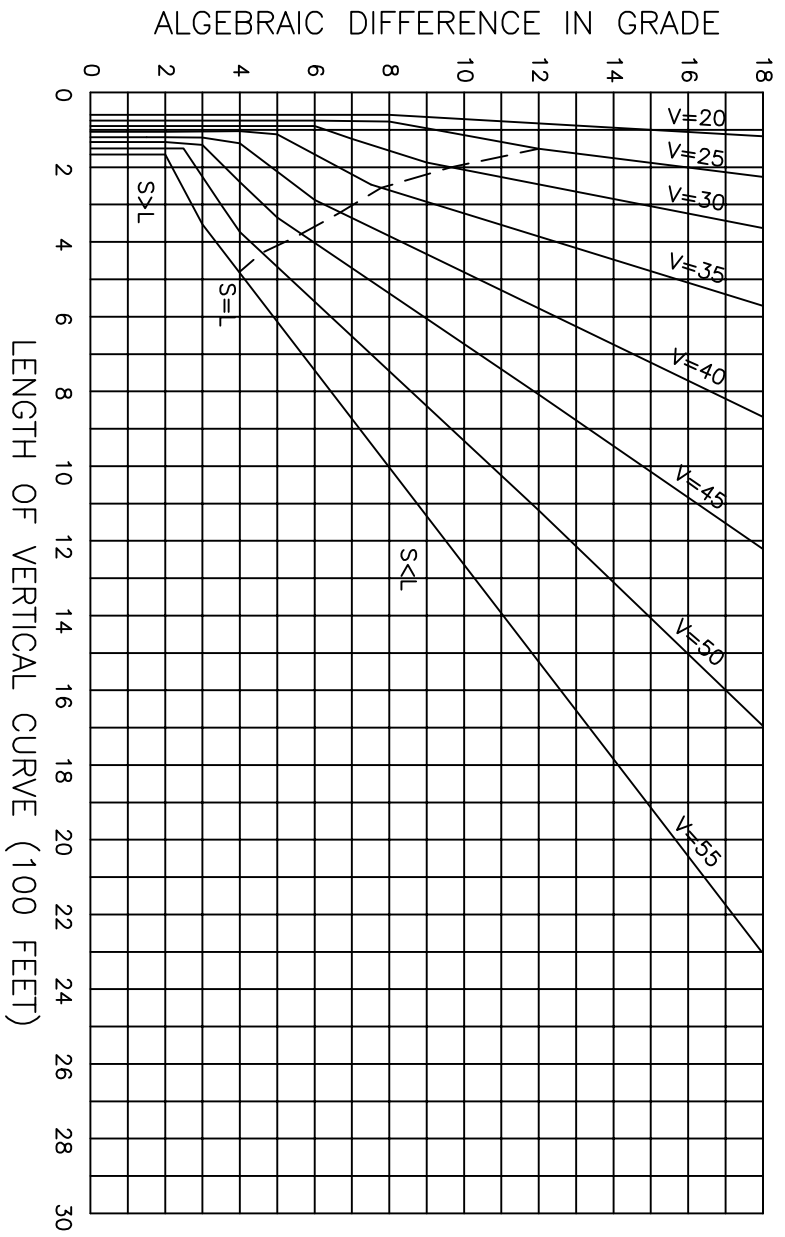


| WHEN $S > L$                             |  | WHEN $S < L$            |
|------------------------------------------|--|-------------------------|
| $L = 2S - \frac{1917}{A}$                |  | $L = \frac{AS^2}{1917}$ |
| L = CURVE LENGTH (FEET)                  |  |                         |
| A = ALGEBRAIC GRADE DIFFERENCE (PERCENT) |  |                         |
| S = SIGHT DISTANCE (FEET)                |  |                         |

| DESIGN SPEED (MPH) | DESIRABLE MINIMUM STOPPING DISTANCE (FEET) | MINIMUM LENGTH (FEET) |
|--------------------|--------------------------------------------|-----------------------|
| 20                 | 115                                        | 60                    |
| 25                 | 155                                        | 75                    |
| 30                 | 200                                        | 90                    |
| 35                 | 250                                        | 105                   |
| 40                 | 305                                        | 120                   |
| 45                 | 360                                        | 135                   |
| 50                 | 425                                        | 150                   |
| 55                 | 495                                        | 165                   |
| 60                 | 570                                        | 180                   |

NOTES:

1. L=MINIMUM LENGTH OF CURVE BASED ON MINIMUM STOPPING SIGHT DISTANCE.
2. BASED ON FIGURE. 650-11 WSDOT DESIGN MANUAL.

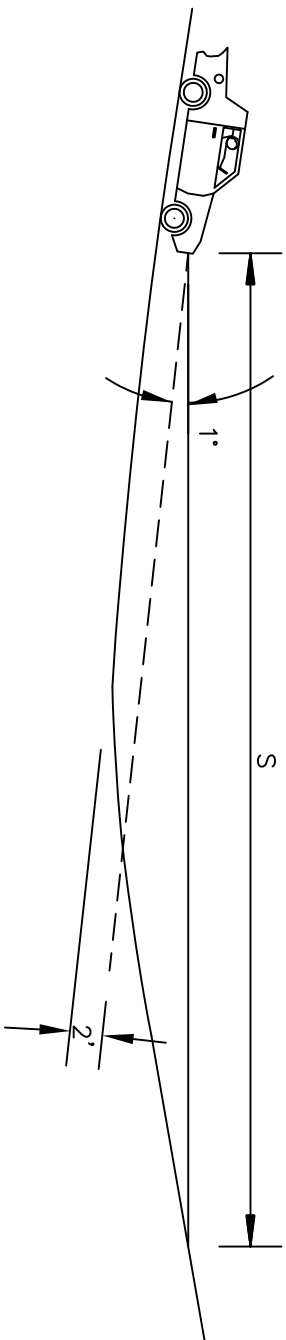


STOPPING SIGHT DISTANCE  
FOR VERTICAL CURVE

STANDARD PLAN 2-180

APPROVED BY  
*Daniel M. Berglund*  
LAKE STEVENS CITY ENGINEER

05/09  
DATE

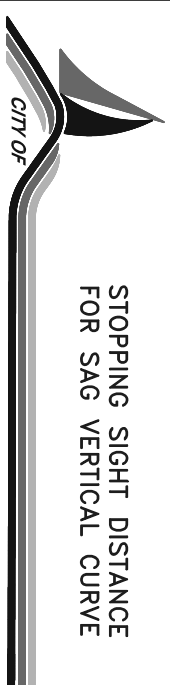
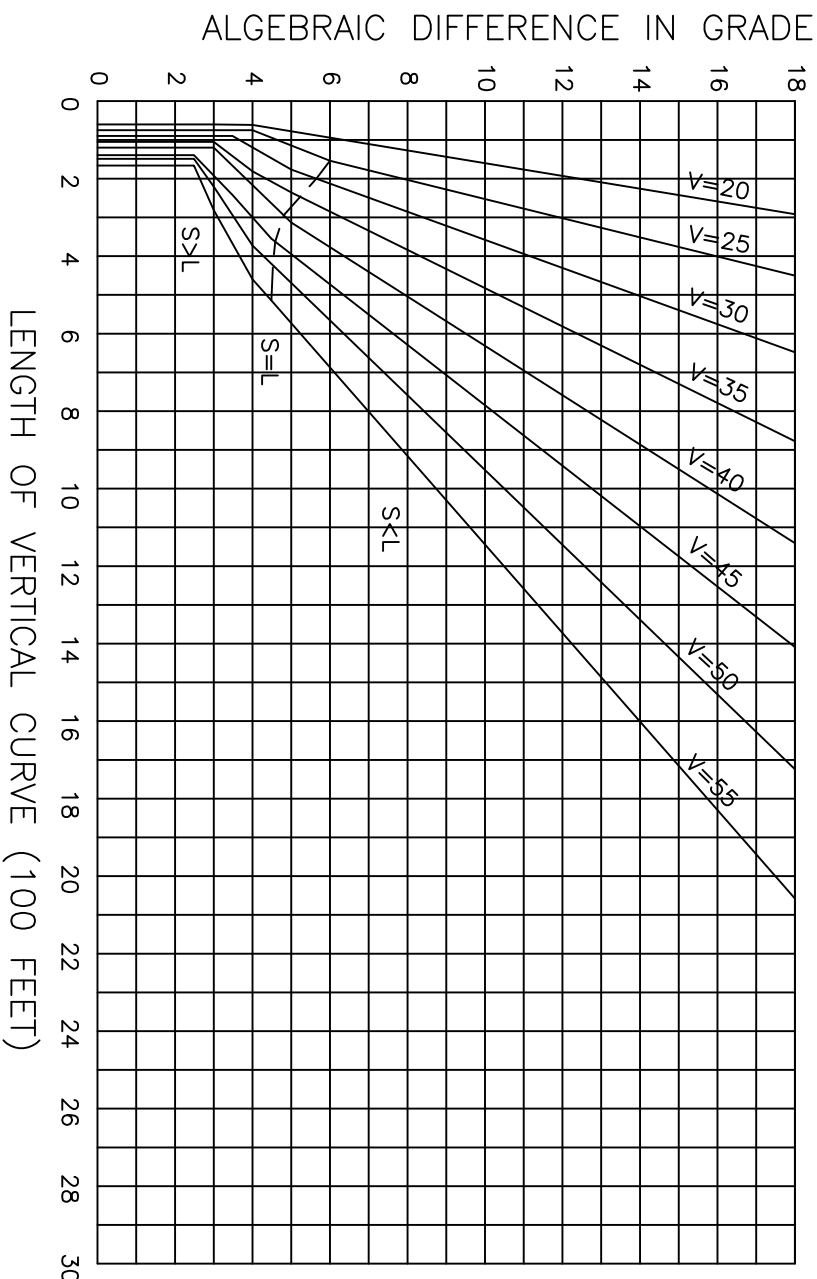


| WHEN $S > L$                                                                                           | WHEN $S < L$                |
|--------------------------------------------------------------------------------------------------------|-----------------------------|
| $L = 2S - \frac{400+3.5S}{A}$                                                                          | $L = \frac{AS^2}{400+3.5S}$ |
| $L$ = CURVE LENGTH (FEET)<br>$A$ = ALGEBRAIC GRADE DIFFERENCE (PERCENT)<br>$S$ = SIGHT DISTANCE (FEET) |                             |

| DESIGN SPEED (MPH) | DESIRABLE MINIMUM STOPPING DISTANCE (FEET) | MINIMUM LENGTH (FEET) |
|--------------------|--------------------------------------------|-----------------------|
| 20                 | 115                                        | 60                    |
| 25                 | 155                                        | 75                    |
| 30                 | 200                                        | 90                    |
| 35                 | 250                                        | 105                   |
| 40                 | 305                                        | 120                   |
| 45                 | 360                                        | 135                   |
| 50                 | 425                                        | 150                   |
| 55                 | 495                                        | 165                   |
| 60                 | 570                                        | 180                   |

NOTES:

1.  $L$  = MINIMUM LENGTH OF CURVE BASED ON MINIMUM STOPPING SIGHT DISTANCE.
2. BASED ON FIGURE. 650-12 WSDOT DESIGN MANUAL.



STOPPING SIGHT DISTANCE  
FOR SAG VERTICAL CURVE

STANDARD PLAN 2-190



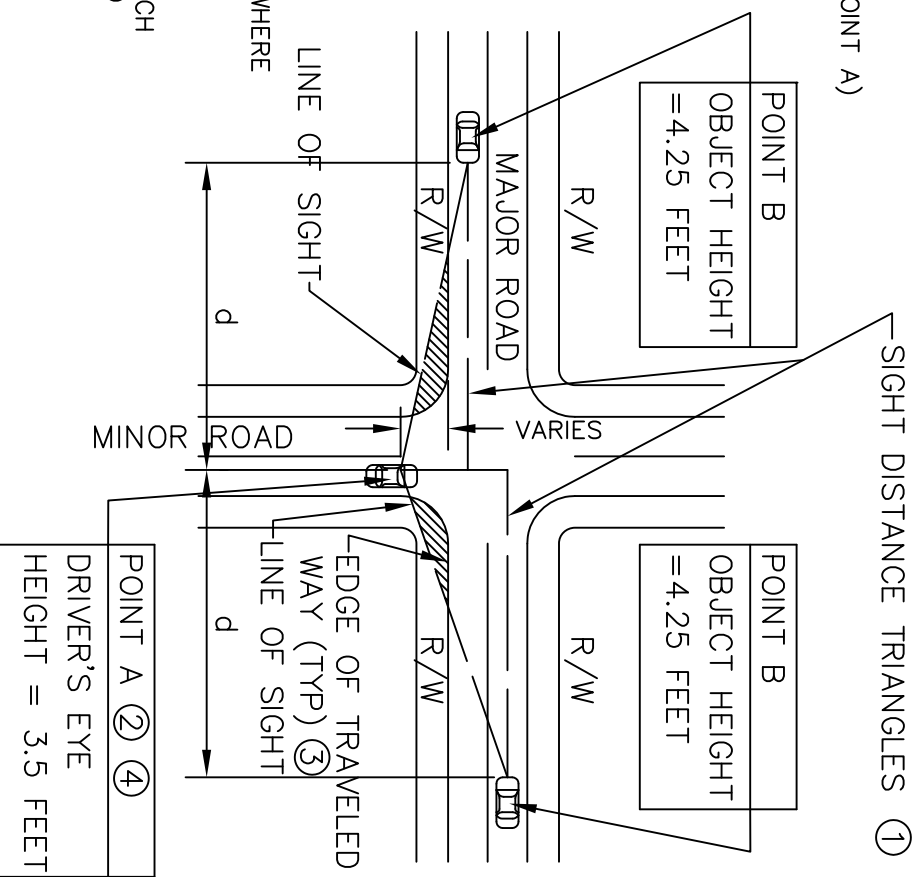
1. AT ANY INTERSECTION OF A PRIVATE ROAD/ACCESS POINT WITH A CITY ROAD OR A CITY ROAD WITH A CITY ROAD, THERE MUST BE A SIGHT DISTANCE TRIANGLE WHICH PROVIDES AN UNOBSTRUCTED LINE OF SIGHT FROM THE INTERSECTING ROAD EDGE OF TRAVELED WAY (POINT A) TO A POINT IN THE TRAVELED WAY (POINT B) AT LEAST EQUAL TO THE REQUIRED SIGHT DISTANCE d. SEE SECTIONS 2-103 AND STANDARD PLAN 2-210.

2. THE DRIVER'S EYE TO DETERMINE LINE OF SIGHT AT INTERSECTIONS IS 3.5 FEET ABOVE THE PAVEMENT, WITH AN OBJECT HEIGHT OF 4.25 FEET ABOVE THE PAVEMENT.

3. THE EDGE OF TRAVELED WAY IS DEFINED AS THE FACE OF CURB FOR ROADS THAT ARE OR WILL BE CONSTRUCTED TO URBAN STANDARDS AND THE EDGE OF PAVEMENT (NOT SHOULDER) FOR ROADS THAT ARE, OR WILL BE CONSTRUCTED TO RURAL STANDARDS. THE AREA WITHIN THE SIGHT DISTANCE TRIANGLE MUST BE FREE FROM ANY SIGHT OBSCURING OBJECTS WITH THE LINE OF SIGHT AT LEAST 18 INCHES ABOVE THE GROUND AND/OR THE TOP OF ANY PROPOSED VEGETATION ALONG THE LINE OF SIGHT.

4. THE DRIVER'S EYE LOCATION MAY BE REDUCED TO A MINIMUM OF 10 FEET BEHIND THE TRAVELED WAY, AT THE DISCRETION OF THE CITY ENGINEER, WHERE THE REDUCTION IN DRIVER'S EYE LOCATION WILL NOT ADVERSELY AFFECT THE SAFETY AND/OR OPERATION. SOME EXAMPLES OF SITUATIONS WHERE THE ENGINEER'S DISCRETION MAY BE USED ARE: AN INTERSECTION ON THE OUTSIDE OF A HORIZONTAL CURVE; AN INTERSECTION WHERE ONE APPROACH IS IN A CUT OR FILL; OR WHERE A BRIDGE RAILING OR ABUTMENT WOULD OBSCURE THE LINE OF SIGHT FROM 15 FEET BACK BUT NOT FROM 10 FEET BACK.

LIN



OBSTRUCTION FREE ZONE.

SIGHT DISTANCE REQUIRED



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-200

APPROVED BY

David D. Chetani

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE \_\_\_\_\_

|                                         | LOCAL<br>ACCESS<br>STREET | NEIGHBORHOOD<br>COLLECTORS | ARTERIAL<br>STREETS | SETBACK<br>DISTANCE<br>POINT A<br>(FEET) |
|-----------------------------------------|---------------------------|----------------------------|---------------------|------------------------------------------|
| PRIVATE<br>RESIDENTIAL<br>DRIVEWAY/ROAD | SSD                       | SSD                        | ESD                 | 10'                                      |
| PRIVATE<br>COMMERCIAL<br>DRIVEWAY       | ESD                       | ESD                        | ESD                 | 15'                                      |
| ALLEY                                   | ESD                       | ESD                        | ESD                 | 15'                                      |
| LOCAL ACCESS<br>STREET                  | ESD                       | ESD                        | ESD                 | 20'                                      |
| NEIGHBORHOOD<br>COLLECTORS              | ESD                       | ESD                        | ESD                 | 20'                                      |
| ARTERIAL<br>STREETS                     | ESD                       | ESD                        | ESD                 | 20'                                      |

NOTES:

REFER TO STANDARD PLAN 2-200  
SSD – STOPPING SIGHT DISTANCE  
ESD – ENTERING SIGHT DISTANCE



SIGHT  
DISTANCE TABLE

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 2-210

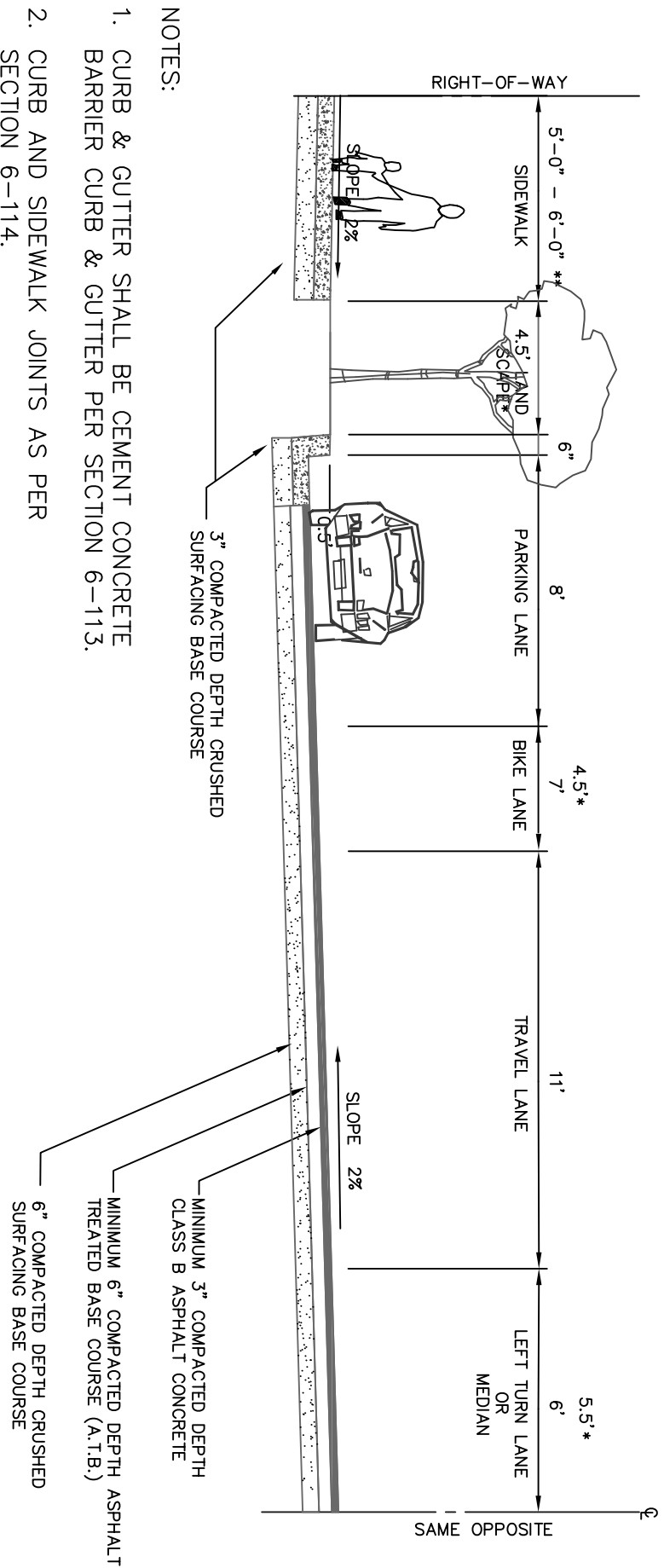
APPROVED BY

*Daniel M. Berglund*

05/09

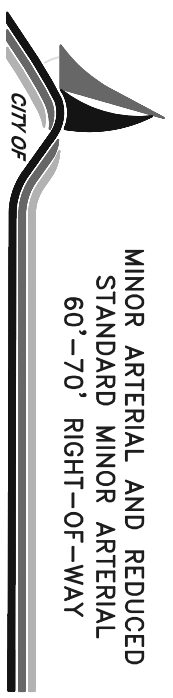
LAKE STEVENS CITY ENGINEER

DATE



NOTES:

1. CURB & GUTTER SHALL BE CEMENT CONCRETE BARRIER CURB & GUTTER PER SECTION 6-113.
  2. CURB AND SIDEWALK JOINTS AS PER SECTION 6-114.
  3. REFER TO SECTION 3-103 FOR DRIVEWAY DETAILS.
  4. CURB RAMP DETAILS AS PER SECTION 6-115.
  5. THIS DRAWING ILLUSTRATES A MINIMUM ASPHALT CONCRETE ROAD SECTION. ACTUAL SURFACING DESIGN FOR ARTERIALS AND COMMERCIAL ACCESS STREETS SHALL BE BASED ON SOILS AND TRAFFIC ANALYSIS.
  6. THE RIGHT-OF-WAY WIDTH SHALL BE WIDENED AN ADDITIONAL 5 FT MIN FOR PLACEMENT OF FIRE HYDRANTS AND MAILBOX CLUSTERS.
  7. DRAINAGE REQUIRED BEHIND WALK IN CUT AREAS.
- \* REDUCED STANDARD WITH 3' LANDSCAPE STRIPS.
- \*\* 6'-0" ADJACENT TO CURB, 5'-0" ADJACENT TO 4.5' PLANTER STRIP.



STANDARD PLAN 2-010

APPROVED BY  
*David M. Christy*  
 LAKE STEVENS CITY ENGINEER  
 DATE 05/09



## **SECTION 3**

### **SITE ACCESS**

#### **3-100 General**

- A.** This section constitutes as the City of Lake Stevens Access Management Plan.
- B.** Access to City roads is regulated through the Right of Way Use Permit Process. No construction of access points or related improvements will be allowed without a valid R/W Use permit. Permits will be evaluated and issued based on the ability of the proposed access or use to meet these Standards.
- C.** Access points shall be designed and constructed:
  - 1.** to minimize conflicts between vehicles, bicycles and pedestrians.
  - 2.** to avoid impacts to wetlands, streams, fish and wildlife habitat areas, buffers and other critical areas, to the maximum extent possible.
  - 3.** to conform to ADA design requirements, where applicable.
  - 4.** so that backing maneuvers from, or onto, a public right-of-way do not occur.Under no circumstances shall an access point be designed so that backing maneuvers occur into an intersection of one or more arterial roads.
- D.** If a proposed property access point cannot meet these Standards, the Engineer may designate one or more access points based on traffic safety, operational needs, and conformance to as many of the requirements of these Standards as possible.
- E.** Access points for parking or loading areas shall be designed so that backing maneuvers from or onto a public street R/W will not occur. This does not apply to single family or duplex residential uses on non-arterial roads.
- F.** Where necessary for the safe and efficient movement of traffic, the Engineer may require investigation by the applicant to determine whether access points should be designed to limit turning movements. The Engineer may also require joint access and circulation agreements between neighboring properties to further provide safe and efficient movement of traffic.
- G.** Temporary access may be granted to undeveloped property prior to completion of a final development plan if access is needed for construction of preliminary site access. Temporary access points are subject to removal, relocation, or redesign after final development plan approval.

- H.** Secondary access for emergency vehicles may be required for certain high volume or public safety sensitive developments. They shall be designed to the satisfaction of the Public Works Director or designee based on review by the City of Lake Stevens Fire Department.
- I.** No relocation, alteration or reconstruction of existing access points is permitted without prior written approval from the Public Works Director or designee.
- J.** Design features, such as medians, channelization or curbing, may be required by the Engineer for control of traffic movements. The Engineer may determine, or require analysis to determine, if an access point must be designed to regulate traffic movements.
- K.** If a proposed development will discontinue use of one or more existing access points, these access points shall be removed by the developer and replaced with appropriate frontage improvements.
- L.** Existing Access points that do not meet these standards may be required to be revised or removed if deemed necessary by the Public Works Director or designee.
- M.** Access to the State Highway system is regulated by Washington State Department of Transportation (WSDOT) or by local jurisdictions for highways within city limits. Permits and approvals for access must be obtained from the appropriate agency.

### ***3-101 Arterial Access Standard***

The access management plan spacing standards for implementation in the City of Lake Stevens arterial system are shown in the Table 3-1. Standard Plan 3-010 depicts the corresponding dimensional locations graphically. As shown in Table 3-1, the driveway spacing standards for a full access driveway range from 125 feet to 300 feet depending on the speed of the arterial, adjacent intersection traffic control, and spacing between adjacent driveways.

**Table 3-1 Driveway Location and Spacing Guidelines**

| <b>Posted Speed</b> | <b>Adjacent Intersection Control</b> | <b>Full Access (A)</b> | <b>Right Turn In/ Right Turn Out Only (B)</b> | <b>Right Turn Out or Right Turn In Only (C)</b> |
|---------------------|--------------------------------------|------------------------|-----------------------------------------------|-------------------------------------------------|
| < or = 30 MPH       | STOP SIGN                            | 125 FT                 | 100 FT                                        | 100 FT                                          |
| < or = 30 MPH       | SIGNALIZED                           | 230 FT                 | 125 – APPROACH<br>150- DEPART                 | 100 FT                                          |
| 35 MPH              | STOP SIGN                            | 150 FT                 | 120 FT                                        | 120 FT                                          |
| 35 MPH              | SIGNALIZED                           | 250 FT                 | 150 – APPROACH<br>200- DEPART                 | 135 FT                                          |
| 40 MPH              | STOP SIGN                            | 175 FT                 | 140 FT                                        | 140 FT                                          |
| 40 MPH              | SIGNALIZED                           | 275 FT                 | 175 – APPROACH<br>250- DEPART                 | 150 FT                                          |

Refer to Standard Plan No. 3-010 for corresponding graphic locations.

Driveway spacing standards for right turn in/right turn out only driveways are slightly lower ranging from 100 feet to 250 feet depending on arterial speed, traffic control and the direction of travel relative to adjacent signalized intersections. The direction of travel relative to the intersection (approaching or departing) is important to maintaining traffic flow where accelerating vehicles and drivers slowing down to enter driveways are the cause of many rear end accidents.

Right turn driveway spacing standards are lower since there are less points of vehicular conflict. Access locations restricted to right turn in only or right turn out only movement range from 100 feet to 150 feet depending on arterial speed and traffic control.

In addition to the access driveway spacing standards above, the following standards should also be considered and implemented as applicable:

1. Driveways are to be restricted to right turns only with the use of medians or driveway pork-chop islands with appropriate signing consistent with WSDOT design criteria and the Manual on Uniform Traffic Control Devices (MUTCD).
2. Left turn access may be restricted if left turn traffic movements significantly interrupt traffic flow and operations as determined by the Public Works Director or designee. Channelization allows traffic to exit the main flow of traffic to conduct the left turn movement while maintaining the capacity of the through lanes. Left turn channelization warrant analysis based on WSDOT

Design Manual guidelines should be conducted to identify if improvements should be provided or constructed.

- 3.** Only one (1) full access shall be allowed for every 500 feet of any contiguous parcel ownership or master plan arterial frontage. In all cases, the number of access locations should be minimized and existing access consolidated if possible.
- 4.** Access point should be placed directly opposite each other. If this is not possible, a separation between the nearest edges of such opposite access points shall meet the spacing criteria set forth in Table 3-1.
- 5.** Where a property has frontage on more than one roadway, access will generally be limited to the lowest volume roadway where the impacts of a new access will be minimized. Access onto other higher volume roadways may be denied or restricted in the interest of traffic safety or in order to lessen congestion on the higher volume road.
- 6.** The spacing measurement for all access standards shall be measured from the near edge of access driveways and the right-of-way line for public streets or the near edge of the adjacent driveway.
- 7.** Spacing for proposed driveways access adjacent to railroad right of way shall be measured from the railroad stop bar to the near edge of the driveway.
- 8.** Provisions for joint access may be required for two adjacent developments where a proposed new access will not meet the spacing requirements of this plan or to limit the number of access points on the arterial. In the event the adjacent property is not ready for development, the first property ready for development may use an interim access.
- 9.** Sight distance standards for ingress and egress movements shall be satisfied for all proposed access locations based on Section 3-212.

Requiring turn movement restrictions based on traffic volumes should be considered when average daily traffic volumes on the arterial reaches between 24,000 to 28,000 vehicles per day. National studies have indicated that arterials with two-way left turn lanes start to become unsafe at this level of daily traffic, although most retrofitting projects occur when traffic volumes reach approximately 40,000 ADT. Access restriction considerations due to high traffic volumes should be reviewed on a case-by-case basis depending on the hourly loading of the daily volumes and the distribution of traffic volumes during the peak hours.

Variance to the arterial access standard is as follows:

- 1.** A variance to the Lake Stevens Access Management Plan standards shall be granted by the City, only if the applicant demonstrates all of the following in writing:



- a.** Special conditions and circumstances exist which are peculiar to the land such as size, shape, topography or location, not applicable to other lands in the same neighborhood, and that literal interpretation of the provisions of the access standards would deprive the property owner of rights commonly enjoyed by other properties similarly situated in the same neighborhood;
  - b.** Special conditions and circumstances do not result from the actions of the applicant, and are not self-imposed hardships;
  - c.** Granting of the variance requested will not confer a special privilege to the subject property that is denied other lands in the same neighborhood;
  - d.** Granting of the variance will not be materially detrimental to the public welfare or injurious to the property or improvements in the neighborhood in which the subject property is situated;
  - e.** Granting of the variance requested will be in harmony with the general purpose and intent of the Access Management Plan and engineering standards;
  - f.** The purpose of the variance is not merely to permit the subject property to be utilized more profitably by the owner or to economize on the cost of improving the property;
  - g.** Granting of the variance will not be detrimental to the existing safety or capacity of the corridor.
- 2.** In granting any variance the City may prescribe appropriate conditions and safeguards that will ensure that the purpose and intent of the Access Management Plan and engineering standards will not be violated.
- 3.** The Public Works Director or designee may approve, approve with conditions, or deny variances to the Access Management Plan standards. For change in existing Land Use, Public Notice of the variance request will be provided to property owners within 300 feet of the subject property. All decisions shall be accompanied by written finding relating to the variance criteria. The Public Works Director's or designee's decisions under this section shall be final on the date issued. Administrative interpretations and administrative approvals may be appealed by applicants or aggrieved adjacent property owners to the Hearing Examiner. Appeal shall be filed within 14 days of the issuance of decision. The appeal process is identified in LSMC 14.16.400.

### ***3-102 Non-Arterial Access Standards***

- A.** The nearest edge of any access point shall be a minimum of 5 feet from the property line.
- B.** No access point shall be placed within the entering sight distance triangle (see Section 3-106).

- C.** The nearest edge of any access point flare or radius must be at least 3 feet from the nearest point of a fire hydrant, no parking zone, utility pole, traffic signal installation or light standard, mailbox cluster or similar appurtenance.
- D.** On lot frontages with 75 feet or less, no more than one driveway per lot shall be constructed. On lot frontages over 75 feet, two or more driveways per lot may be permitted, subject to approval by the Public Works Director or designee and in accordance with the maximum allowable frontage requirements see Section 3-103.
- E.** A minimum corner clearance of 50 feet shall be maintained from the nearest edge of any access point to the edge of traveled way. When minimum corner clearances cannot be attained, the Engineer may require investigation to substantiate whether or not left turns should be prohibited into or out of the access point(see standard plan 3-010 dimension A).
- F.** Where a property has frontage on more than one roadway, access will generally be limited to the lowest volume roadway where the impacts of a new access will be minimized. Access onto other higher volume roadways may be denied or restricted in the interest of traffic safety or in order to lessen congestion on the higher volume road.
- G.** When property frontages are narrow, such that minimum access point spacing criteria cannot be met, joint access locations at property lines may be required.

### **3-103 Driveways**

- A.** Dimensions, slopes, and details shall be as indicated in Standard Plans 3-010 through 3-040, as further specified in the following subsections.
- B.** Conditions for Approval of New Driveways:
  - 1.** Driveways directly giving access onto arterials may be denied if alternate access is available see Section 3-101.
  - 2.** All abandoned driveway areas on the same frontage shall be removed and the curbing and sidewalk shall be properly restored.
  - 3.** Maintenance of driveway approaches shall be the responsibility of the owner whose property they serve.
  - 4.** The standard driveway width shall be 10 feet minimum and 20 feet maximum for single family residential uses, 25 foot minimum and 30 foot maximum for multiple family residential uses, and 30-foot minimum and 40 foot maximum for commercial/industrial driveways. Driveways shall be the minimum width feasible.
  - 5.** Driveway widths shall not be wider than 30% of the property's roadway frontage.
- C.** Location and Width of New Driveways.

- 1.** A residential driveway shall typically serve only one parcel, except as provided in 2.a. and 2.b. below.
  - 2.** No portion of driveway width shall be allowed within 5 feet of side property lines except as follows:
    - a.** A joint use driveway may be used to serve two parcels:
      - 1.** Minimum easement width shall be 20 feet, cross slope in one direction and curb or thickened edge on one side. Minimum easement length shall be 20 feet from right-of-way line. The intent of joint use driveways is for side by side lots fronting the same public roadway, alternate layouts may be considered on a case by case basis requiring Public Works Director or designee or designee approval.
      - 2.** The Public Works Director or designee or designee may allow use of an easement if the only access to a serving roadway is through an adjacent parcel not owned by the applicant or for residential short plats to satisfy minimum lot width requirements.
      - 3.** Joint use driveways exceeding 150 feet in length shall provide an approved turnaround.
      - 4.** Joint use driveways must gain access from a public roadway.
    - b.** Driveways may utilize full width of narrow “pipe-stem” parcels or easements if approved by Public Works Director or designee.
    - c.** On cul-de-sac bulbs as necessary for proposed residential access.
  - 3.** Grade transitions, excluding the tie to the roadway, shall be constructed as smooth vertical curves. Ties to the roadway shall be constructed as shown in Standard Plans 3-020 through 3-040.
- D.** Existing driveways may be reconstructed as they exist provided such reconstruction is compatible with the adjacent road.

- E.** For commercial or industrial driveways with heavy traffic volumes or significant numbers of trucks on arterial streets, the Public Works Director or designee may require construction of the access as a road intersection. The driveway shall be designed with maximum curb return radius of 30 feet and there shall be a pedestrian treatment of red brick, pavers, or portland cement concrete. This requirement will be based on a traffic engineering analysis submitted by the applicant that meets or exceeds the following criteria:
- The development must generate more than 1000 ADT
  - The arterial street has an ADT of greater than 15,000
  - The posted speed of the arterial is 30 mph or greater
  - The site shall not be in an area of high pedestrian activity
- F.** Notwithstanding any other provisions, driveways will not be allowed where they are determined by the Public Works Director or designee to create a hazard or impede the operation of traffic on the roadway.
- G.** Access to commercial or industrial use corner lots shall be located on the lower volume roadway and as close as practicable to the property line most distant from the intersection.
- H.** New private property access points will require the installation of Drop Curb Driveways as shown on Standard Drawings.
- I.** The design of access points must take into consideration the percentage of truck traffic utilizing the access point. Drainage patterns must also be taken into account in the design of access points.
- J.** Larger access point radii (typically between 40 and 50 feet but possibly as much as 70 feet) may be required for access points when multi-unit vehicles or single unit vehicles exceeding 30 feet in length (SU vehicle = 30 feet) comprise 10% or greater of the traffic expected to use the access point.
- K.** Vehicles should be able to utilize radius return access points without encroaching on adjacent lanes of traffic.

### **3-104 Number of Access Points**

- A.** The standard number of access points for a development are:
- 1.** Residential property uses – one two-way access point.
  - 2.** Commercial or Industrial property uses – one two-way access point or two one-way access points per 500 feet of any contiguous parcel ownership or total development frontage.
- B.** Additional access points may be considered by the Engineer provided a development or circulation plan is submitted to the Engineer indicating that more than the maximum number

of access points permitted in Subsection A are required to adequately handle access point volumes, and will not be detrimental to traffic flow on adjacent roads.

- C.** For large developments, it is often desirable to consolidate access traffic at a single point, which can be signalized. Proposed signalization must meet appropriate warrants in the MUTCD. Access point signals should be coordinated with adjacent traffic signals and located to provide satisfactory signal progression for through traffic.
- D.** When property frontages are narrow, such that minimum access point spacing criteria cannot be met, it may be necessary to require joint access locations at property lines.
- E.** The requirements of this section are not intended to override the need for a secondary access for emergency vehicles if such access has been determined by the Fire Marshal to be necessary under the provisions of section 10.207 of the Uniform Fire Code.

### ***3-105 Vertical Alignment of Access Point***

- A.** Approach grades and configuration shall accommodate future street widening to prevent major access point reconstruction.
- B.** For maximum access grades, see standard drawing 3-050.
- C.** The design Engineer for proposed developments shall consider the access driveway profile when designing the serving road to ensure that required grade transitions can be complied with considering building set back and lot terrain conditions.

### ***3-106 Sight Distance***

For determination of minimum sight distance at private access points, see Section 2-104.

### ***3-107 Access and Circulation Requirements***

The need for left turn, right turn, acceleration and deceleration lanes will be determined in conjunction with development proposals on a case by case basis. Evaluation by the Public Works Director or designee may require submittal of traffic data by the Applicant/Developer.

### ***3-108 Construction of Access Points***

- A.** The construction of all access points involving removal of existing vertical curb or vertical curb and gutter shall conform to this section.
- B.** When cutting through or crossing vertical curb, gutter and sidewalk, access approaches must extend from the curb to back of sidewalk and be constructed of Portland Cement Concrete.

- C.** When an opening for an access or for any other purpose is to be constructed through an existing Portland Cement Concrete vertical curb, the existing curb, or curb and gutter shall be saw cut at the limits of work or removed to the nearest construction joint and the opening replaced with standard curb and driveway.
- D.** Existing street trees, streetlights, traffic signal facilities, utility poles, and fire hydrants must be shown on any plan for access point construction in an area of existing vertical curb.
- E.** Prior to commencing any necessary removal or relocation of any public utilities, structures, trees, or plantings due to construction of an access point, the applicant/developer must secure approval from the person or persons having ownership or control of such facilities or features.

***Section 3 drawing index:***

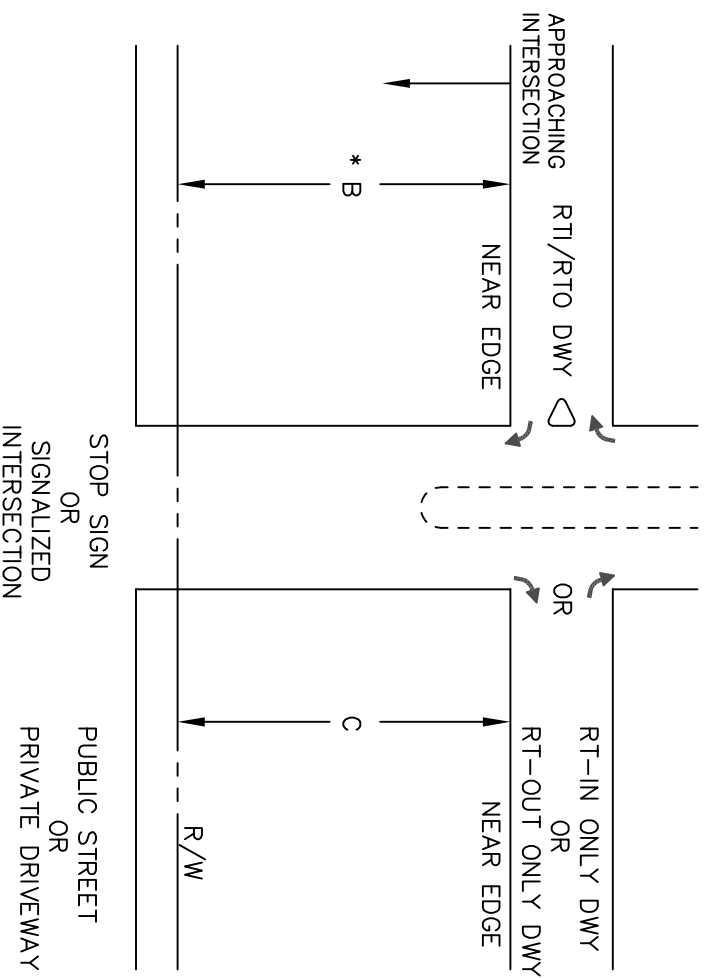
**Standard Drawing 3-010: Arterial Street Driveway Location Spacing**

**Standard Drawing 3-020: Curb & Gutter Driveway Section**

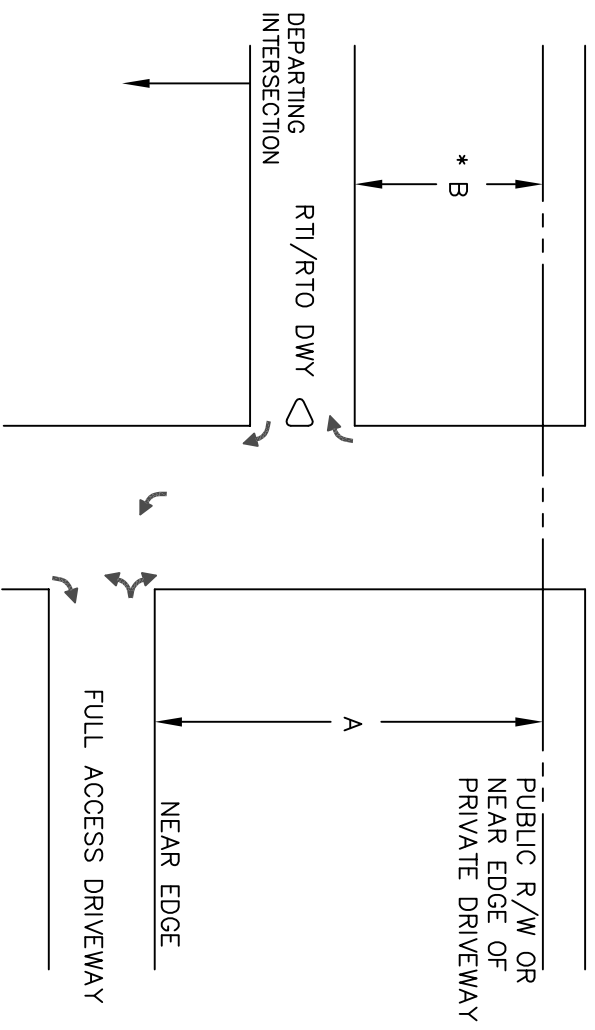
**Standard Drawing 3-030: Curb & Gutter Driveway Section Reverse Slope**

**Standard Drawing 3-040: Shoulder & Ditch Driveway Section**

**Standard Drawing 3-050: Driveway Vertical Alignment**



\* DIMENSION B FOR RIGHT TURN IN/RIGHT TURN OUT ONLY DRIVEWAYS DEPENDS ON WHICH SIDE OF INTERSECTION DRIVEWAY IS LOCATED (APPROACHING OR DEPARTING)



NOTES:  
1. SEE TABLE 3-1 FOR DIMENSION



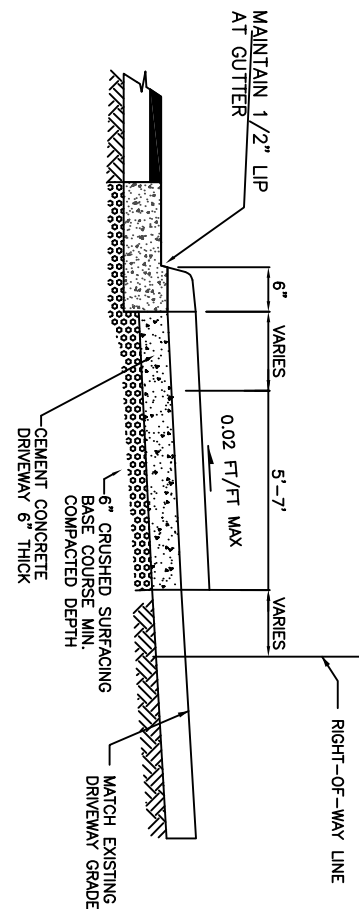
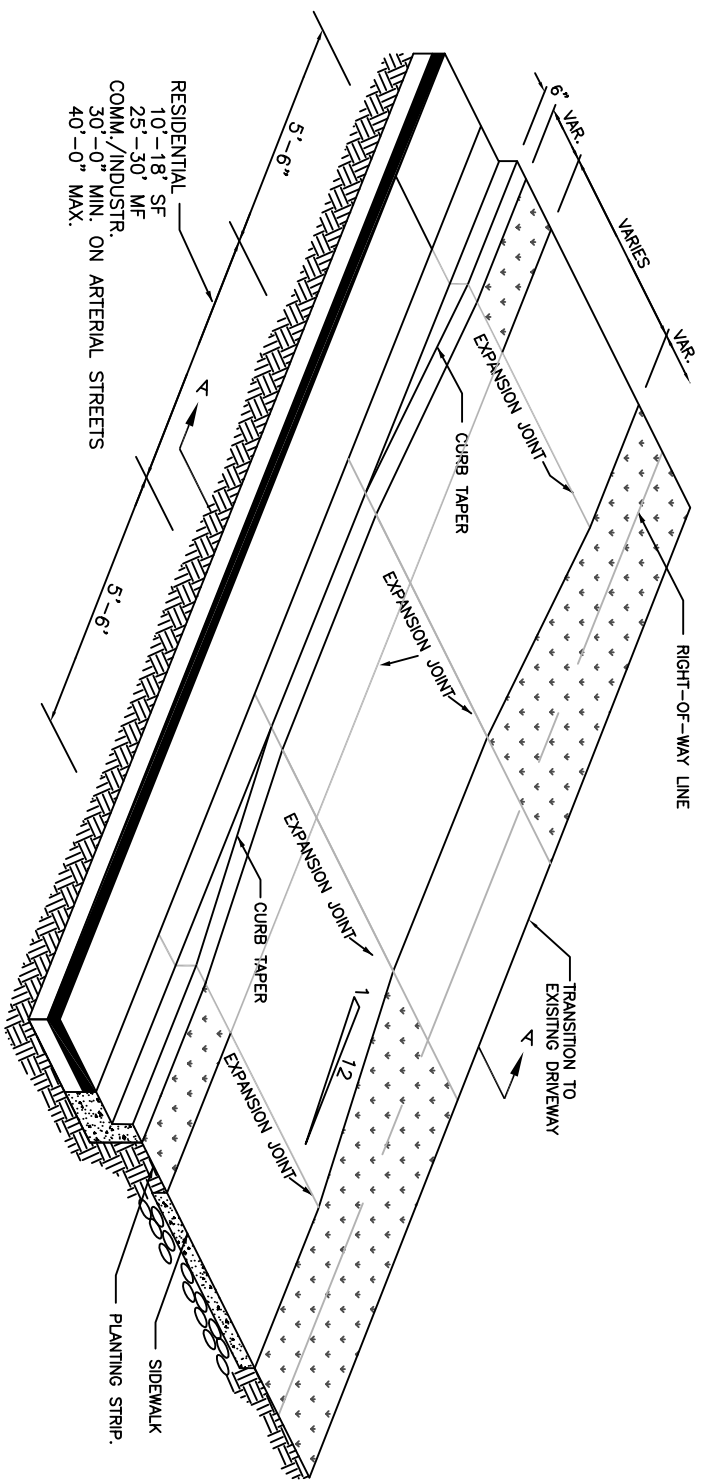
**LAKE STEVENS**  
CITY OF

ARTERIAL STREET  
ACCESS LOCATION  
SPACING

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 3-010

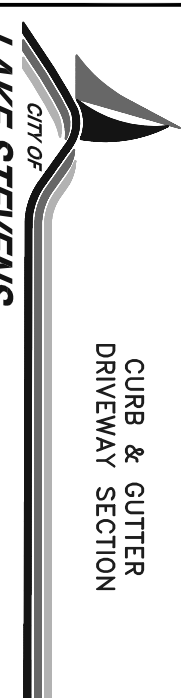


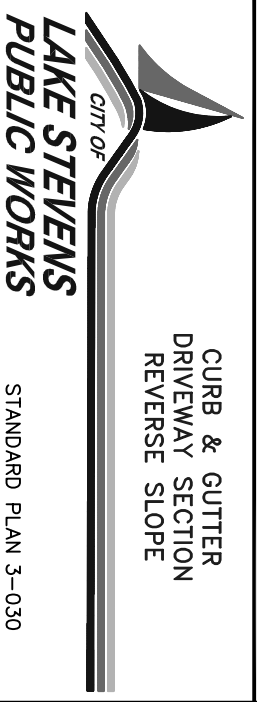


SECTION A-A

NOTES:

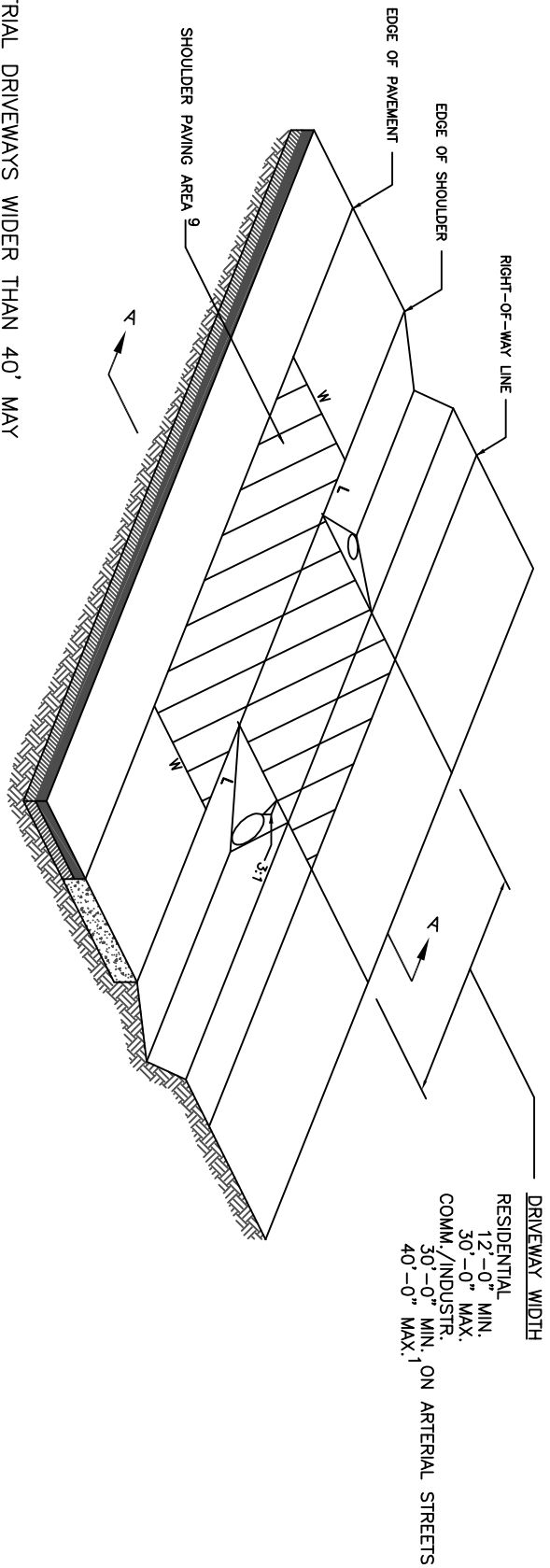
1. COMMERCIAL/INDUSTRIAL DRIVEWAYS WIDER THAN 40' MAY BE APPROVED BY THE ENGINEER CONSIDERING TRAFFIC SAFETY AND NEEDS OF THE ACTIVITY SERVED. ALL COMMERCIAL/INDUSTRIAL DRIVEWAYS SHALL HAVE AN EXPANSION JOINT LOCATED EVERY 15 LINEAL FEET.





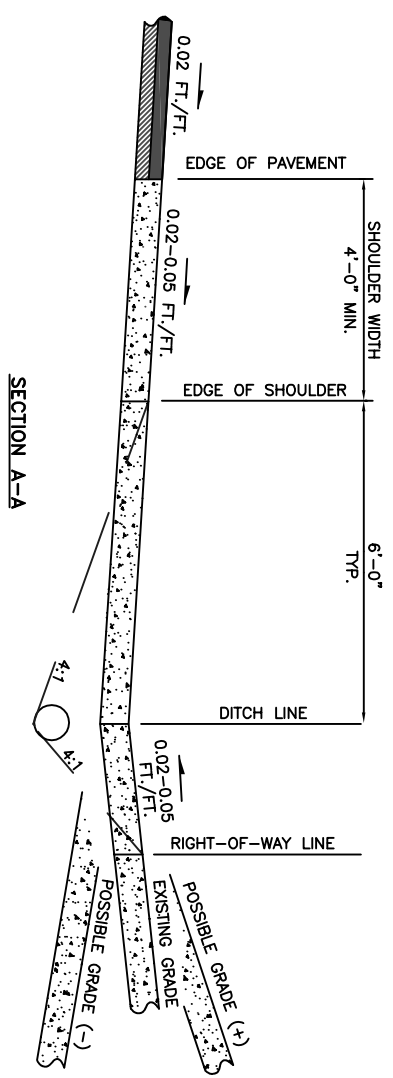
1. A REVERSE SLOPE DRIVEWAY IS SUBJECT TO APPROVAL BY ENGINEER CONSIDERING NEED FOR AND COMPATIBILITY OF THIS FEATURE.
2. COMMERCIAL/INDUSTRIAL DRIVEWAYS WIDER THAN 40' MAY BE APPROVED CONSIDERING TRAFFIC SAFETY AND NEEDS OF THE ACTIVITY SERVED. ALL COMMERCIAL/INDUSTRIAL DRIVEWAYS SHALL HAVE AN EXPANSION JOINT LOCATED EVERY 15 LINEAL FEET.

NOTES:



NOTES:

1. COMMERCIAL/INDUSTRIAL DRIVEWAYS WIDER THAN 40' MAY BE APPROVED BY THE ENGINEER CONSIDERING BOTH TRAFFIC SAFETY AND THE ACTIVITY BEING SERVED. ALL COMMERCIAL/INDUSTRIAL DRIVEWAYS SHALL HAVE AN EXPANSION JOINT LOCATED MID-WIDTH.
2. PIPE SHALL BE:
  - A. SIZED TO CONVEY COMPUTED STORM WATER RUNOFF, AND
  - B. MIN. 12" DIAM., AND
  - C. EQUAL TO OR LARGER THAN EXISTING PIPES WITHIN 500' UPSTREAM.
3. EXPOSED PIPE ENDS SHALL BE BEVELED TO MATCH THE SLOPE FACE AND PROJECT NO MORE THAN 2" BEYOND SLOPE SURFACE. PROJECTING HEADWALLS ARE NOT ACCEPTABLE.
4. DUCTILE IRON PIPE SHALL HAVE MIN. COVER OF 12" TO FINISH GRADE. ALL OTHER TYPES OF PIPE SHALL HAVE MIN. 24" COVER.
5. PIPE SHALL BE INSTALLED IN A STRAIGHT UNIFORM ALIGNMENT AT A MIN. 0.5% SLOPE (0.5 FT. PER 100 FT.) WITH THE DOWNSTREAM END LOWER THAN THE UPSTREAM END.
6. PIPE MAY BE OMITTED IF ROADSIDE DITCH DOES NOT EXIST AND DRIVEWAY DOES NOT BLOCK NATURAL FLOW.
7. DRIVEWAY SLOPE SHALL MATCH TO BACK EDGE OF SHOULDER, BUT SHOULDER SLOPE AND EDGE OF SHOULDER SHALL NOT BE ALTERED AS A RESULT OF DRIVEWAY CONSTRUCTION.
8. PAVED DRIVEWAYS SHALL BE PAVED THROUGH RIGHT-OF-WAY WITH A.C.P. OR B.S.T., BUT NOT P.C.C.
9. GRAVEL DRIVEWAYS SHALL BE PAVED BETWEEN THE EDGE OF PAVEMENT AND R/W WITH A.C.P. OR B.S.T. ONLY WITH DIMENSIONS L=W.



**SHOULDER & DITCH DRIVEWAY SECTION**

**CITY OF LAKE STEVENS PUBLIC WORKS**

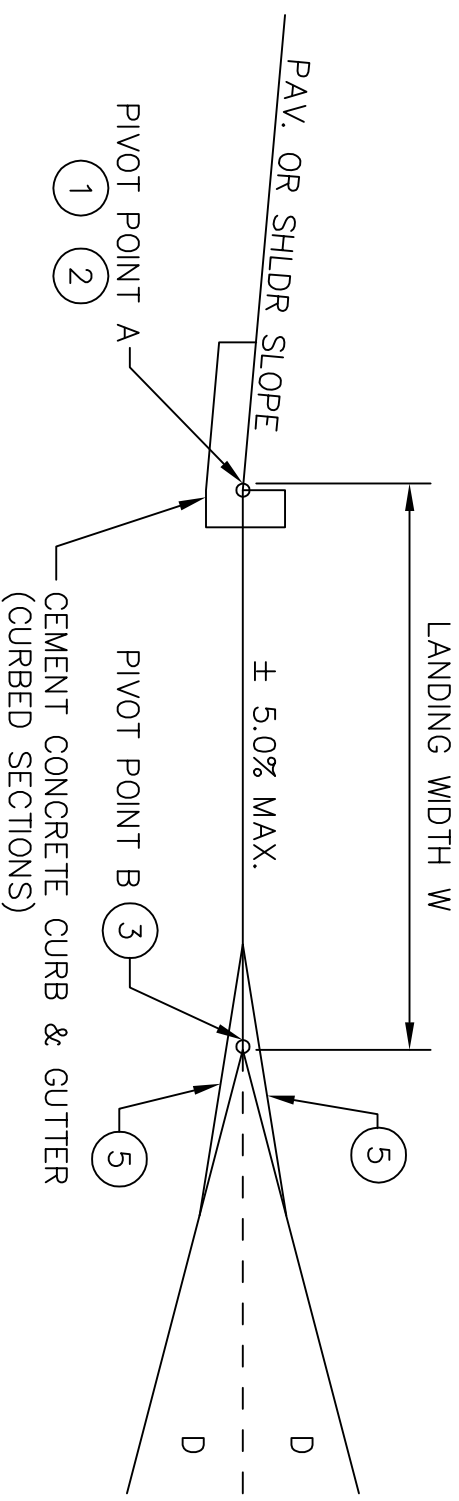
STANDARD PLAN 3-040

APPROVED BY \_\_\_\_\_

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

DATE \_\_\_\_\_



| TYPE OF ACCESS        | ACCESSING    | LANDING WIDTH W (1)     | ACCESS GRADE D |
|-----------------------|--------------|-------------------------|----------------|
| RESIDENTIAL           | NON-ARTERIAL | 5' MIN., 20' DESIRABLE  | ± 15% MAX.     |
| RESIDENTIAL           | ARTERIAL     | 5' MIN., 20' DESIRABLE  | ± 7% MAX.      |
| COMMERCIAL/INDUSTRIAL | NON-ARTERIAL | 10' MIN., 30' DESIRABLE | ± 8% MAX.      |
| COMMERCIAL/INDUSTRIAL | ARTERIAL     | 10' MIN., 30' DESIRABLE | ± 5% MAX.      |

NOTES:

1. WHEN ACCESSING CURBED ROADWAYS, MAINTAIN PAVEMENT SLOPE TO PIVOT POINT A.
2. WHEN ACCESSING SHOULDERED ROADWAYS, MAINTAIN SHOULDER SLOPE TO PIVOT POINT A.
3. ACCESS POINT GRADE SHALL BE MEASURED FROM PIVOT POINT B.
4. DESIRABLE WIDTHS SHOWN WILL BE THE REQUIREMENT, UNLESS THE APPLICANT DEMONSTRATES TO THE ENGINEER'S SATISFACTION THAT THEY CANNOT BE OBTAINED.
5. VERTICAL CURVES NOT TO EXCEED A 3-1/4 INCH HUMPS OR A 2 INCH DEPRESSION IN A 10 FOOT CHORD.



**DRIVEWAY VERTICAL ALIGNMENT**

**LAKE STEVENS PUBLIC WORKS**

STANDARD PLAN 3-050



## SECTION 4

### SURFACING

#### ***4-100 Residential Streets, Driveways, Pedestrian and Bike Facilities***

- A.** The minimum paved section, with alternative combinations of materials, for residential streets, shoulders, sidewalks and bikeways shall be as indicated on the Standard Plans. These sections are acceptable only on good, well drained, stable compacted sub-grade. Any proposed exception to these materials will be subject to soils strength testing and traffic loading analysis and subject to review and approval by the Public Works Director or designee as outlined in Section 4-101. All expenses for determining revised material requirements shall be borne by the Developer.
- B.** Driveways may be surfaced in accordance with LSMC 14.72.050, except:
  - 1.** On curbed streets with sidewalks, driveway shall be paved with Portland Cement Concrete Class 4000 or 3000 3-day mix from curb to back edge of sidewalk. See Standard Plans 3-020 and 3-030.
  - 2.** On shoulder and ditch sections, driveway between edge of pavement and right-of-way shall consist of 2 inches of asphalt treated base and 2 inches of asphalt concrete pavement.
  - 3.** On thickened edge roadways with underground utilities, Portland Cement Concrete may be used for driveways between the thickened edge and the right-of-way line provided that a construction joint is installed at the right-of-way line.
- C.** Street widening/adding traveled way to existing roads.
  - 1.** When an existing asphalt paved street is to be widened, the edge of pavement shall be saw cut to provide a clean, vertical edge for joining to the new asphalt. After placement of the new asphalt section, the joint shall be sealed and the street overlaid with one inch of asphalt concrete pavement, plus a pre-level course, full width throughout the widened area. The Public Works Director or designee, based on the condition of existing pavement, may waive the requirement for overlay and the extent of required changes to channelization.
  - 2.** When an existing shoulder is to become part of a proposed traveled way; the developer's engineer shall perform a pavement evaluation. This evaluation shall analyze the structural capacity and determine any need for improvement. Designs based on these evaluations are subject to review and approval by the Public Works Director or designee. The

responsibility for any shoulder material thickness improvement shall be considered part of the requirement for roadway widening. The shoulder shall be replaced in width as specified in Section 2-103.

3. Any widening of an existing roadway, either to add traveled way, paved shoulder or bikeway, the pavement section shall be in accordance with the Standard Plans for that classification of roadway.
4. In cut areas, a system to collect drainage shall be installed behind the sidewalk.
5. For off-shoulder walkways, asphalt concrete pavement shall be modified by elimination of the coarse aggregate; i.e. substitute the 3/8" screen for the 5/8 inch screen.

#### ***4-101 Requirements for Residential Streets on Poor Sub-grade***

The minimum material thickness as indicated on the Standard Plans is not acceptable if there is any evidence of instability in the sub-grade. This includes free water, swamp conditions, fine-grained or organic soil, slides or uneven settlement. If there are any of these characteristics, the soil shall be sampled and tested sufficiently by a licensed geotechnical engineer to establish a pavement design that will support the proposed construction. Any deficiencies, including an R-value of less than 55 or a CBR of less than 20, shall be fully considered in the design. Remedial measures may include, but are not limited to, a stronger paved section, a strengthening of sub-grade by adding or substituting fractured aggregate, asphalt treated base, installing a geotextile, controlled density fill (CDF), more extensive drainage facilities or a combination of such measures. Both the geotechnical report and the resulting pavement design will be subject to review and approval by the Public Works Director or designee. Proposed pavement design to be by an accomplished Geotech certified in the State of Washington.

#### ***4-102 Arterials and Commercial Access Streets***

Any pavement for arterials and commercial access streets shall be designed using currently accepted methodology that considers the load bearing capacity of the soils and the traffic-carrying requirements of the roadway. Plans shall be accompanied by a pavement thickness design based on soil strength parameters reflecting actual field tests and traffic loading analyses. The analysis shall include the traffic volume and axle loading, the type and thickness of roadway materials and the recommended method of placement. Pavement sections shall not be less than those required for collectors. Shoulders shall be constructed to the same structural section as the roadway.

#### **4-103 Materials & Lay-Down Procedures**

Materials and lay-down procedures shall be in accordance with WSDOT Standard Specifications and the following requirements:

- A.** All base courses shall be ATB except for private access tracts.
- B.** During surfacing activities utility covers in roadway shall be adjusted in accordance with Section 8-103.
- C.** ATB shall be used, and the final lift of asphalt shall not be placed for a minimum of six months or 80% of plat build out to allow time for the observation and repair of failures in the subgrade and ATB.
- D.** Asphalt pavers shall be self contained, power propelled units. Truck mounted type pavers shall only be used for City maintenance and paving of irregularly shaped or minor areas as approved by the Public Works Director or designee, or as follows:
  - 1.** Pavement widths are less than eight feet; and
  - 2.** Length of pavement is less than 150 feet.
- E.** If half or full street grind and overlay is required and existing road section is found to be inadequate for grinding and/or drainage flow, road section shall be reconstructed to meet the corresponding road section per the standard plans.

#### **4-104 Construction Control in Developments**

The provisions of Section 2-03 of the WSDOT Specifications shall apply in all respects to development construction unless otherwise noted. The following elements are mentioned for clarification and emphasis:

- A.** Compacting Earth Embankments:

Compaction of the top two feet of fill subgrade shall meet a minimum 95% of maximum density in accordance with the WSDOT Specifications Section 2-03.3(14)C-Method B. Subgrade fill below the top two feet shall be compacted to 90% of maximum density.
- B.** Testing for Density:
  - 1.** Prior to placing any surfacing material on the roadway, the developer/contractor shall provide density test reports certified by a professional engineer registered in the State of Washington. Optimum moisture content and maximum density shall be determined by methods cited in Section 2-03.3(14)D of the WSDOT Specifications. A minimum of one test is required for every two hundred linear feet, for subgrade and embankment. Test location in



cut sections, shall be at subgrade. For work to be accepted, and prior to paving, tests must show consistent uniform density in conformance with these Standards.

2. Density testing for asphalt pavement shall at a minimum be 1 test per 200 lineal feet, taken in a random pattern. The Public Works Director or designee reserves the right to require the developer/contractor to core the asphalt pavement to verify depth and density.
3. Density requirements for all trenches are included in Section 8-102 of these standards.

**C. Other Requirements:**

1. As-builts of the drainage features are required to be approved prior to paving. Any corrective action needed after review by the City must be undertaken prior to paving.
2. Prior to any site construction involving clearing, logging, or grading, the site/lot clearing limits shall be located and field identified on the approved plans. The developer/project engineer is responsible for water quality on the project site, which includes establishing a water quality monitoring program. The project engineer's name and telephone number shall be listed on the approved construction drawings.
3. The developer shall be responsible to provide suitable materials for construction in accordance with the WSDOT Specifications and these Standards. The developer shall also provide all required materials certifications.
4. Prior to acceptance by the City, the developer/contractor shall provide certification by a registered engineer for the following areas:
  - a. Quality and density of embankment material
  - b. Quality and density for trench backfill materials
  - c. Quality, thickness, and density of all surfacing and base materials, for both roadways and sidewalks
  - d. Quality of concrete and concrete items.
5. The Public Works Director or designee reserves the right to reject all non-conforming materials.

#### ***4-105 Pavement Markings, Markers, Pavement Tapers, and Signage***

Pavement markings, markers or striping shall be used to delineate channelization; lane endings, crosswalks and longitudinal lines to control or guide traffic (see standard plan 4-010). The Public Works Director or designee shall approve channelization plans or crosswalk locations. All public roadways shall have pavement marking.

Channelization shall be required when through traffic is diverted around a lane or obstacle; and when connecting full width streets with different cross sections; and when extending an existing

street with a new cross section different than the existing one. The channelization shall provide tapers equal in length to the value derived from the following formula. See Standard Plan 4-020.

$$L = \frac{WS^2}{60} \quad \text{where}$$

L = length of taper

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

S = speed in miles per hour.

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

All channelization shall be designed per the WSDOT Design Manual.

All pavement markings shall be laid out with spray paint and approved by the Public Works Director or designee before they are installed. Approval may require a three working day advance notice to have field layout approved by the Public Works Director or designee or to make arrangements to meet the Public Works Director or designee on site during the installation.

All signage shall be designed in conformance with the current version of the MUTCD or as directed by the Public Works Director or designee. The channelization plan shall show all signage.

***Section 4 drawing index:***

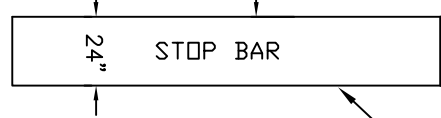
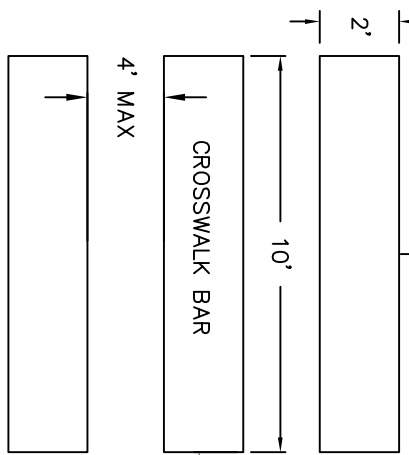
**Standard Drawing 4-010: Intersection Pavement Markers Placement**

**Standard Drawing 4-020: Typical Lane Reduction Transition Markings**

NOTE: ALIGN CROSSWALK BARS CENTER OF HANDICAP ACCESS RAMP.

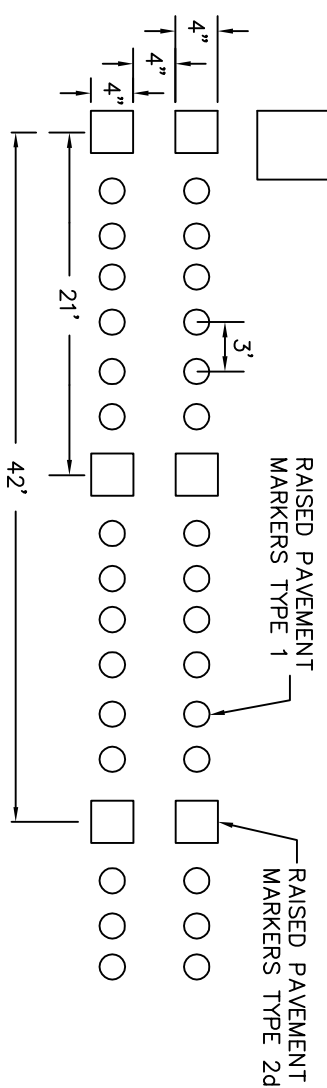
STOP SIGN

NOTE: PLACEMENT OF STOP SIGN CENTERED ON LEADING EDGE OF STOP BAR, OR AS APPROVED BY PUBLIC WORKS DIRECTOR OR DESIGNEE



THERMOPLASTIC (TYP.)

NOTE: NOT TO SCALE.



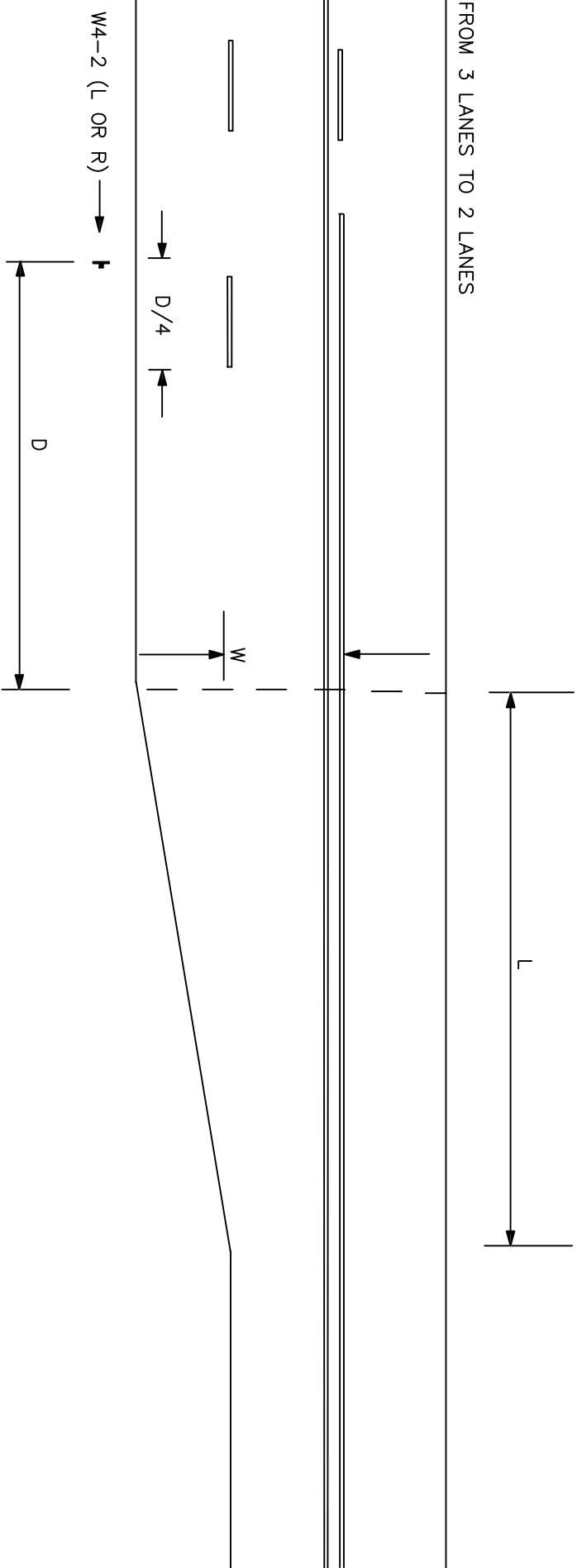


CITY OF  
**LAKE STEVENS**  
**PUBLIC WORKS**

INTERSECTION PAVEMENT  
MARKERS PLACEMENT

STANDARD PLAN 4-010

FROM 3 LANES TO 2 LANES



STANDARD:  
THE MINIMUM  
TAPER LENGTH  
SHALL BE 100  
FEET.

FORMULA WHEN  
POSTED SPEED IS:  
>45 MPH,  $L=WS$ .  
<45 MPH,  
 $L=WS^2/60$ .

VARIABLE LEGEND:  
L=LENGTH IN FEET

S=POSTED SPEED OR 85th-PERCENTILE  
SPEED, WHICHEVER IS GREATER.

W=OFFSET IN FEET

D=ADVANCE WARNING DISTANCE. SEE  
SECTION 2C.05 OF MUTCD FOR PLACEMENT.



LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 4-020

APPROVED BY

*Daniel M. Berglund*

05/09

LAKE STEVENS CITY ENGINEER

DATE



## **SECTION 5**

### **DRAINAGE**

#### ***5-100 Purpose***

It is expressly the purpose of this Chapter to provide for and promote the health, safety, and welfare of the general public through sound development policies and construction procedures which respect and preserve the City's watercourses; to minimize water quality degradation and control of sedimentation of creeks, streams, ponds, lakes, and other water bodies; to preserve and enhance the suitability of waters for contact recreation and fish habitat; to preserve and enhance the aesthetic quality of the waters; to maintain and protect valuable groundwater quantities, locations, and flow patterns; to ensure the safety of City roads and rights-of-way; and to decrease drainage-related damages to public and private property.

The Standards established by this Chapter are intended to represent the minimum design standards for the construction of storm drainage facilities, erosion control, and stream channel improvements. Compliance with these Standards does not relieve the designer of the responsibility to apply conservative and sound professional judgment to protect the health, safety, and welfare of the general public. Special site conditions and environmental constraints may require a greater level of protection than would normally be required under these Standards. The designer must apply these Standards bearing in mind these constraints.

#### ***5-101 Applicability***

- A.** All persons taking any of the following actions or applying for any of the following permits and/or approvals, shall, unless otherwise accepted or exempted, be required to submit for approval by the Public Works Director or Designee, a Stormwater Site Plan with their application and/or request:
- 1.** Creation or alteration of new or additional impervious surfaces.
  - 2.** New development.
  - 3.** Redevelopment.
  - 4.** Building permit.
  - 5.** Grading permit.
  - 6.** Flood control zone permit.
  - 7.** Subdivision approval.

- 8.** Short subdivision approval.
- 9.** Commercial, industrial, or multifamily site plan approval.
- 10.** Planned unit development or Master Plan Development.
- 11.** Conditional use permits.
- 12.** Substantial development permit required under RCW 90.58 (Shoreline Management Act).
- 13.** Right-of-Way use.
- 14.** Logging, clearing, and other land disturbing activities.
- 15.** Contain, or be adjacent to, a floodplain, stream, lake, wetland or closed depression, or a sensitive area as defined by LSMC 14.88.

The Stormwater Site Plan shall use the template in Appendix B.

- B.** Commencement of construction, grading, or site alteration work under any of the permits or approvals listed in subsection above shall not begin until such time as final approval of the Construction Stormwater Pollution Prevention Plan (SWPPP) has been granted by the Public Works Director or Designee.
- C.** Guidance on preparing a Permanent Stormwater Control Plan – Water Quality System is contained in the adopted edition of the State Department of Ecology's (D.O.E.) Stormwater Management Manual for Western Washington (SWMM), which is the City's adopted Technical Manual.
- D.** Other agencies such as those listed below may require drainage review for a proposed project's impact on surface and storm waters. The applicant should take care to note that these other agency drainage requirements are separate from, and in addition to, City of Lake Stevens drainage requirements. The applicant will be responsible to coordinate joint agency drainage review, including resolution of any conflicting requirements between agencies.



**Table 5-1 Joint Agency Approval**

| <b>Agency</b>                                    | <b>Permit/Approval</b>                         |
|--------------------------------------------------|------------------------------------------------|
| Snohomish County Health District                 | On-Site Sewage Disposal and Well Permits       |
| Washington State Department of Transportation    | Developer/Local Agency Agreement               |
| Washington State Department of Ecology           | Short Term Water Quality Modification Approval |
| Washington State Department of Fish and Wildlife | Hydraulic Project Approval                     |
| Washington State Department of Ecology           | Dam Safety Permit                              |
| United States Army Corps of Engineers            | Section 10 Permit                              |
| United States Army Corps of Engineers            | Section 404 Permit                             |
| Washington State Department of Ecology           | Industrial Stormwater Permit                   |
| Washington State Department of Ecology           | Construction Stormwater Permit                 |
| Washington State Department of Ecology           | Underground Injection Control Permit           |
| Department of Natural Resources                  | Aquatic Land Use Permit                        |
| Washington State Department of Ecology           | 401 Water Quality Permit                       |

Refer to Volume I of the D.O.E Stormwater Management Manual for additional permit information.

### **5-102 Exemptions**

- A.** Stormwater facilities owned and maintained, or development undertaken by the Washington State Department of Transportation in state highway rights-of-way which are regulated by and meet the requirements of Chapter 173-270 WAC, the Puget Sound Highway Runoff Program, are exempted from the requirements of this Chapter.
- B.** Commercial agriculture, including only those activities conducted on lands defined in RCW 84.34.020(2), and production of crops or livestock for wholesale trade.
- C.** Forest practices regulated under Title 222 Washington Administrative Code, except for Class IV general forest practices, as defined in WAC 222-16-050, that are conversions from timber land to other uses.
- D.** Activities not requiring machinery for construction or excavation and that are not subject to other environmental regulation are considered exempt from the provisions of this chapter.
- E.** Requests for exemption shall be filed in writing with the Public Works Director or Designee, and shall adequately detail the basis for granting an exemption.

### **5-103 Illicit Discharges**

Illicit discharges to stormwater drainage systems are prohibited. “Illicit” shall be defined as all non-stormwater discharges to stormwater drainage systems that cause or contribute to a violation of State water quality, sediment quality, or groundwater quality standards, including but not limited to sanitary sewer connections, industrial process water, interior floor drains, car washing, and gray water systems.

### **5-104 Storm Drainage Design Standards**

#### **A. Stormwater Management Design Manual**

The City of Lake Stevens adopted edition of the SWMM shall be used for design of all developments. Unless otherwise provided, it shall be the developer’s and property owner’s responsibility to design, construct, and maintain a system which complies with these Design Standards, the Lake Stevens Municipal Code, and the adopted SWMM. Low Impact Development facilities and designs may use the Low Impact Development Technical Guidance Manual for Puget Sound for additional design criteria and guidelines.

The latest versions of approved stormwater modeling software shall be used for modeling for all sites and facilities. Digital project files shall be provided to the City for review if requested.

#### **B. Minimum Requirements for New Development and Redevelopment**

Storm Drainage Design shall be in accordance with the minimum requirements for new and redeveloped sites as established in the adopted SWMM, Chapter 2, Volume I (Minimum Requirements for New Development and Redevelopment). Total new and or redeveloped impervious surfaces shall be calculated as a total for the development, including areas onsite and within public right of way.

#### **C. Stormwater Site Plans**

Minimum Site Plan submittals shall be in accordance with the adopted SWMM Chapter 3, Volume I (Preparation of Stormwater Site Plans), including offsite analysis and mitigation.

#### **D. BMP and Facility Selection Process**

Selection of Facilities and BMP for Permanent Stormwater Control Plans shall be determined in accordance with the BMP and Facility Selection process per the adopted SWMM Chapter 4, Volume I (BMP and Facility selection process for Permanent Stormwater Control Plans).

#### **E. Construction Stormwater Pollution Prevention**

Construction Stormwater Pollution Prevention Plans (SWPPP) shall be developed and designed in accordance with the standard plans in this manual & the adopted SWMM Chapter 3, Volume II on developing and implementing a Construction SWPPP. Each of the 12 elements must be included in the Construction SWPPP unless an element is determined to be not applicable to the project. See Appendix C for the required SWPPP Template.

#### **F. Basin Planning**

Adopted and implemented watershed-based plans may be used to modify any or all of the Minimum Requirements, provided that the level of protection for surface or ground water achieved by the basin plan will equal or exceed that which would be achieved by the Minimum Requirements in the absence of a basin plan. Basin plans shall evaluate and include, as necessary, retrofitting of BMP's for existing development and/or redevelopment in order to achieve watershed-wide pollutant reduction goals. Standards developed from basin plans shall not modify any of the above requirements until the basin plan is formally adopted and fully implemented by the City.

#### **G. Water Quality Sensitive Areas**

Where the Public Works Director or Designee determines that the minimum requirements do not provide adequate protection of water quality sensitive areas, whether on site or within the drainage basin, more stringent controls shall be required to protect water quality. Stormwater treatment BMP's shall not be built within natural vegetated sensitive area buffers except for necessary conveyance systems as approve by the City Planner.

#### **H. Conveyance System Design**

Conveyance systems are drainage facilities, both natural and artificial, that collect, contain, and convey stormwater runoff. Natural conveyance systems include, but are not limited to, swales, wetlands, drainage courses, streams, and rivers. Artificial conveyance systems include, but are not limited to, gutters, ditches, pipes, catch basins, manholes, constructed wetlands, open channels and swales. Any requirement for artificial conveyance systems, where natural systems already exist, does not eliminate or supersede any code requirements for protection of the natural systems.

- 1.** Hydraulic open channel flow capacity for conveyance systems shall be calculated using the Manning Formula. Coefficients for specific conditions are provided in Table 5-1 below. The Manning coefficient values shown in Table 5-2 shall be used for design of open channel conveyance systems. For other materials, designers shall use values contained in

the current WSDOT Hydraulics Manual or the "Normal" value shown in Open Channel Hydraulics, Ven Te Chow, 1959. Designers shall identify the source of the Manning coefficient value used if different from the values below.

**Table 5-2 Open Channel Friction Coefficients**

| Common Open Channel Flow Friction Coefficients |       |
|------------------------------------------------|-------|
| Grass                                          | 0.025 |
| Rock, 8 Inch and Larger                        | 0.050 |
| Rock, Smaller Than 8 Inch                      | 0.030 |
| Smooth Concrete or Asphalt                     | 0.015 |

- a.** All ditches and channels shall be designed to provide a minimum freeboard of 6 inches when the design storm maximum flow is 10 cubic feet per second (cfs) or less. A minimum freeboard of 1.0 foot is required when the maximum design flow is greater than 10 cfs.
- b.** Open channel conveyance systems with slopes of 5% or less shall be vegetation-lined.
- c.** Open channel conveyance systems with slopes between 5% and 9% may be vegetation-lined or rock-lined.
- d.** The Engineer may require use of a standard rock-lined ditch or a closed (pipe) drainage system under a paved shoulder with asphalt thickened edge under certain circumstances. See Standard Drawing 5-010.
- e.** Ditch check dams shall be constructed in accordance with BMP C207 of the SWMM.
- f.** Open channel conveyances shall not be used if the channel slope exceeds 9%, unless an alternative is designed by a professional civil engineer and approved by the Public Works Director of designee. The design shall be based on soils and hydraulic analyses, and shall include rock sizing, filter blanket gradations and/or geotextile fabric.
- g.** Rock-lined open channels shall be lined with quarry spalls, or an acceptable alternative from the WSDOT Qualified Product List, that meet the requirements of Chapter 9-13 of the WSDOT/APWA Standard Specifications. The quarry spalls shall be placed to form a firm, dense protective mat consistent with Standard Drawing 5-010. They shall conform to the typical ditch section and profile. Individual rocks shall not protrude more than three inches from the ditch surface. Ditch dimensions shall be based on calculated stormwater flows.

- 2.** The Manning coefficient values shown in Table 5-3 shall be used for pipe system design. For other types of pipes and/or materials, designers shall use values contained in the current WSDOT Hydraulics Manual or the "Normal" value shown in Open Channel Hydraulics, Ven Te Chow, 1959. Designers shall identify the source of the Manning coefficient value used if different from the values below.

**Table 5-3 Pipe Friction Coefficients**

| Common Open Channel Flow Friction Coefficients |       |
|------------------------------------------------|-------|
| Concrete, Smooth Wall                          | 0.012 |
| Corrugated Steel or Aluminum                   | 0.024 |
| Corrugated Polyethylene (HDPE)                 | 0.024 |
| HDPE Smooth Wall                               | 0.012 |
| PVC                                            | 0.012 |

- a. Pipes 18 inches and less in diameter shall be laid with a minimum slope of 0.5%. Pipes installed as water level equalizers, fish passages, and/or internal components of a detention/retention system may have a flatter slope.
- b. The minimum flow velocity in a conveyance pipe shall be three (3) feet per second when flowing full.
- c. Pipes shall have a minimum diameter of 12 inches. In special cases, such as conflict with underground utilities where redesign would cause unusual hardship, the Public Works Director or designee may approve the use of pipe with a minimum diameter of 8 inches and a maximum length of 60 feet. If 8-inch pipe is allowed by the Public Works Director or designee, the pipe shall be constructed of smooth-walled material (such as concrete, cast iron, double-walled polyethylene, or equivalent material). Installation shall meet or exceed the manufacturer's specification for cover requirements. Replacement of any existing pipe shall be with an equivalent or larger pipe.
- d. For circular culverts, box culverts and pipe arches, the maximum headwater depth for the design storm shall not exceed 2.0 times the culvert height for culverts 18 inches and less, or 1.5 times the culvert height for culverts greater than 18 inches. For bottomless culverts, the headwater depth of the 100-year storm shall not exceed the top of the culvert.
- e. Connections to a pipe system shall be made only at catch basins or manholes. Wyes or tees may be used for roof/footing/yard drain systems with pipes 8 inches or less in diameter. Cleanouts are required upstream of each wye or tee.

**I. Temporary Gravel Construction Entrance**

The temporary construction entrance should be cleared of all vegetation, roots, and other objectionable material. Any drainage facilities required because of washing should be constructed according to specifications in the plan. If wash racks are used, they should be

installed according to manufacturer's recommendations. Construct stabilized construction entrance in accordance with the adopted version of the SWMM.

**J. Oil Control Devices**

Sites shall evaluate the need for an oil control device in accordance with the adopted SWMM Chapter 4, Volume I (BMP and Facility Selection Process for Permanent Stormwater Control Plans).

A Coalescing Plate Separator per Standard Plan 5-040 shall be required for Oil/Lube shops, Vehicle Repair, Wash Bays, Car Washes, and any other applications deemed necessary by the Public Works Director or designee.

For Fueling Stations, an Oil Stop Valve (OSV) such as the AFL/Clark OSV or approved equivalent shall be installed in a manhole or other approved structure prior to the Coalescing Plate Separator. The Oil Stop Valve uses a ballasted float set at a specific gravity between that of oil and water. When an oil spill occurs, the float loses buoyancy as the oil level increases until it finally shuts off the discharge port. The spill will then be confined within the structure and piping for removal and disposal by a hazardous waste hauler.

Tees & Elbows will not be approved as an oil control device. Sites requiring oil control devices per the SWMM will be required to install a coalescing plate separator or storm filter type device for oil control and or additional controls deemed necessary by the Public Works Director or designee.

**K. Debris and trash racks**

Debris and trash racks are to be installed on inlet and outlet piping where trash removal is warranted. Construct and install in accordance with Standard Plans 5-310 and 5-320.

**L. Discharge from Roof Drains**

Runoff from roofs and individual lots may be collected and discharged into the storm drainage system. Refer to Standard Plans 5-340 and 5-350 for details. Roof drains may also be infiltrated or dispersed in accordance with the adopted SWMM, Volume III, Chapter 3 (Roof Downspout Controls). Roof drains shall not be connected to the sanitary sewer. Splash block dispersion may be prohibited at the discretion of the Public Works Department.

#### **M. Storm Sewer Extension Required**

- 1.** The owner of any property which is not connected to the public storm drainage system shall be required to extend any storm drainage line which is within 200 feet of the property, and to connect to and use the same for all developed portions of the property, under any of the following circumstances:
  - a.** As a condition of final approval of a subdivision;
  - b.** As a condition of final approval of a short subdivision;
  - c.** As a condition of final approval of a binding site plan for any mobile home park, condominium, planned unit development, industrial park, or shopping center.
  - d.** As a condition of any building, grading, paving, or other development approval, including rezones or conditional use permits, which will have a significant adverse impact upon storm drainage; as determined by the Public Works Director or Designee.
- 2.** The Public Works Director or Designee may waive the requirement of subsection (1) if it is found that the capacity or condition of the existing public storm drainage system is insufficient or inadequate to serve the subject property; or if it would cause a practical difficulty to require the connection of the subject property to the public storm drainage system by reason of circumstances which are unique to the property and not generally shared by other properties in the vicinity.

#### **N. Extension for Full Lot Frontage**

Whenever a property owner desires to connect to the public storm drainage system, the property owner shall be required to extend the storm drainage lines for the full frontage of the lot which is being connected. If it can be shown that no future extensions beyond said lot will occur, a waiver may be obtained from the Public Works Director or Designee and the owner need only extend the line to the nearest point of connection on the lot.

#### **O. Fencing**

Detention ponds with side slopes steeper than 3:1 and/or with a maximum water depth greater than 3 feet shall require a black powder or vinyl coated chain link perimeter fence. Side slope averaging shall not be allowed. See Standard Plans 6-110 & 6-120.

During construction of drainage facilities and prior to installation of permanent perimeter fence, contractor shall ensure temporary fencing is in place around open cut facilities while construction activities are not underway on said facility and/or at the end of each day until placement of permanent fencing is complete.



**P. Signage**

Detention ponds shall have a Pond Identification Sign. Signs are designed and provided by the City and paid for and installed by the Developer.

Stream Crossings shall be signed with "This Stream is in Your Care" signs provided by the City and paid for and installed by the Developer.

**5-105 Mandatory Requirements for All Storm Drainage Improvements**

- A.** Commencement of construction, grading or under any of the permits or approvals shall not begin until such time as final approval of the Construction Stormwater Pollution Prevention Plan (SWPPP) has been granted by the Public Works Director or Designee.
- B.** All engineering plans and specifications submitted for approval shall be stamped by a professional engineer registered in the State of Washington. All site improvement plans and the cover page of copies of the Drainage Report must be signed and dated by the professional engineer approving the design.
- C.** All land boundary surveys used, and legal descriptions prepared, for preparing preliminary and engineering plans must be stamped by a professional land surveyor registered in the State of Washington. Topographic survey data and mapping prepared specifically for a proposed project may be performed by the professional engineer stamping the engineering plans as allowed by the Washington State Board of Registration for Professional Engineers and Land Surveyors.
- D.** All retention/detention criteria shall be analyzed using SWMM, or as approved by the Public Works Director or Designee.
- E.** Open retention/detention facilities and infiltration facilities shall not be located in dedicated public road right-of-way areas unless specifically approved by the Public Works Director or Designee, or unless part of a Low Impact Development (LID) using approved LID facilities.
- F.** Emergency overflow provisions shall be installed in such a manner as to direct waters away from all structures without causing failure of those structures. The impact of a system failure should be analyzed both in terms of on-site and off-site effects. The impacts may be to adjacent properties or to elements of the public drainage system or other private systems. Retention/detention and infiltration facility design must take into account overflows which may result from:
  - 1.** Higher-intensity or longer-duration storms than the design storm.
  - 2.** Plugged orifices.

3. Inadequate storage due to sediment buildup.
  4. Debris blockage.
  5. An increase in runoff due to future development.
  6. Other reasons causing system failure.
- G.** Maximum allowable release rates from stormwater detention systems shall be based upon the pre-development runoff from the site. The allowable release rate shall be determined as specified in the SWMM. The allowable release rate may be decreased on a case-by-case basis due to constraints in the drainage system downstream.
- H.** All drainage system elements shall provide for adequate maintenance and accessibility at all times. No storm drainage system elements shall be located within ten feet of or underneath any structure and the system shall be designed to eliminate interference from underground utilities and from conditions which exceed design loads for any pipe or other structural elements.
- I.** All aspects of public health and safety must be carefully reviewed in every drainage control system plan. Protective measures are often necessary and shall be required whenever deemed appropriate by the Public Works Director or Designee. The protective measures themselves shall be designed so as not to constitute hazards or nuisances.
- J.** The designer should consider system reliability in terms of layout, specification of materials, methods of installation and the influence of other activities in the area both during and after construction.
- K.** The frequency and difficulty of future maintenance should be minimized by thorough consideration of possible failures in the system during design and what would be required to correct the problem. Design adjustments to ease maintenance should be a major consideration.
- L.** The designer should consider multiple uses of elements of the drainage system. This multiple use may require compromise, but no adjustments to usual policies or standards will be made which would impact the system to the degree that risk of failure, impact of system failure or exposure of the general public to hazard is increased.
- M.** The use of the site should be evaluated to determine if hazardous materials or other pollutants are likely to be present, and if extraordinary design considerations are necessary.
- N.** The visual impact and other potential problems (mosquito breeding, smell, etc.) should be considered. Concerns will vary with the site environment, but aesthetics should always be of concern to the designer.
- O.** Offsite improvements may be required if on-site controls are insufficient to mitigate impacts due to flooding, erosion, sedimentation, pollution, or habitat degradation.

- P.** Roof drains shall not be connected to the sanitary sewer.
- Q.** Developer shall meet all applicable federal, state, and local water quality standards prior to discharge to any wetland, stream, river, or lake.
- R.** Surface water entering the subject property shall be received at the naturally occurring location, and surface water exiting the subject property shall be discharged at the natural location with adequate energy dissipaters to minimize downstream damage and with no diversion at any of these points.
- S.** Where open surface construction is used to handle drainage within the subject property, a minimum of 15 feet will be provided between any structures, ROW, or property line and the top of the bank of the defined channel, pond, or structural wall.
  - 1.** In open channel work, the water surface elevation will be indicated on the plan and profile drawings. The configuration of the finished grades constituting the banks of the open channel will also be shown on the drawings.
  - 2.** Proposed cross-section of the channel will be shown with stable side slopes. Side slopes will be no steeper than 3H:1V unless stabilized in some manner approved by the Public Works Director or Designee.
  - 3.** The 100-year water surface elevation of the design flow will be indicated on the cross-section.
- T.** Where a closed system is used to handle drainage within the subject property, a minimum 10 feet will be provided between any structures, ROW, or property line and the closed system.
  - 1.** The water surface elevation will be indicated on the plan and profile drawings.
  - 2.** The 100-year water surface elevation of the design flow will be indicated on the cross-section.
- U.** The proposed measures for controlling runoff during construction shall include a statement indicating the proposed staging of all clearing, grading and building activities.
- V.** Drainage facilities shall be designed and constructed in accordance with City Standards and as directed by the Public Works Director or Designee.
- W.** Vegetation shall be established on areas disturbed or other locations on the site to protect watercourses from erosion, siltation or temperature increases.
- X.** Surface water exiting from the subject property shall have pollution control and oil separator devices installed at the discharge point from the subject property when draining parking lots of paved roadway surfaces or handling contaminated storm runoff.

### **5-106 Low Impact Development**

For all Low Impact Development (LID) practices please refer to applicable LSMC and the Low Impact Development Technical Guidance Manual for Puget Sound. The purpose of the chapter is to permit design flexibility and provide performance criteria for LID. LID is a stormwater management and land development strategy utilized in site design and construction that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to mimic natural hydrologic functions. Implementation of LID benefits streams, lakes, and Puget Sound by moderating the impacts of stormwater runoff generated by the built environment. LID techniques may supplant or augment traditional, structural stormwater management solutions. Low impact best management practices (BMPs) are described in the current Low Impact Development Technical Guidance Manual for Puget Sound, published by the Puget Sound Action Team.

LID objectives are:

1. To retain or restore native forest cover to capture, infiltrate, and evaporate all or a portion of the rainfall on a site;
2. To confine development to the smallest possible footprint and minimize land disturbance and site grading;
3. To preserve or restore the health and water-holding capacity of soils;
4. To incorporate natural site features that promote stormwater infiltration;
5. To minimize all impervious surfaces and especially those that drain to conventional piped conveyance;
6. To manage stormwater through infiltration, bioretention, and dispersion; and
7. To manage stormwater runoff as close to its origin as possible in small, dispersed facilities.

### **5-107 Roadway Drainage**

#### **A. General**

##### **1. Designs:**

- Drainage facilities shall be designed consistent with City of Lake Stevens Drainage and Erosion Control Design Standards and the SWMM.
- Structures shall be placed and constructed as shown in these Standard Plans or in the SWMM.
- Roadway storm detention facilities shall be provided for all improvements to public roads exceeding 5000 sq. ft. of impervious surface.

- Roadway storm drainage facilities shall be provided for any and all road construction.
  - Roadway storm drainage facilities shall be designed and constructed in such a manner as to provide opportunity for conveyance to and from adjacent properties.
  - Roadway storm drainage shall receive water quality treatment whenever physically possible and as determined by the Public Works Director or designee.
- 2. Specifications:** Materials, construction, and testing are specified in the WSDOT Standard Specifications. The Public Works Director or designee may amend, delete, or add Specifications or Standard Plans.
  - 3. Conflicts:** Where technical conflicts may occur between this document and other Storm Drainage Design Standards, the Public Works Director or designee shall decide which document governs.

#### **B. Storm Sewers and Culverts**

- 1.** Minimum pipe size shall be 12-inch diameter. 8-inch diameter may be permitted on cross street laterals to avoid utility conflict or meet shallow gradient if approved by the Public Works Director or designee.
- 2.** Driveway culverts shall conform to Standard Plan 3-030.
- 3.** The following pipes, specified in Section 9-05 of the WSDOT Standard Specifications are allowed: plain and reinforced concrete storm sewer pipe, aluminized Type 2 corrugated steel, steel spiral rib and corrugated steel with asphalt coating Type 1, spiral rib and corrugated aluminum, ductile iron, polyvinyl chloride (PVC), lined corrugated polyethylene (LCPE), smooth wall polyethylene (SWPE), and high density polyethylene (HDPE) pipe. N-12 pipe is not accepted within City Right of Way.
- 4.** LCPE pipe shall have a smooth interior wall meeting or exceeding Type III, Category 4 or 5, Grade P33 or P34, Class C per ASTM D1248, minimum cell Class ASTM D3350, 324420C. LCPE shall also meet or exceed the requirements of AASHTO M294, Type S. Pipe shall be placed in accordance with City Specifications.
- 5.** SWPE pipe with maximum SDR of 32.5, minimum cell Class ASTM D3350, 334434C and meeting City Specifications for ductile iron pipe with restrained mechanical joints may be used for outfalls on steep slopes.
- 6.** PVC pipe shall require the use of bedding material for flexible pipe specified in Section 9-03 of the WSDOT Standard Specifications.
- 7.** LCPE and SWPE shall be bedded on gravel backfill for pipe bedding as specified in Section 9-03 of the WSDOT Standard Specifications. Above ground installation of SWPE does not require pipe bedding.

8. When required by the Public Works Director or designee, PVC, LCPE and SWPE shall be tested using the deflection test procedure described in Section 7-17.3(2)H of the WSDOT Standard Specifications. Pipe sections failing the mandrel test shall be replaced, except that reshaping SWPE and LCPE sections to meet requirements may be allowed if the original deformation is less than 20 percent.
9. Concrete pipe shall be rubber gasket and metal pipe shall have a gasket and securely banded.
10. Leak testing shall be conducted if required by the Public Works Director or designee.
11. If the depth to the top of pipe exceeds eight feet, the Public Works Director or designee shall select the pipe material.
12. Bevel the projecting ends of culverts within the right-of-way per Standard Plans 5-290 and 5-300.
13. French drains shall be installed where it is desirable to intercept the ground water and transfer it off site. See Standard Plan 5-310.

**C. Catch Basins and Junctions**

1. Catch basins shall be spaced no greater than 150 feet for road grades less than one percent, 200 feet for grades between one and three percent; and 300 feet for grades three percent and greater. Where the width of the tributary road surface exceeds 35 feet, the cross slope exceeds four percent, catch basin spacing analysis is required. The analysis must show the depth of water at the edge of the traveled way does not exceed 0.12 feet or extend more than five feet into the traveled way for the 10-year storm event, using flows generated by the rational formula.
2. New catch basins shall be constructed and installed in conformance with Standard Plans 5-050 through 5-080, and 5-110.
3. Connections to pipe systems may be made without placing a catch basin or manhole on the mainline provided all of the following conditions are met:
  - a. The mainline pipe is 48 inches or greater and at least two times the size of the connecting pipe.
  - b. All connections shall be performed in accordance with the manufacturer's recommendations. Standard shop fabricated tees, wyes and saddles shall be used. Concrete pipe connections shall be constructed in accordance with Standard Plan 5-360.
  - c. There shall be a catch basin or manhole on the connecting pipe within two to ten feet of the external wall of the main line. See Standard Plan 5-360.

- d.** Offset angle of connecting pipe to mainline, horizontally and vertically, shall be less than 45 degrees.
- 4.** Connections to an existing system shall avoid directing project runoff through downstream quality/quantity control facilities. Receiving systems may have separate conveyance facilities: one connecting to quality/quantity facilities and one by-passing them. Connection shall be to the bypass system where available.
- 5.** Use Type 2 catch basins where the depth to the invert of the pipe exceeds five feet or the nominal diameter of the pipe is greater than 18 inches.
- 6.** Manholes may be used in lieu of catch basins if they do not collect surface water. Manholes shall be constructed and installed in conformance with Standard Plans 5-090 through 5-110.
- 7.** Roof and yard drains, or other concentrated flow from adjacent property shall not discharge over the surface of roadways or sidewalks.
- 8.** Catch basins or manholes are required when joining differing types of pipes.
- 9.** Curb inlets shall be used to collect street runoff when catch basins are not used. See Standard Plan 5-120.

**D. Frames, Grates, and Covers**

- 1.** Unless otherwise specified, use vaned grates with standard frames in the traveled way, gutter, or shoulder. Vaned grates shall not be located within cross walks (see Standard Plan 5-130). When vaned grates are impractical, use Standard Grate (see Standard Plan 5-140).
- 2.** At sag vertical curves, or before intersections with a grade 3% or greater, use through curb inlet frames. Where through curb inlets cannot be used, three vaned inlets shall be used. One shall be located at the approximate low point and another on either side at 25 foot horizontal spacing, but not greater than 0.1 foot above the low point, (see Standard Plan 5-150).
- 3.** New & existing catch basins that do not or no longer collect runoff shall use or be replaced with locking frame and solid covers (See Standard Plans 45-160 through 5-180).
- 4.** All storm drain covers and grates shall be locking. Manufacturer as approved by the Public Works Director or designee.
- 5.** Where vertical concrete curbs or extruded curbs are used, catch basin frames and grates shall be installed in accordance with Standard Plan 5-190.
- 6.** Slit drains may be used when approved by the Public Works Director or designee. At a minimum slit drains shall have catch basins at either end unless used as a driveway

culvert. The maximum distance between catch basins along a slit drain shall be 50 feet.

- E. Erosion Control. Filter fabric fences shall be constructed of material designed specifically for erosion control. The fabric shall be composed of rot-proof woven or non-woven polymeric fibers and be free of chemical treatment or coating that may reduce permeability. The fabric shall meet the following test requirements: minimum 110 lbs. grab tensile strength per ASTM D-1682, minimum 40 lbs. puncture strength per ASTM D-751 Modified, and 20-100 Equivalent Opening Size (EOS) based on U.S. standard sieves. Detail shall be per adopted SWMM.
- F. Trenches. See Underground Utility Installation – Section 8.

### **5-108 Additional Information Required**

The requirements of this Chapter may be modified at the discretion of the Public Works Director or Designee when more information is deemed necessary for proper review.

### **5-109 Construction Inspection**

- A. All activities regulated by this Chapter shall be inspected by the Engineer and/or Construction Inspection Division of Public Works. Projects shall be inspected at various stages of the work to determine that adequate control is being exercised. Stages of work requiring inspection include, but are not limited to: preconstruction, installation of BMP's, land-disturbing activities, installation of utilities, landscaping, retaining walls, and completion of project. When required by the Public Works Director or Designee, special inspection and/or testing shall be performed.
- B. At the time of approval of the Construction Stormwater Pollution Prevention Plan or Stormwater Site Plan for the subject property, a schedule for inspection to ensure proper review of construction and facilities will be established by the Public Works Director or Designee. The following inspections may be required as a minimum:
  - 1. Initial Inspection. Whenever work on the site preparation, grading, excavations, or fill is ready to be commenced, but in all cases prior thereto;
  - 2. Rough Grading. When all rough grading has been completed;
  - 3. Bury Inspection. Prior to burial of any underground drainage structure;
  - 4. Finish Grading. When all work including installation of all drainage structures and other protective devices has been completed;
  - 5. Planting. When erosion control planting shows active growth.



In some circumstances not all of the above inspections may be necessary. It shall be the discretion of the Public Works Director or Designee to waive or combine any of the above inspections as dictated by conditions.

- C.** A final inspection by the City will be required at the end of the 2 year maintenance bond period. The Developer will be responsible for repairing any deficiencies found as a result of the City inspection.
- D.** Failure to comply with the provisions of this Chapter may result in enforcement pursuant to LSMC Chapter 4.

### ***5-110 Modification of Facilities During Construction***

The Engineer may require that the construction of drainage facilities and associated project designs be modified or redesigned if conditions occur or are discovered which were not considered or known at the time the permit or approval was issued, such as uncovering unexpected soil and/or water conditions, weather-generated problems, or undue materials shortages. Any such modifications made during the construction of drainage control facilities shall be shown on the final approved drainage plans, a revised copy of which shall be provided to the Engineer for filing as an as-built drawing. All engineered plans, modifications & as-builts are to be on the NAVD 88 Datum.

### ***5-111 Variances***

- A.** A person requesting a variance from the Standards of this Chapter shall file an application with the Public Works Director or Designee setting forth the location of the development, the owner of the property, the nature of the variance request, and the reason for the variance. An application fee established by the City Council shall accompany the application. The application fee shall be applied to all the costs and expenses incurred by the City in processing the application. In the event the filing fee is inadequate the City shall bill any additional costs to the applicant which shall be paid within 30 days and prior to the granting of any variance herein.
- B.** When considering an application for variance, the Public Works Director or Designee shall evaluate the following factors:
  - 1.** Sufficient capacity of downstream facilities under design conditions.
  - 2.** Maintenance of the integrity of the receiving waters.
  - 3.** Possibility of adverse effects of retention/detention.
  - 4.** Utility of regional retention/detention facilities.

5. Capability of maintenance of the system.
  6. Structural integrity of abutting foundations and structures.
  7. That the health, safety, and welfare of the City is not adversely affected.
  8. The variance provides equivalent environmental protection and is in the overriding public interest; and that the objectives of safety, function, environmental protection, and facility maintenance, based upon sound engineering, are fully met.
  9. That there are specific physical circumstances or conditions affecting the property such that the strict application of these provisions would deprive the applicant of all reasonable use of the site in question, and every effort to find creative ways to meet the intent of the minimum standards has been made.
  10. That the granting of the variance will not be detrimental to the public health, welfare, and safety, not injurious to other properties in the vicinity and/or downstream, and to the quality of the receiving waters.
  11. The variance is the least possible variance that could be granted to comply with the intent of the Minimum Requirements.
- C. Requests for variances shall be filed in writing with the Public Works Director or Designee and shall adequately detail the basis for granting a variance.
- D. The decision of the Public Works Director or Designee concerning a request for a variance shall be made in writing.
- F. The decision of the Public Works Director or Designee may be appealed as discussed in LSMC 14.16.400.

### **5-112 *Establishment of Regional Facilities***

- A. In the event that public benefits would accrue due to modification of the Storm Drainage Plan for the subject property to better implement the recommendations of the City's comprehensive drainage plans, the Public Works Director or Designee may recommend that the City should assume some responsibility for the further design, construction, operation, and maintenance of drainage facilities receiving runoff from the subject property. Such decision shall be made concurrently with review and approval of the Storm Drainage Plan.
- B. In the event the City decides to assume responsibility for all or any portion of the design, construction, operation, and maintenance of the facilities, the applicant shall be required to contribute a pro rata share to the estimated cost of the facilities, provided that such share shall not exceed the estimated costs of improvements the applicant would otherwise have been required to install. The applicant may be required to supply additional information at the

request of the Public Works Director or Designee to aid in determination by the City. Guidelines for implementing this section will be defined by the Public Works Director or Designee.

### **5-113 Bonds Required**

- A.** The City is authorized to require all persons constructing retention/detention or other drainage treatment/abatement facilities to post surety and cash bonds.
- B.** Where such persons have previously posted or are required to post other such bonds on the facility itself or on other construction related to the facility, such persons may, with the permission of the Public Works Director or Designee and to the extent allowable by law, combine all such bonds into a single bond; provided, that at no time shall the amount thus bonded be less than the total amount which would have been required in the form of separate bonds; and provided, further, that such a bond shall on its face clearly delineate those separate bonds which it is intended to replace.
  - 1. Construction/Performance Bond:** Prior to commencing construction, the person constructing the facility shall post a construction bond in an amount sufficient to cover the cost of performing the construction per the approved drainage plans. After determination by the Public Works Director or Designee that all facilities are constructed in compliance with the approved plans, the construction bond shall be released. Alternatively, an equivalent cash deposit to an escrow account administered by a local bank designated by the City may be allowed at the City's option. Reference
  - 2. Maintenance Bond:** After satisfactory completion of the facilities and release of the construction bond by the City, the person constructing the facility shall commence a two year period of satisfactory maintenance of the facility. A cash bond to be used at the discretion of the City to correct deficiencies in said maintenance affecting public health, safety and welfare must be posted and maintained throughout the two year maintenance period. The amount of the cash bond shall be determined by the City. In addition, at the discretion of the Public Works Director or Designee, a Surety bond or cash bond to cover the cost of design defects or failures in workmanship, shall also be posted and maintained through the two year maintenance period. Alternatively, an equivalent cash deposit to an escrow account administered by a local bank may be allowed at the City's option.
  - 3. Liability Policy:** The person constructing the facility shall maintain a liability policy in an amount to be determined by the City which shall name the City of Lake Stevens as an additional insured and which shall protect the City from any liability for any accident, negligence, failure of the facility, of any other liability whatsoever, relating to the construction or maintenance of the facility. The liability policy shall be maintained for the

duration of the facility by the owner of the facility, provided that in the case of facilities assumed by the City for maintenance, the liability policy shall be terminated when the City maintenance responsibility commences.

## **5-114 Operation and Maintenance Requirements**

### **A. Maintenance Required**

All stormwater facilities shall be maintained in accordance with the adopted D.O.E Stormwater Manual, the LID Technical Guidance Manual (for LID Sites), and the provisions provided herein. Systematic, routine preventive maintenance is preferred.

### **B. Minimum Standards**

The following are the minimum standards for the maintenance of stormwater facilities:

- 1.** It shall be the duty of the owner to maintain, repair and restore, at the owner's expense, all private stormwater and drainage systems located on the owner's property. Maintenance shall be performed in accordance with the minimum requirements of this Chapter and in accordance with any maintenance schedule adopted during the plan review process for constructing the facilities. The City shall be granted the right to conduct emergency maintenance as deemed necessary by the Public Works Director or designee. The City will be reimbursed by the private owner for any emergency maintenance costs incurred.
- 2.** No person shall cause or permit any drainage system located on the owner's property to be obstructed, filled, graded, or used for disposal of debris.
- 3.** Minimum requirements for the maintenance of stormwater facilities shall include but not be limited to the following:
  - a.** Annual inspection.
  - b.** Removing brush, vegetation, debris and other blockage.
  - c.** Removing sediment, silts, sands and gravels.
  - d.** Removing oils, grease, tars and other pollutants.
  - e.** Repairing and replacing damaged facilities as required.
  - f.** All other activities necessary to ensure the facilities are operating as designed.

### **C. Disposal of Waste From Maintenance Activities**

Disposal of waste from maintenance activities shall be conducted in accordance with the minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC, guidelines by the Washington State Department of Ecology for disposal of waste materials from stormwater maintenance activities, and where appropriate, the Dangerous Waste Regulations, Chapter 173-303 WAC.

**D. Maintenance of Drainage Swales, Biofiltration Swales, and Ditches:**

1. Open drainage swales and ditches which are located on private property (and often located within public drainage easements) shall be cleaned, maintained, and protected in continuous compliance with the standards and specifications of the City. Responsibility for such work shall be borne by the owner of the underlying property; provided, that the City shall bear such responsibility for regional drainage ditches and facilities, as determined by the Director of the Department of Public Works, if the same are publicly owned or within public easements which are accessible to City personnel.
2. Vegetated stormwater facilities, such as grassed swales and biofilters, shall be inspected semi-annually and mowed and replanted as required by the Public Works Director or Designee. Clippings shall be removed and properly disposed of.
3. No person shall cause or permit open drainage swales and ditches to be obstructed, filled, graded, or used for disposal of debris.
4. Upon receiving express approval from the Director of the Department of Public works, a property owner may convert a drainage swale or ditch into an enclosed drainage system. Such work shall be performed in compliance with the standards and specifications of the City and shall be subject to inspection and approval by the Department of Public Works. Culverts and drainage appurtenances installed by private owners may be conveyed to the City, at no cost, by a bill of sale.

**E. Authority**

The Public Works Director or Designee shall have the authority to enforce this Chapter. The Public Works Director or Designee is authorized to develop an inspection program for stormwater facilities in the City of Lake Stevens. Persons or occupants of the site shall allow any authorized representative of the Public Works Department access at all reasonable times to all parts of the premises for the purpose of inspection, sampling, and record examinations.

**F. Maintenance Inspection Program**

Whenever implementing the provisions of the inspection program or whenever there is cause to believe that a violation has been or is being committed, the inspector is authorized to inspect during regular working hours and at other reasonable times all stormwater drainage systems within the City to determine compliance with the provisions of these regulations.

Procedures: Prior to making any inspections, the inspector shall present identification credentials, state the reason for the inspection, and request entry.

1. If the property or any building or structure on the property is unoccupied, the inspector shall first make a reasonable effort to locate the owner or other person(s) having charge or control of the property or portions of the property and request entry.
2. If after reasonable effort, the inspector is unable to locate the owner or other person(s) having charge or control of the property, and has reason to believe the condition of the stormwater drainage system creates an imminent hazard to persons or property, the inspector may enter.
3. Unless entry is consented to by the owner or person(s) in control of the property or portion of the property or unless conditions are reasonably believed to exist which create imminent hazard, the inspector shall obtain a search warrant prior to entry, as authorized by the laws of the State of Washington.
4. The inspector may inspect the stormwater drainage system without obtaining a search warrant provided for in Subsection 3 above, provided the inspection can be conducted while remaining on public property or other property when permission to enter has been obtained.

#### **G. Inspection Schedule**

The Public Works Director or Designee shall establish a master inspection and maintenance schedule to inspect appropriate stormwater facilities that are not owned by the City. Inspections shall be annual. Critical stormwater facilities may require a more frequent inspection schedule.

#### **H. Inspection and Maintenance Records**

As existing stormwater facilities are encountered, they shall be added to the master inspection and maintenance schedule. Records of new stormwater facilities shall include the following:

1. As-built plans and locations.
2. Findings of fact from any exemption granted by the local government.
3. Operation and maintenance requirements and records of inspection, maintenance actions and frequencies.
4. Engineering reports, as appropriate.

#### **I. Orders**

The Public Works Director or designee shall have the authority to issue an owner or person an order to maintain or repair a component of a stormwater facility BMP to bring it in compliance with this Chapter, and/or City regulations. The order shall include:

1. A description of the specific nature, extent and time of the violation and the damage or potential damage that reasonably might occur.

2. A notice that the violations or the potential violation cease and desist and, in appropriate cases, the specific corrective actions to be taken.
3. A reasonable time to comply, depending on the circumstances.

### ***5-115 Operation and Maintenance – Assumption by City***

The City may assume the operation and maintenance responsibility of retention/detention or other drainage treatment/abatement facilities according to City policy after the expiration of the two-year operation and maintenance period if:

- A. All of the requirements of this Chapter have been fully complied with.
- B. The facilities have been inspected and approved by the Engineer after two years of operation.
- C. All necessary easements entitling the City to properly operate and maintain the facility have been conveyed to the City and recorded with the Snohomish County Auditor.
- D. All drainage facilities including but not limited to ponds, vaults, CB's, Control Structures, and like shall be cleaned to a condition acceptable to the City prior to assumption.
- E. The developer has supplied to the City an accounting of capital, construction, and operation and maintenance expenses or other items, for the drainage facilities up to the end of the two-year period, for the purposes of establishing the basis for future bonding requirements for other developments.

### ***5-116 Operation and Maintenance of LID Facilities***

#### **A. Introduction**

The maintenance of LID facilities is essential to ensure that designed stormwater management performance and other benefits continue over the full life cycle of the installation. Some of the maintenance agreements and activities associated with LID practices are similar to those performed for conventional stormwater systems; however, the scale, location, and the nature of a LID approach will also require new maintenance strategies.

The following outlines typical maintenance goals and objectives, types of maintenance agreements and training, and provides matrices with maintenance activities and schedules for bioretention areas, amended construction site soils, permeable paving, vegetated roofs, and roof rainwater collection systems.

## **1. Goals and Objectives**

Many maintenance goals of LID facilities will be similar throughout the Puget Sound region.

The following provides a standard set of goals that can be added to or modified according to the specific physical settings and needs of a local jurisdiction.

### **A. Flow Control and Drainage**

- Maintain infiltration capacity within facility
- Maintain detention capability within facility to reduce peak flows.
- Safely convey design storm flows.

### **B. Water Quality Treatment**

- Maintain pre-development infiltration and detention capability.
- Preserve soil and plant health and contact of storm flows with those plant soil systems.

### **C. Safety and Emergency Vehicle Access**

- Maintain adequate sight distances.
- Create signage for emergency vehicle access and facilities.
- Ensure the sufficient carrying capacity for emergency vehicles of any permeable load-bearing surfaces.

### **D. Cost Effectiveness**

- Maintain facilities for long-term, high quality performance at a cost that is equal to, or less than, conventional systems.
- Prevent expensive repair of large scale or catastrophic problems through continued routine procedures.

### **E. Aesthetics**

- Develop LID facilities as a landscape amenity as well as a stormwater management system.

### **F. Public Health**

- Minimize potential for disease transmission and mosquito breeding by maintaining designed infiltration capacity, storm flow conveyance, ponding depths, and dewatering rates.

### **G. Community Participation**



- Provide educational materials to homeowners and commercial property owners explaining the benefits, function, and importance of community participation for the long-term performance of LID facilities.

## **2. *Support Strategies***

Effective measures to support and ensure quality maintenance of LID facilities include education, incentives, and regulations. In order to provide the most effective maintenance programs, a variety of strategies should be selected from the list below.

### **A. Education**

- Simple, concise messages delivered throughout the project life cycle.
- Brochures explaining the functions, benefits, and responsibilities of facilities at transfer of deed.
- Information bulletins over public access channels.
- Community volunteers providing informal workshops.
- Ongoing involvement of developer with community groups.
- Training programs for those maintaining the systems.

### **B. Incentives**

- Reduce stormwater utility fees for individual homeowners or commercial properties.
- Provide support for property owners with technical advice and materials, such as mulch and plants.
- Provide awards and recognition to innovative developers and communities that build and properly maintain LID facilities.

### **C. Regulations**

- Require maintenance plans and agreements prior to project approvals. (These would include a list of all proposed facilities, facility locations, a schedule of maintenance procedures, monitoring requirements, if any, and an agreement that all subject properties are collectively liable for the ongoing maintenance of the facilities.)

- Mandate jurisdictional maintenance and additional taxes for funding.
- Require fines for corrective actions.
- State that maintenance responsibilities and liabilities are shared by all property owners for projects with facilities designed to serve multiple properties or owned and/or maintained collectively.
- Require deed restrictions or covenants conveyed with deed for the full life cycle of all project types.

### **3. *Maintenance Responsibilities***

Low Impact Development facilities range in size and complexity. Accordingly, entities responsible for maintenance should be appropriately matched to the tasks required to ensure long-term performance. An individual homeowner may be able to reasonably maintain a rain garden, permeable driveway, or other small facility; however, larger facilities are often maintained through private parties, shared maintenance agreements or the presiding jurisdiction. In addition, the use and ownership of properties can often help dictate the most appropriate means of facility maintenance. Below are some general guidelines for the three primary categories of Maintenance Responsibilities.

#### **A. Property Owners**

- Are usually responsible for small facilities located on an individual property.
- Require basic knowledge and understanding of how the system functions.
- Jurisdiction(s) can improve system function over time by offering basic training to property owners.
- Should know when to seek and where to find technical assistance and any additional information.
- Requirements for maintenance should be conveyed with deed.
- Failure to properly maintain LID facilities may result in jurisdictional liens.

#### **B. Private Parties**

- Handle the widest range of LID projects in size and scope.

- Handle most commercial or multi-family properties. Copies of agreement may be required prior to project approval.
- Unique maintenance agreements should be developed based on the scale, use, and characteristics of the site and conservation areas, as well as level of expertise of the property owner and the responsible jurisdiction.
- Maintenance agreements can be between a variety of parties, such as individual homeowners, property owner associations, or even jurisdictions.
- Outside groups responsible for maintenance should be trained in the design, function, benefits, and maintenance of LID facilities.
- Recognize that integrated LID management practices require more frequent inspection than conventional facilities.
- Third-party maintainers should provide documentation to the property owners of the type of maintenance performed, a certificate of function, and any non-routine maintenance needs requiring specialized corrective actions.
- Jurisdictions may choose to provide an educational course for prospective maintenance parties and a list of approved or recommended parties.

#### **C. Jurisdictions**

- Will handle most public LID infrastructure.
- Should be prepared to handle non-routine maintenance issues for a variety of facilities.
- Maintain primarily large facilities, except for those requiring corrective action.
- Private LID facilities requiring corrective action may require a jurisdiction to hire a private party or use their own staff to complete the work. Property owners should be billed for these expenses.

#### **4. *Inspections***

Regular and appropriately timed inspections are necessary for the proper operation of LID facilities over the full life cycle of the installation. Inspectors should be trained in the design and proper function and appearance of LID practices. Inspections should be seasonally timed in order to have early detection, repair and efficiency. These inspections should include the following: During Fall to clear debris and organic

material from structures and prepare for impending storms; early winter storm events to confirm proper flow control operation and to identify any erosion problems; before major horticultural cycles (i.e., prior to weed varieties dispersing seeds); and any other regularly scheduled maintenance activities. To ensure continuity and to better identify trends in the function of facilities, the same individual(s) should inspect the same drainage area. Finally, LID facilities are integrated into the development landscape and willing homeowners can provide frequent inspection and identification of basic problems with minimal training.

## B. Bioretention Maintenance Schedule

Bioretention areas require annual plant, soil, and mulch layer maintenance to ensure optimum infiltration, storage and pollutant removal capabilities. The majorities of routine maintenance procedures are typical landscape care activities and can be performed by various entities including individual homeowners.

### ***Routine***

| Activity                                                                                                                | Objective                                                                                                                                                                                                          | Schedule                                                       | Notes                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Watering:</b> Maintain drip irrigation system without breaks or blockages. Hand water as needed for specific plants. | Establish vegetation with a minimum 80% survival rate.                                                                                                                                                             | Twice annually (May and July) or as indicated by plant health. | Plants should be selected to be drought tolerant and not require watering after establishment (2-3 years). Watering may be required during prolonged dry periods after plants are established. |
| <b>Clean curb cuts:</b> Remove any accumulation of debris from gutter and entrance to bioretention area.                | Maintain proper flow of stormwater from paved/impervious areas to bioretention facility.                                                                                                                           | Twice annually (October and January)                           |                                                                                                                                                                                                |
| <b>Remove and/or prune vegetation</b>                                                                                   | Maintain adequate plant coverage and plant health. Reduce shading of under-story if species require sun. Maintain soil health and infiltration capability. Maintain clearances from utilities and sight distances. | Once or twice annually.                                        | Depending on aesthetic requirements, occasional pruning and removing dead plant material may be necessary.                                                                                     |
| <b>Weeding:</b> Remove undesired vegetation by hand.                                                                    | Reduce competition for desired vegetation. Improve aesthetics.                                                                                                                                                     | Prior to major weed species disbursing                         | Periodic weeding is necessary until plants are established. The weeding schedule should                                                                                                        |

|                                                                                                                             |                                                                                                              |                                   |                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                             |                                                                                                              | seeds (usually twice annually)    | become less frequent if the appropriate plant species and planting density have been used and, as a result, undesirable plants excluded.                                                                                                                              |
| <b>Mulching:</b> Replace or add mulch with hand tools to a depth of 2-3 inches.                                             | Replenish organic material in soil, reduce erosion, prolong good soil moisture level, and filter pollutants. | Once annually or every two years. | Consider replacing mulch annually in bioretention facilities where high pollutant loading is likely (e.g. contributing areas that include quick marts). Use compost in the bottom of the facility and wood chips on side slopes and rim (above typical water levels). |
| <b>Trash removal</b>                                                                                                        | Maintain aesthetics and prevent clogging of infrastructure.                                                  | Twice annually.                   |                                                                                                                                                                                                                                                                       |
| <b>Maintain access to infrastructure:</b> Clear vegetation within 1 foot of inlets and out falls, maintain access pathways. | Prevent clogging of infrastructure and maintain sight lines and access for inspections.                      | Once annually.                    |                                                                                                                                                                                                                                                                       |

#### **Non routine**

| Activity                                                                                                                          | Objective                                                                                                                                                              | Schedule                  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Erosion control:</b><br>Replace soil, plant material, and/or mulch layer in areas if erosion has occurred.                     | Reduce sediment transport and clogging of infrastructure. Maintain desired plant survival and appearance of facilities.                                                | Determined by inspection. | Properly designed facilities with appropriate flow velocities should not have erosion problems except perhaps in extreme events. If erosion problems persist, the following should be reassessed: (1) flow volumes from contributing areas and bioretention cell sizing; (2) flow velocities and gradients within the cell; and (3) flow dissipation and erosion protection strategies in the pretreatment area and flow entrance. |
| <b>Sediment removal:</b><br>Shovel or rake out sediment within vegetated areas. Vacuum catch basins or other sediment structures. | Reduce sediment transport and clogging of infrastructure. Maintain desired plant survival and appearance of facilities. Maintain proper elevations and ponding depths. | Determined by inspection. | If sediment is deposited in the bioretention area, immediately determine the source within the contributing area and stabilize.                                                                                                                                                                                                                                                                                                    |
| <b>Clean under-drains:</b> Jet clean or rotary cut                                                                                | Maintain proper subsurface drainage,                                                                                                                                   | Determined by inspection  |                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                                                                                                                                            |                                                                                                                                                        |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| debris/roots from under-drains.                                                                                                                                            | ponding depths, and dewatering rates.                                                                                                                  | of clean-outs.                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Clean intersection of pavement and vegetation:</b> Remove excess vegetation with a line trimmer, vacuum sweeper, rake or shovel.                                        | Prevent accumulation of vegetation at pavement edge and maintain proper sheet flow of stormwater from paved/impervious areas to bioretention facility. | Determined by inspection.                                                             | Bioretention facilities should be designed with a proper elevation drop from pavement to vegetated area to prevent blockage of storm flows by vegetation into infiltration area.                                                                                                                                                                                                                                                                                      |
| <b>Replace vegetation:</b> Reseed or replant bare spots or poor performing plants.                                                                                         | Maintain dense vegetation cover to prevent erosion, encourage infiltration and exclude unwanted weed species.                                          | Determined by inspection.                                                             | If specific plants have a high mortality rate, assess the cause and replace with appropriate species.                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Replace soil:</b> Remove vegetation (save as much plant material as possible for replanting) and excavated soil with backhoe, excavator or, if small facility, by hand. | Maintain infiltration, soil fertility, and pollutant removal capability.                                                                               | Determined by inspection (visual, infiltration, pollutant, and soil fertility tests). | Soil mixes for bioretention facilities are designed to maintain long-term fertility and pollutant processing capability. Estimates from metal attenuation research suggest that metal accumulation should not present an environmental concern for at least 20 years in bioretention systems. Replacing mulch in bioretention facilities where heavy metal and hydrocarbon deposition is likely provides an additional level of protection for prolonged performance. |
| <b>Rebuild or reinforce structures:</b> Various activities to maintain walls, intake and outfall pads, weirs, and other hardscape elements.                                | Maintain proper drainage, and aesthetics and prevent erosion.                                                                                          | Determined by inspection.                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Re-grade or re-contour side slopes:</b> Maintain proper slope with hand tools, back hoe or excavator, replant exposed areas.                                            | Prevent erosion where side slopes have been disturbed by foot or auto traffic intrusion.                                                               | Determined by inspection.                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### C. Compost Amended Construction Site Soil Maintenance Schedule

Compost amendments enhance the water storage and pollutant filtering capability of disturbed soils and improve plant performance on construction sites.

#### ***Routine***

| Activity                                                                                   | Objective                                                                                                                               | Schedule                     | Notes                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Add compost or mulch:</b> Spread material by hand to minimize damage to plant material. | Maintain organic matter content of soil, optimize soil moisture retention, prevent erosion, and enhance plant growth and survivability. | Once every one or two years. | Compost amended landscapes are stormwater management facilities and pesticide inputs should be eliminated or used only in unusual circumstances. Landscape management personnel should be trained to adjust chemical applications accordingly. |

## D. Permeable Paving Maintenance Schedule

The following matrices provide general maintenance recommendations applicable to all permeable paving and specific procedures for asphalt, concrete, Eco-Stone pavers, and Gravelpave2.

### **Routine**

| Activity                                                                                                                                           | Objective                                                                                    | Schedule                             | Notes                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All permeable paving surfaces                                                                                                                      |                                                                                              |                                      |                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Erosion and sediment control:</b><br>Mulch and/or plant all exposed soils that may erode to paving installation.                                | Minimize sediment inputs to pavement, reduce clogging and maintain infiltration of pavement. | Once annually.                       | Erosion control is critical for long-term performance of permeable paving.                                                                                                                                                                                                                                                                                                       |
| Permeable asphalt or concrete                                                                                                                      |                                                                                              |                                      |                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Clean permeable paving installation:</b><br>Use street cleaning equipment with suction, sweeping and suction or high-pressure wash and suction. | Maintain infiltration capability.                                                            | Once or twice every year.            | Street cleaning equipment using high-pressure wash with suction provides the best results for improving infiltration rates. Sweeping with suction provides adequate results and sweeping alone is minimally effective. Hand held pressure washers are effective for cleaning void spaces and appropriate for smaller areas such as sidewalks (may require special spray nozzle). |
| <b>Remove snow:</b> Use conventional snow removal techniques.                                                                                      | Maintain access.                                                                             | Determined by inspection/snow depth. |                                                                                                                                                                                                                                                                                                                                                                                  |
| Eco-Stone pavers                                                                                                                                   |                                                                                              |                                      |                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Clean permeable paving installation:</b><br>Use street cleaning equipment with sweeping and suction when surface and debris are dry.            | Maintain infiltration capability.                                                            | Once annually.                       | Washing should not be used to remove debris and sediment in the openings between the pavers. Vacuum settings may have to be adjusted to prevent excess uptake of aggregate from paver openings or joints.                                                                                                                                                                        |
| <b>Remove snow:</b> Use snow plow with skids or rollers to slightly raise blade above pavers.                                                      | Maintain access.                                                                             | Determined by inspection/snow depth. | The structure of the top edge of the paver blocks reduces chipping from snowplows. For additional protection, skids or rollers on the corner of plow blades are recommended.                                                                                                                                                                                                     |
| All permeable paving surfaces                                                                                                                      |                                                                                              |                                      |                                                                                                                                                                                                                                                                                                                                                                                  |



|                                                                                     |                                                                                                                                                                    |                           |                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Backfill utility cuts:</b><br>Use same aggregate base as under permeable paving. | Maintain conveyance of stormwater through base and prevent migration of fines from standard base aggregate to the more open graded permeable paving base material. | Determined by inspection. | Small utility cuts can be repaired with permeable top course or with conventional asphalt or concrete if small batches of permeable material are not available or are too expensive. |
| <b>Replace permeable paving material</b>                                            | Maintain infiltration and stormwater storage capability.                                                                                                           | Determined by inspection. | If facility is designed, installed and maintained properly permeable paving should last as long as conventional paving.                                                              |

### **Non-routine**

| Activity                                                                                                                                                                               | Objective                                                    | Schedule                    | Notes                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eco-Stone pavers                                                                                                                                                                       |                                                              |                             |                                                                                                                                                                                                                         |
| <b>Replace aggregate in paver cells:</b><br>Remove aggregate with suction equipment.                                                                                                   | Maintain infiltration capacity.                              | Determined by inspection.   | Clogging is usually an issue in the upper most few centimeters of aggregate. Check infiltration at various depths in the aggregate profile to determine excavation depth.                                               |
| <b>Utility maintenance:</b><br>Remove pavers individually by hand and replaced when utility work is complete.                                                                          | Repair utilities, maintain structural integrity of pavement. | When maintaining utilities. | Pavers can be removed individually and replaced when utility work is complete.                                                                                                                                          |
| <b>Replace broken pavers:</b> Remove individual pavers by hand and replace.                                                                                                            | Maintain structural integrity of pavement.                   | Determined by inspection.   |                                                                                                                                                                                                                         |
| Gravelpave2                                                                                                                                                                            |                                                              |                             |                                                                                                                                                                                                                         |
| <b>Clean permeable paving installation:</b><br>Use vacuum trucks for stormwater collection basins to remove and replace top course aggregate if clogged with sediment or contaminated. | Restore infiltration capability.                             | Determined by inspection.   | Permeable gravel paving systems have a very high void to surface coverage ratio. System failure due to clogging is unlikely except in unusual circumstances.                                                            |
| <b>Replenish aggregate material:</b> Spread gravel with rake                                                                                                                           | Maintain structural integrity.                               | Determined by inspection.   | Gravel level should be maintained at the same level as the plastic rings or slightly above the top of rings. In high traffic areas, such as aisle ways, entrances or exits, gravel may become compacted or transported. |

|                                                                                                          |                                                                  |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                               |
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| <b>Remove and replace grid segments:</b> Remove pins, pry up grid segments, replace gravel.              | Maintain structural integrity.                                   | Determined by inspection.                                                       | Replace grid segments where three or more adjacent rings are broken or damaged. Potholes should be remedied in the same way; the base course should be brought to the proper grade and compaction before replacing grid.                                                                                                                                                      |
| <b>Remove snow:</b> Use snow plow with skids or rollers to slightly raise blade above gravel surface.    | Avoid concentrated sedimentation accumulation.                   | Determined by inspection/snow depth.                                            | Elevating blades at least one (1) inch above the aggregate surface prevents loss of top course aggregate and damage to plastic grid.                                                                                                                                                                                                                                          |
| Grasspave <sup>2</sup>                                                                                   |                                                                  |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Aeration:</b> (see note)                                                                              |                                                                  |                                                                                 | <b>Do not Aerate Grasspave<sup>2</sup> installations.</b> Aeration equipment will damage the structure of Grasspave <sup>2</sup> and could prevent its long term function. Soil compaction and poor water penetration can be the result of soil types or local conditions and should be treated accordingly.                                                                  |
| <b>Replace Grasspave<sup>2</sup> installation:</b> Place units over porous gravel base, fill with grass. | Restore system capability.                                       | Determined by inspection.                                                       | Do not place any form of topsoil between sandy gravel base and Grasspave <sup>2</sup> units.                                                                                                                                                                                                                                                                                  |
| <b>Invasive or nuisance plants:</b> Remove manually and without herbicide applications.                  | Promote selected plant growth and survival, maintain aesthetics. | Twice annually.                                                                 | At a minimum, schedule weeding with inspections to coincide with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).                                                                                                                                                                                                                       |
| <b>Fertilization:</b> If necessary apply by hand (see note).                                             | Plant growth and survival.                                       | Determined by inspection.                                                       | Installations should be designed to not require fertilization after plant establishment. If fertilization is necessary during plant establishment or for plant health and survivability after establishment, use an encapsulated, slow release fertilizer (excessive fertilization can contribute to increased nutrient loads in the stormwater system and receiving waters). |
| <b>Irrigate:</b> Use subsurface or drip irrigation.                                                      |                                                                  | Determined by inspection and only when absolutely necessary for plant survival. | Surface irrigation systems can promote weed establishment, root development near the drier surface layer of the soil substrate, and increase plant dependence on irrigation.                                                                                                                                                                                                  |

|                                                                                                       |                                                |                                      |                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                       |                                                |                                      | Accordingly, subsurface irrigation methods are preferred. If surface irrigation is the only method available, use drip irrigation to deliver water to the base of the plant. |
| <b>Remove snow:</b> Use snow plow with skids or rollers to slightly raise blade above gravel surface. | Avoid concentrated sedimentation accumulation. | Determined by inspection/snow depth. | Elevating blades at least one (1) inch above the aggregate surface prevents loss of top course aggregate and damage to plastic grid.                                         |

## E. Vegetated Roof Maintenance Schedule

Proper maintenance and operation are essential to ensure that designed performance and benefits continue over the full life cycle of the installation. Each roof garden installation will have specific design, operation and maintenance guidelines provided by the manufacturer and installer. The following guidelines are for extensive roof systems and provide a general set of standards for prolonged roof garden performance.

### *General maintenance guidelines*

- All facility components, including structural components, waterproofing, drainage layers, soil substrate, vegetation, and drains should be inspected for proper operation throughout the life of the roof garden.
- Drain inlets should provide unrestricted stormwater flow from the drainage layer to the roof drain system unless the assembly is specifically designed to impound water as part of an irrigation or stormwater management program.
- The property owner should provide the maintenance and operation plan and inspection schedule.
- Written guidance and/or training for operating and maintaining roof gardens should be provided along with the operation and maintenance agreement to all property owners and tenants.
- All elements of an extensive roof installation should be inspected twice annually.
- The facility owner should keep a maintenance log recording inspection dates, observations, and activities.
- Inspections should be scheduled to coincide with maintenance operations and with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).

### ***Routine***

| Activity                                                                        | Objective                              | Schedule        | Notes |
|---------------------------------------------------------------------------------|----------------------------------------|-----------------|-------|
| Structural & drainage components                                                |                                        |                 |       |
| <b>Clear inlet pipes:</b><br>Remove soil substrate, vegetation or other debris. | Maintain free drainage of inlet pipes. | Twice annually. |       |

|                                                                                                                                                                |                                        |                 |                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Inspect drain pipe:</b><br>Check for cracks settling and proper alignment, and correct and re-compact soils or fill material surrounding pipe, if necessary | Maintain free drainage of inlet pipes. | Twice annually. |                                                                                                                                                                                                                                                         |
| <b>Inspect fire ventilation points for proper operation</b>                                                                                                    | Fire and safety.                       | Twice annually. |                                                                                                                                                                                                                                                         |
| <b>Maintain egress and ingress:</b> Clear routes of obstructions and maintained to design standards                                                            | Fire and safety.                       | Twice annually. |                                                                                                                                                                                                                                                         |
| <b>Insects</b> (see note)                                                                                                                                      |                                        |                 | Roof garden design should provide drainage rates that do not allow pooling of water for periods that promote insect larvae development. If standing water is present for extended periods correct drainage problem. Chemical sprays should not be used. |

|                                                                                                                                                                                                                           |                                                                  |                                                                   |                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Prevent release of contaminants:</b><br>Identify activities (mechanical systems maintenance, pet access, etc.) that can potentially release pollutants to the roof garden and establish agreements to prevent release. | Water quality protection.                                        | During construction of roof and then as determined by inspection. | Any cause of pollutant release should be corrected as soon as identified and the pollutant removed.                                                                                                    |
| Vegetation and growth medium                                                                                                                                                                                              |                                                                  |                                                                   |                                                                                                                                                                                                        |
| <b>Invasive or nuisance plants:</b> Remove manually and without herbicide applications.                                                                                                                                   | Promote selected plant growth and survival, maintain aesthetics. | Twice annually.                                                   | At a minimum, schedule weeding with inspections to coincide with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).                                                |
| <b>Removing and replacing dead material:</b> See note.                                                                                                                                                                    | See note.                                                        | Once annually.                                                    | Normally, dead plant material will be recycled on the roof; however specific plants or aesthetic considerations may warrant removing and replacing dead material (see manufacturer's recommendations). |

|                                                              |                            |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fertilization:</b> If necessary apply by hand (see note). | Plant growth and survival. | Determined by inspection.                                                       | Extensive roof gardens should be designed to not require fertilization after plant establishment. If fertilization is necessary during plant establishment or for plant health and survivability after establishment, use an encapsulated, slow release fertilizer (excessive fertilization can contribute to increased nutrient loads in the stormwater system and receiving waters). |
| <b>Mulching:</b> (see note)                                  |                            |                                                                                 | Avoid application of mulch on extensive roof gardens. Mulch should be used only in unusual situations and according to the roof garden provider guidelines. In conventional landscaping mulch enhances moisture retention; however, moisture control on a vegetated roof should be through proper soil/growth media design. Mulch will also increase establishment of weeds.           |
| <b>Irrigate:</b> Use subsurface or drip irrigation.          |                            | Determined by inspection and only when absolutely necessary for plant survival. | Surface irrigation systems on extensive roof gardens can promote weed establishment, root development near the drier surface layer of the soil substrate, and increase plant dependence on irrigation. Accordingly, subsurface irrigation methods are preferred. If surface irrigation is the only method available, use drip irrigation to deliver water to the base of the plant.    |

## F. Roof Rainwater Collection System Maintenance Schedule

Maintenance requirements for rainwater collection systems include typical household and system specific procedures. All controls, overflows and cleanouts should be readily accessible and alerts for system problems should be easily visible and audible. The following procedures are operation and maintenance requirements recorded with the deed of homes using roof water harvesting systems in San Juan County, Washington.

### ***Routine***

| Activity                                                                                                                                                  | Objective                                                                          | Schedule                                                                                                                                                                               | Notes                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remove debris from roof: Sweep, rake or use leaf blower.                                                                                                  | Prevent debris from entering collection and filter system.                         | Determined by inspection.                                                                                                                                                              |                                                                                                                                                                     |
| Clean gutters: By hand or use leaf blower.                                                                                                                | Prevent debris from entering collection and filter system.                         | Determined by inspection (generally September, November, January and April). The most critical cleaning is in mid- to late-Spring to flush the pollen deposits from surrounding trees. | Covers for gutters may be appropriate for specific locations, but can make regular cleaning more difficult and will not prevent pollen from entering filter system. |
| Clean downspout basket screens: Remove debris from screens at top of downspout.                                                                           | Prevent debris from entering collection and filter system, and clogging of system. | Same as gutters.                                                                                                                                                                       |                                                                                                                                                                     |
| Clean pre-filters                                                                                                                                         | Prevent debris from entering collection and filter system, and clogging of system. | Monthly                                                                                                                                                                                |                                                                                                                                                                     |
| Clean storage tanks of debris: Drain tank and remove debris from bottom of tank.                                                                          | Prevent contamination.                                                             | Determined by inspection.                                                                                                                                                              |                                                                                                                                                                     |
| Clean particle filters                                                                                                                                    | Prevent contamination.                                                             | 6 months or determined by pressure drop in system.                                                                                                                                     |                                                                                                                                                                     |
| Clean and replace UV filters                                                                                                                              | Prevent contamination.                                                             | Clean every 6 months and replace bulb every 12 months or according to manufacturer's recommendation.                                                                                   |                                                                                                                                                                     |
| Chlorinate storage tank: Chlorinate to 0.2ppm-0.5ppm (1/4 cup of household bleach (5.25%) at the rate of 1 cup of bleach to 1000 gallons of stored water) | Prevent contamination.                                                             | Quarterly                                                                                                                                                                              |                                                                                                                                                                     |
| Flush household taps:                                                                                                                                     | Prevent contamination.                                                             | When storage tanks are                                                                                                                                                                 |                                                                                                                                                                     |

|                                                                                                                                                                           |  |          |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------|--|
| Remove carbon filter and flush until chlorine odor is noticed at taps. Chlorinated water should be left standing in the piping for 30 minutes. Replace the carbon filter. |  | cleaned. |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------|--|

### **5-117 Enforcement and Penalties**

Enforcement action shall be in accordance with LSMC 14.28 and LSMC 9.

### **5-118 Storm Drainage Notes**

1. Prior to any site work, including drainage, the contractor shall contact the City of Lake Stevens Public Works Department at 425-377-3222 to schedule a pre-construction conference.
2. All pipe shall be placed on stable earth. If, in the opinion of the City inspector, the existing trench foundation is unsatisfactory, then it shall be excavated below grade and backfilled with gravel bedding to support the pipe.
3. Backfill shall be placed equally on both sides of the pipe or pipe-arch in 6" average depth loose lifts. Maximum lift depth shall not exceed 9". Each lift shall be thoroughly compacted. Compacted lifts must extend at least one pipe diameter on each side of the pipe or to the side of the trench. Backfill over the pipe shall be performed in accordance with Sections 7-04.3(3) and 2-03.2(14)C - Method B and C of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction.
4. All grates located in the gutter flow line (inlet and catch basin) shall be depressed 0.1 feet below pavement level.
5. All catch basins to be Type I unless otherwise approved by the Public Works Director or designee or designated representative. The use and installation of inlets is not encouraged.
6. The contractor shall be responsible for adjusting all manhole, inlet and catch basin frames and grates to grade just prior to curb installation and/or paving.
7. All catch basins with a depth of 5 feet or greater to the flow line shall be Type II catch basins.
8. Vaned grates are required on all storm structures where the roadway profile grade is greater than 3%. All catch basins and manholes shall have locking lids. Rolled grates are not approved for use outside of the City right-of-way or for use with Type II manholes.



- 9.** Polypropylene safety steps and ladder steps shall be provided in all manholes and shall be positioned correctly with the bolt areas on the rim.
- 10.** Catch basin frames and grates shall be Olympic Foundry Model SM60, SM52, or SM44, locking type or equivalent. Model SM52 shall be referred to as a "Through Curb Inlet" on the plans; Model SM44 shall be referred to as a "Rolled Grate Inlet" on the plans.
- 11.** Detention ponds with side slopes steeper than 3:1 or with a maximum water depth greater than 3 feet shall require a powder or vinyl coated chain link perimeter fence per Standard Plans 6-110 & 6-120. Side slope averaging shall not be allowed. All inlet and outfall pipes shall have a trash rack installed and a mortared riprap headwall. Refer to storm drainage note 18.
- 12.** Prior to sidewalk construction, lot drainage systems, stub-outs and any behind sidewalk drains must be installed as required. Pipe shall be PVC 3034, or SDR-35. Stub-outs shall be marked with a 2" x 4" with 3 feet visible above grade and marked "storm". Locations of these installations shall be shown on the as-built construction plans submitted to the City.
- 13.** Storm water retention/detention facilities, storm drainage pipe and catch basins shall be flushed and cleaned by the developer prior to City of Lake Stevens final acceptance of the project and upon commencement and completion of the 2 year warranty period for the storm drainage system.
- 14.** Unless otherwise noted, all storm sewer pipe shall be non-reinforced concrete (CP), ASTM C-14; reinforced concrete (RCP) for concrete pipe diameters 24" or greater, ASTM C-76; or corrugated metal (CMP). CMP to be is to be galvanized steel with Treatment I asphalt coating or better, corrugated aluminum, or AASHTO M274-70 aluminized steel. All pipes shall be installed with rubber gaskets as per manufacturer's recommendations.

Coverage Requirements for 12" diameter pipe:

Backfill over pipe less than 12" requires RCP Class IV.

Backfill over pipe less than 24" requires RCP minimum.

Backfill over pipe greater than 24" requires 16 gage CMP minimum.

- 15.** Corrugated Polyethylene Pipe (CPP):
  - A.** All pipe shall be smooth interior. CPP shall be double-walled. All pipe shall meet AASHTO and ASTM specifications.
  - B.** Upon request by the City inspector, all pipe runs shall pass the low pressure air test requirements of Section 7-04.3(1) E & F of the WSDOT Standard Specifications for Road,

Bridge, and Municipal Construction. Pipe runs shall be tested with pipe loaded and compacted to finish grade.

- C.** Upon request by the City inspector, pipe shall be subject to mandrel testing (mandrel size = 90% of nominal pipe diameter).
  - D.** Pipe shall be stored on site in shipping bunks on a flat level surface. This requirement will be strictly enforced; failure to comply may result in rejection of the pipe and/or future restriction on use of material.
  - E.** Minimum depth of cover shall be 2 feet.
  - F.** Couplings shall be integral bell and spigot or double bell separate couplings. Split couplings will not be allowed.
  - G.** Backfill shall comply with Section 7-08.3(3) of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction modified as follows: "The material used for backfilling around and to a point 1 foot above the top of the pipe shall be clean earth or sand, free from clay. Any gravel or stones included in the backfill shall pass through a 1 inch sieve."
- 16.** All non-perforated metal pipe shall have neoprene gaskets at the joints. O-ring gaskets may be used for type-F coupling band.
- 17.** Culvert ends shall be beveled to match side slopes. Field cutting of culvert ends is permitted when approved by the Public Works Director or designee or designated representative.
- 18.** All field cut culvert pipe shall be treated as required in the Standard Specifications or General Special Provisions.

### **5-119 Site Grading and SWPPP Notes**

- 1.** Noncompliance with the erosion control requirements, water quality requirements, LSMC 14.44, 14.64, and clearing limits violations may result in revocation of project permits and plan approval and bond foreclosures.
- 2.** Prior to any site construction, including clearing, logging or grading, the site clearing limits shall be located and field identified by the project surveyor (or project engineer) as required by these plans. The project surveyor's name and phone number is \_\_\_\_\_.
- 3.** Developer (or project engineer) is responsible for water quality as determined by the monitoring program established by the project engineer. The project engineer's name and phone number is \_\_\_\_\_.
- 4.** The Construction Stormwater Pollution Prevention facilities shall be constructed in accordance with the approved SWPPP prior to any grading or extensive land clearing. An inspection by the

City of these facilities shall be arranged for by the contractor prior to any grading. These facilities must be satisfactorily maintained until construction and landscaping is completed and the potential for on-site erosion has passed.

5. All site work must be performed in accordance with the current City adopted International Building Code.
6. All earth work shall be performed in accordance with City Standards. Preconstruction soils investigation may be required to evaluate soils stability.
7. If cut and fill slopes exceed a maximum of two feet horizontal to one foot vertical, a rock or concrete retaining wall may be required. All rock retaining walls greater than four (4) feet in height are to be designed and certified by a professional engineer experienced in soil mechanics.
8. Stockpiles are to be located in safe areas and adequately protected by temporary seeding and mulching. Hydroseeding is preferred.
9. All structural fills shall be compacted to a minimum of 95% maximum density in the upper 4 feet & 90% maximum density below 4 feet as determined by modified proctor.
10. Prior to any site work pertaining to drainage, the contractor shall contact the Construction Inspection Division of Public Works Department at 360-377-3222 to schedule a preconstruction conference.
11. Construction Stormwater Pollution Prevention measures shall be installed prior to any site work. (See attached detailed drainage plan).
12. The surface of all slopes shall be compacted. This may be accomplished by over-building the slopes, then cutting back to final grades; or by compacting each lift as the slope is being constructed. All slopes shall be compacted by the end of each working day.
13. Upon completion of work, final reports must be submitted to the City in conformance with the current City adopted International Building Code.

#### **5-120 Temporary Gravel Construction Entrance Notes**

1. The temporary construction entrance should be cleared of all vegetation, roots, and other objectionable material. Any drainage facilities required because of washing should be constructed according to specifications in the plan. If wash racks are used, they should be installed according to manufactures specifications.

2. Gravel shall be crushed ballast rock, 8" to 12" in depth and installed to the specified dimensions at the entrance.
3. The gravel ballast rock shall be 4" to 8" in diameter and placed across the full width of the vehicular ingress and egress area. The length of entrance shall be a minimum of 100 feet or as specified by the City Construction Inspector or designee.
4. If conditions on the site are such that most of the mud is not removed from vehicle tires by contact with the gravel, then the tires must be washed before vehicles enter onto a public road. Wash water must be carried away from entrance to a settling area to remove sediment. A wash rack may also be used to make washing more convenient and effective.
5. The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 2" stone, as conditions demand, and repair and/or clean out any structures used to trap sediment. All materials spilled, dropped, washed or tracked from vehicles onto roadway or into storm drains must be removed immediately.

#### **5-121 Hydroseeding General Notes**

1. Construction Acceptance will be subject to a well established ground cover that fulfills the requirements of the approved construction plans and City of Lake Stevens Standards.
2. All disturbed areas such as retention facilities, roadway backslopes, etc., shall be seeded with a perennial ground cover grass to minimize erosion. Grass seeding will be done using an approved hydroseeder or as otherwise approved by the City of Lake Stevens.
3. Preparation of Surface: All areas to be seeded shall be cultivated to the satisfaction of the City Inspector. This may be accomplished by disking, raking, harrowing, or other acceptable means.
4. Immediately following finish grading permanent vegetation shall be applied consistent with the design and maintenance standards for Temporary and Permanent Seeding in the City adopted Department of Ecology Stormwater Management Manual for Western Washington.
5. All hydroseeding firms shall have a printout of the application rate for each job readily available for inspection by the Public Works Department.
6. The City of Lake Stevens Public Works Department shall be notified of potential hydroseeding prior to the commencement of same to ensure compliance of these specifications.

### **5-122 Maintenance of Siltation Barriers Note**

1. Siltation barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits should be removed after each rainfall. Sediment deposits must be removed when sediment level reaches approximately one-half the siltation barrier height. Any sediment deposits remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

### **5-123 Stand Pipe Pond Maintenance Notes**

1. The embankment of the basin should be checked regularly to insure that it is structurally sound and has not been damaged by erosion or construction equipment. The emergency spillway should be checked regularly to insure that the lining is well established and erosion resistant. The siltation basin should be checked for sediment cleanout after each rainfall which produces runoff. When the sediment reaches the cleanout level, it shall be removed and properly disposed.

### **5-124 Biofilter Swale Planting Notes**

1. Final engineering approval is contingent on swale inspection by the City of Lake Stevens Construction Inspection Division of the Public Works Department.
2. Inspection must be requested by calling the City of Lake Stevens Construction Inspection Division of Community Development at 425-377-3222 at least 24 hours prior to inspection date.
3. Erosion control seed mix or shingle-weave sod, as determined by the Public Works Director or designee or designated representative, shall be placed above the design water surface for the 6-month, 24-hour storm event. A minimum topsoil depth of 4" shall be placed within the swale. The topsoil surface shall be at design grade for the swale. An erosion control blanket shall cover the topsoil to prevent erosion of topsoil and seed mix until a well defined ground cover is established. The wetted surface area as defined by the 6-month, 24-hour storm event shall be planted with wet tolerant plant species.
4. Recommended Seed Mix for Bioswales:

|                       | % Weight | % Purity | % Germination |
|-----------------------|----------|----------|---------------|
| Tall or meadow fescue | 75-80    | 98       | 90            |

*Festuca arundinacea* or *Festuca elatior*

|                            |       |    |    |
|----------------------------|-------|----|----|
| Seaside/Creeping bentgrass | 10-15 | 92 | 85 |
|----------------------------|-------|----|----|

*Agrostis palustris*

|                  |      |    |    |
|------------------|------|----|----|
| Redtop bentgrass | 5-10 | 90 | 80 |
|------------------|------|----|----|

*Agrostis alba* or *Agrostis gigantea*

### ***Section 5 drawing index:***

**Standard Drawing 5-010: Flow Restrictor/Oil Pollution Debris Control Device, Tee Type (Frop-T) Installation**

**Standard Drawing 5-020: Frop-T Shear Gate Detail**

**Standard Drawing 5-030: Flow Restrictor/Debris Pollution Control Device Baffle Type (Frop-B)**

**Standard Drawing 5-040: Standard Coalescing Plate Separator**

**Standard Drawing 5-050: Type 1 Catch Basin (18" Max Dia.)**

**Standard Drawing 5-060: Type 1-L Catch Basin (18"-28" Max Dia.)**

**Standard Drawing 5-070: Type 2 Catch Basin 48", 54", 72", 96"**

**Standard Drawing 5-080: Type 1 & 1L Catch Basin Installation Detail**

**Standard Drawing 5-090: Type 4 Manhole**

**Standard Drawing 5-100: Offset Corrugated Manhole**

**Standard Drawing 5-110: Catch Basin & Manhole Details**

**Standard Drawing 5-120: Curb Inlet**

**Standard Drawing 5-130: Vaned Grate**

**Standard Drawing 5-140: Standard Grate**

**Standard Drawing 5-150: Thru-Curb Inlet Frame & Grate W/ Vertical Curb Installation**

**Standard Drawing 5-160: Locking Manhole Frame Detail**

**Standard Drawing 5-170: Locking Manhole Cover Detail**

**Standard Drawing 5-180: Solid Cover**

**Standard Drawing 5-190: Standard Frame W/ Vertical or Extruded Curb Installation**

**Standard Drawing 5-251: Typical Bioretention Cell Section**

**Standard Drawing 5-252: LID Cul-de-sac Bioretention Cell**

**Standard Drawing 5-253: LID Road Plan Transition**

**Standard Drawing 5-270: Rock Lined Shoulder Ditches & Curbed or Turnpike Shoulders**

**Standard Drawing 5-290: Beveled End Pipe Section**

**Standard Drawing 5-300: Rock Headwall Detail**

**Standard Drawing 5-310: Debris Cage**

**Standard Drawing 5-320: Trash Rack**

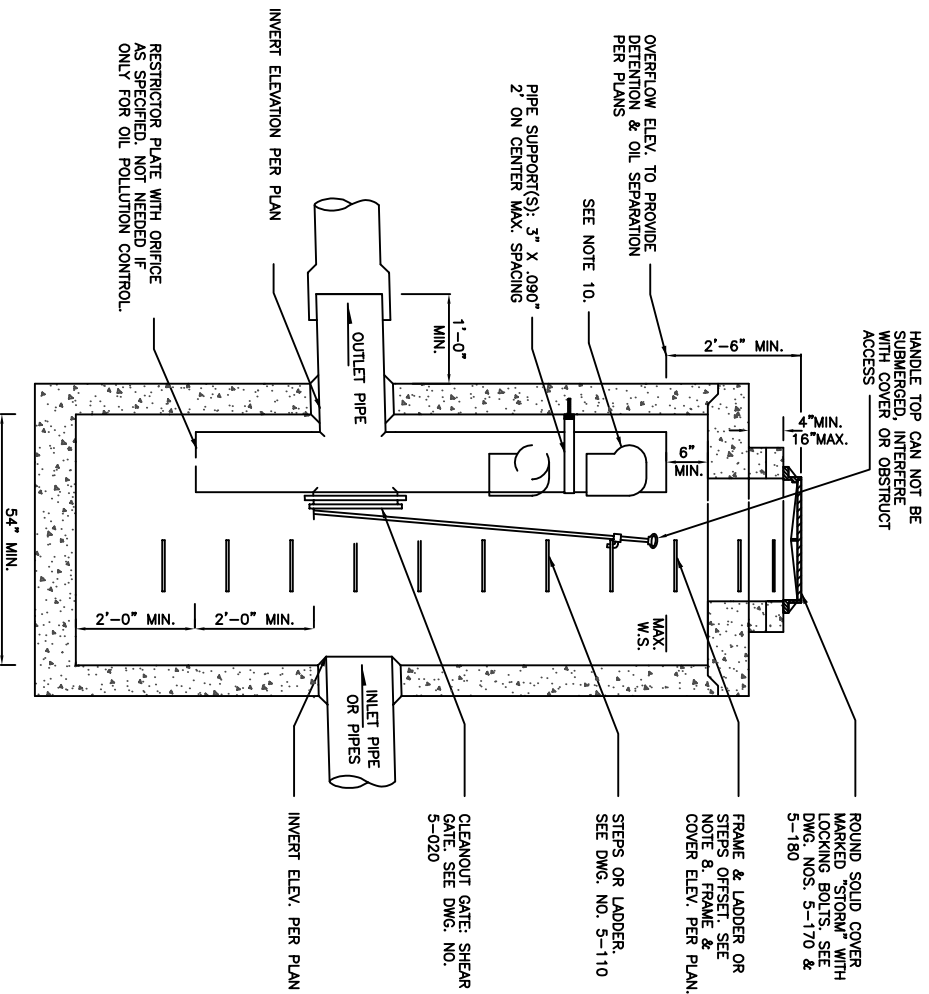
**Standard Drawing 5-330: French Drain**

**Standard Drawing 5-340: Individual Lot & Roof Plan Details**

**Standard Drawing 5-350: Lot and Roof Plan Multi-Lots**

**Standard Drawing 5-360: Field Tapping of Concrete Pipe**

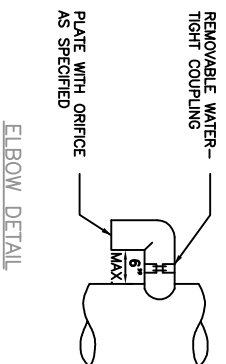
**Standard Drawing 5-370: 8" Clean Out**



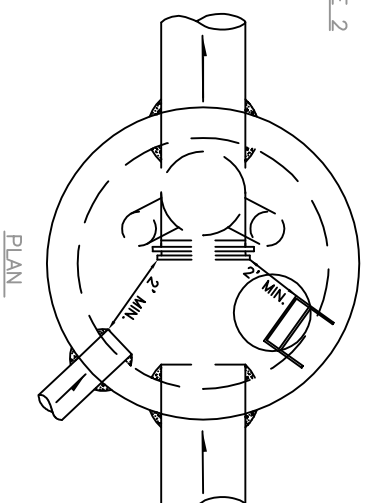
# NOTES:

- PIPE SIZES AND SLOPES: PER PLANS.
- OUTLET CAPACITY: NOT LESS THAN COMBINED INLETS.
- EXCEPT AS SHOWN OR NOTED, UNITS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS FOR CATCH BASIN TYPE 2, 54" MIN. DIAM.
- PIPE SUPPORTS AND RESTRICTOR/SEPARATOR SHALL BE OF SAME MATERIAL, AND BE ANCHORED AT 3' MAX. SPACING BY 5/8" DIAM. STAINLESS STEEL EXPANSION BOLTS OR EMBEDDED 2" IN WALL.
- THE RESTRICTOR/SEPARATOR SHALL BE FABRICATED FROM .060" ALUMINUM, OR .064" ALUMINIZED STEEL, OR .064" GALVANIZED STEEL PIPE. IN ACCORDANCE WITH AASHTO M 36, M 196, M 197 AND M 274. GALVANIZED STEEL SHALL HAVE TREATMENT 1.
- OUTLET SHALL BE CONNECTED TO CULVERT OR STORM DRAIN WITH A STANDARD COUPLING BAND FOR CORRUGATED METAL PIPE, OR GROUTED INTO THE BELL OF CONCRETE PIPE.
- THE VERTICAL RISER STEM OF THE RESTRICTOR/SEPARATOR SHALL BE THE SAME DIAM. AS THE HORIZONTAL OUTLET PIPE, WITH AN 8" MIN. DIAM.
- FRAME AND LADDER OR STEPS OFFSET SO THAT:
  - CLEANOUT GATE IS VISIBLE FROM TOP
  - CLIMB DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE.
  - FRAME IS CLEAR OF CURB.
- IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE: OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS 1/4".
- MULTI-ORIFICE ELBOWS MAY BE LOCATED AS SHOWN OR ALL ON ONE SIDE OF RISER TO ASSURE LADDER CLEARANCE.

CATCH BASIN TYPE 2  
DIAM. AS REQUIRED  
SEE DWG. NO. 5-070



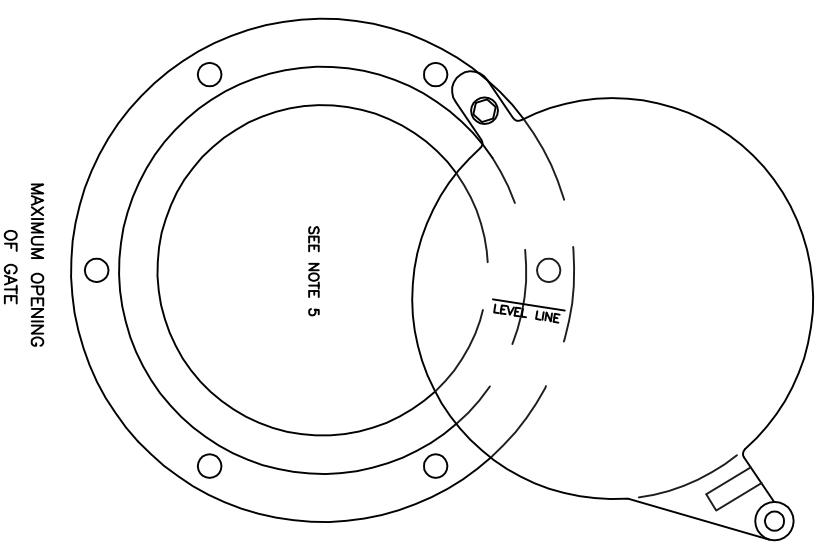
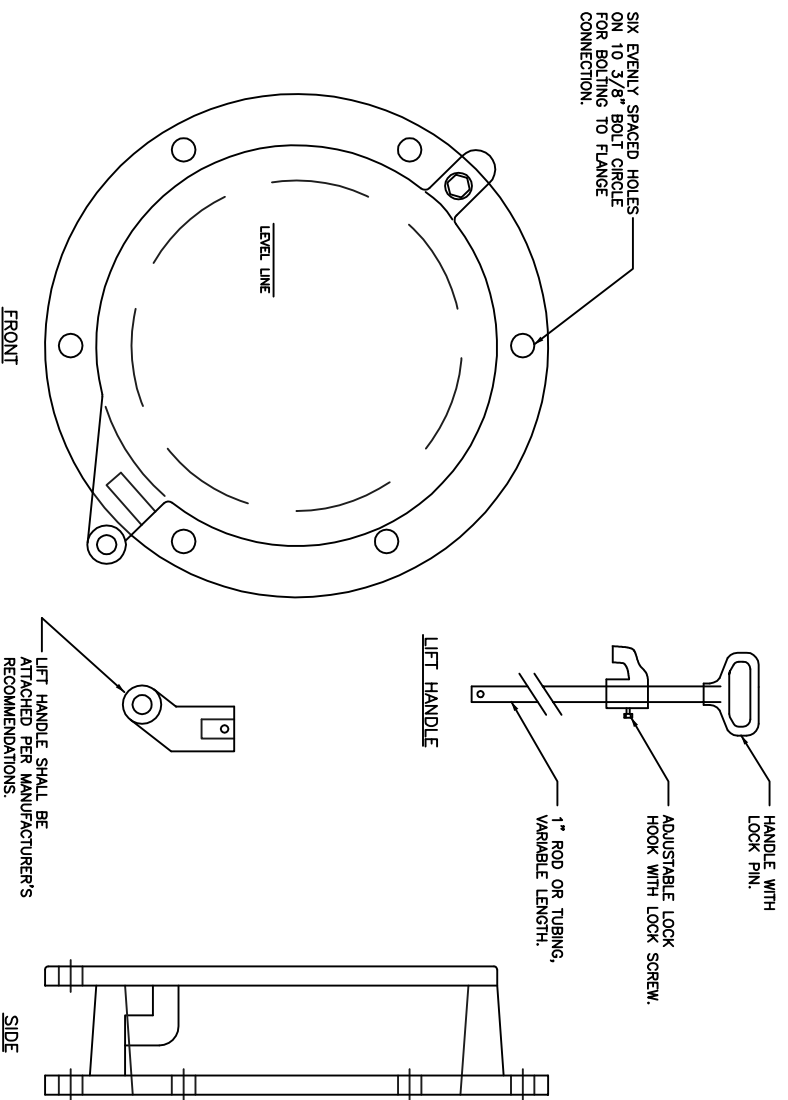
ELBOW DETAIL



FLOW RESTRICTOR/OIL  
POLLUTION DEBRIS CONTROL  
DEVICE, TEE TYPE (FROP-T)  
INSTALLATION

STANDARD PLAN 5-010





NOTES:

1. SHEAR GATE SHALL BE ALUMINUM ALLOY PER ASTM B-26-Z6-32 $\alpha$  OR CAST IRON ASTM A48 CLASS 30B AS REQUIRED.
2. GATE SHALL BE 8" DIAM. UNLESS OTHERWISE SPECIFIED.
3. GATE SHALL BE JOINED TO TEE SECTION BY BOLTING (THROUGH FLANGE), WELDING, OR OTHER SECURE MEANS.
4. LIFT ROD: AS SPECIFIED BY MFR. WITH HANDLE EXTENDING TO WITHIN ONE FOOT OF COVER AND ADJUSTABLE HOOK LOCK FASTENED TO FRAME OR UPPER HANDHOLD.
5. GATE SHALL NOT OPEN BEYOND THE CLEAR OPENING BY LIMITED HINGE MOVEMENT, STOP TAB, OR SOME OTHER DEVICE.
6. NEOPRENE RUBBER GASKET REQUIRED BETWEEN RISER MOUNTING FLANGE AND GATE FLANGE.
7. MATING SURFACES OF LID AND BODY TO BE MACHINED FOR PROPER FIT.
8. FLANGE MOUNTING BOLTS SHALL BE 3/8" DIAM. STAINLESS STEEL.
9. ALTERNATE CLEANOUT/SHEAR GATES TO THE DESIGN SHOWN ARE ACCEPTABLE, PROVIDED THEY MEET THE MATERIAL SPECIFICATIONS ABOVE AND HAVE A SIX BOLT, 10 3/8" BOLT CIRCLE FOR BOLTING TO THE FLANGE CONNECTION.



FRONT SHEAR GATE  
DETAIL

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 5-020

APPROVED BY

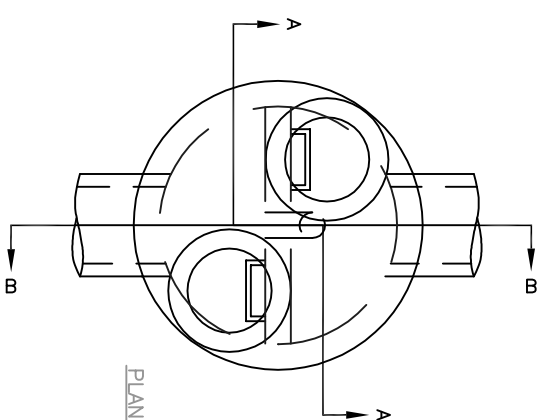
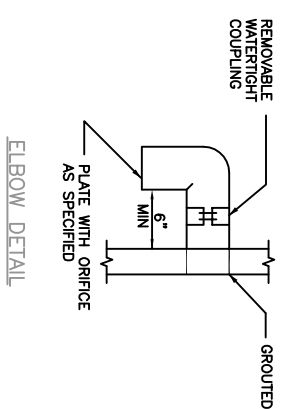
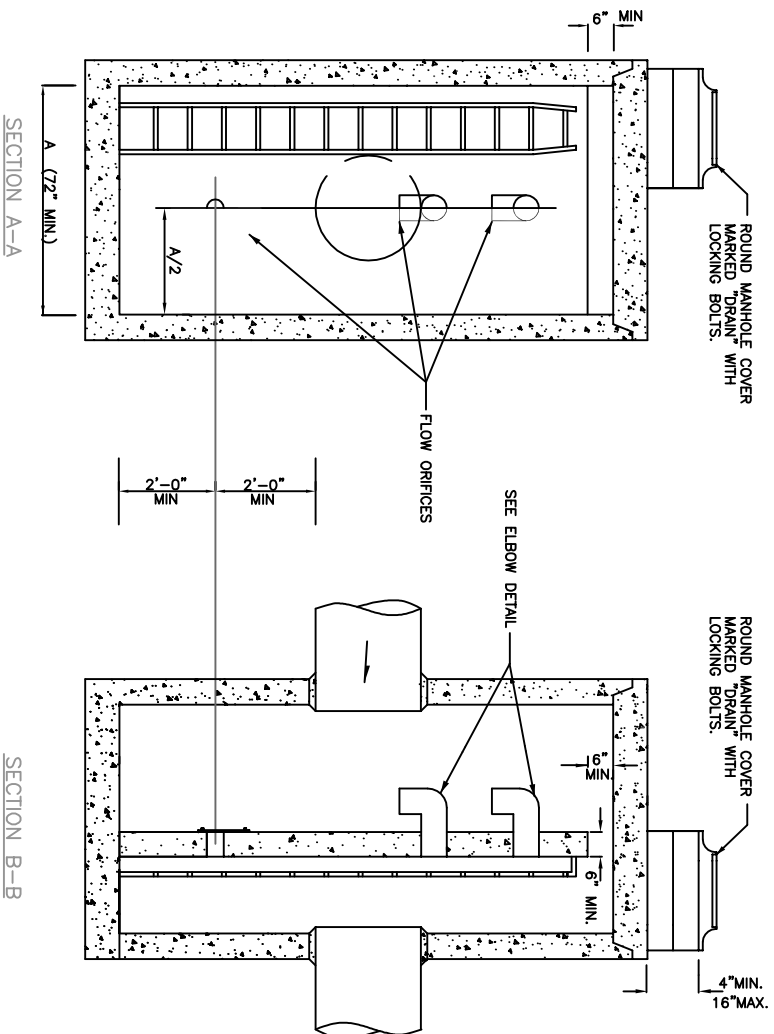
*David M. Berglund*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE



**NOTES:**

1. PIPE SIZE, SLOPES AND ALL ELEVATIONS: PER PLANS.
2. OUTLET CAPACITY: NOT LESS THAN COMBINED INLETS.
3. CATCH BASIN: TYPE 2, TO BE CONSTRUCTED IN ACCORDANCE WITH DWG. NO. 5-070 AND ASHTO M199 UNLESS OTHERWISE SPECIFIED
4. COVERS: ROUND, SOLID MARKED "DRAIN," WITH LOCKING BOLTS
5. ORIFICES: SIZED AND LOCATED AS REQUIRED, WITH LOWEST ORIFICE MINIMUM 2' FROM BASE
6. BAFFLE WALL SHALL HAVE #4 BAR AT 12" SPACING EACH WAY.
7. PRECAST BAFFLE WALL SHALL BE KEYED AND GROUTED IN PLACE.
8. BOTTOM ORIFICE PLATE TO BE 1/4" MIN. GALVANIZED STEEL AND ATTACHED WITH 1/2" STAINLESS STEEL BOLTS. OMIT ORIFICE PLATE IF ONLY FOR OIL SEPARATION.
9. UPPER FLOW ORIFICE SHALL BE ALUMINUM, ALUMINIZED STEEL OR GALVANIZED STEEL. SEE DWG. NO. 5-010. GALVANIZED STEEL SHALL HAVE TREATMENT 1.



STANDARD PLAN 5-030

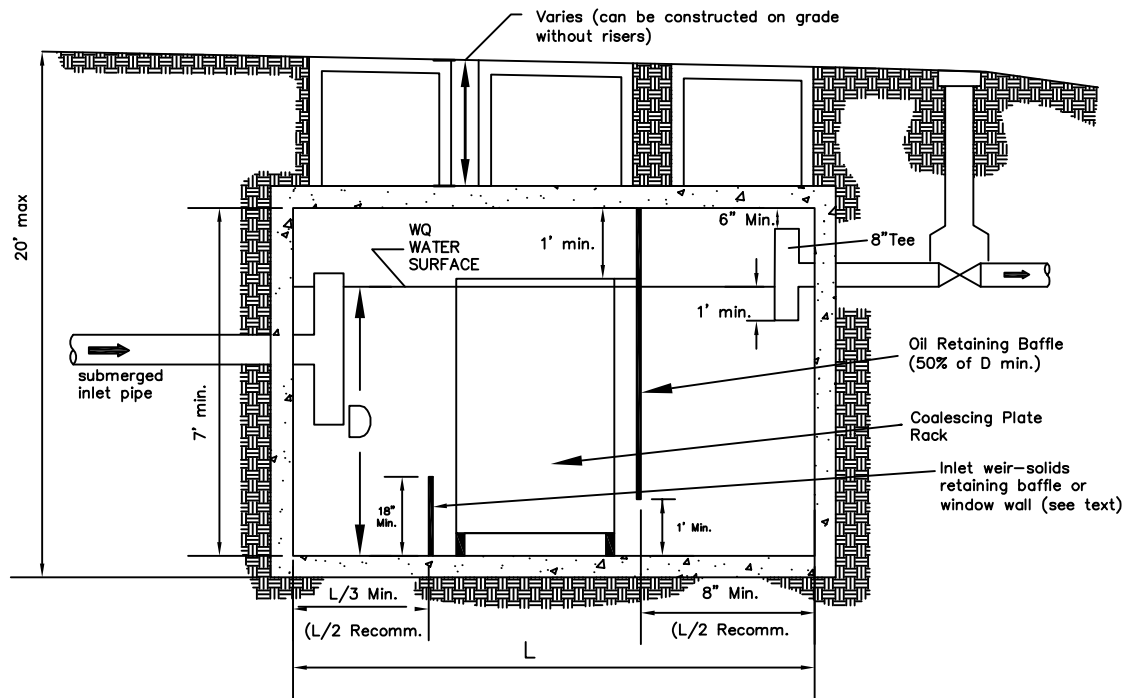
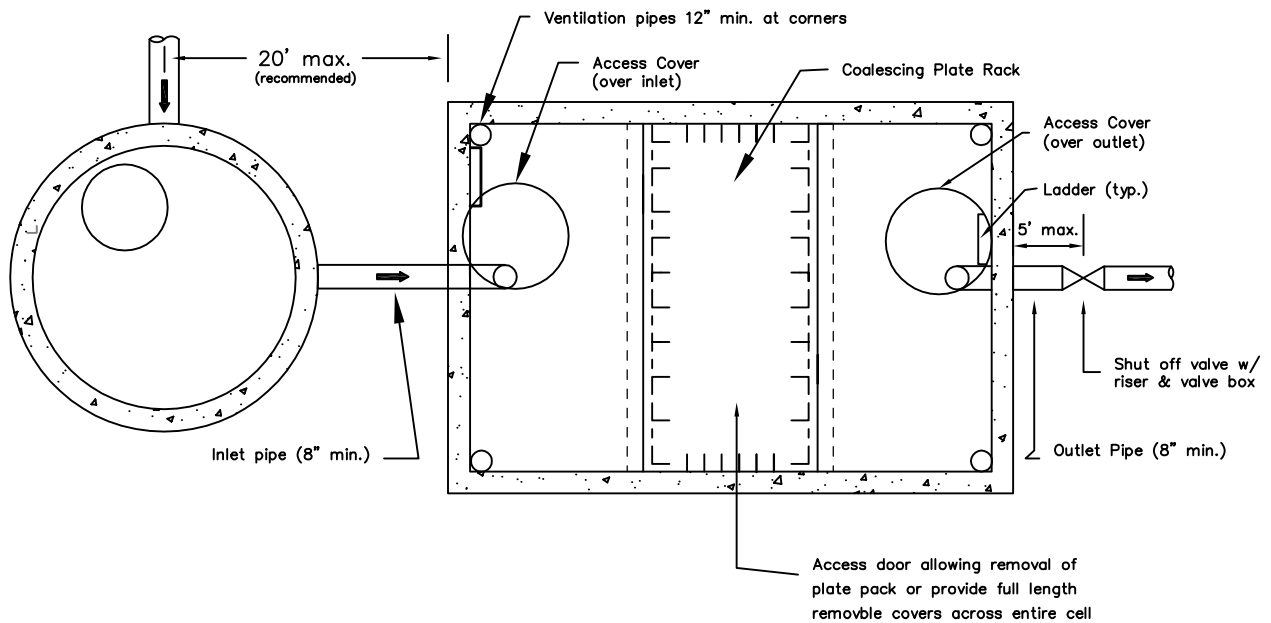
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*Dwight D. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE



**LAKE STEVENS  
PUBLIC WORKS**

**STANDARD COALESCING  
PLATE SEPARATOR**

STANDARD PLAN 5-040

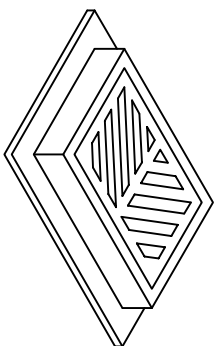
APPROVED BY

*David V. Ostergaard*

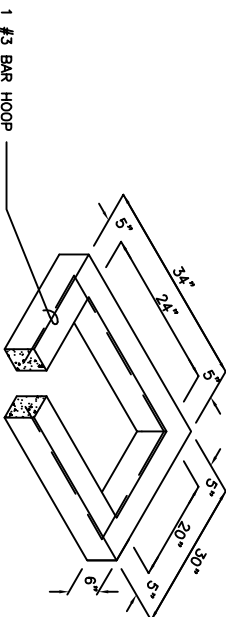
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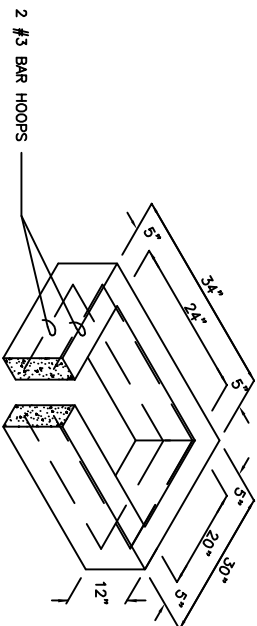
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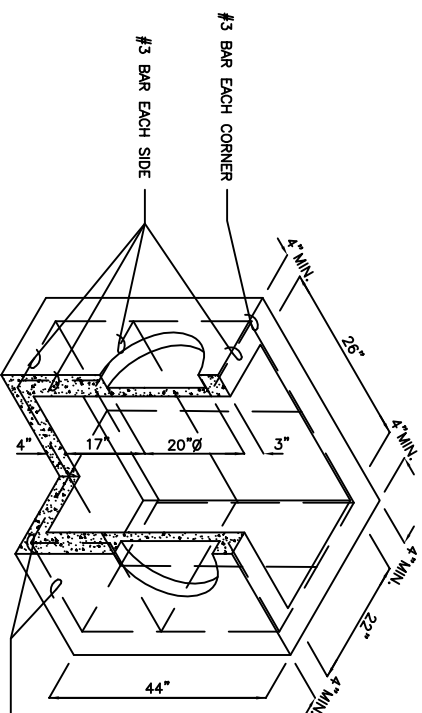
FRAME AND GRATE  
SEE SEC. 5-107D  
AND  
APPLICABLE DWGS.



6" RISER SECTION



12" RISER SECTION



PRECAST BASE SECTION  
(MEASUREMENT AT THE TOP  
OF THE BASE)

# NOTES:

1. CATCH BASINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 (AASHTO M 199) & C890 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT/APWA STANDARD SPECIFICATIONS.
2. AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WELDED WIRE FABRIC HAVING A MIN. AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED. WELDED WIRE FABRIC SHALL COMPLY TO ASTM A497 (AASHTO M 221). WIRE FABRIC SHALL NOT BE PLACED IN KNOCKOUTS.
3. ALL REINFORCED CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000.
4. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. ALL PIPE SHALL BE INSTALLED IN FACTORY PROVIDED KNOCKOUTS. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT.
5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAM. PLUS CATCH BASIN WALL THICKNESS.
6. ROUND KNOCKOUTS MAY BE ON ALL 4 SIDES, WITH MAX. DIAM. OF 20". KNOCKOUTS MAY BE EITHER ROUND OR "D" SHAPE.
7. THE MAX. DEPTH FROM THE FINISHED GRADE TO THE PIPE INVERT IS 5'-0".
8. THE TAPER ON THE SIDES OF THE PRECAST BASE SECTION AND RISER SECTION SHALL NOT EXCEED 1/2"/FT.
9. CATCH BASIN FRAME AND GRATE SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS AND MEET THE STRENGTH REQUIREMENTS OF FEDERAL SPECIFICATION RR-F-621D. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
10. FRAME AND GRATE MAY BE INSTALLED WITH FLANGE DOWN OR CAST INTO RISER.
11. FOR CATCH BASINS IN PARKING LOTS REFER TO WSDOT/APWA STANDARD DWG. B1-b.
12. EDGE OF RISER OR BRICK SHALL NOT BE MORE THAN 2" FROM VERTICAL EDGE OF CATCH BASIN WALL.
13. MINIMUM 4" ADJUSTMENT SECTION BETWEEN BOTTOM OF GRATE AND TOP OF BASE SECTION.



TYPE 1  
CATCH BASIN  
(18" MAX DIA.)

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 5-050

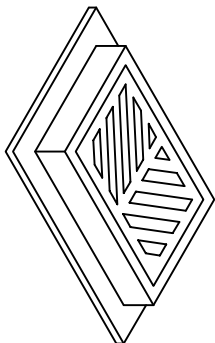
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*Daniel M. Berglund*

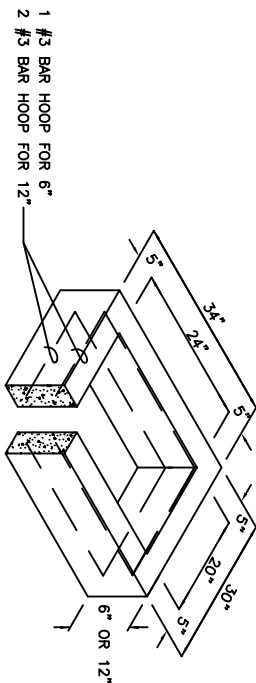
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05/09

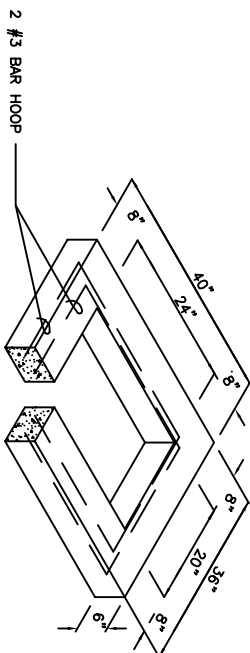
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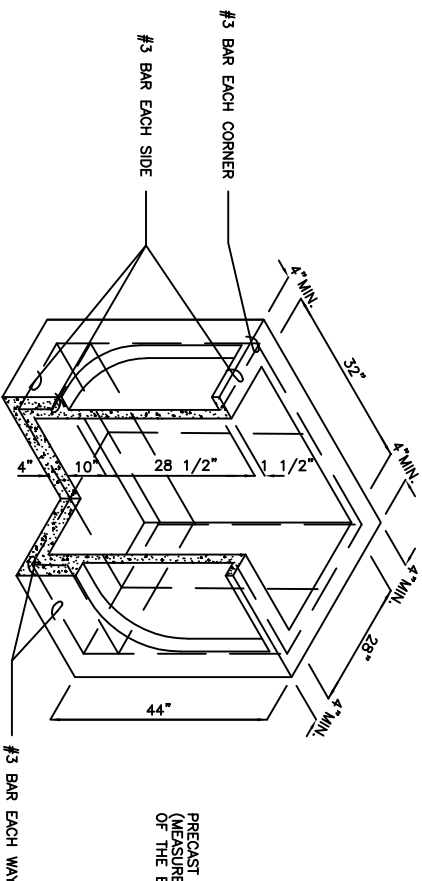
FRAME AND GRATE  
SEE SEC. 5-107D AND  
APPLICABLE DWCS.



RISER SECTION



6" REDUCING SECTION



PRECAST BASE SECTION  
(MEASUREMENT AT THE TOP  
OF THE BASE)

# NOTES:

- CATCH BASINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 (ASHTO M 199) & C890 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT/APWA STANDARD SPECIFICATIONS.
- AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WELDED WIRE FABRIC HAVING A MIN. AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED. WELDED WIRE FABRIC SHALL COMPLY TO ASTM A497 (ASHTO M 221). WIRE FABRIC SHALL NOT BE PLACED IN KNOCKOUTS.
- ALL REINFORCED CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000.
- PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. ALL PIPE SHALL BE INSTALLED IN FACTORY PROVIDED KNOCKOUTS. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT.
- KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAM. PLUS CATCH BASIN WALL THICKNESS.
- KNOCKOUTS MAY BE ON ALL 4 SIDES WITH MAX. DIAM. OF 28". KNOCKOUTS MAY BE EITHER ROUND OR "D" SHAPE.
- THE TAPER ON THE SIDES OF THE PRECAST BASE SECTION AND RISER SECTION SHALL NOT EXCEED 1/2"/FT.
- CATCH BASIN FRAME AND GRATE SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS AND MEET THE STRENGTH REQUIREMENTS OF FEDERAL SPECIFICATION RR-F-621D. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
- FRAME AND GRATE MAY BE INSTALLED WITH FLANGE DOWN OR CAST INTO RISER.
- MAX. DEPTH FROM FINISHED GRADE TO PIPE INVERT SHALL BE 5'-0".
- EDGE OF REDUCING SECTION OR BRICK SHALL NOT BE MORE THAN 2" FROM VERTICAL EDGE OF CATCH BASIN WALL.
- MINIMUM 4" ADJUSTMENT SECTION BETWEEN BOTTOM OF GRATE AND TOP OF BASE SECTION.



TYPE 1-L CATCH BASIN  
(18"-28" DIA.)

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 5-060

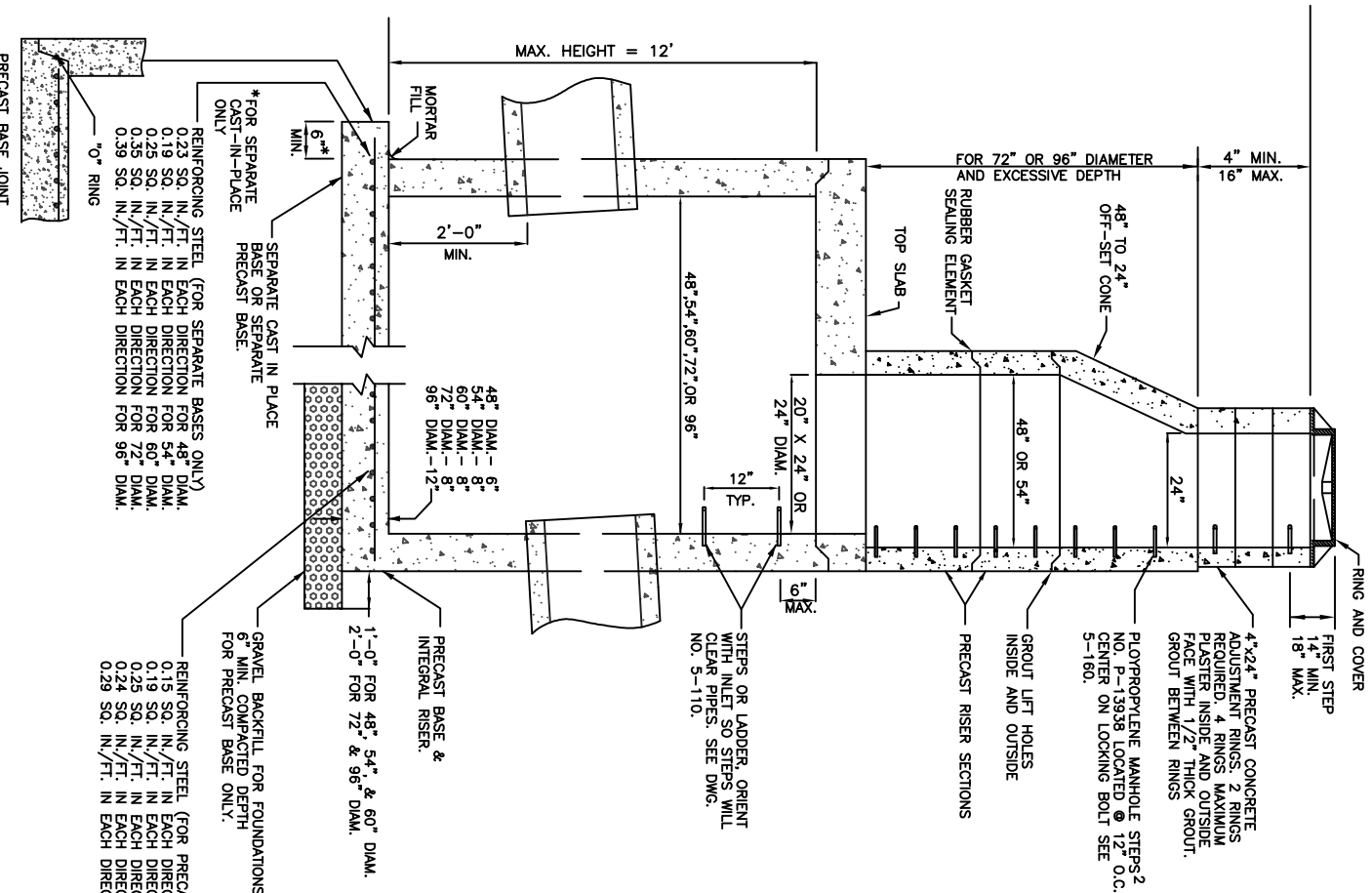
APPROVED BY

*Dwight A. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE



#### NOTES:

1. CATCH BASINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 (AASHTO M199) AND ASTM C880 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT/APWA STANDARD SPECIFICATIONS.
2. HANDHOLDS IN ADJUSTMENT SECTION SHALL HAVE 3" MIN. CLEARANCE. STEPS IN CATCH BASIN SHALL HAVE 6" MIN. CLEARANCE. SEE DWG. NO. 5-110. CATCH BASIN DETAILS. HANDHOLDS SHALL BE PLACED IN ALTERNATING GRADE RINGS OR LEVELING BRICK COURSE WITH A MIN. OF ONE HANDHOLD BETWEEN THE LAST STEP AND TOP OF THE MANHOLE.
3. ALL REINFORCED CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
4. PRECAST BASES SHALL BE FURNISHED WITH CUTOUPS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE WALL THICKNESS OF 2" MIN. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT. PIPES SHALL BE INSTALLED ONLY IN FACTORY KNOCKOUTS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
5. KNOCKOUT OR CUTOUP HOLE SIZE SHALL EQUAL PIPE OUTER DIAM. PLUS CATCH BASIN WALL THICKNESS. MAX. HOLE SIZE SHALL BE 36" FOR 48" CATCH BASIN, 42" FOR 54" C.B., 48" FOR 60" C.B., 60" FOR 72" C.B., 84" FOR 96" C.B. MIN. DISTANCE BETWEEN HOLES SHALL BE 8" FOR 48", 54", AND 60" C.B.; 12" FOR 72" AND 96" C.B.
6. CATCH BASIN FRAMES AND GRATES OR COVERS SHALL BE IN ACCORDANCE WITH SEC. 5-107(D) AND MEET THE STRENGTH REQUIREMENTS OF FEDERAL SPECIFICATION RR-F-621D. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
7. ALL BASE REINFORCING STEEL SHALL HAVE A MIN. YIELD STRENGTH OF 60,000 PSI AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MIN. CLEARANCE.
8. MIN. SOIL BEARING VALUE SHALL EQUAL 3,300 POUNDS PER SQUARE FOOT.
9. FOR DETAILS SHOWING LADDER, STEPS, HANDRAILS AND TOP SLABS, SEE DWG. NO. 5-110.
10. SEE THE WSDOT/APWA STANDARD SPECIFICATIONS SEC. 7-05.3 FOR JOINT REQUIREMENTS.



TYPE 2 CATCH BASIN  
48", 54", 72", 96"

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STANDARD PLAN 5-070

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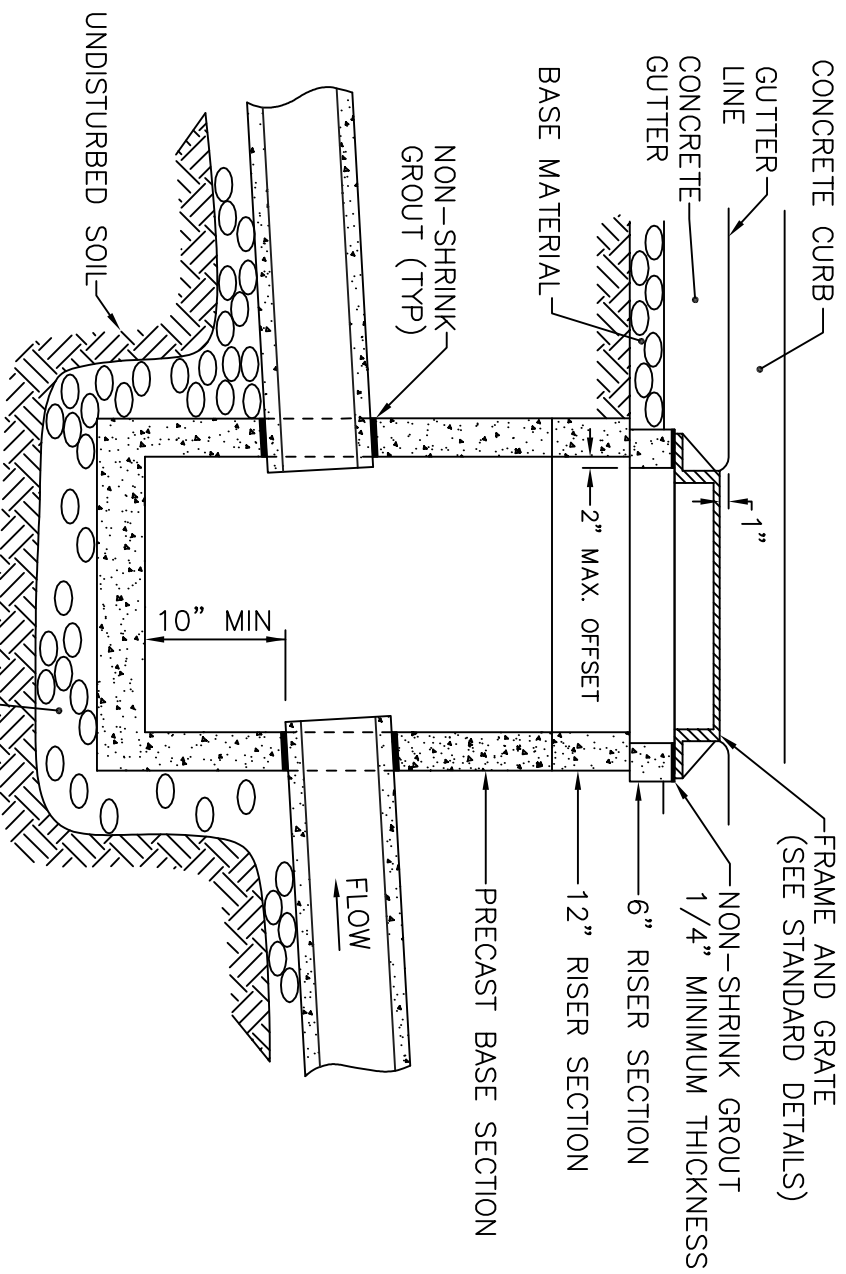
*Daniel M. Berglund*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

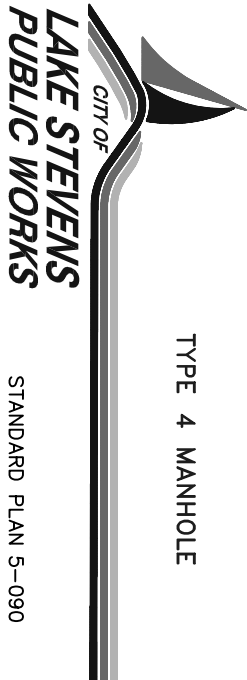
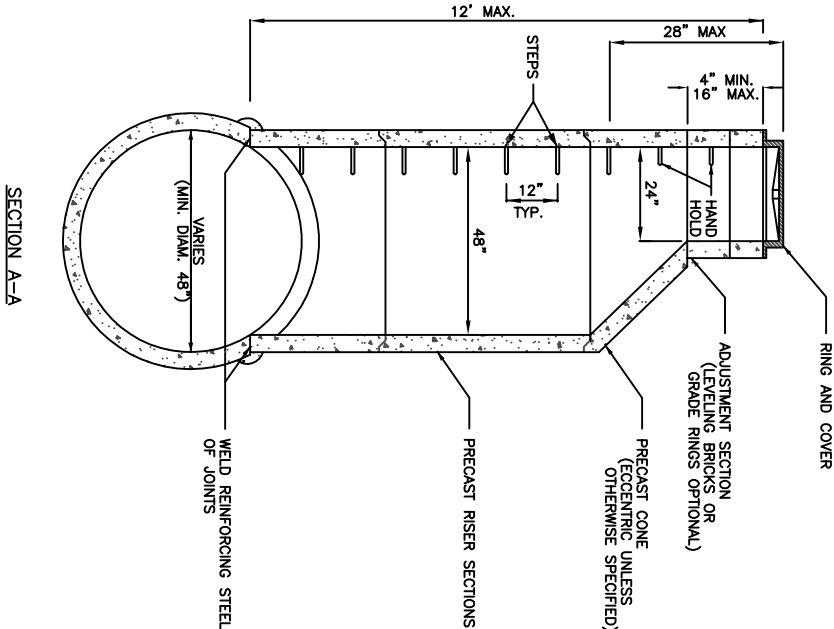
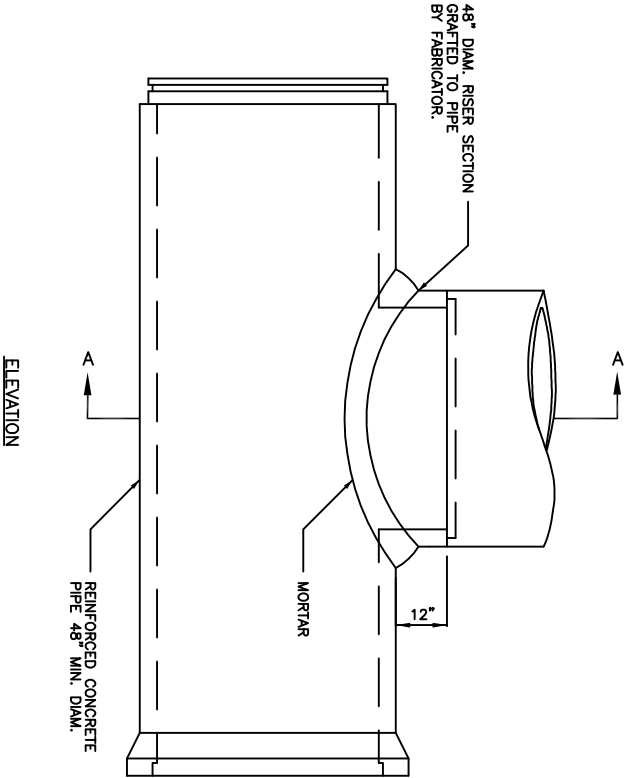
DATE



TYPE 1 & 1L  
CATCH BASIN  
INSTALLATION DETAIL

STANDARD PLAN 5-080

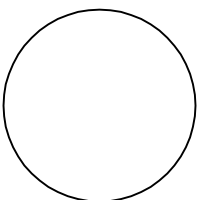
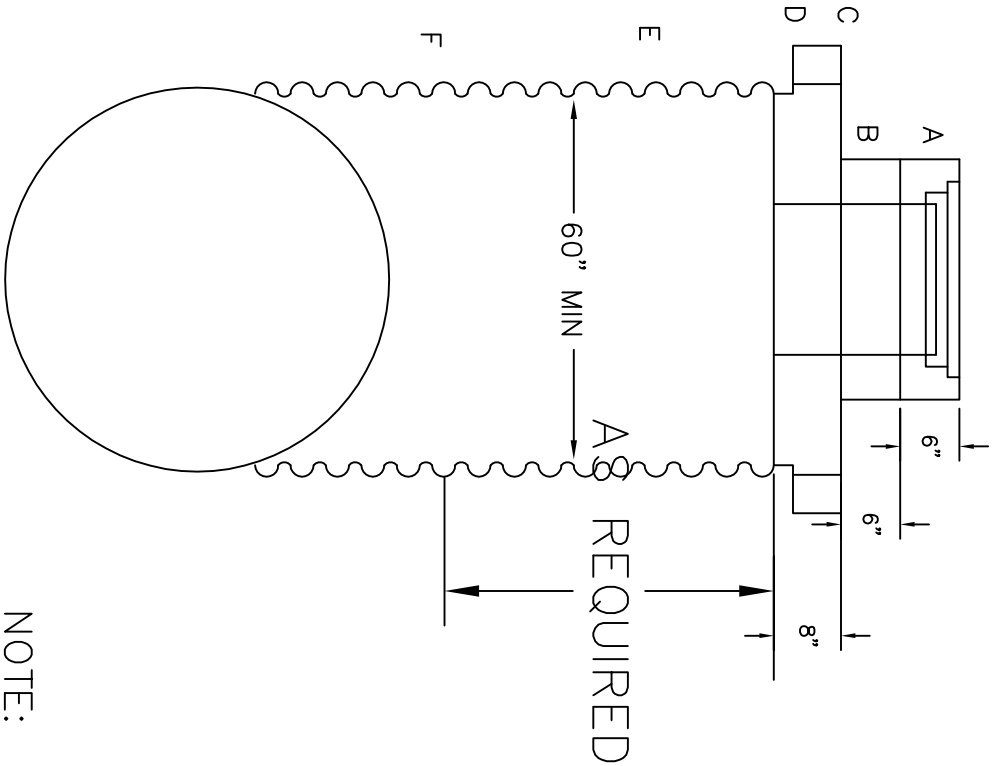
- NOTES:
1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M199 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT/APWA STANDARD SPECIFICATIONS.
  2. HANDHOLDS IN ADJUSTMENT SECTION SHALL HAVE 3" MIN. CLEARANCE. STEPS IN MANHOLE SHALL HAVE 6" MIN. CLEARANCE. SEE DWG. NO. 5-110, "MANHOLE DETAILS."
  3. MANHOLE RINGS AND COVERS SHALL BE IN ACCORDANCE WITH SEC. 5-107 AND MEET THE STRENGTH REQUIREMENTS OF FEDERAL SPECIFICATION RR-F-621D. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
  4. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
  5. FOR DETAILS SHOWING GRADE RING, LADDER, STEPS, HANDHOLDS, AND TOP SLABS, SEE DWG. NO. 5-110, "MANHOLE DETAILS."
  6. NOT FOR USE IN TRAFFIC BEARING AREAS.



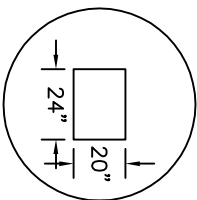


- A. CONCRETE TOP SLAB: SHORT ADJUSTMENT SECTION WITH DUCTILE IRON FRAME AND GRATE, PER STDs.
- B. CONCRETE 6" ADJUSTMENT SECTION AS REQUIRED.
- C. CONCRETE REDUCING FLAT SLAB: UNITS "M", "N", "P", OR "R", AS REQUIRED BY PLANS.
- D. OPTIONAL STEEL LID FOR HS20 LOAD.
- E. RISER: 10 GAUGE, 54" HELICAL OR ANULAR CORRUGATED PIPE IN HEIGHTS AS REQUIRED. FOR HEIGHTS GREATER THAN 4' USE PRE FABRICATED LADDER PER APWA STANDARD PLAN B-13.
- F. CORRUGATED PIPE 60" AND GREATER IN DIAMETER WITH GAUGE AND SIZE AS REQUIRED ON PLAN.

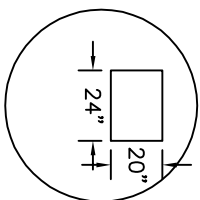
NOTE: ALL METAL PARTS AND SURFACES MUST BE MADE OF CORROSION RESISTANT MATERIAL OR ASPHALT COATED GALVANIZED, TREATMENT #1 OR BETTER; COMPLETE CORROSION PROTECTION MUST BE ASSURED.



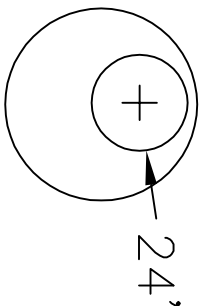
UNIT "M"



UNIT "N"



UNIT "P"



UNIT "R"

NOTE:  
NOT FOR PUBLIC  
ROADWAY CONSTRUCTION



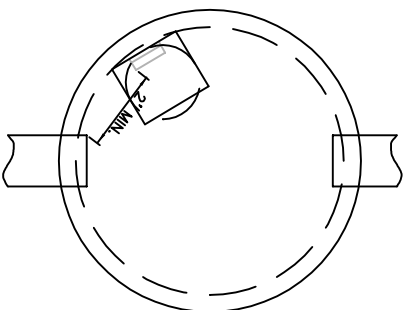
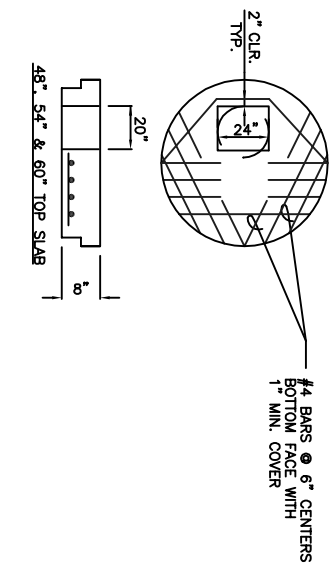
**OFFSET CORRUGATED  
MANHOLE**

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PUBLIC WORKS**

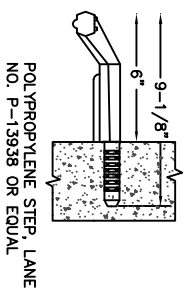
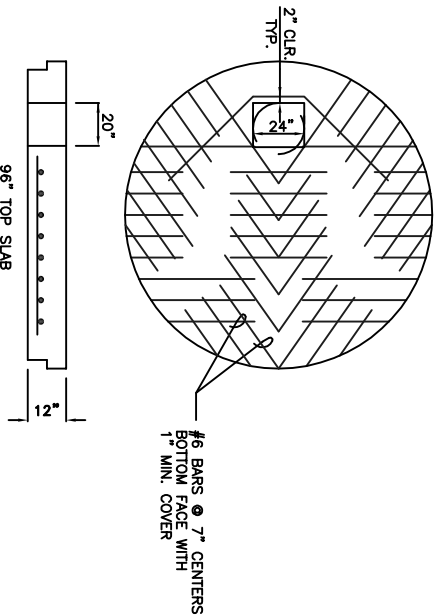
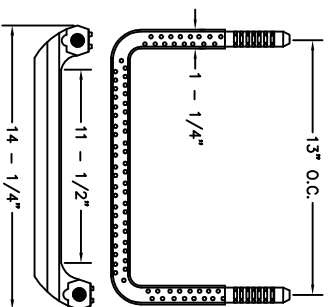
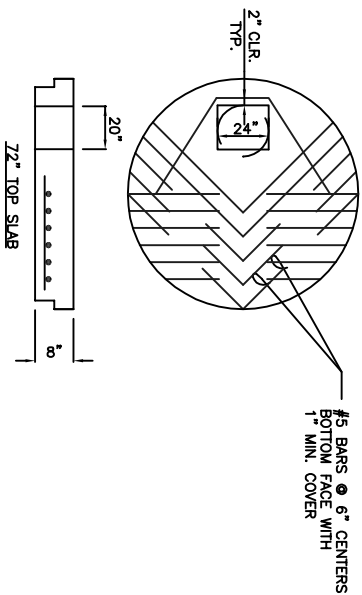
STANDARD PLAN 5-100

APPROVED BY  
*Daniel M. Berglund*  
LAKE STEVENS CITY ENGINEER

05/09  
DATE



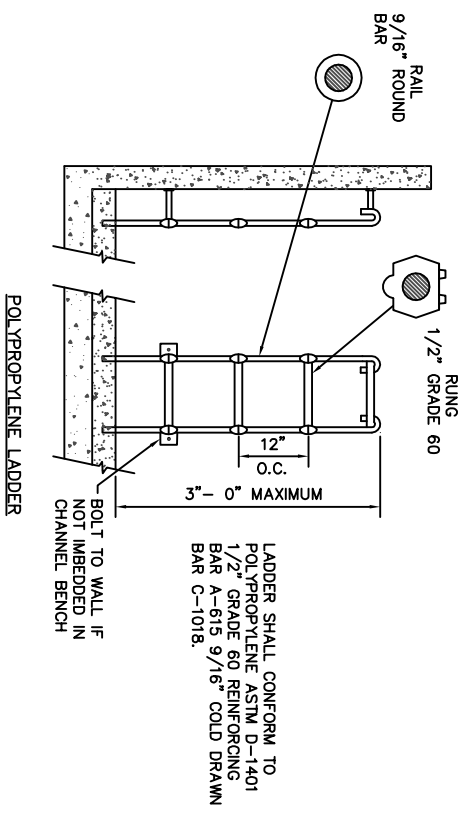
TYPICAL ORIENTATION  
FOR ACCESS AND STEPS



POLYPROPYLENE MANHOLE STEPS

NOTES:

1. PROPRIETARY CATCH BASIN HANDHOLDS AND STEPS ARE ACCEPTABLE PROVIDED THAT THEY CONFORM TO SEC. R, ASTM C478, AASHTO M-199 AND MEET ALL WISHA REQUIREMENTS.
2. CATCH BASIN STEP/HANDHOLD LEGS SHALL BE PARALLEL OR APPROXIMATELY RADIAL AT THE OPTION OF THE MANUFACTURER, EXCEPT THAT ALL STEPS IN ANY CATCH BASIN SHALL BE SIMILAR. PENETRATION OF OUTER WALL BY A LEG IS PROHIBITED.
3. SLAB OPENING MAY BE 24" X 20" OR 24" DIAM.
4. AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WELDED WIRE FABRIC HAVING A MIN. AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED. WELDED WIRE FABRIC SHALL COMPLY TO ASTM A497.
5. LADDERS OR STEPS SHALL EXTEND TO WITHIN 16" OF BOTTOM OF CATCH BASIN.
6. HANGING LADDERS SHALL BE PERMANENTLY FASTENED AT TOP BY HANGING ON STEP AND BY BOLTING OR EMBEDDING IN CONCRETE. EACH SHALL BE EMBEDDED AT BOTTOM IN BASE.
7. ADDITIONAL SAFETY FEATURES MAY BE REQUIRED IN VERY DEEP OR UNUSUAL STRUCTURES.

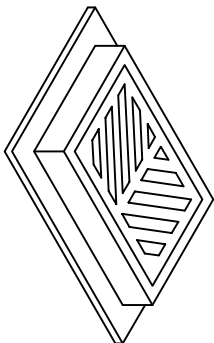


LADDER SHALL CONFORM TO  
POLYPROPYLENE ASTM D-1401  
1/2" GRADE 60 REINFORCING  
BAR A-615 9/16" COLD DRAWN  
BAR C-1018.

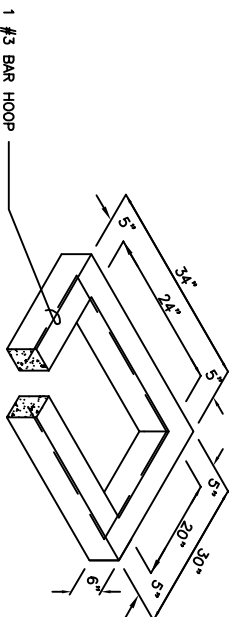
**CITY OF  
LAKE STEVENS  
PUBLIC WORKS**

**CATCH BASIN &  
MANHOLE DETAILS**

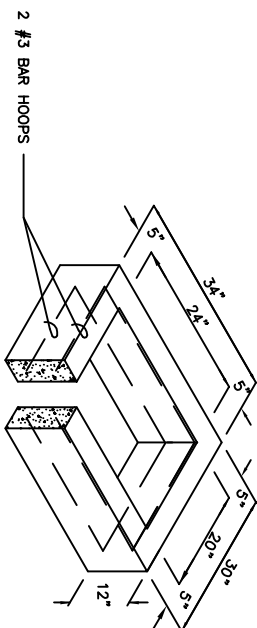
STANDARD PLAN 5-110



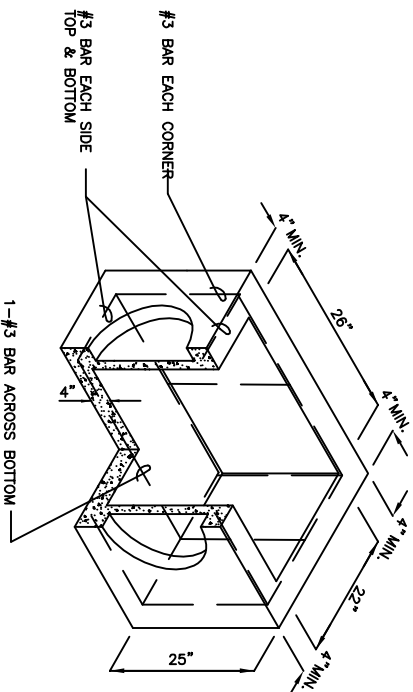
FRAME AND GRATE  
SEE SEC. 5-107D AND  
APPLICABLE DWGS.



6" RISER SECTION



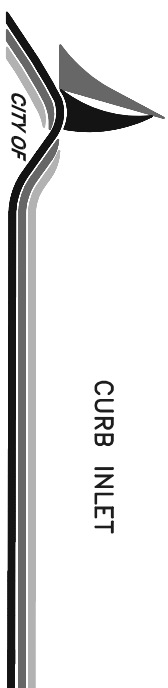
12" RISER SECTION



PRECAST BASE SECTION  
(MEASUREMENT AT THE TOP  
OF THE BASE)

# NOTES:

1. CURB INLET TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 & C890 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE STANDARD SPECIFICATIONS.
2. AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WELDED WIRE FABRIC HAVING A MIN. AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED. WELDED WIRE FABRIC SHALL COMPLY TO ASTM A497. WIRE FABRIC SHALL NOT BE PLACED IN KNOCKOUTS.
3. ALL REINFORCED CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000.
4. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. ALL PIPE SHALL BE INSTALLED IN FACTORY PROVIDED KNOCKOUTS. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT.
5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAM. PLUS CURB INLET WALL THICKNESS.
6. ROUND KNOCKOUTS MAY BE ON ALL 4 SIDES WITH MAX. DIAM. OF 17".
7. THE MAX. DEPTH FROM THE FINISHED GRADE TO THE PIPE INVERT IS 5'-0".
8. THE TAPER ON THE SIDES OF THE PRECAST BASE SECTION AND RISER SECTION SHALL NOT EXCEED 1 1/2"/FT.
9. CONCRETE INLET FRAME AND GRATES SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS AND MEET THE STRENGTH REQUIREMENTS OF FEDERAL SPECIFICATION RR-F-621D. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY OTHER COVER POSITION.
10. FRAME AND GRATE MAY BE INSTALLED WITH FLANGE DOWN OR CAST INTO RISER.
11. MAXIMUM DIAMETER OUTLET 8", MUST BE DIRECTLY CONNECTED TO CATCH BASIN.



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STANDARD PLAN 5-120

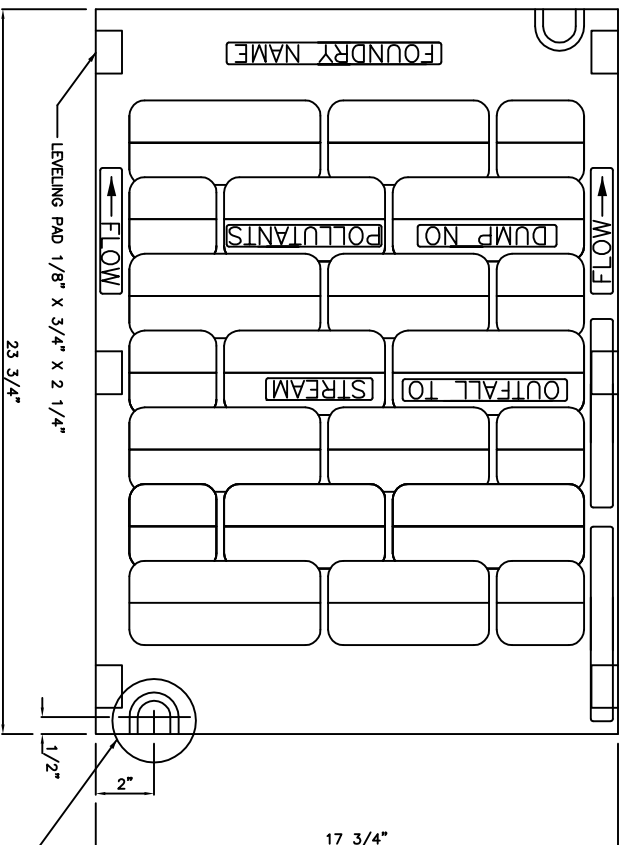
APPROVED BY \_\_\_\_\_

*Dwight A. Berglund*

LAKE STEVENS CITY ENGINEER

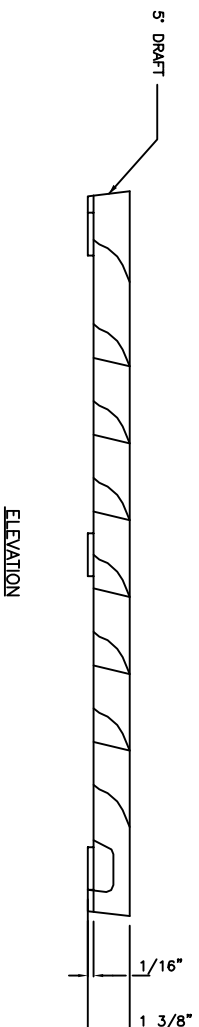
05/09

DATE



FOR SLOT DETAIL SEE  
DWG. NO. 5-080

PLAN



NOTES:

1. SELF-LOCK VANED GRATE MANUFACTURER SUBJECT TO APPROVAL BY ENGINEER.
2. USE WITH TWO LOCKING BOLTS 5/8"-11 NC STAINLESS TYPE 304 STEEL SOCKET HEAD (ALLEN HEAD) CAP SCREWS 2" LONG. NOTE SLOT DETAIL.
3. MATERIAL IS DUCTILE IRON ASTM A536 GRADE 80-55-06.
4. "OUTFALL TO STREAM DUMP NO POLLUTANTS" MAY BE LOCATED ON BORDER AREA.
5. SEE SEC. 5-107(D).
6. SEE STANDARD PLAN 5-190 FOR FRAME.
7. SHALL BE USED ON ALL ROADS WITH SLOPES EQUAL TO OR GREATER THAN 3%.



STANDARD PLAN 5-130

APPROVED BY

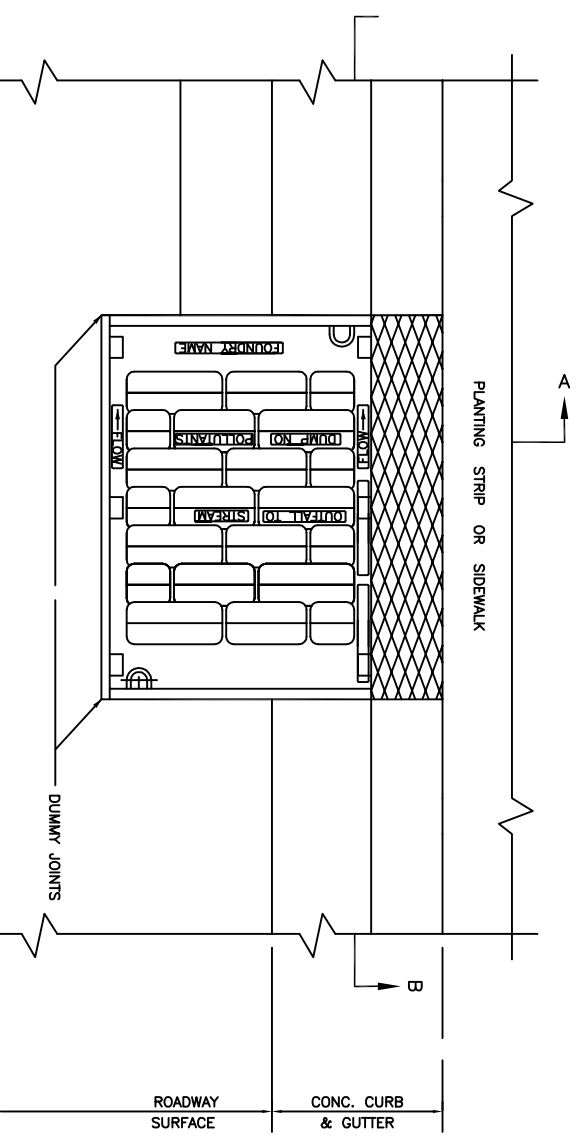
*Dwight A. Berglund*

LAKE STEVENS CITY ENGINEER

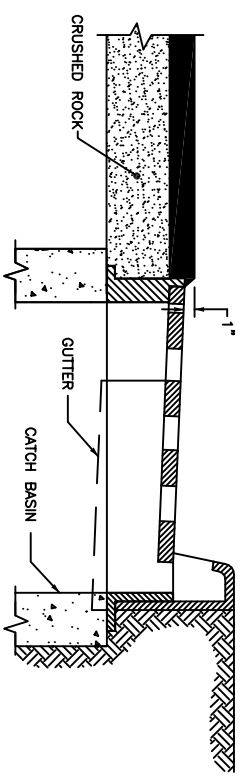
05/09

DATE

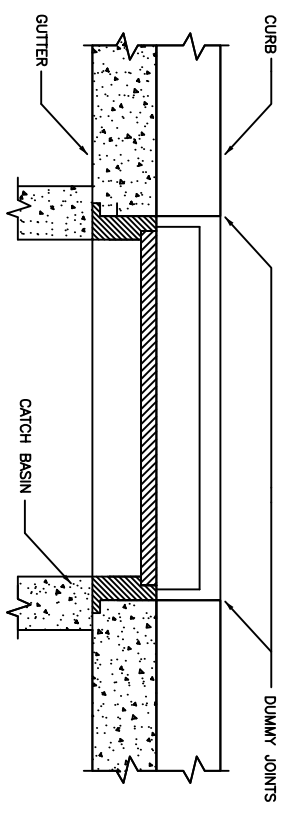




PLAN

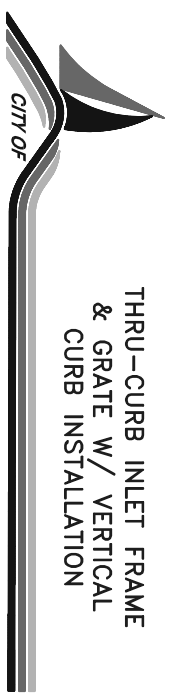


SECTION A-A



SECTION B-B

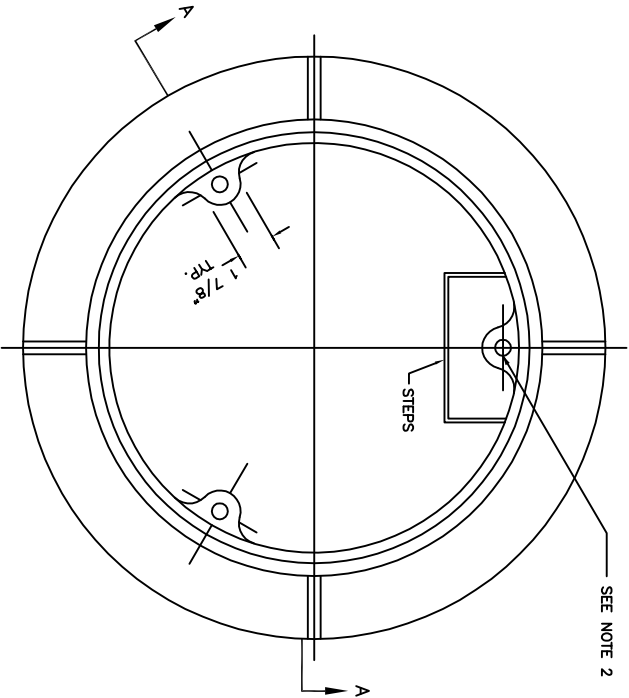
- NOTES:
1. SET TO GRADE AND CONSTRUCT ROAD AND GUTTER TO BE FLUSH WITH FRAME.
  2. SEE EXPANSION JOINT REQUIREMENTS, SECTION 3.



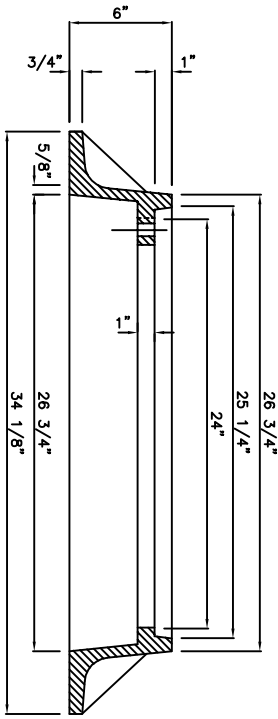
THRU-CURB INLET FRAME  
& GRATE W/ VERTICAL  
CURB INSTALLATION

LAKE STEVENS  
PUBLIC WORKS

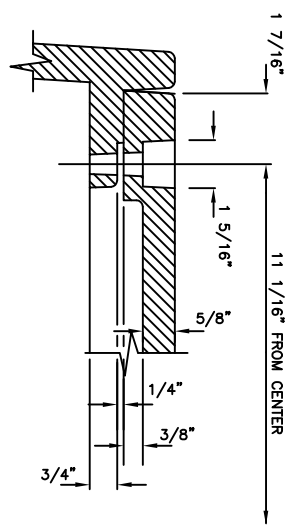
STANDARD PLAN 5-150



PLAN



SECTION A-A

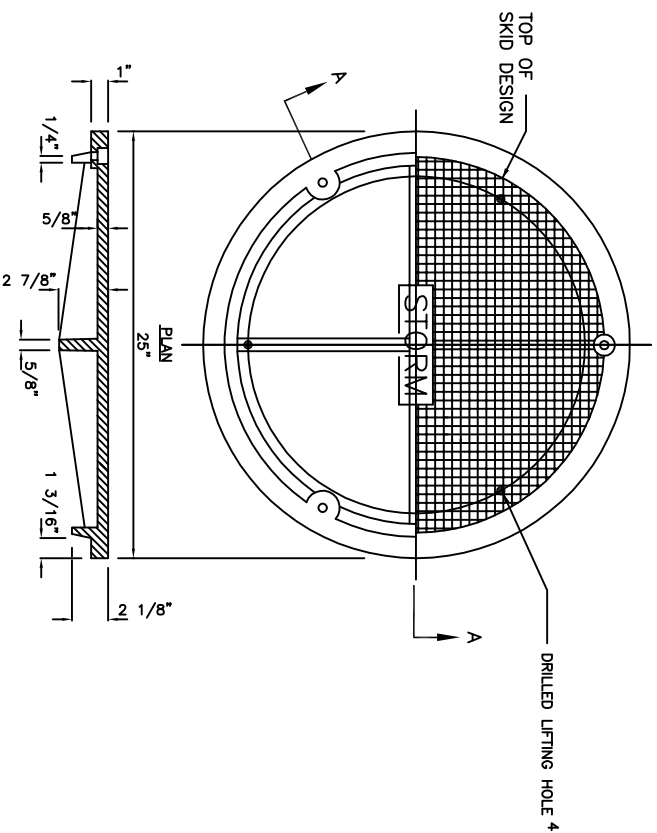


BOLT-DOWN DETAIL

- NOTES:
1. MATERIAL IS CAST IRON ASTM A48 CLASS 30.
  2. DRILL AND TAP THREE 5/8"-11 NC HOLES THROUGH FRAME AT 120° AND 11 1/16" RADIUS.
  3. SEE SEC. 5-107(D)
  4. FOR INSTALLATION SEE DWG. NO. 5-107(D).



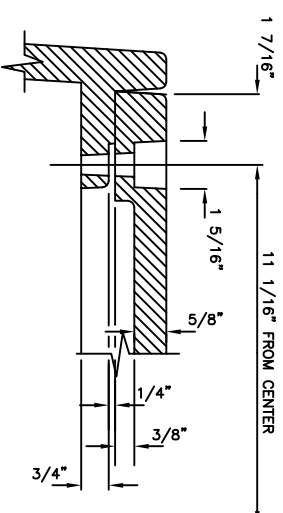
STANDARD PLAN 5-160



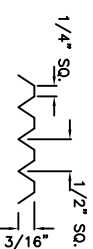
SECTION A-A

NOTES:

1. USE WITH THREE LOCKING BOLTS 5/8"-11 NC STAINLESS TYPE 304 STEEL SOCKET HEAD (ALLEN HEAD) CAP SCREWS 2" LONG. DRILL HOLES SPACED 120° AT 11 1/16" RADIUS.
2. MATERIAL IS DUCTILE IRON ASTM A536 GRADE 80-55-06
3. SEE SEC. 5-107(D).
4. DRILL THREE 1 INCH HOLES SPACED AT 120° AND 9 1/2" RADIUS.
5. FOR INSTALLATION SEE DWG. NO. 5-070.



BOLT-DOWN DETAIL



COVER SKID DESIGN DETAIL



LOCKING MANHOLE  
COVER DETAIL

STANDARD PLAN 5-170

APPROVED BY

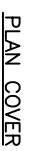
*Dwight M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE





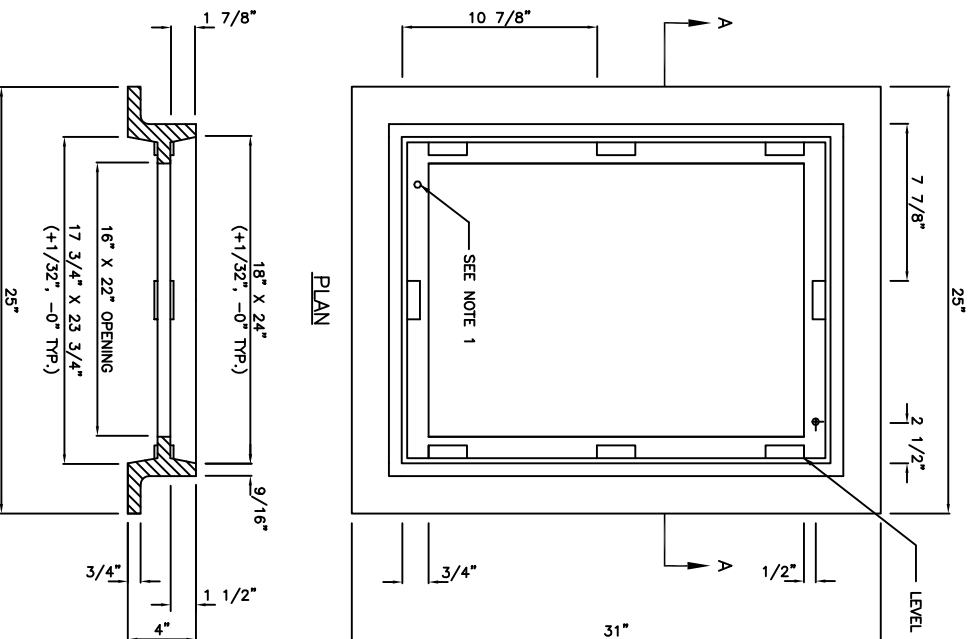
- NOTES:



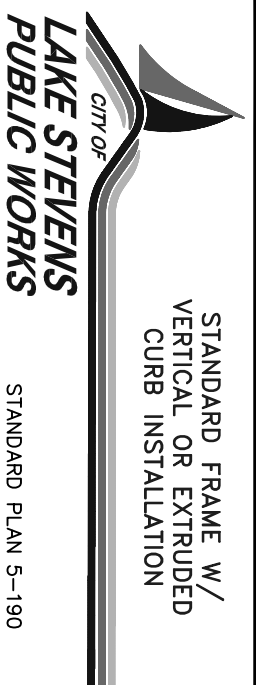
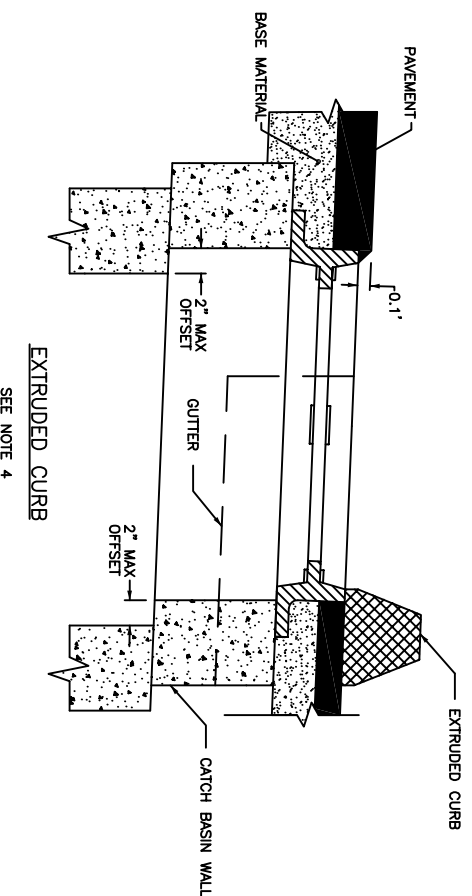
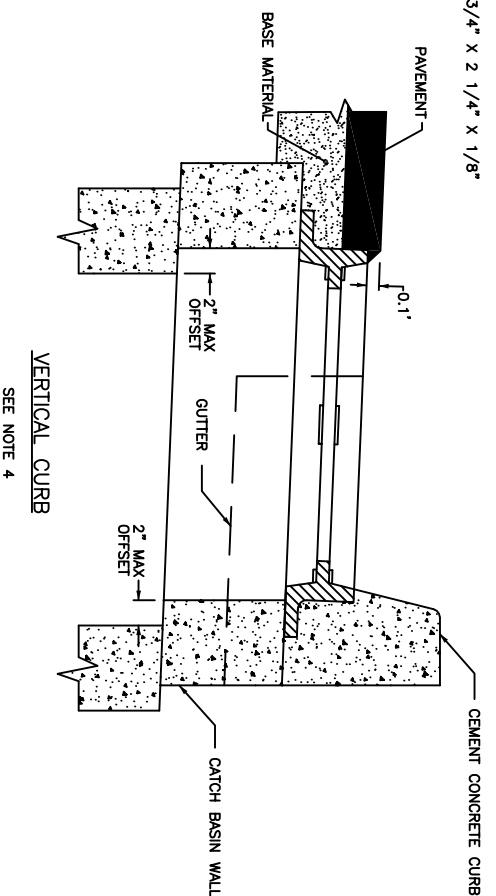
STANDARD PLAN 5-180

David D. Chetani

05/09



- NOTES:
1. DRILL AND TAP FOR, AND PROVIDE, TWO LOCKING BOLTS 5/8"-11 NC STAINLESS TYPE 304 STEEL SOCKET HEAD (ALLEN HEAD) CAP SCREWS 2" LONG WHEN USED WITH SOLID COVER (DWG. NO. 5-180).
  2. FRAME MATERIAL IS CAST IRON PER ASTM A48 CLASS 30.
  3. SET FRAME TO GRADE AND CONSTRUCT ROAD AND GUTTER TO BE FLUSH WITH FRAME.
  4. SEE SEC. 5-107(D).





4. UNDERDRAINS ARE REQUIRED IN SOILS WITH INFILTRATION RATES INADEQUATE TO MEET MAXIMUM POOL AND SYSTEM DEWATER RATES.
5. SEE LID-07 FOR CURB INLETS.
6. ZONE 1 PLANTINGS SHOULD BE USED BELOW THE DESIGN WATER ELEVATION.
7. USE OF ALL LID PRACTICES ARE DEPENDANT OF SITE CONDITIONS AND REQUIRE THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR DESIGNEE.

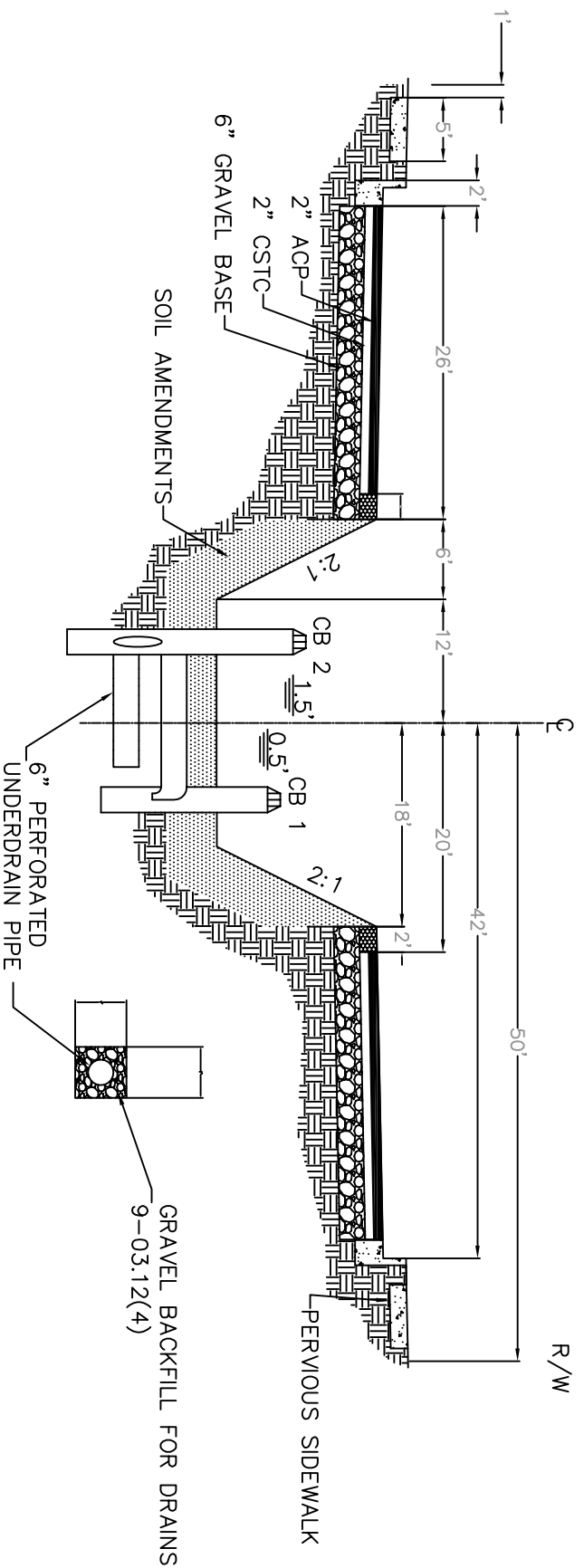


STANDARD PLAN 5-251

David D. Chetani

05/09

DATE \_\_\_\_\_



CB 1 – DETENTION CB  
RIM ELEV. SET 6 INCHES ABOVE FINISHED GRADE.  
SHOULD BE CB TYPE 1 OR EQUIVALENT 18" DIAMETER ADS TYPE.  
OUTLET IS DOWNTURNED ELBOW WITH ORIFICE. CONNECT OUTLET TO CB 2.

CB 2 – OVERFLOW CB  
RIM ELEV. SET 18 INCHES ABOVE FINISHED GRADE. CONNECT PERFORATED UNDERDRAIN PIPES TO CB. OUTLET TO CONVEYANCE CHANNEL WITHIN THE DEVELOPMENT OR TO DISPERSION TRENCH ADJACENT TO NATURAL RESOURCE PROTECTION AREA.

#### NOTES

- 1) IN BIORETENTION AREA COMPOST SHOULD BE AMENDED TO A 13 INCH DEPTH (ABOUT 5 INCHES OF COMPOST TO 8 INCHES OF SOIL). COMPACT SUBSOILS MUST BE SCARIFIED AT LEAST 4 INCHES BELOW THE 13 INCH DEEP AMENDED LAYER. THE BIORETENTION SOIL, COMPOSITION AND PH LEVELS SHALL MEET THE STANDARDS SET FORTH IN THE LID TECHNICAL GUIDANCE MANUAL FOR PUGET SOUND (CURRENT EDITION).
- 2) BIORETENTION AREA SHALL BE VEGETATED WITH NATIVE TREES AND SHRUBS HOWEVER VEGETATION WITHIN 6 FEET OF THE INSIDE RADIUS EDGE OF THE REINFORCED GRASS SHALL NOT BE OVER 18 INCHES IN HEIGHT.
- 3) USE OF ALL LID PRACTICES ARE DEPENDANT OF SITE CONDITIONS AND REQUIRE THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR DESIGNEE.



**LAKE STEVENS**  
**PUBLIC WORKS**

LID CUL-DE-SAC  
BIORETENTION SWALE

STANDARD PLAN 5-252

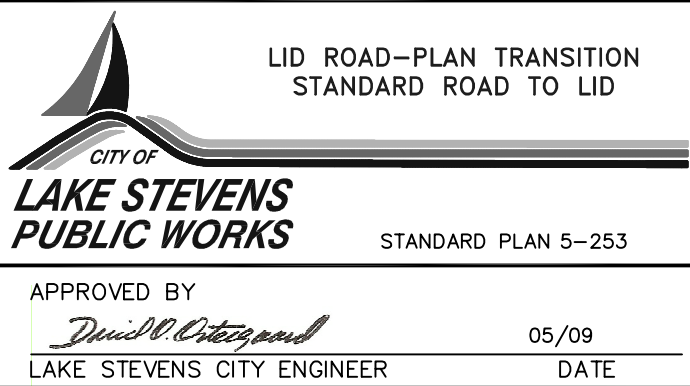
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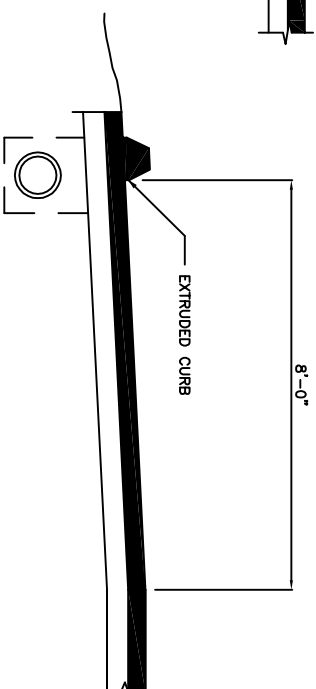
*Daniel M. Fitzgerald*

CITY LAKE STEVENS ENGINEER

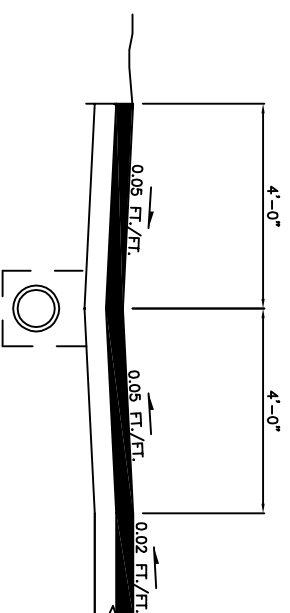
05/09

DATE





CURBED SHOULDER



## TURNPIKE SHOULDER

ROCK LINED SHOULDER  
DITCHES & CURBED OR  
TURNPIKE SHOULDERS

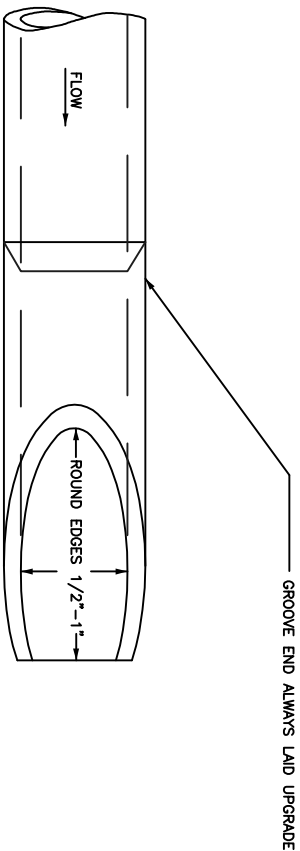
- ROCK LINED SHOULDER  
DITCHES & CURBED OR  
TURNPIKE SHOULDERS



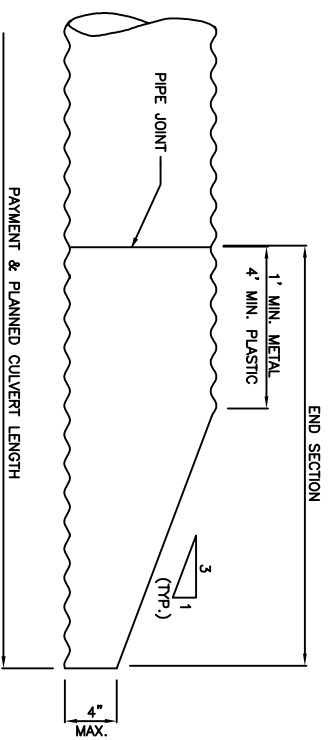
STANDARD PLAN 5-270

David D. Chetani

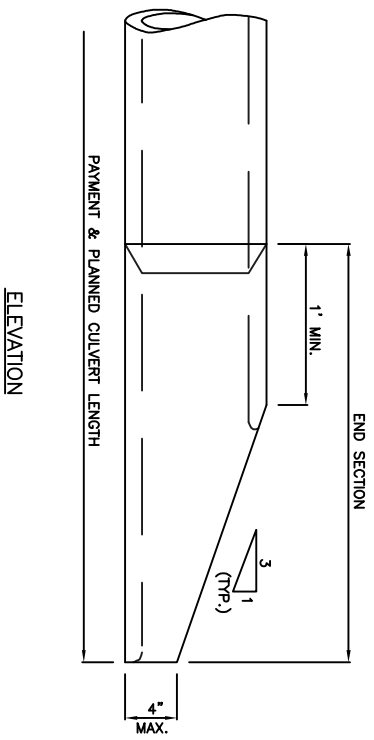
05/09



PLAN



METAL & PLASTIC PIPE

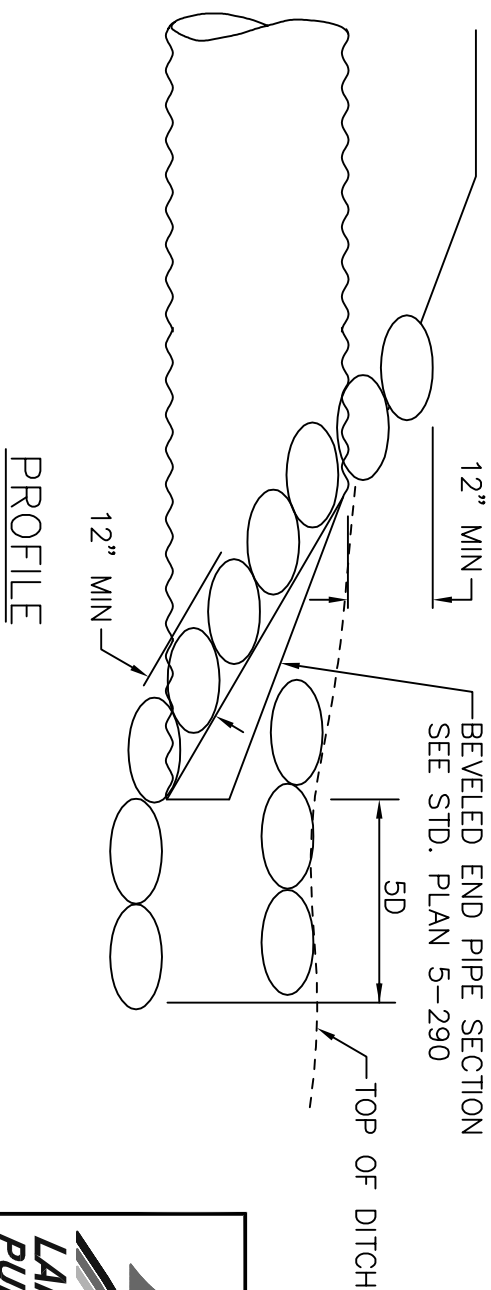
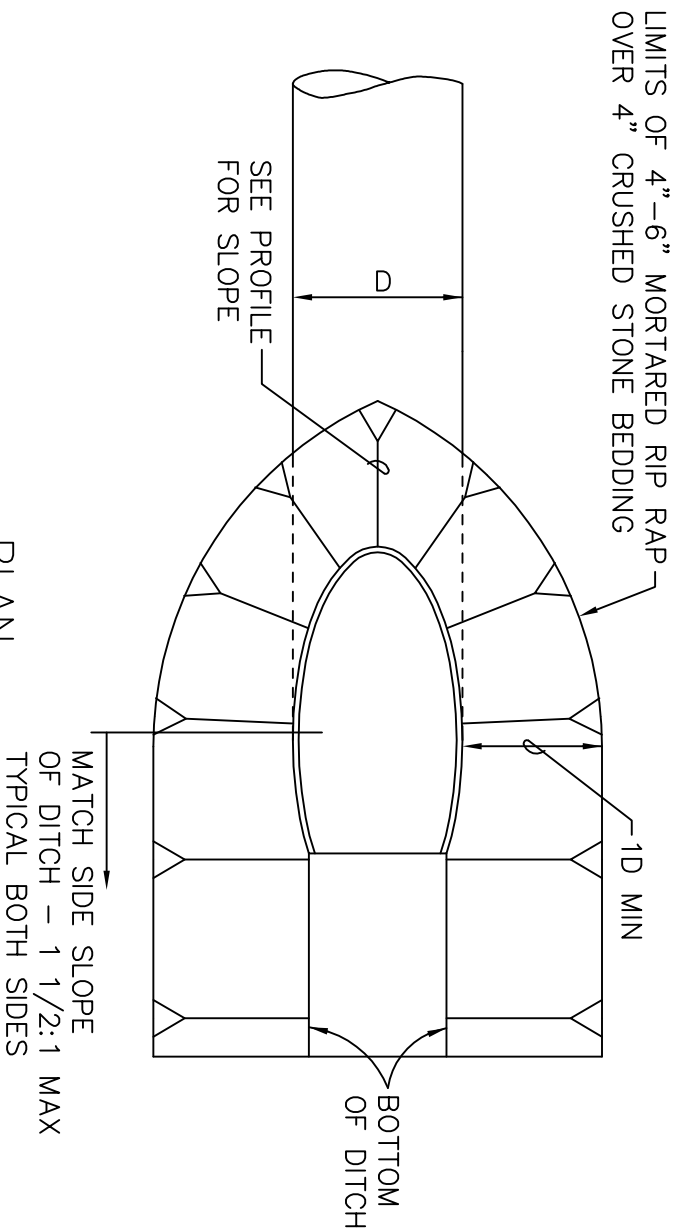


CONCRETE PIPE

NOTE:  
SIDE SLOPE SHALL BE WARPED TO MATCH THE BEVELED PIPE  
END. WHEN CULVERT IS ON SKEW, BEVELED END SHALL BE  
ROTATED TO CONFORM TO SLOPE. IF SLOPE DIFFERS FROM  
3:1, PIPE SHALL BE BEVELED TO MATCH SLOPE.



STANDARD PLAN 5-290



DEBRIS CAGE

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 5–310

APPROVED BY

*Daniel M. Berglund*

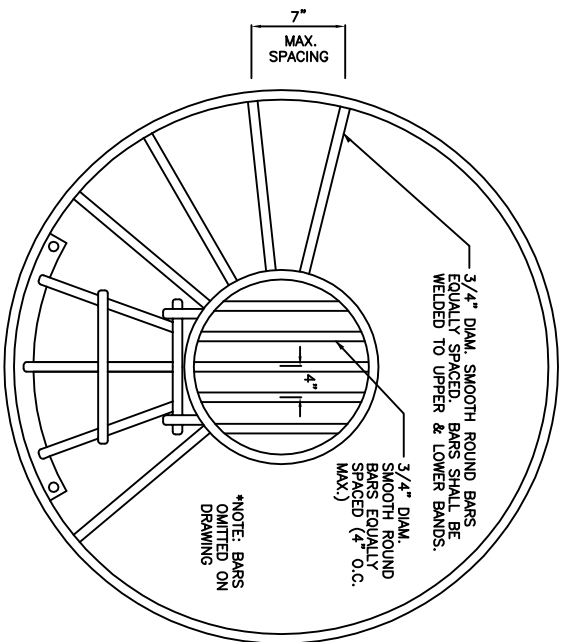
05/09

LAST REVISED 05/09

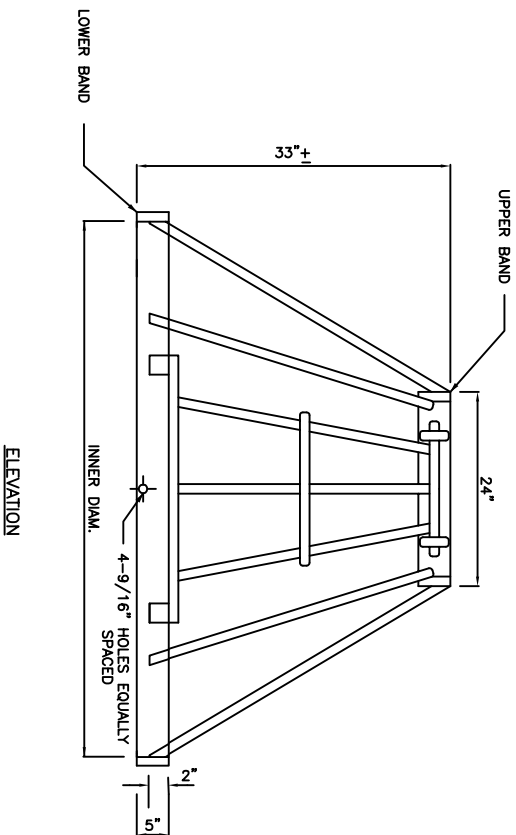
LAKE STEVENS CITY ENGINEER

DATE





PLAN

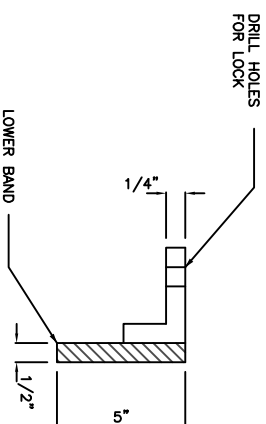
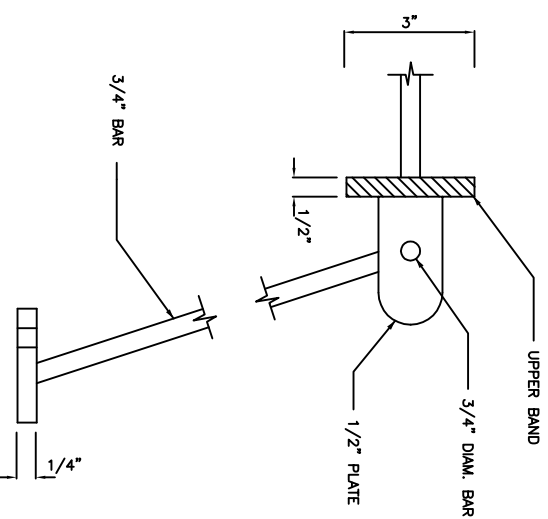


ELEVATION

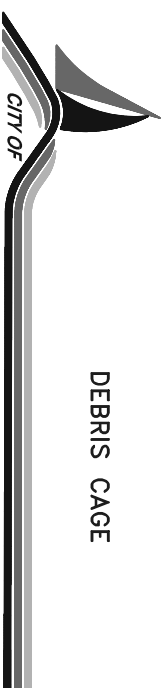
- NOTES:
1. ALL STEEL IN PLATES, BARS AND BANDS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36.
  2. DEBRIS CAGE SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 (AASHTO M111).

LAST REVISED 05/09

| CB  | INNER DIAM. |
|-----|-------------|
| 48" | 58"         |
| 54" | 65"         |
| 60" | 72"         |
| 72" | 86"         |
| 96" | 114"        |



ENTRY GATE DETAIL



DEBRIS CAGE

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 5-310

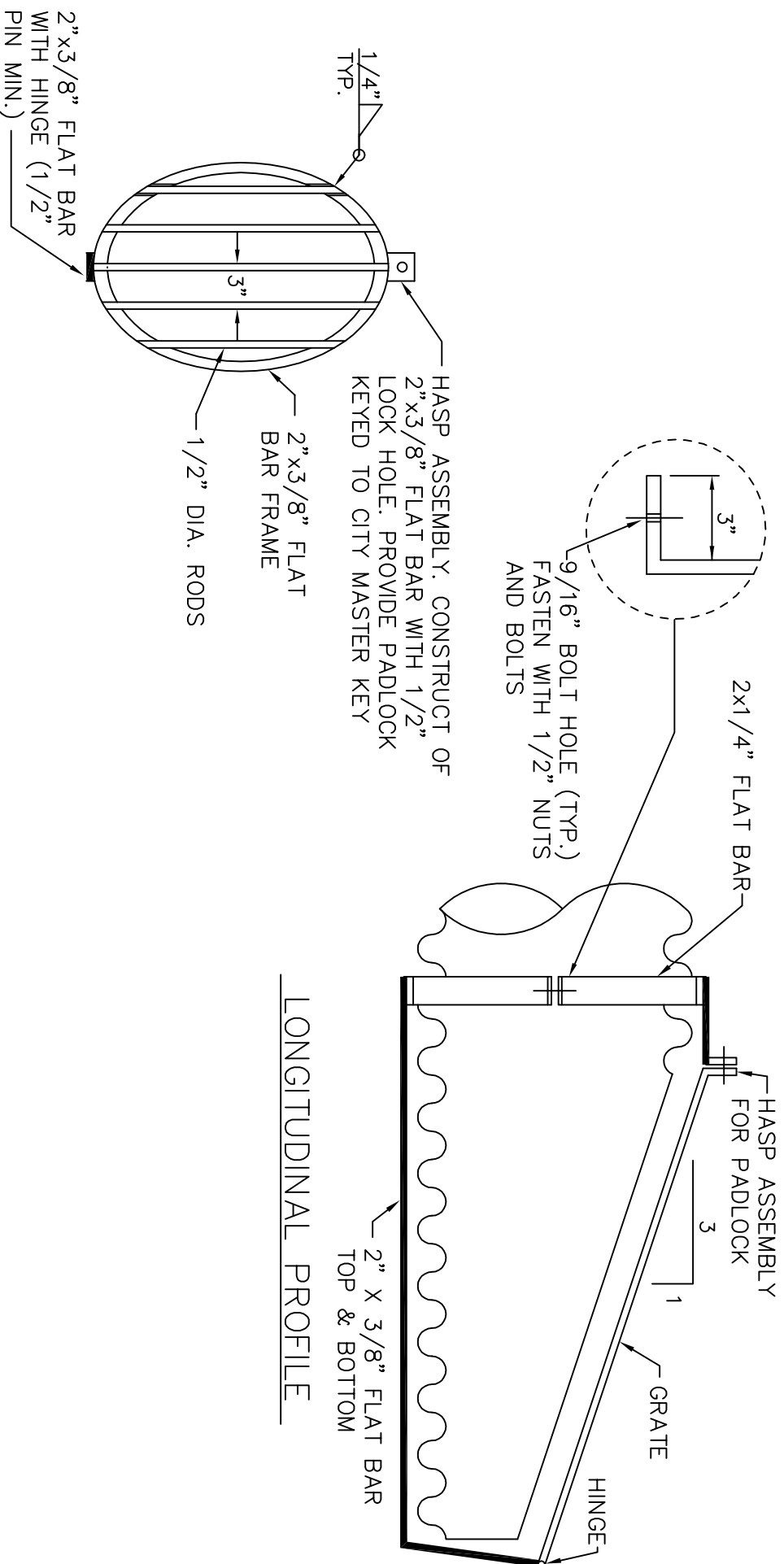
APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE



HASP ASSEMBLY. CONSTRUCT OF 2"x3/8" FLAT BAR WITH 1/2" LOCK HOLE. PROVIDE PADLOCK KEYED TO CITY MASTER KEY

### LONGITUDINAL PROFILE

### END VIEW

#### NOTES:

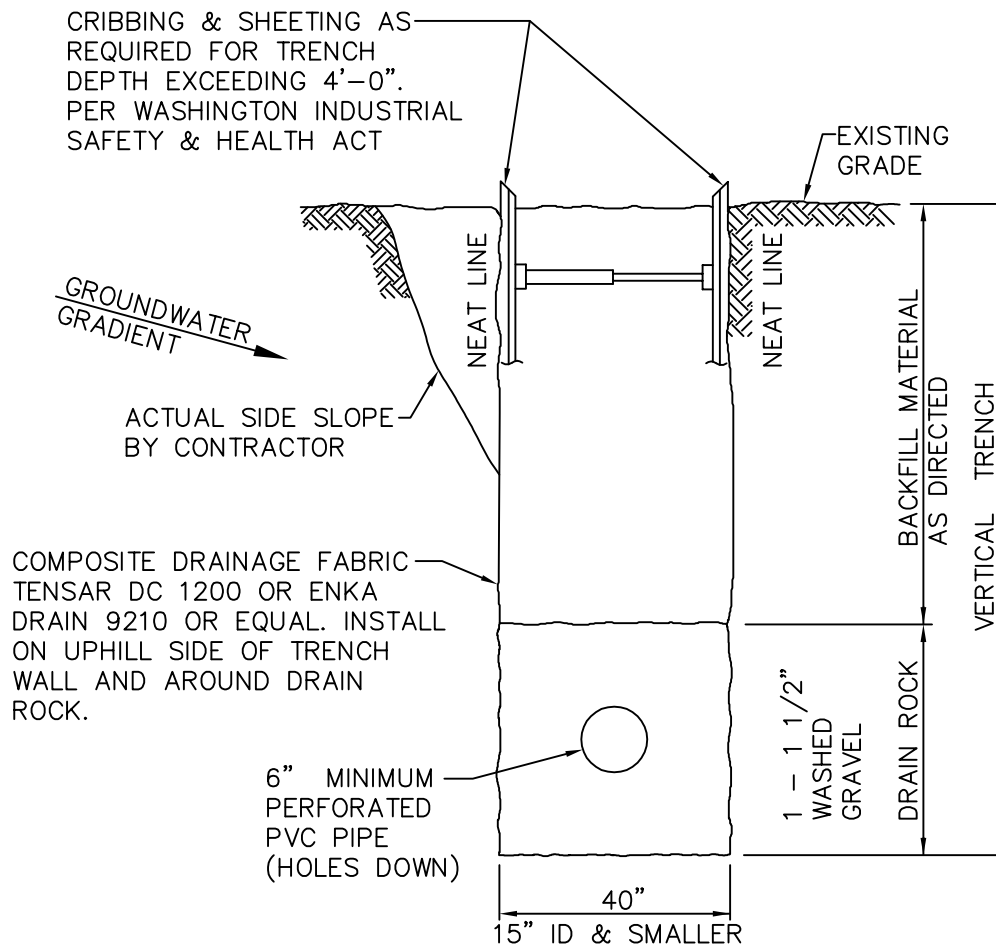
- INSTALL AT INLETS AND OUTLETS OF ALL STORM PIPE 18 INCHES AND GREATER AND AT INLETS OF ALL STORM PIPE SMALLER THAN 18 INCHES.
- CONTRACTOR TO PROVIDE SHOP DRAWINGS PRIOR TO FABRICATION. SHOP FABRICATE.
- CONSTRUCTION SHALL BE ALL STEEL. HOT DIP GALVANIZE AFTER FABRICATION.



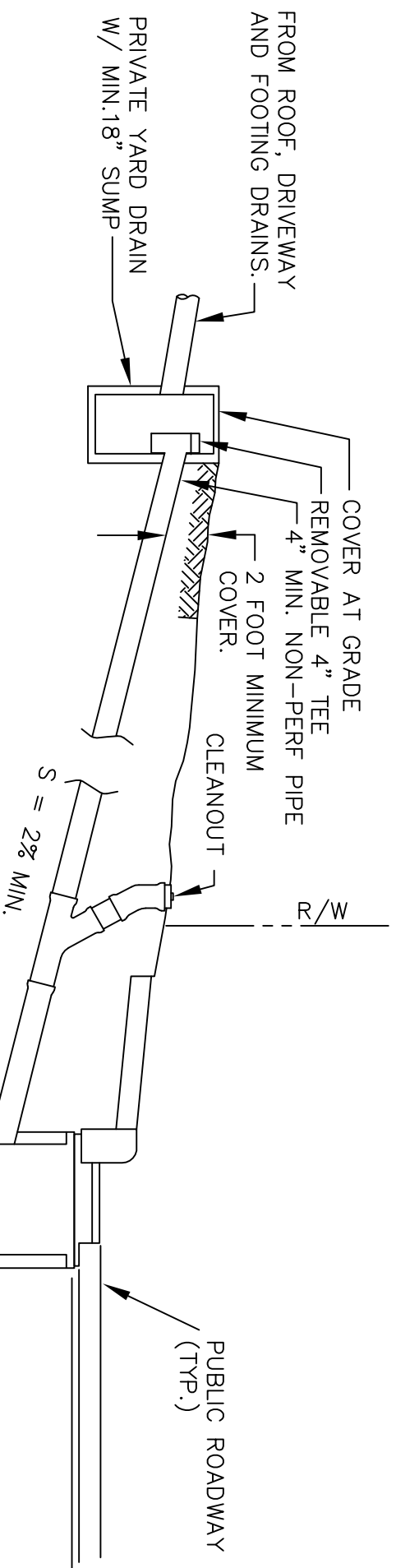
**LAKE STEVENS**  
CITY OF  
**PUBLIC WORKS**

TRASH RACK

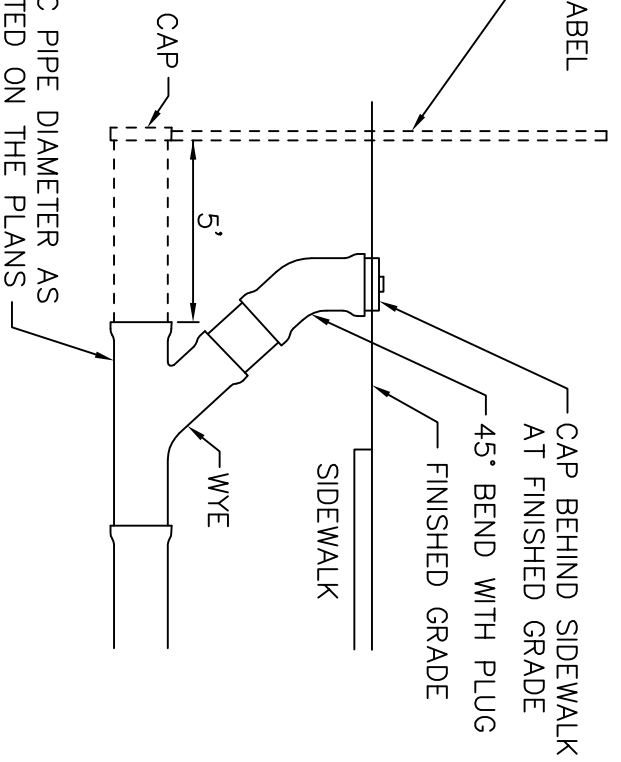
STANDARD PLAN 5-320



|                                                                                      |  |                     |  |
|--------------------------------------------------------------------------------------|--|---------------------|--|
|  |  | FRENCH DRAIN        |  |
| <b>CITY OF<br/>LAKE STEVENS<br/>PUBLIC WORKS</b>                                     |  | STANDARD PLAN 5-330 |  |
| APPROVED BY                                                                          |  |                     |  |
|  |  | 05/09               |  |
| LAKE STEVENS CITY ENGINEER                                                           |  | DATE                |  |



SET 2"x4"x8' DIRECTLY ON CAP.  
 PAINT 2"x4" WHITE AND NOTE  
 DEPTH TO TOP OF CAP ON  
 2"x4" WITH BLACK PAINT  
 (DEPTH TO EVEN FOOT) LABEL  
 'STORM'



ROOF DRAIN CLEANOUT DETAIL

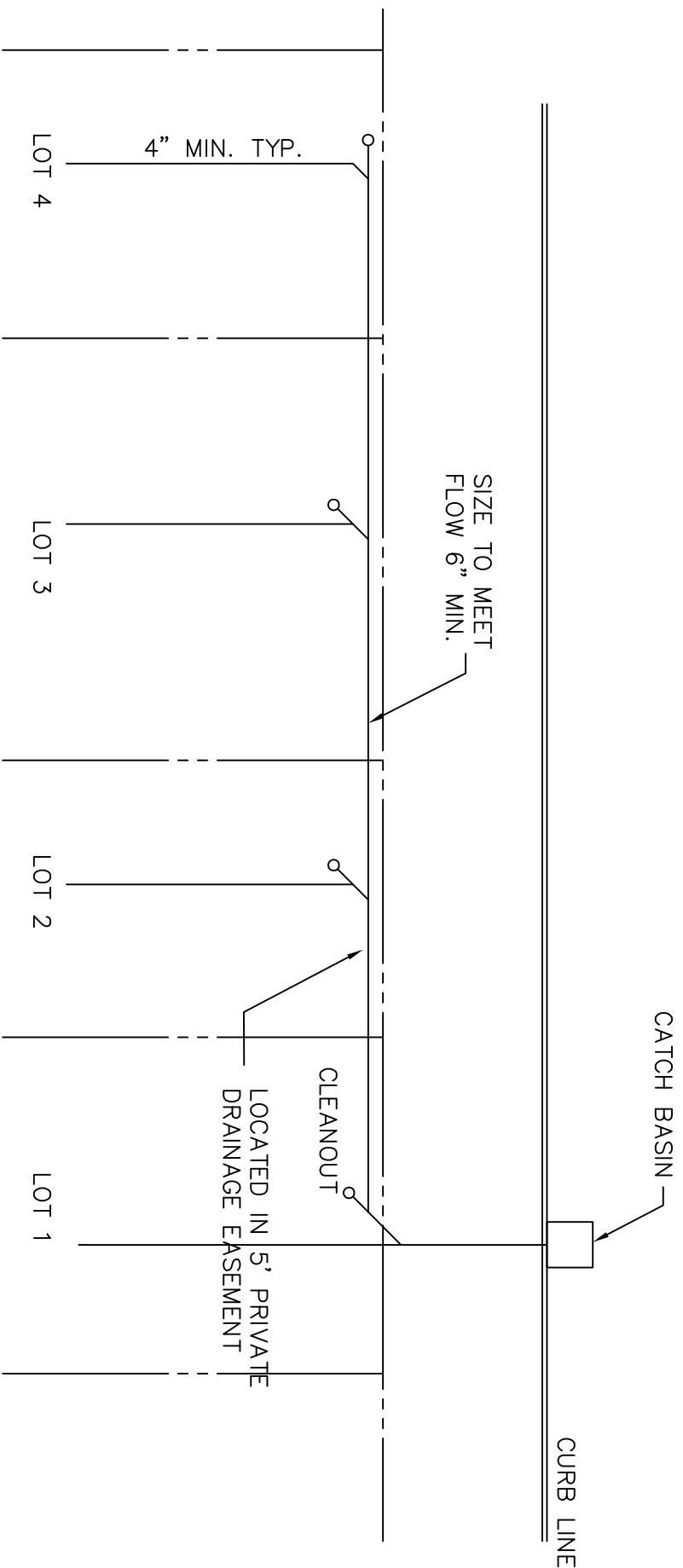
NOTE:  
 IF CLEANOUT FALLS IN DRIVEWAY USE  
 STANDARD PLAN 5-370 FOR  
 UPPER RING AND COVER



**CITY OF  
LAKE STEVENS  
PUBLIC WORKS**

INDIVIDUAL LOT &  
ROOF PLAN DETAILS

STANDARD PLAN 5-340



NOTE: YARD DRAINS TO BE LOCATED ON THE LOWER ELEVATION OF THE LOT.



LOT AND ROOF PLAN  
MULTI-LOTS

STANDARD PLAN 5-350

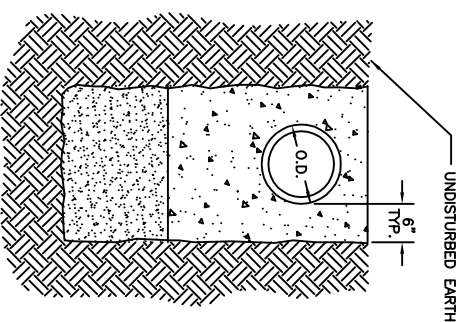
APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE



1. "D", THE INSIDE DIAM. OF THE INLET PIPE, SHALL BE 24" OR LESS. FOR LARGER VALUES OF "D", USE AN APPROVED STRUCTURE.
2. IN NO CASE SHALL THE OUTSIDE DIAM. OF THE INLET PIPE EXCEED ONE-HALF THE INSIDE DIAM. OF THE MAIN STORM SEWER.
3. C. OF INLET PIPE SHALL BE ON RADIUS OF MAIN STORM DRAIN.
4. THE MIN. OPENING INTO THE EXISTING STORM DRAIN SHALL BE THE OUTSIDE DIAM. OF THE INLET PIPE PLUS 1 IN.
5. IF A IS GREATER THAN 45° FIELD TAPPING IS NOT ALLOWED.
6. SEE SEC. 5-107(C).
7. SEE SEC. 5-107(B) FOR ALLOWED INLET PIPE TYPE.



# FIELD TAPPING OF CONCRETE PIPE

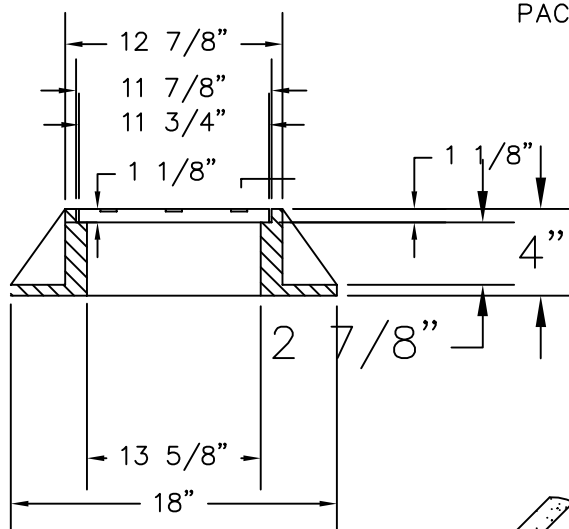
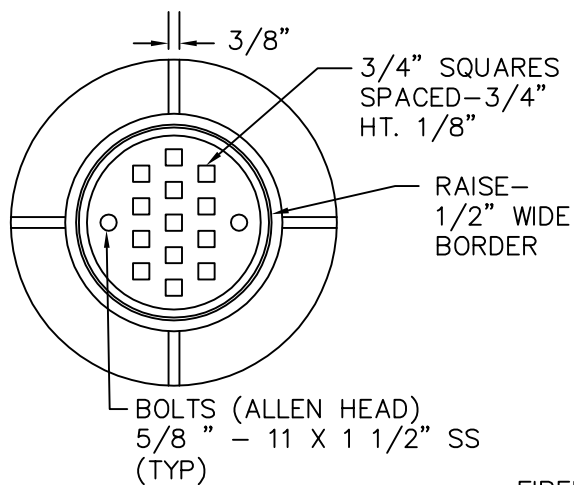
**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 5-360

APPROVED BY

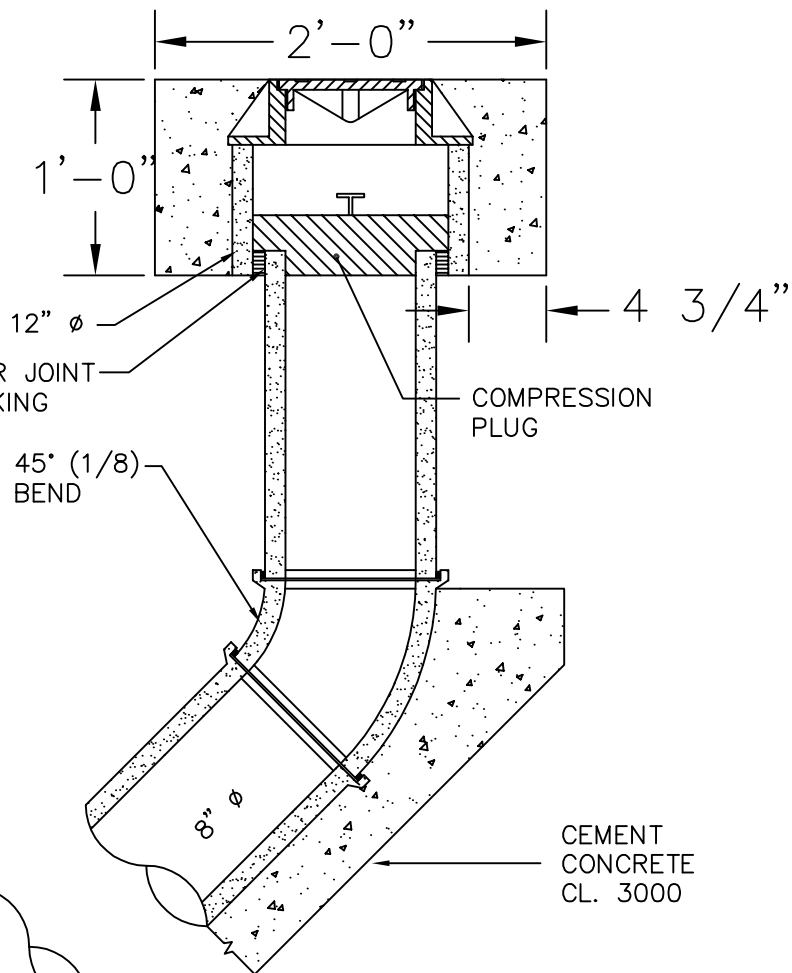
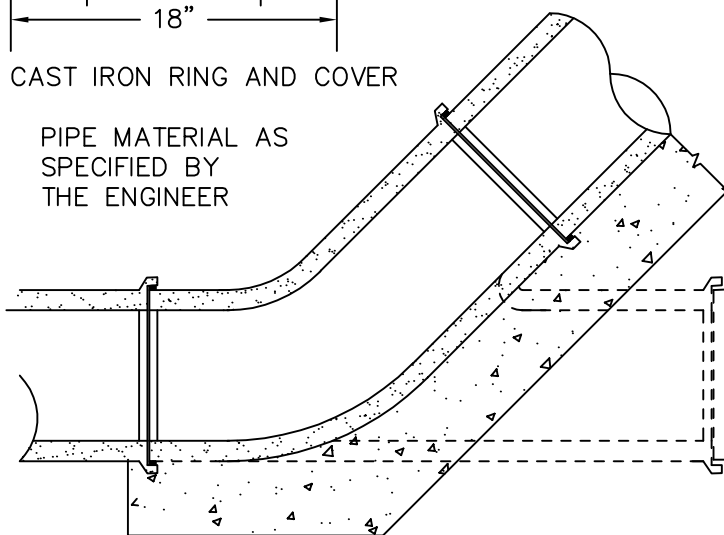
David D. Chetani

05/09



CAST IRON RING AND COVER

PIPE MATERIAL AS  
SPECIFIED BY  
THE ENGINEER



CLEANOUTS NOT IN ROADWAY  
SHALL HAVE A 3'X3'X4" CONC.  
PAD AT GROUND LEVEL.

8" CLEAN OUT



CITY OF  
**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 5-370

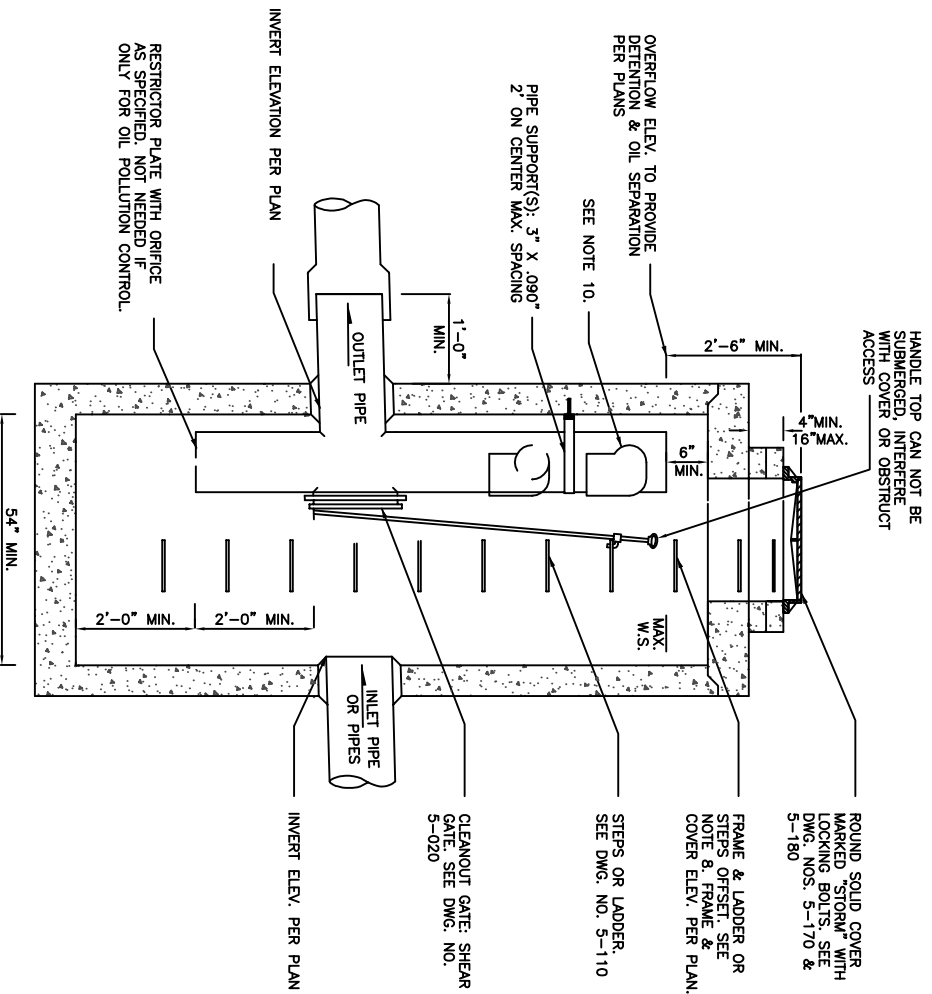
APPROVED BY

*David V. Ostergaard*

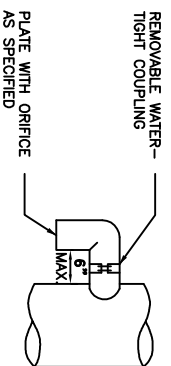
LAKE STEVENS CITY ENGINEER

05/09

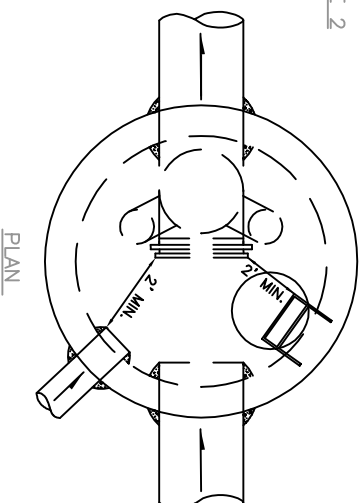
DATE



CATCH BASIN TYPE 2  
DIAM. AS REQUIRED  
SEE DWG. NO. 5-070



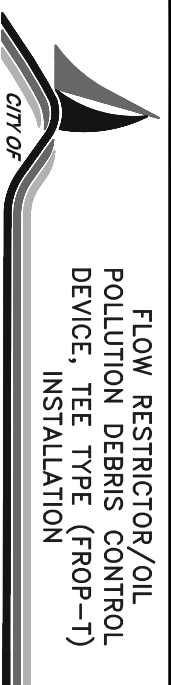
ELBOW DETAIL



PLAN

NOTES:

1. PIPE SIZES AND SLOPES: PER PLANS.
2. OUTLET CAPACITY: NOT LESS THAN COMBINED INLETS.
3. EXCEPT AS SHOWN OR NOTED, UNITS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS FOR CATCH BASIN TYPE 2, 54" MIN. DIAM.
4. PIPE SUPPORTS AND RESTRICTOR/SEPARATOR SHALL BE OF SAME MATERIAL, AND BE ANCHORED AT 3' MAX. SPACING BY 5/8" DIAM. STAINLESS STEEL EXPANSION BOLTS OR EMBEDDED 2" IN WALL.
5. THE RESTRICTOR/SEPARATOR SHALL BE FABRICATED FROM .060" ALUMINUM, OR .064" ALUMINIZED STEEL, OR .064" GALVANIZED STEEL PIPE; IN ACCORDANCE WITH AASHTO M 36, M 196, M 197 AND M 274. GALVANIZED STEEL SHALL HAVE TREATMENT 1.
6. OUTLET SHALL BE CONNECTED TO CULVERT OR STORM DRAIN WITH A STANDARD COUPLING BAND FOR CORRUGATED METAL PIPE, OR GROUTED INTO THE BELL OF CONCRETE PIPE.
7. THE VERTICAL RISER STEM OF THE RESTRICTOR/SEPARATOR SHALL BE THE SAME DIAM. AS THE HORIZONTAL OUTLET PIPE, WITH AN 8" MIN. DIAM.
8. FRAME AND LADDER OR STEPS OFFSET SO THAT:
  - A. CLEANOUT GATE IS VISIBLE FROM TOP
  - B. CLIMB DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE.
  - C. FRAME IS CLEAR OF CURB.
9. IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE: OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS 1/4".
10. MULTI-ORIFICE ELBOWS MAY BE LOCATED AS SHOWN OR ALL ON ONE SIDE OF RISER TO ASSURE LADDER CLEARANCE.



LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 5-010

APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE





## SECTION 6

### ROAD ELEMENTS AND ROADSIDE FEATURES

#### **6-100 Rock Facings**

- A.** Rock facings may be used for the protection of cut or fill embankment up to a maximum height of eight feet above the keyway in stable soil conditions which will result in no significant foundation settlement or outward thrust upon the walls. See Standard Plans 6-010 through 6-040. For heights over four feet above the keyway or when soil is unstable, a structural wall of acceptable design shall be used. As an exception, rock-facing heights may exceed eight feet to a limited extent based on favorable soil analyses and a design by a geotechnical Engineer or other professional Engineer qualified in rock wall design, subject to approval by the Public Works Director or designee. Terracing of rockeries is subject to approval by the Public Works Director or designee.

**B. Materials**

**1.** Size categories shall include:

- a.** Two-man rocks (200 to 700 pounds), 18"-28" in average dimension;
- b.** Three-man rocks (701 to 2000 pounds), 28-36" in average dimension; and
- c.** Four-man rocks (2001 to 4000 pounds), 36-48" in average dimension. Four-man rocks shall be used for bottom course rock in all rock facings over six feet in height.

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

**C. Keyway**

A keyway consisting of a shallow trench of minimum 12-inch depth shall be constructed the full rockery length, and slightly inclined towards the face being protected. It shall be excavated the full rockery width including the rock filter layer. The keyway subgrade shall be firm and acceptable to the geotechnical engineer. See Standard Plans 6-010 through 6-040.

**D. Underdrains**

1. A minimum six-inch diameter PVC perforated or slotted drainpipe shall be placed in a shallow excavated trench located along the inside edge of the keyway. The pipe shall be bedded on and surrounded by "Gravel Backfill for Drains" (WSDOT 9-03.12(4)) to a minimum height of 18 inches above bottom of pipe. A filter fabric shall surround the gravel backfill and shall have a minimum one-foot overlap along the top surface of the gravel. The pipe shall be set at a minimum 0.5% slope. The Public Works Director or designee may waive this requirement for fabric if shown that soils and water conditions make it unnecessary. See Standard Plans 6-010 through 6-040.
2. The perforated pipe shall be connected to the storm drain system or to an acceptable outfall.

#### **E. Rock Selection and Placement**

Rock selection and placement shall be such that there will be minimum voids and, in the exposed face, no open voids over six inches across in any direction. The final course shall have a continuous appearance and be placed to minimize erosion of the backfill material. The larger rocks shall be placed at the base of the facing so that it will be stable and have a stable appearance. The rocks shall be placed in a manner such that the longitudinal axis of the rock shall be at right angles to the face. The rocks shall have all inclined faces sloping to the back of the facing. Each course of rocks shall be seated as tightly and evenly as possible on the course beneath. The rocks shall be placed so that there are no continuous joint planes either horizontally or vertically. After setting each course of rock, all voids between the rocks shall be chinked on the back with quarry rock to eliminate any void sufficient to pass a two-inch square probe. See Standard Plans 6-010 through 6-040.

#### **F. Rock Filter Layers**

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

#### **G. Fill Rockery Facing Supporting Roadway Embankment**

Embankment behind rockeries exceeding four feet in height above the keyway shall be reinforced with a geosynthetic fabric or geogrid specifically manufactured for soil reinforcement, designed on a project specific basis by a qualified engineer, See Standard Plan 6-040.

#### **H. Sidewalks above Rockery Facings**

When a sidewalk is to be built over a rock facing, the top of the facing shall be sealed and leveled with a cap constructed of cement concrete Class 3000 in accordance with the applicable provisions of Section 6-02 of the WSDOT Standard Specifications, but with reduced water content resulting in slump of not over two inches. See Standard Plan 6-030.

**I. Fences and Handrails**

A chain link fence or metal handrail shall be installed when rockery is 30 inches or greater in height. See Standard Plan 6-010 through 6-120.

**6-101 Side Slopes**

- A. Side slopes shall generally be constructed no steeper than 3:1 on both fill slopes and cut slopes. The Public Works Director or designee may approve steeper slopes if soil analyses show that the slopes will be stable. All side slopes shall be designed per the WSDOT Design Manual Clear Zone requirements.
- B. Side slopes shall be stabilized by grass sod or seeding or by other planting or surfacing materials acceptable to the Public Works Director or designee.

**6-102 Slope, Wall, & Drainage Easements**

Either the functional classification or particular design features of a road may necessitate slope, sight distance, and wall or drainage easements beyond the right-of-way line. Such easements may be required by the Public Works Director or designee in conjunction with dedication or acquisition of right-of-way.

**6-103 Street Trees & Landscaping**

- A. Street trees and landscaping shall be incorporated into the design of road improvements for all classifications of roads. Such landscaping shall be coordinated with off-street landscaping required on developer's property under the provisions of City of Lake Stevens Municipal Code 14.76. Root guard is required for street trees adjacent curb and/or sidewalk.
- B. Planting strips are required along all residential access and arterial roadways designated to receive street tree treatment. Design of planting strips must be approved by the Public Works Director or designee and must include a landscaping plan in which plant maintenance, utilities and traffic safety requirements are discussed & specified.
- C. Existing trees and landscaping shall be preserved where desirable and placement of new trees shall be compatible with other features of the environment. In particular, maximum heights and spacing shall not conflict unduly with overhead utilities, or root development with

underground utilities. When street trees are planted, they shall conform reasonably to the requirements of Standard Plan 6-130 and LSMC 14.76.

- D.** New trees shall not include poplar, cottonwood, soft maples, gum, any fruit bearing trees or any other tree or shrub whose roots are likely to obstruct sanitary or storm sewers. New street trees shall not be allowed to obstruct entering sight distance for intersection or driveways. Specific trees to avoid include bigleaf maple, box elder, silver maple, catalpa, London plane, cottonwoods, weeping willows, Douglas fir, western red cedar, western hemlock, deodara cedar, spruces, and pines.
- E.** Street tree plans on bus routes shall be reviewed by Community Transit.

#### **6-104 Mail Boxes**

- A.** The responsibilities for location and installation of mailboxes in connection with the construction or reconstruction of City streets are as follows:
  - 1.** Public Works Director or designee or his representative will:
    - a.** Require street improvement plans, whether for construction by the City or by a private builder, to show clearly the designated location or relocation of mailboxes.
    - b.** Require with this information any necessary widening or reconfiguration of sidewalks with suitable knockouts or open strips for mailbox posts or pedestal.
    - c.** Require these plans to bear a statement on the first sheet that mailbox locations as shown on these plans have been coordinated with the Lake Stevens Post Office. This will be a prerequisite to plan approval.
    - d.** Require construction of mailbox locations in accordance with these plans, through appropriate inspections and enforcement procedures.
    - e.** Require vehicle turnouts for mailboxes along arterial roads or as required by the Public Works Director or designee due to public health & safety concerns per Standard Plan 6-150.
  - 2.** Lake Stevens Post Office will:
    - a.** Designate location and manner of grouping of mailboxes when so requested by the City. Note on the plans the type of mailbox delivery: NDCBU (Neighborhood Delivery and Collection Box Unit). Authenticate by stamp or signature when the data has been correctly incorporated into the plans.
    - b.** Do all necessary coordination with owners or residents involved to secure agreement as to mailbox location and to instruct them regarding mailbox installation.

3. Owners or residents served by mailboxes, at time of original installation, will, if using individual mailboxes, clustered or separate, install and thereafter maintain their own mailboxes as instructed by the Post Office.
  4. Builders or their contractors shall:
    - a. Where there are existing mailboxes and no plans to replace them with NDCBU'S:

When it becomes necessary to remove or otherwise disturb existing mailboxes within the limits of any project, install the boxes temporarily in such a position that their function will not be impaired and in coordination with the Lake Stevens Post Master. After construction work has been completed, reinstall boxes at original locations or at new approved locations as indicated on the plans or as directed by the Public Works Director or designee. Use only existing posts or materials except that any damage caused by the builder or his contractor is to be repaired at the expense of the builder.
    - b. Where there are existing NDCBU's or plans to install NDCBU'S:

Call Lake Stevens Post Office for approved location.
- B. Installation methods are as follows:
1. NDCBU's will be purchased and installed by the Contractor generally in accordance with Standard Plan 6-140.
  2. NDCBU's shall be Auth-Florence Model 1570 series.

## **6-105 Street Illumination**

### **A. General**

1. Illumination of transportation facilities enhances the visual perception of conditions or features that require additional driver or pedestrian alertness. A properly designed illumination system provides safety for motorists and pedestrians and enhances security for parking facilities.
2. The responsibility for illumination of transportation facilities belongs to the agency or party responsible for the roadway. That is, PUD is responsible for illumination of city public road facilities while the State Department of Transportation is responsible for illumination of state highways.
3. Illumination standards and design criteria are provided in Chapter 8 of the WSDOT Design Manual.
4. All illumination design for existing city roads shall be approved by the Public Work Director or designee. Such designs shall become the property of Public Works with entitlement to an electronic copy of the plans.

### **B. Illumination Levels**

1. Two levels of illumination are defined, with appropriate locations listed below:
  - "Basic illumination" is required at the following facilities:
  - Channelized intersections
  - Signalized intersections
  - Transit stops
  - Parking lots
  - Railroad crossings with automatic gates
  - Pedestrian under-crossings or overcrossings
  - Curbs and hard channelization
  - Medians and landscape planters
  - Urban arterials
2. "Illumination beyond basic" may be installed at the following facilities provided the warrant conditions listed in the following section are met and the Public Works Director or Designee grants approval:
  - Signalized intersections where video traffic detection is installed
  - Railroad crossings within the 95 percentile queue of a traffic signal
  - Traffic calming devices
  - High accident locations
  - Unchannelized intersections
  - Roadway tunnels
  - Railroad crossings without gates
  - Trail crossings
  - Raised pedestrian crosswalks
  - Speed humps
  - Multi-lane arterials
  - Roadways adjacent to high traffic generators

### **C. Illumination Warrants**

#### **2. General**

- a. The nighttime peak hour volume shall be used to determine the level of service for illumination analysis.
- b. ii. Nighttime traffic volume warrant analysis shall use traffic counts taken after 4:30 p.m. and before 7:30 a.m.
- c. iii. Illumination may also be warranted by accident rates. The ratio of nighttime to daytime accidents should be at least 1.5 times higher than the ratio for comparable

locations. A study should be conducted to verify that illumination will reduce nighttime accidents.

### **3. Warrants**

- High Speed Roadways - High speed is defined as 40 miles per hour or greater. Illumination beyond basic is warranted when the level of service for the nighttime peak hour is D or worse and two or more of the following conditions are satisfied:
  - a.** Three or more successive signalized intersections have an average spacing of 700 feet or less.
  - b.** ii. The roadway is within an urban growth area boundary.
  - c.** iii. The lighting algorithm warrant is met. Refer to the "Intersection Lighting Evaluation" of the USDOT Roadway Lighting Handbook, Implementation Package 78-15, Form 2 or contact Public Works' Traffic Operations.

### **4. Channelized Intersections**

- Illumination of intersections is warranted if any of the following conditions occur:
  - a.** The approach level of service during the nighttime peak hour is D or worse.
  - b.** The lighting algorithm warrant is met.
- Low Speed Roadways - Low speed is defined as less than 40 miles per hour. Illumination beyond basic is warranted if the area is classified as intermediate and the level of service for the nighttime peak hour is D or worse or if the nighttime accident warrant is met.
- Arterials - Illumination is warranted at all channelized intersections along arterials. Continuous illumination is warranted if the level of service for the nighttime peak hour is D or worse or if the nighttime accident warrant is met.
- Unchannelized Intersections - Illumination of unchannelized intersections is warranted if channelization warrants are met or if the nighttime accident warrant is met.
- Tunnels - Daytime illumination is warranted if portal conditions result in a brightness reduction greater than 15 times and the length to vertical clearance ratio is ten to one or greater. Underdeck illumination is required if pedestrian facilities are present. A light meter measurement is required to justify the installation of daytime illumination in existing tunnels. 114 Engineering Design and Development Standards 2004
- Construction Zones - Nighttime construction activities on the roadway may warrant illumination.
- Illumination requirements shall be determined by the Engineer on a case by case basis.
- Detours - Detour alignments and grades that are unusual or result in unexpected maneuvers warrant illumination. Illumination requirements will be determined by the Engineer on a case-by-case basis.



- Bridges - Warrants for illuminating bridges are the same as those for high or low speed roadways, whichever is applicable. Underdeck and bridge deck illumination is required if pedestrian facilities are present.
- Railroad Crossings - Illumination of railroad crossings is warranted if there is a potential for nighttime accidents. The extent of nighttime train activity should be taken into consideration.
- Pedestrian Facilities - Areas in which a high level of pedestrian activity occurs or is expected to occur may warrant illumination. Additionally, security problems may justify the installation of nighttime lighting.
- Trails - Illumination is warranted if security problems have developed or are anticipated. Requirements will be determined by the Engineer on a case by case basis.

#### **6-106 Survey Monuments**

- A. All existing survey monuments, which are disturbed, lost, or destroyed due to land disturbance shall be referenced and re-established by a land surveyor registered in the State of Washington at the expense of the responsible contractor or developer.
- B. Survey monuments shall be placed or replaced in accordance with recognized good practice in land surveying, and in conformance with Standard Plans 6-160 and 6-170.
- C. Establishment of new monumentation will be required at the expense of the responsible contractor or developer.
- D. If a monument is to be permanently removed, it must be approved by DNR. Proof of authorization to remove said monument shall be provided to the City prior to construction plan approval.

#### **6-107 Roadway Barricades**

Temporary and permanent barricades shall conform to the standards described in Section 6F.63 of the Manual on Uniform Traffic Control Devices (MUTCD) and Standard Plan 6-180.

- A. Type I or Type II barricades may be used when traffic is maintained through the area being constructed/reconstructed.
- B. Type III barricades shall be used when roadways and/or proposed future roadways are closed to traffic. Type III barricades may extend completely across a roadway (as a fence) or from curb to curb. Where provision must be made for access of equipment and authorized vehicles, the Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where

job site access is provided through the Type III barricades, the developer/contractor shall assure proper closure at the end of each working day.

- C.** In the general case, Type III permanent barricades shall be installed to close arterials or other through streets hazardous to traffic. They shall also be used to close off lanes where tapers are not sufficiently delineated.
- D.** Type III barricades shall be used at the end of a local access street terminating abruptly without cul-de-sac bulb or on temporarily stubbed off streets. Each such barricade shall be used together with an end-of-road marker and shall include a sign stating that the road will be extended in the future.
- E.** Permanent Type III Barricades shall be retroreflective white and retroreflective red.

### **6-108 Bollards**

When necessary to deny motor vehicle access to an easement, tract, or trail, except for maintenance or emergency vehicles, the point of access shall be closed by a line of bollards. These shall include one or more fixed bollards on each side of the traveled way and removable, locking bollards across the traveled way. Spacing shall provide one bollard on centerline of trail and other bollards spaced at minimum 50 inches on center on trails 10 feet wide or less. Spacing shall be 60 inches on center on trails wider than 10 feet. Bollard design shall be in accordance with Standard Plan 6-190 or other design acceptable to the Public Works Director or designee or Public Works Director or designee. No fire apparatus access roads shall be blocked in this manner without the concurrence of the Fire Marshal. Bollards shall be located at least 10 feet laterally from the paved edge of roadway.

### **6-109 Guardrail/Embankment Heights**

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

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

### **6-110 Off-Street Parking Spaces**

Specifications for the number and type of off-street parking spaces required shall conform to the City of Lake Stevens Municipal Code 14.72.

### **6-111 Roadside Obstacles**

Roadside obstacles in the right-of-way shall be located so that adequate clear zones are provided.

- 1.** Clear zone standards for roads with posted speeds of 35 mph or less shall be:
  - a.** 2 feet beyond the face of curb, (curb section) or
  - b.** 10 feet beyond the edge of traveled way (shoulder section).
- 2.** Clear zone standards for roads with posted speeds greater than 35 mph shall comply with Chapter 7 of the WSDOT Design Manual.
  - a.** New roadside features that could present a public hazard shall be placed outside of clear zone areas unless approved by the Engineer.
  - b.** Existing features located inside clear zones should be relocated unless approved by the Engineer.
  - c.** Installation of poles and other aboveground appurtenances will not be permitted in sidewalks, walkways or bikeways unless approved by the Engineer. As specified in the WSDOT Design Manual, there shall be an unobstructed vertical clearance of at least 7 feet above the surface of any sidewalk or walkway and 8 feet above any bikeway.

### **6-112 Concrete Sidewalks**

- A.** Cement concrete sidewalks shall be required on all arterials, collectors, and access streets. Sidewalks may be required to be constructed on both sides of the roadway.
- B.** Sidewalks shall be constructed:
  - 1.** Next to the curbs unless planting strips are part of the design and are approved by the Public Works Director or designee, and the Planning Department as part of a landscaping plan.
  - 2.** Back of planting strips where planting strips are to be constructed,
  - 3.** At least five feet wide on access streets. This means five feet clear of mailboxes or other obstructions, except where approved as a variance.
- C.** When Portland cement concrete sidewalks are constructed, specifications for joints shall be in accordance with Section 6-114 and Standard Plan 6-250.

- D. See Standard Plan 6-210 for cement concrete sidewalk transition to asphalt shoulder.
- E. Sidewalks shall not exceed maximum grade permitted for slope standards of the ADA.

### **6-113 Curbs, Gutters and Sidewalks**

- A. Curbs, Gutters and Sidewalks are required across a developments entire frontage where topography, and property line allow. Developments shall tie into all adjacent frontage that may have not been constructed to the property line due to access ramps, grade brakes, and property line reswtrictions.
- B. A Subgrade compaction for curbs, gutters, and sidewalks shall meet a minimum 95 percent of maximum density (modified proctor).
- C. Base material shall consist of 3" compacted depth crushed surfacing base course.
- D. Cement concrete for curbs, gutters, and sidewalks shall be Class 3000, furnished and placed in accordance with the WSDOT Standard Specifications and Standard Plans 6-220. Cold weather precautions as set forth in WSDOT Standard Specifications shall apply.
- E. Extruded cement concrete curb shall be anchored to existing pavement by either steel tie bars or adhesive in conformance with WSDOT Standard Specification Section 8-04.
- F. Extruded asphalt curbs shall be anchored by means of a tack coat of asphalt in accordance with WSDOT Standard Specification Section 8-04.
- G. Existing Sidewalk Replacement shall be determined per Standard Plan 6-230.
- H. Low Impact Flow Through Curb or approved alternate per Standard Plan 6-240 may be used in Low Impact Development applications and requires Public Works Director or designee approval.
- I. Rolled curb may be installed in special circumstances such as infill with rolled curb on both sides, cul-de-sacs, and PRD's that do not allow adequate driveway spacing for vertical curb tapers. Rolled curb acceptance is on a case-by-case basis and requires Public Works Director or designee approval.

### **6-114 Expansion and Dummy Joints**

See Standard Plan 6-250.

- A. An expansion joint consisting of 3/8" x 2-1/2" pre-molded joint material shall be placed around fire hydrants, poles, posts, and utility castings and along walls or structures in paved areas. Joint material shall conform to the requirements of ASTM D994 (AASHTO M33).
- B. Expansion joints shall be placed in curbs, sidewalks, and driveway aprons at a minimum of 15 foot intervals and at sides of drainage inlets.

- C. Dummy joints in sidewalk shall be located so as to match the joints in the curb whether sidewalk is adjacent to curb or separated by planting strip.
- D. Tool marks consisting of 1/4" V-grooves shall be made in sidewalk at five-foot intervals intermediate to the expansion joints.
- E. As alternative to expansion joints around structures, reinforcing bars may be embedded in concrete on four sides of structures.
- F. Interface between curb and adjacent sidewalk on integral pour construction shall be formed with 1/4" radius edging tool. On separate pour construction an expansion joint consisting of 3/8" x 2-1/2" of pre-molded joint material shall be placed between the curb or thickened edge and the adjacent sidewalk.

### **6-115 Curb Ramps**

On all streets with vertical, ramped sections to facilitate passage of physically challenged person(s) shall be constructed through curb and sidewalk at street intersections and other crosswalk locations. See Standard Plan 6-260. Where a ramp is constructed on one side of the street, a ramp shall also be provided on the opposite side of the street. Curb ramps shall be positioned so that a ramp opening is situated within the marked crosswalk or crossing area if unmarked. Curb ramps shall meet all ADA standards including maximum grade and cross-slope requirements. Curb ramps shall be design and constructed in accordance with the latest WSDOT standard plans. Dual ramp layouts are preferred unless technically infeasible.

### **6-116 Concrete Steps, Metal Handrail and Handicapped Access Ramps**

- A. Steps shall only be used where acceptable alternative access is available for handicapped access and there is a need for a separate stairway. Where used, concrete steps shall be constructed in accordance with Standard Plan 6-090 or other design acceptable to the Public Works Director or designee and consistent with the WSDOT Standard Specifications. Handrails, whether for steps or other applications, shall be provided in accordance with Standard Plans 6-010 and the WSDOT Standard Specifications.
- B. Ramps used to provide handicapped access shall be no steeper than 12:1 with a maximum rise of 30 inches between landings. Landings shall have a minimum length of five feet and should be of sufficient width to allow wheelchairs to pass, generally five feet minimum width for two way traffic.

### **6-117 Asphalt Shoulders**

- A.** Asphalt paved shoulders may be used where approved by the Public Works Director or designee on existing roads to provide for bicycle and pedestrian use and to provide continuity of design. When allowed, paved shoulders shall be placed in conformance with Sections 2-103.
- B.** A four-inch white painted edge line shall delineate between the travel lane and shoulder.

### **6-118 Separated Walkways, Bikeways and Trails**

Separated pedestrian, bicycle and equestrian trails shall be provided where designated in Lake Steven's Comprehensive Plan or where required by the Public Works Director or designee because of anticipated significant public usage. Separated pedestrian walkways may also be required where the local school district has identified unsafe walking conditions. Separated facilities are typically located on an easement or within the right-of-way when separated from the roadway by a drainage ditch or barrier. Where separate walkways, bikeways, or equestrian trails intersect with motorized traffic, sight distance, marking and signalization (if warranted) shall be as provided in MUTCD. Facilities shall be designed as follows:

- A.** Separated walkways are designed primarily for pedestrians and are typically located within the right-of-way or easement. Minimum width shall be five feet.
- B.** Neighborhood pathways are soft surface facilities designed for pedestrians and equestrians. Such pathways shall be a minimum four feet wide with at least one and one-half foot clearance to obstructions on both sides and 10-foot vertical clearance. Pathways shall be designed and located so as to avoid drainage and erosion problems. Pathways shall be constructed of two and one-half inches of crushed surfacing top course or wood chips over cleared native material as approved by the Public Works Director or designee.
- C.** Multi-purpose trails are typically designated for bicycle and pedestrian use and in general follow a right-of-way independent from any road. Multi-Purpose trails shall be designed in accordance with the WSDOT Design Manual Section 1020.05(2) and figures 1020-13 & 1020-14.

### **6-119 Bus Zones and Turn-outs**

Permit Applicants and/or Developers on bus routes are required to submit their development plans to the Community Transit Systems Planning Office and the local school district for review prior to submittal for City approval. Community Transit will determine whether transit improvements are

appropriate. Improvements may vary from pedestrian accessibility improvements to provision of bus stops, either in-lane stops or pullouts.

Generally, bus pullouts will be specified if (1) Traffic and passenger boarding and departing conditions warrant; (2) Traffic flow would be greatly hindered due to in lane stopping; or (3) The posted speed limit is in excess of 35 mph.

#### **A. Locations For Bus Pullouts**

- 1.** Placement of Bus Pullouts on the far side of signalized intersections immediately following the intersection is preferred. When no signalized intersection exists, the pullout should be placed on the far side of the intersection. Sight distance shall be determined by consulting these standards. Distance between pullouts should not be less than 1000 feet.
- 2.** If far side pullouts are not possible, near side pullouts will be evaluated. Mid-block pullouts are generally discouraged.
- 3.** Bus pullouts should be constructed on both sides of a two way street in a complementary pair if possible.
- 4.** Maintaining adequate separation between access point/intersections and bus pullouts can increase the safety and efficiency of both the roadway and the transit service.
- 5.** When locating a bus pullout in reference to existing access points or an access point in reference to an existing bus pullout, the following guidelines need to be taken into consideration:
  - a.** A minimum distance of 105 feet, 125 feet preferred, should be maintained between the pullout and the access point on arterial roadways and a minimum of 55 feet, 75 feet preferred on non-arterial roads. This distance is measured from the edge of the access point to the front or back of the transit vehicle, whichever end is closer.
  - b.** Driveways within the limits of a bus pullout are discouraged. Any exception to this requirement will require approval by the Engineer.

#### **B. Design Of Bus Pullouts**

Bus pullouts should be designed as depicted in Standard Drawing 6-280. All pullout designs must follow applicable guidelines for facilities used by the handicapped (Americans with Disabilities Act). The Community Transit Systems Planning Office should be contacted for specific design questions.

#### **C. Other Design References**

- 2.** Chapter 1060 entitled Transit Benefit Facilities, WSDOT Design Manual.

3. A Guide to Land Use and Public Transportation for Snohomish County, Washington, prepared by the Snohomish County Transportation Authority.

## **6-120 Bikeways**

- A. Bikeways are generally shared with other transportation modes, although they may be provided exclusively for bicycle use. Bikeways are categorized below based on degree of separation from motor vehicles and other transportation modes. This classification does not denote preference of one type over another. Bikeways are categorized as follows:
  1. Bike Path (Class I): A separate paved multipurpose trail for the principal use of bicycles and other non-motorized modes. Bike paths are 12 feet.
  2. Bike Lane (Class II): A portion of the road that is designated by pavement striping for exclusive bicycle use. Bicycle lanes may be signed as part of a directional route system. Bicycle lanes are five feet wide on a curbed road and minimum four feet wide as a shoulder bike lane.
  3. Wide Curb Lane (Class III): A road that provides a widened paved outer curb lane to accommodate bicycles in the same lane as motor vehicles. Lane width shall be increased at least three feet.
  4. Shoulder: A lane contiguous to the traveled way but separated by a stripe. Typically shared with pedestrians and occasional emergency vehicle access.
  5. Shared Roadway: All roads not categorized above where bicycles share the roadway with motor vehicles.
- B. A bikeway shall be provided:
  1. Wherever called for in the Comprehensive Plan or Capital Improvement Program.
  2. When substantial bike usage is expected which would benefit from construction of a bicycle facility.
- C. Striping and signing shall be implemented as follows:
  1. Pavement markings shall be installed on bike lanes and paths in accordance with the MUTCD, subject to local modification by the Public Works Director or Designee.
  2. The design of all signalized intersections shall consider bicycle usage and the need for bicyclists to actuate the signal.
- D. The planning and design of bikeways in any category shall be in accordance with Section 1020 of the WSDOT Design Manual and the AASHTO Guide for the Development of Bicycle Facilities, current edition.



### **6-121 Medians (Optional Design Feature)**

Median width shall be additional to, not part of; the specified width of traveled way. Edges shall be similar to outer road edges: either extruded or formed vertical curb; or shoulder and ditch; except that median shoulders shall be minimum four feet in width. Twenty feet of drivable surface (which includes traveled way and paved shoulders, if any) shall be provided on either side of the median. Median may be grassed, landscaped, or surfaced with stamped Portland Cement Concrete or pavement. Median shall be designed so as not to limit turning radii or sight distance at intersections. No portion of a side street median may extend into the right-of-way for an arterial street. The Public Works Director or designee may require revisions to medians as necessary to provide for new access points and to maintain required sight distance. Non-yielding or non-breakaway structures shall not be installed in medians. Street trees and/or shrubbery may be planted in median subject to the installation of an automatic irrigation system and approval by the Public Works Director or designee and Planning Department.

### **6-122 School Access**

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

### **6-123 Equestrian Facilities**

- A.** Equestrian facilities adjacent to the traveled way shall be provided where proposed by the Comprehensive Plan or as required by the Public Works Director or designee. Facilities shall be provided as follows:
  - 1.** Shoulders adjacent to the traveled way intended for equestrian use shall be surfaced full-width, minimum four feet with eight feet desirable. Surface shall be two and one-half inches of crushed surfacing base course and one and one-half inches of crushed surfacing top course.
  - 2.** A separated equestrian trail shall be constructed with an 18 percent maximum grade, 10-foot vertical clearance and a five-foot wide pathway zone. The trail shall be constructed of native soil or, where drainage or erosion problems are present, a minimum of two and one-half inches of crushed surfacing top course on graded and compact native soil. Native soil, which is not free draining, shall be removed and replaced with sand or gravel as necessary to provide a maintainable and well-drained sub-grade. Additional crushed

surfacing, cinders or other stabilizing materials shall be required if heavy usage is anticipated or if there is any evidence of instability in the sub-grade; including free water, swamp conditions, fine-grained or organic soils, slides or uneven trails.

#### **6-124 *Traffic Calming***

All new residential access streets shall have traffic calming devices. The devices may include but are not limited to neckdowns, chokers, gateways, medians, chicanes, speed tables, speed bumps, traffic circle, and raised intersections.

**Table 6-1 Traffic Calming Measures**

| <b>Device</b>       | <b>Classification of Street</b> | <b>Spacing</b>                 | <b>Standard Plan</b> |
|---------------------|---------------------------------|--------------------------------|----------------------|
| Neckdowns           | Neighborhood Access             | Every intersection             | 6-290 & 6-300        |
| Alternating Parking | Neighborhood Access             | 300 ft.                        |                      |
| Chokers             | Collectors                      | 400 ft.                        | 6-310                |
| Gateway*            | Neighborhood Access             | Main Entrance to a development | 6-320                |
| Chicane             | Neighborhood Access             | mid-block                      | 6-330                |
| Speed Table         | Neighborhood Access             | 400 ft.                        | 6-340 & 6-350        |
| Speed Bump          | Neighborhood Access             | 300 ft.                        | 6-360                |
| Traffic Circle      | Neighborhood Access             | Every intersection             | 6-370 through 6-390  |

Minimum traffic calming shall include neckdowns and alternating parking on neighborhood access streets, and chockers for collector streets. A gateway treatment may replace the neckdown treatment at the main entrance to a development. Landscaping must be maintained by a homeowners association or responsible entity or parties including all benefited property owners.

The design and implementation of the traffic calming devices shall be approved by the Public Works Director or designee.

## **6-125 Traffic Signal Specifications**

### **A. General**

1. A pre-design conference is required with the Public Works Department for any proposal to install a traffic signal. A signal warrant analysis is required for each new traffic signal

installation. Preparation of the warrant analysis shall conform to the applicable sections of the MUTCD. The warrant analysis shall be submitted to the Traffic Engineer for consideration before any design work is submitted.

2. The Engineer has approval authority for all traffic signal installations. The following documentation shall be submitted to Traffic Operations and approved before a signal installation will be considered.

- Signal Warrant Analysis
- Design Report
- Preliminary Signal Plan

3. The designer shall submit plans, specifications, and estimates at 30%, 60%, 90%, and 100% plan completion stages.

**Table 6-2 Submittal Schedule**

| Submittal | Plans                                                                                                                                                                                                                                                                                                                                                                                               | Changes Requiring Approval                                              |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 30%       | <ul style="list-style-type: none"> <li>• Channelization (including turning radii and stop bar locations)</li> <li>• Existing Utilities</li> <li>• Phasing Diagram</li> <li>• Pole Locations</li> <li>• Controller Location</li> <li>• Signal Head Displays</li> <li>• Loop Layout</li> <li>• Sidewalk Ramps</li> <li>• Preliminary Illumination Design</li> <li>• Temporary Signal Plans</li> </ul> |                                                                         |
| 60%       | <ul style="list-style-type: none"> <li>• Wire Notes</li> <li>• Construction Notes</li> <li>• General Notes</li> <li>• Pole Schedule</li> <li>• Foundation Elevations</li> <li>• Wiring Diagrams</li> <li>• Service Cabinet Details</li> <li>• Miscellaneous Details</li> <li>• Special Provisions</li> <li>• Preliminary Estimate</li> <li>• Temporary Signal Plans</li> </ul>                      | Channelization<br>Pole Locations<br>Loop Layout<br>Signal Head Displays |
| 90%       | <ul style="list-style-type: none"> <li>• Complete Set of Plans</li> <li>• Special Provisions</li> <li>• Estimate</li> <li>• Temporary Signal Plans</li> </ul>                                                                                                                                                                                                                                       | Utilities                                                               |

|       |                                                                                                                                                                                         |  |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Final | <ul style="list-style-type: none"> <li>• Final Plans</li> <li>• Special Provisions</li> <li>• Estimate</li> <li>• Electronic Copy of Plans</li> <li>• Temporary Signal Plans</li> </ul> |  |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

- a. An electronic copy of the plans and base, in the City's current CADD format, must be approved with the final plans. It is recommended the electronic copy be submitted early in the design process for review and comment.
- b. The 30% design shall show channelization including all turning radii and stop bar locations, existing utilities, phasing diagram, pole locations, controller location, signal head displays, loop layout, sidewalk ramps and preliminary illumination design. Because channelization is critical to signal design, the channelization plan shall be approved by the Public Works Department prior to the 30% plan submittal.
- c. The 60% design shall show, in addition to the 30% requirements, wire notes, construction notes, general notes, pole schedule, foundation elevations (pole foundations, controller/service foundations, and any other constructed foundations), wiring diagrams, service cabinet details, miscellaneous details, special provisions and a preliminary estimate.
- d. The 90% design shall show, in addition to the 60% design, a complete set of plans, special provisions and estimates.
- e. Final 100% plans, special provisions, and estimates shall incorporate all comments from the City and be complete before approval will be granted. An electronic copy of the plans and base in the City's current CADD format shall be submitted with the final plans for approval.
- f. If an interim signal system is needed during construction, a temporary signal plan shall be submitted with the 30%, 60%, 90%, and final submittals.

## **B. Signal Design**

1. General design criteria are contained in Chapter 8 of the WSDOT Design Manual and Chapter 4 of the MUTCD as adopted and modified by WSDOT. The Public Works Department shall provide specific design criteria and guidance for signal design.
2. Emergency vehicle preemption systems are required for all signals. The preemption system shall be capable of identifying and logging specific preempting vehicles in a manner compatible with existing preemption system transmitters.

### ***Section 6 drawing index:***

**Standard Drawing 6-010: Rock Facing Cut Section**

**Standard Drawing 6-020: Rock Facing Fill Section**

**Standard Drawing 6-030: Rock Facing Under Sidewalk**

**Standard Drawing 6-040: Rock Facing Fill Section Reinforcement in Excess of 4' Height**

**Standard Drawing 6-050: CMU Block Wall**

**Standard Drawing 6-090: Concrete Steps, Metal Handrail, & Guardrail**

**Standard Drawing 6-091: Handrail & Guardrail Notes**

**Standard Drawing 6-110: Chain Link Fence**

**Standard Drawing 6-120: Chain Link Gates**

**Standard Drawing 6-130: Street Tree Standards**

**Standard Drawing 6-131: Tree Planting and Staking Detail**

**Standard Drawing 6-132: Tree Well in Sidewalk Area**

**Standard Drawing 6-133: Tree Well in Raised Planter Strip or Island**

**Standard Drawing 6-134: LID Tree Box**

**Standard Drawing 6-135: LID Tree Box Bulbed - Plan**

**Standard Drawing 6-136: LID Tree Box Recessed - Plan**

**Standard Drawing 6-137: LID Parking Island Plan – Treatment A&B**

**Standard Drawing 6-138: LID Parking Island Planting Swale**

**Standard Drawing 6-139: LID Typical Detail Bulb-out Parking**

**Standard Drawing 6-140: Neighborhood Delivery & Collection Box Unit Installation**

**Standard Drawing 6-150: Mailbox Turnout**

**Standard Drawing 6-160: Roadway Survey Monument W/Case & Cover**

**Standard Drawing 6-170: Off Roadway Survey Monument**

**Standard Drawing 6-180: Barricades**

**Standard Drawing 6-190: Bollards**

**Standard Drawing 6-200: Clearance of Roadside Obstacles on Shoulder Type Road**

**Standard Drawing 6-220: Curb Details**

**Standard Drawing 6-230: Sidewalk Replacement Requirements**

**Standard Drawing 6-240: Low Impact Flow Through Curb Paved Shoulder Section**

**Standard Drawing 6-241: LID Vertical Curb Inlet**

**Standard Drawing 6-242: LID Alternative Surfacing Pervious Paving Details**

**Standard Drawing 6-243: LID Stormwater Sidewalk and Planter**

**Standard Drawing 6-250: Curb & Sidewalk Joints**

**Standard Drawing 6-260: Curb ramp Locations**

**Standard Drawing 6-280: Bus Pullouts**

**Standard Drawing 6-290: Neckdowns Arterial/Residential Access Street Intersection**

**Standard Drawing 6-300: Neckdowns Residential Access Street Intersection**

**Standard Drawing 6-310: Chokers**

**Standard Drawing 6-320: Gateways**

**Standard Drawing 6-330: Chicane**

**Standard Drawing 6-340: 22' Speed Table Neighborhood Collector**

**Standard Drawing 6-350: 22' Speed Table Striping Detail**

**Standard Drawing 6-360: 14' Local Access Speed Bump**

**Standard Drawing 6-370: Traffic Circle Detail**

**Standard Drawing 6-380: Intersection Diagram**

**Standard Drawing 6-390: Dimension Chart**

**Standard Drawing 6-400: Warning Signs**

**Standard Drawing 6-410: Alternate Parking Channelization**

**Standard Drawing 6-411: Bus Turnout Dimensions**

**Standard Drawing 6-420: TCP (one lane closed with alternating one-way traffic and flaggers)**

**Standard Drawing 6-421: TCP (partial lane closure)**

**Standard Drawing 6-422: TCP (shoulder work)**

**Standard Drawing 6-423: TCP (5 lane roadway with right lane closed)**

**Standard Drawing 6-424: TCP (6 lane roadway with left lane turn closed)**

**Standard Drawing 6-425: TCP (center of intersection work)**

**Standard Drawing 6-426: TCP (5 lane roadway with left turn closure far side of intersection)**

**Standard Drawing 6-427: TCP (5 lane roadway with right lane closure far side of intersection)**

**Standard Drawing 6-429: TCP (5 lane roadway with multilane closure)**

**Standard Drawing 6-430: TCP (two way left turn lane closure)**

**Standard Drawing 6-431: TCP (5 lane roadway with left lane closed)**

**Standard Drawing 6-432: Traffic Control Devices**

**Standard Drawing 6-440: Post Mounting Detail for Street Name Sign**

**Standard Drawing 6-441: Traffic Regulatory Sign Installation**

**Standard Drawing 6-442: Mastarm Mounted Street Name Sign**

**Standard Drawing 6-443: Post Mounted Street Sign**

**Standard Drawing 6-450: Pavement Marking Detail**

**Standard Drawing 6-451: Raised Pavement Marking Detail**

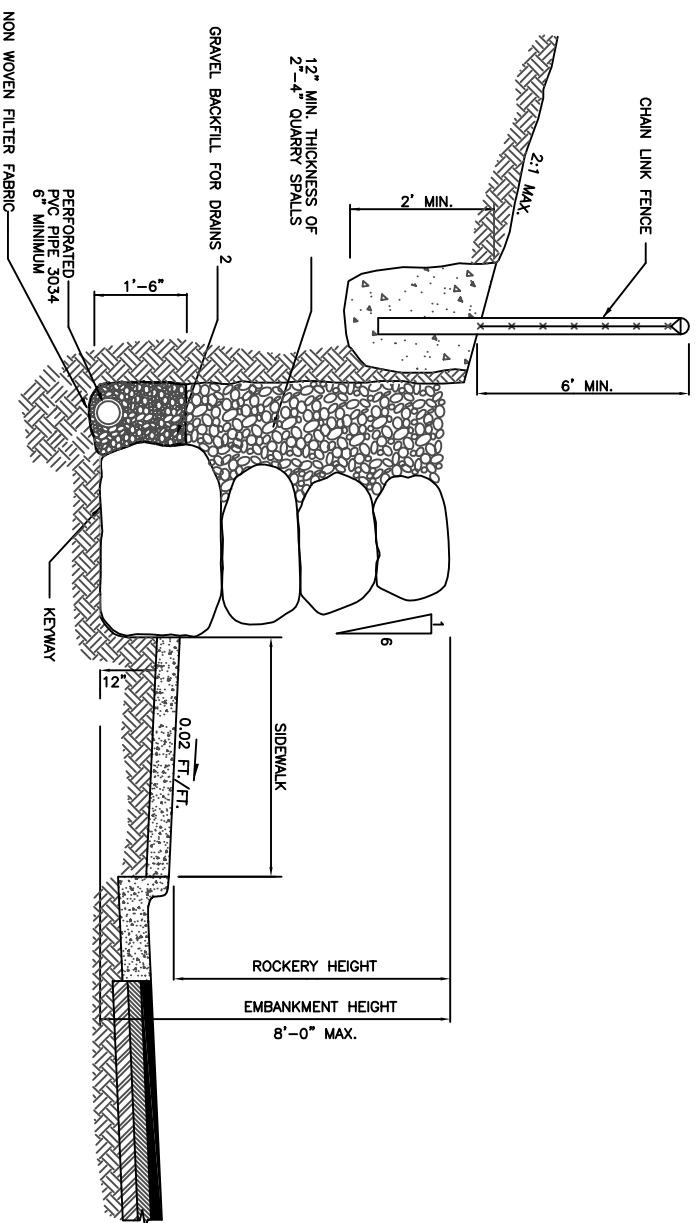
**Standard Drawing 6-452: Paint Striping Details**

**Standard Drawing 6-453: Typical Stopline and Crosswalk Layout**

**Standard Drawing 6-454: Left Turn Pocket Detail**

**Standard Drawing 6-455: Transit Stop Curb Striping**

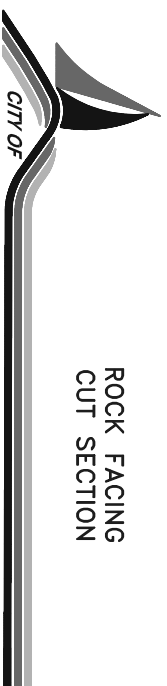




- NOTES:
1. WSDOT 9-03.12[4]

2. IF ROCKERY OR RETAINING WALL IS BEHIND ROLLED CURB OR ON A RURAL SECTION, FACE OF ROCKERY OR RETAINING WALL MUST BE BEYOND THE CLEAR ZONE PER WSDOT DESIGN MANUAL.
3. CHAIN LINK FENCE SHALL COMPLY WITH STD. PLAN 6-110 AND IS REQUIRED WHEN ROCKERY HEIGHT IS 30" OR GREATER AND ROCKERY IS LOCATED ON PUBLIC RIGHT-OF-WAY OR EASEMENT.
4. MAXIMUM HEIGHT OF ROCKERY IS 8' UNLESS APPROVED BY THE CITY ENGINEER.

NOTE:  
EMBANKMENT HEIGHTS 4'-0" AND ABOVE REQUIRES  
BUILDING PERMIT AND SET OF STAMPED ENGINEERING  
PLANS



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-010

APPROVED BY

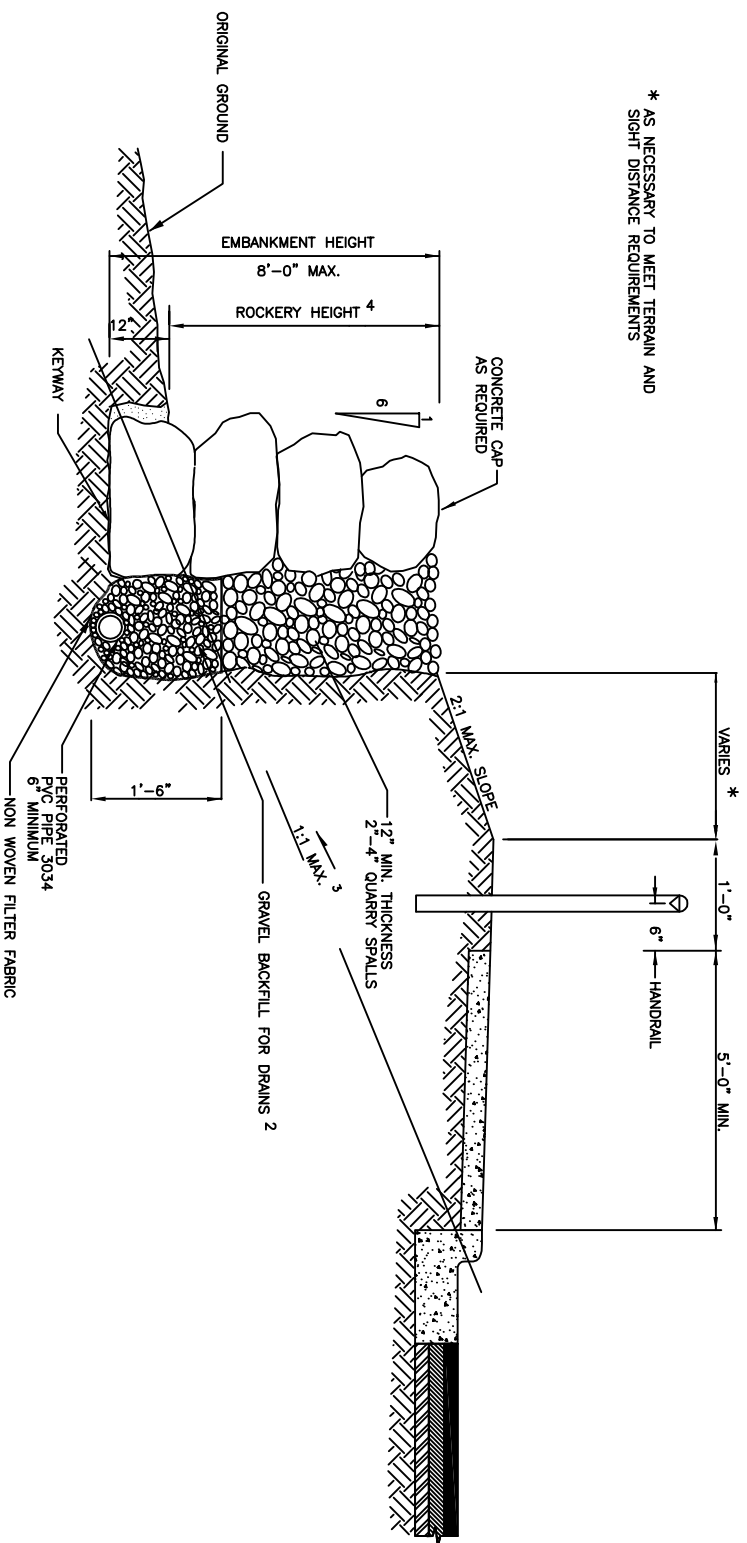
*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE

\* AS NECESSARY TO MEET TERRAIN AND SIGHT DISTANCE REQUIREMENTS



NOTE:  
EMBANKMENT HEIGHT IN EXCESS OF 4'-0" REQUIRES  
BUILDING PERMIT AND SET OF STAMPED ENGINEERING  
PLANS

NOTES:

1. WSDOT 9-03.12[4].
2. FLATTER SLOPE MAY BE REQUIRED IN LESS STABLE SOIL.
3. HANDRAIL REQUIRED WHEN ROCKERY HEIGHT IS 30" OR GREATER. SEE DWG. NO. 6-090.
4. FOR ROCKERY HEIGHTS EXCEEDING 4', SEE DWG. NO. 6-040.
5. TRAFFIC BARRIERS MAY BE REQUIRED ON ROADS WITH POSTED SPEED LIMITS OF 35 MPH OR GREATER, WHERE ROCKERY HEIGHTS EXCEED 6'. SEE CHAPTER 7 OF THE WSDOT DESIGN MANUAL.



**LAKE STEVENS  
PUBLIC WORKS**

ROCK FACING  
FILL SECTION

STANDARD PLAN 6-020

APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE

- NOTE:  
EMBANKMENT HEIGHTS 4'-0" AND ABOVE REQUIRES  
BUILDING PERMIT AND SET OF STAMPED ENGINEERING  
PLANS



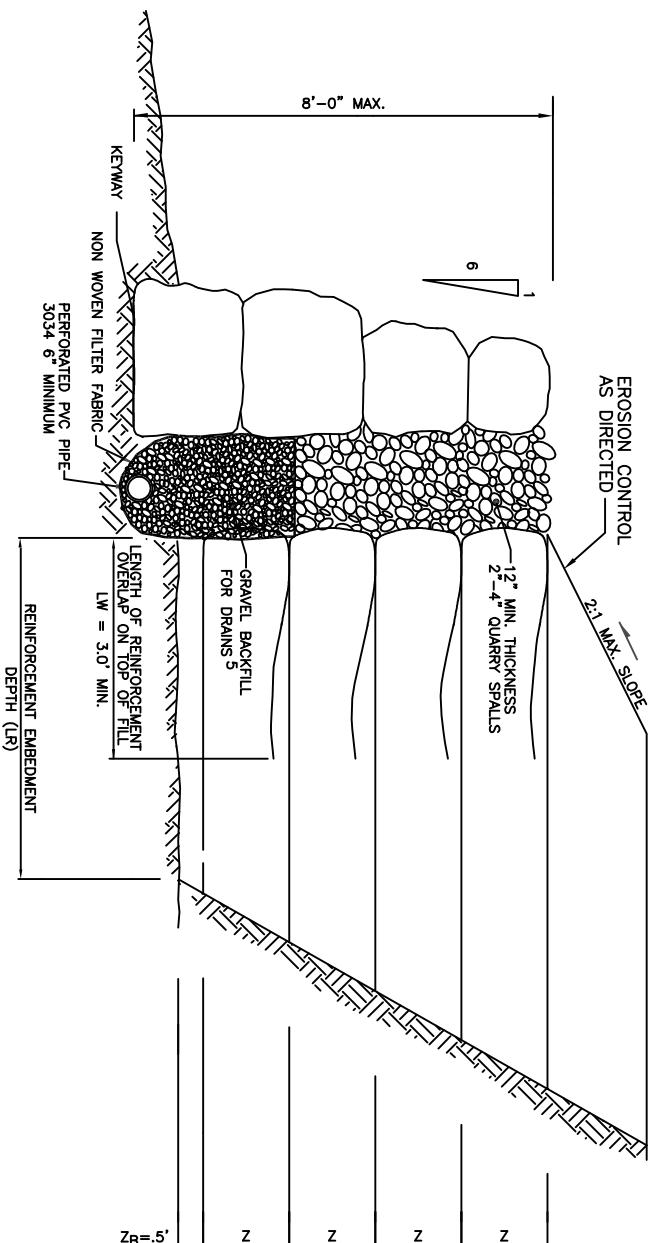
STANDARD PLAN 6-030

## ROCK FACING UNDER SIDEWALK

APPROVED BY

David D. Chetani

05/09

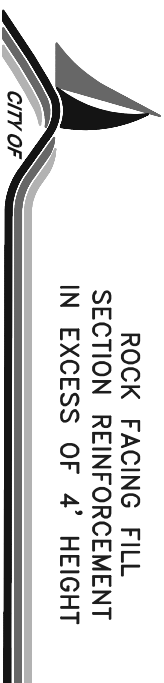


# NOTES:

1. ROCKERY FACINGS ARE TO BE CONSTRUCTED PER SEC. 6-100.
2. THE WALL FOUNDATION IS TO BE CLEARED OF ORGANIC MATTER AND DEBRIS AND THE UNDERLYING MINERAL SOIL COMPACTED TO 95 PERCENT OF THE MAX. DRY DENSITY. THE EMBANKMENT MATERIAL IS TO BE GRAVEL BORROW MEETING THE REQUIREMENTS OF 9-03.14 OF THE WSDOT STANDARDS. THE BACKFILL IS TO BE PLACED IN THIN LIFTS, NOT EXCEEDING SIX INCHES IN THICKNESS AND COMPACTED TO 95 PERCENT OF THE MAX. DRY DENSITY.
3. GEOSYNTHETIC FABRIC OR GEOGRID REQUIREMENTS INCLUDING TYPE, VERTICAL SPACING (Z), AND EMBEDMENT (LR), WILL BE DETERMINED ON A ROCKERY BY ROCKERY BASIS BY A PROFESSIONAL ENGINEER.
4. Z<sub>B</sub> IS HEIGHT OF FIRST LAYER OF REINFORCEMENT ABOVE COMPACTED SUBGRADE ELEVATION.
5. WSDOT 9-03.12[4]

## NOTE:

EMBANKMENT HEIGHTS 4'-0" AND ABOVE REQUIRES BUILDING PERMIT AND SET OF STAMPED ENGINEERING PLANS



STANDARD PLAN 6-040

APPROVED BY

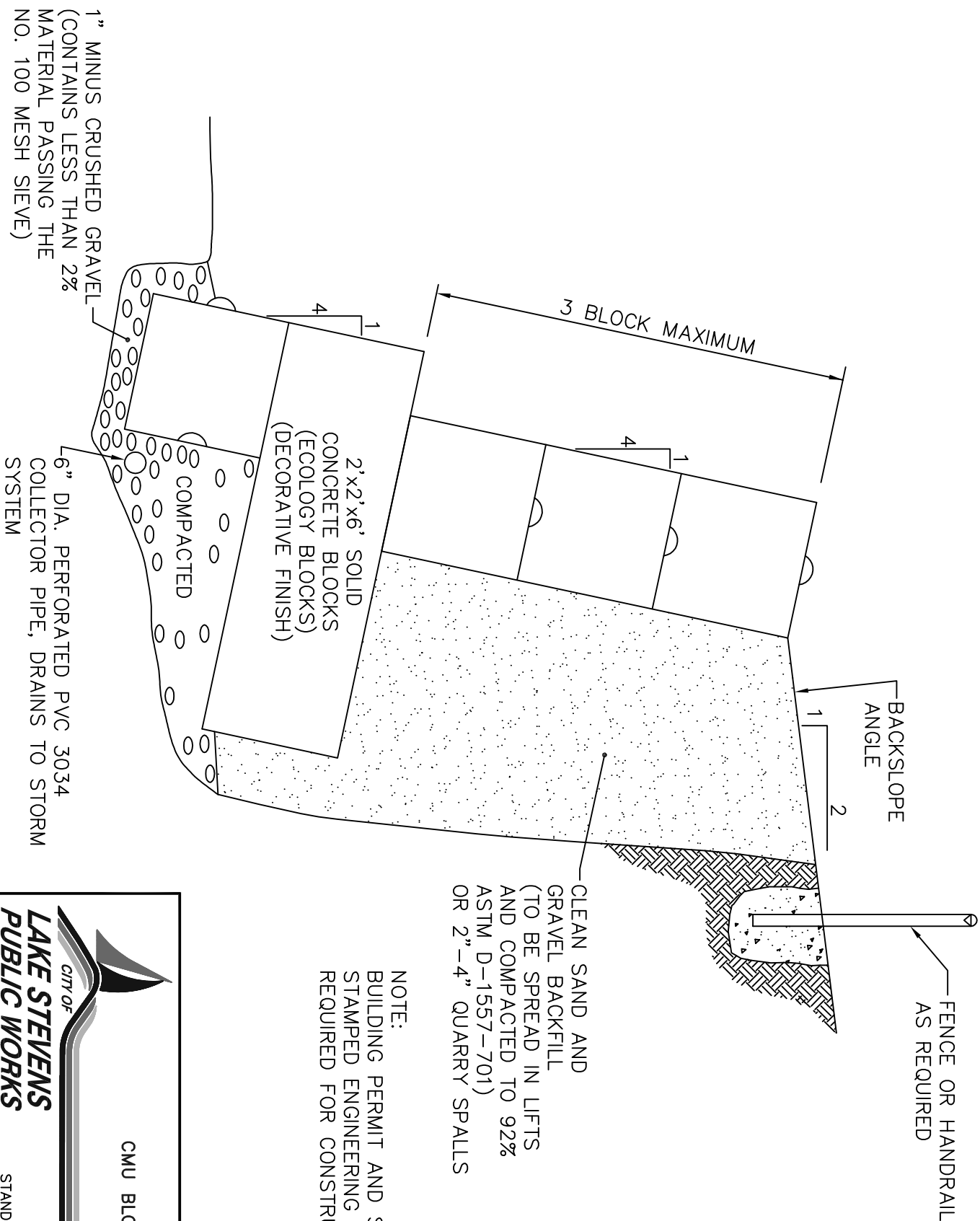
*Daniel M. Berglund*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE



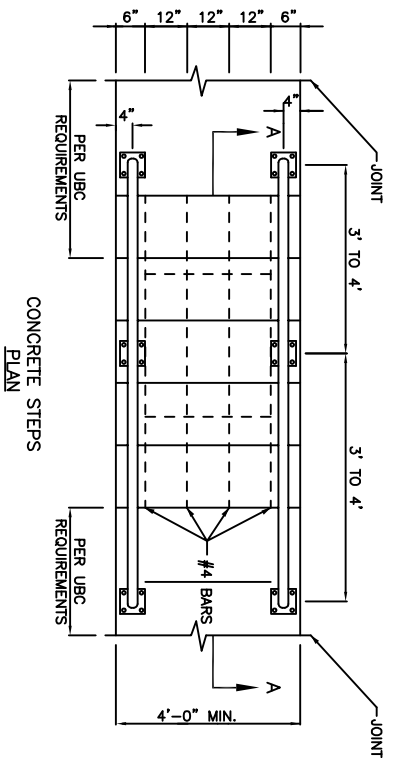
LAST REVISED 05/09



STANDARD PLAN 6-050

APPROVED BY  
*Daniel M. Berglund*  
LAKE STEVENS CITY ENGINEER

05/09  
DATE

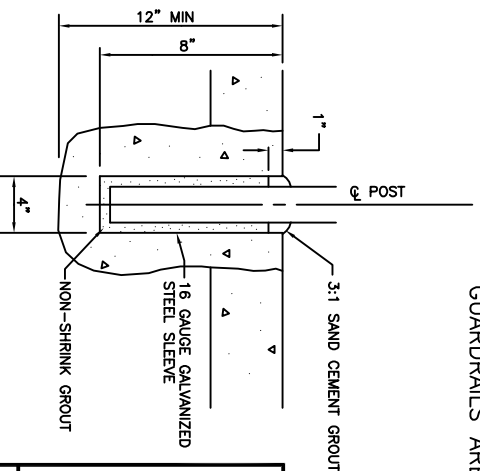
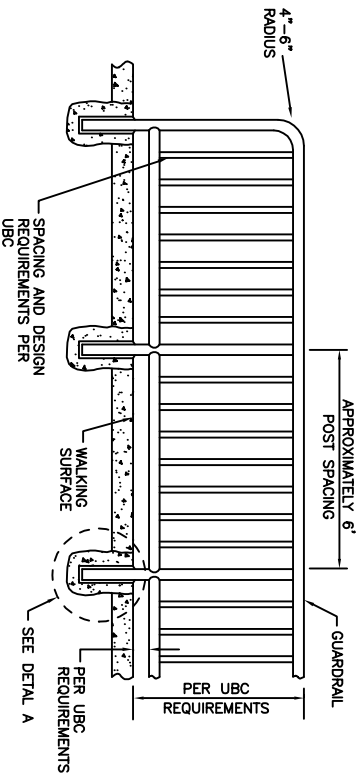
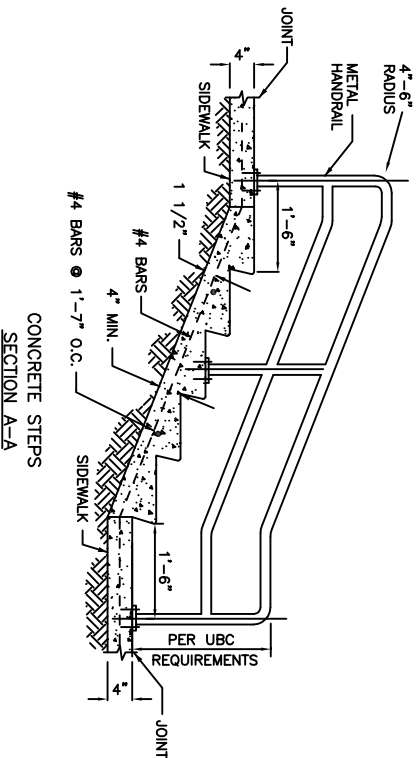


NOTES FOR CONCRETE STEPS:

1. CONCRETE: CEMENT CONCRETE CLASS 3000.
2. ALL STEPS: PER UBC REQUIREMENTS.
3. RISERS: PER UBC REQUIREMENTS.
4. TREADS: PER UBC REQUIREMENTS.
5. LOCATION OF METAL HANDRAIL AND GUARDRAIL PER UBC REQUIREMENTS, SEE NOTES BELOW.
6. REINFORCING BARS SHALL MEET THE REQUIREMENTS OF ASTM A-615, GRADE 60 .
7. SEE UBC SEC. 3306.
8. MAX. VERTICAL DISTANCE BETWEEN LANDINGS PER UBC REQUIREMENTS.

NOTES FOR HANDRAILS AND PEDESTRIAN GUARDRAILS:

1. GALVANIZED STEEL OR ALUMINUM.
2. ROUND OR OVAL PIPE, SIZE PER IBC REQUIREMENTS.
3. WELDED, WITH SMOOTH SURFACE AND JOINTS.
4. POSTS SET IN CLASS 3000 CONCRETE A MINIMUM OF 8".
5. SEE IBC SEC. 3306.
6. GALVANIZED STEEL OR ALUMINUM GUARDRAILS WHEN GUARDRAILS ARE REQUIRED BY IBC.



CONCRETE STEPS,  
METAL HANDRAIL,  
& GUARDRAIL  
STANDARD PLAN 6-090

HANDRAILS AND GUARDRAILS (GALVANIZED STEEL).

GALVANIZED HANDRAIL AND GUARDRAIL SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH THESE SPECIAL PROVISIONS AND STANDARD DRAWING.

GALVANIZED STEEL HANDRAIL AND GUARDRAIL SHALL CONFORM TO ASTM DESIGNATION A120. ALL WELDING SHALL CONFORM TO AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE AWS D1.1-72. AFTER FABRICATION EACH SECTION OF RAILING SHALL BE HOT-DIPPED GALVANIZED WITH A MINIMUM ZINC COATING OF 2 OUNCES PER SQUARE FOOT. ALL BURRS AND SHARP EDGES SHALL BE REMOVED PRIOR TO GALVANIZING.

FIELD WELDS SHALL BE GALVANIZED WITH "GALVALLOY" OR APPROVED EQUAL. PAINTING OF WELDS WILL NOT BE PERMITTED.

HORIZONTAL RAILS AND VERTICAL POSTS SHALL BE 2 INCH DIAMETER AND BALUSTERS SHALL BE 1" DIAMETER STANDARD WEIGHT GALVANIZED STEEL PIPE. RAILS, POSTS AND BALUSTERS SHALL BE MACHINE CUT TO PROVIDE A UNIFORM LENGTH PRIOR TO ASSEMBLY.

RAILING SHALL BE ERECTED AND ADJUSTED, IF NECESSARY, TO ASSURE A CONTINUOUS LINE AND GRADE. FINISHED HEIGHT IS TO BE PER UBC REQUIREMENTS ABOVE PEDESTRIAN SURFACE. EXPANSION JOINTS SHALL BE PROVIDED AT INTERVALS SHOWN ON THE STANDARD DRAWING.

HANDRAILS AND GUARDRAILS (ALUMINUM).

ALUMINUM HANDRAIL AND GUARDRAIL SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH THESE SPECIAL PROVISIONS AND STANDARD DRAWING.

ALUMINUM HANDRAIL AND GUARDRAIL SHALL BE NATURAL ALUMINUM COLOR.

IF ANODIZATION IS SPECIFIED, ALL ALUMINUM PARTS SHALL BE GIVEN A CLEAR ANODIC COATING AT LEAST 0.0006 INCH THICK AND SHALL BE SEALED TO MEET THE REQUIREMENTS OF ASTM B 136 AND SHALL HAVE A UNIFORM FINISH.

WELDING OF ALUMINUM SHALL BE IN ACCORDANCE WITH THE "STRUCTURAL WELDING CODE ALUMINUM, AWS D 1.2".

ALL MATERIALS USED IN THE FABRICATION OF ALUMINUM HANDRAILS AND GUARDRAILS SHALL MEET THE REQUIREMENTS OF ASTM B241 OR B429 ALLOY 6061-T6 SCHEDULE 40(STD. PIPE).

HORIZONTAL RAILS AND VERTICAL SUPPORT POSTS SHALL BE 1.9" OD AND BALUSTERS SHALL BE 1.05" OD. STANDARD WEIGHT ALUMINUM PIPE. RAILS, POSTS AND BALUSTERS SHALL BE MACHINE CUT TO PROVIDE A UNIFORM LENGTH PRIOR TO ASSEMBLY.



**HANDRAIL & GUARDRAIL  
NOTES**

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-091

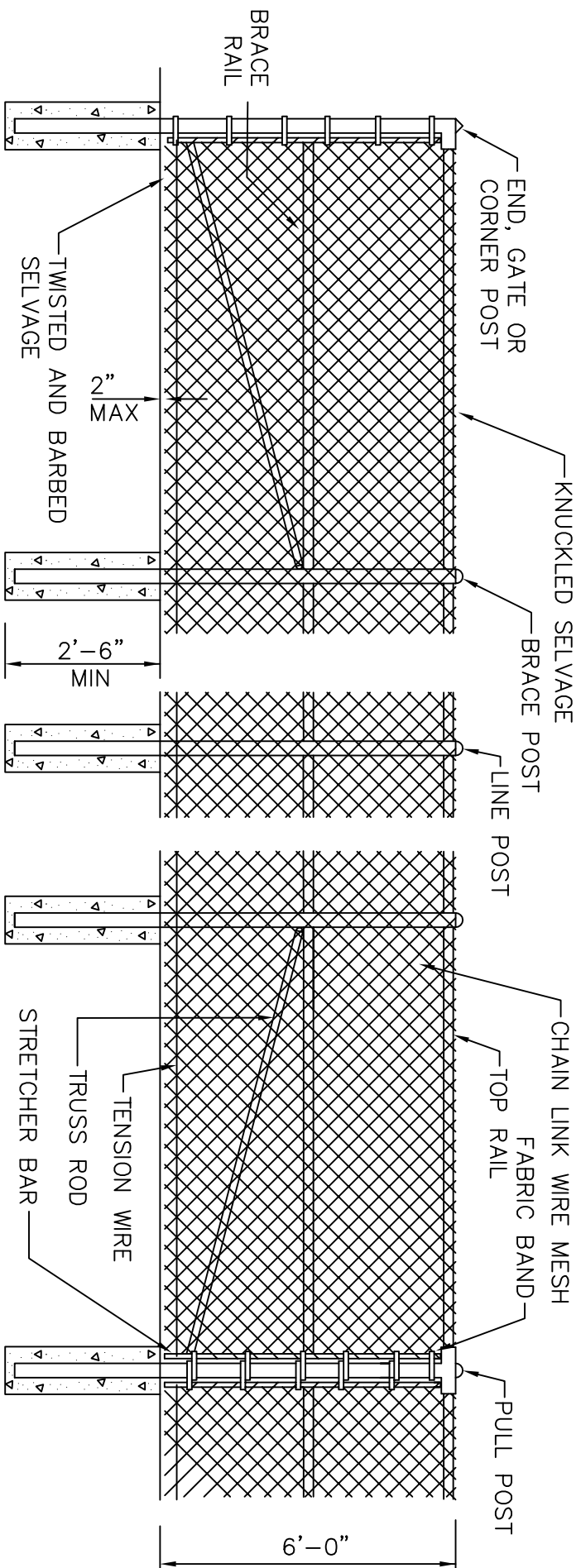
APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE



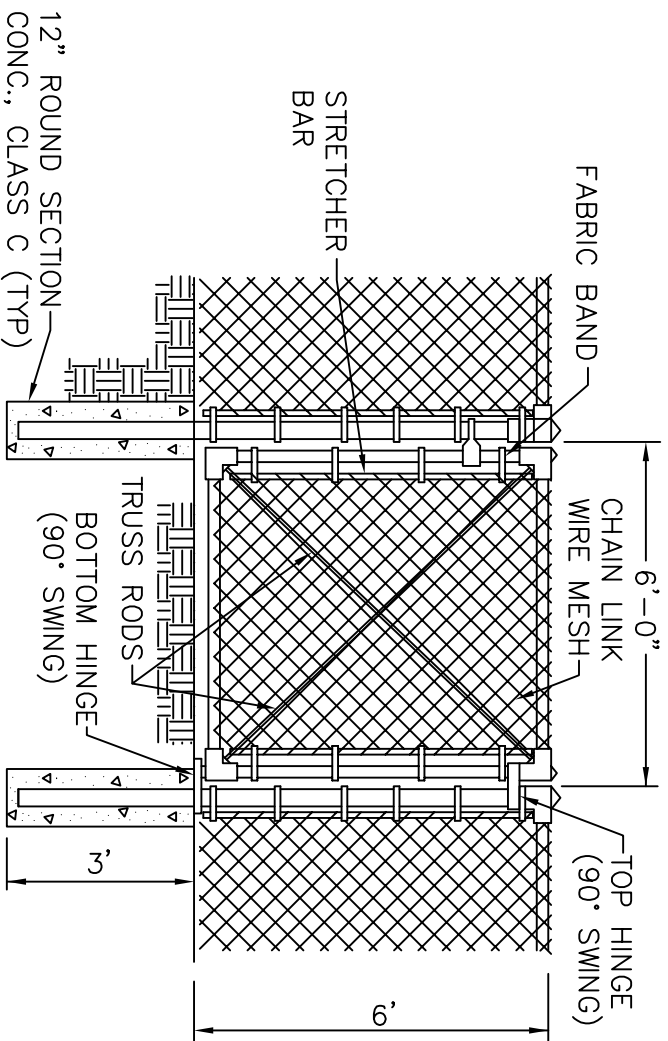
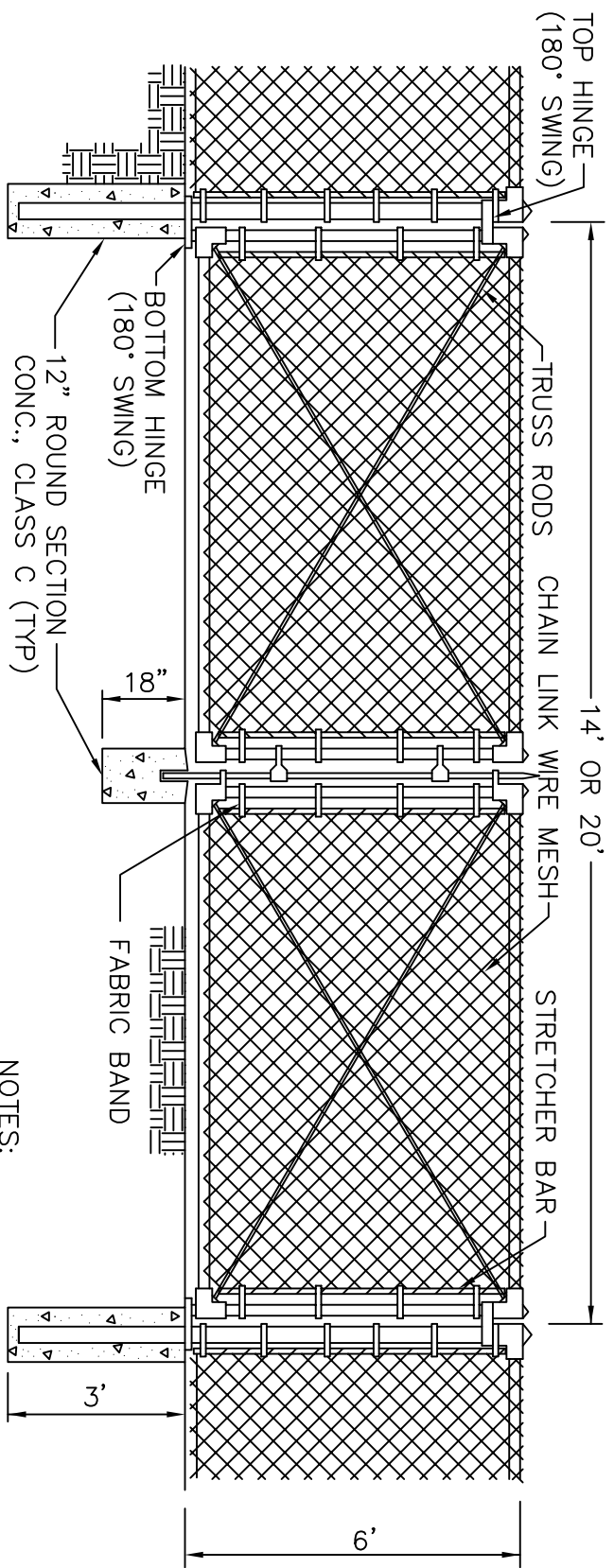
NOTES:

1. MATERIAL SHALL BE SCHEDULE 40
2. WIRE MESH SHALL BE 9 GAUGE WIRE
3. BARBED WIRE TO BE PLACED ON TOP AS DIRECTED
4. WOOD SLATS MAY BE REQUIRED
5. SCHEDULE 40 IS REQUIRED FOR ALL POSTS FOR FUTURE SLATES AND WIND SHEAR.
6. TENSION WIRE SHALL BE 7 GAUGE
7. ALL CHAIN LINK FENCE SHALL BE BLACK VINYL OR POWDER COATED



STANDARD PLAN 6-110





NOTES:

1. FENCE FABRIC SHALL BE SECURED TO GATE FRAMES WITH KNUCKLED SELVAGE ALONG TOP EDGE.
2. MINIMUM POST LENGTH: 8'-8"
3. PROVIDE LOCKING MECHANISM (PADLOCK BY CITY)
4. BARBED WIRE TO BE PLACED ON TOP AS DIRECTED.
5. ALL CHAIN LINK SHALL BE BLACK VINYL



**LAKE STEVENS  
PUBLIC WORKS**

CHAIN LINK GATES

STANDARD PLAN 6-120

APPROVED BY

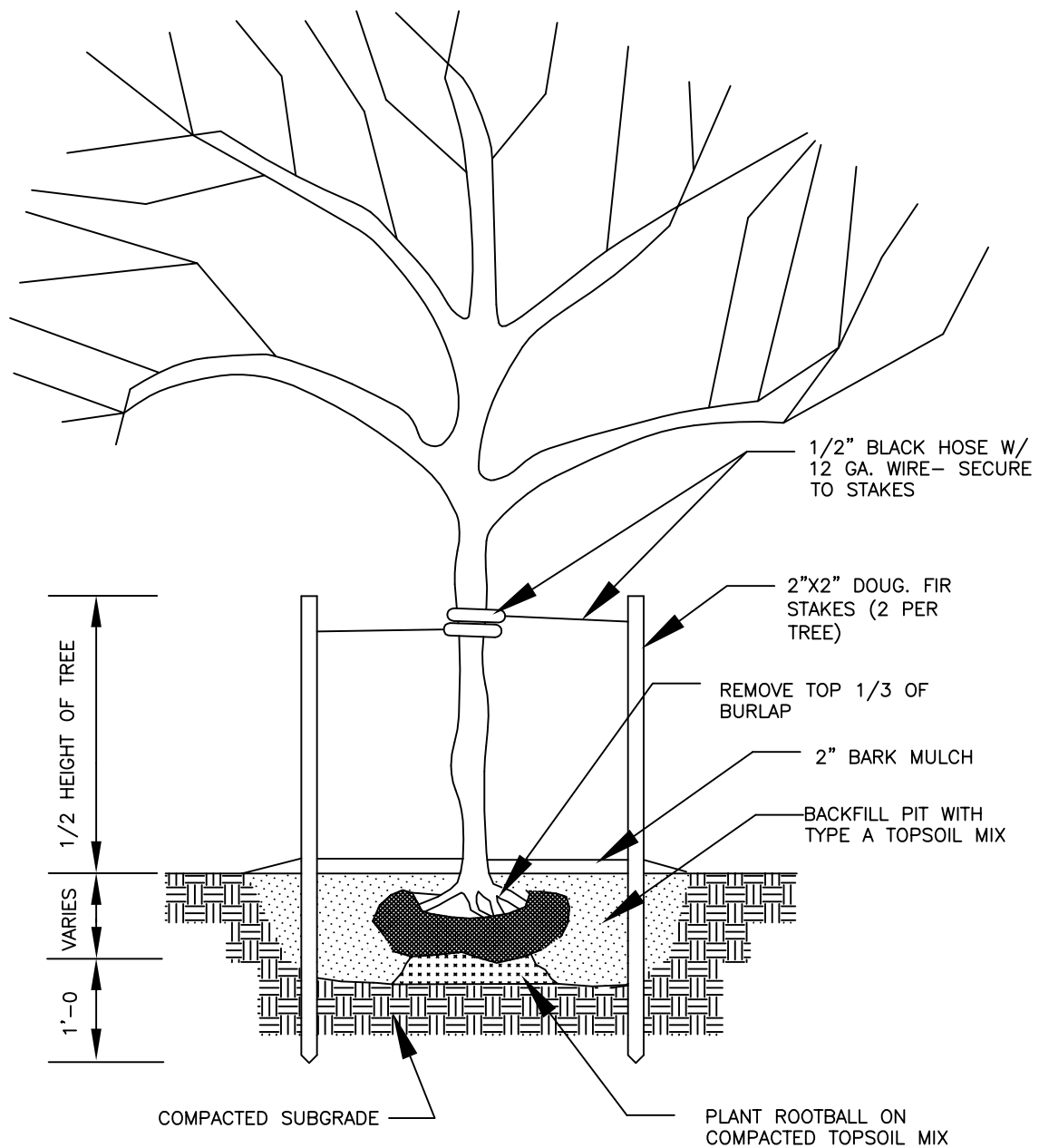
*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE





TREE PLANTING SHALL CONFORM TO THE  
REQUIREMENTS OF SECTION 8-02 OF THE  
WSDOT / APWA STANDARD SPECIFICATIONS.

TREE PLANTING AND STAKING  
DETAIL



STANDARD PLAN 05/09

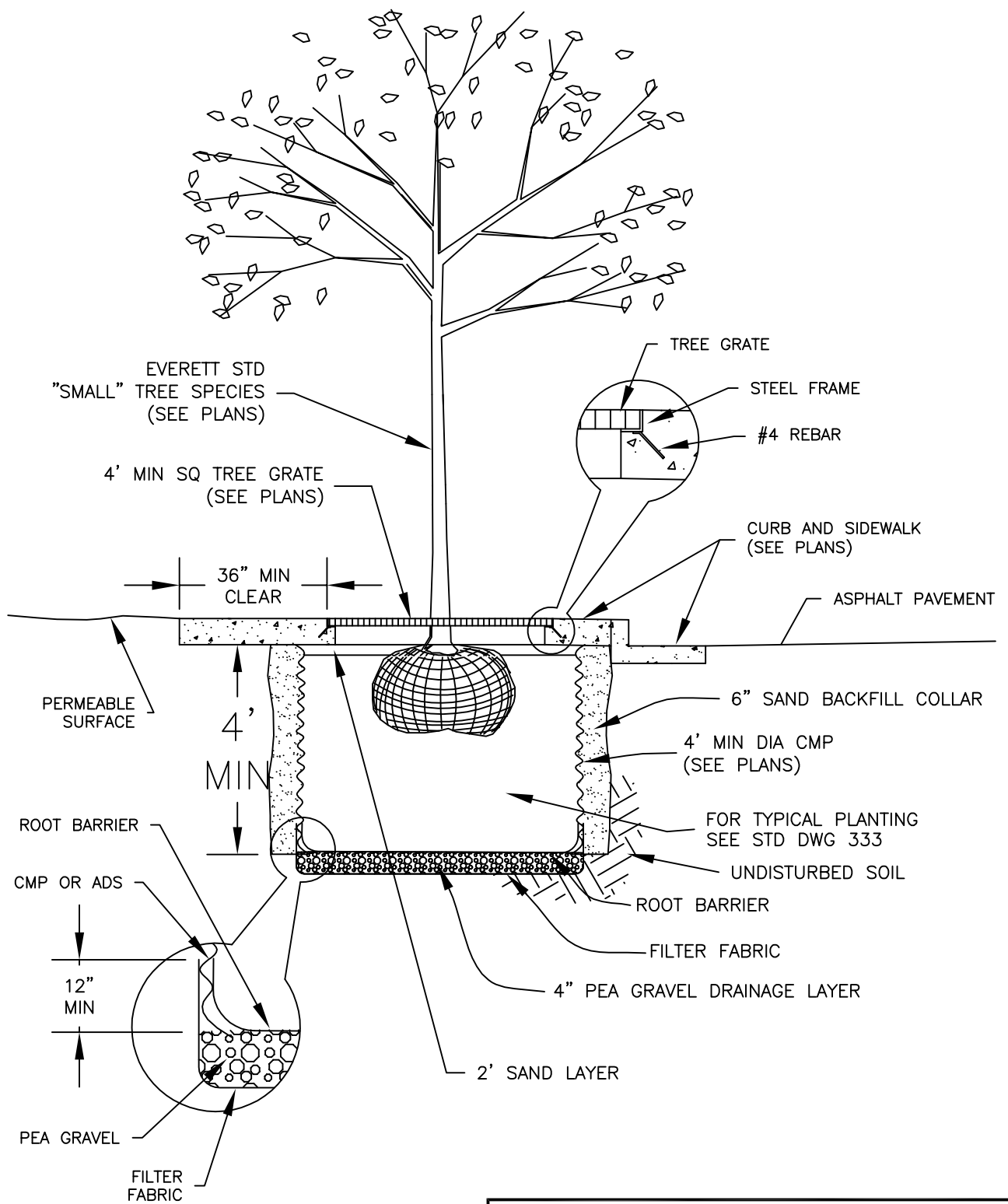
APPROVED BY

*David V. Otergaard*

LAKE STEVENS CITY ENGINEER

01/01/09

DATE



TREE WELL IN SIDEWALK AREA



CITY OF  
**LAKE STEVENS**  
**PUBLIC WORKS**

STANDARD PLAN 6-132

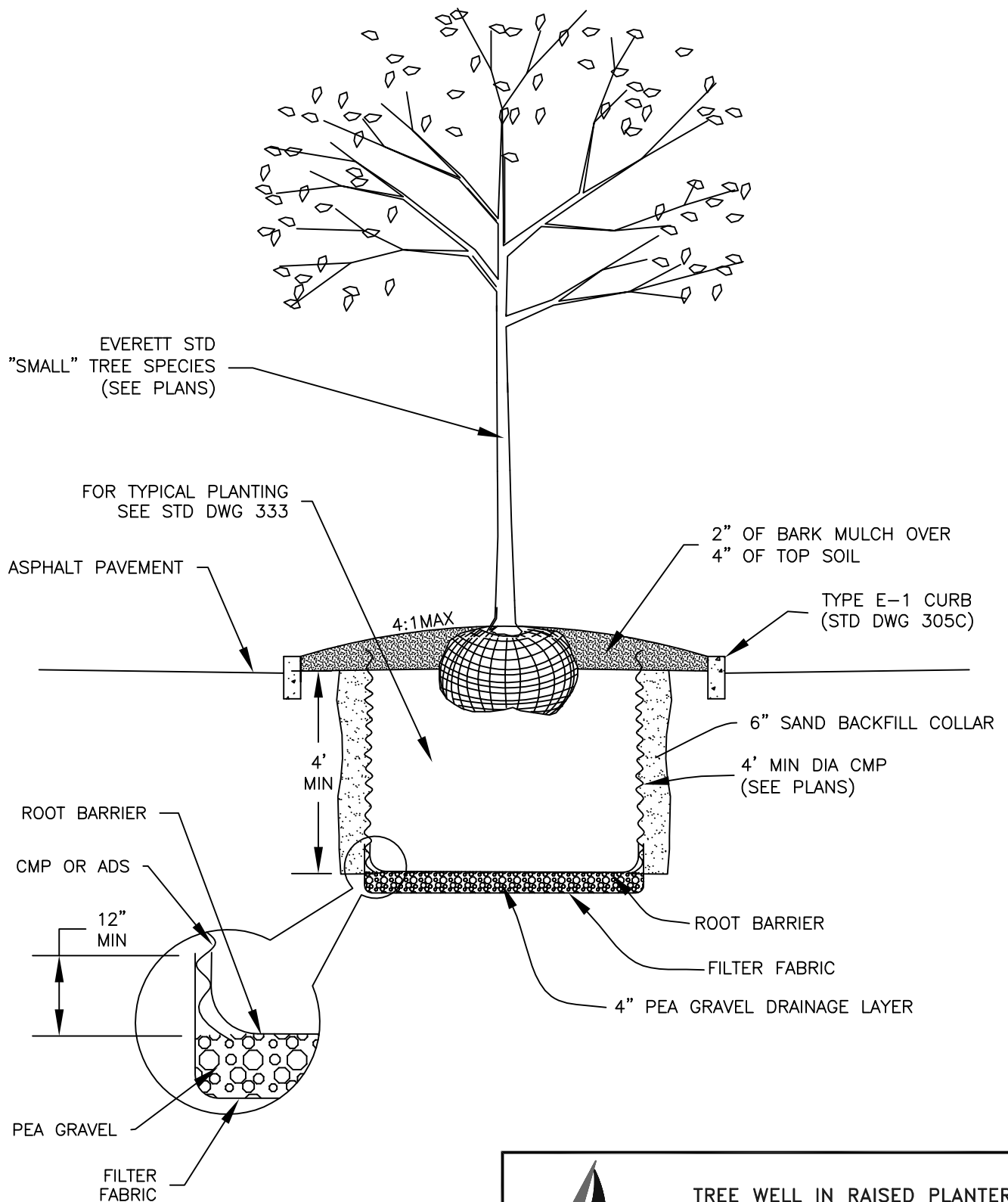
APPROVED BY

*David V. Ostergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE



**LAKE STEVENS  
PUBLIC WORKS**

TREE WELL IN RAISED PLANTER  
STRIP OR ISLAND

STANDARD PLAN 6-133

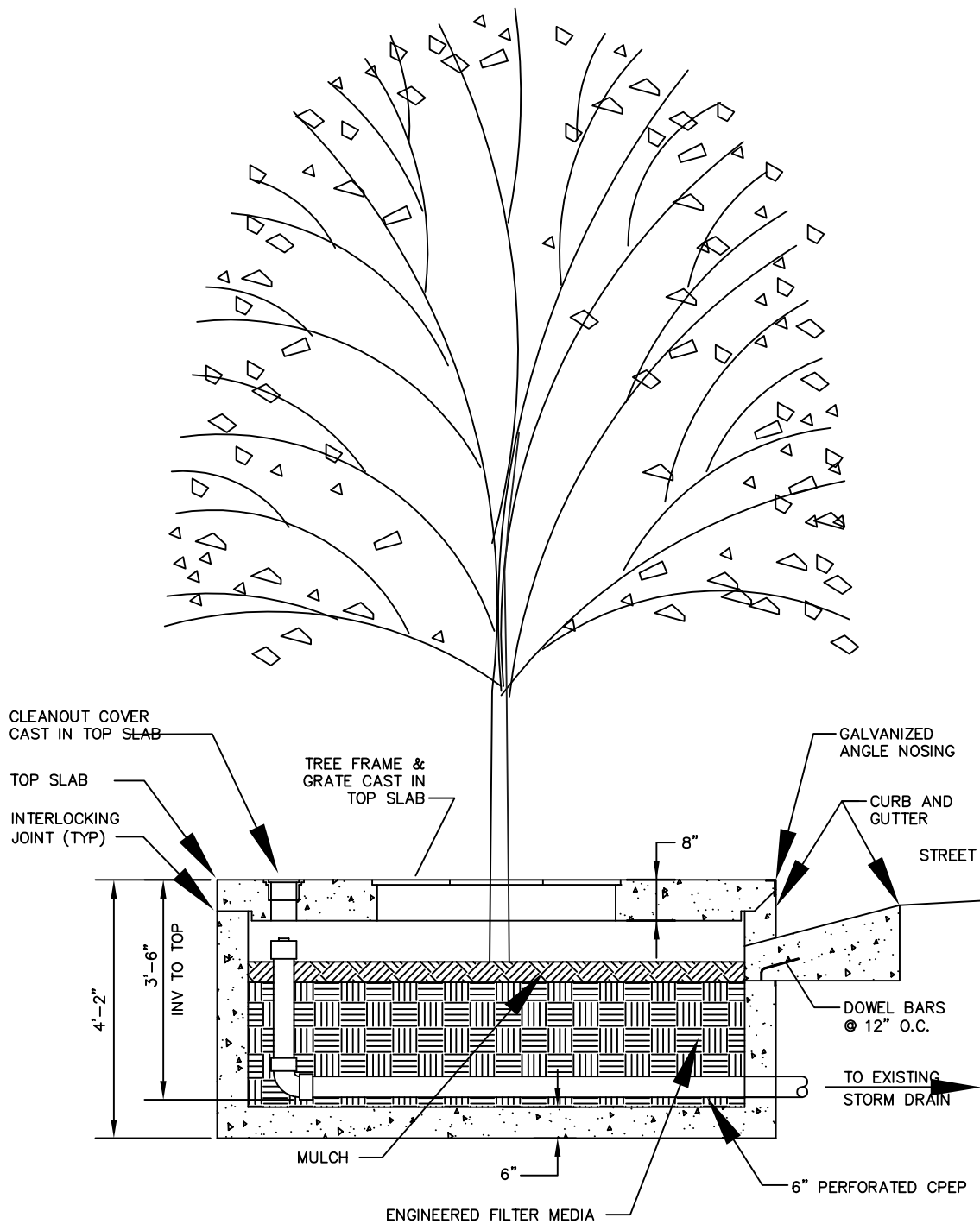
APPROVED BY

*David V. Otergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE



| DESIGNATION | LENGTH | WIDTH  | TREE GRATE QTY & SIZE |
|-------------|--------|--------|-----------------------|
| 4 X 6       | 4'-0"  | 6'-0"  | (1) 3X3               |
| 4 X 8       | 4'-0"  | 8'-0"  | (1) 3X3               |
| 6 X 8       | 6'-0"  | 8'-0"  | (1) 4X4               |
| 6 X 10      | 6'-0"  | 10'-0" | (1) 4X4               |
| 6 X 12      | 6'-0"  | 12'-0" | (2) 4X4               |



**LID TREE BOX  
TYPICAL SECTION**

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-134

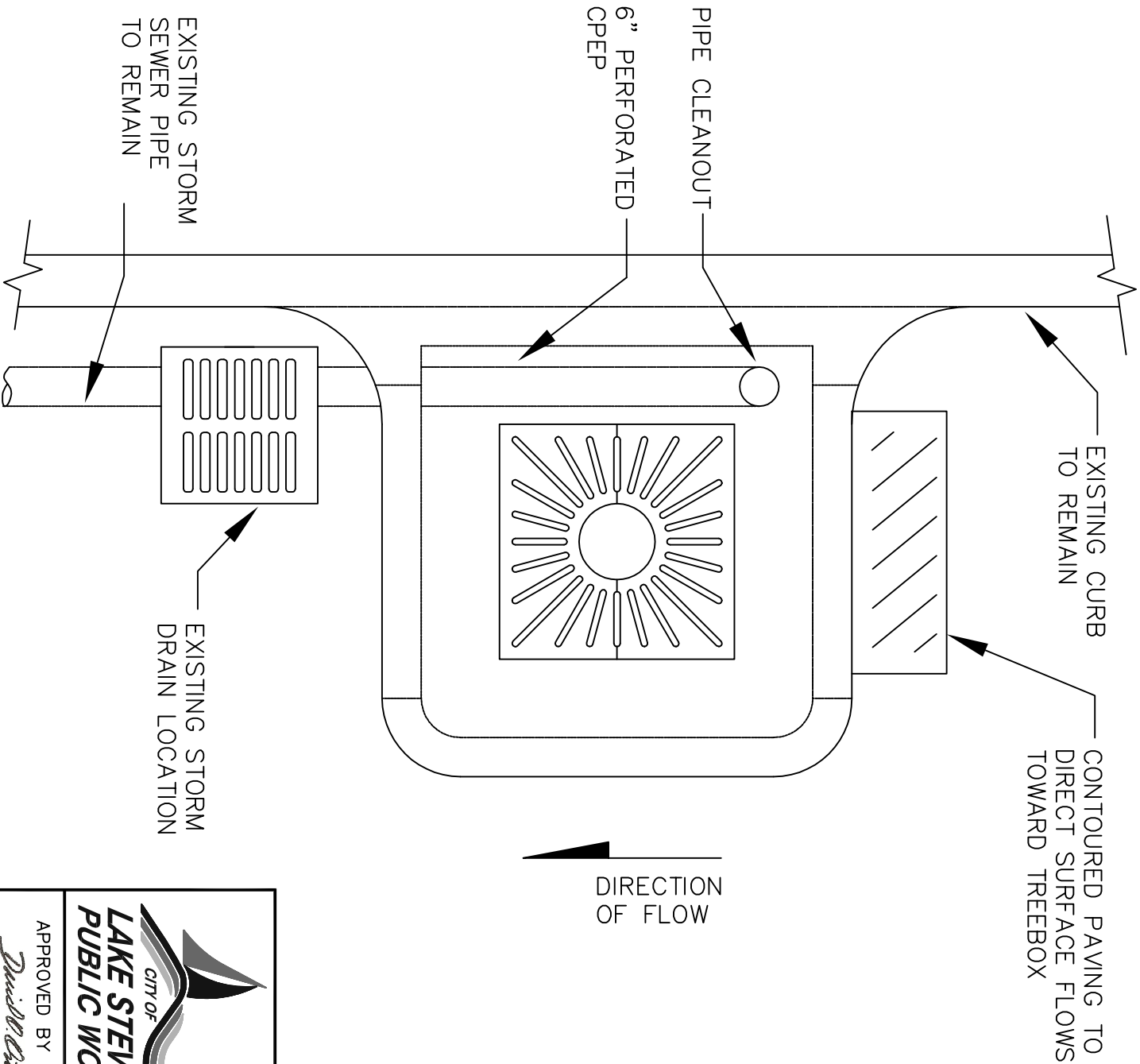
APPROVED BY

*David V. Ostergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE



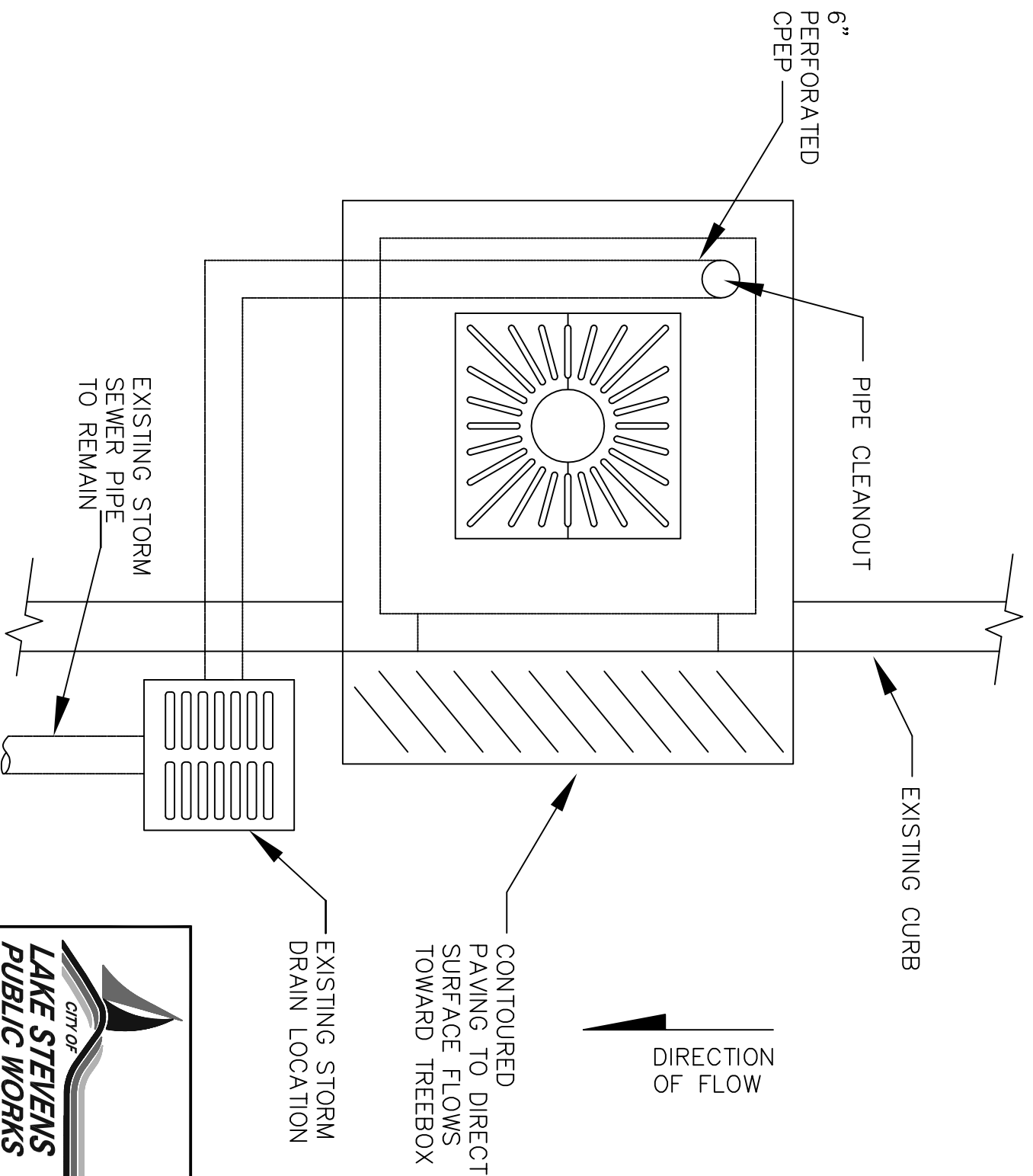


**CITY OF  
LAKE STEVENS  
PUBLIC WORKS**

**LID TREE BOX  
BULBED – PLAN**

STANDARD PLAN 6-135

APPROVED BY  
*David M. Berglund*  
CITY LAKE STEVENS ENGINEER



LAST REVISED 05/09



**LID TREE BOX  
RECESSED - PLAN**

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**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-136

APPROVED BY

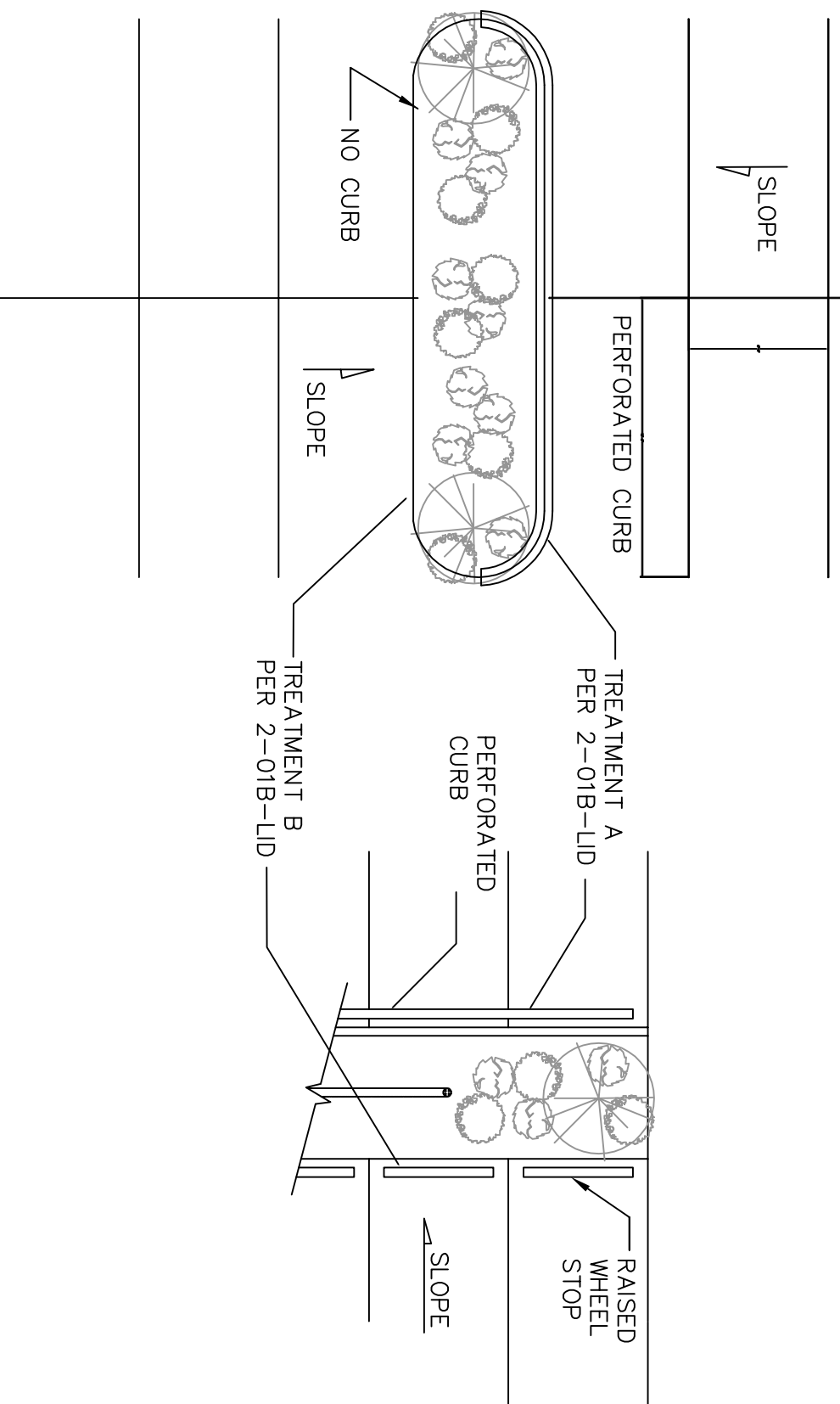
*Daniel M. Berglund*

CITY LAKE STEVENS ENGINEER

05/09

DATE





NOTES:

1. UNDERDRAINS ARE ONLY PERMITTED IN SOILS WITH INFILTRATION RATES INADEQUATE TO MEET MAXIMUM POOL AND SYSTEM DEWATER RATES.
2. WHERE PERFORATED CURBS, OR WHEEL STOPS FLUSH WITH THE PAVEMENT, ARE USED, APPROXIMATELY 6 INCHES OF ROCK OR OTHER EROSION PROTECTION MATERIAL SHOULD BE USED TO DISSIPATE ENERGY AND/OR FLOW DISPERSION. SEE DETAILS 6-138



LID PARKING ISLAND  
PLAN - TREATEMENT A&B

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-137

APPROVED BY

*Daniel M. Berglund*

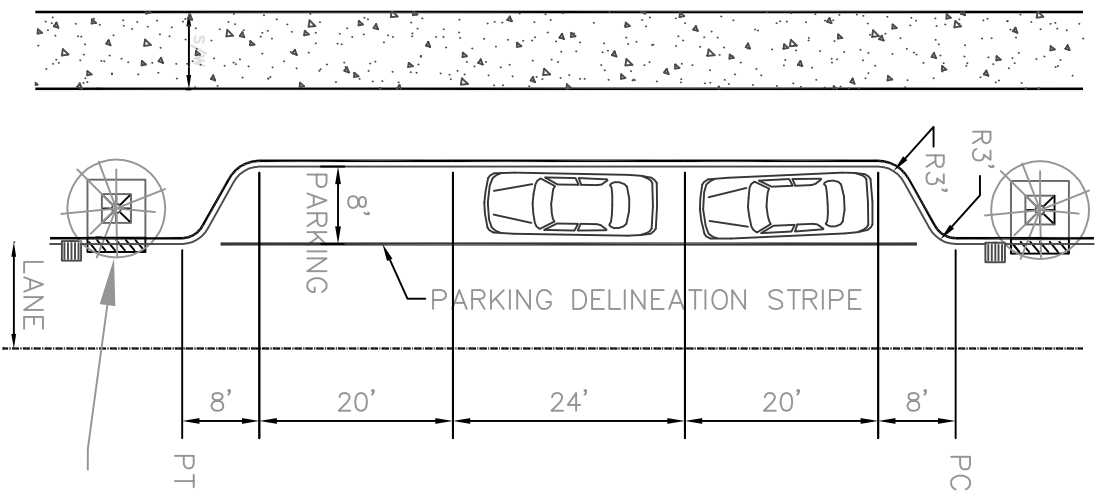
05/09

LAST REVISED 05/09

CITY LAKE STEVENS ENGINEER

DATE





GENERAL NOTES:

1. CATCH BASINS ARE NOT PERMITTED IN BULB-OUT PARKING AREAS.
2. CATCH BASINS SHOULD BE LOCATED DOWNSLOPE FROM TREE BOXES.
3. IF VALLEY GUTTERS ARE NOT UTILIZED, BULB-OUT PARKING SHALL BE DELINEATED BY STRIPING.
4. UTILITY VALVE BOXES AND MANHOLES SHALL NOT BE LOCATED IN THE BULB-OUT PARKING AREAS.



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-139

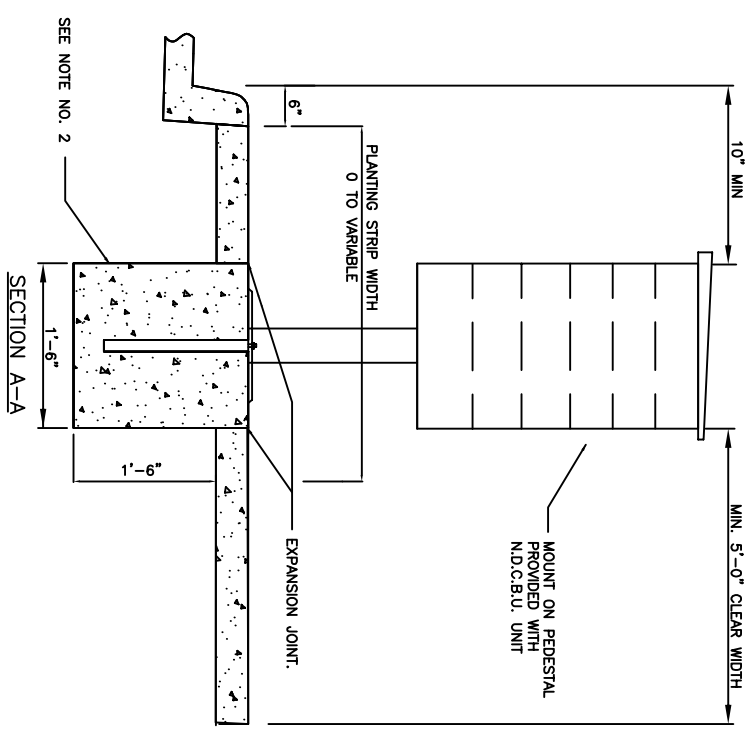
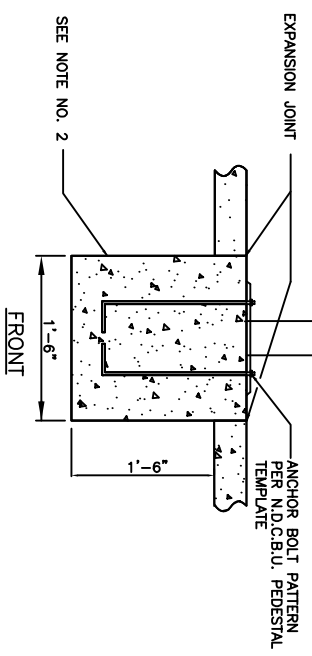
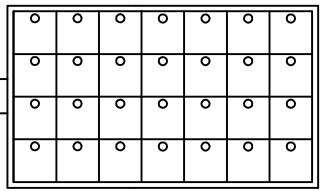
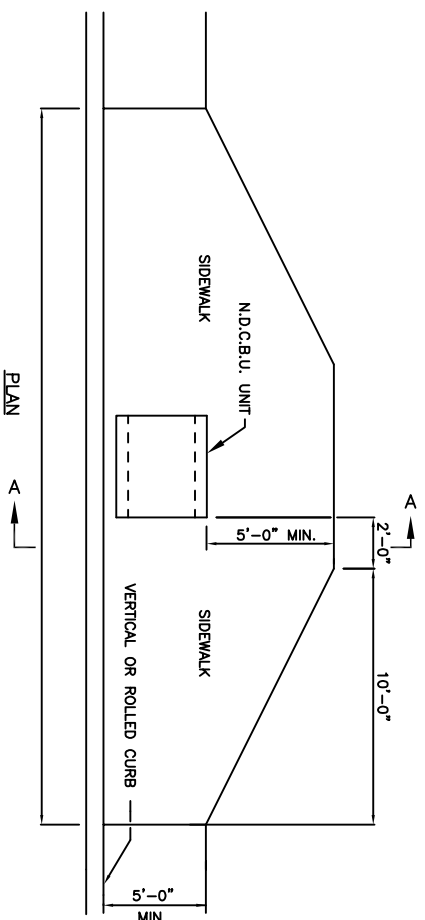
APPROVED BY

*Daniel M. Berglund*

CITY LAKE STEVENS ENGINEER

05/09

DATE



NOTES:

1. INSTALLATION OF N.D.C.B.U. (INCLUDING CONSTRUCTION OF BASE) WILL BE DONE BY CONTRACTOR.
2. SEE SEC. 6-104 FOR JOINT REQUIREMENTS.
3. CITY RIGHT-OF-WAY PERMIT REQUIRED.



NEIGHBORHOOD DELIVERY &  
COLLECTION BOX UNIT  
INSTALLATION

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-140

APPROVED BY

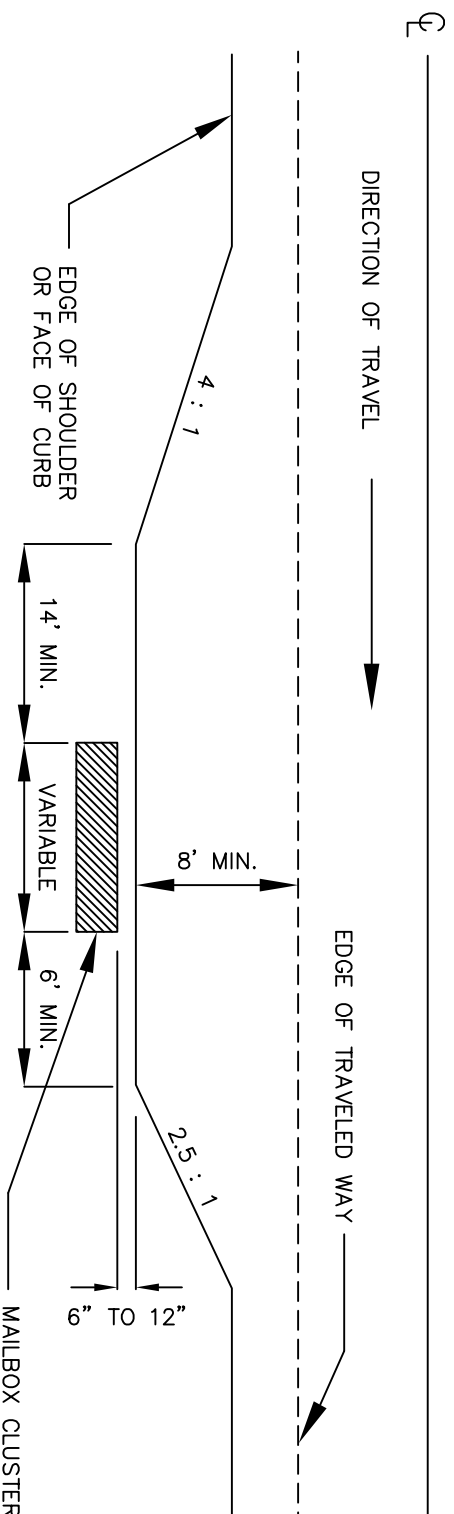
*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE

LAST REVISED 05/09



NOTES:

1. FOR ARTERIAL ROADS OR AS REQUIRED BY THE CITY ENGINEER.
2. SEE SECTION 6-104.



STANDARD PLAN 6-150

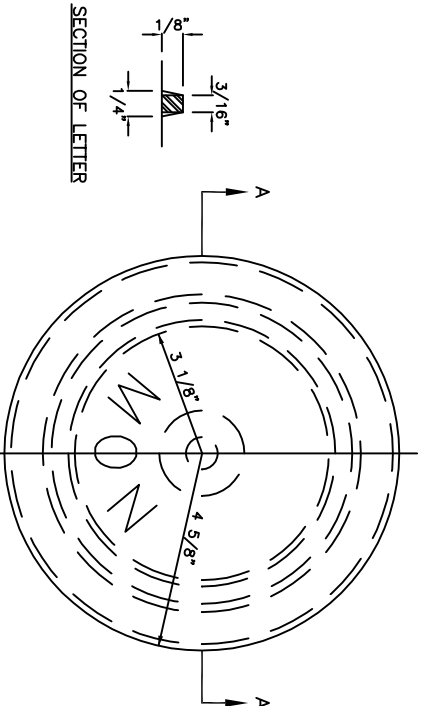
APPROVED BY

*Daniel M. Berglund*

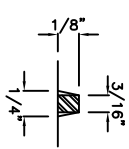
LAKE STEVENS CITY ENGINEER

05/09

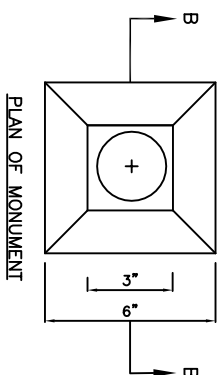
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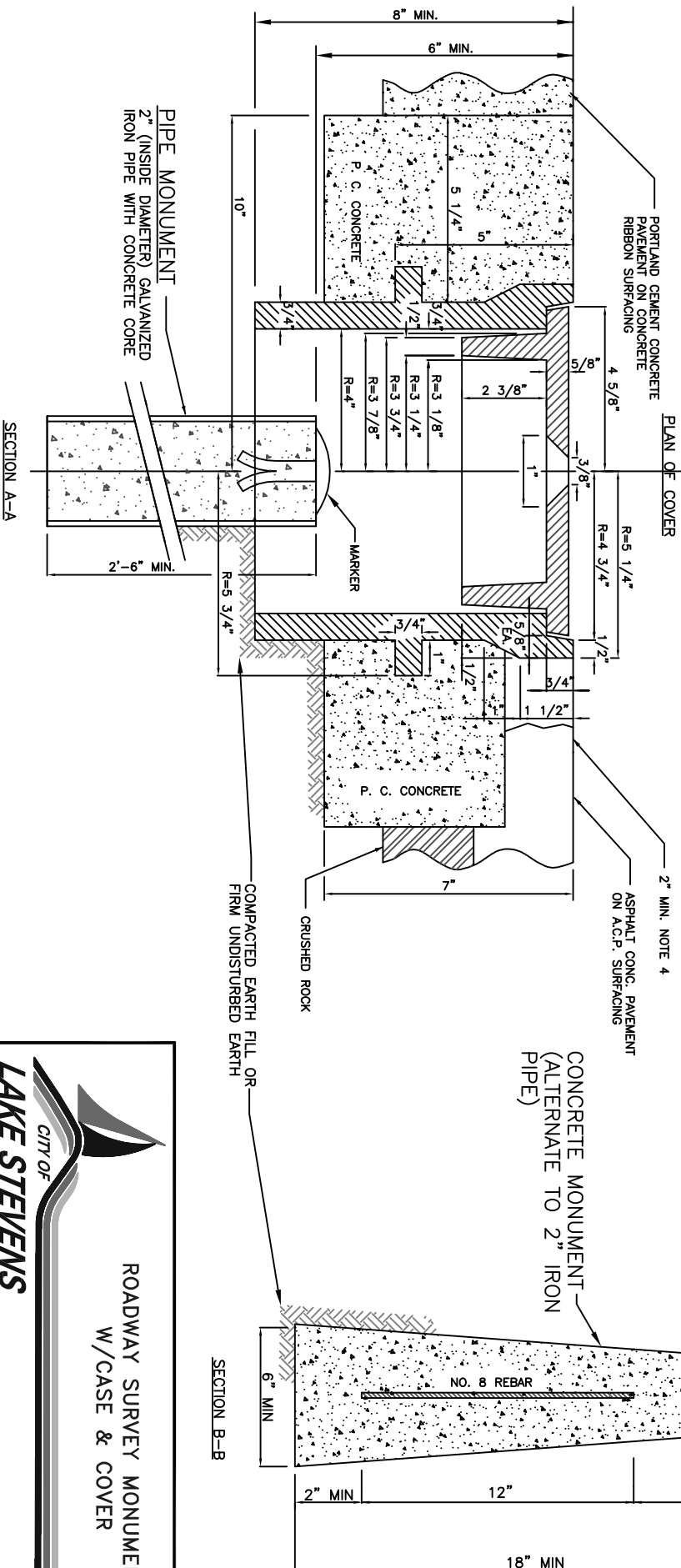
SECTION OF LETTER



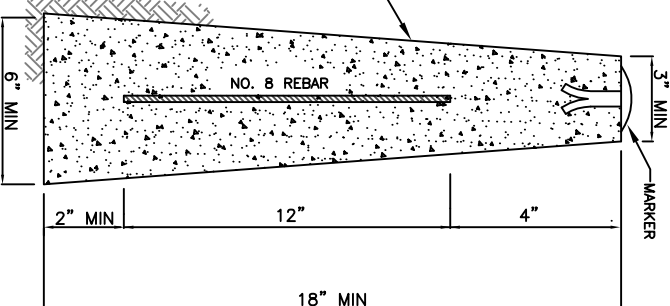
- NOTES:
1. CASTINGS SHALL BE GRAY IRON ASTM A48, AASHTO M 105, CLASS 30.
  2. COVER AND SEAT SHALL BE MACHINED FOR PERFECT CONTACT AROUND CIRCUMFERENCE AND FULL WIDTH OF BEARING SURFACE.
  3. APPROXIMATE WEIGHTS, STANDARD.  
CASE 60 LBS  
COVER 19 LBS  
TOTAL 79 LBS
  4. PAVEMENT SHALL BE ASPHALT CONCRETE OR APPROVED SUBSTITUTE.
  5. CONCRETE SHALL BE CLASS 4000.



PLAN OF MONUMENT



SECTION B-B



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-160

ROADWAY SURVEY MONUMENT  
W/CASE & COVER

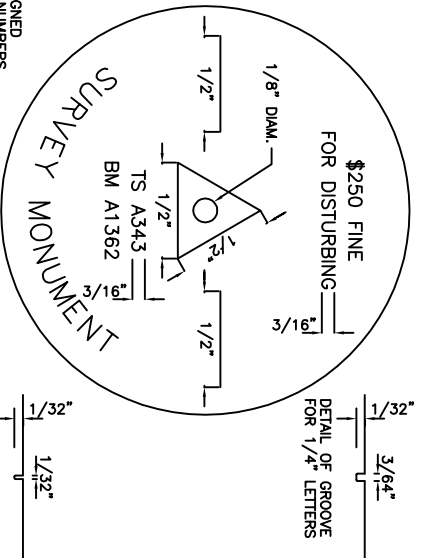
APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

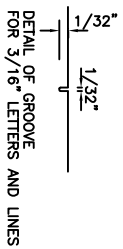
05/09

DATE

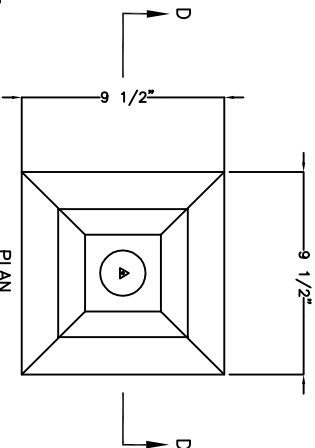


NOTE:  
ONLY THE ASSIGNED  
IDENTIFICATION NUMBERS  
ARE TO APPEAR ON THE  
BRASS DISC.

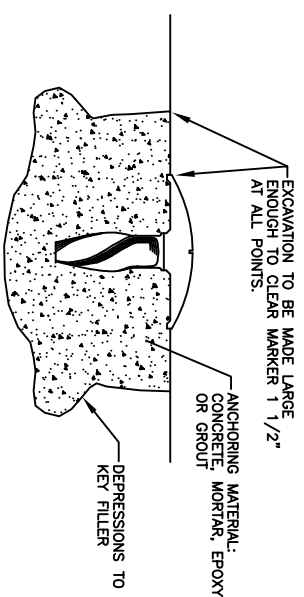
PLAN



DETAIL OF GROOVE  
FOR 1/4" LETTERS AND LINES



PLAN

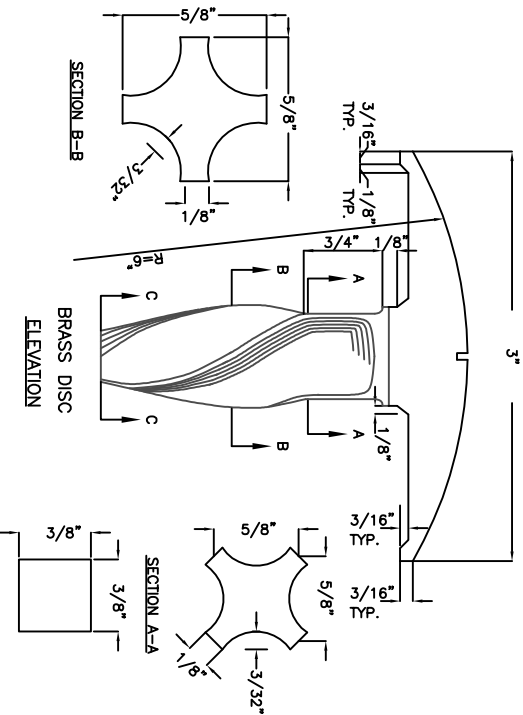


THE MARKER OR ADDITIVE TO THE ANCHORING  
MATERIAL IN THIS TYPE OF INSTALLATION TO BE  
CAPABLE OF DETECTION BY A FERROUS TYPE  
METAL DETECTOR.

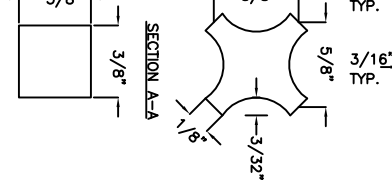
LEDGE ROCK OR  
CONCRETE INSTALLATION

NOTES:

1. THE MARKER SHALL BE CAST OF YELLOW BRASS  
SAE 41, BRONZE OR ALUMINUM.
2. CONCRETE SHALL BE CLASS 4000.
3. THE HOLE SHALL BE 18" MIN. IN DEPTH. ALL  
LOOSE MATERIAL SHALL BE REMOVED FROM THE  
BOTTOM OF THE HOLE SO THAT THE CONCRETE IS  
ON FIRM, UNDISTURBED EARTH.
4. THE TOP OF THE CONCRETE SHALL BE TROWLED  
SMOOTH AND THE BRASS DISC SET IN THE CENTER  
WITH ITS TOP EDGE FLUSH AND LEVEL.
5. USE JUDGEMENT ON DEPTH OF BURY. DO NOT MAKE  
A HAZARD FROM TRIPPING OVER OF FALLING ON. IF IN  
SHOULDER OF ROAD BURY BELOW LIKELIHOOD OF  
BEING GRADED OUT.

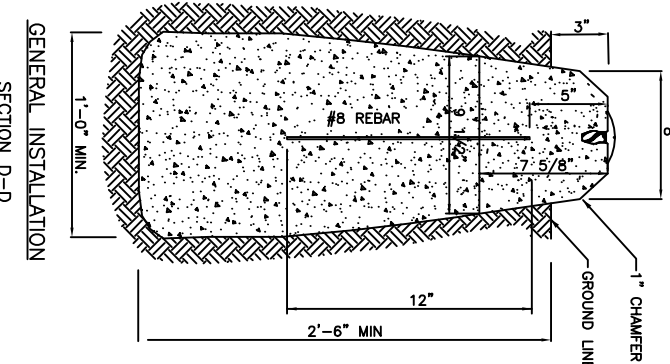


SECTION B-B

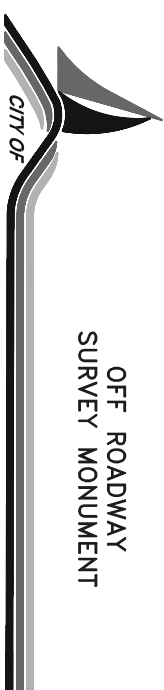


SECTION A-A

SECTION C-C



GENERAL INSTALLATION  
SECTION D-D



OFF ROADWAY  
SURVEY MONUMENT

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 6-170

APPROVED BY

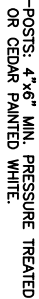
*Dwight A. Berglund*

05/09

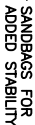
LAKE STEVENS CITY ENGINEER

DATE

LAST REVISED 05/09



TYPE III BARRICADE (2 REQUIRED)



MOVABLE (TEMPORARY)  
TYPE III BARRICADE



**DRUM**



## TYPE II BARRICADE

BARRICADE NOTES:

STRIPE NOTES:

NOTE:  
FOR DIMENSIONS NOT  
SHOWN, SEE TABLE.

ORANGE & WHITE IF TEMPORARY.  
RED & WHITE IF 3 MONTHS OR  
GREATER. REFLECTORIZED  
SLANT DOWNWARD, RIGHT OR LEFT,  
IN DIRECTION TRAFFIC WILL PASS.  
SLANT BOTH DIRECTIONS FROM MIDDLE  
IF TRAFFIC PASSES BOTH ENDS.  
WIDTH 6" EXCEPT 4" IF RAILS ARE  
LESS THAN 3' LONG.  
SLANT DOWNWARD TO MIDDLE AT END  
OF CLOSED ROAD.

SEE SEC. 6-107 AND MUTCD SEC.6C-8.



TYPE | BARRICADE



## BARRICADES

STANDARD PLAN 6-180

APPROVED BY

David D. Oetzel, and

05/09

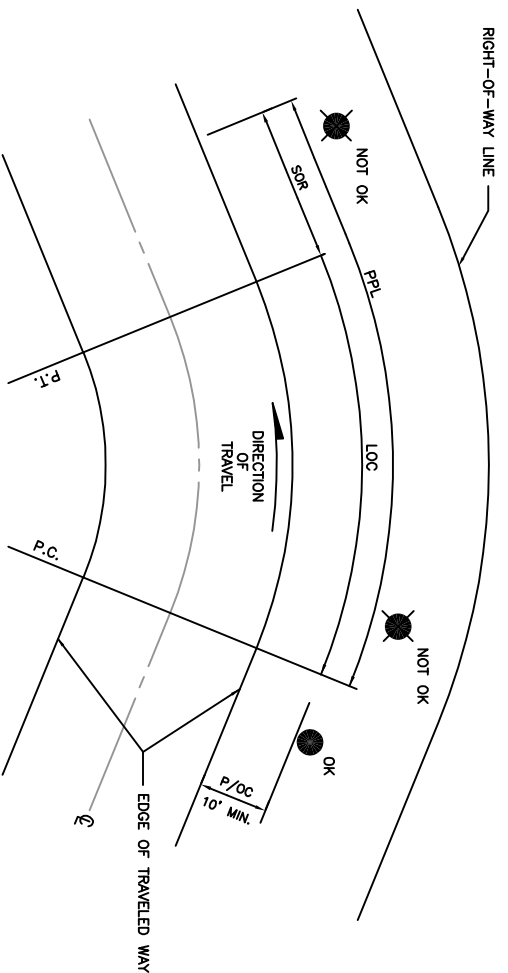
LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE \_\_\_\_\_







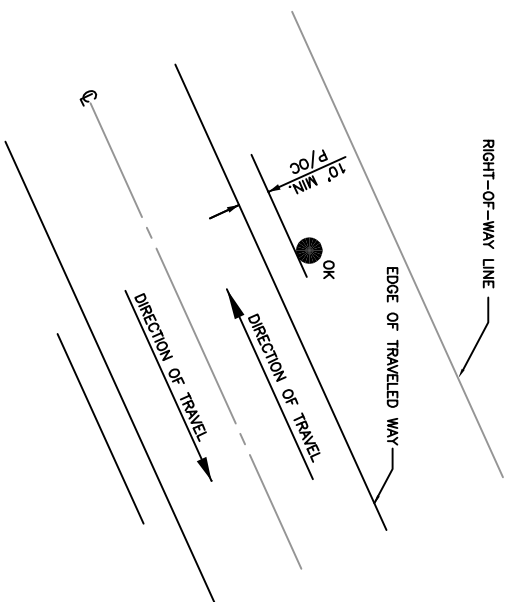
**OUTSIDE OF CURVE  
POSTED 40 MPH & OVER**

LOC: LENGTH OF CURVE (FEET) AT EDGE OF TRAVELED WAY FROM P.C. TO P.T.  
 SOR: SAFETY OVERRUN (FEET) BEYOND P.T.  
 PPL: PROHIBITED POLE LOCATION (FEET) (LOC + SOR) WHERE POLES OR OBSTACLES MUST BE REMOVED OR BARRICADED.

| PPL (FEET) ON OUTSIDE OF CURVES WITH POSTED SPEED LIMIT OF 40 MPH & OVER. |                 |  |
|---------------------------------------------------------------------------|-----------------|--|
| 40 MPH                                                                    | LOC + 220 (SOR) |  |
| 45                                                                        | LOC + 255       |  |
| 50                                                                        | LOC + 290       |  |
| 55                                                                        | LOC + 325       |  |

APPLIES TO ROADWAY WITH SHOULDER OR MOUNTABLE CURB ON OUTSIDE OF CURVE, WITH:  
 -RADIUS LESS THAN 3500', AND  
 -POSTED SPEED GREATER THAN OR EQUAL TO 40 M.P.H.

- NOTES:
1. THE STANDARDS SHALL APPLY TO EVERY NEW PLACEMENT AND EVERY PLANNED, NON-EMERGENCY REPLACEMENT OF EXISTING POLES AND OTHER UTILITY STRUCTURES WITHIN THE RIGHT-OF-WAY.
  2. NO POLES MAY BE REPLACED ON THE OUTSIDE OF A CURVE WITH A POSTED SPEED LIMIT OF 40 MPH OR OVER UNLESS APPROVED THROUGH A VARIANCE REQUEST.



**GENERAL CASE**

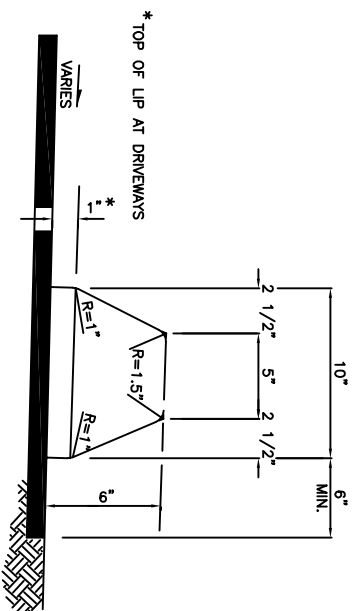
P/O.C.: POLE/OBSTACLE CLEARANCE TO NEAREST FACE OF POLE/OBSTACLE.

APPLIES: TO ROADWAY WITH SHOULDER OR MOUNTABLE CURB ON:

1. TANGENT, OR
2. INSIDE OF CURVE, OR
3. OUTSIDE OF CURVE, EITHER WITH  
 -POSTED SPEED LESS THAN 40 MPH OR  
 -RADIUS GREATER THAN 3500' ON ROADWAY MEETING ALL CURRENT DESIGN STANDARDS.

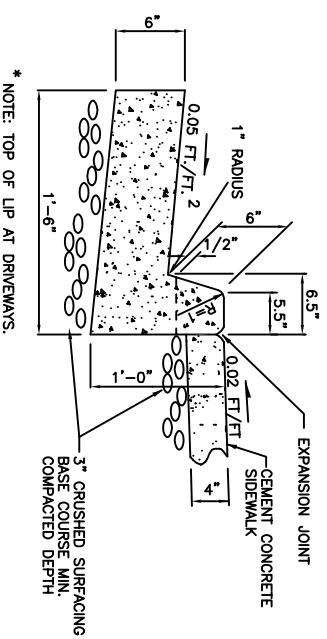


STANDARD PLAN 6-200

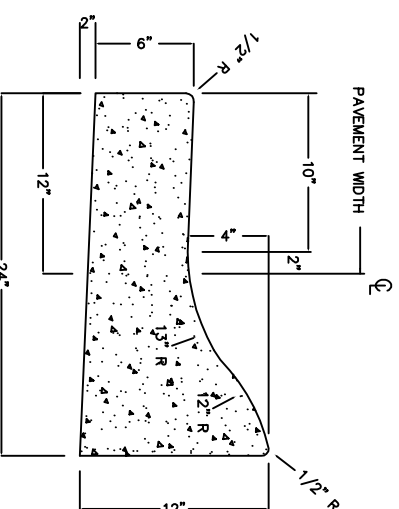


NOTES:

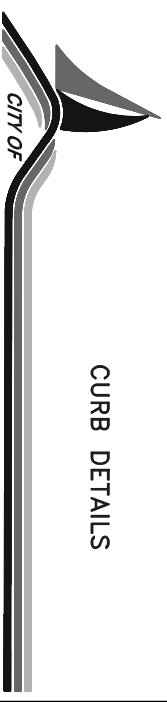
1. SEE SEC. 6-114 FOR JOINT REQUIREMENTS.
2. ROLL GUTTER TO MATCH POSITIVE SUPERELEVATION.
3. SEE SEC. 6-113 FOR EXTRUDED CURB ANCHORAGE.
4. VERTICAL CURB WILL BE REQUIRED EXCEPT AS NOTED IN SECTION 3-514



CEMENT CONCRETE CURB & GUTTER



CEMENT CONCRETE ROLLED CURB & GUTTER



CURB DETAILS

LAKE STEVENS  
PUBLIC WORKS

STANDARD PLAN 6-220

APPROVED BY

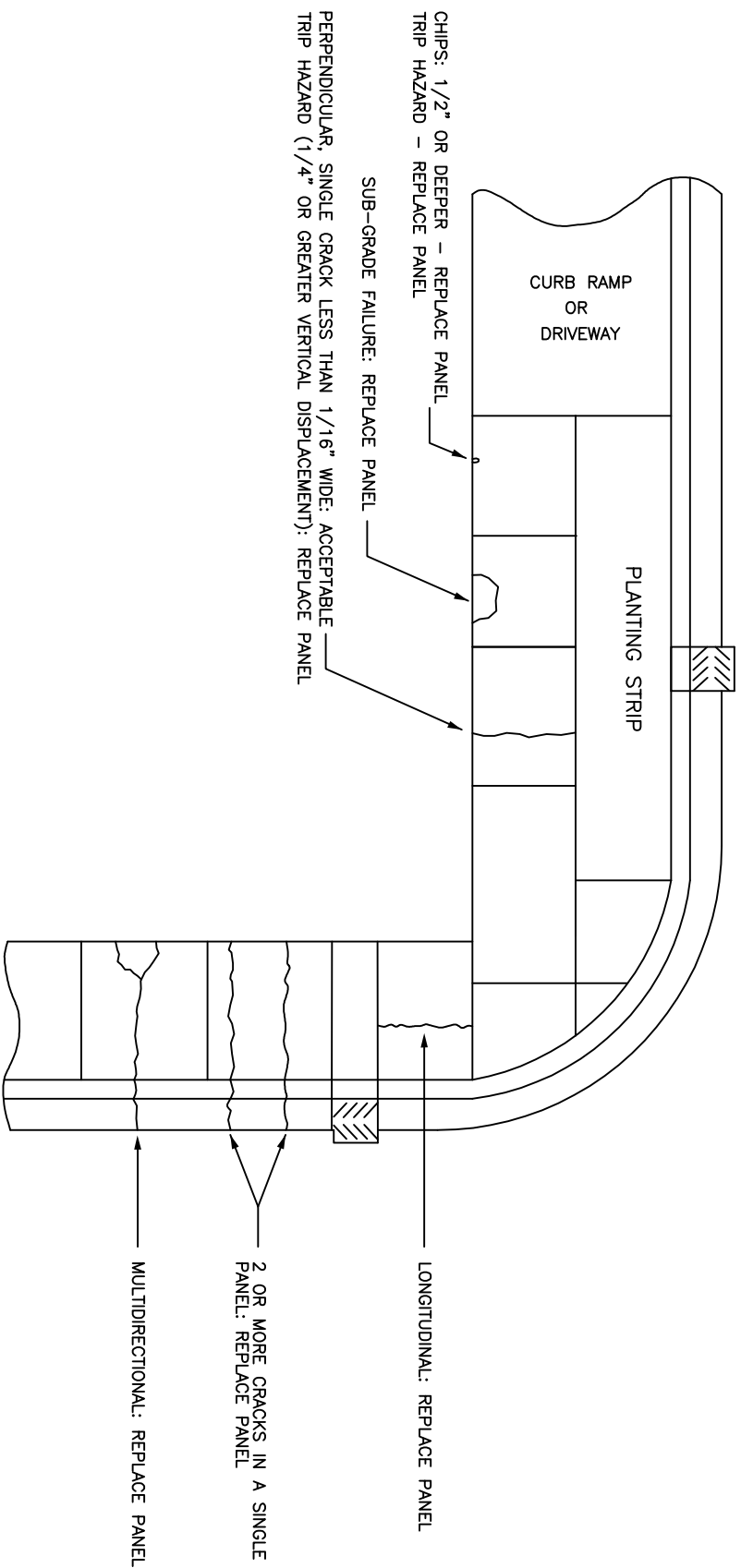
*Daniel M. Berglund*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE



**NOTE:**

1. PANEL EDGES ARE DEFINED BY EXPANSION JOINTS OR DUMMY JOINTS
2. PANEL REPLACEMENT AT DUMMY JOINTS SHALL BE SAWCUT
3. "PANEL" REFERS TO DRIVEWAY RAMPS, CURB & GUTTER, AND SIDEWALK.



**SIDEWALK REPLACEMENT  
REQUIREMENTS**

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-230

APPROVED BY

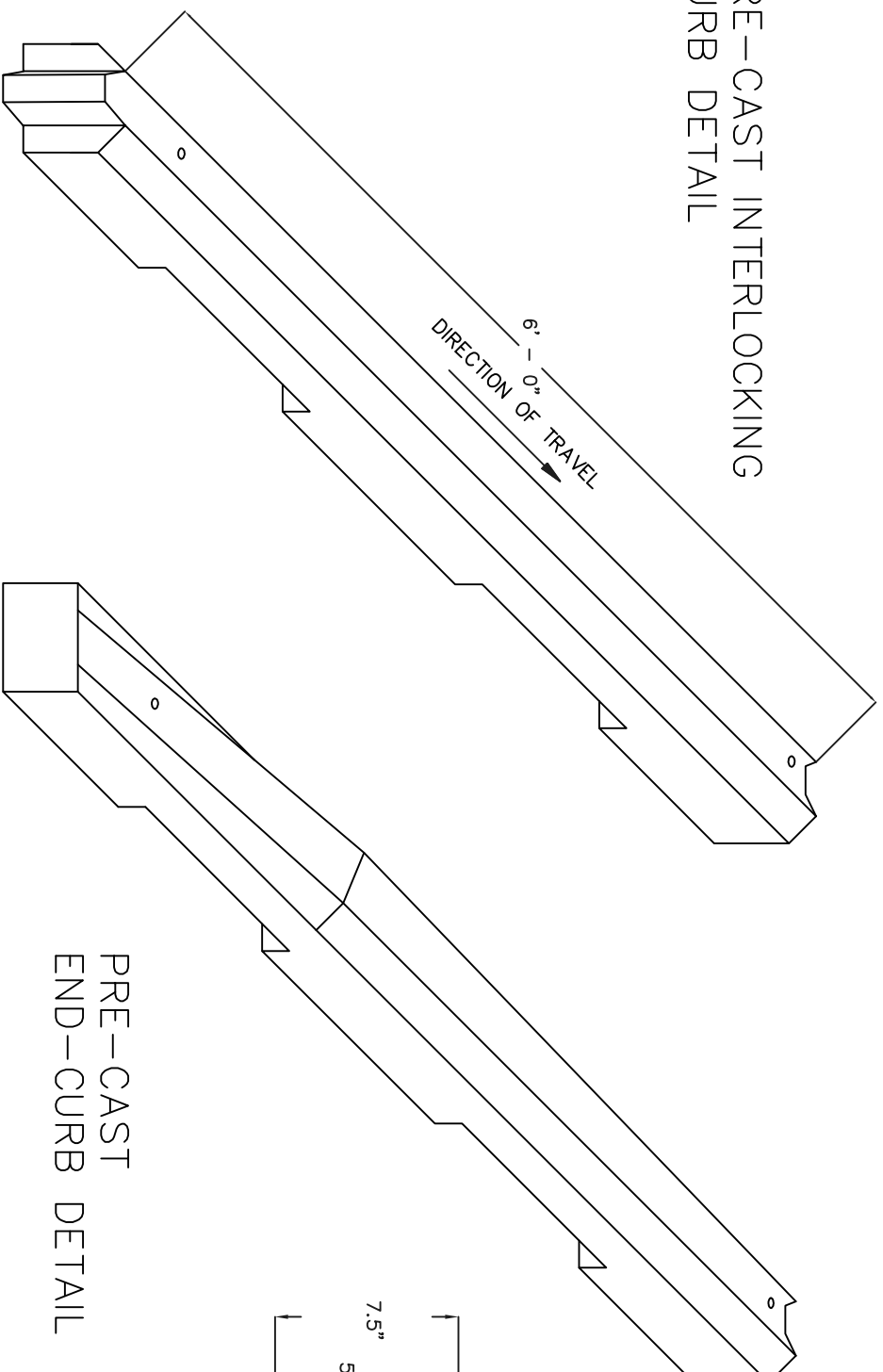
*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

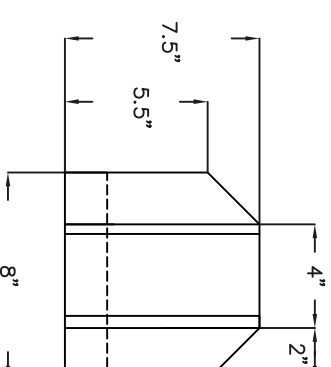
05/09

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# PRE-CAST INTERLOCKING CURB DETAIL

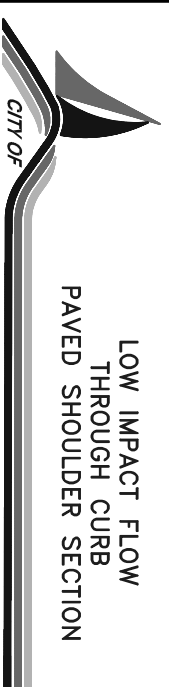


# PRE-CAST END-CURB DETAIL



1. DIMENSIONS SHOWN SUGGESTED AND MAY VARY UPON MANUFACTURING.
2. CURBS SET WITH NO. 12 REBAR 2 FT IN LENGTH APPROX. 2 FT ON CENTER.

## NOTES:



STANDARD PLAN 6-240

APPROVED BY

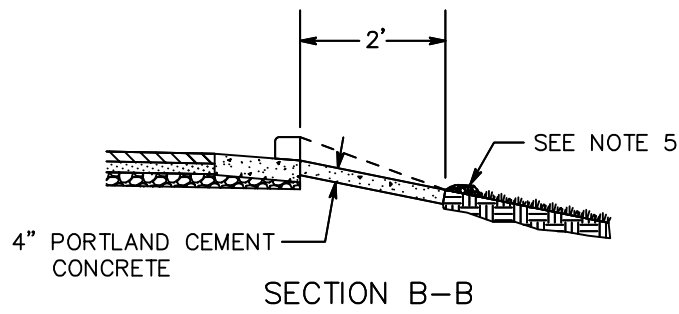
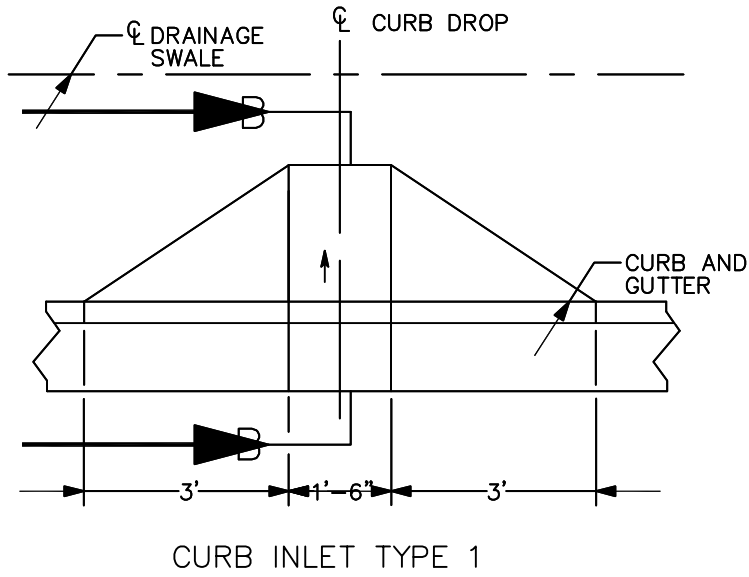
*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE

LAST REVISED 05/09



### GENERAL NOTES

1. CURB INLET SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C 478 (AASHTO M 199) & ASTM C 890 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE PROJECT SPECIAL PROVISIONS.
2. TOP SURFACE TO BE BROOM FINISHED.
3. ALL EXTERNAL EDGES NOT LABELED SHALL BE TROWELLED WITH 1/4" RADIUS EDGER.
4. INLETS SHOULD BE SPACED CONSISTENT WITH CATCH BASIN SPACING REQUIRED IN THE STORM WATER MANUAL.
5. WHERE CURB INLETS ARE USED, APPROX. 6 INCHES OF ROCK OR OTHER EROSION PROTECTION MATERIAL SHOULD BE USED TO DISSIPATE ENERGY AND/OR FLOW DISPERSION.
6. PERVIOUS PAVING MAY BE USED FOR INLET WITH CITY APPROVAL.

LID VERTICAL CURB  
INLET



CITY OF  
**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-241

APPROVED BY

*David V. Ostergaard*

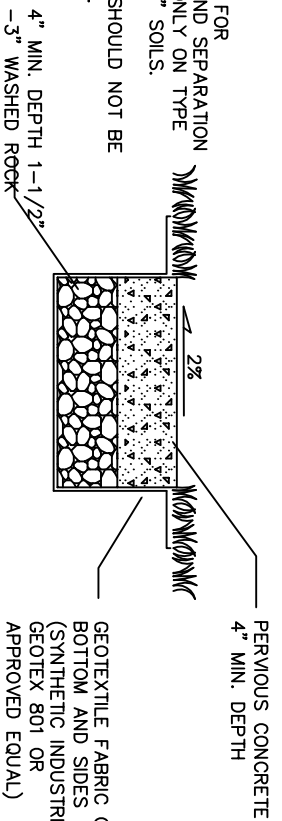
LAKE STEVENS CITY ENGINEER

05/09

DATE

**NOTES:**

1. GEOTEXTILE FOR UNDERGROUND SEPARATION REQUIRED ONLY ON TYPE "C" AND "D" SOILS.
2. SUBGRADE SHOULD NOT BE COMPACTED.

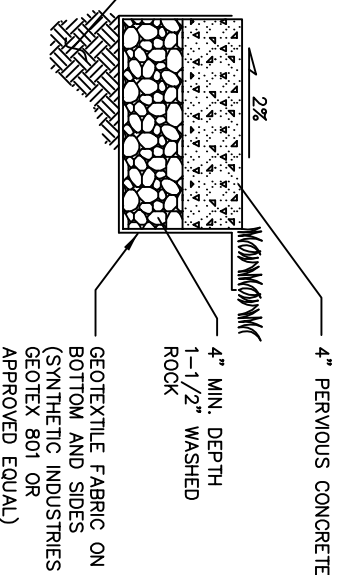


**PERVIOUS CONCRETE SIDEWALK**

REMOVE UNSUITABLE MATERIAL AND COMPACT SUBGRADE TO 90% OF MAXIMUM DRY DENSITY.

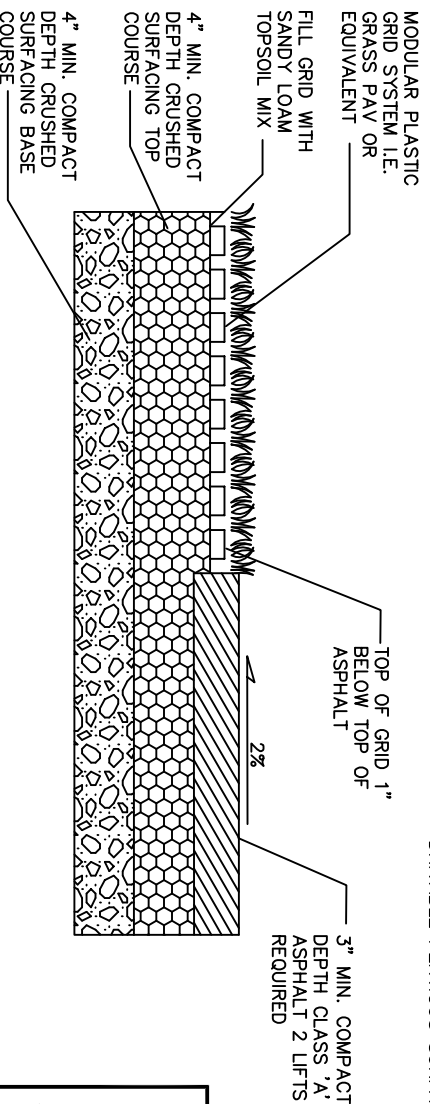
**NOTES:**

GEOTEXTILE FOR UNDERGROUND SEPARATION REQUIRED ONLY ON TYPE "C" AND "D" SOILS.

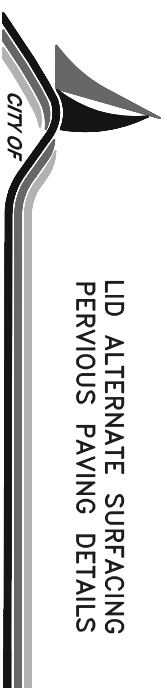


**PERVIOUS CONCRETE SURFACING**

DRIVABLE PERVIOUS SURFACING: DRIVE LANE, SHOULDERS, ON-STREET PARKING



**GRASS PAVING**



LID ALTERNATE SURFACING  
PERVIOUS PAVING DETAILS

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-242

APPROVED BY

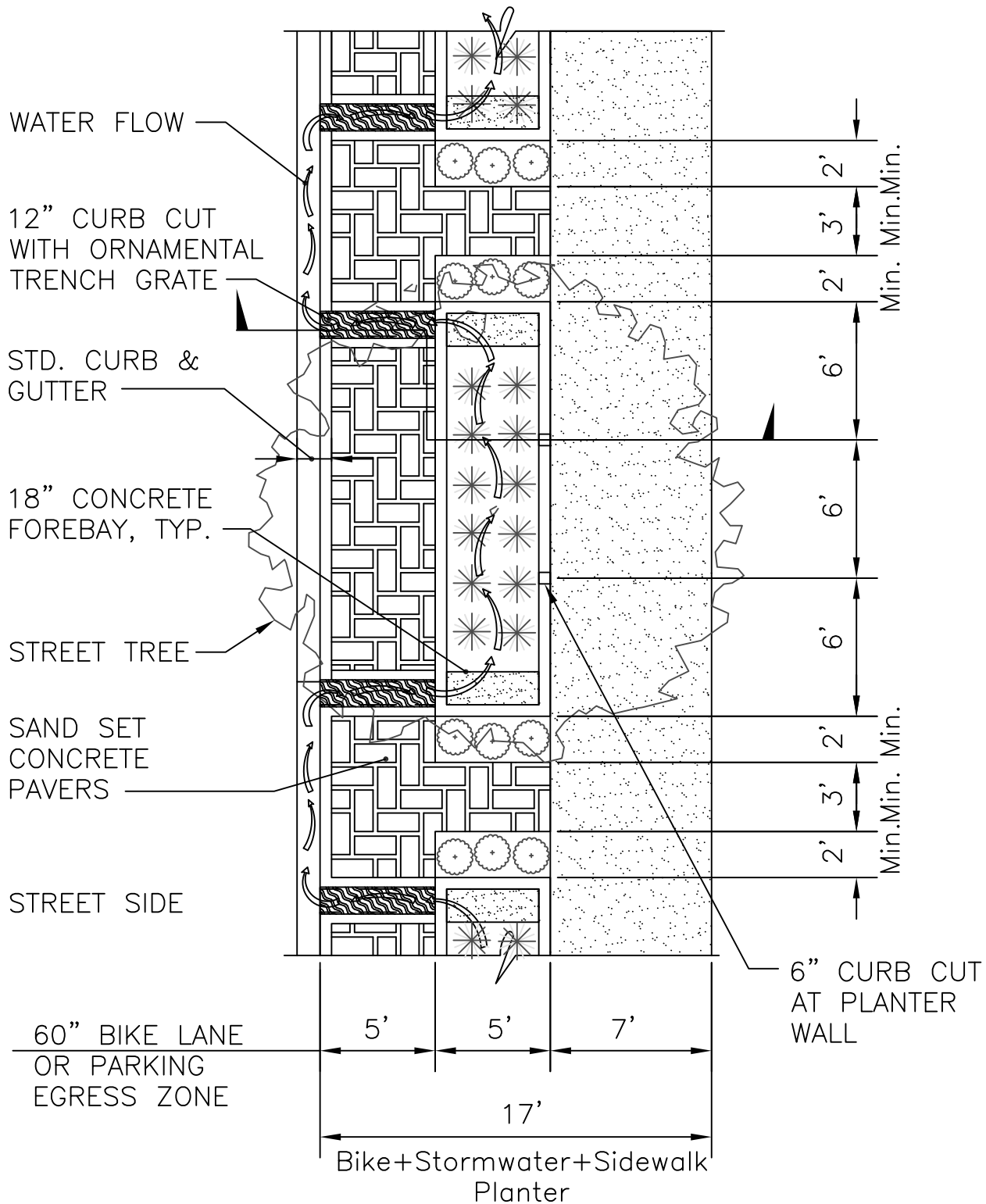
*Daniel M. Berglund*

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CITY LAKE STEVENS ENGINEER

DATE





LID STORMWATER SIDEWALK  
AND PLANTER

**CITY OF**  
**LAKE STEVENS**  
**PUBLIC WORKS**

STANDARD PLAN 6-243

APPROVED BY

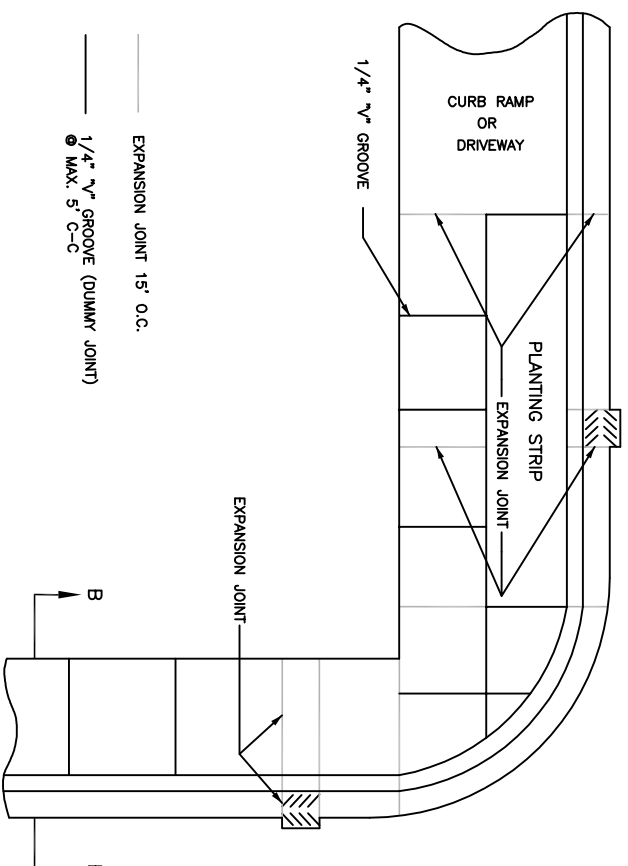
*David C. Ostergard*

LAKE STEVENS CITY ENGINEER

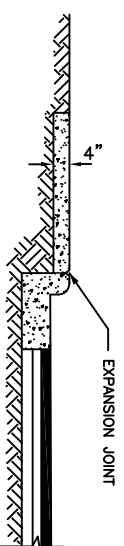
05/09

DATE





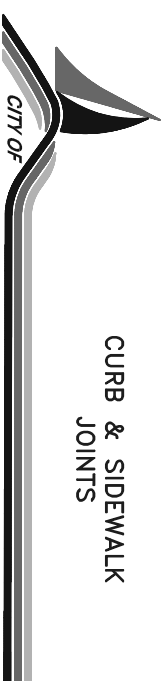
VERTICAL CURB & SIDEWALK



SECTION B-B

NOTE:

1. SEE SEC. 6-114 FOR JOINT REQUIREMENTS.
2. EXPANSION JOINTS IN SIDEWALK AND CURB TO BE ALIGNED WITH EACH OTHER.
3. EXPANSION JOINT SHALL BE 3/8"x2 1/2" MINIMUM.



STANDARD PLAN 6-250

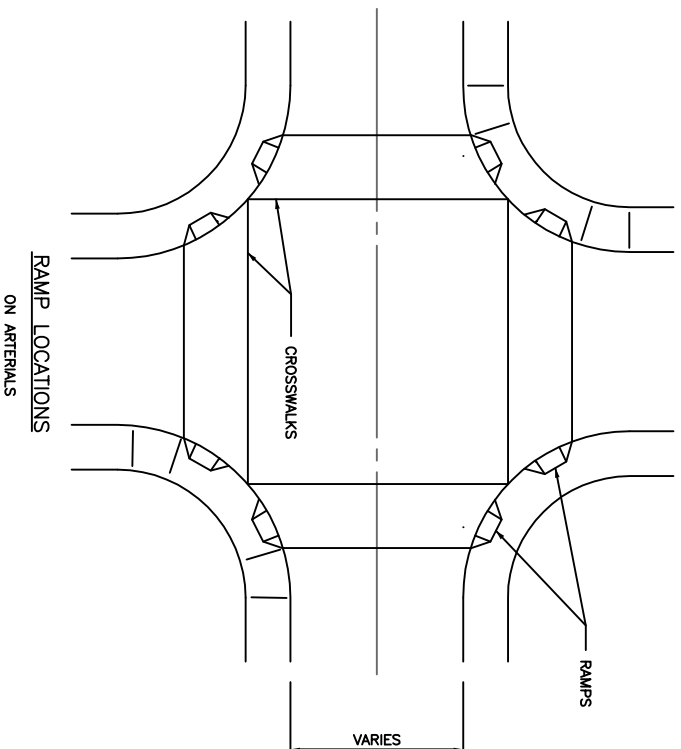
APPROVED BY

*Daniel M. Berglund*

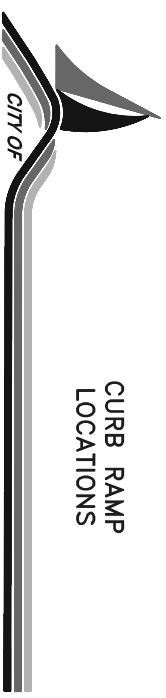
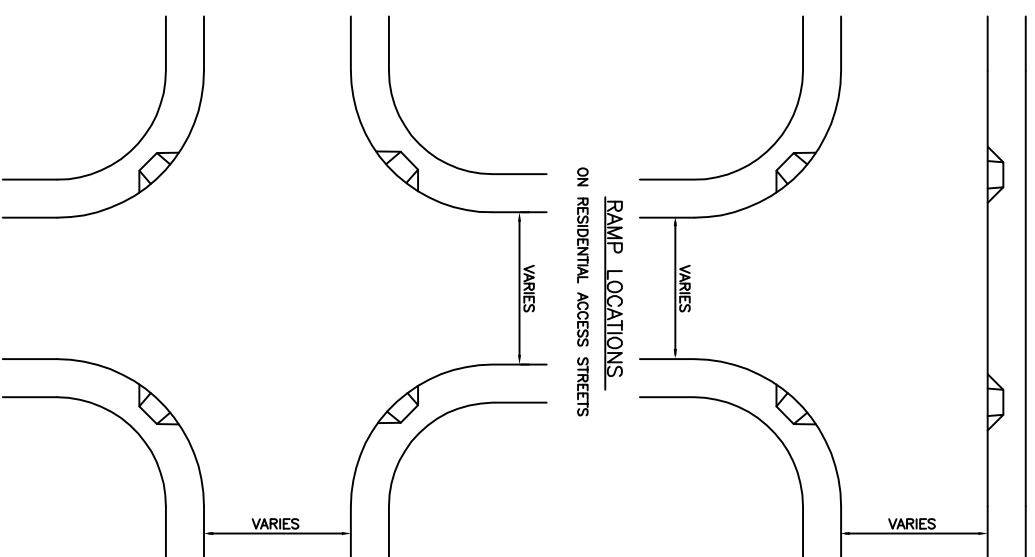
LAKE STEVENS CITY ENGINEER

05/09

DATE



- NOTES:
1. CATCH BASIN AND INLETS SHALL BE OUTSIDE THE CURB RAMP (24" MIN. CLEARANCE FROM RAMP).
  2. CARE SHALL BE TAKEN TO KEEP THE RAMP FROM CONFLICTING WITH HYDRANTS, POLES, INLETS, AND OTHER UTILITIES.
  3. CONSTRUCT RAMP IN ACCORDANCE WITH STANDARD WSDOT/APWA DETAILS.
  4. CROSSWALKS ARE NOT ALWAYS MARKED.
  5. WHEN RAMPS ARE CONSTRUCTED ON ONE SIDE OF STREET, RAMPS SHALL BE CONSTRUCTED AT CORRESPONDING LOCATIONS ON OPPOSITE SIDE OF STREET.
  6. ALL CURB RAMPS SHALL MEET THE WSDOT STANDARD PLANS AND AMERICAN WITH DISABILITY ACT.



CURB RAMP  
LOCATIONS

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-260

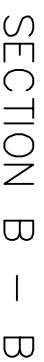
APPROVED BY

*Dwight M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

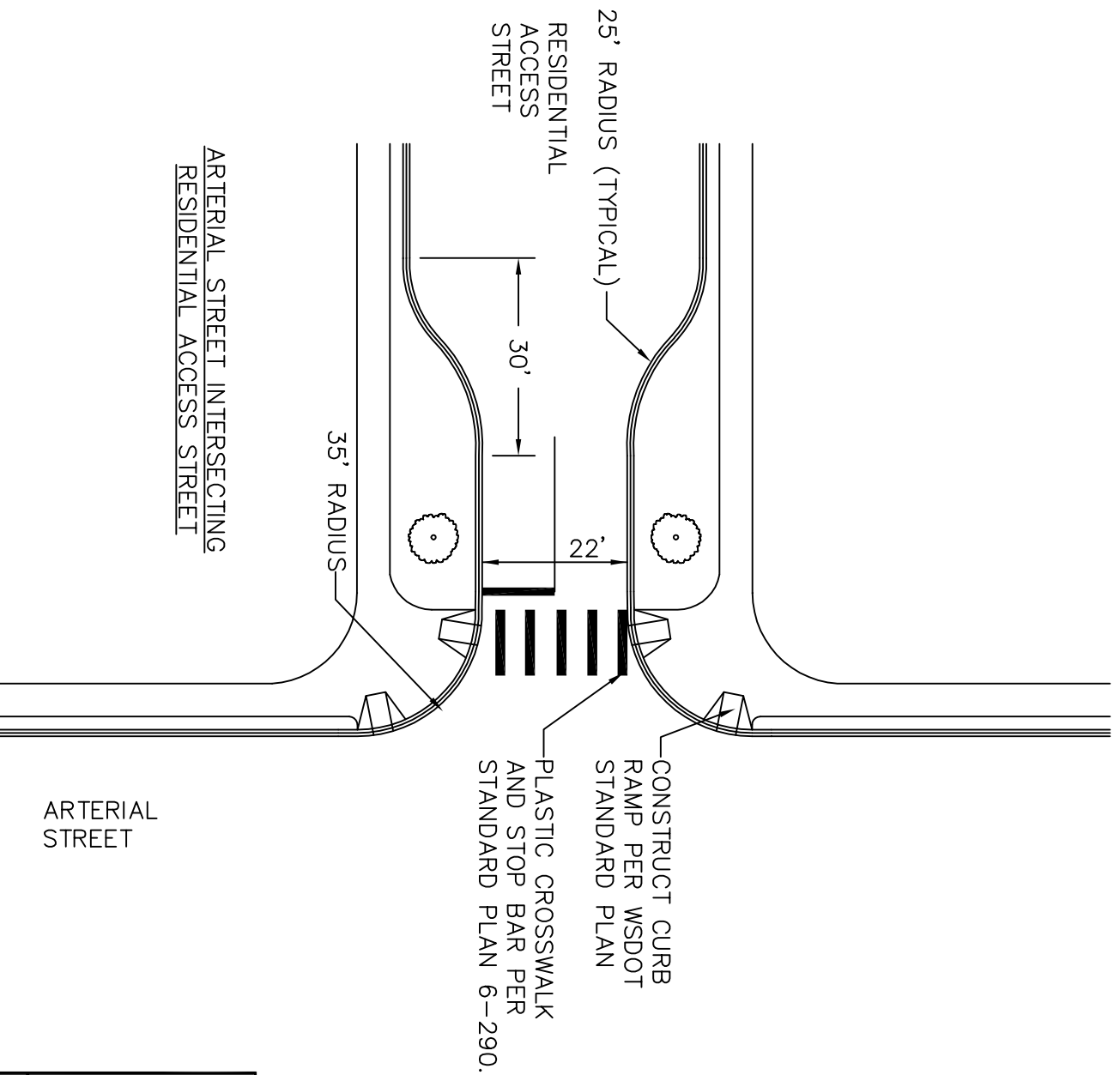
DATE



DATE \_\_\_\_\_

NOTE

1. CURB RAMP LOCATION PER STANDARD PLAN 6-260.



STANDARD PLAN 6-290

APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE

PLASTIC CROSSWALK  
AND STOP BAR PER  
STANDARD PLAN 4-010.

25' RADIUS (TYPICAL)

30'

22'

35' RADIUS

CONSTRUCT CURB  
RAMP PER WSDOT  
STANDARD PLAN

RESIDENTIAL ACCESS STREET INTERSECTING  
RESIDENTIAL ACCESS STREET

NOTE

1. CURB RAMP LOCATION PER  
STANDARD PLAN 6-260.
2. CROSSWALKS SHALL ONLY BE  
STRIPED ON CONTROLLED LEG  
OF INTERSECTION



**LAKE STEVENS  
PUBLIC WORKS**

NECKDOWNS RESIDENTIAL  
ACCESS STREET INTERSECTION

STANDARD PLAN 6-300

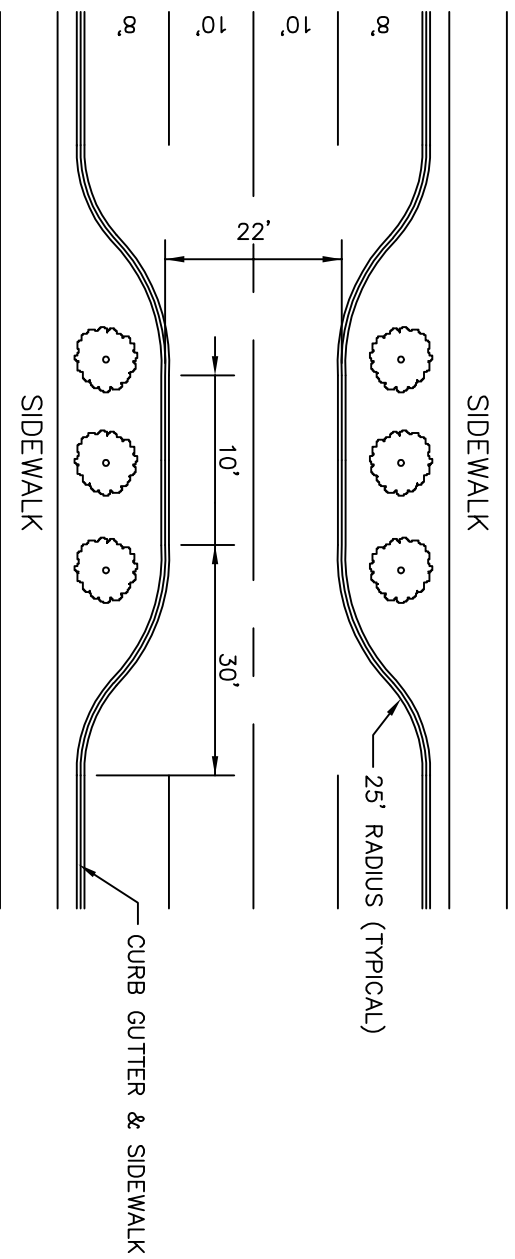
APPROVED BY

*Daniel M. Berglund*

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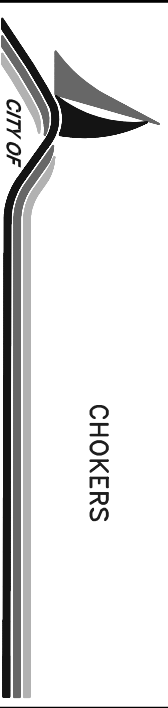
05/09

DATE



## NOTES

1. CHOKERS SHALL BE USED ONLY ON NEIGHBORHOOD COLLECTOR STREETS.
2. CHOKERS SHALL BE SPACED A MAXIMUM OF 400' CENTER TO CENTER.



## CHOKERS

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-310

APPROVED BY

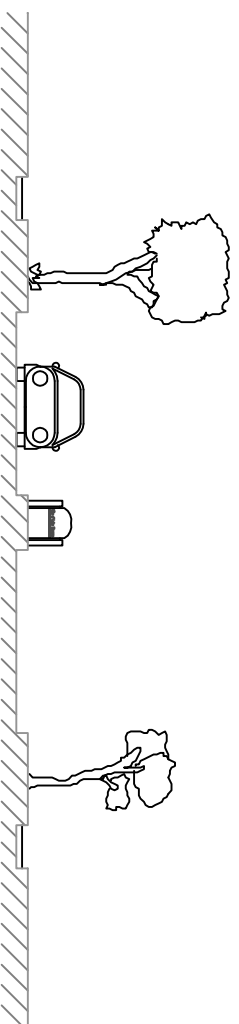
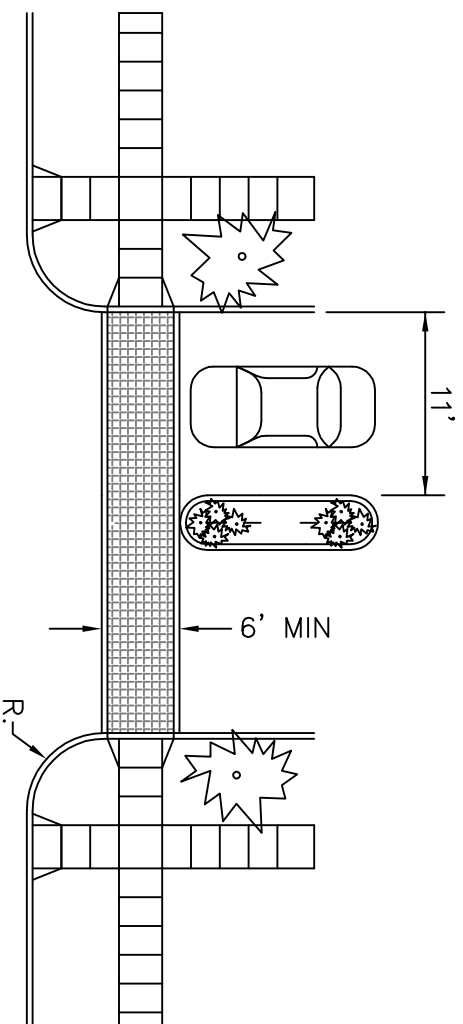
*David M. Berglund*

05/09

LAST REVISED 05/09

LAKE STEVENS CITY ENGINEER

DATE



# NOTES

1. FOR RADIUS RETURN SEE SECTION 2-111.
2. CURB RAMPS PER STANDARD PLAN 6-260.
3. PEDESTRIAN TREATMENT SHALL BE RED BRICK, PAVERS, OR STAMPED PORTLAND CEMENT CONCRETE.
4. ISLAND SHALL BE CONSTRUCTED USING CEMENT CONCRETE CURB AND GUTTER. SEE STANDARD PLAN 6-220.
5. LANDSCAPING SHALL BE APPROVED BY THE CITY.



## GATEWAYS

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-320

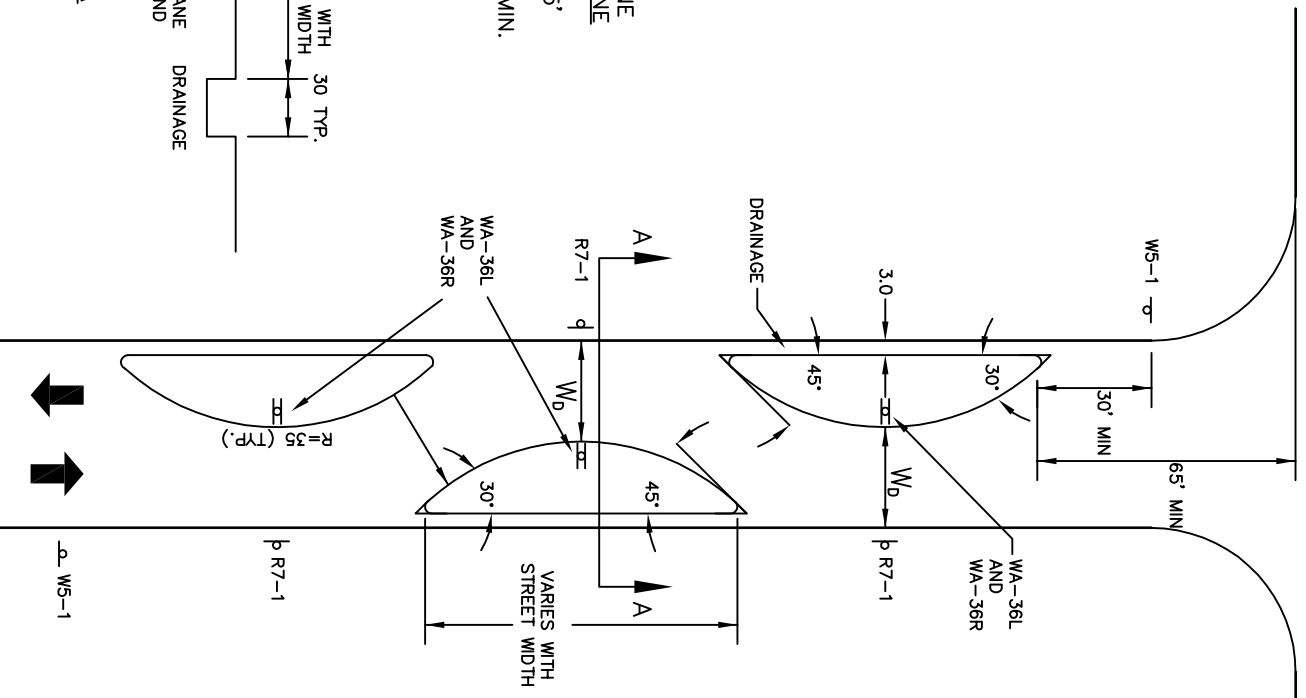
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*David M. Berglund*

05/09

LAKE STEVENS CITY ENGINEER

DATE



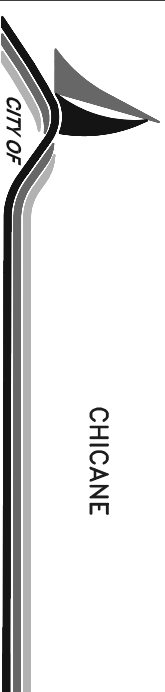
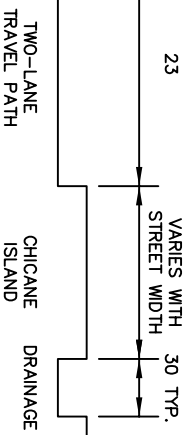
**SIGN DESCRIPTIONS:**

- R7-1 NO PARKING
- W5-1 ROADWAY NARROWS
- WA-36L HAZARD MARKER LEFT
- WA-36R HAZARD MARKER RIGHT

**NOTES**

1. THE TRAVEL PATH THROUGH THE CHICANE CAN BE ONE LANE OR TWO LANES AS NOTED.
2. SPACING OF CHICANE SEGMENTS DEPENDENT ON SITE CONSIDERATIONS, E.G. DRIVEWAY LOCATIONS.
3. ISLAND PLANTINGS SHOULD NOT OBSCURE DRIVER'S VIEW OF CHICANE TRAFFIC.
4. ADDITIONAL R7-1 SIGNS MAY BE REQUIRED TO SATISFY LOCAL CONVENTION.

**SECTION A-A**



**CHICANE**

**LAKE STEVENS PUBLIC WORKS**

STANDARD PLAN 6-330

APPROVED BY

*Dwight A. Berglund*

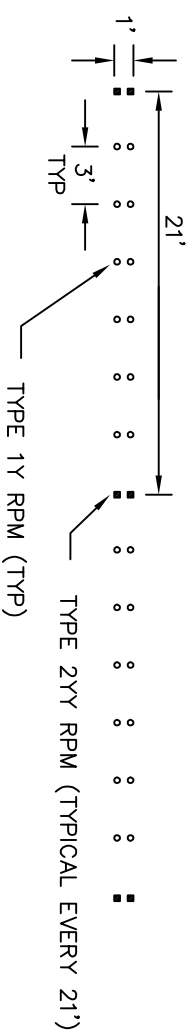
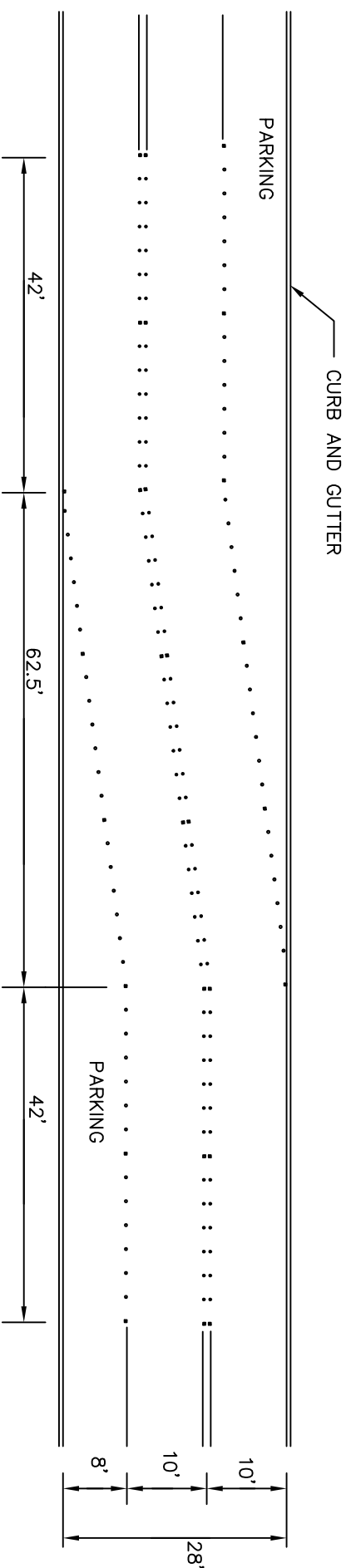
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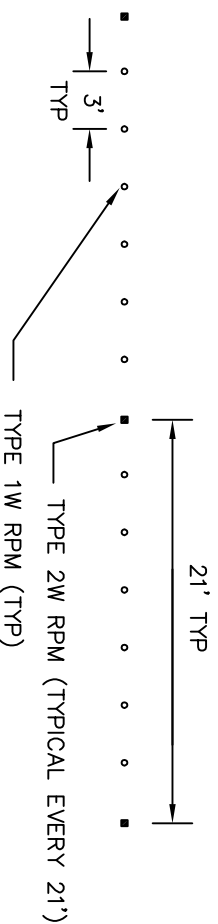
DATE





- NOTES:
- ① ALTERNATE PARKING EVERY 300' +OR-.
  - ② DIMENSIONS ARE FOR POSTED SPEED OF 25 MPH.

## CENTER OF TRAVEL WAY



## EDGE OF TRAVEL WAY



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-410

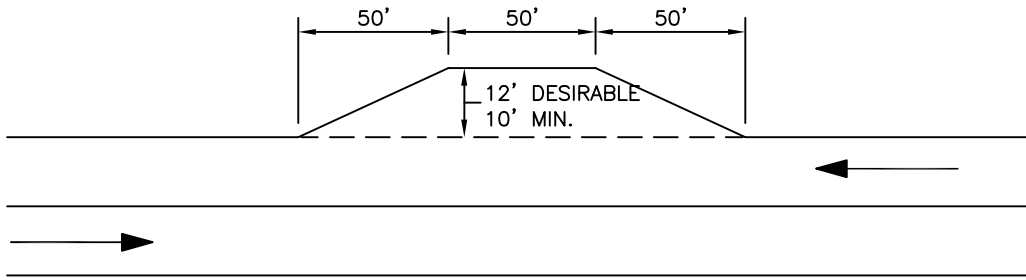
APPROVED BY

*Daniel M. Berglund*

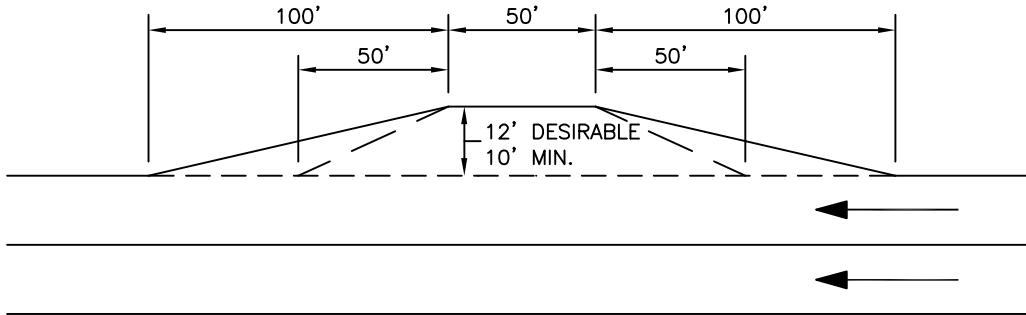
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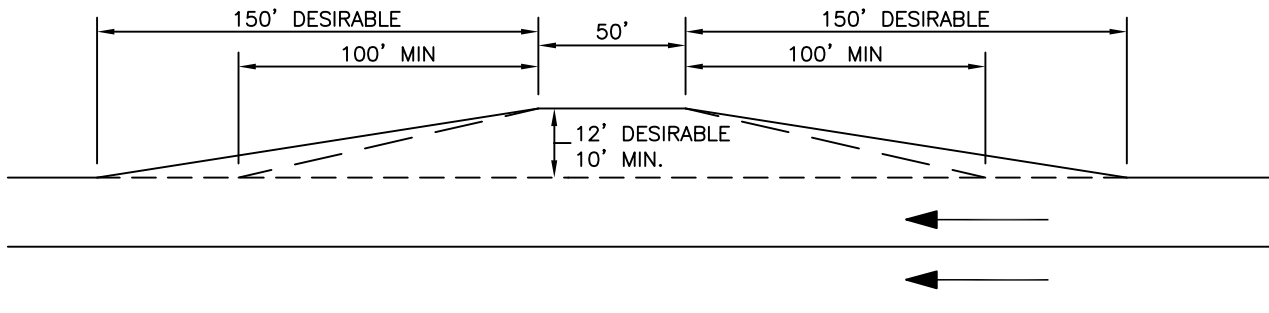
DATE



COLLECTOR ARTERIAL



MINOR ARTERIAL



PRINCIPAL ARTERIAL

NOTES:

1. LOCAL ACCESS STREETS DO NOT REQUIRE BUS TURNOUTS.
2. LOCATION AND REQUIREMENT FOR BUS STOPS WILL BE AT THE DIRECTION OF THE CITY ENGINEER.
3. PAVEMENT SECTION FOR BUS TURNOUT SHALL BE THE SAME AS REQUIRED FOR THE ADJACENT STREET.

**BUS TURNOUT DIMENSIONS**

**CITY OF  
LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-411

APPROVED BY

*David V. Ortega*

LAKE STEVENS CITY ENGINEER

05/09

DATE

TABLE A

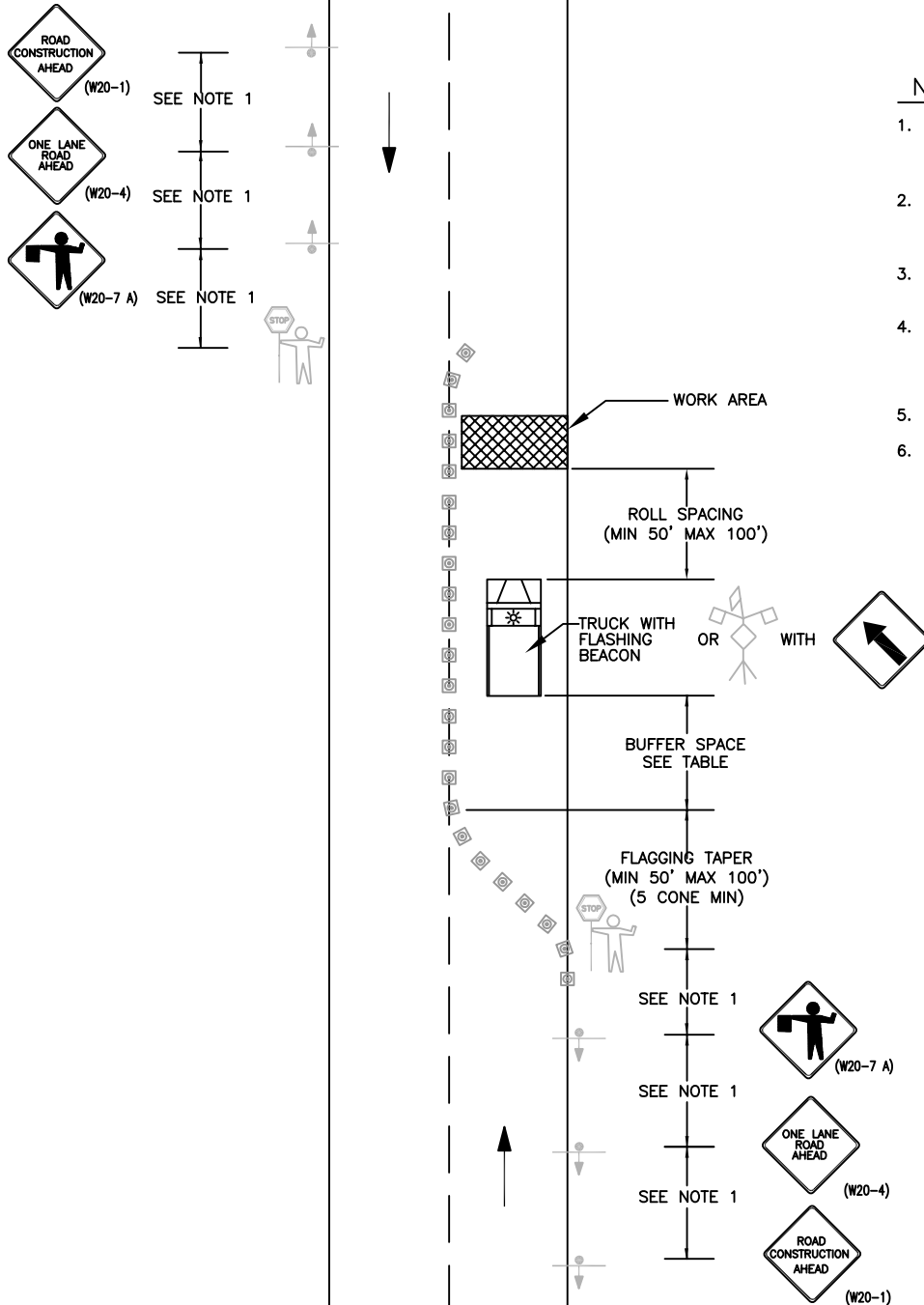
| SPEED<br>(MPH) | CONE SPACING<br>(FT) |       | BUFFER<br>SPACING<br>(FT) |
|----------------|----------------------|-------|---------------------------|
|                | TANGENT              | TAPER |                           |
| 25             | 25                   | 20    | 55                        |
| 30             | 30                   |       | 85                        |
| 35             | 35                   |       | 120                       |
| 40             | 40                   |       | 170                       |
| 45             | 45                   |       | 220                       |

## NOTE:

1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGN SIZE PER MUTCD.
6. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.

## LEGEND:

- ☒ CONE OR CHANNELIZING DEVICE (SEE STD 702)



TRAFFIC CONTROL PLAN  
2 Lane Roadway: One lane  
closed with alternating  
one-way traffic and flaggers

CITY OF  
**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-420

APPROVED BY

LAKE STEVENS CITY ENGINEER

05/09

DATE



(W20-1)



(W5-1)

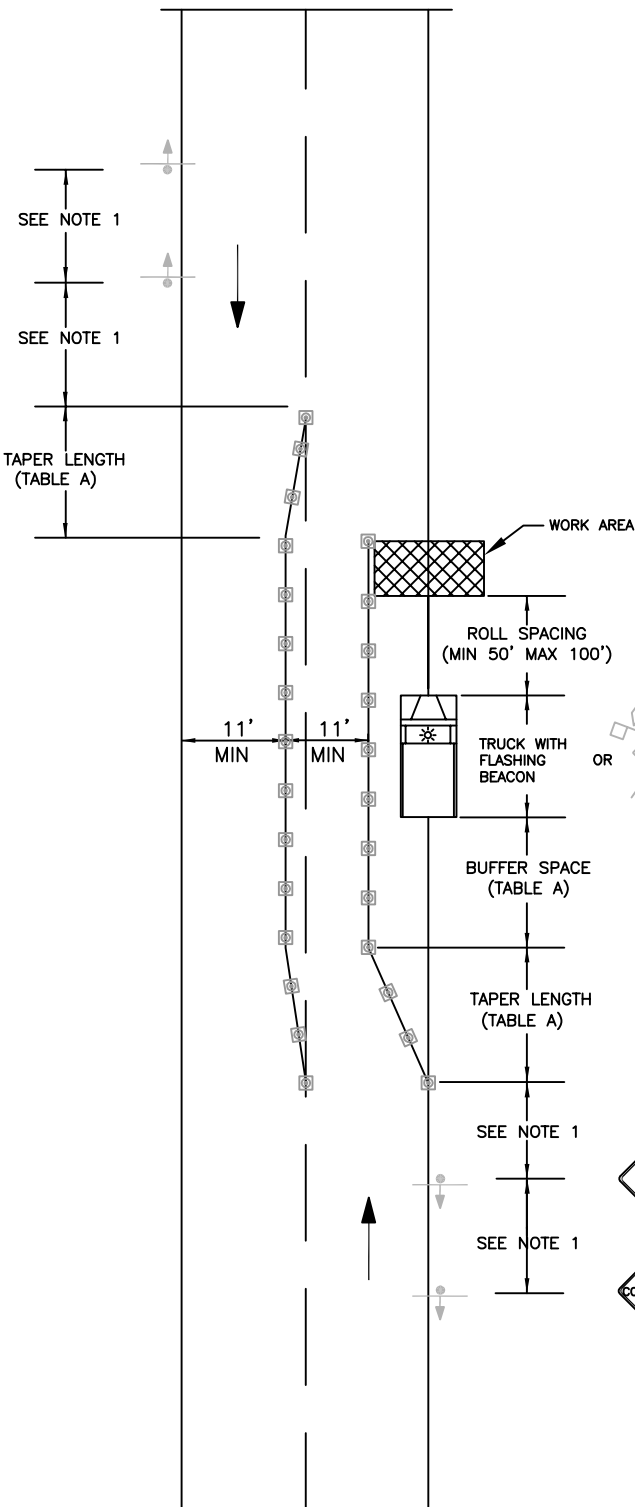


TABLE A

| SPEED<br>(MPH) | TAPER LENGTH<br>FOR<br>SHIFT WIDTH |      | CONE SPACING<br>(FT) |       | BUFFER<br>SPACING<br>(FT) |
|----------------|------------------------------------|------|----------------------|-------|---------------------------|
|                | 5'                                 | 6'   | TANGENT              | TAPER |                           |
| 25             | 26'                                | 31'  | 25                   | 20    | 55                        |
| 30             | 38'                                | 45'  | 30                   |       | 85                        |
| 35             | 51'                                | 61'  | 35                   |       | 120                       |
| 40             | 67'                                | 80'  | 40                   |       | 170                       |
| 45             | 113'                               | 135' | 45                   |       | 220                       |

NOTE:

1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. FOR ALTERNATE LANE SHIFT WIDTH REFERR TO "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) TABLE 6C-2 PAGE 6C-10
6. SIGN SIZE PER MUTCD.
7. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.

LEGEND:

- ☐ CONE OR CHANNELIZING DEVICE (SEE STD 702)



**LAKE STEVENS  
PUBLIC WORKS**

**TRAFFIC CONTROL PLAN  
2 Lane Roadway: Partial lane  
closure**

STANDARD PLAN 6-421

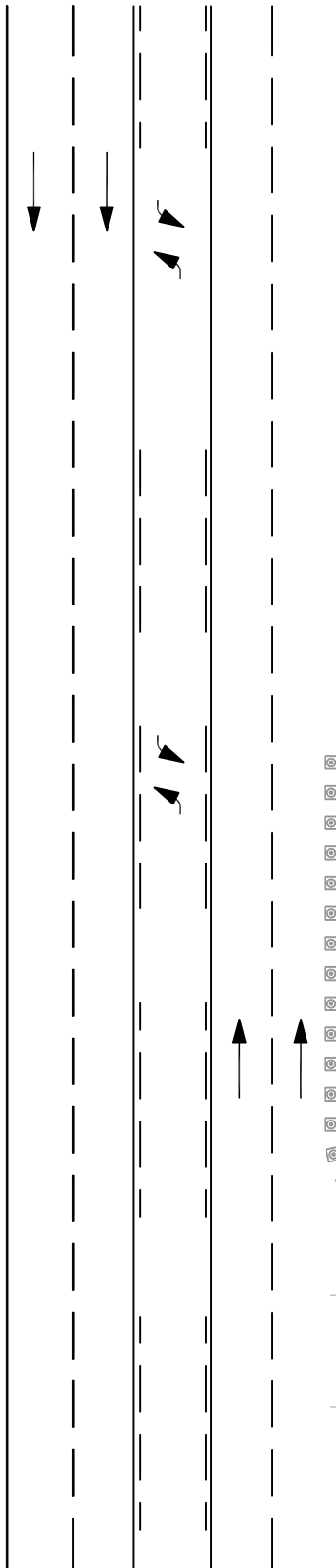
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*David V. Ostergaard*

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05/09

DATE



**NOTE:**

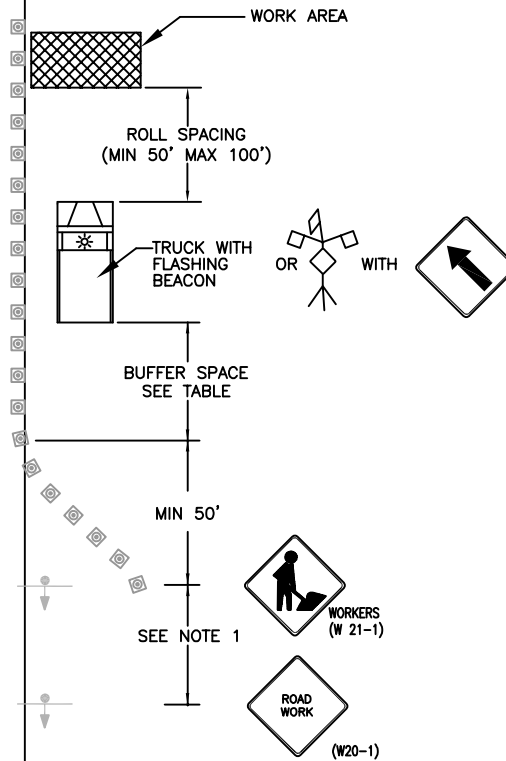
1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGN SIZE PER MUTCD.
6. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.

**TABLE A**

| SPEED<br>(MPH) | CONE SPACING<br>(FT) |       | BUFFER<br>SPACING<br>(FT) |
|----------------|----------------------|-------|---------------------------|
|                | TANGENT              | TAPER |                           |
| 25             | 25                   | 20    | 55                        |
| 30             | 30                   |       | 85                        |
| 35             | 35                   |       | 120                       |
| 40             | 40                   |       | 170                       |
| 45             | 45                   |       | 220                       |

**LEGEND:**

⊗ CONE OR CHANNELIZING DEVICE  
(SEE STD 702)



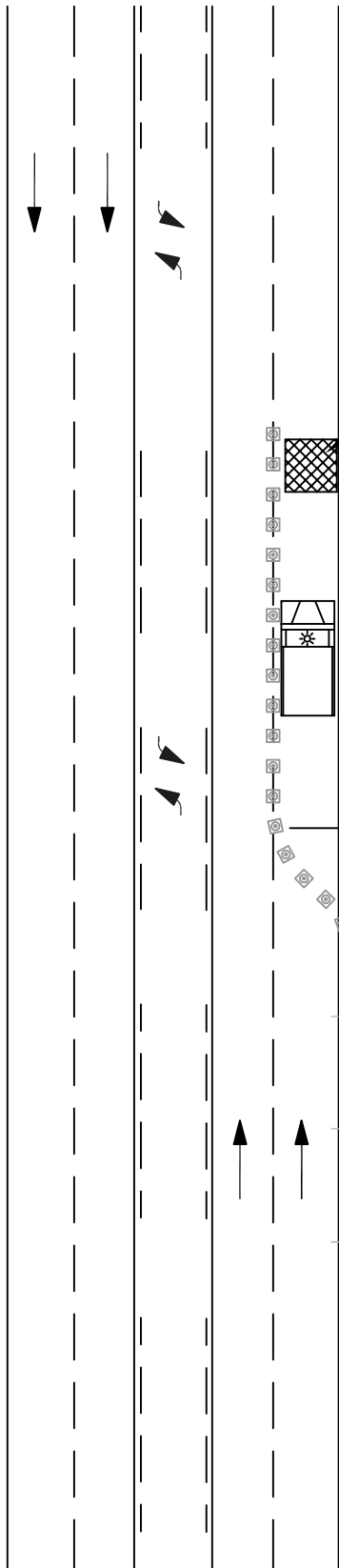
**TRAFFIC CONTROL PLAN**  
**Shoulder Work**

**LAKE STEVENS**  
**PUBLIC WORKS**

STANDARD PLAN 6-422

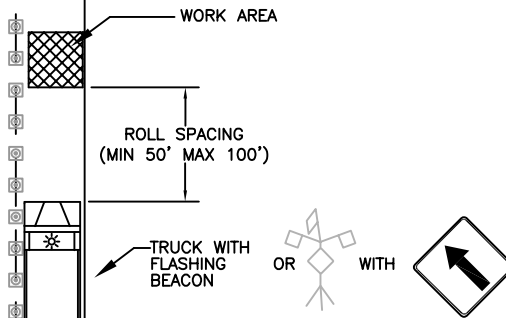
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 LAKE STEVENS CITY ENGINEER

05/09  
DATE



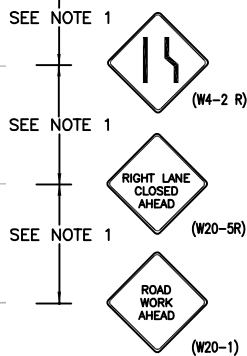
**NOTE:**

1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGN SIZE PER MUTCD.
6. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.



**TABLE A**

| SPEED<br>(MPH) | TAPER LENGTH<br>FOR<br>MERGING WIDTH |      | CONE SPACING<br>(FT) |       | BUFFER<br>SPACING<br>(FT) |
|----------------|--------------------------------------|------|----------------------|-------|---------------------------|
|                | 10'                                  | 12'  | TANGENT              | TAPER |                           |
| 25             | 105'                                 | 125' | 25                   | 20    | 55                        |
| 30             | 150'                                 | 180' | 30                   |       | 85                        |
| 35             | 205'                                 | 245' | 35                   |       | 120                       |
| 40             | 270'                                 | 320' | 40                   |       | 170                       |
| 45             | 450'                                 | 540' | 45                   |       | 220                       |



**LEGEND:**

- ☐ CONE OR CHANNELIZING DEVICE  
(SEE STD 702)



**TRAFFIC CONTROL PLAN**  
5 Lane Roadway With Right Lane Closed

**CITY OF LAKE STEVENS PUBLIC WORKS**

STANDARD PLAN 6-423

APPROVED BY

*David V. Ostergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE

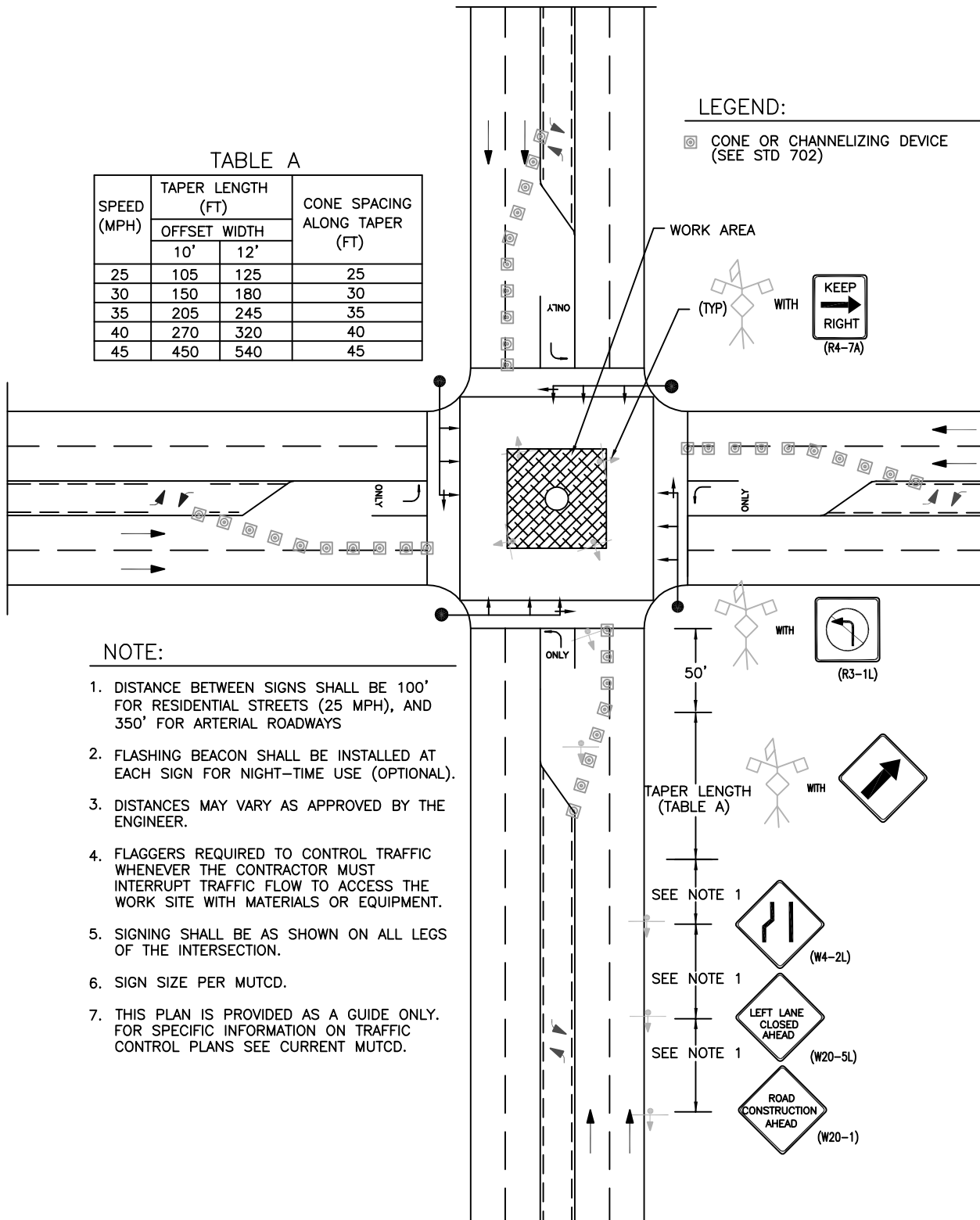


TABLE A

| SPEED<br>(MPH) | TAPER LENGTH<br>(FT) |     | CONE SPACING<br>ALONG TAPER<br>(FT) |
|----------------|----------------------|-----|-------------------------------------|
|                | OFFSET WIDTH         |     |                                     |
|                | 10'                  | 12' |                                     |
| 25             | 105                  | 125 | 25                                  |
| 30             | 150                  | 180 | 30                                  |
| 35             | 205                  | 245 | 35                                  |
| 40             | 270                  | 320 | 40                                  |
| 45             | 450                  | 540 | 45                                  |

LEGEND:

☐ CONE OR CHANNELIZING DEVICE  
(SEE STD 702)



NOTE:

1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGNING SHALL BE AS SHOWN ON ALL LEGS OF THE INTERSECTION.
6. SIGN SIZE PER MUTCD.
7. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.



TRAFFIC CONTROL PLAN  
Center of Intersection Work

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-425

APPROVED BY

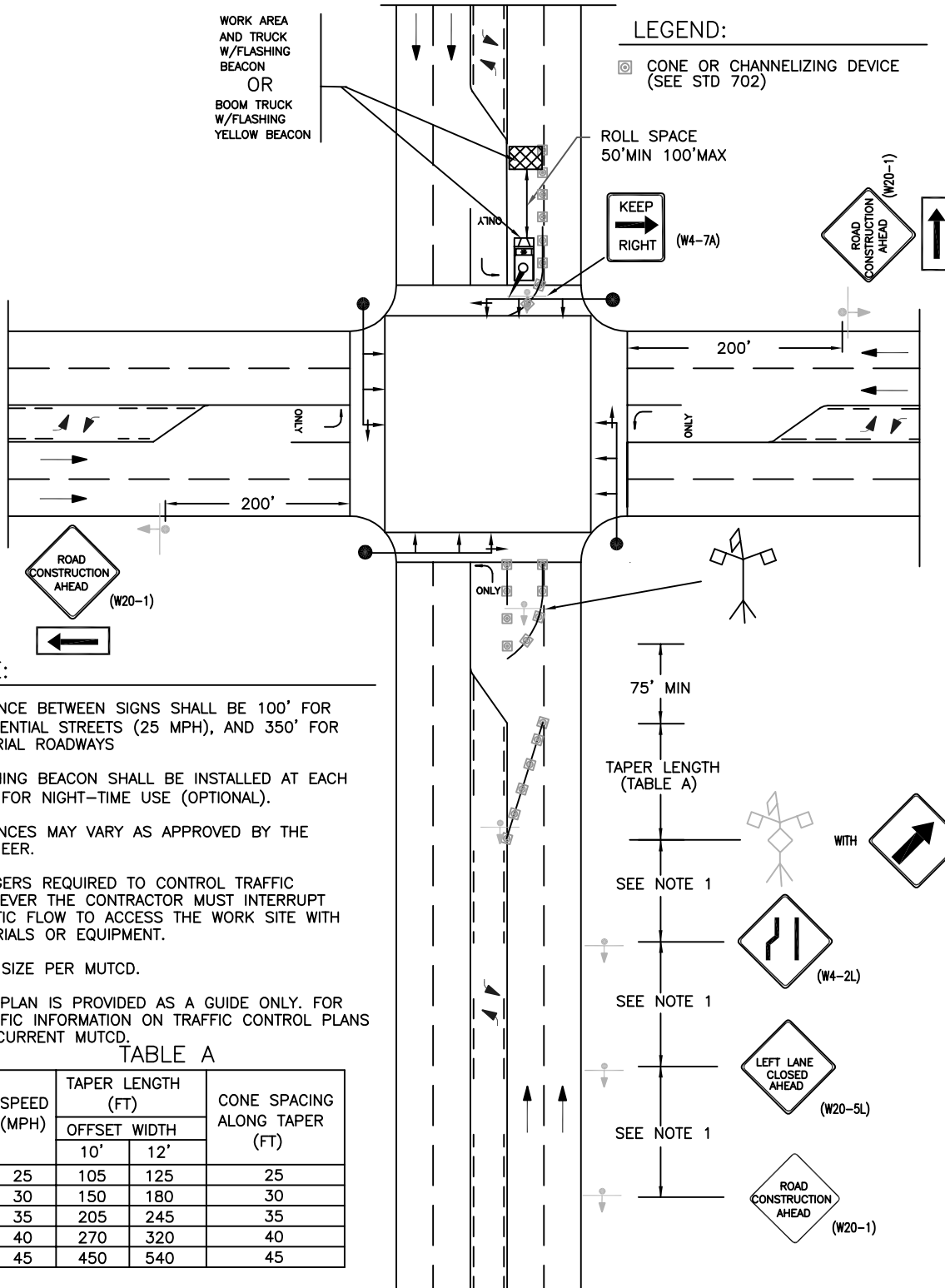
*David V. Ortega*

LAKE STEVENS CITY ENGINEER

05/09

DATE







TRAFFIC CONTROL PLAN  
5 Lane Roadway With Left  
Turn Closure Far Side of  
Intersection

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-426

APPROVED BY



LAKE STEVENS CITY ENGINEER

05/09

DATE

# NOTE:

1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGN SIZE PER MUTCD.
6. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.

# LEGEND:

- ☐ CONE OR CHANNELIZING DEVICE (SEE STD 702)

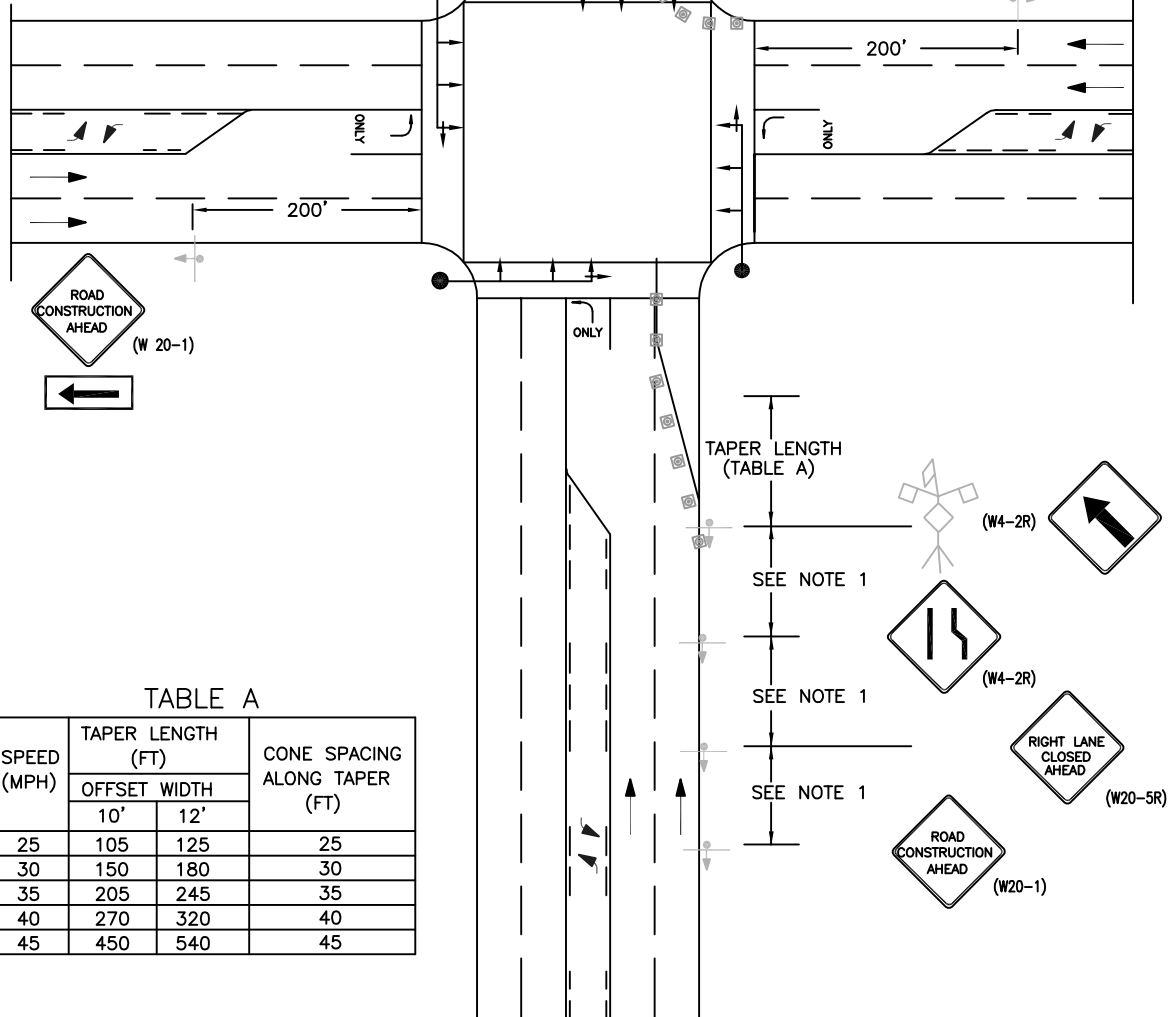


TABLE A

| SPEED<br>(MPH) | TAPER LENGTH<br>(FT) |       | CONE SPACING<br>ALONG TAPER<br>(FT) |
|----------------|----------------------|-------|-------------------------------------|
|                | OFFSET               | WIDTH |                                     |
|                | 10'                  | 12'   |                                     |
| 25             | 105                  | 125   | 25                                  |
| 30             | 150                  | 180   | 30                                  |
| 35             | 205                  | 245   | 35                                  |
| 40             | 270                  | 320   | 40                                  |
| 45             | 450                  | 540   | 45                                  |



TRAFFIC CONTROL PLAN  
5 Lane Roadway With Right  
Lane Closure Far Side of  
Intersection

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-427

APPROVED BY

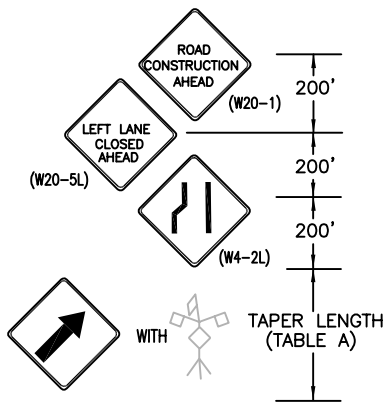
*David V. Ostergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE





#### NOTE:

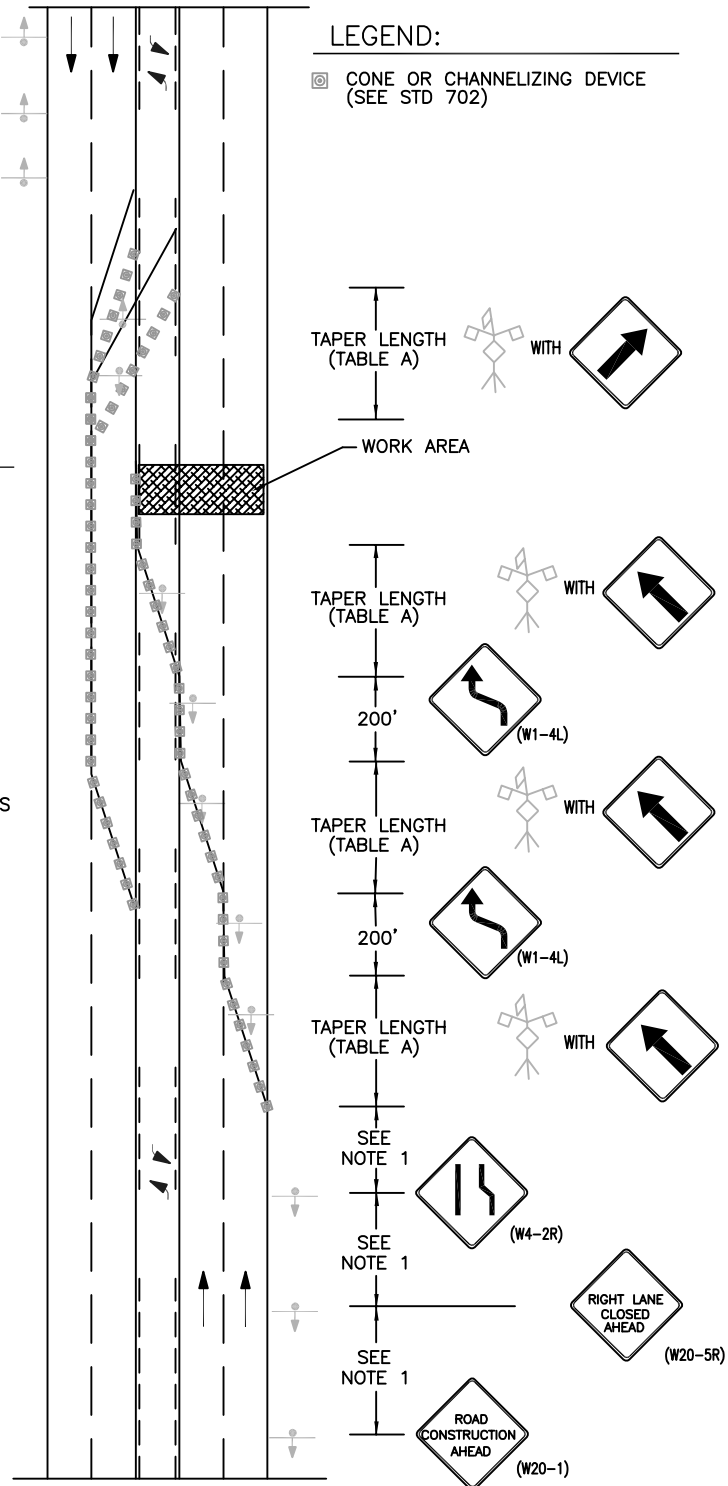
1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGN SIZE PER MUTCD.
6. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.

TABLE A

| SPEED<br>(MPH) | TAPER LENGTH<br>FOR<br>MERGING WIDTH |      | CONE SPACING<br>(FT) |       |
|----------------|--------------------------------------|------|----------------------|-------|
|                | 10'                                  | 12'  | TANGENT              | TAPER |
| 25             | 105'                                 | 125' | 25                   | 20    |
| 30             | 150'                                 | 180' | 30                   |       |
| 35             | 205'                                 | 245' | 35                   |       |
| 40             | 270'                                 | 320' | 40                   |       |
| 45             | 450'                                 | 540' | 45                   |       |

#### LEGEND:

- ☒ CONE OR CHANNELIZING DEVICE  
(SEE STD 702)





**TRAFFIC CONTROL PLAN**  
5 Lane Roadway With Multilane Closure

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-429

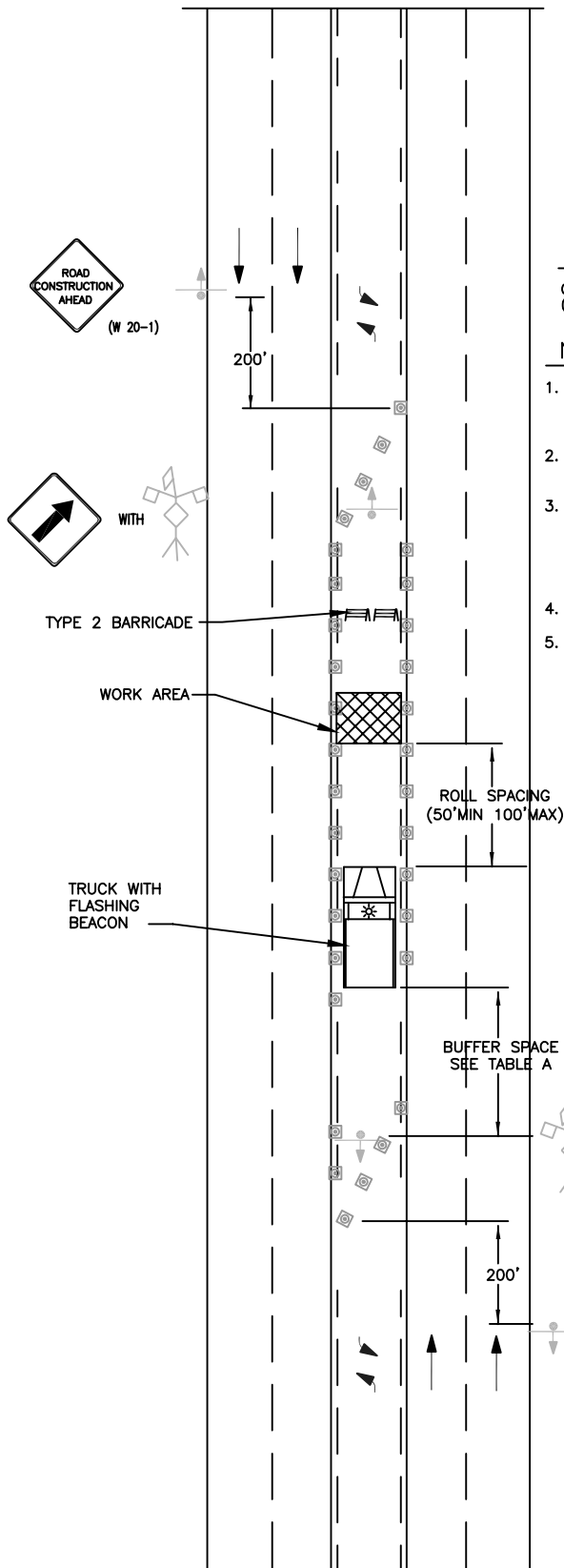
APPROVED BY

*David V. Ostergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE



#### LEGEND:

CONE OR CHANNELIZING DEVICE  
(SEE STD 702)

#### NOTE:

1. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
2. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
3. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
4. SIGN SIZE PER MUTCD.
5. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURRENT MUTCD.

TABLE A

| SPEED<br>(MPH) | CONE SPACING<br>(FT) |       | BUFFER<br>SPACING<br>(FT) |
|----------------|----------------------|-------|---------------------------|
|                | TANGENT              | TAPER |                           |
| 25             | 25                   | 20    | 50                        |
| 30             | 30                   |       | 85                        |
| 35             | 35                   |       | 120                       |
| 40             | 40                   |       | 170                       |
| 45             | 45                   |       | 220                       |



**LAKE STEVENS  
PUBLIC WORKS**

**TRAFFIC CONTROL PLAN  
Two Way Left Turn Lane  
Closure**

STANDARD PLAN 6-430

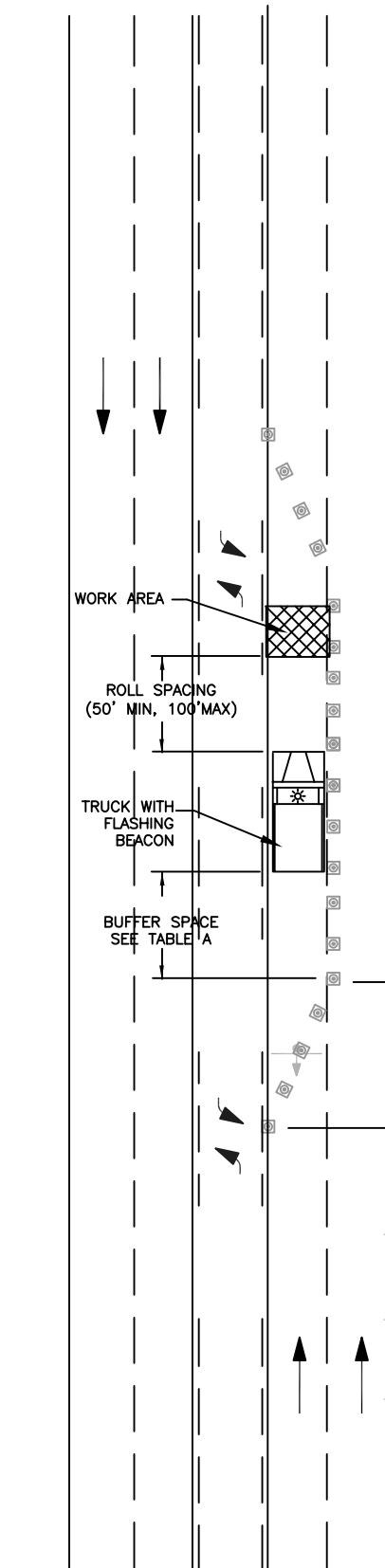
APPROVED BY

*David V. Ortega*

LAKE STEVENS CITY ENGINEER

05/09

DATE



### LEGEND:

- ☐ CONE OR CHANNELIZING DEVICE  
(SEE STD 702)

### NOTE:

1. DISTANCE BETWEEN SIGNS SHALL BE 100' FOR RESIDENTIAL STREETS (25 MPH), AND 350' FOR ARTERIAL ROADWAYS
2. FLASHING BEACON SHALL BE INSTALLED AT EACH SIGN FOR NIGHT-TIME USE (OPTIONAL).
3. DISTANCES MAY VARY AS APPROVED BY THE ENGINEER.
4. FLAGGERS REQUIRED TO CONTROL TRAFFIC WHENEVER THE CONTRACTOR MUST INTERRUPT TRAFFIC FLOW TO ACCESS THE WORK SITE WITH MATERIALS OR EQUIPMENT.
5. SIGN SIZE PER MUTCD.
6. THIS PLAN IS PROVIDED AS A GUIDE ONLY. FOR SPECIFIC INFORMATION ON TRAFFIC CONTROL PLANS SEE CURENT MUTCD.

TABLE A

| SPEED<br>(MPH) | TAPER LENGTH<br>FOR<br>MERGING WIDTH |      | CONE SPACING<br>(FT) |       | BUFFER<br>SPACING<br>(FT) |
|----------------|--------------------------------------|------|----------------------|-------|---------------------------|
|                | 10'                                  | 12'  | TANGENT              | TAPER |                           |
| 25             | 105'                                 | 125' | 25                   | 20    | 55                        |
| 30             | 150'                                 | 180' | 30                   |       | 85                        |
| 35             | 205'                                 | 245' | 35                   |       | 120                       |
| 40             | 270'                                 | 320' | 40                   |       | 170                       |
| 45             | 450'                                 | 540' | 45                   |       | 220                       |

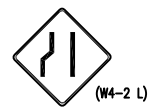
TAPER LENGTH  
SEE TABLE A



SEE NOTE 1

SEE NOTE 1

SEE NOTE 1



**LAKE STEVENS  
PUBLIC WORKS**

TRAFFIC CONTROL PLAN  
5 Lane Roadway With Left  
Lane Closed

STANDARD PLAN 6-431

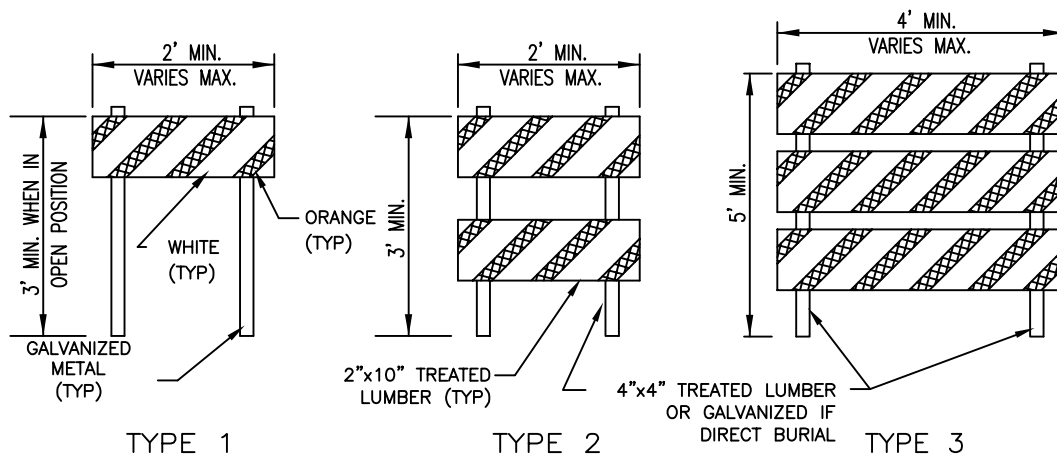
APPROVED BY

*David V. Ortega*

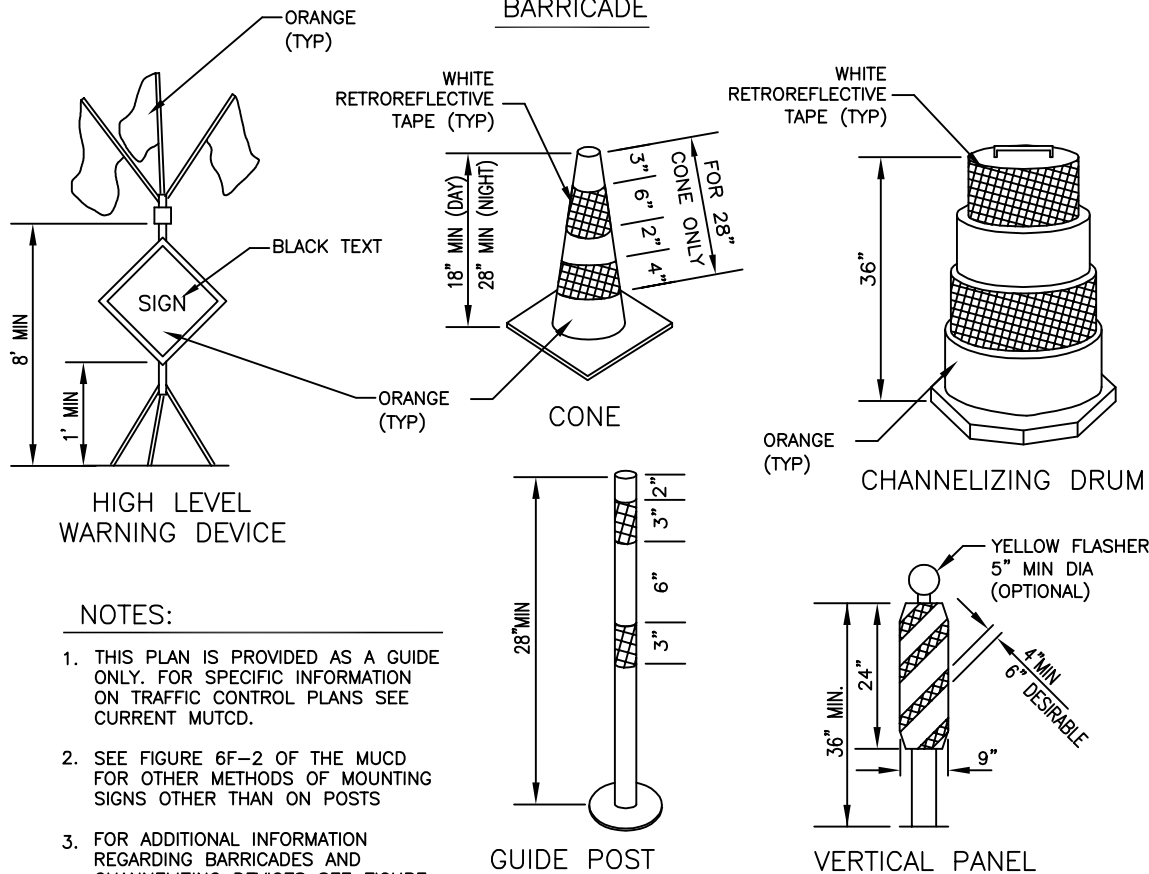
LAKE STEVENS CITY ENGINEER

05/09

DATE



### BARRICADE



TRAFFIC CONTROL DEVICES

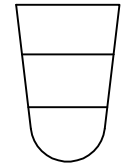


CITY OF  
**LAKE STEVENS  
PUBLIC WORKS**

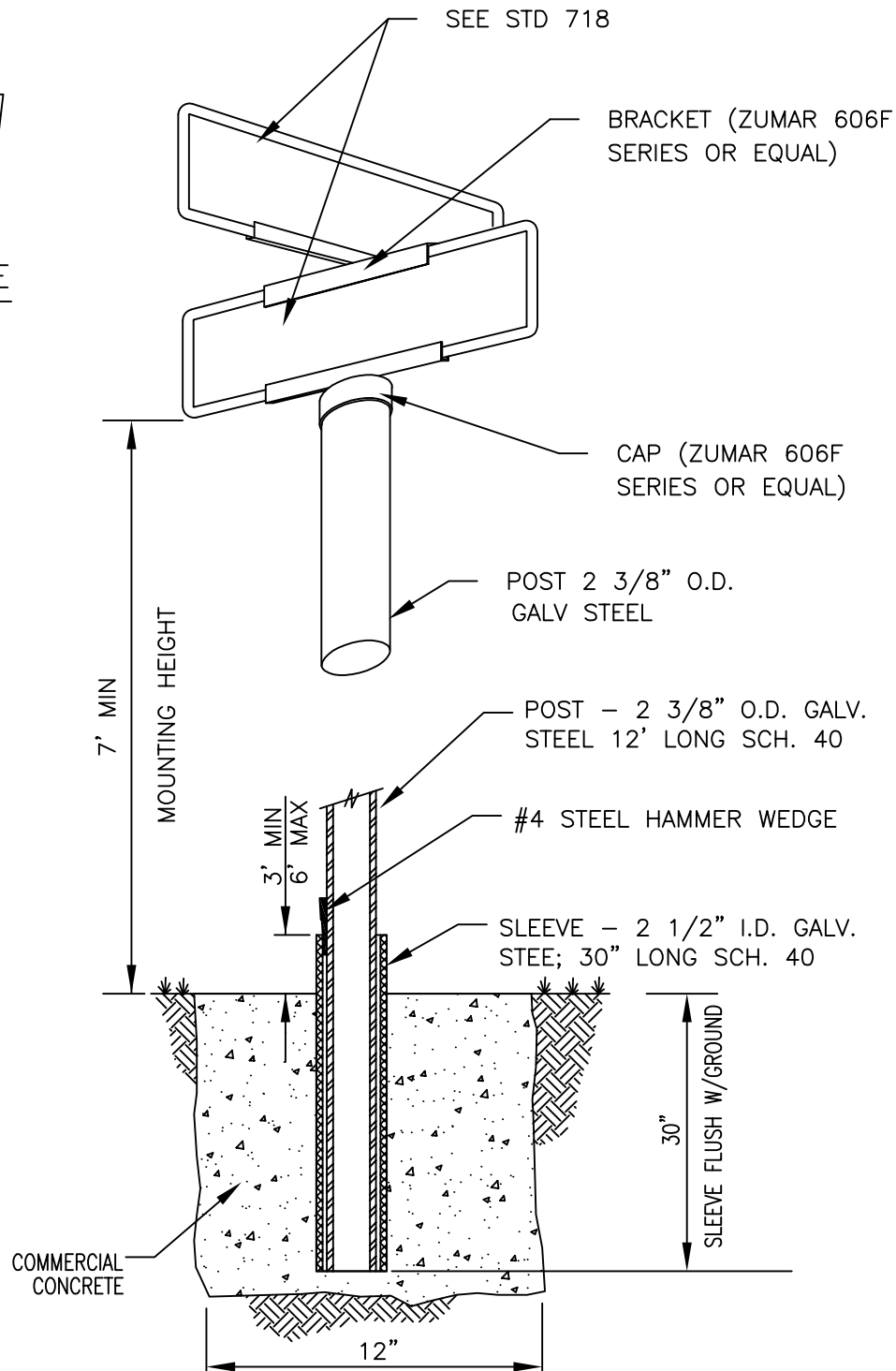
STANDARD PLAN 6-432

APPROVED BY  
  
 LAKE STEVENS CITY ENGINEER

05/09  
 DATE



WEDGE



TYPICAL SECTION



CITY OF  
**LAKE STEVENS  
PUBLIC WORKS**

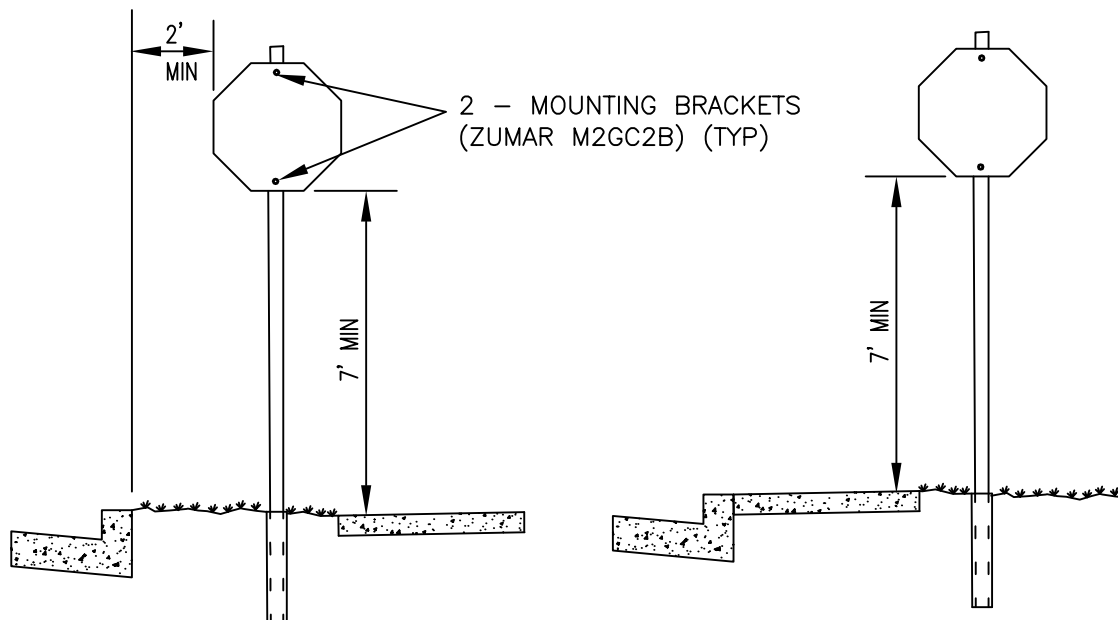
POST MOUNTING DETAIL FOR  
STREET NAME SIGN

STANDARD PLAN 6-440

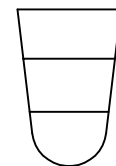
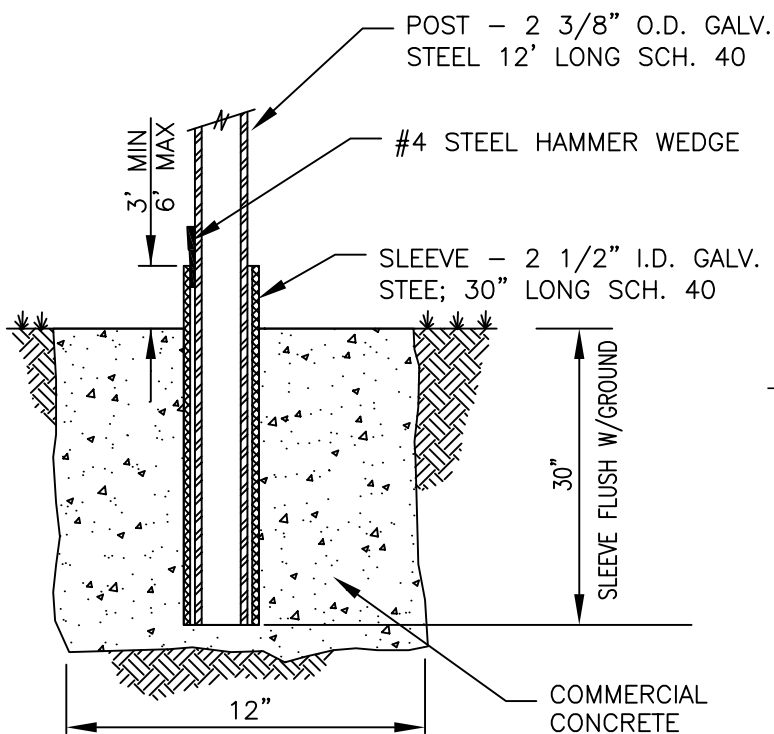
APPROVED BY  
  
LAKE STEVENS CITY ENGINEER

05/09  
DATE





### TYPICAL INSTALLATIONS



WEDGE

### NOTES:

- 1 STANDARD STOP SIGNS SHALL BE 30"x30" PER MUTCD #R1-1 UNLESS OTHERWISE APPROVED OR DIRECTED BY CITY OF EVERETT TRAFFIC ENGINEER.
- 2 STREET NAME SIGNS MAY BE INSTALLED AT TOP OF POST. SEE STANDARD PLAN 715.

### TYPICAL SECTION

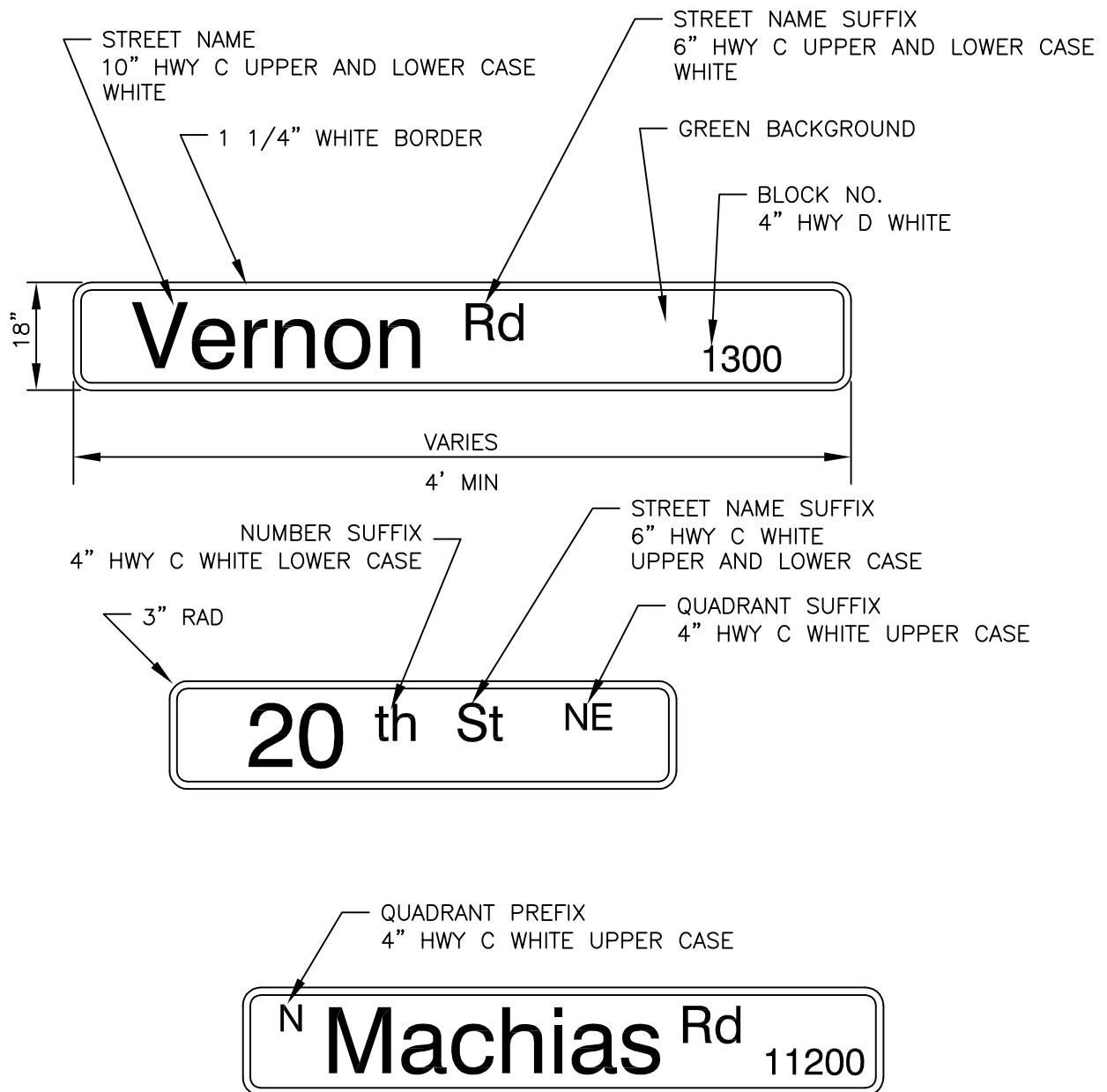


TRAFFIC REGULATORY SIGN  
INSTALLATION

**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-441

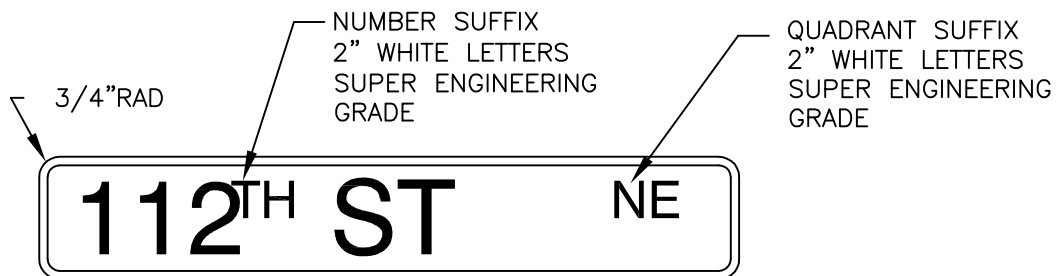
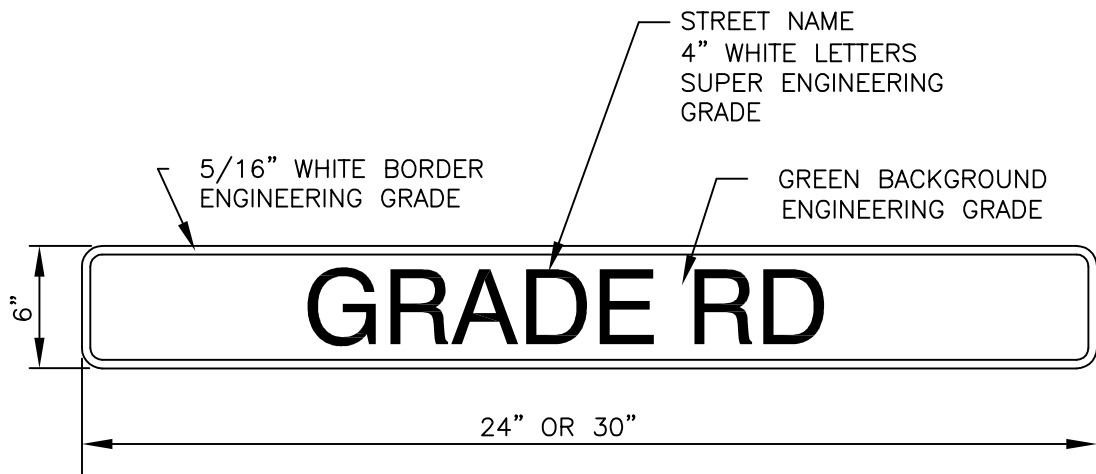
|                                                                                                                                   |               |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------|
| APPROVED BY<br><br>LAKE STEVENS CITY ENGINEER | 05/09<br>DATE |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------|



NOTES:

- 1 TEXT SHALL BE CAPS AND LOWER CASE STANDARD HIGHWAY SERIES "C" LETTERS AND HIGHWAY SERIES "D" NUMBERS.
- 2 MATERIAL SHALL BE .10" ANODIZED ALUMINUM SHEET STOCK UNLESS OTHERWISE SPECIFIED. WITH SUPER ENGINEERING GRADE REFLECTIVE BACKGROUND AND TEXT.
- 3 SIGNS CAN ALSO BE USED ON SPAN WIRE INSTALLATIONS.

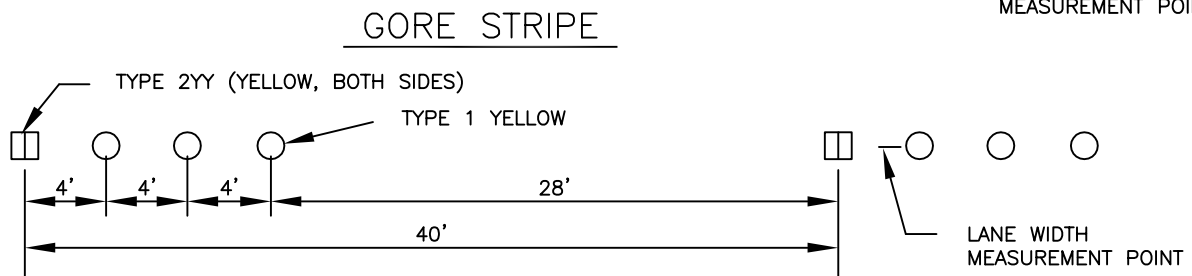
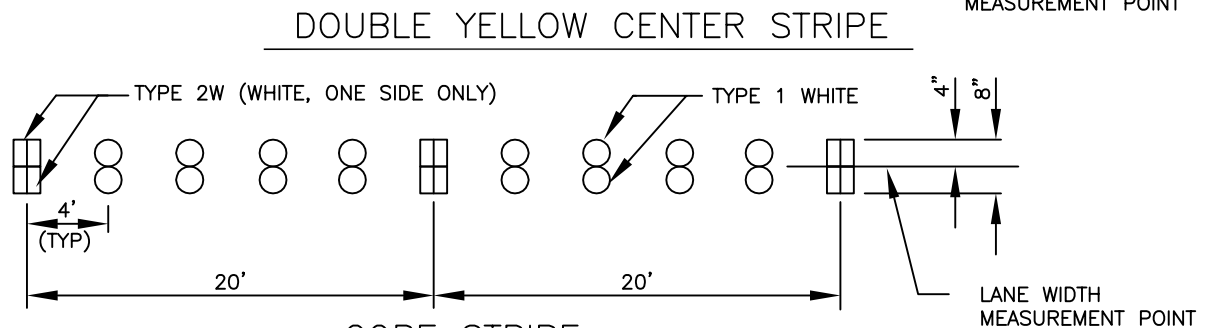
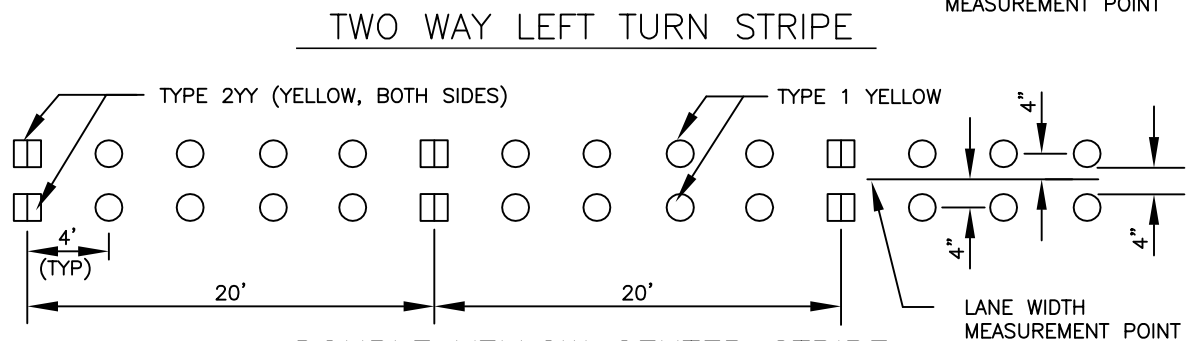
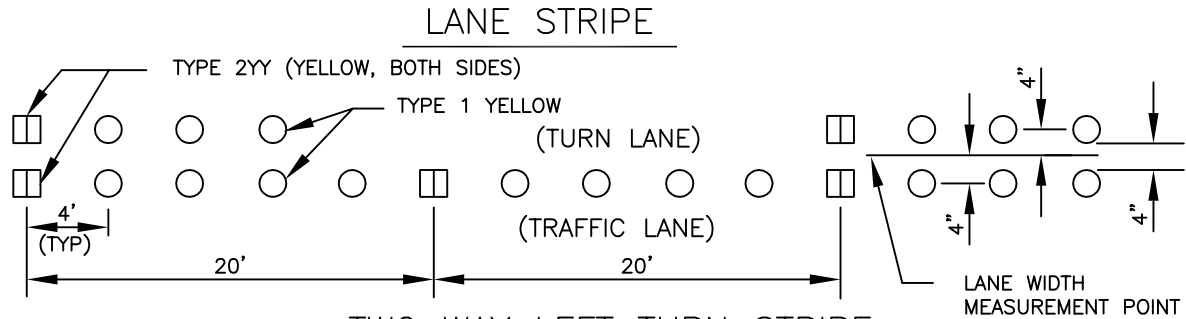
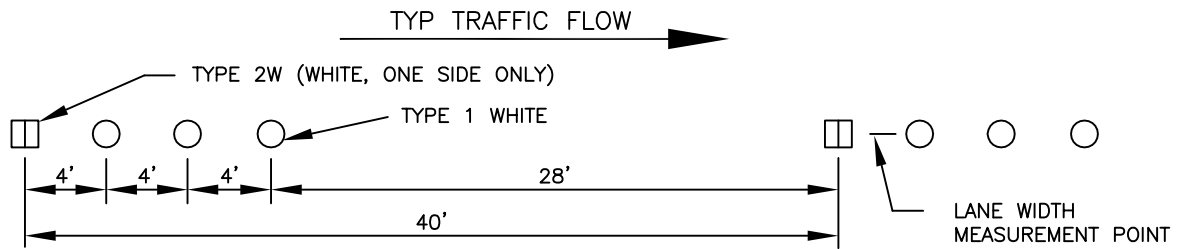
|                                                                                        |                                             |
|----------------------------------------------------------------------------------------|---------------------------------------------|
|    | <p>MASTARM MOUNTED STREET<br/>NAME SIGN</p> |
| <p><b>LAKE STEVENS<br/>PUBLIC WORKS</b></p>                                            |                                             |
| <p>STANDARD PLAN 6-442</p>                                                             |                                             |
| <p>APPROVED BY</p> <p><i>David D. Ostergaard</i></p> <p>LAKE STEVENS CITY ENGINEER</p> |                                             |
| <p>05/09</p> <p>DATE</p>                                                               |                                             |



#### NOTES:

- 1 TEXT SHALL BE ALL CAPS AND STANDARD HIGHWAY SERIES "B" LETTERS AND NUMBERS.
- 2 MATERIAL SHALL BE .08" ANODIZED ALUMINUM SHEET STOCK UNLESS OTHERWISE SPECIFIED.
- 3 BACK SIDE OF SIGN TO BE THE SAME AS THE FRONT.

|                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------|--|
|  <p>POST MOUNTED STREET SIGN</p> |  |
| <p><b>CITY OF<br/>LAKE STEVENS<br/>PUBLIC WORKS</b></p>                                                              |  |
| <p>STANDARD PLAN 6-443</p>                                                                                           |  |
| <p>APPROVED BY</p> <p><i>Daniel V. Ostergaard</i></p> <p>LAKE STEVENS CITY ENGINEER</p>                              |  |
| <p>05/09</p> <p>DATE</p>                                                                                             |  |



SKIP CENTER STRIPE

PAVEMENT MARKING DETAILS



**LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-450

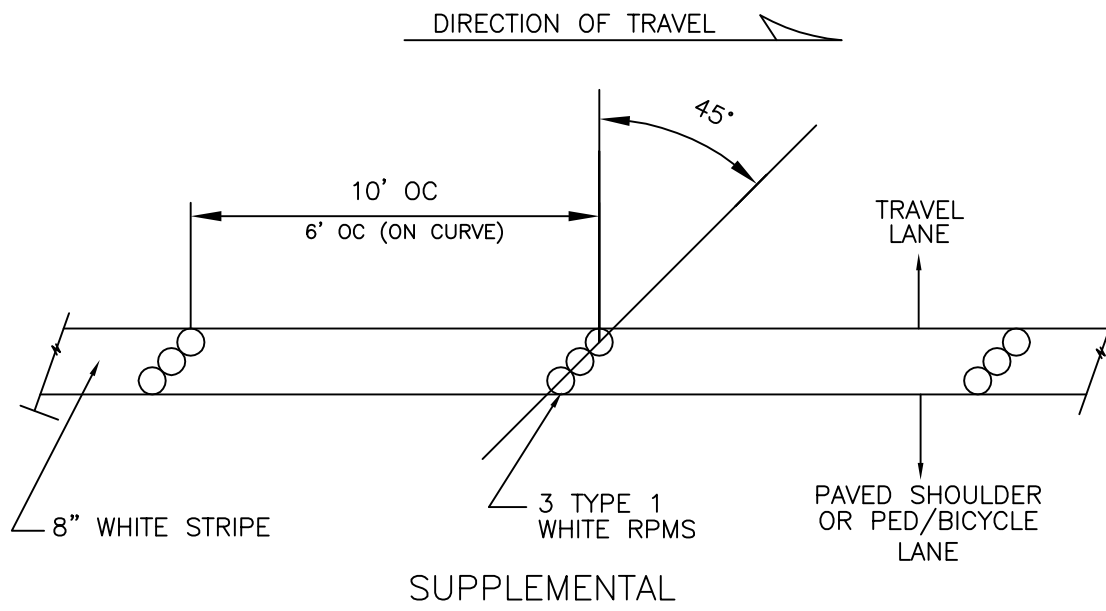
APPROVED BY

*David V. Otergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE





RAISED PAVEMENT MARKING  
DETAIL

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**CITY OF**  
**LAKE STEVENS**  
**PUBLIC WORKS**

STANDARD PLAN 6-451

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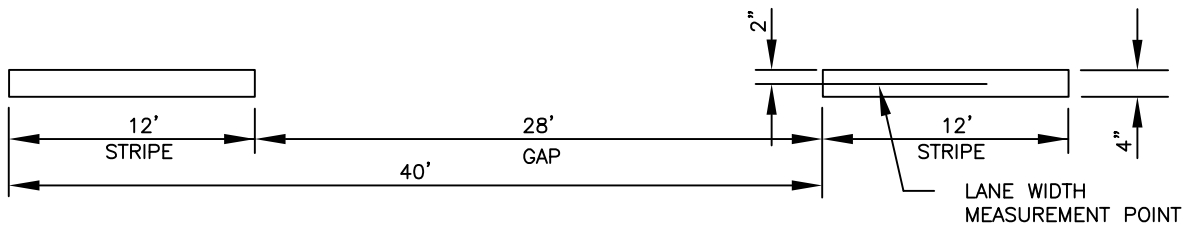
APPROVED BY

*David V. Ortega*

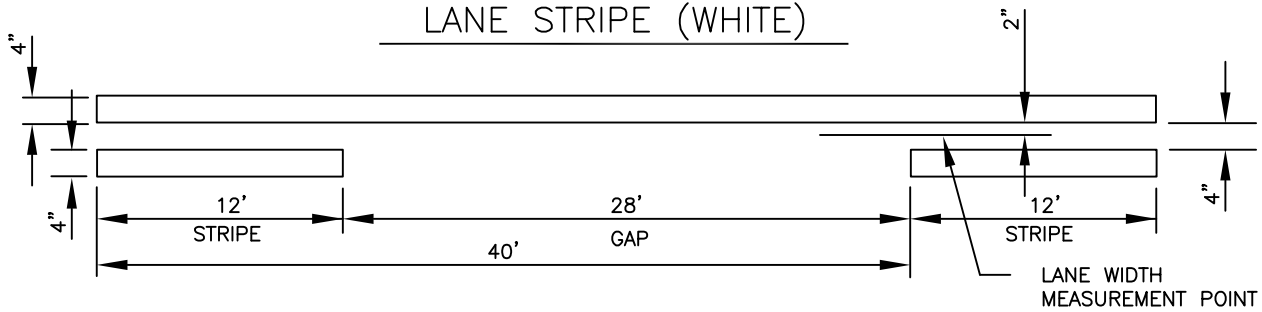
LAKE STEVENS CITY ENGINEER

05/09

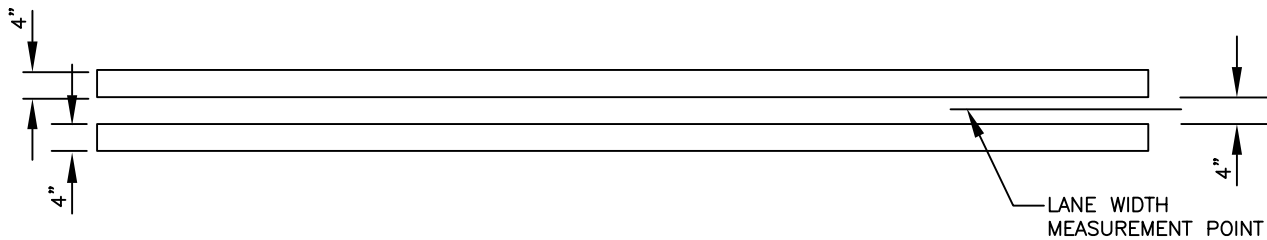
DATE



### LANE STRIPE (WHITE)



### TWO WAY LEFT TURN STRIPE (YELLOW)

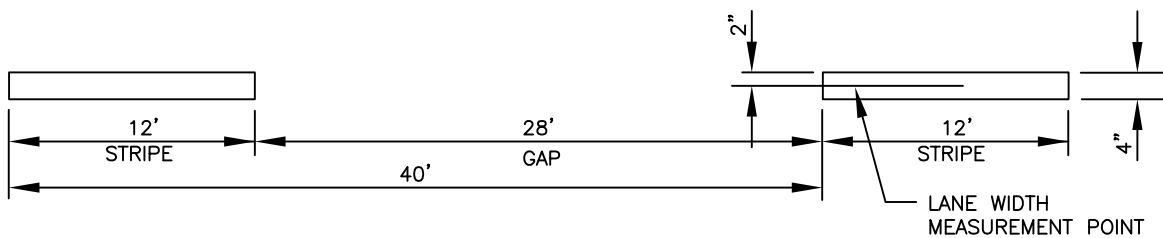


### DOUBLE YELLOW CENTER STRIPE



GORE,  $X=8"$ ; EDGE,  $W=4"$ ; BICYCLE,  $W=8"$

### GORE, EDGE, AND BICYCLE STRIPE (WHITE)



### SKIP CENTER STRIPE (YELLOW)

PAINT STRIPING DETAILS

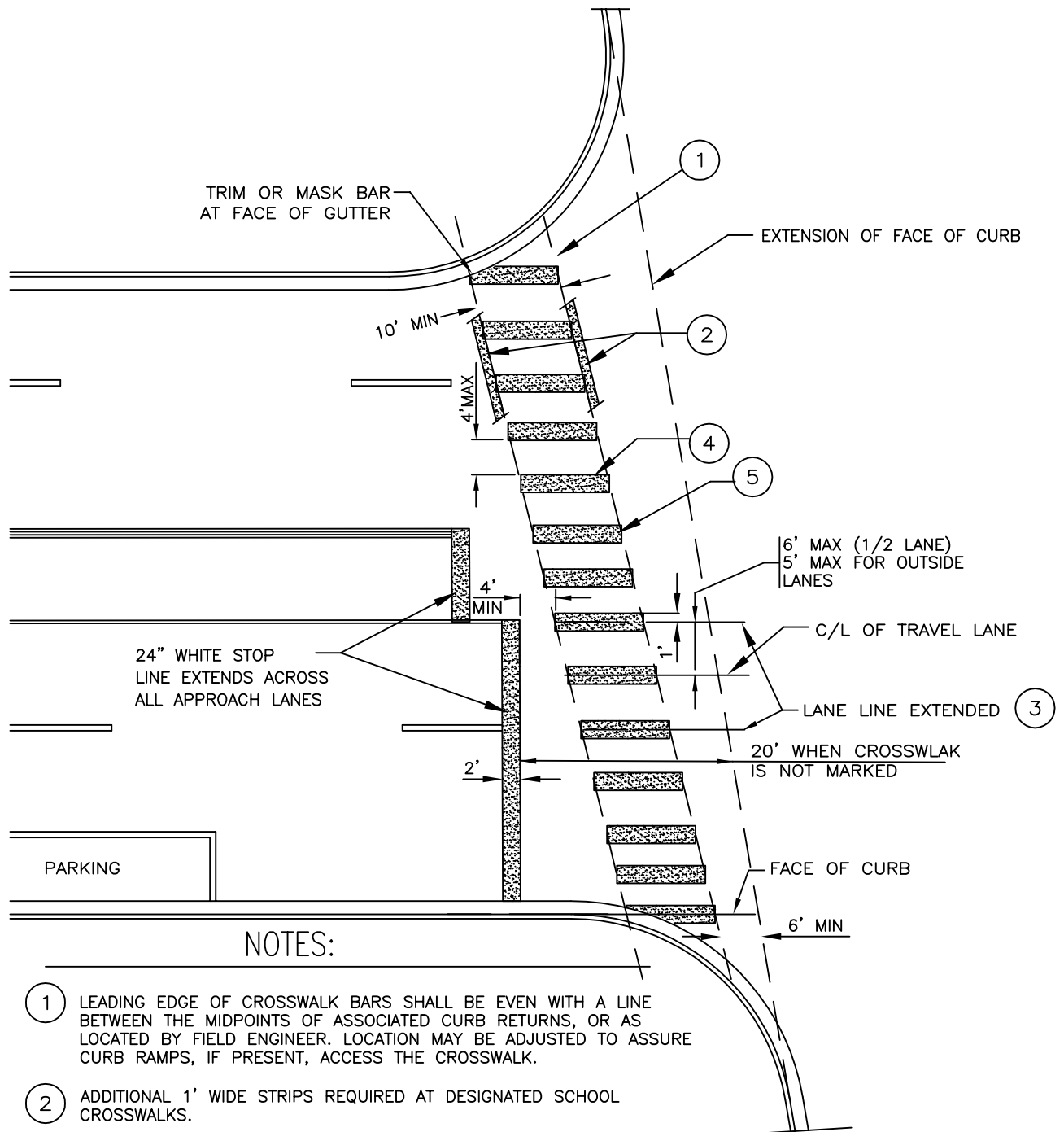


**CITY OF**  
**LAKE STEVENS**  
**PUBLIC WORKS**

STANDARD PLAN 6-452

APPROVED BY  
  
 LAKE STEVENS CITY ENGINEER

05/09  
 DATE



**TYPICAL STOPLINE AND  
CROSSWALK LAYOUT**



**CITY OF  
LAKE STEVENS  
PUBLIC WORKS**

STANDARD PLAN 6-453

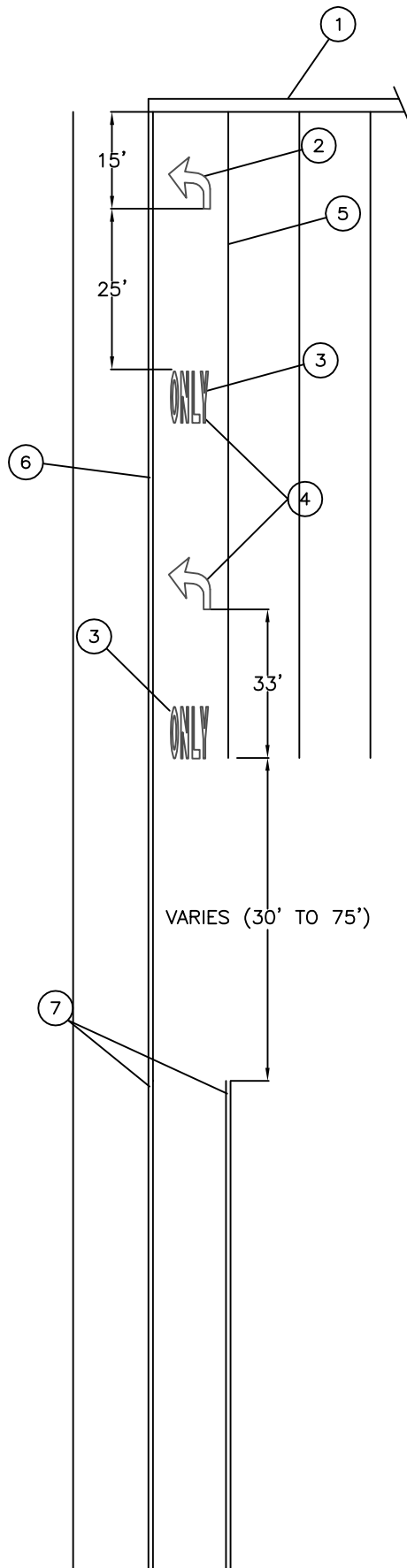
APPROVED BY

*David V. Ostergaard*

LAKE STEVENS CITY ENGINEER

05/09

DATE



## NOTES

- ① STOP LINE AS REQUIRED BY ENGINEER, SEE PLANS
- ② PAVEMENT MARKINGS (SYMBOLS, ETC) PER WSDOT/APWA STANDARD PLAN H-5C.
- ③ SIZE OF LEGENDS SUCH AS "ONLY", "SCHOOL", "STOP", ETC SHALL BE PER THE CURRENT MUTCD.
- ④ INTERMEDIATE PAVEMENT MARKINGS AND LEGENDS AS REQUIRED BY ENGINEER SEE PLANS.
- ⑤ 8" WHITE GORE STRIPE, LENGTH PER PLAN.
- ⑥ DOUBLE YELLOW CENTER STRIPE.
- ⑦ TWO WAY LEFT TURN STRIPE.



APPROVED BY

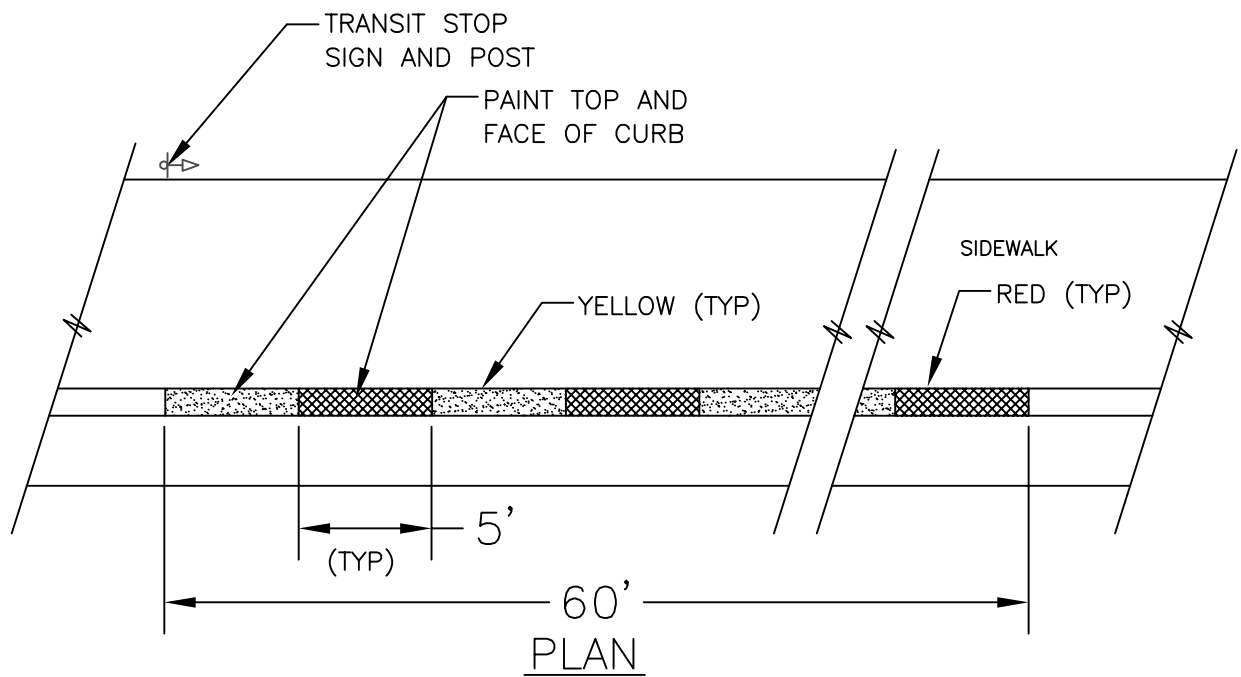
*David V. Ortega*

LAKE STEVENS CITY ENGINEER

05/09

DATE







TRANSIT STOP CURB STRIPING

**CITY OF**

**LAKE STEVENS**

**PUBLIC WORKS**

STANDARD PLAN 6-455

APPROVED BY

*David V. Ostergaard*

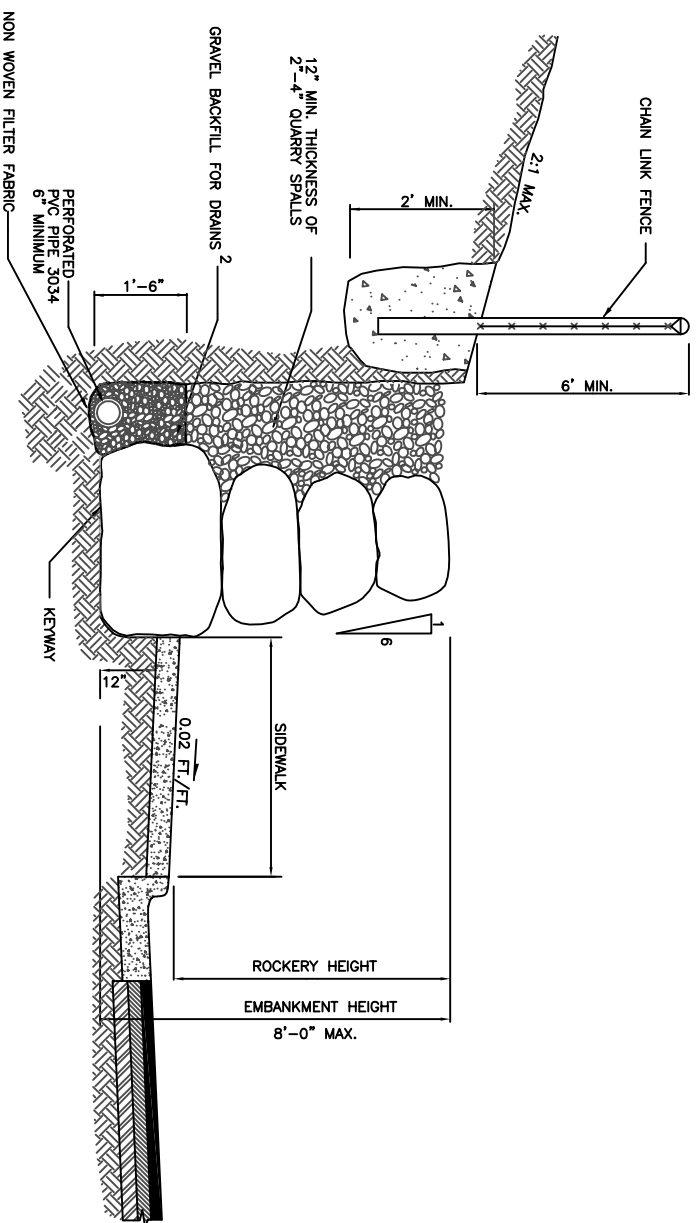
LAKE STEVENS CITY ENGINEER

05/09

DATE

- NOTES:
1. WSDOT 9-03.12[4]
  2. IF ROCKERY OR RETAINING WALL IS BEHIND ROLLED CURB OR ON A RURAL SECTION, FACE OF ROCKERY OR RETAINING WALL MUST BE BEYOND THE CLEAR ZONE PER WSDOT DESIGN MANUAL.
  3. CHAIN LINK FENCE SHALL COMPLY WITH STD. PLAN 6-110 AND IS REQUIRED WHEN ROCKERY HEIGHT IS 30" OR GREATER AND ROCKERY IS LOCATED ON PUBLIC RIGHT-OF-WAY OR EASEMENT.
  4. MAXIMUM HEIGHT OF ROCKERY IS 8' UNLESS APPROVED BY THE CITY ENGINEER.

NOTE:  
EMBANKMENT HEIGHTS 4'-0" AND ABOVE REQUIRES  
BUILDING PERMIT AND SET OF STAMPED ENGINEERING  
PLANS



LAST REVISED 05/09

CITY OF  
LAKE STEVENS  
PUBLIC WORKS

APPROVED BY *Daniel M. Berglund* 05/09

LAKE STEVENS CITY ENGINEER DATE



## **SECTION 7**

### **BRIDGES**

#### ***7-100 Principal References***

Except as specified below, City of Lake Stevens bridges, whether on public roads or on private roads serving subdivided land, shall be designed and constructed to meet the minimum requirements set forth in the latest edition, including all interim addenda, of "Standard Specifications for Highway Bridges," adopted by AASHTO and in accordance with the requirements of WSDOT Standard Specifications. Bridge and approach railings shall be provided in accordance with those references or with WSDOT/APWA Standard Plans. All new bridges shall be designed to carry an AASHTO HS 20-44 live load or greater. All bridgework shall comply with City Codes regarding sensitive and shoreline management areas for stream and wetland protection and flooding concerns.

#### ***7-101 Bridge Geometrics***

- A.** In the general case, the bridge shall comprise the full width and configuration of the road being served -- traveled way plus curb, sidewalks, walkway, bike lane, equestrian lane and/or shoulder on one or both sides. Requirements of utilities shall be duly considered. Bridge roadway width shall be measured between curbs or between faces of rails, whichever is less, but in no case shall be less than 28 feet.
- B.** Where typical speed is 35 MPH or higher-and significant pedestrian, bike and/or horseback traffic can be expected, the Public Works Director or designee may require that the lanes for these other modes of traffic be separated from motor vehicle traffic by use of a bridge traffic rail and further protected by a rail at outer edge. On designated bike routes, combination traffic and bicycle railings shall be used.
- C.** Approach railings shall be made structurally continuous with bridge railings and shall meet AASHTO specifications as cited in Section 3-510 above.
- D.** Overhead vertical clearances for motor traffic on the traveled way or under overpasses shall be 16.5 feet minimum. Vertical clearance of structures above a walkway or sidewalk shall be 8 feet minimum and shall be 10 feet on designated equestrian routes.

- E. The height of bridge clearance above streams shall be as required by the Surface Water Design Manual.

### **7-102 Bridge Design Criteria**

- A. Approach slabs Will be required for all bridges and new bridge plans shall provide pavement seats for approach slabs unless otherwise approved by the Public Works Director or designee. Waiver or modification of the requirement for approach slabs will be considered only on the basis of adequate geotechnical analysis. Approach slabs shall be constructed in accordance with WSDOT/APWA Standard Plan A-2,
- B. New bridge decks and approach slabs shall be designed with a protective system to prevent corrosion of the reinforcing steel.
- C. Criteria under other recognized road and bridge project classifications, such as those of 3-R projects, set forth in WSDOT Local Agency Guidelines, may be applied under conditions deemed appropriate by the Public Works Director or designee.
- D. The design of bridge expansion joints shall consider the presence of bicycle traffic.

### **7-103 Special Permits**

Permit requirements for construction or reconstruction of bridges include but are not limited to the following:

- A. Bridges over navigable waters require U. S. Coast Guard permits.
- B. Bridges involving deposition of material in waters of the United States or their adjacent wetlands require an U. S. Army Corps of Engineers Permit.
- C. Any work involving alteration of flow or bed materials below the ordinary high water line of any water body or water course requires a-Hydraulic Project approval from the State Department of Fisheries or the State Department of Wildlife.
- D. Any work within waters of the State requires a Water Quality Certification Waiver from the State Department of Ecology.
- E. Where bridge structures lie on or over submerged lands a lease from the Washington State Department of Natural Resources may be necessary,
- F. Structures located on shoreline zones as defined in City of Lake Stevens Code require a substantial development permit from the City subject to concurrence of the State Department of Ecology.

- G.** Bridges over waterways require the Public Works Director or designee's approval of the size and shape of the hydraulic opening, the height of the superstructure over high water, the location of piers, channel, improvement, and other hydraulic considerations.

## SECTION 8

### UTILITIES

#### ***8-100 Franchising Policy and Permit Procedure***

- A.** Utilities to be located within existing and proposed City road right-of-way shall be constructed in accordance with current franchise and/or permit procedure and in compliance with these Standards. In their use of the right-of-way, utilities will be given consideration in concert with the traffic carrying requirements of the road which are, namely, to provide safe, efficient and convenient passage for motor vehicles, pedestrians, and other transportation uses. Aesthetics shall be a consideration. As a matter of policy, undergrounding of electric utilities will be required per LSMC 14.60.450. Also, utilities are subject to City policies relating to drainage, erosion/sedimentation control and sensitive areas as set forth in City Codes and the Storm Drainage Design Standards.
- B.** All permits for new placement and replacement of existing utility poles and other utility structures above grade shall be accompanied by written certification from a professional Engineer or from an agent authorized by the utility to certify that the installations conform to these Standards and that the proposed work is in conformity with sound engineering principles relating to highway safety.
- C.** Requests for exceptions to these Standards will be processed in accordance with variance procedure as referenced in Section 1-105.

#### ***8-101 Standard Utility Locations within the Right-of-Way***

Utilities within the right-of-way on new roads or on roads where existing topography, utilities or storm drains are not in conflict shall be located as indicated below. Where existing utilities or storm drains are in place, new utilities shall conform to these Standards as nearly as practicable and yet be compatible with the existing installations. Above ground utilities located within intersections shall be placed so as to avoid conflict with placement of curb ramps.

##### **A. Gas and Water Lines:**

- 1.** Shoulder-and-Ditch Section:
  - If practical: Outside of ditch line.
  - Otherwise: In shoulder three feet from edge of traveled lane.
- 2.** Curb and Gutter Section:

- Preferable: One and one-half feet back of curb, or at distance which will clear root masses of street trees if these are present or anticipated.
  - Otherwise: In the street as close to the curb without encroaching on the storm drainage system. Mains and service connections to all lots shall be completed prior to placing of surface materials.
- 3. Designated Side of Centerline:**
- GAS: South and West.
  - WATER: North and East.
- 4. Depth:** 42 inches minimum cover from finished grade, ditch bottom or natural ground.
- B. Individual water service lines shall:**
- 1.** Be placed with minimum 36-inch cover from finished grade, ditch bottom or natural ground.
  - 2.** Use road right-of-way only as necessary to make side connections,
  - 3.** For any one connection, not extend more than 60 feet along or through the right-of-way, or the minimum width of the existing right-of-way.
  - 4.** Water meter boxes, when placed or re-placed, shall be located on the right-of-way line immediately adjacent to the property being served, unless otherwise approved by the Public Works Director or designee. Meter box locations within the right-of-way may be approved by the Public Works Director or designee based on site conditions, which make routine, service access difficult or impractical,
- C. Sanitary Sewers:** In the general case, five feet south and west of centerline; depth 60-inch minimum cover from finished grade, ditch bottom or natural ground,
- D. In the case of individual sanitary sewer service lines, which are force mains, the pipe shall:**
- 1.** Is minimum four inches D.I., or as required by the utility to maintain internal scouring velocity.
  - 2.** If nonmetallic, contain wire or other acceptable proximity detection features; or be placed in a cast iron or other acceptable metal casing.
  - 3.** Be placed with minimum three-foot cover from finished grade, ditch bottom or natural ground, within 10 degrees of perpendicular to road centerline, and extend to right-of-way line,
  - 4.** Be jacked or bored under road unless otherwise approved by the Public Works Director or designee
- E. Sanitary and water lines shall be separated in accordance with good engineering practice such as the Criteria for Sewage Work Design, Washington Department of Ecology latest edition.**



- F.** Gravity systems, whether sanitary or storm drainage, shall have precedence over other systems in planning and installation except where a non-gravity system has already been installed under previous approved permit and subject to applicable provisions of such permits or franchises.
- G.** Electric utilities, power, telephone, cable TV: Preferable: Underground with 36 inch minimum cover, either side of road, at plan location and depth compatible with other utilities and storm drains. Otherwise: Every new placement and every replacement of existing utility poles and other utility structures above grade shall conform to the following:
- 1.** Utility poles or other obstacles may be placed within the right-of-way and shall be as far back from the traveled way or auxiliary lane as practicable. The utility pole shall be placed outside of the clear zone per the WSDOT Design Manual.
- H.** Notwithstanding the other provisions regarding pole locations described in these standards, no pole shall be located so that it poses a hazard to the general public. Utilities shall place and replace poles with primary consideration given to public safety.
- 1.** The above constraints on pole and obstacle location will not apply to locations not accessible by moving vehicles, “breakaway” structures whose break-off resistance does not exceed that of 4” x 4” wood post or a 1-1/2-inch standard (hollow) iron pipe or to “breakaway” fire hydrants installed to manufacturer’s specifications,
  - 2.** Deviations from these pole and obstacle clearance criteria may be allowed by an approved variance when justified by suitable engineering study considering traffic safety. Only the Utility may request a variance from pole and obstacle clearance criteria. Up to three contiguous damaged or weakened poles may be replaced at existing locations under permit in accordance with emergency procedures, however, sequential permits resulting in continuous replacement of a pole line shall not be allowed. A pole or other obstacle, which incurs repeated damage from errant vehicles, shall be relocated or protected.
  - 3.** Locations of poles shall also be compatible with driveways, intersections, and other road features (i.e., they shall not interfere with sight distances, road signing, traffic signals, culverts, etc.). To the extent possible, utilities shall share facilities so that a minimum number of poles are needed.
  - 4.** Where road uses leave insufficient overhang, anchor, and tree-trimming space for overhead utilities, consideration will be given to variance from the Standards or to acquisition of additional easements and/or right-of-way for this purpose. Costs incurred for said acquisition shall be borne by the developer, builder, or other party initiating the road

construction. However, the associated cost of relocating the utility shall not be borne by the City of Lake Stevens.

- I. Notwithstanding other provisions, underground systems shall be located at least five feet away from road centerline and where they will not otherwise disturb existing survey monumentation.

## **8-102 Underground Utility Installation**

- A. General: The WSDOT Standard Specifications will generally apply unless otherwise stated below.

- B. Utility Cuts On Existing Traveled Roads

### **1. General Policy**

- Trench restoration guidelines ensure that the condition of the pavement on existing and new public streets is not degraded by trenching and restoration activities. These guidelines shall be followed by City departments, utility companies and contractors when doing trench work within the paved portion of City right of way.
- Modifications or exemptions to these policies may be authorized by the Public Works Director or designee per section 3-107 of these standards.
- Whenever a new street is completed or an overlay of an existing street has been completed within five (5) years of a newly proposed cut, additional roadway restoration shall be required as determined by the Public Works Director or designee.
- Pavement trenching may be allowed, under compelling circumstances, provided a more reasonable alternative does not exist.
- Boring under the roadway shall be by guided boring equipment. A boring mole will not be allowed.
- A Development Standard Handout is attached in Appendix E.

### **2. Policy**

Overlay is required:

- On all streets with a pavement condition index of greater than 80 a full street width or lane width overlay is required.
- On all streets with a pavement condition index between 70 and 80 a full street or lane width overlay may be required based on the location of the trench work. If any part of the trench or trench edge falls within the standard vehicle wheel path (seven feet eight inches centered within the lane, see Standard Drawings 8-010 and 8-020 then an overlay will be required.

No Overlay is required:

- On all streets with a pavement condition index of less than 70 trench restorations per the standard plans is required.

### **3. Trench Backfill and Restoration**

Longitudinal Cut

- Trench restoration shall be per Standard Plan 8-020.

Transverse Cut

- Trench restoration shall be per Standard Plan 8-030.

**A.** Materials and workmanship shall be in conformance with the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction. Construction shall be in conformance with all applicable standard plans, and with the details and conditions outlined in the Right-of-Way Use Permit, and with the following:

- (1) Trench restoration shall be accomplished with a patch or an overlay as required by the Public Works Director or designee.
- (2) If a patch is used, the trench limits shall be saw cut prior to final patch.
- (3) All trench and pavement cuts shall be made by saw cuts or by grinding. The saw cuts or grinding shall be a minimum of 1 foot outside the trench width or as directed by the city inspector.
- (4) If the Right-of-Way Use Permit requires an overlay, then the contractor may use a jackhammer or drum grinder for the cutting of the existing pavement.
- (5) Within the top 4 feet of trenching, backfill shall be crushed surfacing materials or a controlled-density fill.
- (6) If the existing material is determined by the City Inspector to be suitable for backfill and the trench is not perpendicular to a travel lane or driveway, the contractor may use the native material as long as the top 8 inches is crushed surfacing material.
- (7) Material used for backfill below 4 feet in depth must be approved by the City Inspector.
- (8) All trench backfill shall be compacted to 95% maximum density, as described in Section 2-03 of the Standard Specifications.
- (9) Backfill compaction shall be performed in 8-to-12-inch lifts. The compaction tests shall be performed in maximum increments of 2 feet.

The test results shall be given to the City Inspector for review and approval prior to paving. Material testing will be required for trench backfill (native or imported), asphalt, and concrete. Testing shall be performed by a certified independent testing laboratory. The cost of testing is the responsibility of the franchise utility or contractor. The number of tests required shall be the same as for asphalt density testing, or as directed by the inspector.

- (10) Temporary restoration of trenches for overnight use shall be accomplished by using cold mix, asphalt-treated base (ATB), or steel plates. ATB used for temporary restoration may be dumped directly into the trench, bladed out, and rolled. After rolling, the trench must be filled flush with asphalt to provide a smooth riding surface.
- (11) ATB shall be placed to the compacted depth as shown on standard plans or as directed by the Public Works Director or designee. Asphalt cement shall be paving asphalt AR-4000W. Materials shall conform with Section 9-02.1(4) of the Standard Specifications.
- (12) Tack shall be emulsified asphalt grade CSS-1 as specified in Section 9-02.1(6) of the Standard Specifications and shall be applied to the existing pavement and edges of saw cuts as specified in Section 5-04 of the Standard Specifications.
- (13) Asphalt concrete Class B shall be placed on the prepared surface by an approved paving machine and shall be in accordance with the requirements of Section 5-04 of the Standard Specifications, except that longitudinal joints between successive layers of asphalt concrete shall be displaced laterally a minimum of 12 inches, unless otherwise approved by the Inspector. Fine and coarse aggregate shall be in accordance with Section 9-03.8 of the Standard Specifications. Asphalt concrete over 2 inches thick shall be placed in equal lifts not to exceed 2 inches each.
- (14) Cuts for trenches in all street surfaces, walks, and driveways shall be either ground or saw cut. Ground joints shall be feathered and shimmed to provide a smooth surface. Feathering and shimming shall be accomplished by raking out the oversized aggregates from the class B mix. Surface smoothness shall conform to Section 5-04.3(13) of the

Standard Specifications. The paving shall be corrected by removal and repaving of the trench only.

- (15) Compaction of all lifts of asphalt shall be at an average of 92% of maximum density as determined by WSDOT Test Method 705. The number of tests required per square foot of trenching shall be as follows:
- One test for less than 50 square feet of trenching area
  - Two tests for 50 to 100 square feet of trenching area
  - Three tests for 100-plus to 300 square feet of trenching area
  - One test for every 200 square feet over 300 square feet of trenching area or every 100 lineal feet of trench, if applicable

Testing shall be performed by a certified independent testing laboratory. The cost of testing is the responsibility of the franchise utility or contractor.

The testing is not intended to relieve the contractor from any liability for the trench restoration. It is intended to show the Inspector and the city that the restoration meets these specifications.

- (16) All joints shall be sealed using paving asphalt AR4000W.

- B.** Whenever a new street is completed or an overlay of an existing street has been completed within five (5) years of a newly proposed cut, additional roadway restoration shall be required as determined by the Public Works Director or designee.
- C.** Asphalt patch depths will vary based upon the classification of the streets being trenched. The asphalt depths shall be shown on the Right-of-Way Use Permit and the work shall be performed as required by the attached details. The minimum paving depths for all trenching are:
- (1) 8 inches for arterial streets
  - (2) 6 inches for local streets
  - (3) 4 inches for driveway approaches and walkways

- D.** When trenching occurs within the street shoulder, the shoulder shall be restored to its original or better condition within 30 days of first opening the trench.
- E.** The final patch shall be completed within 30 days of the first opening the trench. This time frame may be adjusted if delays are due to inclement weather or other adverse conditions. Delay of final patch or overlay work must be approved by the Review Engineer.
- F.** Any patch or overlay Downtown shall be permanent and completed as soon as possible. Hours of work on all arterials shall be limited to 8:30 AM to 2:30 PM or as determined by the Public Works Director or designee.

#### **4. General Information**

##### **Inspection**

The City inspectors may determine in the field that a full street width or lane width overlay is required due to changes in the permit conditions such as the following:

- a.** Trenches needed to be relocated in the field because of existing utilities.
- b.** Additional damage to existing asphalt surface due to the contractors equipment.
- c.** The trench width increases significantly.
- d.** Significant problems that were not expected or are discovered during the construction.

##### **Overlay**

- Lane width or a full street width overlay will be determined based on the location of the proposed trench within the roadway cross-section.
  - a.** If the trenching is down the middle of a single lane then a lane width overlay will be required.
  - b.** If the trenching is down the middle of the roadway a full width overlay will be required.
  - c.** If the trenching is down the middle of two lanes in the same direction or is within three feet of any lane then the lanes affected will be overlayed.
- All existing pavement shall receive a 2" grinding prior to the overlay.
- All overlays shall extend 10 feet beyond the edge of the trench.

##### **New Streets and Recent Overlay**

- Whenever a new street is accepted from a developer or a new overlay has been completed within five (5) years of a newly proposed cut (non-emergency), additional

roadway restoration shall be required as determined by the Public Works Director or designee.

- In the event of an emergency, pavement excavation may be allowed provided a more reasonable alternative does not exist and restoration of the pavement complies with one of three options described below:
  - a.** Option 1: This option applies to street crossings and/or longitudinal trenches and requires the grinding down of existing pavement and overlay of the entire roadway or vehicle lane impacted by the trenching. Once the trench work is completed and the trench restored per the standard plan, the entire roadway will be ground down to a depth of 2.0 inches between adjacent intersections and a 2 inch overlay of Class B modified asphalt applied per City Standards.
  - b.** Option 2: This option applies to street crossings and/or longitudinal trenches where a partial grinding and complete overlay can be substituted for Option 1. Once the trench work is completed and the trench restored the outside lanes can be ground to width of six (6) feet from the curb for a depth of 2.0 inches between adjacent intersections and a 2.0 inch overlay of Class B modified asphalt applied to the entire roadway surface per City Standards.
- C.** On Proposed Roads (e.g., New Subdivisions): Backfill compaction for trenches within the roadway shall be achieved throughout the entire depth of the trench, by mechanical compaction as described above.
- D.** Controlled Density Backfill: As an alternative to mechanical compaction, trench backfill above the bedding and below the base course or ATB may be accomplished by use of controlled density backfill (CDF) in a design mixture approved by the Public Works Director or designee. On crossings required to be opened to traffic prior to final trench restoration, steel plates may be used-as approved by the Public Works Director or designee.
- E.** Testing:
  - 1.** Consistent with the above and prior to placing any surface materials on the roadway, it shall be the responsibility of the developer to provide density test reports certified by a professional Engineer. A minimum of one test shall be taken within every 50 feet of trench length and at depths up to 50 percent of trench depth, or as directed by the Public Works Director or designee. Compaction of laterals or service line trenches shall be tested where directed by the Public Works Director or designee. Testing of CDF shall be in accordance with ASTM D4832.

2. Whichever compaction method the installer elects, the backfill below four feet must test to be not less than 90 percent maximum density (modified proctor) and the upper four feet of backfill must test not less than 95 percent maximum density (modified proctor). Where this cannot be achieved, all affected backfill in the top four feet shall be removed and replaced by gravel base and mechanically compacted to 95 percent as in B.2 above.

**F. Notification and Inspection:**

1. Consistent with these Standards, any developers, utilities, or others intending to trench in existing or proposed traveled City streets shall notify City of Lake Stevens Public Works Inspection office not less than one working day prior to doing the work. This notification shall include:
  - a. Location of the work
  - b. Method of compaction to be used
  - c. Day and hour when compaction is to be done
  - d. Day and hour when testing is to be done.
2. As set forth in these Standards, failure to notify may necessitate testing or retesting by City of Lake Stevens at the expense of the Developer or Utility. Furthermore, the work may be suspended pending satisfactory test results.

**8-103 Final Utility Adjustment (To Finish Grade)**

- A. All utility covers, which are located on proposed asphalt roadways, shall be temporarily placed at subgrade elevation prior to placing crushed surfacing material.
- B. Final adjustment of all covers and access entries shall be made following final paving by:
  1. Saw-cutting or neat-line jack hammering of the pavement around lids and covers. Opening should not be larger than 12 inches beyond the radius of the cover.
  2. Removing base material, surfacing course, and frame; adding raising bricks; replacing frame and cover no higher than finished grade of pavement and no lower than one-half inch below the pavement.
  3. Filling and mechanically compacting around the structure and frame with crushed surfacing material or ATB, or pouring in five-inch minimum thickness of cement concrete Class 3000 to within two inches of the top.
  4. Filling the remaining two inches with asphalt concrete Class B hot mix, compacted and sealed to provide a dense, uniform surface.
  5. Final adjustment of all covers and access entries shall be completed within 30 days of final paving.



### **8-104 Final Cleanup and Restoration**

In addition to restoration of the road as described above, the responsible utility shall care for adjacent areas in compliance with these standards and section 8-01 in the WSDOT Standard Specifications. In particular:

- A.** Streets and roads shall be cleaned and swept both during and after the installation work. No blading of asphalt streets will be permitted.
- B.** Disturbed soils shall be final graded, seeded and mulched after installation of utility. In limited areas seeding and mulching by hand, using approved methods, will be acceptable.
- C.** Ditch lines with erodible soil and subject to rapid flows may require seeding, jute matting, netting, or rock lining to control erosion.
- D.** Any silting of downstream drainage facilities, whether ditches or pipe and catch basins, which results from the utility installation shall be cleaned out and the work site restored to a stable condition as part of site cleanup.

### **8-105 ROW RESTORATION GENERAL NOTES**

1. AT THE ENGINEER'S DISCRETION, PRIOR TO COMMENCING ANY CONSTRUCTION, PHOTOGRAPHS DEPICTING PRE-EXISTING ROADWAY CONDITIONS WILL BE REQUIRED EVERY 50 FEET IN PAVED AREAS OR ANY OTHER LOCATION AS SPECIFIED BY THE ENGINEER.
2. SIGNING, FLAGGING AND TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THESE STANDARDS, THE WSDOT TRAFFIC MANUAL AND THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
3. ONE LANE OF TRAFFIC SHALL REMAIN OPEN AT ALL TIMES, ATTENDED BY FLAGMEN AND APPROPRIATE CONSTRUCTION SIGNING PROVIDED. THE ROAD SHALL BE RESTORED TO TWO-WAY TRAFFIC AT THE END OF EACH WORKING DAY. APPLICATIONS FOR TOTAL ROAD CLOSURES MUST BE FILED WITH THE CITY PUBLIC WORKS AT LEAST 5 DAYS PRIOR TO THE ANTICIPATED CLOSURE.
4. EXISTING DRAINAGE DITCHES, CULVERTS, ETC., SHALL BE KEPT CLEAN AT ALL TIMES. TEMPORARY DIVERSION OF ANY DRAINAGE SYSTEM WILL NOT BE PERMITTED WITHOUT THE CONSENT OF THE ENGINEER. ANY DRAINAGE CULVERT, CATCHBASIN, MANHOLE OR OTHER DRAINAGE STRUCTURE DISTURBED BY EXCAVATION SHALL BE REPLACED WITH NEW MATERIAL OR REPAIRED TO THE

SATISFACTION OF THE ENGINEER. TEMPORARY EROSION/SEDIMENTATION CONTROL MEASURES SHALL BE EMPLOYED TO PROTECT ADJACENT PROPERTY AND STORM DRAINAGE FACILITIES.

5. GRAVEL SHOULDERS DISTURBED BY EXCAVATION SHALL BE SHAPED TO CITY STANDARDS AND PROVIDED WITH A MINIMUM OF 6 INCHES COMPACTED CRUSHED SURFACING TOP COURSE.

6. IF IN THE OPINION OF THE ENGINEER, WEATHER CONDITIONS DETERIORATE TO THE POINT WHERE THE TRAVELED ROADWAYS ARE UNSAFE FOR THE PUBLIC OR DETRIMENTAL TO THE RESTORATION OF THE ROADWAY, EXCAVATION SHALL CEASE IMMEDIATELY AND CLEANUP SHALL BE PROMPTLY ACCOMPLISHED.

7. ALL PIPE OR OTHER MATERIAL STORED ALONG CITY RIGHT-OF-WAY MUST BE PLACED AT A SAFE DISTANCE FROM THE TRAVELED ROADWAY IN SUCH A MANNER AS TO AVOID FALLING ONTO THE ROADWAY.

8. NO EXCESS OR UNSUITABLE MATERIAL SHALL BE WASTED ON CITY RIGHT-OF-WAY. ANY SUCH MATERIAL DUMPED ON PRIVATE PROPERTY MAY REQUIRE A GRADING PERMIT. VERIFICATION WITH SNOHOMISH COUNTY PLANNING & DEVELOPMENT SERVICES IS REQUIRED.

9. STREET SURFACES SHALL BE CLEANED AT THE END OF EACH DAY'S OPERATION WITH A POWER BROOM OR OTHER APPROVED MEANS.

10. NO OPEN CUT CROSSING OF COUNTY ROADS OR STREETS SHALL BE MADE WITHOUT THE APPROVAL OF THE ENGINEER.

11. MAXIMUM AMOUNT OF OPEN TRENCH IN ROADS SHALL BE 400 LINEAL FEET. AT THE END OF EACH DAY, ALL DITCHES MUST BE BACKFILLED OR COVERED WITH STEEL PLATES AND BARRICADED WITH FLASHING WARNING LIGHTS TO PREVENT PEOPLE OR ANIMALS FROM FALLING INTO THE TRENCH. STEEL PLATES SHALL NOT BE ALLOWED ON PAVED SURFACES.

12. FINAL CLEANUP INCLUDING COMPLETE RESTORATION OF SHOULDERS, CLEANING OF DITCHES, CULVERTS AND CATCHBASINS, AND REMOVAL OF LOOSE MATERIAL FROM BACK SLOPES OF DITCHES SHALL NOT EXCEED 1500 L.F. BEHIND EXCAVATING OPERATIONS OR AS REQUIRED BY THE ENGINEER.

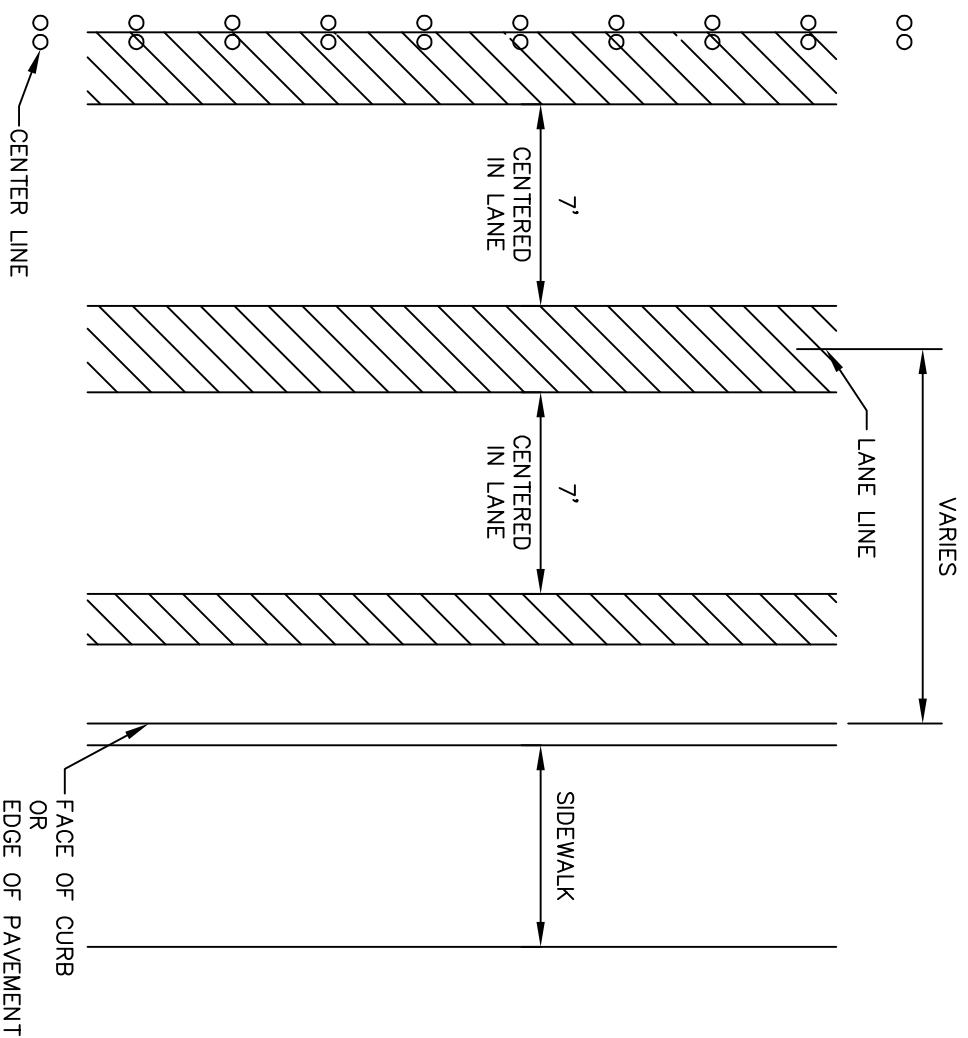
**Section 8 drawing index:**

**Standard Drawing 8-010: Trench Location Within Roadway**

**Standard Drawing 8-020: Section of Longitudinal or Transverse Cut**

**Standard Drawing 8-040: Typical Utility Locations Shoulder Section**

**Standard Drawing 8-050: Typical Utility Locations Curb Section**



## NOTES:

1. IF THE TRENCH FOR LONGITUDINAL WORK OCCURS WITHIN THE HATCHED AREA, AN OVERLAY WILL BE REQUIRED.



STANDARD PLAN 8-010

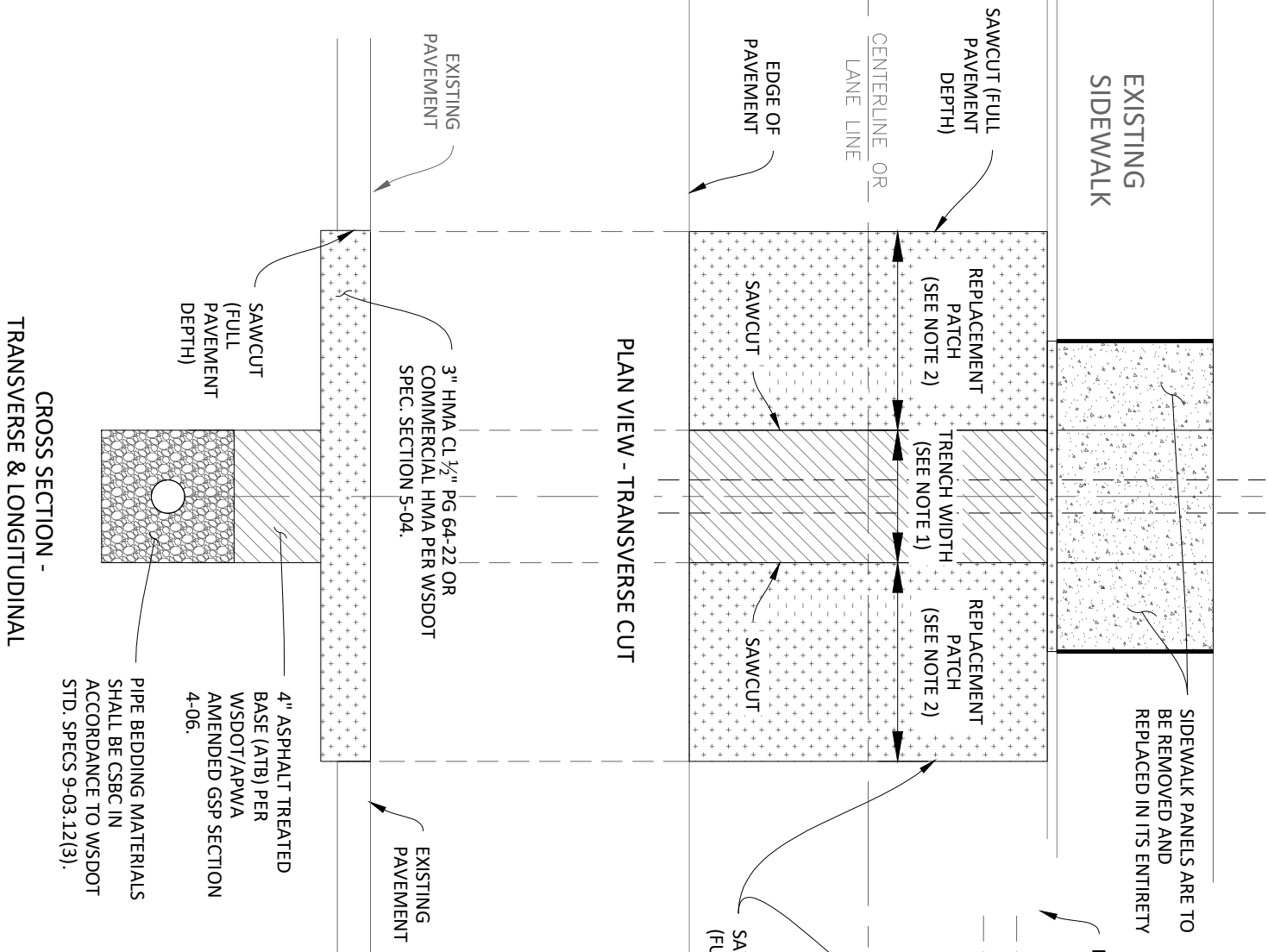
APPROVED BY

*Dwight M. Berglund*

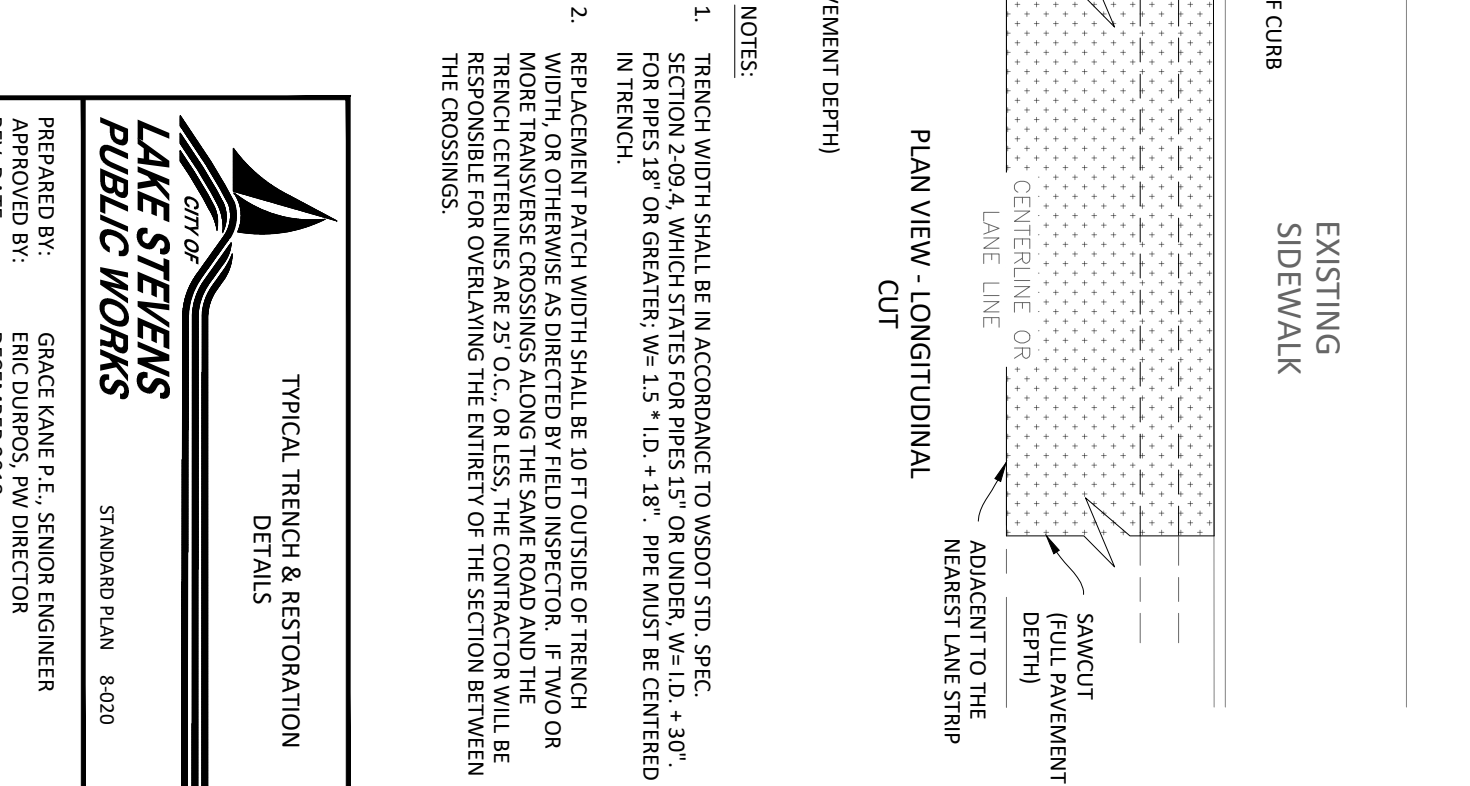
LAKE STEVENS CITY ENGINEER

05/09

DATE



CROSS SECTION -  
TRANSVERSE & LONGITUDINAL



- NOTES:
1. TRENCH WIDTH SHALL BE IN ACCORDANCE TO WSDOT STD. SPEC. SECTION 2-09.4, WHICH STATES FOR PIPES 15" OR UNDER,  $W = I.D. + 30"$ , FOR PIPES 18" OR GREATER,  $W = 1.5 * I.D. + 18"$ . PIPE MUST BE CENTERED IN TRENCH.
  2. REPLACEMENT PATCH WIDTH SHALL BE 10 FT OUTSIDE OF TRENCH WIDTH, OR OTHERWISE AS DIRECTED BY FIELD INSPECTOR. IF TWO OR MORE TRANSVERSE CROSSINGS ALONG THE SAME ROAD AND THE TRENCH CENTERLINES ARE 25' O.C., OR LESS, THE CONTRACTOR WILL BE RESPONSIBLE FOR OVERLAYING THE ENTIRETY OF THE SECTION BETWEEN THE CROSSINGS.

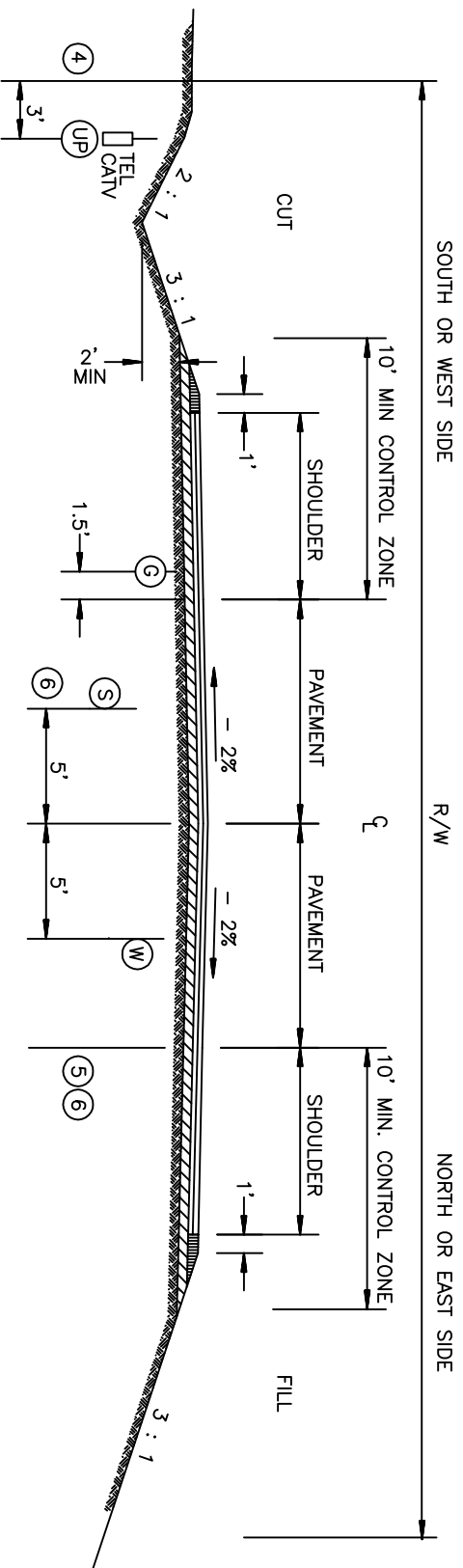


TYPICAL TRENCH & RESTORATION  
DETAILS

STANDARD PLAN 8-020

PREPARED BY: GRACE KANE P.E., SENIOR ENGINEER  
APPROVED BY: ERIC DURPOS, PW DIRECTOR  
REV. DATE: DECEMBER 2018

UTILITY PERMIT STAGE ON A CASE BY CASE BASIS. NO UTILITY SHALL BE LOCATED DIRECTLY BELOW A ROADSIDE DITCH OR SWALE.



KEY

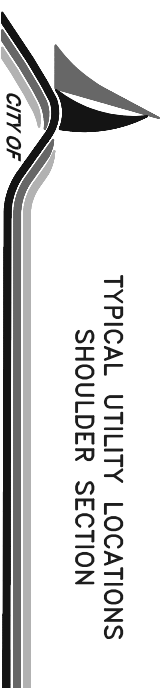
- ## UNDERGROUND POWER

- ☐ TEL TELEPHONE, CABLE  
CATV TELEVISION

- ☐ GAS  
☐ SANITARY SEWER  
☐ WATER

- STORM SEWER  
NOT SHOWN

- 1000000



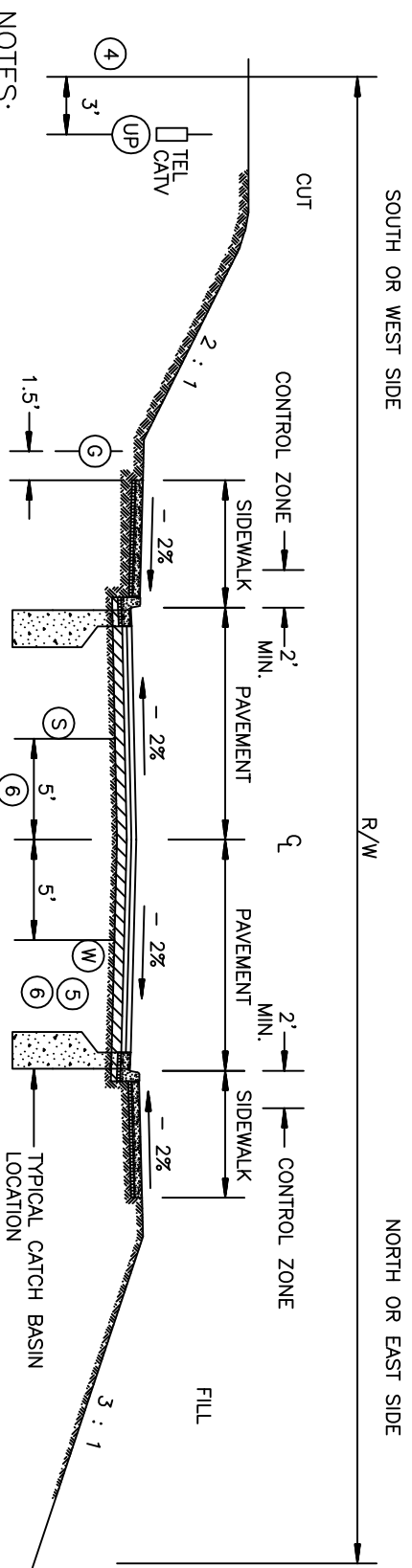
STANDARD PLAN 8-040

David D. Chetani

LAST REVISED 05/09

DATE \_\_\_\_\_

UTILITY LOCATIONS SHOWN ARE FOR NEW CONSTRUCTION. INSTALLATIONS WITHIN EXISTING ROADS MAY VARY AND WILL BE EVALUATED AT THE UTILITY PERMIT STAGE ON A CASE BY CASE BASIS. NO UTILITY SHALL BE LOCATED DIRECTLY BELOW A ROADSIDE DITCH OR SWALE.



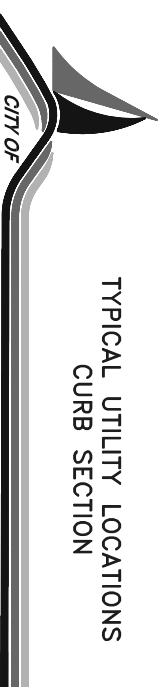
# NOTES:

1. MINIMUM COVER AND SEPARATION FOR FIBEROPTICS, SANITARY SEWER, WATER, GAS, POWER AND NON-FIBEROPTICS TELEPHONE AND CABLE TELEVISION SHALL BE IN COMPLIANCE WITH FEDERAL AND STATE REGULATIONS.
2. POWER POLES AND OTHER ABOVE GROUND UTILITY OBJECTS SHALL BE PLACED OUTSIDE CONTROL ZONE AREAS UNLESS JUSTIFIED TO THE ENGINEER'S SATISFACTION BY SUITABLE ENGINEERING STUDIES CONSIDERING TRAFFIC SAFETY (2) SHIELDED BY A BARRIER, (3) PLACED IN AN AREA NORMALLY INACCESSIBLE TO VEHICLES OR (4) UTILIZING A BREAKAWAY DESIGN. INSTALLATION OF POWER POLES AND OTHER ABOVE GROUND UTILITY OBJECTS WILL NOT BE PERMITTED IN SIDEWALKS OR WALKWAYS.
3. CONTROL ZONE DISTANCES SHOWN APPLY TO ROADS WITH A POSTED SPEED OF 35 MPH OR LESS. CONTROL ZONE DISTANCES FOR ROADS POSTED AT GREATER THAN 35 MPH SHOULD BE DETERMINED ACCORDING TO CHAPTER 710, TRAFFIC BARRIERS, OF THE WSDOT DESIGN MANUAL.
4. POWER, TELEPHONE, CABLE TV AND GAS MAY SHARE THE SAME TRENCH IN RESIDENTIAL PLATS.
5. WATER LINE LOCATION TO BE DETERMINED BASED ON SITE CONDITIONS IN CONJUNCTION WITH THE WATER PROVIDER.
6. SANITARY SEWER AND WATER LINES SHALL HAVE 10 FT. MINIMUM HORIZONTAL SEPARATION AND 1.5 FT. MINIMUM VERTICAL SEPARATION FROM BOTTOM OF WATER LINE TO CROWN OF SEWER. REFER TO DOE "CRITERIA FOR SEWAGE WORKS DESIGN."

## KEY

- (UP) UNDERGROUND POWER
- (TEL CATV) TELEPHONE, CABLE TELEVISION
- (G) GAS
- (S) SANITARY SEWER
- (W) WATER

## TYPICAL UTILITY LOCATIONS CURB SECTION



LAKE STEVENS PUBLIC WORKS

STANDARD PLAN 8-050

APPROVED BY

*Daniel M. Berglund*

LAKE STEVENS CITY ENGINEER

05/09

DATE





## **SECTION 9**

### **CONSTRUCTION**

#### ***9-100 Basis for Control of the Work***

- A.** Work performed in the construction or improvement of City streets, whether by or for a private developer or by City contractor, shall be done in accordance with these Standards and approved plans and specifications. It is emphasized that no work may be started until such plans are approved. The Public Works Director or designee shall approve any revision to such plans before being implemented.
- B.** The Public Works Director or designee will have authority to enforce the Standards as well as other referenced or pertinent specifications. The Public Works Director or designee will appoint project engineers, assistants, and inspectors as necessary to inspect the work and they will exercise such authority as the Public Works Director or designee may delegate.
- C.** Provisions of Section 1-05 of the WSDOT Standard Specifications shall apply, with the term "Public Works Director or designee" therein construed to be the Public Works Director or designee.

#### ***9-101 Subdivision, Commercial and Right-of-Way Inspection***

On all road and drainage facility construction, proposed or in progress, which relates to subdivision, commercial and right-of-way development, City of Lake Stevens Public Works will do control and inspection. Unless otherwise instructed by the Public Works Director or designee, construction events which require monitoring or inspection by Public Works is identified as follows, with prior notification to Public Works (telephone 425-377-3222):

- A.** Preconstruction Conference: Three working days prior notice. Conference must precede the beginning of construction and include contractor, designing Engineer, utilities, and other parties affected. Plan approvals and permits must be in hand prior to the conference.
- B.** Clearing and Temporary Erosion/Sedimentation Control: One working day notice prior to initial site work involving drainage and installation of temporary water retention/detention and siltation control. Such work to be in accordance with the approved plans.
- C.** Utility and Storm-Drainage Installation: One working day notice prior to trenching and placing of storm sewers and underground utilities such as sanitary, water, gas, power, telephone, and TV lines.

- D.** Utility and Storm Drainage Backfill and Compaction: One working day notice before backfill and compaction of storm sewers and underground utilities.
- E.** Subgrade Completion. One working day notice at stage that underground utilities and roadway grading are complete, to include placement of gravel base if required. Inspection to include compaction tests and certifications described in these standards.
- F.** Curb and Sidewalk Forming: One working day notice to verify proper forming and preparation prior to pouring concrete.
- G.** Curb and Sidewalk Placement: One working day notice to check placement of concrete.
- H.** Crushed Surfacing Placement: One working day notice to check placement and compaction of crushed surfacing base course and top course.
- I.** Paving: Three working days notice in advance of paving with asphalt or portland cement concrete.
- J.** Structural: Three working days notice prior to each of critical stages such as placing foundation piling or footings, placement and assembly of major components, and completion of structure and approaches. Tests and certification requirements will be as directed by the Public Works Director or designee.
- K.** Final Construction Inspection: 15 working days prior to overall check of road or drainage project site, to include completion of paving and associated appurtenances and improvements, cleaning of drainage system, and all necessary clean-up. Prior to approval of construction work, acceptance for maintenance and release of construction performance bonds, the developer/contractor shall pay any required fees, submit any required maintenance and defect financial guarantees, provide a certificate of monumentation and submit one photo mylar or ink-on-mylar set and sets of blue line final, corrected plans (as-built) reflecting all minor and design plan changes of the road and drainage systems.
- L.** Final Maintenance Inspection: 30 days prior to the end of the maintenance period, Prior to release of the maintenance guarantee, there shall be successful completion of the maintenance period, repair of any failed facilities and the payment of any outstanding fees.

### ***9-102 Penalties for Failure to Notify for Inspection***

Timely notification by the developer as noted above is essential for the City to verify through inspection that the work meets the standard. Failure to notify in time may oblige the City to arrange appropriate sampling and testing after-the-fact, with certification by a professional Engineer. Costs of such testing and certification shall be borne by the developer. At the time that such action is directed by the Public Works Director or designee, the Public Works Director or designee may prohibit or limit further work on the development until all directed tests have been

completed and corrections made to the satisfaction of the Public Works Director or designee. If necessary, the City may take further action as set forth in the municipal code.

### **9-103 Embankment Construction Control in Developments**

The provisions of Section 2-03 of the WSDOT Standard Specifications apply in all respects to development construction unless otherwise instructed by the Public Works Director or designee. The following elements are mentioned for clarification and emphasis:

- A. Embankment and Cut Section Compaction:** Compaction of the top two feet of fill subgrade and top six inches of cut subgrade shall meet a minimum 95 percent of maximum density in accordance with WSDOT Standard Specifications Section 2-03.3(14) C - Method B. Subgrade fill below the top two feet shall be compacted to 90 percent of maximum density.
- B. Testing for Density**
  - 1.** Prior to placing any surfacing material on the roadway, it will be the responsibility of the developer/contractor to provide density test reports reviewed and approved by a professional Engineer. Optimum moisture content and maximum density shall be determined by methods cited in Section 2-03.3(14) D of WSDOT Standard Specifications or by other test procedures approved by the Public Works Director or designee. In fill sections, a minimum of one test shall be taken for every 1,000 cubic yards or fraction thereof and on each lift of embankment. In cut sections, the interval shall be every 100 feet of roadway. For work to be accepted tests must show consistent uniform density as required by tests referenced above.
  - 2.** In cases where tests do not meet the minimum standard, corrective action shall be taken such as adding water, aerating, replacing material or applying more compactive effort as directed by the developer's Engineer. Retests shall show passing densities prior to placing the next lift of subgrade fill.
  - 3.** For trenching in existing roads, see these standards.
- C. Finishing Subgrade:** After the subgrade preparation has been completed, it shall be thoroughly checked by the developer/contractor using a level, string line, crown board, or other means to determine that the subgrade conforms to the typical section or special plan conditions prior to placing any surfacing material.

#### **9-104 Traffic Control in Development Construction**

- A. Interim Traffic Control:** The developer/contractor shall be responsible for interim traffic control during construction on or along traveled City roads. When road or drainage work is to be performed on City roads that are open to traffic, the developer/contractor will be required to submit a traffic control plan for approval by the Public Works Director or designee prior to beginning the work. Traffic control shall follow the guidelines of Section 1-07.23 of the WSDOT Standard Specifications. All barricades, signs and flagging shall conform to the requirements of the MUTCD Manual. For more specific requirements for barricades, see Section 3-508 and Standard Plan 3-508-001. Signs must be legible and visible and should be removed at the end of each workday if not applicable after construction hours.
- B. Temporary Road Closures and Detours:** When temporary road closures cannot be avoided, the developer/contractor shall post "To Be Closed" signs a minimum of five days prior to the closing. The types and locations of the signs shall be shown on a detour plan. A detour plan must be prepared and submitted to the Public Works Director or designee at least 10 working days in advance, and approved prior to closing any City street. In addition, the developer/contractor must notify, in writing, local fire, school, law enforcement authorities, Metro transit, and any other affected persons as directed by the Public Works Director or designee at least five days prior to closing.
- C. Haul Routes:** If the construction of a proposed development is determined by the Public Works Director or designee to require special routing of large trucks or heavy construction equipment to prevent impacts to surrounding roads, residences or businesses, the developer/contractor shall be required to develop and use an approved haul route.

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

If the developer/contractor's traffic fails to use the designated haul route, the Public Works Director or designee may prohibit or limit further work on the development until such time as the requirements of the haul route are complied with,
- D. Haul Road Agreement:** When identified as a need by the SEPA review process or by the Public Works Director or designee, a haul road agreement shall be obtained by the franchised utility, developer or property owner establishing restoration procedures to be performed upon completion of the haul operation.

### **9-105 City Forces and City Contract Road Inspection**

Road construction performed by City forces or by contract for the City will be inspected under the supervision of the Public Works Director or designee.

### **9-106 Call Before You Dig**

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

### **9-107 Record Drawings**

Prior to acceptance of improvements, a Professional Engineer or Professional Land Surveyor currently licensed in the State of Washington shall prepare the Record Drawings. The P.E. or P.L.S. shall verify that installation of roads and utilities was in accordance with the approved construction plans. The Record Drawing plan is to include accurate locations, elevations and sizes of all constructed features and utility easements, noting on the appropriate sheet any variance to the approved construction plans. All sheets of the original approved construction plans will be included in the As-Built plans. Record Drawings will bear the signature, stamp and date of the licensed Professional Engineer or Land Surveyor preparing them.

#### **Preliminary Record Drawing Plan Review Process**

Submit 3 PRINTS FROM THE PLOTTED DIGITAL FILE for review to Engineering Division. See Format Requirement.

If review of the preliminary Record Drawings reveals errors and/or omissions, the drawings will be returned to the Engineer/Surveyor for corrections. The Engineer/Surveyor shall make all corrections in the digital copy, re-plot and resubmit three revised preliminary Record Drawings and redlines for re-review. Upon approval of preliminary Record Drawings, the Engineer/Surveyor will be notified to proceed with the "Final Submittal".

#### **Final Record Drawing Plan Submittal**

The Final "Record Drawing" plan shall be submitted to the Engineering Division. See Format Requirements.

Each drawing, except for the Digital file, shall bear the P.E./P.L.S. Stamp, Signature and Date and be reproduced on the following media:

Digital file on CD or DVD

Three sets of full size PRINTS, FOLDED.

## **Format Requirements**

### **1) Digital File Format**

- A) **AutoCAD** Release 2003 or later “.DWG” format, including all support files required to display or plot the files in the same manner as they were developed shall be delivered along with these files. These files include but are not limited to Customized Line Styles Libraries, Cell Libraries, Font Libraries, Pen Tables and Referenced Files, (AutoCAD) Block Libraries, Font Files, Menu Files, Plotter Setup and Referenced Files. **Do not include P.E./P.L.S. stamps, signature and border files.**
- B) The files will be submitted on a CD or DVD. Each disc will be labeled with the project name and the name of the company that prepared them.
- C) All Record Drawing changes will be made in the digital format.  
Changes to text, for example: invert elevations, dimensions, notes, etc. will be lined out with the As-Built text placed above it.  
Changes made to Graphic features, for i.e.: pipe, catch basins, hydrants, etc. shall be moved to reflect their accurate As-Built locations.
- D) The drawing will be at full scale. Each sheet shall be identified with the words “**Record Drawings**” in bold block letters 3/8” plotted height placed above the title block.  
The date of completion and the words “**REVISED Record Drawing**” shall be placed in the revision block.
- E) The drawing will be established in model space using the state plan coordinate system, Washington North Zone 4601, with horizontal survey control of NAD 83 and vertical control of NAVD 88, tied to any 2 City of Lake Stevens Horizontal Control Monuments.
- F) A detailed digital and hard copy list of asbuilt water, sewer & storm, lighting, signal and signal component layers/levels and their contents. The digital copy will be included with and in the same format as the drawing file.

### **2) Hard Copy Format**

- A) Three sets of prints derived from the Record Drawing digital file will include the Stamp, Signature and Date of the Professional Engineer or Professional Land Surveyor that prepared the Record Drawing document.
- B) Record Drawing submittals are to include all sheets of original city approved construction drawings except TЕСP and City Standard Details, i.e.: Title sheet, Plan(s), Profile(s), Sensitive Areas/Wetlands and Site Specific Details.





**Appendix A**  
**Construction Plan Completeness Checklist**



PUBLIC WORKS DEPARTMENT

1812 Main Street ♦ Lake Stevens, WA 98258

(425) 377-3222 ♦ (425) 334-0835 FAX

## Construction Plan Completeness Checklist

---

Project Name: \_\_\_\_\_

PA Number \_\_\_\_\_

Construction Plan Examiner: \_\_\_\_\_

Date: \_\_\_\_\_

Review #: 1 2 3 4 5

**NOTE:** All materials submitted for review must use and comply with City of Lake Stevens Engineering Design and Development Standards (EDDS), City of Lake Stevens Municipal Code (LSMC), the most recent adopted version of the Department of Ecology's Stormwater Management Manual for Western Washington (SWMM), and the Low Impact Development Technical Guidance Manual for Puget Sound (LID). Any deviations shall include a deviation request form. LSMC and City of Lake Stevens EDDS can be found on line at <http://ci.LakeStevens.wa.us/communitydev/planning/index.html>.

### FILE INVENTORY AND PLAN SUBMITTAL

**Plans shall comply with the following reports and materials that are applicable:**

- ☐ Preliminary Plat Map
- ☐ Hearing Examiner's Report & Related Correspondence (check for latest report)
- ☐ Preliminary Plat Approval Ordinance
- ☐ SEPA Checklist

**Submittal shall contain: (check satisfied conditions, circle missing elements)**

- ☐ A complete set of surveyed construction plans prepared by a licensed surveyor and stamped by a Professional Engineer. Plans need to include applicable information such as a Cover Sheet, Grading Plan, SWPPP, Drainage Plan, Signage and Striping Plan, Sanitary Sewer and Water Plans, Roads and Transportation Plans, and Construction Notes and Details.

- ☐ A Drainage Report
- ☐ A Geotechnical/Hydrogeotechnical Investigation Report
- ☐ A Sensitive Areas or Wetland Investigation Report

**Note: Fees for review of construction plans will be charged per Resolution No. 2007-23.**

#### **GENERAL REQUIREMENTS FOR PLAN SETS**

- ☐ Sheet size shall be 24" x 36" unless otherwise requested.
- ☐ Construction plan view shall be drawn to common engineering scale (maximum 1"=50')
- ☐ The ratio of the vertical to the horizontal scale shall be 1V:10H.
- ☐ All details and cross sections must have titles and identify scale. Details must reference a source.
- ☐ For each standard detail in the engineered construction drawings plan set, include the corresponding City of Lake Stevens Standard Detail number from the EDDS or other source. When possible, correlate the standard detail number to the plan view sheets.
- ☐ All details, cross sections, and profiles must be labeled and referenced out on their corresponding plans.
- ☐ Roads and general lot layout must conform to the approved preliminary plat map.
- ☐ Construction Plans must comply with Hearing Examiners Decision or Notice of Preliminary Approval.
- ☐ Notes and specifications are to be provided directly from EDDS, WSDOT Standard Specifications, manufacturer specifications, LID specifications, and materials specifications, and are to be provided in their entirety. At a minimum, plan sets are to contain the following applicable notes from the EDDS:
  - ☐ General Notes
  - ☐ Storm Drainage Notes
  - ☐ Site Grading & TESCP Notes
  - ☐ Temporary Gravel Construction Entrance Notes
  - ☐ Hydroseeding General Notes
  - ☐ Biofilter Swale Planting Notes
  - ☐ Stand Pipe & Sedimentation Pond Maintenance Notes
  - ☐ Maintenance of Silt Barrier Notes
  - ☐ Construction sequence and schedule

#### **GENERAL REQUIREMENTS FOR ALL PLAN SHEETS**

**All sheets in the construction plans shall include the following information:**

- ☐ a project title.

- ☐ a page title (For example: Site Plan, Drainage Plan...).
- ☐ a Title Block to contain Engineering Firm, Project name, Name of sheet, Sheet \_\_ of \_\_, located on right margin.
- ☐ a City of Lake Stevens Project Number.
- ☐ a Professional Engineer's seal, signature, date of signature, and expiration date **(Final Plans Only)**.
- ☐ ¼ Section, Section, Township and Range centered at top border on all sheets.
- ☐ an Acknowledgement Block for City Engineer with note "Approval for 18 months from date of signature", located in lower right corner.
- ☐ an approval Block for Fire Marshal on Water Plans or other applicable plans.
- ☐ an approval Block for Post Master on applicable plans.
- ☐ a note on all sheets that "The Contractor shall verify the location of all existing utilities prior to any construction. Agencies involved shall be notified within a reasonable time prior to the start of construction." Provide a prominent note "Call 1-800-424-5555 Before You Dig".
- ☐ a north arrow.
- ☐ an engineering scale on site plans shall not be more than 1" = 20' nor less than 1" = 50'.
- ☐ a complete legend for line types, hatches, and symbols on **ALL** plans and profiles.

#### GENERAL REQUIREMENTS FOR ALL SITE AND TOPOGRAPHIC INFORMATION

- ☐ Show onsite benchmark locations and provide descriptions.
- ☐ All property lines are to be shown with bearings, distances, and ties to controlling corners or subdivision corners.
- ☐ Show location, size and type of any existing or proposed structures, impervious areas, drainage facilities, wells, drain fields, drain field reserve areas, roads, pavement, striping, signs, easements, setbacks, and utilities on the site. Clearly differentiate between proposed and existing elements.
- ☐ Property lines are to be shown with bearings, distances, and ties to controlling corners or subdivision corners. Show existing and proposed drainage pattern(s), storm drainage and LID facilities (e. g. ditch lines, culverts, catch basins, french drains, surface drainage or sheet flow arrows). Clearly/differentiate between proposed and existing.
- ☐ Show location of all property boundaries, easements, lakes, streams, creeks and structures on site and within 50 feet of site boundaries.
- ☐ Show location of all wetlands, sensitive areas, primary association areas for threatened and endangered species, and erosion hazardous areas and landslide areas on site and those within 100 feet of the site boundaries.
- ☐ Show location of all setbacks and buffers from critical areas, property lines, structures, and utilities.

- ☐ Show location of all existing and proposed native growth protection areas (NGPA's) or native growth easements (NGPAE) on the site.
- ☐ Show boundaries or limits of site disturbance, clearing, and grading.
- ☐ Show location of any off-site critical areas, and boundaries of areas which are affected by the construction.
- ☐ Map existing wells, drain fields, infiltration systems, rain gardens and drain field reserve areas located within the distances of concern.
- ☐ Show location and type of all existing and proposed water quality and source control BMPs.
- ☐ Show location and type of existing and proposed water quality control facilities or measures such as detention ponds, rain gardens, roof gardens or other BMP's. Provide high water elevations for design of infiltration systems, if any.
- ☐ Grading setback details are to include 1/2 height of fill, 1/5 height of cut, 2' minimum.

## **COVER SHEET**

- ☐ Provide a preliminary plat map that complies with requirements outlined in LSMC 14.16.
- ☐ Provide a Vicinity Map with north arrow and scale.
- ☐ Provide name, address and phone number of applicant or developer, engineer, architect, contractors, etc.
- ☐ Provide a legal description of site along with property tax account number(s) of subject property and adjacent properties.
- ☐ Provide a Sheet Index.
- ☐ Provide a horizontal and vertical datum or basis for elevation and the benchmark used for elevation control (NAD 83 and NAVD 88 datum only).

## **GRADING PLAN**

- ☐ Provide cut volumes and fill volumes in cubic yards.
- ☐ Depict locations considered for cut and fill calculations.
- ☐ Provide finished floor elevations if applicable.
- ☐ Provide lot areas if applicable.

## CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

**Note: The SWPPP will comply with all criteria outlined in Vol. 1, Ch. 3 of the SWMM. For LID developments, the SWPPP will also comply with the LID Manual.**

- ☐ Address all 12 Elements of the SWPPP.
- ☐ Show location and type of proposed measures (BMPs) for Temporary Erosion and Sedimentation Control (TESC) or SWPPP as contained in Vol. 2 of the DOE Stormwater Management Manual for Western Washington.
- ☐ Provide details and notes for erosion control.
- ☐ Show locations of temporary stockpiles.
- ☐ Show all construction BMP's and reference or provide standard details.
- ☐ Show construction site access.
- ☐ Show flow arrows or paths for stormwater control during construction.
- ☐ Protect drain inlets.
- ☐ Stabilize soils, slopes, channels and outlets.
- ☐ Control sources of pollution.
- ☐ Control dewatering (sites requiring dewatering will need to develop a dewatering plan).

## DRAINAGE PLAN

**Note: The Drainage Plan and stormwater design will comply with Section 5 of the EDDS, Title 11 of the LSMC, the SWMMWW, and the LID Manual.**

- ☐ Provide spot elevations/flow arrows/contours for stormwater flow at post-development construction.
- ☐ Convey or control water from proposed and existing roads and/or adjacent properties.
- ☐ Show locations of emergency overflows and bypasses.
- ☐ Show roof drains and yard drains.
- ☐ Provide a 20' minimum drainage easement for open channel storm drainage facilities and closed storm drainage facilities.
- ☐ Provide a 15' minimum building setback line from the top of bank of a defined channel.
- ☐ Provide a 10' minimum building setback for closed drainage systems.
- ☐ If a drainage easement is to run along a lot line within a subdivision, the easement may straddle the lot line provided the drainage facilities can be located entirely along one lot.

- ☐ Access is to be provided for inspection and maintenance purposes for drainage structures that are to be located within an easement.
- ☐ No storm sewer pipe within a drainage easement shall have its centerline closer than 5' to a rear or side property line.
- ☐ Minimum storm sewer pipe diameter in right of way and between catch basins and/or manholes shall be 12".
- ☐ 24" pipe cover is preferred for storm drain systems. Alternative pipe material and City approval will be required for pipes with less than 24" of cover.
- ☐ Show all sizes, pipe materials and structures.
- ☐ Show direction of pipe flow.
- ☐ Show pipe's invert, slope, length, type, and catch basin grate elevation on plan view.
- ☐ Show existing and proposed storm drainage system profile(s) with pipe size, slope, catch basin type, location, station, rim and invert elevations.
- ☐ Provide energy dissipater at outfalls.

## **STORMWATER SITE PLAN (DRAINAGE REPORT)**

**Note: The Stormwater Site Plan shall comply with Volume 1 of the SWMM.**

- ☐ The Stormwater Site Plan will be submitted in the following format:
  - ☐ Section 1 Project Overview – Provide a project description, pertinent details, and proposed land uses.
  - ☐ Section 2 Existing Conditions Summary – Address subject matter outlined in Volume 1, Chapter 3.1.1 in the SWMMWW. Provide a figure that illustrates the subject matter.
  - ☐ Section 3 Offsite Analysis Report – Address subject matter outlined in Volume 1, Chapter 3.1.3 in the SWMMWW. Provide a figure that illustrates the subject matter.
  - ☐ Section 4 Minimum Requirements – Address all applicable Minimum Requirements in Volume 1, Chapter 2 of the SWMMWW. Show how you arrived at the requirements by including Figure 2.2 or 2.3.
  - ☐ Section 5 Stormwater Control Plan – Address subject matter outlined in Volume 1, Chapter 3.1.5 in the SWMM. Discuss the following information:
    - Existing Site Hydrology
    - Developed Site Hydrology
    - Treatment and Flow Control Needed
    - Performance Standards and Goals per Volume 1, Chapter 4 of the SWMMWW for BMP and Facility Selection Process. Include Figure 4.1 from the SWMM showing your selection process.

- Flow Control System
  - Water Quality System
  - Conveyance System Analysis.
- ☐ Section 7 SWPPP – Address all 12 Elements outlined in Volume 1, Chapter 3.1.6 and Volume 1, Chapter 2 of the SWMMWW.
  - ☐ Section 8 Project Overview – Address subject matter outlined in Volume 1, Chapter 3.1.7 in the SWMMWW.
  - ☐ Hydrologic Analysis and Flow Control Design shall be analyzed using the most recent version of the Western Washington Hydrology Model.
  - ☐ Include all computer generated reports, sources, references, tables, graphs, aeriels, maps, and calculations used for all design and analysis in appendices.

## ROADS AND TRANSPORTATION PLAN

**Note: Road and transportation design shall comply with Section 3 of the EDDS and Title 7 of the LSMC.**

- ☐ Travel and parking lane(s) must be labeled on the roadway sections.
- ☐ Provide typical roadway sections and identify street names and classifications.
- ☐ Provide road alignment with 100 foot stationing and stationing at PCs and PTs with bearing and distances on centerlines
- ☐ Provide right of way lines and widths for existing and proposed road and intersecting roads
- ☐ Provide channelization plan and match or tie into existing channelization.
- ☐ Provide a signalization plan.
- ☐ Provide street Illumination per EDDS 3-506. PUD submittal may be required.
- ☐ Provide curve data with radius, delta, arc length, and tangent distance for all curves. These may be shown in a curve table.
- ☐ Show details for frontage improvements and overlays.
- ☐ Show limits of existing and proposed paving including grinds and overlays.
- ☐ Side slopes shall not be steeper than 4:1 and are to be designed per EDDS 3-502.
- ☐ All new residential access streets shall have traffic calming devices per EDDS 3-525.
- ☐ Provide mailbox location and detail with Post Master approval per EDDS 3-505.
- ☐ Rock facings over 4' in height are to be designed by a Geotechnical Engineer and are subject to approval by the Public Works Director or Designee.
- ☐ Road grades are to comply with EDDS 3-201, 3-202, and 3-203.
- ☐ Minimum road grade is to be 0.5%.



- ❑ Grades are to be shown to 3 decimal places and as a percent.
- ❑ Vertical curves are to show elevations and stations of vertical PI (s) , P.C. (s) , PT (s), sag (low point) and crest (high point).
- ❑ Super elevation criteria/data is required to be shown for all roads greater than 25 MPH design speed.
- ❑ Include sight distance triangles at each roadway intersection. Sections 3-211 and 3-212 of the EDDS provide design standards for the sight distance triangles.

## **Appendix B**

### **Preliminary and Final**

### **Stormwater Site Plan/Drainage Report Template**



# Stormwater Site Plan

For

~

## Prepared For

City of Lake Stevens  
1812 Main Street, P.O. Box 257  
Lake Stevens, WA 98258-0257  
425-377-3222

### Owner

~

~

~

### Developer

~

~

~

### Operator/Contractor

~

~

~

### Project Site Location

### Certified Erosion and Sediment Control Lead

~

~

### Stormwater Site Plan Prepared By

~

~

~

~, ~

### Stormwater Site Plan Preparation Date

~

### Approximate Project Construction Dates

~

~

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## Contents

|                                                        |    |
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## 1.0 Project Overview

|              |
|--------------|
| INSTRUCTIONS |
|--------------|

The project overview must provide a general description of the project, predeveloped and developed conditions of the site, site area and size of the improvements, and the pre- and post-developed stormwater runoff conditions. The overview should summarize difficult site parameters, the natural drainage system, and drainage to and from adjacent properties, including bypass flows.

A vicinity map should clearly locate the property, identify all roads bordering the site, show the route of stormwater off-site to the local natural receiving water, and show significant geographic features and sensitive/critical areas (streams, wetlands, lakes, steep slopes, etc.).

A site map should display:

- Acreage and outlines of all drainage basins;
- Existing stormwater drainage to and from the site;
- Routes of existing, construction, and future flows at all discharge points; and
- The length of travel from the farthest upstream end of a proposed storm drainage system to any proposed flow control and treatment facility.

A soils map should show the soils within the project site. Soil Survey maps may be used. However, it is the designer's responsibility to ensure that the soil types of the site are properly identified and correctly used in the hydrologic analysis.

## 2.0 Existing Conditions Summary

|              |
|--------------|
| INSTRUCTIONS |
|--------------|

Collect and review information on the existing site conditions, including topography, drainage patterns, soils, ground cover, presence of any critical areas, adjacent areas, existing development, existing stormwater facilities, and adjacent on- and off-site utilities. Analyze data to determine site limitations including:

- Areas with high potential for erosion and sediment deposition (based on soil properties, slope, etc.); and
- Locations of sensitive and critical areas (e.g. vegetative buffers, wetlands, steep slopes, floodplains, geologic hazard areas, streams, etc.).

Delineate these areas on the vicinity map and/or a site map that are required as part of this Stormwater Site Plan. Prepare an Existing Conditions Summary that will be submitted as

part of the Site Plan. Part of the information collected in this step should be used to help prepare the Construction Stormwater Pollution Prevention Plan (SWPPP).

### 3.0 Off-site Analysis Report

|              |
|--------------|
| INSTRUCTIONS |
|--------------|

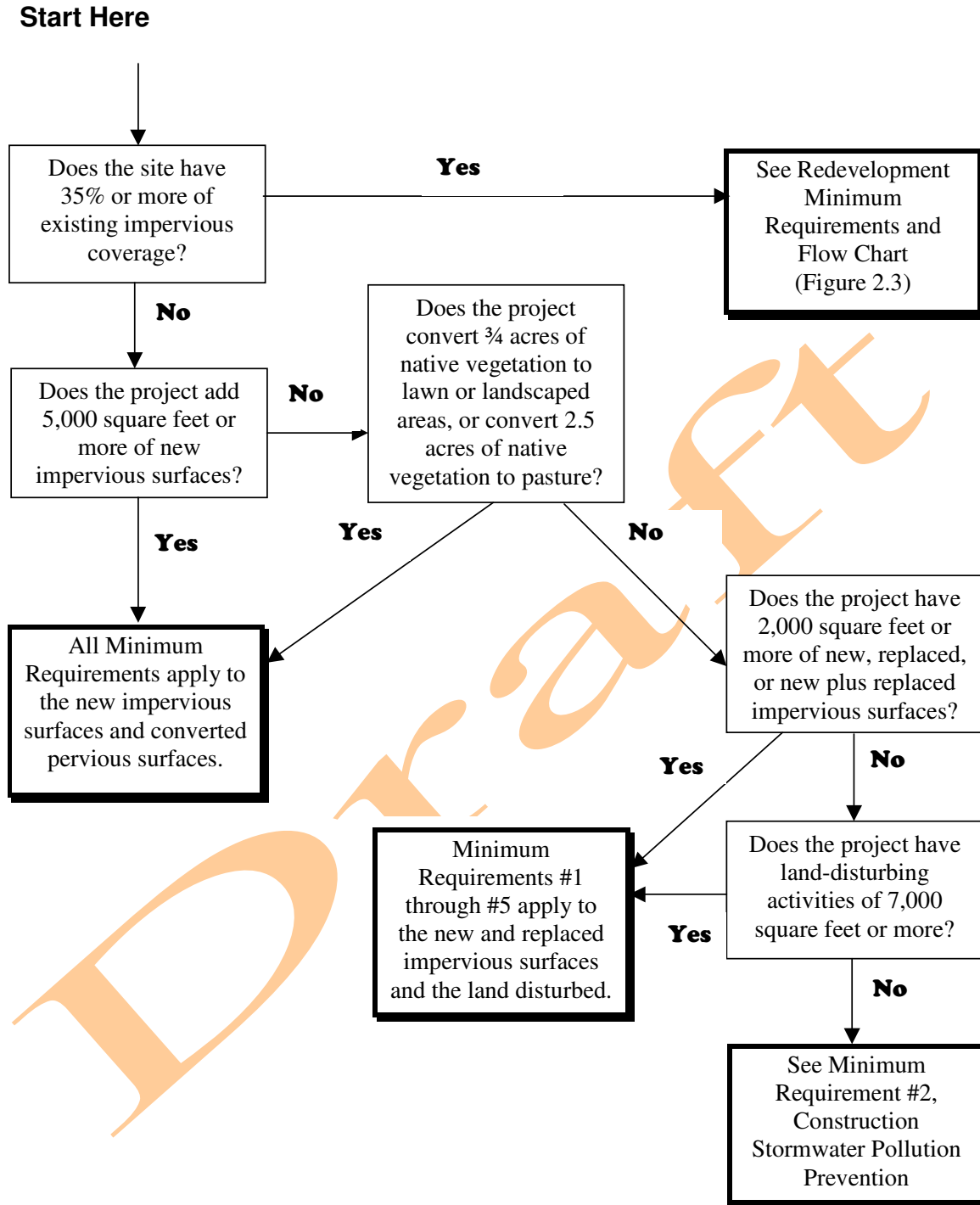
An offsite analysis will be required for projects that add 5,000 square feet or more of new impervious surface or that convert  $\frac{3}{4}$  acres (32,670 sf) of pervious surfaces to lawn or landscaped areas, or convert 2.5 acres (108,900 sf) of forested area to pasture.

The phased offsite analysis approach outlined in Optional Guidance #2 in the SWMMWW is recommended. This phased approach relies first on a qualitative analysis. If the qualitative analysis indicates a potential problem, the local government may require mitigation or a quantitative analysis. For more information, see Section 2.6.2 in the SWMMWW.

### 4.0 Minimum Requirements

|              |
|--------------|
| INSTRUCTIONS |
|--------------|

Not all of the Minimum Requirements apply to every development or redevelopment project. The applicability varies depending on the type and size of the project. This section identifies thresholds that determine the applicability of the Minimum Requirements to different projects. The flow charts in Figures 2.2 and 2.3 can be used to determine which requirements apply. The Minimum Requirements themselves are presented in Section 2.5 of the SWMMWW. Figures 2.2 and 2.3 (below) provide the same thresholds in a flow chart format. Use these flow charts to determine the minimum requirements for your project and include them in this report.



**Figure 2.2 Flow Chart for Determining Requirements for New Development**

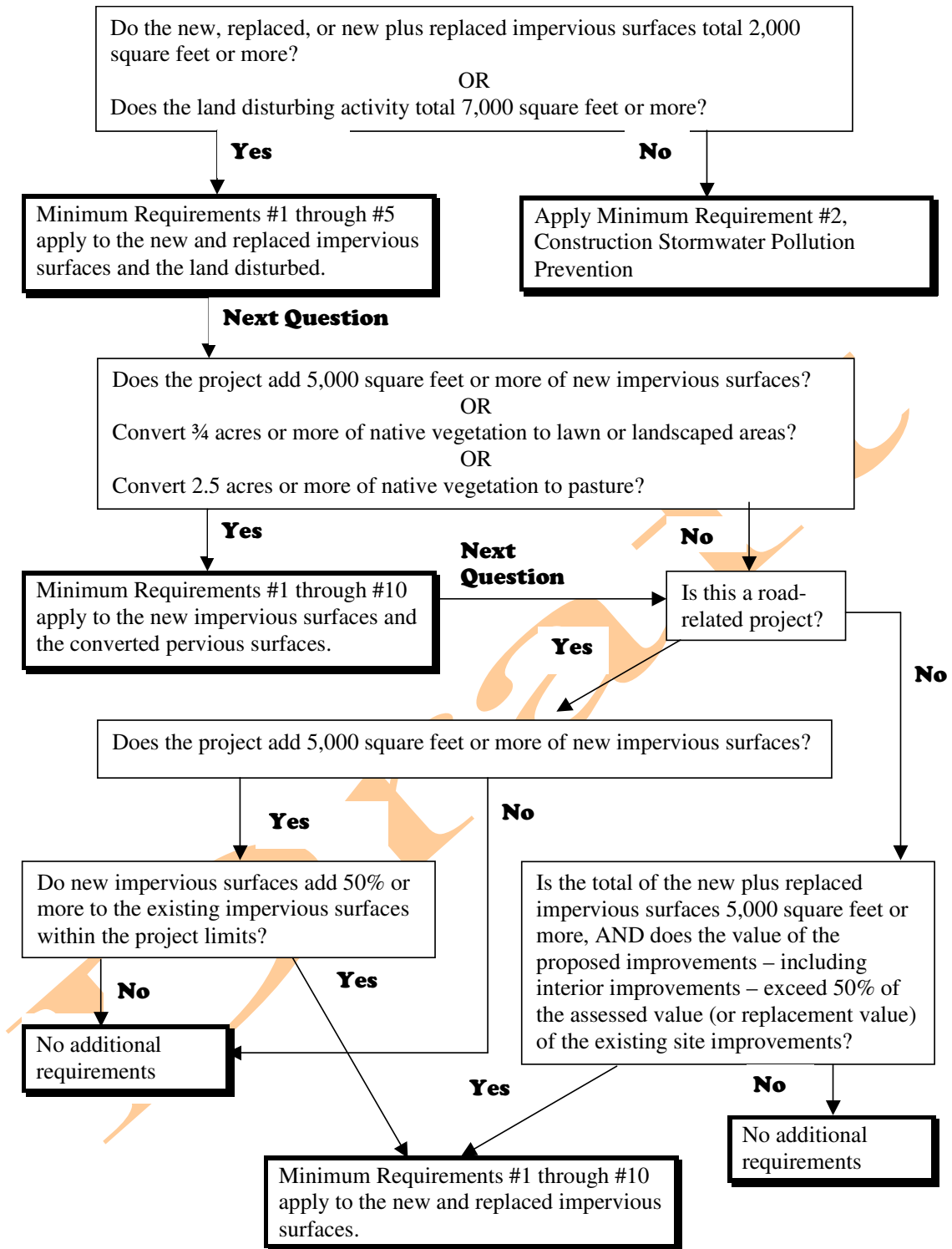


Figure 2.3 Flow Chart for Determining Requirements for Redevelopment

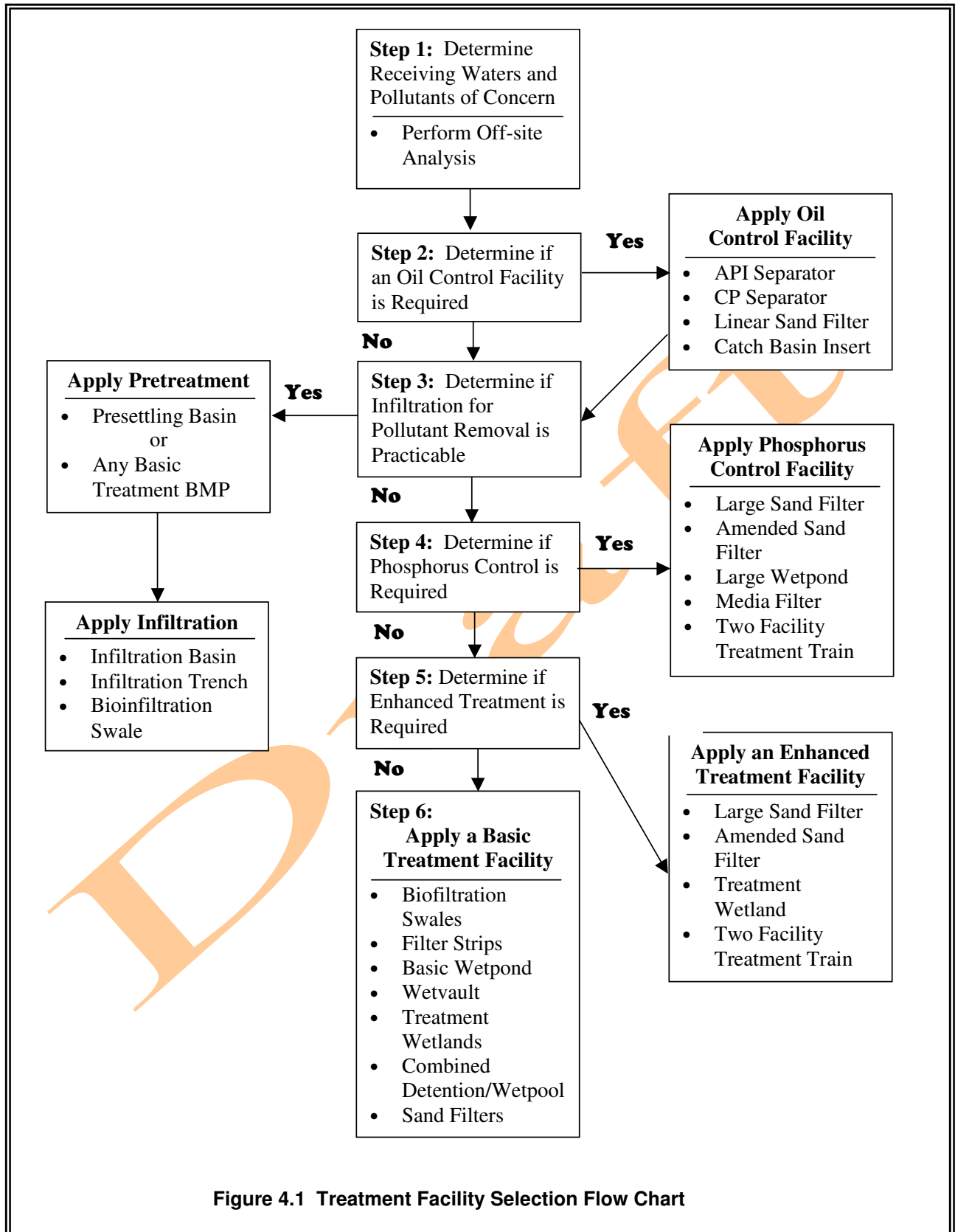


## 5.0 Stormwater Control Plan

### INSTRUCTIONS

Select stormwater control BMPs and facilities that will serve the project site in its developed condition. This selection process is presented in detail in Chapter 4 of this Volume.

A preliminary design of the BMPs and facilities is necessary to determine how they will fit within and serve the entire preliminary development layout. After a preliminary design is developed, the designer may want to reconsider the site layout to reduce the need for construction of facilities, or the size of the facilities by reducing the amount of impervious surfaces created and increasing the areas to be left undisturbed. Use the attached Figure 4.1 Treatment Facility Selection Flow Chart to determine the appropriate BMP's and facilities.



After the designer is satisfied with the BMP and facilities selections, the information must be presented within a Permanent Stormwater Control Plan. The Permanent Stormwater Control Plan should contain the following sections:

### **Existing Site Hydrology**

If flow control facilities are proposed to comply with Minimum Requirement #7, provide a listing of assumptions and site parameters used in analyzing the pre-developed site hydrology. The acreage, soil types, and land covers used to determine the pre-developed flow characteristics, along with basin maps, graphics, and exhibits for each subbasin affected by the project should be included. The pre-developed condition to be matched shall be a forested land cover unless reasonable, historic information is provided that indicates the site was prairie prior to settlement.

Provide a topographic map, of sufficient scale and contour intervals to determine basin boundaries accurately, and showing:

- Delineation and acreage of areas contributing runoff to the site;
- Flow control facility location;
- Outfall;
- Overflow route; and
- All natural streams and drainage features.

The direction of flow, acreage of areas contributing drainage, and the limits of development should be indicated. Each basin within or flowing through the site should be named and model input parameters referenced.

### **Developed Site Hydrology**

#### *All Projects:*

Totals of impervious surfaces, pollution-generating impervious surfaces, and pollution generating pervious surfaces must be tabulated for each threshold discharge area for which On-site Stormwater Management BMPs are the sole stormwater management approach. These are needed to verify that the thresholds for application of treatment facilities (Minimum Requirements #6 and #8) and flow control facilities (Minimum Requirement #7 and #8) are not exceeded.

#### *Projects and Threshold Discharge Areas within Projects That Require Treatment and Flow Control Facilities:*

Provide narrative, mathematical, and graphic presentations of model input parameters selected for the developed site condition, including acreage, soil types, and land covers, road layout, and all drainage facilities.

Developed basin areas, threshold discharge areas, and flows should be shown on a map and cross-referenced to computer printouts or calculation sheets. Developed basin flows should be listed and tabulated.

Any documents used to determine the developed site hydrology should be included. Whenever possible, maintain the same basin name as used for the pre-developed site hydrology. If the boundaries of a basin have been modified by the project, that should be clearly shown on a map and the name modified to indicate the change.

Final grade topographic maps shall be provided. Ecology recommends local governments also require finished floor elevations.

### **Performance Standards and Goals**

If treatment facilities are proposed, provide a listing of the water quality menus used (Chapter 3, Volume V). If flow control facilities are proposed, provide a confirmation of the flow control standard being achieved (e.g., the Ecology flow duration standard).

### **Flow Control System**

Provide a drawing of the flow control facility and its appurtenances. This drawing must show basic measurements necessary to calculate the storage volumes available from zero to the maximum head, all orifice/restrictor sizes and head relationships, control structure/restrictor placement, and placement on the site.

Include computer printouts, calculations, equations, references, storage/volume tables, graphs as necessary to show results and methodology used to determine the storage facility volumes. Where the Western Washington Hydrology Model (WWHM), or other approved runoff model, is used, its documentation files should be included.

### **Water Quality System**

Provide a drawing of the proposed treatment facilities, and any structural source control BMPs. The drawing must show overall measurements and dimensions, placement on the site, location of inflow, bypass, and discharge systems.

Include WWHM or other approved model printouts, calculations, equations, references, and graphs as necessary to show the facilities are designed consistent with the Volume V requirements and design criteria.

### **Conveyance System Analysis and Design**

Present an analysis of any existing conveyance systems, and the analysis and design of the proposed stormwater conveyance system for the project. This information should be presented in a clear, concise manner that can be easily followed, checked, and verified. All pipes, culverts, catch basins, channels, swales, and other stormwater conveyance appurtenances must be clearly labeled and correspond directly to the engineering plans.

## **6.0 Stormwater Pollution Prevention Plan (SWPPP)**

### **INSTRUCTIONS**

The Construction SWPPP for projects adding or replacing 2,000 sf of impervious surface or more, or clearing 7,000 sf or more must contain sufficient information to satisfy the local government Plan Approval Authority that the potential pollution problems have been adequately addressed for the purpose of the project. Address all 12 Elements listed in Section 2.5.2.

## **7.0 Special Reports and Studies**

### **INSTRUCTIONS**

Include any special reports and studies conducted to prepare the Stormwater Site Plan (e.g. soil testing, wetlands delineation).

## **8.0 Other Permits**

### **INSTRUCTIONS**

Include a list of other necessary permits and approvals as required by other regulatory agencies, if those permits or approvals include conditions that affect the drainage plan, or contain more restrictive drainage-related requirements.

## **9.0 Operation and Maintenance Manual**

### **INSTRUCTIONS**

Submit an operations and maintenance manual for each flow control and treatment facility. The manual should contain a description of the facility, what it does, and how it works. The manual must identify and describe the maintenance tasks, and the frequency of each task. The maintenance tasks and frequencies must meet the standards established in this manual or an equivalent manual adopted by the local government agency with jurisdiction.

Include a recommended format for a maintenance activity log that will indicate what actions will have been taken.

The manual must prominently indicate where it should be kept, and that it must be made available for inspection by the local government.

DRAFT

## **Appendix C**

### **Deviation Request Form**



PUBLIC WORKS DEPARTMENT

1812 Main Street ♦ Lake Stevens, WA 98258

(425) 377-3222 ♦ (425) 334-0835 FAX

### **EDDS DEVIATION REQUEST**

A fee will be charged for each deviation. As authorized by the applicant, this request constitutes permission to delay processing the application for up to 21 calendar days to allow analysis and decision by the City Engineer. DPW may advise Planning Department to add the time between receiving this request and the decision being made to the project timeline.

**Instructions: One deviation per form.**

Attach copies of the EDDS section(s) and/or drawings for which a deviation is requested. Include documentation such as drainage calculations, other engineering data and drawings, which will verify and substantiate the request. Engineering elements not meeting the required standards may require submittal by an engineer licensed in the State of Washington.

**Submittal:** Call 425-377-3222 Ext. 2790 to Schedule a Submittal Appointment

***Bring one complete set of the request and all supporting documentation, together with your payment, to: the submittal appointment at the Permit Center, 1812 Main Street, Lake Stevens, WA 98258.***

***Check one (complete additional information as requested):***

☐ **Project #:** \_\_\_\_\_ **Project Name:** \_\_\_\_\_

☐ **Other #:** \_\_\_\_\_ **Note: EDDS # Assigned by PW:** \_\_\_\_\_

**Requestor:** \_\_\_\_\_ **Firm:** \_\_\_\_\_

**Phone:** (\_\_\_\_) \_\_\_\_\_ **Address:** \_\_\_\_\_

**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip:** \_\_\_\_\_

**Traffic/Drainage Reviewer:** \_\_\_\_\_ **PDS Planner:** \_\_\_\_\_

**Check EDDS Edition:** ☐ 2009

**EDDS Section No.:** \_\_\_\_\_

**Type of EDDS Deviation:** ☐ Road/RW ☐ Drainage

**Is this an LID Project** ☐ Yes ☐ No

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**Describe the EDDS standard to be deviated from:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



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**Describe why the above EDDS standard cannot be achieved:**

**Describe the proposed design:**

**Justification for deviation:**

1. Describe how the deviation will achieve the intended result with a comparable or superior design and quality of improvement:

2. Describe how traffic safety and operations will not be adversely affected by this deviation:

3. Describe how the deviation will not adversely affect maintenance and associated costs:

4. Describe how the aesthetic appearance will be maintained or improved:

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**5. Other Information:**

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## **Appendix D**

### **EDDS Comment/Change Request Form**



PUBLIC WORKS DEPARTMENT

1812 Main Street ♦ Lake Stevens, WA 98258

(425) 377-3222 ♦ (425) 334-0835 FAX

## EDDS Comment/Change Request Form

**Send to:** Program Planning Supervisor, DPW, at address above.

Date: \_\_\_\_\_

Requestor: \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Daytime Phone: ( ) \_\_\_\_\_ -- \_\_\_\_\_

EDDS Section #: \_\_\_\_\_ Section Title: \_\_\_\_\_ Page: \_\_\_\_\_

Comment(s) or Change(s) Requested: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Justification: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*For DPW Use*

Analysis:    ☐ Approve    ☐ Disapprove    Initial/Date: \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Requestor Notified: Letter \_\_\_\_\_ Phone \_\_\_\_\_ Date \_\_\_\_\_

## Appendix E

### RECORD DRAWING CHECKLIST

This checklist is provided only as a guide for the Record Drawing review process. Refer to the RECORD DRAWING REQUIREMENTS Document for a detailed explanation of each step. If you have any questions in regards to this process, call the Engineering Department.

- A registered Professional Engineer or Professional Land Surveyor shall verify that installation of roads and utilities was in accordance with the approved construction plans. Any variance from the plans needs to be noted on the appropriate sheet with related design object changed to reflect the field survey.
- Prepare three Hard copies of the preliminary Record Drawings for review. Record Drawing submittals are to include all sheets or original approved construction drawings except the TЕСP & City Standard Details. (See Hard Copy Format Requirements).
- Submit three folded Hard Copies of the preliminary Record Drawings for review to Public Works Engineering Division.
- Review Record Drawing submittal. If review of the preliminary Record Drawings reveals errors and/or omissions, the drawings (redlines and Digital copies) will be returned to the Engineer/Surveyor for corrections. The Engineer/Surveyor shall make all corrections in the digital copy, re-plot and resubmit the revised preliminary Record Drawings and redlines for re-review.  
**Upon approval of preliminary Record Drawings, the Engineer/Surveyor will be notified to proceed with the “Final Submittal”.**
- The Final “Record Drawing” plan submittal shall bear the Professional Engineer/Professional Land Surveyor Stamp, Signature and Date and be reproduced on the following media:
  - Digital file on CD or DVD (without P.E./P.L.S. Stamp)
  - Full size MYLAR\*
  - THREE sets of full size PRINTS, FOLDED.

\*Sepia Mylars or Xerox type copies will not be accepted as a substitute for Mylar.

**Appendix F**  
**Construction Drawing Review Acknowledgement**

**CITY OF LAKE STEVENS**

**SECTION 10 CONSTRUCTION DRAWING REVIEW ACKNOWLEDGMENT**

THIS PLAN SHEET HAS BEEN REVIEWED AND EVALUATED FOR GENERAL COMPLIANCE WITH THE APPLICABLE CITY OF LAKE STEVENS CODES AND ORDINANCES. CONFORMANCE OF THIS DESIGN WITH ALL APPLICABLE LAWS AND REGULATIONS IS THE FULL AND COMPLETE RESPONSIBILITY OF THE LICENSED DESIGN ENGINEER, WHOSE STAMP AND SIGNATURE APPEAR ON THIS SHEET.

ACKNOWLEDGMENT OF CONSTRUCTION DRAWING REVIEW DOES NOT IMPLY CITY APPROVAL FOR CONSTRUCTION ACTIVITIES THAT REQUIRED OTHER COUNTY, STATE OR FEDERAL PERMIT REVIEW AND APPROVAL. THE PROPERTY OWNER AND LICENSED DESIGN ENGINEER SHALL BE RESPONSIBLE FOR THE ACQUISITION AND COMPLIANCE OF ALL APPLICABLE PERMITS OR AUTHORIZATIONS THAT MAY INCLUDE, BUT ARE NOT LIMITED TO, WDFW HYDRAULIC PROJECT APPROVAL (HPA),

WASHINGTON STATE ECOLOGY'S NOTICE OF INTENT (NOI), NPDES CONSTRUCTION STORMWATER GENERAL PERMIT, ALL U.S. ARMY CORPS OF ENGINEERS FILL PERMITS, AND THE REQUIREMENTS OF THE ENDANGERED SPECIES ACT.

THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_.

BY:

\_\_\_\_\_  
**DAVE OSTERGAARD, P.E., CITY ENGINEER/PUBLIC WORKS DIRECTOR**