City of Kelso
Engineering Design Manual

Amended May 2021
Effective Date May, 18, 2021

Chapter 1

General Requirements

City of Kelso
Engineering Design Manual
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Chapter 1
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Table of Contents

CHAPTER 1 – GENERAL REQUIREMENTS

1.00 General Design and Construction

A. Purpose

The purpose of the Kelso Engineering Design Manual (KEDM) is to set standards for the design and construction of both public and private infrastructure improvements.

B. Applicability

The KEDM shall govern all new construction and upgrading of facilities both in the right-of-way and on-site for: transportation-related facilities; storm drainage facilities and stream channel improvements; sewer and water improvements; and park, recreation, and open-space facilities used by the public. No construction of public improvements shall commence prior to City approval of the required design reports and construction plans.

C. Design Preparation

Construction plans and design reports shall be prepared and stamped by a registered professional civil engineer licensed to practice in the State of Washington. Other professionals in the technical fields of Electrical Engineering, Geotechnical Engineering, Landscape Architecture, Soils Engineering, Structural Engineering, and Surveying who prepare or are responsible for the process of obtaining required permits/approvals shall be currently licensed or registered in the State of Washington and qualified by both experience and educational background in the specific technical areas as warranted by the specific needs of the proposed development project**.**

Specific design standards and requirements by infrastructure type are detailed in the chapters that follow.

D. Construction Standards

Construction shall comply with the most current version of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction and the City of Kelso Standard Plans. The WSDOT Standard Specifications are hereby adopted as the City's Standard Specifications, and incorporated as part of this document by reference except as modified herein.

E. Director Decisions

Final approval of design and construction will be by the Director. The Director may impose additional design and construction requirements based on special conditions.

1.01 Precedence of Documents

If there is a conflict between approval documents, the document highest in precedence shall control. The precedence shall be:

First: Permits from other agencies as may be required by law.

Second: Conditions of approval, facilities review, and site development permit.

Third: City of Kelso Ordinances.

Fourth: The 2012 Stormwater Management Manual for Western Washington, as amended in December 2014 (where applicable).

Fifth: Modifications to the KEDM as approved by the Director.

Sixth: KEDM.

Seventh: Plans and details prepared by the Design Engineer.

Eighth: WSDOT Standard Specifications for Road, Bridge, and Municipal Construction.

Ninth: City of Kelso Standard Plans

Supplemental written agreements and approved revisions to plans and specifications by the appropriate jurisdiction will take precedence over documents listed above. Detailed plans shall have precedence over general plans. In any event, the determination of the Director shall be final.

1.02 Abbreviations and Definitions

AASHTO	The most current version of the standards of the American Association of State Highway and Transportation Officials.
ADA	Americans with Disabilities Act of 1990 and the most current version of the proposed ADA Guidelines as updated and issued by the United States Access Board, USDOJ and USDOT.
Applicant	Any person, firm or corporation applying for public services, or responsible party for a development application.
ASTM	American Society for Testing and Materials.

Best Management Practice (BMP)	The schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington State or the stormwater drainage system.
Bicycle Facilities	A general term denoting improvements and provisions which accommodate or encourage bicycling, including parking facilities, maps, signs, pathways, bike lanes, widened sidewalks, bikeways, and shared roadways designated for bicycle use.
Bicycle Lane (Bike Lane)	A portion of a roadway, which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.
City	City of Kelso.
City Engineer	City Engineer for the City of Kelso or their Designee.
Construction Stormwater Pollution Prevention Plan (C-SWPPP)	A document that describes potential pollution sources on a construction project and explains and illustrates the measures to be taken on the construction site to prevent, control and mitigate for discharge of those pollutants.
Contractor	The agent of the Applicant completing the construction activities associated with a given project, who is licensed, bonded and insured in the State of Washington, and qualified by experience to perform the Work.
Developer	The owner and/or their agents or contractors responsible for a given project.
Development	Any improvement, public or private, which requires a building or civil engineering permit.
Director	Community Development Director/City Engineer or their designee.
DOH	Washington State Department of Health.
Driveway	Any access to any property that is not defined as a public or private road.
Ecology	Washington State Department of Ecology (ECY)
Erosion	The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Also, detachment and movement of soil or rock fragments by water, wind, ice, or gravity.
Engineer	A Professional Civil Engineer registered in the State of Washington responsible for the project design.

ESAL	Equivalent Single Axle Load
fps	Feet per second
Hard Surface	An impervious surface, a permeable pavement, or a vegetated roof.
HMA	Hot Mix Asphalt. Also known as asphaltic concrete.
Impervious surface	A non-vegetated surface area that either prevents or retards the entry of water into the soil mantle as compared to natural infiltration conditions prior to development. A non-vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow compared to natural conditions prior to development. Common impervious surfaces include but are not limited to roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural storage and infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of the Minimum Requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.
Intersection	The at-grade junction where two or more roads or streets meet or cross. Also includes approaches of a continuous street at an acute curve or some other angle point where each leg of the approach has different street names.
KMC	Kelso Municipal Code
Land-disturbing Activity	Any activity that results in a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land-disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered a land-disturbing activity. Vegetation maintenance practices, including landscape maintenance and gardening, are not considered land-disturbing activity. Stormwater facility maintenance is not considered land-disturbing activity if conducted according to established standards and procedures.
LID Manual	Low Impact Development Technical Guidance Manual for Puget Sound, December 2012
Low Impact Development (LID) BMPs	A synonym for on-site stormwater management BMPs.
MR	Ecology's Minimum Requirements

Multi-Use Trail	An off-street pathway designated for pedestrian or bicycle use.
MUTCD	The most current version of the Manual of Uniform Traffic Control Devices
Native vegetation	Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the Kelso area, and which reasonably could have been expected to naturally occur on the site.
NPDES	National Pollutant Discharge Elimination System
Owner	Property owner of the property being developed
On-site Stormwater Management BMP	Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to: BMP T7.30: Bioretention Cells, Swales, and Planter Boxes, BMP T5.14A: Rain Gardens, BMP T5.14B: Bioretention, BMP T5.15: Permeable Pavements, roof downspout controls, dispersion, BMP T5.13: Post-Construction Soil Quality and Depth, BMP T5.19: Minimal Excavation Foundations, BMP T5.17: Vegetated Roofs, and water re-use.
Parking Lot	Any area intended to accommodate parked vehicles improved with surfacing and drainage and not accessory to single-family residences.
Permeable Pavement	Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir. Also known as a permeable pavement BMP.
Pollution-generating hard surface (PGHS)	Those hard surfaces considered to be a significant source of pollutants in stormwater runoff. See the listing of surfaces under pollution-generating impervious surface.
Pollution-generating impervious surface (PGIS)	Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in this glossary); or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall; metal roofs unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating); or roofs that are subject to venting significant amounts of dusts, mists, or fumes from manufacturing, commercial, or other indoor activities.

Pollution-generating pervious surface (PGPS)	Any non-impervious surface subject to vehicular use, industrial activities (as further defined in this glossary); or storage of erodible or leachable materials, wastes or chemicals, and that receives direct rainfall or run-on or blow-in of rainfall, use of pesticides and fertilizers, or loss of soil. Typical PGPS include permeable pavement subject to vehicular use, lawns and landscaped areas including: golf courses, parks, cemeteries, and sports fields (natural and artificial turf).
Private Street	Any vehicular access way, designed or intended to serve three or more parcels or dwelling units, or any commercial/industrial business, and which has not been dedicated and accepted as a public roadway.
Rain Garden	A non-engineered shallow, landscaped depression, with compost-amended native soils, or soils meeting ECY requirements for bioretention soil media (BMP T7.30), and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile.
Securities	Bonds, retainers, cash deposits, assigned savings, or another type of guarantee used to guarantee the performance of or correct deficient work.
sf	Square feet.
Sidewalk	The portion of a street designed for preferential use by pedestrians.
Standard Plans	City of Kelso and City of Kelso adopted WSDOT Standard Plans found in the appendices to the KEDM.
Stormwater facility	A constructed component of a stormwater drainage system designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include but are not limited to pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales.
Stormwater Site Plan	The comprehensive report containing all of the technical information and analysis necessary for a regulatory agency to evaluate a proposed new development or redevelopment project for compliance with stormwater requirements.
Street	A public or private way, which affords the principal means of access to abutting property.
SWMMWW	2012 Stormwater Management Manual for Western Washington, as Amended in December 2014, by Department of Ecology.

SWPPP	Stormwater Pollution Prevention Plan.
Threshold Discharge Area (TDA)	An on-site area draining to a single discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath).
Trail	"Trail" is synonymous with Multi-Use Path (off-street pathway).
Trip Generation	The most recent calculated trip rates (either calculated by average or formula), published by the Institute of Traffic Engineers or other traffic engineering analysis proposed by an applicant and deemed appropriate by the Director.
Unimproved Surface	Any surface that is not maintained or where natural vegetation is expected to grow taller than 6 inches.
Unsignalized Access Spacing	The distance between intersections that do not have traffic signals.
WAC	Washington Administrative Code.
WSDOT	Washington State Department of Transportation
Wetlands	Those areas that meet the State and/or Federal definition for a wetland. Typically, these are areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas, but can include lands that are only wet during the rainy season. Identification and delineation of jurisdictional wetlands and wetland boundaries shall be performed by a qualified biologist using applicable State and Federal guidelines.
Work	The definition given in the WSDOT Standard Specifications
WSDOT Standard Specifications	The latest edition of the "Standard Specifications for Road, Bridge, and Municipal Construction" as published by the Washington State Department of Transportation and the American Public Works Association.

1.03 Permits

Permits, approvals, or agreements are required by the City and may be required by other jurisdictions, prior to initiating any construction or demolition work elements described within the KEDM.

The majority of work covered under the KEDM will require multiple permit authority review and approvals. Several types of permits and approvals require prior approval from the authority before a building or other substantial permit can be issued. Any questions regarding information about permits, approvals, and agreements should be directed to the Director.

Grading permits may be issued between May 1st and October 1st. The Director may extend or shorten this time period on a case by case basis depending on actual weather conditions. If structures are proposed to be constructed in the future, the grading permit must be closed prior to issuance of a building permit.

1.04 Submittal Requirements

A. General

Submittal requirements for development review consist of a Civil Site Development Plan, and where required, grading plans, stormwater plans and reports, erosion control plans, drainage calculations, geotechnical reports, and other information as required. Letters of transmittal referencing the project name shall accompany all submittals.

B. Design Plan Format Specifications

Design Plan Format Specifications shall be the minimum specifications used for all plan sets, including the Civil Site Development Plan, the Stormwater Site Plan, and other plans. Some plans may have additional specifications.

1. The plans shall be submitted on 22" x 34" sheets, landscape format.

2. Each Plan shall have a Cover sheet showing the following:

    a. Project name

    b. Date

    c. Vicinity map showing the location of the project in respect to the nearest major street intersection

    d. Site information including street address (if applicable), Assessor’s tax lot, and/or Abbreviated Legal Description

e. Name and mailing address of the Applicant and the Owner, engineering firm, survey firm, geotechnical engineer, and landscape architect

f. Notice to excavators to call for locates prior to excavation

g. Index of sheets

h. Legend that provides the name and symbol for all symbols used on the subsequent sheets. (Note: the Legend may be shown instead on a Notes and Legends sheet behind the Cover sheet. Alternatively, a legend may be placed on each sheet showing symbols used on that sheet.)

3. The scale shall be 1-inch = 5 feet vertically, and 1-inch = 20 feet horizontally for all drawings. A scale of 1-inch = 10 feet may be used for more detailed drawings such as intersection drawings. Scale shall be shown with north arrow and within a title block.

4. The horizontal survey datum shall be NAD83/2011. The vertical survey datum shall be NAVD88. No other datums shall be used without permission of the City. The location and elevation of a National Geodetic Survey, United States Geological Survey, Cowlitz County, or City of Kelso bench mark shall be shown. Temporary control bench marks and elevations shall also be shown on the plans.

5. A north arrow and scale bar shall be shown on each plan view sheet of the plans and adjacent to any other drawing, which is not oriented the same as other drawings on the sheet.

6. Letter size shall not be smaller than 0.10 of an inch high.

7. A title block shall appear on each sheet of the plan set. The title block shall include the name of the project, the engineering firm, the Owner, the sheet title, and the sheet number.

8. The seal of the Engineer responsible for preparation of the plans shall appear on each sheet.

9. The description and date of all revisions to the plans shall be shown on each sheet affected, and shall be approved and dated by the Engineer of record as evidenced by an original signature or initial.

10. Indicate the location and direction of view for all sections.

11. Match lines shall be on even stationing with sheet number references.

C. Civil Site Development Plan

The Civil Site Development Plan is the master plan set, which can or may incorporate other required plan submittals, such as the site grading plan and the Stormwater Site Plan. At the minimum the Civil Site Development Plan shall include the following:

1. Approved preliminary plat (if it's a subdivision).

2. Composite street and utility plans: include existing topography, public and private utilities, and proposed public and private street improvements, bike facilities and sidewalks.

3. Signing, striping/delineation, illumination and signal plans, if applicable.

4. Other plans, as applicable, including but not limited to:

   a. Landscape, onsite stormwater management BMP's and irrigation plans

   b. Structural plans, including large culverts, bridges and retaining walls.

5. Plan view shall show the following when applicable:

   a. Right-of-way, property, tract, and easement lines (existing and proposed).
   b. Subdivision name, lot numbers, street names, and other identifying labels. Subdivision and street names are subject to the approval of the City Planning Director, Fire Chief, and Director.
   c. Location and stationing of existing and proposed street center lines and curb faces.
   d. Horizontal alignment and curve data of street center lines and curb returns including bearings along centerline.
   e. Existing underground utilities and trees over 6-inches in diameter within the construction limit.
   f. Location of existing buildings, wells, septic tanks, on-site sewage drain fields, fuel tanks, and any other buried structures.
   g. Location, stationing, and size of all mains and service lines for storm drainage, sanitary sewer, and water; and location of all fire hydrants. Stationing shall be located in relationship to the street stationing at all manholes or other key locations.
   h. Provisions for cross-connection control must be clearly shown on the plans, including any retro-fitting of existing water service connections and existing auxiliary water supplies, conversions to City of Kelso water service that are required as a condition of development approval, upgrading of existing service connections by replacement of same, and

any other cross connection control required by state and local rules and codes.

i. Street stationing shall be noted at a minimum of 100-foot stations.

j. Top of curb elevations along curb returns at quarter-delta's and 100-foot stations.

k. Location and elevation of the low points of street grades and curb returns.

l. Sidewalk locations. This shall include ADA ramps, transitions in location or width, and relationship with driveways. Proposed sidewalks shall be shown with hatching . Separate details shall be prepared for each ADA ramp showing all dimensions and showing elevations at

m. Crown lines along portions of streets transitioned from one typical section to another.

n. Centerline stationing of all intersecting streets.

o. Location and description of existing survey monuments, including but not limited to: section corners, quarter corners, donation land claim corners, and City bench marks.

p. Location of proposed street intersection monument boxes.

q. FEMA designated 100-year flood plains and flood ways, or areas of flooding during a 100-year storm event. Include established base flood elevations (BFE).

r. Existing drainage and stormwater facilities, including off-site facilities, upstream and downstream that affect the design (e.g. downstream restrictions that back water onto project site). Locations of catch basins, pipes, channels, ditches, swales, culverts.

s. Streams, springs, wetland areas, wetland buffers and other waters of the State.

t. Any additional information that the City deems necessary.

6. Profile views shall show the following:

a. Stationing, elevations, vertical curve data (including curve k factors), and slopes for center of streets or top of curbs. For off-set or superelevation cross-sections, both curbs shall be profiled. Where curbs are not to be constructed, center line of street and ditch inverts shall be shown.

b. Original ground along the center line, and, if necessary, at the edges of the right-of-way if grade differences are significant.

c. Center line, top of curb, and gutter flow lines of existing streets for a distance of at least 50 feet (300 feet required for design review submittal) each way at intersections with proposed streets. For stub streets that may be extended in the future, the horizontal and vertical alignment shall be

designed to accommodate future extension.. Submit design review drawings showing the future proposed alignment at least 300 feet beyond the end of the stub.. Additional design information concerning the vertical and horizontal alignment of future street extensions may be required.

d. Vertical alignment of streets, including existing center line monumentation.

e. The top of curb for all cul-de-sacs and curb returns.

f. Profiles of existing sanitary sewers, water mains, drainage and stormwater facilities, including off-site drainage facilities upstream and downstream that affect the design (e.g. downstream restrictions that back water onto project site). For sanitary sewer, drainage and stormwater facilities, include structure locations, rim elevations, pipes with pipe sizes, materials and slopes. For water mains, show pipes, pipe sizes and materials.

g. All proposed drainage and stormwater facilities, sanitary sewers and water mains For sanitary sewers, drainage and stormwater facilities, show all invert and rim elevations, slopes, direction of flow, stations of structures and laterals, materials, and pipe sizes. For water mains show pipe size and material.

h. Profiles for ditch and creek flowlines shall extend a minimum of 25 feet (200 feet for design review submittal) beyond the project, both upstream and downstream with typical cross sections at 50-foot intervals.

i. Designate structures using alpha or numeric labels on profiles to correspond to plan view notation.

j. All existing and proposed sanitary, water, storm lines, and other utilities crossing the profile.

7. Detail sheets

Detail sheets shall be provided as part of the Site Development Plans and other required plans. The detail sheet(s) shall show City Standard Plans and special details necessary for the project.

The special details shall be full size, and City Standard Plans shall be at original scale.

D. Site Grading Plan

The City of Kelso requires a site grading plan as part of the application for any development that involves excavation or fill, or land-disturbing activity. The scope of the grading plan shall be determined by completion of the Grading Permit Worksheet. Grading contours (existing & proposed) shall be at no more than 1-foot intervals for existing ground slopes of 10% or less, and no more than 2-foot intervals for existing ground slopes greater than 10%. Existing contours shall extend beyond

the project site a minimum of 50 feet. Existing contours and elevations on the grading plan shall be prepared, stamped and sealed by a surveyor licensed in the State of Washington.

E. Structural Submittal

Structural construction plans and the necessary calculations stamped by a structural engineer shall be submitted for proposed structures, as determined by the Director (i.e. walls, box culverts, bridges).

A letter from the structural engineer approving and certifying that the as-built construction of the structure complies with the engineer's plans shall be submitted prior to as-built approval.

F. Stormwater Submittal

For development projects and land-disturbing activities that are proposed to exceed the thresholds in Chapter 2 of the KEDM, the Applicant shall submit a Stormwater Site Plan. Thresholds and content are described in KEDM Chapter 2.

G. Traffic Impact Analysis (TIA)

The TIA is an analysis prepared to determine the traffic impacts of a given development. When required, the TIA shall be submitted with the land use application. See below and Chapter 3 for criteria and requirements.

H. Street Access Connection Permit

If the new development, or change in use, will generate or create an increase of more than 50 Peak Hour Trips (as defined within the Institute of Transportation Engineers Trip Generation Manual[1]), each application for a street access connection permit, whether accompanying an underlying land use application or not, shall include the following:

1. Traffic Impact Analysis (TIA).

2. Existing Conditions Plan – The Applicant shall provide a map or plan illustrating the following conditions on both sides of all streets within a study area as defined for a TIA:

   a. Existing driveways

   b. Existing sidewalks

1 Institute of Transportation Engineers Trip Generation Manual, 7th Edition, 2003.

c. Surrounding off-site conditions

d. Street depictions with names of streets for identification

e. Existing roadway classifications

f. Three Year accident history

If none of these cases apply, a TIA may still be necessary if the Director deems that special circumstances require analysis (e.g., existing traffic congestion, safety concerns, public controversy, etc.). Conversely if any of these cases apply, the Director may waive the requirement of a TIA, or require less analysis than would be required for a full TIA, depending on the situation.

I. Project Acceptance and Closeout

Prior to acceptance of public improvements, the following shall be submitted to the Director for review and approval:

1. Final plat showing:

   a. Lot layout with bearings and distances

   b. Right-of-way shall include all dimensions and curve information

   c. Public easements

   d. Public tracts

   e. Required notes

2. As-built drawings: The as-built drawings shall be mylars of the approved construction drawings notated with changes made during construction. The words "As-Built Drawing" shall appear as the last entry in the revision block along with the month, day and year the as-built drawing was prepared.

3. Flash drive containing:

   a. PDF version of the as-built drawings

   b. DWG version of the as-built drawings.

4. Copy of a receipt from the finance department showing that all required engineering fees have been paid.

1.05 Changes to these Engineering Standards

From time to time changes may be needed to add, delete, or modify the provisions of the KEDM. The Director may propose changes to the KEDM and upon approval of the City Council; they will become effective and will be incorporated into the existing provisions.

1.06 Design Exception Process

A. Submittal

Requests to take exceptions to the standards of the KEDM for a specific development shall be submitted in writing to the Director by the Applicant Engineer. This written request shall state the desired exceptions(s), the reason(s) for the request(s) and a comparison between the specification(s), standard(s), and the exception(s).

Requests for exception to the standards of the KEDM shall be documented with reference to nationally accepted specifications/standards.

B. Review

The request to take exception to the KEDM for a development will be reviewed by the Director, who will consult the appropriate review authorities and make one of the following decisions:

1. Approve as requested;

2. Approve with changes, or

3. Deny with an explanation.

The exception, if approved, is for the specific project and for the specific location and issue described in the request. Approval of a request for exception does not constitute a precedent for other locations on the project or for future projects.

C. Appeal

The Applicant may appeal the Director's decision to the Hearing Examiner.

D. Criteria for Exception to the KEDM Standards

1. The Director may grant an exception to a KEDM Standard when any one of the following conditions are met:

    a. The KEDM Standard does not apply in the particular application.

    b. Topography, right-of-way, or other geographic conditions impose an unusual or unique hardship on the Applicant and an equivalent alternative which can accomplish the same design objective is available that does not compromise public safety or accessibility for the disabled.

    c. A change to a Standard is required to address a specific design or construction problem which if not enacted will result in an undue hardship or would jeopardize public safety.

1.07 Errors and Omissions

At the discretion of the City, any significant errors or omissions in the approved plans, or information used as a basis for such approvals, may constitute grounds for withdrawal of any approvals and/or stoppage of any or all of the permitted work. It shall be the responsibility of the Applicant to show cause why such work should continue, and make such changes in plans that may be required by the City before the plans are re-approved.

1.08 Penalties

Failure to comply with the KEDM, or the conditions of any permit required by the KEDM, will be cause for withholding or withdrawing approval of plans or plats, forfeiture of bond, issuance of a stop work order or a compliance order, withholding Temporary and/or Final Certificate of Occupancy, and/or other penalties as provided by law.

1.09 Construction Site Limitations

A. Historical and Archaeological Areas

1. During construction, when burial sites, buried camp areas, village sites, and other distinctive archaeological or historical items are uncovered, or other items suspected of being of historical or archaeological significance are encountered, the Contractor shall stop work and immediately report the matter to the City and the state liaison officer. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work.

2. Under the National Historical Preservation Act (P.L. 89-665; 1966), state liaison officers shall be notified when historical or archaeological items are unearthed.

3. The Washington Criminal Code prohibits disinterment of a corpse without permission of the appropriate authorities.

B. Other Requirements

1. Construction noise shall be minimized by the use of proper engine mufflers, protective sound reducing enclosures, and other sound barriers. Construction activities producing excessive noise that cannot be reduced by mechanical means shall be restricted to locations where their sound impact is reduced to a minimum at the edge of the work area. All construction noise shall be in accordance with KMC 8.28.

2. The construction shall be done in a manner to minimize the adverse effects on fish, habitat, and wildlife resources.

3. The use of water from a stream or impoundment shall not result in altering the temperature of the water body enough to affect aquatic life.

Chapter 2

Storm Drainage, Grading, and Erosion Control

City of Kelso
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Chapter 2
Storm Drainage, Grading, and Erosion Control

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Table of Contents

CHAPTER 2 - STORM DRAINAGE, GRADING, AND EROSION CONTROL

2.00 Purpose

This chapter is intended to provide minimum standards for managing storm drainage and controlling erosion and sedimentation with land-disturbing activities, including development, redevelopment, clearing, and grading.

A. Minimum standards are established to:

1. Protect the public health, safety, and welfare by minimizing risk from flood events;

2. Protect property and habitat from increased runoff caused by development;

3. Allow efficient operation, repair, and maintenance of the storm drain system;

4. Reduce discharge of pollutants to the storm drain system and protect water quality;

5. Reduce impacts to hydrology of surface waters;

6. Reduce the erosion of soils on active construction sites and cleared areas: and

7. Limit the discharge of sediment-laden runoff from active construction sites and cleared areas.

B. The requirements of this chapter cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals.

2.01 General

A. The KEDM is written to comply with the Department of Ecology's (Ecology's) Phase II Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) Permit, which requires Kelso to adopt the 2019 Stormwater Management Manual for Western Washington (SWMMWW) or an equivalent.

B. This Chapter adopts the SWMMWW. The Chapter references and supplements the SWMMWW and is meant to be used in conjunction with the SWMMWW. An online version of the SWMMWW can be found at:

https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm.

C. When portions of this chapter and the SWMMWW conflict, this chapter shall apply. When provisions of this chapter conflict with other City of Kelso Code or state and federal requirements, the more stringent provisions apply.

D. This Chapter is intended to represent the minimum Standards for the design and construction of stormwater drainage facilities.

1. Compliance with these Standards does not relieve the designer of the responsibility to apply sound professional judgment to protect the health, safety, and welfare of the general public.

2. Special site conditions and environmental constraints may require a greater level of protection than would be required under these Standards.

3. Site or weather changes or other unforeseen conditions may require modification of a site's erosion and sediment control strategy.

4. The project must be designed (and may require modification) to ensure compliance with the conditions of any permits, codes and regulations, and these Standards.

5. The design of stormwater drainage and/or retention/detention systems will depend on their type and local site conditions.

E. Erosion and sediment control BMPs shall be implemented prior to initial soil disturbance and until final stabilization following project completion and removal of temporary controls.

F. The City may temporarily suspend project work or require additional or modified protection measures if it appears to the Director, based upon observed conditions, that the approved plan is insufficient to prevent environmental harm and that such suspension or additional measures will prevent or minimize the harm.

G. The City may require a construction project to be scheduled to minimize the potential for erosion or other environmental harm.

H. Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site plan (e.g. subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling.

I. Clearing and grading shall be prohibited in critical or environmentally sensitive areas unless written variances are secured from all applicable agencies.

J. Preparation of submittals:

1. All plans, studies, calculations, and reports that require the practice of engineering as defined in RCW 18.43.020(5)(a) shall be prepared by or under the direction of a professional civil engineer registered in the state of Washington. Such plans, studies, calculations, and reports shall be stamped, signed, and dated by the licensed civil engineer(s) responsible for preparation of the Stormwater Site Plans.

2. Unless otherwise specified in these Standards, soils reports shall be prepared by a professional soil scientist certified by the Soil Science Society of America (or equivalent national program) or other suitably trained persons working under the supervision of a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the state of Washington.

3. Stormwater Site Plans shall be prepared in accordance with the SWMMWW Vol. III, Section 3.2, Preparing a Stormwater Site Plan, as modified in Section 2.05 of the KEDM.

K. Construction and Industrial Stormwater NPDES Permits. Obtain Ecology's Construction or Industrial Stormwater General Permit if/as required by Ecology. See Ecology website: http://www.ecy.wa.gov/programs/wq/stormwater/index.html.

L. Other State and Federal requirements that could impact stormwater programs are summarized in SWMMWW Vol. I, Section 2.15: Other Requirements.

2.02 Applicability

A. Development and redevelopment projects that meet the thresholds in the SWMMWW Vol. I, Section 3.3 shall:

1. Apply the Minimum Requirements (MRs) for stormwater management in accordance with the SWMMWW Vol. I, Section 3.4, and as modified in KEDM Section 2.03.

2. Meet all the requirements of this Chapter.

B. All land-disturbing projects regardless of size shall comply with KEDM Sections 2.11, 2.12, 2.13, and 2.15.

2.03 Minimum Requirements for Development and Redevelopment

A. Instructions for complying with each MR are as follows:

1. Preparation of Stormwater Site Plans

- Consult SWMMWW Vol. I, Section 3.4.1 for requirements for Preparation of Stormwater Site Plans.
- Consult SWMMWW Vol. III, Section 3.2 for step-by-step requirements for preparing a Stormwater Site Plan, as modified in KEDM Section 2.05.
- Consult KEDM Chapter 1 for submittal requirements.

2. Construction Stormwater Pollution Prevention

- Consult SWMMWW Vol. I, Section 3.4.2 and Vol. II for requirements for Erosion Control and Construction Stormwater Pollution Prevention.
- Consult this KEDM Section 2.04.D for variations from MR 2.

3. Source Control of Pollution

   - Consult SWMMWW Vol. I, Section 3.4.3 and Vol. IV for requirements for Source Control of Pollution.

4. Preservation of Natural Drainage Systems and Outfalls

   - Consult SWMMWW Vol. I, Section 3.4.4 for requirements for Preservation of Natural Drainage Systems and Outfalls.
   - Supplemental Guidelines for Outfall Protection shall apply.

5. On-Site Stormwater Management

   - Consult SWMMWW Vol. I, Section 3.4.5 for requirements for On-Site Stormwater Management.
   - Also, consult SWMMWW Vol. III and V for design of on-site stormwater management facilities.

6. Runoff Treatment

   - Consult SWMMWW Vol. I, Section 3.4.6 for requirements for Runoff Treatment.
   - Consult Section 2.04.C of these Standards for additional requirements.
   - Also, consult SWMMWW Vol. V for selection and design of runoff treatment facilities.

7. Flow Control

   - Consult SWMMWW Vol. I, Section 3.4.7 for requirements for Flow Control.
   - Consult KEDM Section 2.04.A and B for exemptions and variations from MR 7.
   - Also, consult SWMMWW Vol. III for selection and design of flow control facilities.

8. Wetlands Protection

   - Consult SWMMWW Vol. I, Section 3.4.8 for requirements for Wetlands Protection. Note that meeting the requirement of this Chapter does not

substitute for compliance with the Critical Areas requirements of KMC Chapter 17.26.

9. Operation and Maintenance

- Consult SWMMWW Vol. I, Section 3.4.9 for requirements for Operation and Maintenance.
- Consult KEDM Section 2.20 for additional requirements for long-term operation and maintenance.

B. Redevelopment projects must rectify any drainage problems upon replacement or refurbishment of the affected system. For example, projects that grind and resurface a parking lot which sheets over a sidewalk shall divert or intercept that runoff to a drainage system or to landscaping.

2.04 Exemptions and Variations to the Minimum Requirements

A. Development and redevelopment projects are exempt from MRs only as described in the SWMMWW Vol. I, Section 3.2 and in the following circumstances:

1. Minimum Requirement 7; Flow Control. Projects within the Consolidated Diking Improvement District #1 (CDID #1) and Consolidated Diking Improvement District #3 (CDID #3) boundaries and sites discharging to these boundaries via manmade conveyances are exempt from MR 7 if the discharge meets each restriction listed in SWMMWW Vol. I, Section 3.4.7.

2. Regional Facilities. The requirements for on-site management and against the transfer of runoff from one basin to another may be waived by the Director in areas served by a regional stormwater control facility. Such a waiver must be conditioned on the following provisions:

   a. Basin Plans. The alternative or regional approach must comply with the Basin Plans provisions of SWMMWW Vol. I, Appendix 1-B.

   b. Services Contracted. The developer shall provide the City a copy of an executed contract with the regional facility demonstrating full compliance with the applicable standards.

   c. Conveyance System Capacity. The conveyance system transporting the stormwater from the development to the facility shall be sized to handle the additional runoff. The developer shall be required to demonstrate the adequacy of the conveyance system by an engineer registered in the State of Washington.

3. Natural Drainage Features. Restoration of flow to natural drainage features may be allowed as an alternative to traditional detention to solve significant, pre-existing (i.e. not otherwise caused by the project) flooding, stream stability, water

quality or habitat problems as determined by the Director. The project shall also satisfy all conditions of SWMMWW Vol. I, Sections 3.4.7 and 3.4.8, be documented by a qualified engineer or wetlands biologist, and receive approval from all relevant regulatory authorities.

B. Flow Control Variations

Flow control facilities shall be designed in accordance with the SWMMWW Vol. III and the following requirements:

1. Tailwater. Pond outfalls shall be analyzed for the tailwater effect on discharge with a backwater analysis. Consideration must be given to the backwater effect of high surface elevations in the downstream conveyance system. High tailwater elevations may affect performance of the upstream facility and reduce live storage volumes.

2. Fencing. Ponds shall be fenced in accordance with the SWMMWW Vol. V, Section V-12, BMP D.1: Detention Ponds, except as follows:

   a. A pond in which less than 10% of the perimeter has a vertical drop of greater than 30" and the remaining interior side slope is not steeper than 3H:1V may provide guardrail over the vertical drop in lieu of fencing.

   b. Where chain link fence is required, landscaping shall be installed as screening, unless not feasible.

3. Access.

   a. Access to flow control facilities shall be provided in accordance with the SWMMWW Vol. V, Section V-12, BMP D.1: Detention Ponds.

   b. Access roads shall have a durable all-weather surface.

C. Water Quality Variations

Water quality facilities shall be designed in accordance with the SWMMWW Vol. V and the following requirements:

1. All catch basins, inlets, and manholes with grates, shall be stamped "Dump No Pollutants – Outfall to Stream," or equivalent. Similar-themed markers or stenciling in addition to this minimum requirement are encouraged.

2. Permanent markers or signs, such as those described in the SWMMWW Vol. V, Section V-12, BMP D.1: Detention Ponds, shall be installed for significant aboveground facilities such as ponds, bioswales, pervious streets, bioretention, or developments that rely on numerous dispersed LID BMPs. Signs should identify the feature(s), state the purpose and/or function, provide contact information (for public facilities), and give any advisory message that is key to its proper and

continued performance, such as "Dump no debris or pollutants. For more information or to report littering, vandalism, or other problems, call 360-423-6590."

D. Construction Stormwater Pollution Prevention Variations

1. Underground utility projects shall comply with MR 2 and the following additional requirements:

   a. Excavated material shall be placed to minimize runoff into the trench and adjacent roadway consistent with safety and space considerations; and

   b. Trench dewatering devices shall be managed as described in Element #10 in SWMMWW Vol. I, Section 3.4.2.

2. Diking District Maintenance. Routine dike and channel maintenance activities performed by diking districts must comply with MR 2 but are exempt from the requirement to submit a Construction Stormwater Pollution Prevention Plan.

2.05 Preparation of Stormwater Site Plans

A. The applicant for a development or redevelopment project that triggers MR 1 shall prepare a Stormwater Site Plan.

Depending on the size and complexity of the development or activity, applicants must prepare either an Abbreviated Stormwater Site Plan or a Full Stormwater Site Plan. The size and complexity are evaluated using the applicability criteria found in Chapter 2 of the KEDM.

1. Abbreviated Stormwater Site Plan

   An Abbreviated Stormwater Site Plan shall be prepared for sites that trigger MRs 1-5 in accordance with Chapter 2 of the KEDM. The Abbreviated Stormwater Site Plan meets the requirements of MR 1.

   To fulfill this requirement, applicants shall complete the Abbreviated Stormwater Site Plan form available from the City and shall provide the required attachments.

2. Full Stormwater Site Plan

   Sites that trigger MRs 1-9 shall prepare a Full Stormwater Site Plan. The Full Stormwater Site Plan fulfills MR 1.

   The following four separate documents comprise the Full Stormwater Site Plan:

   a. Site Development Drawings

b. Drainage Design Report

c. Long-Term Stormwater Site Management Plan

d. Construction Stormwater Pollution Prevention Plan

B. The Full Stormwater Site Plan shall be prepared as follows:

1. Follow the instructions in the SWMMWW Vol. III, Section 3, except:

a. References to "Project required to meet Minimum Requirements1-5" shall mean and refer to the City's stormwater submittal type "Abbreviated Stormwater Site Plan," and references to "Project required to meet Minimum Requirements 1-9" shall mean and refer to the City's stormwater submittal type "Full Stormwater Site Plan"; and

b. Step 6 – Prepare a Construction Stormwater Pollution Prevention Plan may be delayed at the applicant's option until the Pre-construction Conference; and

c. Step 7 – Complete the Stormwater Site Plan shall be replaced with the following text:

The Stormwater Site Plan encompasses the entire submittal for stormwater and drainage review. The Stormwater Site Plan includes the following four separate documents:

1. Stormwater Site Development Drawings
2. Drainage Design Report
3. Long-Term Stormwater Site Management Plan
4. Construction Stormwater Pollution Prevention Plan

Elements of the Long-Term Stormwater Site Management Plan include those items necessary to assure continued operation and maintenance of the site's stormwater management facilities. These elements are required as described in Sections 2.16 and 2.20.

2. Stormwater Site Development Drawings

A. The Stormwater Site Development Drawings must meet the requirements of the Civil Site Development Plan in accordance with Section 1.04.C of the KEDM. The Site Development Drawings are engineering drawings that provide sufficient detail to construct the project's stormwater facilities and conveyances.

1. In addition to the requirements of Chapter 1, the following specifications apply to Civil Site Development Plans:

a. Include a survey meeting the requirements of the SWMMWW Vol. III, Section 3.2 for projects required to meet MRs 1-9.

b. Threshold Discharge Areas (TDA) in accordance with Chapter 2 of the KEDM. TDAs shall be identified and labeled consistently in all submittals – plans, reports, and maps. A Threshold Discharge Area is "an on-site area draining to a single discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath). The purpose of this definition is to clarify how the thresholds of the SWMMWW are applied to project sites with multiple discharge points." See the Glossary in the SWMMWW.

c. Location of the point of stormwater and surface water discharge from each TDA, which preserves natural drainage patterns.

d. Location and overflow route for the 100-year, 24-hour storm.

e. Location of soil logs, test pits, and extents of soils as documented in the Drainage Design Report.

f. Location of slope instability and steep slopes.

g. Areas of the site predominantly covered by native vegetation and areas of native vegetation to be preserved.

h. Existing and proposed stormwater drainage; offsite areas contributing runoff to the site; location and number of stormwater facilities and on-site stormwater BMPs; designated flow paths and dispersion areas; direction of flow; size, type and kind of drainage channels and pipes.

i. Existing and proposed pollution-generating pervious surfaces (PGPS) and pollution-generating hard surfaces (PGHS).

j. Location of on-site stormwater BMPs (MR 5).

k. Include locations of on-site BMPs on individual lots if they are used to meet MRs 6 or 7.

l. Show areas of disturbed soils to be amended (BMP T5.13)

m. Location of all runoff treatment facilities (MR 6)

n. Location of all flow control facilities (MR 7)

o. Location of structural source control BMPs used to meet MR 3.

p. Dimension of permeable pavements. Use different hatches for permeable pavement vs. traditional pavement.

q. Dimensions of setbacks of stormwater facilities and on-site stormwater BMPs from property lines, structures, wells, on-site sewer systems, landfills, slopes, and other natural features as applicable to the facility.

r. Locations and species of retained trees and newly planted trees for which impervious surface reductions are claimed. Show distance from associated impervious surface.

s. Show all tracts or easements used to enclose drainage features or stormwater facilities.

t. If individual lots will connect to the public stormwater drainage system, locations of approved connections.

u. Approved location for storm runoff from building lots (if applicable)

v. The Director may require additional site or vicinity information if needed.

w. Include in the landscape plan:

x. Locations and dimensions of vegetated stormwater facilities and vegetated on-site stormwater management BMPs

y. Locations and dimensions of areas of preserved native vegetation

z. Locations and species of retained trees Locations and dimensions of any required flow lengths and vegetated flow paths, (e.g. for dispersion BMPs)

aa. Detailed planting plan and specifications for trees, vegetated stormwater facilities, and vegetated on-site stormwater management BMPs

2. The following additional Profile specifications apply:

   a. Original surface grade profile

   b. Proposed surface and storm drain profile

3. The following additional Detail specifications apply:

   a. Details of each bioretention BMP showing the following:

      i. Width, length, side slopes, and maximum design pond depth. If bioretention is used to meet MR 6 or MR 7, show sufficient details to confirm accurate representation of the facility in the continuous simulation hydrologic model.

      ii. Descriptions of all materials such as underdrain, drain rock, pipe, filter fabric, outlet structure, irrigation, bioretention soil mix, and mulch

      iii. Locations, elevations, and slopes of any catch basins and pipes

      iv. Designs for any retaining walls proposed. Structural walls shall meet City building permit requirements.

      v. A minimum of two cross-sections showing original property lines, slope catch points and other information to construct the facility

   b. Details of each permeable pavement installation showing the following:

      i. Dimensions of permeable pavement

ii. Dimensions of underground storage layer. If permeable pavement is used to meet MR 6 or MR 7, show sufficient details to confirm accurate representation of the facility in the continuous simulation hydrologic model.

iii. Pavement section

iv. Descriptions of all materials such as geotextile; underdrain; base material; storage layer; asphalt, concrete, or pavers

v. Direction and percentage of slope

c. Details of each treatment facility showing the following:

i. Overall measurements and dimensions

ii. Flow direction

iii. Location and elevations of inverts, inflow, bypass, and discharge

iv. Slope (if applicable)

d. Details of each flow control facility showing the following:

i. Overall measurements and dimensions

ii. Measurements necessary to calculate storage volumes

iii. Control structure/restrictor placement

iv. Details of flow control structures showing size, dimensions, elevations, and orientations of all orifices, weirs, risers, tee-sections, etc.

v. A minimum of two cross-sections of each infiltration or detention pond showing original property lines, slope catch points, and other information to construct the facility.

e. Details of each on-site stormwater BMP used to meet MR 5 sufficient to construct the BMP.

f. For infiltration facilities and on-site stormwater BMPs used to infiltrate runoff from a pollution-generating hard surface, provide details to confirm accurate representation in the continuous simulation hydrologic model (see Drainage Design Report).

4. Drainage Design Report

The Drainage Design Report contains the technical information to support the site's drainage and stormwater plan. The report shall contain the following sections and components and shall address MRs 1-9.

A. All sections listed below shall be included in each Drainage Design Report. If a section is not applicable, write "N/A" in the section contents and describe why the section is not applicable.

All page numbers of the report shall be numbered. Appendices shall have page numbers.

1. Cover Page

The Cover Page shall contain the following items:

a. Name of Report
b. Project Name
c. Project Number, if a City project
d. Situs Address
e. Applicant's Name and Contact Information
f. Applicant Engineer's Name and Contact Information
g. Date of Submittal

2. Seal of the Applicant Engineer with the Applicant Engineer's certification statement. The Applicant Engineer shall certify in a statement that all the required information is included in the Drainage Design Report, the report was prepared by the Applicant Engineer or under his/her supervision, and that the proposed stormwater facilities are feasible.

3. Table of Contents

The Table of Contents shall contain the following items:

a. List of section headings and their respective page numbers
b. List of tables with page numbers
c. List of figures with page numbers
d. List of attachments and/or appendices, numbered
e. List of references

4. Maps

All maps shall contain a scale and north arrow. The following maps shall be included:

a. **Vicinity Map:** All vicinity maps shall clearly show the project site.

b. **Basin Maps:** Show project boundaries, sub-basin boundaries, TDAs, and off-site contributing areas for both the pre-development and the post-development scenarios. TDAs shall be identified and labeled consistently in all submittals – plans, reports, and maps. Show drainage features, the flow path to and from the project site, and stormwater treatment and flow

control facilities. Identify the point of compliance of each TDA for modeling site hydrology using an approved continuous simulation hydrologic model.

c. **Soils Map:** The soils map shall show soils on the site and within the contributing area that drains to the site itself. Information should be consistent with the Soils Report.

d. **Other Maps:** The following additional maps shall be required in the situations noted:

   i. Wellhead Protection. If the site lies within the 10-year time-of-travel zone of a public water supply well or within a Category I or II critical aquifer recharge area (CARA), maps showing all of the zones of contribution that overlap the site are required.

   ii. Floodplains. If a floodplain mapped by the Federal Emergency Management Agency (FEMA) exists on or adjacent to the site, a map showing the floodplain is required.

   iii. Shoreline Management Area. If the site requires a shoreline permit, a map showing the boundary of the shoreline management area in relation to the site is required.

5. Section A – Project Overview

The Project Overview is a brief narrative describing and summarizing the site and the proposed project. Most of the information is the Project Overview is discussed or shown in detail in other sections of the Stormwater Site Plan.

a. Describe the site location, including legal description, address, parcel number, zoning, etc.

b. List the primary type of permit required for the work and briefly summarize the type of development project.

c. Summarize the existing conditions including topography, natural drainage patterns, vegetative ground cover, presence of agricultural drain tiles, and presence of critical areas.

d. List existing onsite stormwater systems and describe their functions.

e. Summarize site parameters that influence stormwater system design.

f. List adjacent areas, including streams, lakes, rivers, wetland and buffer areas, residential areas, and roads that might be affected by the construction project.

g. Generally describe proposed site construction, size of improvements, and proposed methods of mitigating stormwater runoff quantity and quality impacts.

h. Describe how the proposed project considers the six listed site layout considerations described in SWMMWW, Vol III, Section 3.2, Step 2 – Prepare Preliminary Development Layout.

i. Describe other permits from City of Kelso and/or other agencies that may affect the design of the stormwater system. Describe how any conflicts will be managed.

6. Section B – Existing Conditions and Soils

Provide a detailed narrative of the site's survey, using the information gathered in Step 1 – Analyze Existing Site Conditions to Determine LID Feasibility in SWMMWW, Vol. III, Section 3.2.

Provide a detailed narrative of the soils and subsurface investigations also required in SWMMWW, Vol. III, Section 3.2. Describe the soils on the site.

Attach the required Soils Report as an appendix to the Drainage Design Report.

At a minimum, include the following:

a. Existing ground cover, including pervious and developed areas

b. Drainage through the site and to and from adjacent properties

c. Locate and describe point of discharge from the site

d. State whether the site is located in a Diking District

e. Describe streams, rivers, ponds, ravines, gullies, steep slopes, springs, and erosion hazards on or downgradient of the site

f. Describe critical areas on the site and those that receive runoff from the site to a minimum of ¼ mile away from the site boundary

g. For agricultural sites with drain tiles, discuss the impact on site drainage

h. Location of or proximity to high groundwater

i. Location of or proximity to aquifer recharge areas or wellhead protection areas

j. Describe known drainage problems such as flooding, erosion

k. Describe location and proximity to structures, basements, property lines, sewers, septic tanks and drain fields, closed or active landfills, and storage tanks, both aboveground and underground

l. Reference and describe any relevant reports or studies such as geotechnical reports on the site or adjacent to it, environmental impact statements, critical areas reports, flood studies, or basin plans. Describe any conditions imposed on the site or development activity by such reports or studies.

m. Describe the soils on the site, using information included in the required Soils Report.

n. Describe the infiltration testing done to assess the feasibility of bioretention and permeable pavement.

o. State the results of the results of testing for saturated hydraulic conductivity, the results of testing for a hydraulic restriction layer, water table elevations, and results of analysis of shallow lateral flow (if needed).

p. If full dispersion is proposed for the site, provide a narrative of the native vegetation survey required in SWMMWW, Vol. III, Section 3.2.

- Attach the survey as an appendix to the Drainage Design Report.

7. Section C – Minimum Requirements Analysis

Following instructions in SWMMWW, Vol. III, Section 3.2 to determine and read the MRs, describe the land-disturbing activity and document the applicable MRs for the project site.

a. Provide a table to document the totals of land-disturbing activities and surfaces on the post-development site in the following categories:

i. The amount of existing hard surface.

ii. The amount of new hard surface.

iii. The amount of replaced hard surface.

iv. The amount of vegetation converted to lawn or landscaping.

v. The amount of native vegetation converted to pasture.

vi. The total amount of land-disturbing activity.

vii. The total amount of PGHS

viii. The total amount of PGPS, not including permeable pavements

ix. The total amount of effective impervious surface

If the site includes multiple TDAs, provide the same information for each TDA and aggregated for the entire site.

b. Document through an approved continuous simulation hydrologic model the increase in the 100-year flood frequency from pre-developed to developed conditions for each TDA.

c. List the proposed commercial or industrial uses of the site, if any.

d. Based on the information above and on an understanding of the MRs:

i. List the TDAs that must meet the on-site stormwater management requirements listed in MR 5.

ii. List the TDAs that must meet the water quality requirements listed in MR 6.

iii. List the TDAs that must meet the flow control requirements listed in MR 7. List which, if any, are also Flow Control Exempt.

iv. List the TDAs that must meet the wetlands protection requirements listed in MR 8.

v. List the TDAs that must meet the pollutant source control requirements listed in MR 3.

8. Section D – On-Site Stormwater Management Selection and Sizing (MR 5)

Describe how the site meets the requirements of on-site stormwater management listed in MR 5.

Information and calculations in the Drainage Design Report shall support and be consistent with the Site Development Drawings. All on-site stormwater management BMPs shall be shown on the Stormwater Site Development Drawings.

At a minimum, include the following in the Drainage Design Report:

a. Describe the site's suitability for on-site stormwater management.

b. For each TDA, state whether MR 5 is being met using List #2 or the LID Performance Standard.

c. Provide a narrative describing how the project will fulfill the requirement for on-site stormwater management (MR 5) to the extent feasible.

d. List total area of native vegetation retained.

e. List the on-site stormwater management BMPs selected.

f. Show an illustrative sketch of the on-site stormwater plan.

g. Describe site suitability, including soils, slopes, infiltration rate, and native vegetation, as applicable, for each on-site stormwater management BMP.

h. Describe how design criteria will be met for each on-site stormwater management BMP.

i. Describe specifications for amending disturbed soils in accordance with BMP T5.13.

j. Summarize proposed ownership of on-site stormwater management BMPs. [Additional details to be provided in the Long-Term Stormwater Site Management Plan.]

<u>If Using List #2</u>

k. Provide justification and documentation, if needed, for any determination that an on-site stormwater management BMP is infeasible. The only acceptable infeasibility criteria are found in the SWMMWW. Site-specific information is required.

If Using the LID Performance Standard

l. Show calculations for impervious surface reduction credits for retained or newly planted trees, if any.

m. If full dispersion or full downspout infiltration are proposed, describe how BMP designs meet requirements allowing removal of the associated drainage areas from computer model input.

n. Complete a detailed hydrologic analysis for existing and developed site conditions, in accordance with the requirements of SWMMWW, Vol. III, Section 2, using an approved continuous simulation hydrologic model. Compute pre-developed and developed flow durations for all TDAs. Provide an output table from the continuous flow model, including the following:

   i. Flow rates for the 2, 10, and 100-year, 24-hour storm return periods for pre- developed and developed conditions.

   ii. A table listing the pass/fail rates for each flow level where duration statistics were calculated.

   iii. A graph showing the flow rate on the y axis and percent time exceeding on the x axis for pre-developed conditions and post-developed mitigated conditions, from 8% of the 2-year through the 50% of the 2-year flow rate.

o. Provide the electronic computer model input and output files on a CD or a USB flash drive. [Note: the media will not be returned.]

If Using Bioretention

p. Describe the bioretention soil mix specifications.

If Using Permeable Pavement

q. Show supporting design calculations showing adequate infiltration rates to accommodate flows from all surfaces directed to the permeable pavement.

r. Base material gradation.

s. Asphalt or concrete mix design and void calculations.

t. Acceptance test procedures.

9. Section E – Runoff Treatment Analysis and Design

Describe how the site meets the requirements for runoff treatment listed in MR 6. Provide a separate analysis for each TDA required to meet MR 6.

Information and calculations in the Drainage Design Report shall support and be consistent with the Stormwater Site Development Drawings. All runoff treatment facilities shall be shown on the Stormwater Site Development Drawings. A detail drawing shall be provided in the Stormwater Site Development Drawings for each runoff treatment facility.

At a minimum, include the following in the Drainage Design Report:

a. Document the level of treatment required; list the water quality menus used.

b. Document assumptions about roofs, driveways, and other hard surfaces to be constructed after site development (e.g. in a subdivision)

c. Provide background and description to support the selection of the treatment BMPs being proposed

d. List the BMPs used in the design

e. Show an illustrative sketch of the runoff treatment plan

f. Complete a detailed analysis and design of all proposed runoff treatment system elements, in accordance with SWMMWW, Vol. V. Reference runoff treatment system elements to labeled points shown on the Stormwater Site Development Drawings.

g. Show model printouts, calculations, equations, references, and graphs as necessary to show facilities are designed consistent with the SWMMWW, Vol. V and the minimum volume criteria of MR 6.

h. Summarize the results of the runoff treatment design and describe how the proposed design meets the requirements of the SWMMWW.

i. If bioretention or infiltration below PGHS are used to meet the treatment requirement the runoff model output file must include the volume of water that has been treated through those BMPs.

j. If infiltration is used to meet runoff treatment requirements, document how the facility design and the site's soils meet the Site Suitability Criteria as described in the SWMMWW, Vol. V, Section 5.6.

k. Include and reference in the Appendices all computations, equations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design water quality system elements.

l. Provide the electronic computer model input and output files on a CD or a USB flash drive. [Note: the media will not be returned.]

10. Section F – Flow Control Analysis and Design

Describe how the site meets the requirements for flow control listed in MR 7 and protection of wetland hydrology from MR 8, if applicable. Provide a separate analysis for each TDA required to meet MR 7 and/or MR 8.

Information and calculations in the Drainage Design Report shall support and be consistent with the Stormwater Site Development Drawings. All flow control facilities shall be shown on the Stormwater Site Development Drawings (1.02.H). A detail drawing shall be provided in the Stormwater Site Development Drawings for each flow control facility.

At a minimum, include the following in the Drainage Design Report:

a. Describe the assumptions and site parameters used in determining the pre-development site hydrology, including acreage, soil types, and land covers. Include any maps, exhibits, graphics, and references contributing to the analysis.

b. Identify initial conditions, including stream base flows, beginning water surface elevations, hydraulic or energy grade lines, initial groundwater elevations, beginning storage volumes, and other data or assumptions used to complete the analyses of initial conditions. Reference the sources of information.

c. Document assumptions about roofs, driveways, and other hard surfaces to be constructed after site development (e.g. in a subdivision)

d. Describe use of flow control credits from on-site stormwater management BMPs

e. Reflect the site's suitability for stormwater infiltration for flow control, as described in the Soils Report.

f. Identify and describe geotechnical or other studies and critical areas reports used to complete the analysis and design

g. List the flow control facilities used in the design

h. Show an illustrative sketch of the flow control facilities and their appurtenances and state their storage volumes

i. Describe the approximate location and sizing of each flow control facility

j. Include any bioretention and permeable pavement BMPs to be installed on individual lots by subsequent contractors, if those BMPs contribute to meeting the Flow Control Standard

k. Complete a detailed hydrologic analysis for existing and developed site conditions, in accordance with the requirements of SWMMWW, Vol. III, Section 2, using an approved continuous simulation hydrologic model. Compute pre-developed and developed flow durations for all TDAs.

Provide an output table from the continuous flow model, including the following:

i. Flow rates for the 2, 10, and 100-year, 24-hour storm return periods for pre- developed and developed conditions.

ii. A table listing the pass/fail rates for each flow level where duration statistics were calculated.

iii. A graph showing the flow rate on the y axis and percent time exceeding on the x axis for pre-developed conditions and post-developed mitigated conditions, from 50% of the 2-year through the 50-year flow rate.

iv. Include models and calculations demonstrating protection of wetland hydrology in accordance with MR 8, if applicable.

l. Provide a hydraulic analysis of pipes and/or channels that lead to and/or from the outlet structure. The analysis should confirm the capacity of pipes and channels to convey the peak flow rates for the 2, 10, 50, and 100-year return period flow rate with the water surface elevation of the pond at the elevation for those return period flow rates.

m. Include and reference all hydrologic and hydraulic computations, equations, rating curves, stage/storage/discharge tables, graphs, and any other aids necessary to clearly show the methodology and results.

n. Include all maps, exhibits, graphics, and references used to determine existing and developed site hydrology.

o. Summarize the results of the flow control design and describe how the proposed design meets the requirements of the SWMMWW, including MR 7 and, if applicable, MR 8.

p. Identify locations and species of newly planted or retained trees for which impervious surface reduction credits are claimed. Show calculations for impervious surface reduction credits.

q. If full dispersion or full downspout infiltration are used, describe how BMP designs meet requirements allowing removal of the associated drainage areas from computer model input.

r. Attach computer model printouts, calculations, equations, references, and graphs as necessary to show facilities are designed consistent with the SWMMWW, Vol. III and the Flow Control Performance Standard of MR 7.

s. Provide the electronic computer model input and output files on a USB flash drive. [Note: the media will not be returned.]

11. Section G – Conveyance System Analysis and Design

Describe how the site meets the requirements for conveyance from KEDM Sections 2.08, 2.09, and 2.10.

Information and calculations in the Drainage Design Report shall support and be consistent with the Stormwater Site Development Drawings. All conveyances shall be shown on the Stormwater Site Development Drawings. A profile drawing of each proposed conveyance shall be provided with the Stormwater Site Development Drawings. A detail drawing of each catch basin, manhole and/or other structures required to construct the project's conveyance, as shown in the City Standard Plans, shall be provided with the Stormwater Site Development Drawings.

At a minimum, include the following in the Drainage Design Report:

a. An analysis of on-site hydrologic connectivity of surface conveyance channels and pipes and points of concentration

b. An off-site analysis (SWMMWW Vol. I, Section 3.5.3) is required for developments creating more than 25,000 square feet of new impervious surface. For developments creating 25,000 square feet or less of new impervious surface, an off-site analysis may be required depending on the development location, and the condition of the downstream drainage system, as determined by the Director.

c. Describe the upstream contributing basin and any assumptions used to determine the full build-out conditions

d. Identify and discuss initial conditions, including stream base flows, beginning water surface elevations, hydraulic or energy grade lines, beginning storage elevations, and other data or assumptions used to complete the analyses of initial conditions. Reference the sources of information.

e. Describe locations and dimensions of conveyance features

f. Complete a detailed hydraulic analysis of all proposed collection and conveyance system elements and existing collection and conveyance elements, including outfall structures and outlet protection that influence the design or are affected by the proposal, in accordance with KEDM Section 2.08 through 2.10. Identify, compute, reference, verify, summarize, and tabulate the following:

    i. Design flows and velocities and conveyance element capacities for all conveyance elements within the development.

    ii. The 10-year recurrence interval stage for detention facility outfalls. Provide stage-frequency documentation from the approved continuous simulation hydrologic model.

iii. The existing 100-year floodplain elevations and lateral limits for all channels, and no net loss of conveyance or storage capacity from development.

iv. The conveyance system elements to labeled points shown on the Site Development Drawings.

v. The capacity of each conveyance system element to convey design flow and discharge at non-erosive velocities and the capacity of the onsite conveyance system to convey design flows that result from ultimate build-out of upstream areas.

vi. All hydraulic computations, equations, pipe flow tables, flow profile computations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design and confirm the performance of conveyance systems.

vii. The results of system analyses, and how the proposed design meets the requirements of the KEDM.

g. Document approval of the Diking District to discharge to its facilities, if applicable.

12. Section H – Source Control

If the development activity requires source control (MR 3), identify the source control BMPs to be used.

Show any structural source control BMPs on the Stormwater Site Development Drawings, and include all details needed to construct the facility.

13. Section I – Ongoing Operation and Maintenance

Summarize legal instruments needed to guarantee preservation of the drainage system and access for maintenance. List intended ownership and responsibility for operating and maintaining stormwater treatment and flow control facilities and on-site stormwater management BMPs. Describe dedications, tracts, easements, and agreements.

Additional details and attachments shall be included with the Long-Term Stormwater Site Management Plan.

14. Section J – Groundwater Monitoring Program

Where required by the City, a groundwater monitoring program shall be included in the Drainage Design Report. The groundwater monitoring program shall be prepared by a person with expertise in groundwater contamination investigation, prevention, and monitoring and shall clearly describe a comprehensive groundwater testing and evaluation program designed to ensure

compliance with federal and state of Washington laws and the KEDM. The Director will review proposed groundwater monitoring programs on a site-specific basis.

15. Section K – Appendices

Provide a technical appendix that includes all computations completed in the preparation of the Drainage Design Report, together with copies of referenced data, charts, graphs, nomographs, hydrographs, stage-storage discharge tables, maps, exhibits, and all other information required to clearly describe the on-site stormwater management, flow control, and runoff treatment design for the proposed development activity. The format of the technical appendix shall follow as closely as possible the section format of the Drainage Design Report and shall be adequately cross-referenced to ensure that the design may be easily followed, checked, and verified. The technical appendix shall also contain all special reports and studies. Additional required subjects of special reports may include, but are not limited to:

a. Geotechnical
b. Wetlands
c. Floodplains and floodways
d. Groundwater
e. Structural design
f. Fluvial geomorphology (erosion and deposition)

5. Specifications for Long-Term Stormwater Site Management Plan

The Long-Term Stormwater Site Management Plan assures continued operation and maintenance of the site's stormwater management facilities to maintain intended function. The sheet size for the Plan shall be 8.5" x 11". The plan shall comply with the recording standards of the Cowlitz County Auditor.

The Long-Term Stormwater Site Management Plan is a standalone plan that must be understandable by a typical property owner and site operator. It includes illustrative and narrative guidance for locating, operating, and maintaining all elements of the site's stormwater management and drainage strategy.

A. All sections listed below shall be included in each Long-Term Stormwater Site Management Plan. All page numbers of the plan shall be numbered. Attachments shall have page numbers.

1. Cover Sheet

The Cover Sheet shall contain the following items:

a. Name of Plan
b. Project Name
c. Project Number, if a City project
d. Situs Address
e. Applicant's Name and Contact Information
f. Applicant Engineer's Name and Contact Information
g. Date of Submittal

2. Operations and Maintenance Summary

Generally describe the drainage and stormwater management facilities on the site.

Summarize the ownership and operational and maintenance responsibility of the site's drainage and stormwater control features. Describe drainage easements and stormwater tracts, if any. Include all types of on-site stormwater management BMPs used on the site, including retained and newly planted trees, and areas of native vegetation retained for full dispersion. Include treatment and flow control facilities. If MR 3 is applicable, include a summary of pollutant source control measures.

If the site is a subdivision, and if on-site stormwater management BMPs to be located on individual lots contribute to meeting MR 6 or MR 7, then include those BMPs in the summary.

The summary shall be consistent with the attachments that describe ownership and operation and maintenance in detail.

3. Stormwater Improvement Restrictive Covenants

Attach a copy of the Stormwater Improvement Restrictive Covenant required by KEDM Section 2.21.C.

4. Site Stormwater System Manual

Attach the Site Stormwater System Manual, which describes ongoing operation and maintenance of the storm drainage system, required by KEDM Section 2.21.D(1).

5. Individual Lot Operation and Maintenance Instructions

If the site is a subdivision or short subdivision, prepare, but do not attach, simplified maintenance instructions for on-site stormwater management BMPs on individual residential lots as required by KEDM Section 2.21.D(2) for each

lot. These documents shall be recorded with the Stormwater Improvement Restrictive Covenant for each lot.

Write "See recorded Stormwater Improvement Restrictive Covenant for each lot" in this section of the plan.

If the site is not a subdivision, write "N/A" in this section of the plan.

6. Pollution Source Control Plan

If MR 3 is applicable to the site, describe the applicable source control BMPs as described in the SWMMWW, Vol. IV.

7. Inspection

Inspection checklists and logs shall be included in the Management Plan and shall be used to guide and record the site inspections. The checklists and logs shall be provided to the Director on the schedule established by the Stormwater Improvement Restrictive Covenant.

6. Specifications for Construction Stormwater Pollution Prevention Plan

The Construction Stormwater Pollution Prevention Plan (C-SWPPP) describes the operational practices and structural BMPs that prevent erosion on construction sites and prevent sediment from leaving sites and entering into the drainage system.

Submit a C-SWPPP prepared in accordance with the SWMMWW, Vol. II, Section 2. BMPs shall be selected from the SWMMWW, Vol. II, Section 3.

A. At the minimum include the following:

1. Narrative meeting the requirements of SWMMWW, Vol. II, Section 2.4

2. Drawings meeting the requirements of SWMMWW, Vol. II, Section 2.4

2.06 Setbacks

Setbacks for stormwater facilities and on-site stormwater management BMPs shall be according to Table 2.1 below:

Table 2.1: Stormwater Facility Setbacks

	Structure / Foundation	Sensitive Area[1]	Property Line	Other
On-Site Infiltration BMP (serving <5,000 sf)	10’	10’	10’	See applications, limitations, suggested setbacks, and infeasibility criteria for each BMP in SWMMWW Vol. V.
Site Dispersion BMP Device (e.g. dispersion trench)[2]	5’	10’	5’	See applications, limitations, suggested setbacks, and infeasibility criteria for each BMP in SWMMWW Vol. V.
Large Infiltration Facility (serving >5,000 sf)	100’, if building is downslope; 20’ if building is upslope	20’ (from buffer)	20’	See Site Suitability Criteria in SWMMWW Vol. V, Section 5.6. If the facility is bioretention or permeable pavement, also see infeasibility criteria for each BMP in Vol. V.
Detention Facility	20’	20’ (from buffer)	20’	See suggested setbacks for each type of detention facility in SWMMWW Vol. V.
Water Quality Facility (e.g. bioswale)	20’	10’	20’	See setbacks for runoff treatment facilities in SWMMWW Vol. V.

[1] Given setbacks to sensitive areas may be used when no specific setback is given in KMC 17.26.
[2] Setback is from the dispersion device, not from the flowpath. Flowpath may not enter an adjacent property.

2.07 Infiltration

A. Infiltration facilities must comply with Ecology’s Underground Injection Control (UIC) program, the Washington Department of Health’s (DOH’s) Wellhead Protection Program and other regulatory protections.

2.08 General Conveyance Requirements

A. Conveyance, collection, culvert, and bridge design shall accommodate the entire contributing drainage area projected under full build-out conditions and not adversely affect existing downstream conveyance elements and flow conditions.

B. Natural drainage flow routes to streams and wetlands shall be maintained, and discharges from the site shall occur at the natural location(s) and elevation(s), to the maximum extent practicable. See MRs 4 and 8.

C. Vegetated open-channel conveyance is preferred and should be used wherever feasible and reasonable.

D. Outfalls shall enter creeks or drainage channels perpendicular to the channel or angled downstream. Outfalls shall use energy dissipation to prevent erosion of the existing

bank and/or channel bottom during the 100-year, 24-hour design storm in accordance with MR 4 Supplemental Guidelines. Energy dissipation shall be designed in accordance with SWMMWW Vol. V, Section 1.4.3, Outfall Systems.

E. Storm drain conveyance systems shall be installed in accordance with the Kelso Standard Plans (see Appendix A) and the current WSDOT Standard Plans and Specifications for Road, Bridge, and Municipal Construction, with the notations as provided in this Chapter.

F. Discharge to a diking district facility requires the diking district's approval.

G. Any standard engineering methodology may be used to design closed conduit and open conveyance systems.

H. Closed conduit systems shall be designed in accordance with KEDM Section 2.09.

I. Open conveyance systems shall be designed in accordance with KEDM Section 2.10.

2.09 Closed Conduit Systems

A. Design Requirements

1. The 25-year, 24-hour storm shall show free-flowing conditions through the proposed and/or existing conveyance system.

2. The 100-year, 24-hour storm may overtop the conveyance system, provided:

   a. The additional flow shall not extend beyond one-half of the width of the outside lane of the traveled way and shall not exceed a 4-inch depth at the deepest point, and

   b. Waters do not rise to elevations more than one foot below that of the lowest aboveground floor of buildings.

3. Backwater Analysis. At the discretion of the Director, a backwater analysis shall be conducted to determine the hydraulic grade line to ensure a minimum of 1.0-foot freeboard between the water surface and the top of any manhole or catch

4. Pipe. All storm pipes shall be constructed of smooth interior pipe including bell & spigot joints with gaskets and shall be subject to air testing.

   a. Alternate Materials. Where required for strength, such as for shallow bury (less than 24 inches to top of pipe), Class 52 ductile iron pipe shall be used. Other pipe materials may be used if approved by the Director.

   b. Location (Tracer) Wire. Non-conductive pipe shall be laid with warning tape and location wire.

5. Size. The minimum pipe size within the public right-of-way shall be 12 inches unless otherwise approved by the City Engineer. Storm laterals from private drains to inlets may be 6 inches and shall have a cleanout installed at the property line.

6. Velocity. All storm drains shall be on a grade which produces a mean velocity when flowing full of at least three fps, unless prohibited by site conditions. The Director may waive this minimum where existing drainage systems make it impractical to meet the standard.

    a. If velocities exceed 15 fps during the 25-year storm, anchors shall be provided at bends and junctions.

    b. Velocities in pipes other than HDPE and iron are limited to 30 fps.

7. Slope. A uniform slope between structures is required for all installed conveyance pipes. The allowable tolerance for sags or bellies in a newly installed pipe shall be 0.5 inches. For slopes steeper than 20 percent, closed conduit systems shall be designed by accepted engineering practices.

8. Minimum separations from storm drains to sewers and water lines shall be as required for sanitary sewers, or as approved by the Director. Storm lines shall be laid higher than sanitary sewers where possible.

9. Pipes over 8 inches in diameter that "daylight" to the surface shall have a protective grate installed that prohibits wildlife and children from entering the storm line. The grate shall be hinged or otherwise designed to allow for cleaning and to reduce accumulation of debris from behind the grate.

B. Alignment and Cover

1. All changes in pipe direction, slope, size and junctions shall be made at a manhole or other City approved structure.

2. Storm drain lines shall not be curved between structures unless approved by the Director.

3. Unless otherwise approved by the Director, a minimum cover of 36 inches of cover is required above the top of the pipe to the top of the ground surface. There shall be a minimum of one 1-foot separation from the top of pipe to the bottom of the roadway section (e.g. laterals from catch basins).

4. In areas of relatively flat terrain, the design engineer must show that sufficient depth is provided at the boundary of the development to drain the upstream basins.

5. When necessary to locate drains in easements or tracts, the storm drain shall be centered in the easement. However, drains may be offset due to site conditions.

6. The invert elevation of all upstream pipes shall not be lower than the invert elevation of the downstream pipe.

C. Manholes

1. Manholes shall be located at all changes in slope, alignment, pipe size, and at all pipe junctions with present or future storm drains.

2. Manholes shall be spaced no greater than 300 feet apart.

3. Standard manholes are required when rim to crown of pipe elevations exceed four feet, otherwise flat-top manholes shall be used.

4. The manhole cover shall be stamped "STORM."

5. Storm drain manholes shall have a sump at least 1' deep.

D. Collection. Stormwater collection systems shall be designed by accepted engineering practices with the following notes:

1. Catch basins or inlets shall be located in streets at the curb-line to receive stormwater and convey it to the main storm drain.

2. Catch basins or inlets shall be at the following locations, whichever is less, unless otherwise approved by the Director:

   a. Less than 300 feet apart measured along the drainage flow path;

   b. In the tangent section immediately in advance of the curb returns on the upstream side of the intersection;

   c. At all street ends with a descending grade,

   d. At intermediate locations such that gutter flow does not exceed three 3 feet in width or 3 inches in depth, and

   e. Catch basins and inlets shall be used with curb and gutter installations up to 8% in tangential grade. Combination curb inlets shall be used for steeper grades and at road "low points."

3. Catch Basins, inlets, and manholes with grates, shall be stamped on the top or on the top of the curb next to the catch basin or inlet, "Dump no Pollutants - Outfall to Stream," or equivalent.

4. Catch basins and inlets shall have a sump at least 15 inches below the lowest invert to collect sediment and debris. 5. Herringbone grates shall be used for Type 1, Type 1L, Type 2 catch basins and Combination Inlets, except vaned grates shall be used where the surface slope adjacent to the catch basin exceeds 8%.

2.10 Open Conveyance

A. The **25-year, 24-hour storm** shall show free-flowing conditions through the proposed and/or existing conveyance system. Culverts with contributing drainage areas greater than 200-acres shall be designed to pass the peak runoff from the 100-year design storm.

B. The **100-year, 24-hour** storm may flow at bank-full, provided:

1. Runoff is contained within defined conveyance system elements;

2. The hydraulic grade line does not exceed the elevation of the roadway subgrade, and;

3. Waters do not rise to elevations more than one foot below that of the lowest aboveground floor of buildings and no portions of a building will be flooded.

C. Culverts. Culverts shall be designed in accordance with the current WSDOT Hydraulics Manual. Fish passage culverts shall meet the design criteria specified in the Washington Department of Fish and Wildlife (WDFW) *Design of Road Culverts for Fish Passage*.

D. Backwater Analysis. A backwater analysis (see the King County Surface Water Design Manual for an example) shall be performed if a flow restriction (such as a bridge or culvert) causes flow to rise above normal depth within a channel reach.

E. Side Slopes. Channel side slopes shall not exceed 2:1. Depth, safety, and erosion concerns must be considered with slopes steeper than 3:1.

F. Freeboard. Channels designed for 25-year storm flows of 10 cubic feet per second (cfs) or less shall have at least 0.5 feet of freeboard, and 1.0 feet for greater velocities.

G. Lining and Armor. Open channels shall be designed to withstand channel erosion and not degrade water quality.

1. Channels with peak velocities less than 5 fps shall be vegetated.

2. Channels with velocities above 5 fps shall be sufficiently armored to the maximum water surface elevation.

3. Channels must be stabilized against erosion at the completion of construction. This may require temporary erosion control practices until the design vegetation is established.

2.11 Private Drainage

A. Drainage Accessibility. Subdivision lots which drain to the rear should be avoided. But, if drainage to the rear of lots is necessary due to topography to collect roof drains, footing drains, and surface run-off, the Developer shall:

1. Provide a recorded stormwater easement for the City inspection of the private system and/or a recorded stormwater easement for any crossing of private property to reach the approved point of discharge in favor of the upstream landowner.

2. Design and install the system to meet the Uniform Plumbing Code requirements.

B. Stormwater easement geometry shall be in accordance with KEDM Section 2.16.

2.12 Subsurface Drainage

Underdrains shall be provided at the following locations:

A. For all existing springs and underdrain pipe intercepted during construction.

B. Where high ground water exists or when it is necessary to reduce the piezometric surface to an acceptable level to prevent land slippage or under-floor flooding of buildings.

C. The drainage line installed shall begin at a cleanout and terminate at an approved point of discharge.

2.13 Curb Drains and Perforated Connections

A. When downspouts and footing drains must be connected to the private or public storm sewer systems, perforated connections (SWMMWW Vol. V, Section V-4) from the home to the property line or curb are required where feasible in accordance with MR 5.

B. Drainage from residential roofs and footings may drain directly to a street via a curb drain under the following circumstances:

1. If the project is subject to MR 5, MR 5 must be satisfied for roofs;

2. Perforated connections are used and designed in accordance with the SWMMWW.

3. It can be shown that gravity drainage is possible.

4. The existing street is adequately crowned and its drainage system, including curb, gutter, and storm lines, is adequately sized to accept the additional flow.

5. Pressurized outfalls, e.g. sump pumps, shall not be allowed to plume into the street or where they cause standing pools in the gutter, a slip or a vector hazard.

6. For residential redevelopment, historical installation of curb drains are evident in the immediate neighborhood.

7. Perforated connections shall not act as a conduit to discharge groundwater or springs to the storm sewer system.

C. Curb drains will be allowed for residential development and redevelopment as approved by the Director.

D. Curb drains shall not be allowed for new commercial development. Commercial redevelopment may use curb drains as approved by the Director.

2.14 Stormwater Facility Plantings

Vegetated stormwater facilities shall be planted as described in this section.

A. Bioretention BMPs and Rain Gardens within a City right-of-way shall:

1. Meet the planting plan requirements of KEDM Section 3.19 and;

2. Be planted in accordance with KEDM Section 3.19.

B. There are two options for planting Bioretention BMPs and Rain Gardens on private property or within a stormwater tract dedicated to the City.

1. Optional Schematic Rain Garden Planting Plan and Worksheet for Private Property.

a. The applicant may elect to use the Optional Schematic Rain Garden Planting Plan and Worksheet for Private Property to develop the planting plan.

b. Fill out the worksheet for each Rain Garden, and submit it with the Site Development Drawings (see KEDM Section 1.04.H).

2. 2012 LID Technical Guidance Manual for Puget Sound planting guidance.

a. Develop a detailed planting plan in accordance with the 2012 LID Technical Guidance Manual for Puget Sound.

b. Submit the planting plan with the Site Development Drawings (see KEDM Section 1.04.H).

C. Detention ponds, biofiltration swales and other vegetated stormwater facilities not listed in paragraphs A or B, above, shall be planted in accordance with recommended planting specifications in the SWMMWW.

2.15 Tracts and Easements

A. Stormwater treatment and flow control facilities to be owned by the City shall be located in a City right-of-way or on a storm drainage tract dedicated to the City.

B. Storm drainage conveyances (including watercourses), treatment facilities, flow control facilities, and those on-site stormwater management BMPs used to meet treatment and flow control requirements to be privately maintained shall be located on a drainage easement.

The drainage easement shall grant the City and its representatives the right of entry for the purposes of inspecting and of maintaining, repairing, or restoring storm drainage facilities or BMPs that have not been properly operated and maintained by the property owner. The right shall include the right to charge the property owner for the cost of maintenance, repair, and restoration of BMPs. The right shall include the right to enter a property when the City has a reasonable basis to believe that a violation of this Chapter is occurring or has occurred and to enter when necessary for abatement of a public nuisance or correction of a violation of this Chapter.

C. Stormwater tracts and drainage easements shall be placed on all plats and property deeds and recorded with the Cowlitz County Auditor, after approval by the City.

D. A drainage easement shall not be used for any purpose which would interfere with the unrestricted use of the storm drainage facilities or BMP's. No structures that prevent access are permitted within tracts or easements. Fences crossing tracts shall provide gates of sufficient width to provide access for maintenance, but not less than 10 feet wide.

E. Minimum widths for public easements and/or tracts shall be as follows:

1. Storm lines of all diameters less than ten feet deep: twenty (20) feet, except additional width may be required for pipes larger than thirty-six (36) inches diameter.

2. For pipes ten feet deep and greater, the width of easements shall be equal to or greater than the numerical value of twice the depth of the pipe invert measured from finish grade plus the outside bell diameter of the pipe, but not less than 20 feet.

3. Easement widths for channels with sufficient width to contain the 100-year floodplain line, shall be fifteen feet from the waterway centerline, or ten feet from the top of the recognized bank, whichever is greater. A fifteen-foot-wide access easement shall be provided on both sides of the channel for channel widths greater than fourteen feet at the top of the recognized channel.

4. Where right-of-way (or an easement) is required for access, it shall be a minimum of 15 feet wide and the tract (or easement) shall extend to an acceptable public access location.

2.16 Stormwater Performance Bond

At the discretion of the Director, the Applicant seeking to build a stormwater facility may be required to furnish a stormwater facility performance bond, or equivalent guarantee in lieu of a bond in a form acceptable to the City, in an amount sufficient to cover all costs associated with the construction of the facility. This bond is to secure the installation and performance of the stormwater facilities identified in the approved Stormwater Site Plan. Performance shall include, when applicable, plant establishment, infiltration rate and/or facility drawdown time within parameters established in the design, and all workmanship and materials. The Applicant shall be responsible for any costs incurred by the City to secure performance of the stormwater facilities that are in excess of the amount of the bond.

A. Term of Performance Bond. The stormwater performance bond furnished pursuant to this section, or the unexpended or unobligated portion thereof, shall be released to the Applicant within sixty (60) days of issuance of the final acceptance of the permanent stormwater facilities by the City. A final inspection by the City is required before any performance bond will be released.

B. Partial Release of Bond. The Director shall have the sole discretion to adopt provisions for a partial pro-rata release of the performance bond on the completion of various stages or phases of development.

C. Bond Estimation. The Applicant shall be responsible for determining bond value and submitting the estimation to the Director for approval. If the Director disagrees with the applicant's estimate, the Director shall determine a reasonable estimate. The bond value for public and private facilities shall be 125 percent of the estimated cost for the City to construct the stormwater features and achieve final stabilization.

2.17 Stormwater Maintenance Bond

A. Stormwater Maintenance Bond. The Applicant seeking final acceptance of a stormwater treatment and/or flow control facility for public ownership shall be required to furnish a maintenance bond, or equivalent financial guarantee in a form acceptable to the City, in an amount sufficient to cover costs associated with maintenance or repair in the event the stormwater facility does not meet the maintenance standards of the manufacturer, the SWMMWW, the KEDM, and/or the approved operation and maintenance plan. A finding of deficiency in facility condition shall be based on inspection. For vegetated facilities, a finding of deficiency shall be made if plant survival after two years is less than 90% of the approved design. This bond is to secure the maintenance and repair of the stormwater facilities identified in the approved stormwater site plan. The Applicant shall be responsible

for any costs incurred by the City to bring the facility up to maintenance into compliance with approved standards in the event such costs that are in excess of the amount of the bond.

B. Term of Maintenance Bond. The stormwater maintenance bond furnished pursuant to this section, or the unexpended or unobligated portion thereof, shall be released to the Applicant within ninety days of the City inspection conducted on or after two years after the City's final acceptance of the permanent stormwater facilities.

C. Bond Estimation. The Applicant shall be responsible for submitting the estimation of bond value to the Director for approval. If the Director disagrees with the applicant's estimate, the Director shall determine a reasonable estimate. The bond value for public facilities shall be ten percent of the cost to construct the facility.

2.18 As-Built Plans

As-Built Plans. Applicants shall submit as-built plans for all permanent stormwater treatment and/or flow control facilities, including any on-site stormwater management BMPs that are used to meet treatment or flow control requirements, after final construction is completed. The plans must show the final design specifications for all stormwater management facilities, meet the criteria for as-built plans in KEDM Chapter 1, and be sealed by a registered professional engineer.

2.19 Dedication of Facilities

The City will accept a dedication of a stormwater facility, together with necessary easements and appurtenances, upon a determination and acceptance, as provided herein, except that dedications made during the subdivision platting process shall not be subject to the following process:

A. Preliminary Determination by Community Development. Upon receipt by the City of an offer of dedication of a stormwater facility, the Director shall make a preliminary determination that the dedication of the facility is appropriate to protect the public health, safety and general welfare, and furthers the goals of the City's stormwater management program and/or associated watershed plans. Budgetary implications will be a component of the determination. Prior to making a determination, the Director will inspect the facility to determine whether it has been properly maintained and is in good repair, and may condition the recommendation of acceptance on completion of any necessary maintenance items. The Director will forward his/her determination to the City Council.

B. Acceptance by City Council. City Council may reject or accept the offer of dedication by adoption of a resolution. Upon acceptance, the Owner shall record the document dedicating the stormwater facility with the Cowlitz County Auditor by and at the owner's sole expense.

C. Owner to Provide Documentation. The Owner, at his or her sole expense, shall provide any document or information requested by the Director and/or the City Council in order for a decision to be reached on whether or not to accept the facility.

2.20 Long-Term Operation and Maintenance

A. Operation and Maintenance Required. All erosion controls and stormwater facilities (including, but not limited to, structural and operational BMPs, on-site stormwater management BMPs, treatment and flow control facilities, catch basins and other protective devices, necessary access routes, and appurtenances) shall be operated and maintained in accordance with the manufacturer's specifications, the SWMMWW, the KEDM, the approved Stormwater Site Plan, and the stormwater maintenance agreement and plan, as discussed below.

B. Responsible Party. The Owner shall be responsible for the proper operation and maintenance of the parcel's stormwater facilities and shall pass such responsibility to any successor owner, unless such responsibility is transferred to the City or to another governmental entity as per KEDM Sections 2.16 or 2.20.

C. Stormwater Improvement Restrictive Covenant. The Applicant shall prepare a Stormwater Improvement Restrictive Covenant that runs with the land for the site (e.g. plat) and for each lot within a subdivision that contains stormwater facilities. Prior to final acceptance of the project, the applicant shall record the covenant(s) with the Cowlitz County Auditor. The Covenant and Long-Term Site Management Plan shall comply with the requirements of the Cowlitz County Auditor's for recording documents. A sample of a Stormwater Improvement Restrictive Covenant is included in Appendix 2-C.

1. Each Stormwater Improvement Restrictive Covenant for the site shall, at a minimum, include the following:

    a. Designate the responsible party permanently responsible for maintenance.

    b. Pass the responsibility for such maintenance to successors in title.

    c. Establish a Stormwater Operation and Maintenance Plan to ensure the continued effectiveness of the stormwater facilities. The specifications of the Operation and Maintenance Plan vary depending on the types of facilities used on the site, as described in KEDM Section 2.21.D.

    d. Restrict the removal and alteration of stormwater and drainage facilities without approval from the City of Kelso.

    e. Grant the City and its representatives the right of entry for the purposes of inspecting all stormwater BMPs and of maintaining, repairing, or restoring BMPs that have not been properly operated and maintained by the property owner. The right shall include the right to charge the property owner for the cost of maintenance, repair, and restoration of BMPs.

f. Require submittal to the City of the preceding year's inspection and maintenance records by January 31st.

2. Each Stormwater Improvement Restrictive Covenant for individual lots, if required, shall include the following:

a. Designate the responsible party permanently responsible for maintenance.

b. Pass the responsibility for such maintenance to successors in title.

c. Describe and illustrative the operation and maintenance of the on-site stormwater management BMPs as described in KEDM Section 2.21.D.

d. Restrict the removal and alteration of on-site stormwater and drainage facilities without approval from the City of Kelso.

D. Stormwater Operation and Maintenance Plan

1. Site Stormwater System Manual. The Applicant shall prepare a Site Stormwater System Manual for treatment facilities (MR 6) and flow control facilities (MR 7), including any on-site stormwater management facilities (MR 5) used to help meet MR 6 or MR 7 requirements.

The manual shall be submitted on 8 1/2" x 11" paper.

The Site Stormwater System Manual shall be customized to the particular facilities used on the site and shall contain at the minimum:

a. An illustrative drawing of all stormwater management facilities, on-site stormwater management BMPs, and conveyances on the site.

b. A narrative description of each facility, what it does, and how it works using language suitable for a non-technical audience such as an owner or maintenance staff.

c. An illustration of each facility.

d. Maintenance tasks and frequencies meeting standards of the SWMMWW.

Pages drawn from the Clark County Stormwater Manual 2015, Book 4, or the City of Olympia 2016 Drainage Design and Erosion Control Manual Appendix IV-J may be used the meet the requirements of items b through d.

e. Sample inspection form/checklist for each facility.

f. Sample maintenance activity log.

g. A prominent notification that the site owner must make the Site Stormwater System Manual and inspection records available for inspection by the City.

h. A prominent notification that the site owner is required to record inspection and maintenance activities and to submit to the City by January 31 documentation of inspections performed during the previous year.

2. Individual Lot Operation and Maintenance Instructions. The Applicant shall prepare simplified operation and maintenance instructions for each on-site stormwater management BMP (MR 5) on an individual lot or commercial site.

   The Individual Lot Operation and Maintenance Instructions shall be customized to the particular facilities used on the lot or site and shall contain at the minimum:

   a. An illustrative drawing of all on-site stormwater management BMPs and conveyances on the site.

   b. A narrative description and maintenance instructions for each BMP on the lot using language suitable for a non-technical audience. The City offers simplified maintenance instruction handouts, which may be used to meet this requirement.

   c. An illustration or design detail of each facility.

   d. If full dispersion is proposed, or if newly planted trees or retained trees were claimed as flow reduction credits, then include a map of trees and vegetation areas to be retained.

E. Maintenance Escrow Requirement

   1. At the discretion of the Director, the Applicant will be required to post a cash escrow, letter of credit, or other acceptable form of performance security in an amount that would cover costs associated with maintenance and repair in the event of stormwater facility failure, at least 10% of the project engineer's estimate to construct the facility, in the event the Director determines that such security is necessary to ensure the facility satisfies the maintenance and performance requirements identified in these Standards and the approved Operation and Maintenance Plan. This instrument is required to be posted prior to completion of construction and release of the Stormwater Performance Bond and remain in place for a minimum of two (2) years.

   2. At the discretion of the Director, the stormwater performance bond may be extended in lieu of the maintenance escrow account.

F. Maintenance Records. The responsible party shall keep records of the BMPs' installation and all subsequent maintenance and repairs, and shall retain the records for at least five (5) years. These records shall be made available to the City within 1 week of inspection or upon request by the City.

2.21 Enforcement

Enforcement shall be consistent with KMC 1.50.

A. Protection of Watercourses and Facilities. It shall be a criminal violation to break, block, damage, destroy, uncover, deface or tamper with any watercourse, stormwater facility, or erosion control system.

B. Public Nuisance Declared. In addition to other remedies, failure to install and/or maintain watercourses, stormwater facilities, or erosion controls as required in KEDM and applicable permits is declared to be a public nuisance, subject to abatement as provided by KMC 1.50.

C. Suspension of Work or Access

1. Access to the municipal stormwater drainage system may be suspended if such termination is needed to abate or reduce an illicit discharge.

2. Work shall be suspended for un-permitted clearing and grading, or for projects that fail to provide required runoff controls for land-disturbing activities. After the stop-work period, the Director may allow work on-site to resume, provided that such work is necessary to ensure compliance with this Manual, permits, or an approved stormwater drainage plan or SWPPP.

3. Resumption of work or reinstatement of connection to the municipal stormwater drainage system, without the prior approval of the City, shall be subject to the civil and/or criminal penalties delineated in KMC 1.50.

D. Financial Liability. The property owner, Applicant, and all persons engaged in development or land-disturbing activity shall be liable, jointly and severally, for all costs incurred by the City in any public nuisance action taken hereunder, or on account of damage or threatened damage to City property or facilities or water bodies, or associated with remedial actions necessitated by the damage or failure to install and/or maintain required stormwater facilities. The City may assess the responsible parties for these costs which shall be a lien on the property, or prorated against the beneficial users of the property, and may be placed on the tax bill and collected as ordinary taxes by the City**.**

Appendix 1: Standard Plans

Standard Plan Index

Title	Standard Plan No.
Standard Storm Drainage, Grading and Erosion Control Plans	
Storm Drain General Notes	SD-000
Curb Inlet	SD-010
Ditch Inlet	SD-020
Area Drainage Basin or Field Inlet	SD-030
Bioretention Planter	SD-040 LID
Bioretention Curb Extension Plan	SD-050 LID
Bioretention Curb Extension Planting Plan	SD-060 LID
Planter Wall	SD-070 LID
Beehive Outlet Structure	SD-080 LID
Trench Drain to Bioretention Facility	SD-090 LID
Inlet/Outlet for Curb Extensions	SD-100 LID
Side Curb Cut	SD-110 LID
Catch Basin Type 1	WSDOT B-05.20-02
Supplemental to WSDOT B-05.20-02	
Catch Basin Type 1L	WSDOT B-05.40-02
Supplemental to WSDOT B-05.40-02	
Catch Basin Type 2	WSDOT B-10.20-02
Supplemental to WSDOT B-10.20-02	
Manhole Type 1	WSDOT B-15.20-01
Supplemental to WSDOT B-15.20-01	
Combination Inlet	WSDOT B-25.20-02
Supplement to WSDOT B-25.20-02	

Title	Standard Plan No.
Rectangular Frame (Reversible)	WSDOT B-30.10-03
Rectangular Vaned Grate	WSDOT B-30.30-03
Rectangular Herringbone Grate	WSDOT B-30.50-03
Circular Frame (Ring) and Cover	WSDOT B-30.70-04
Supplemental to WSDOT B-30.70-04	
Miscellaneous Details for Drainage Structures	WSDOT B-30.90-02
Supplemental to WSDOT B-30.90-02	
Grate Inlet Type 2	WSDOT B-35.40-00
Supplement to WSDOT B-35.40-00	
Welded Grates for Grate Inlet	WSDOT B-40.20-00
Pipe Zone Bedding and Backfill	WSDOT B-55.20-02
Supplemental to WSDOT B-55.20-02	
Connection Details for Dissimilar Culvert Pipe	WSDOT B-60.20-01
Beveled End Sections, Culverts 30” Diameter or Less	WSDOT B-70.20-00
Supplemental to WSDOT B-70.20-00	
Headwalls for Culvert Pipe and Underpass	WSDOT B-75.20-02
Type 2 Safety Bars for Culvert Pipe or Pipe Arch (On Cross Road)	WSDOT B-75.60-00
Supplemental to WSDOT B-75.60-00	
Silt Fence	WSDOT I-30.15-02
Wattle Installation on Slope	WSDOT I-30.30-02

Title	Standard Plan No.
Compost Sock	WSDOT I-30.40-02
Storm Drain Inlet Protection	WSDOT I-40.20-00
Check Dams	WSDOT I-50.20-01
Biodegradable Erosion Control Blanket Placement for Slopes	I-60.10-01
Biodegradable Erosion Control Blanket Placement for Ditches	I-60.20-01
Miscellaneous Erosion Control Details	I-80.10-02

STORM DRAINAGE CONSTRUCTION NOTES

TRACER WIRE SHALL BE INSTALLED ALONG THE TOP OF ALL PIPE. EXTEND THE TRACER WIRE INTO MANHOLES AND ALL OTHER STRUCTURES, THEN UP THE INSIDE WALL OF STRUCTURES AND ATTACH THE WIRE TO THE TOP INSIDE OF THE STRUCTURE. PROVIDE 3 FEET OF COILED TRACER WIRE SLACK ATTACHED TO THE TOP INSIDE OF THE STRUCTURE.

MANHOLES AND TYPE 2 CATCH BASINS SHALL BE ADJUSTED TO GRADE FOLLOWING PAVING. ADJUST TO GRADE USING AN APPROVED FOUR-POINT ADJUSTMENT SYSTEM SUCH AS THE RIMRISER SHIMLESS ADJUSTMENT SYSTEM, OR APPROVED EQUAL.

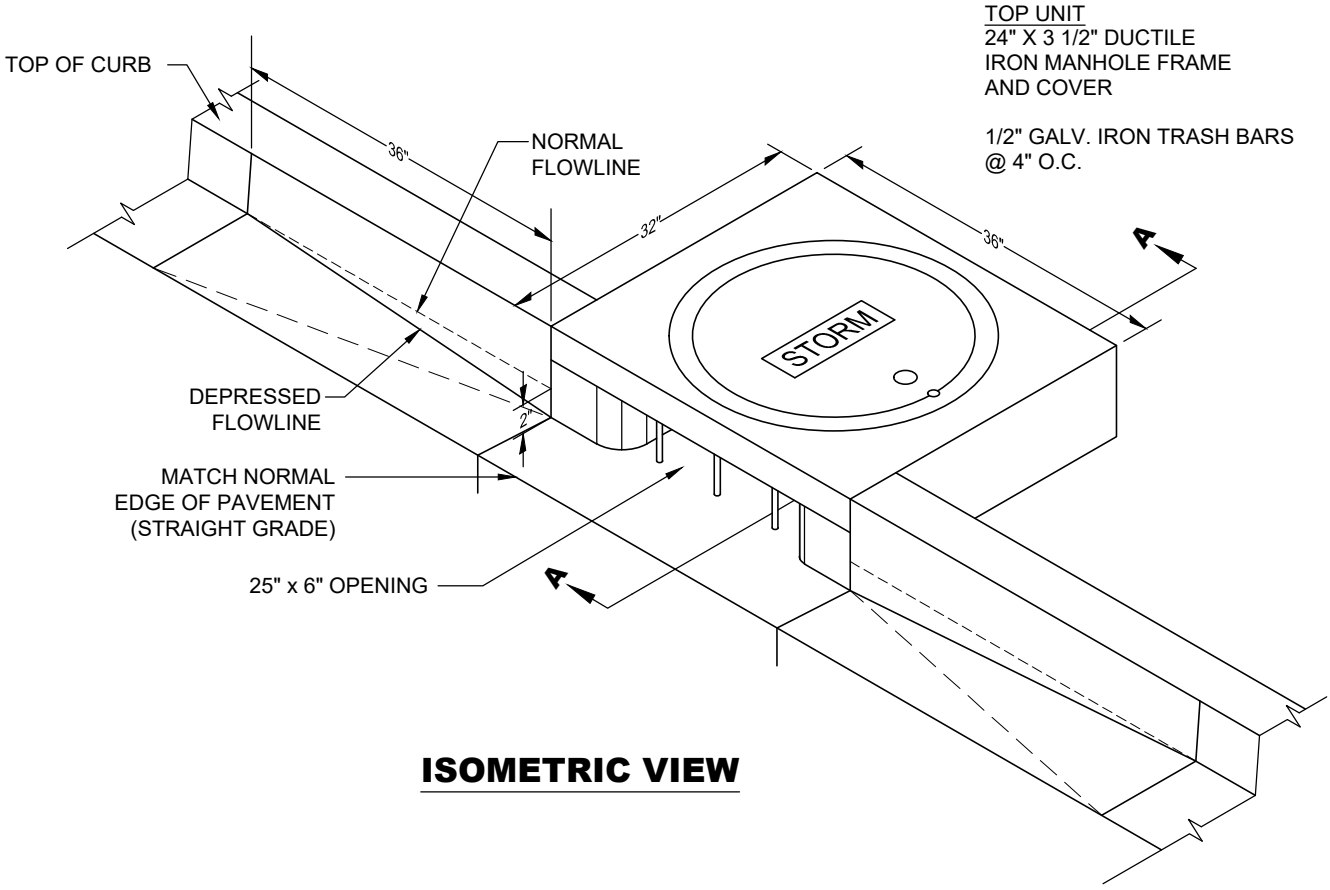
STORM SEWERS AND APPURTENANCES SHALL BE CLEANED, AIR TESTED AND DEFLECTION TESTED AFTER BACKFILLING. THE LOW PRESSURE AIR TEST METHOD SHALL BE USED. TV INSPECTION SHALL BE PERFORMED AFTER CLEANING, TESTING AND CORRECTIONS ARE COMPLETE. CLEANING, AIR TESTING, INFILTRATION TESTING, DEFLECTION TESTING, AND TV INSPECTION SHALL BE COMPLETED PRIOR TO PAVEMENT RESTORATION OF THE TRENCH. AN ELECTRONIC COPY OF THE TV INSPECTION VIDEO AND THE TV INSPECTION REPORT SHALL BE PROVIDED TO THE INSPECTOR. TOP LIFT OF PAVING SHALL NOT BE PLACED UNTIL THE INSPECTOR HAS APPROVED THE TV INSPECTION.

ALL MANHOLES SHALL BE WATERTIGHT. FOLLOWING BACKFILL AND PRIOR TO FINAL PAVING, PERFORM VACUUM TESTING ON MANHOLES PER THE REQUIREMENTS OF THE SUPPLEMENT TO STANDARD PLAN B-15.20-01.

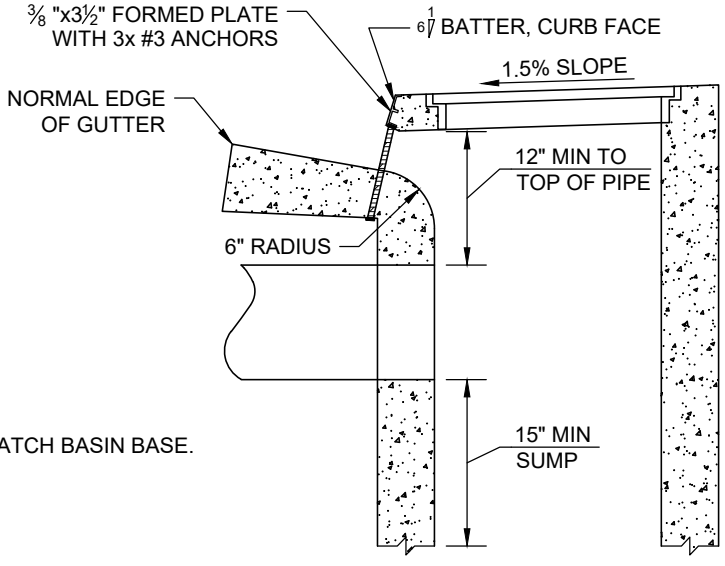
AS-BUILT DRAWINGS AND TV REPORTS SHALL BE PROVIDED PRIOR TO FINAL ACCEPTANCE.

N.T.S.

Kelso WASHINGTON	**STORM DRAIN GENERAL NOTES**	STANDARD PLAN NO. **KSD-000-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



ISOMETRIC VIEW



NOTE:

TO BE USED WITH TYPE 1 CATCH BASIN BASE.

SECTION A-A

N.T.S.

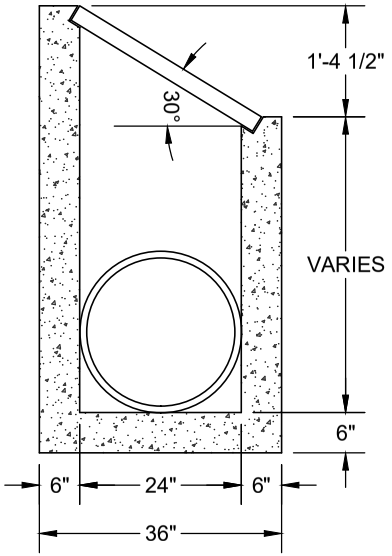
Kelso WASHINGTON	**CURB INLET**	STANDARD PLAN NO. **KSD-010-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

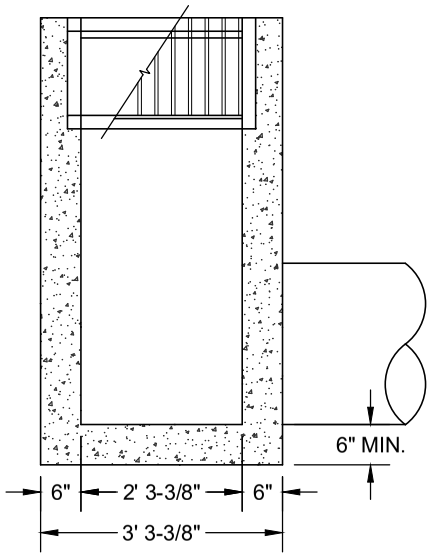
CITY ENGINEER APPROVAL: Michael Kardas, P.E.

X _____

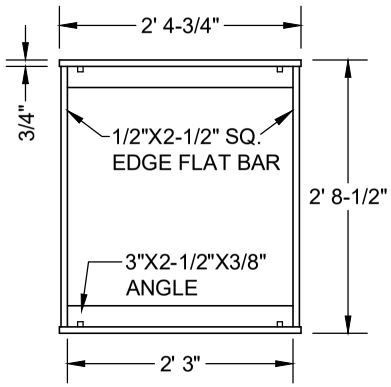
DITCH INLET



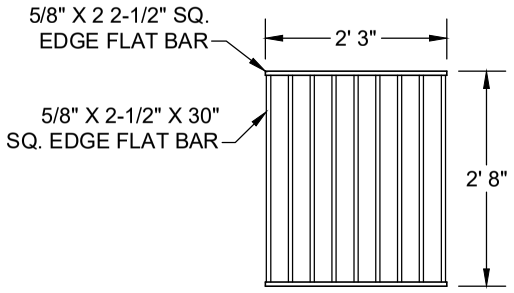
SECTION A-A



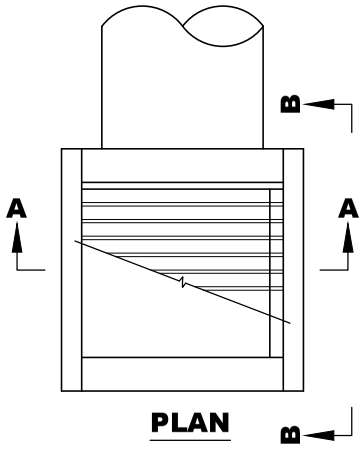
SECTION B-B



FRAME PLAN



PLAN



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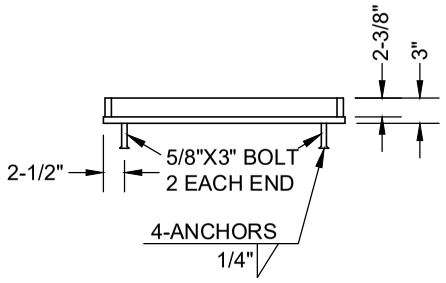
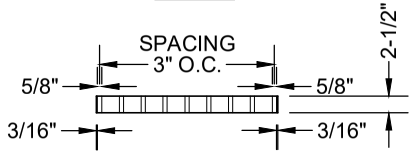


FRAME SECTION

NOTE:
3/16" CROSS BARS SHALL BE FLUSH WITH THE GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.



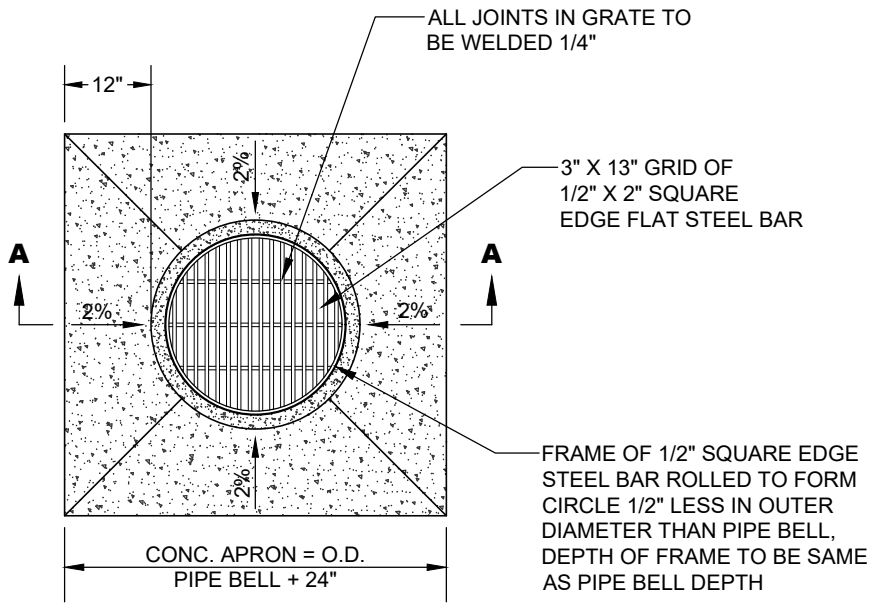
GRATE SECTION
TYPE 1

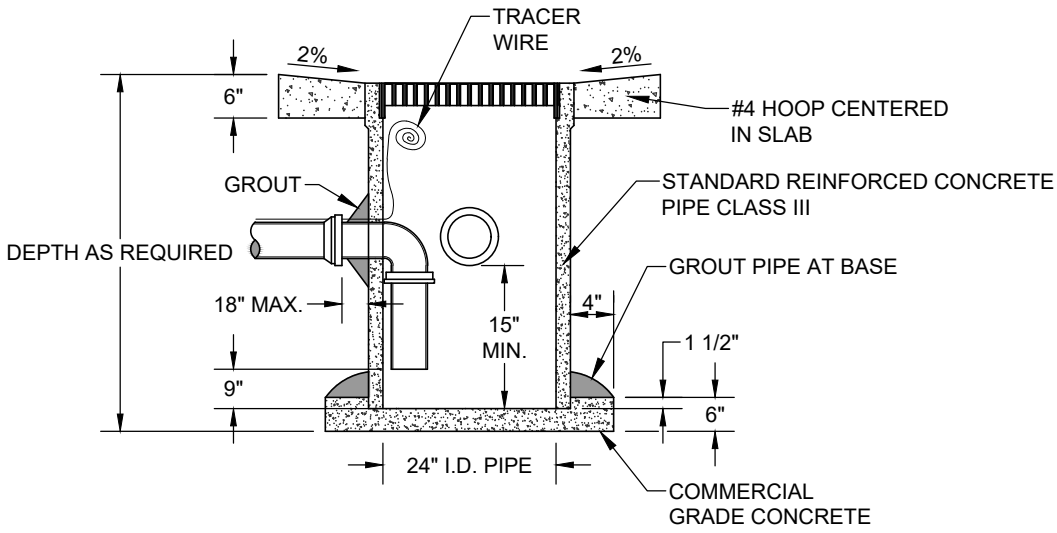
NOTES:

1. CONCRETE SHALL BE COMMERCIAL GRADE.
2. CATCH BASIN, FRAME & GRATES SHALL MEET H20 LOADING.
3. INSIDE FRAME DIMENSIONS: 2' 3-3/8" X 2' 8-1/2".
4. GROUTING SHALL BE SUFFICIENT TO PREVENT LEAKS BETWEEN THE PRECAST COMPONENTS OF THE COMPLETED STRUCTURE & SHALL BE PERFORMED INSIDE, BETWEEN & OUTSIDE OF ALL RISERS, JOINTS & PIPE PENETRATIONS.
5. ALL RISERS OR ADJUSTMENT SECTIONS SHALL BE THE SAME INSIDE DIMENSIONS AS BASE SECTIONS.

STANDARD PLAN NO.
KSD-020-21
DATE:
MAY 2021

N.T.S.





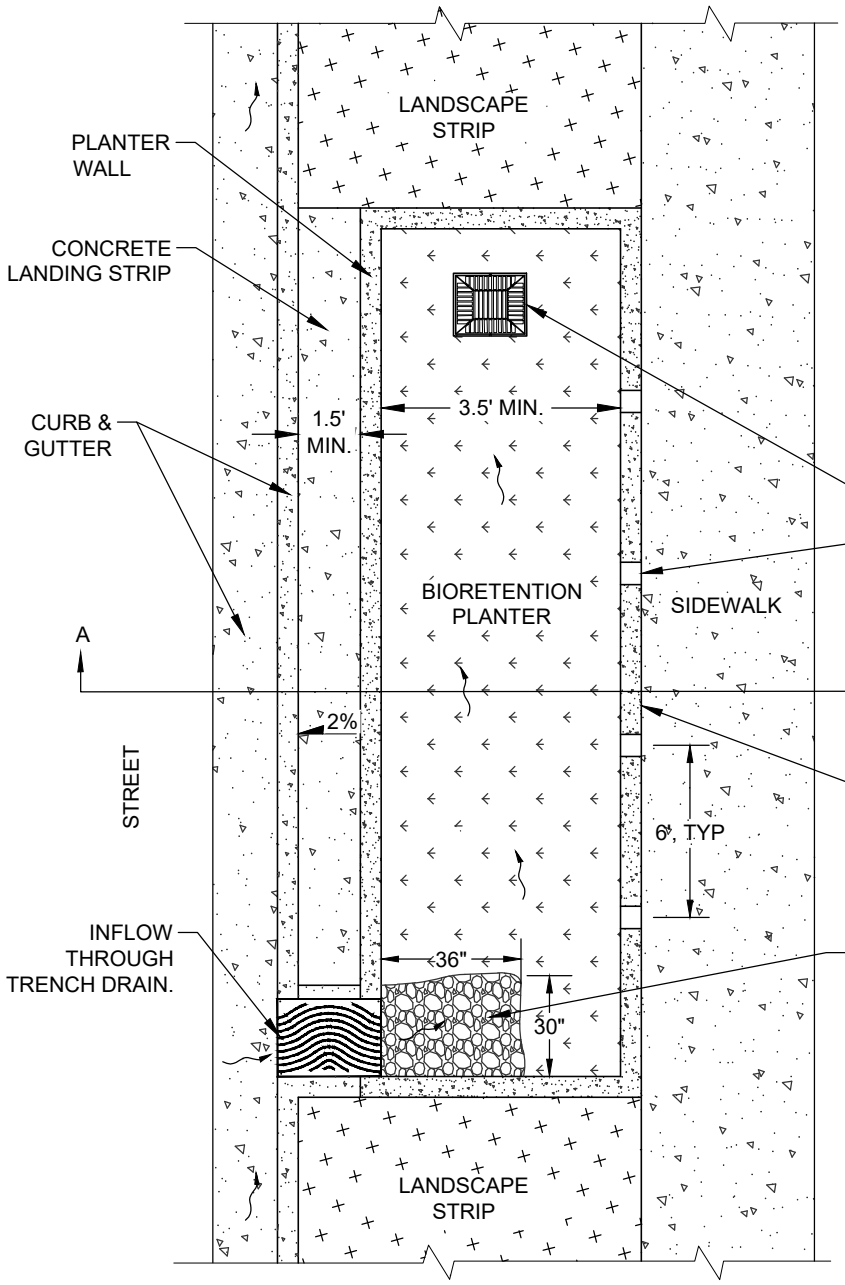
SECTION A-A

NOTES:

1. GRATES SHALL BE CONSTRUCTED FOR BICYCLE SAFETY.
2. PRECAST CONCRETE CATCH BASINS MAY BE USED WHEN SPECIFIED OR APPROVED. PLASTIC BASINS MAY BE USED WHEN APPROVED.
3. NOT FOR USE IN VEHICULAR TRAFFIC AREAS.
4. ANCHOR VERTICAL LEG OF INLET PIPE IF NOT A GLUED JOINT.

N.T.S.

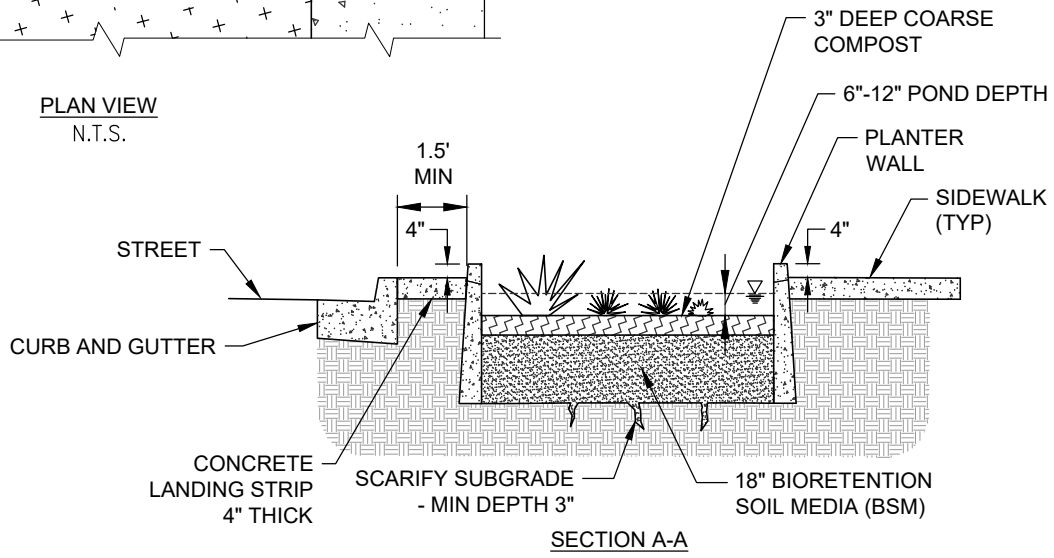
Kelso WASHINGTON	**AREA DRAINAGE BASIN OR FIELD INLET**	STANDARD PLAN NO. **KSD-030-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



PLAN VIEW
N.T.S.

NOTES:

1. SIDEWALK ELEVATION SHALL BE SET A MINIMUM OF 2" ABOVE INLET ELEVATIONS
2. EXISTING UTILITY LINES SHALL BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES SHALL NOT BE LOCATED IN THE FACILITY.
3. LONGITUDINAL SLOPE OF PLANTER SHALL MATCH THE ROAD.
4. ADDITIONAL TRENCH DRAIN INLETS TO BE ADDED AS NECESSARY TO MEET FLOW SPREAD CRITERIA AND FULL STORMWATER CAPTURE.
5. INSTALL OPENINGS IN PLANTER WALL EVERY 6' TO ALLOW FLOW ENTRANCE.



SECTION A-A
N.T.S.

N.T.S.

BIORETENTION PLANTER

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

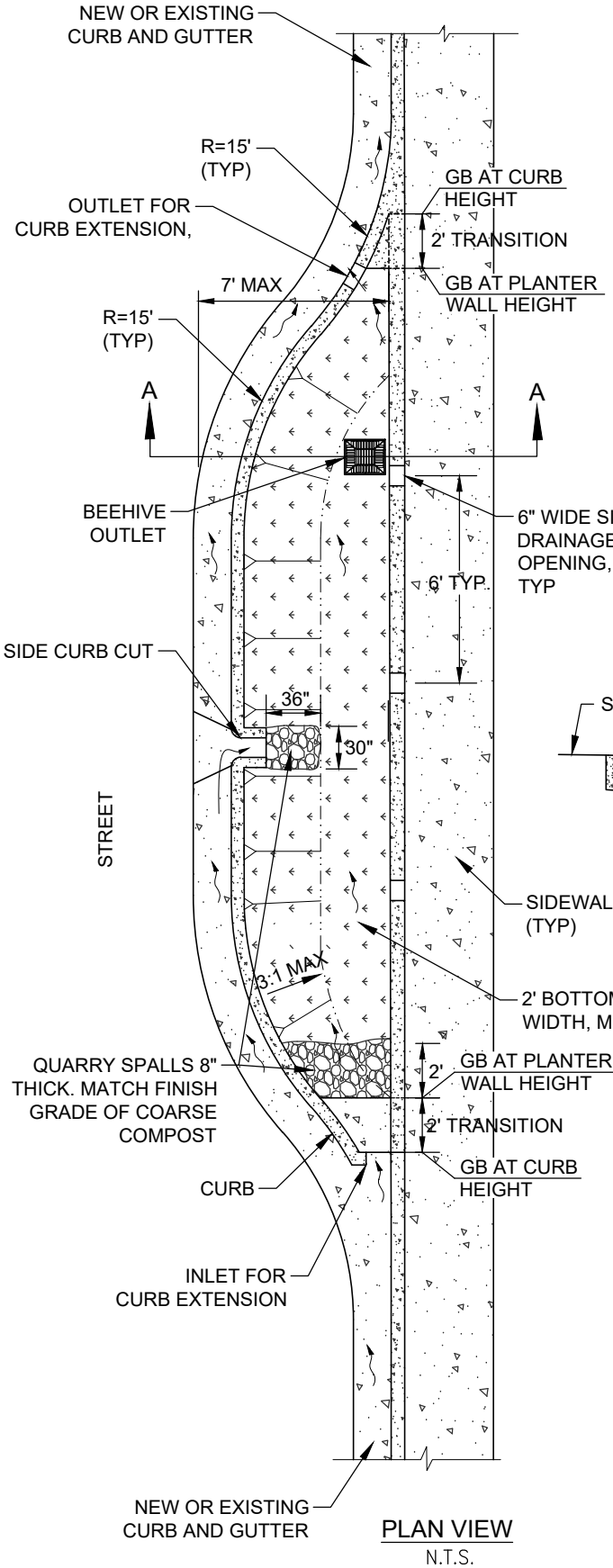
×_____

STANDARD PLAN NO.
KSD-040-21
LID

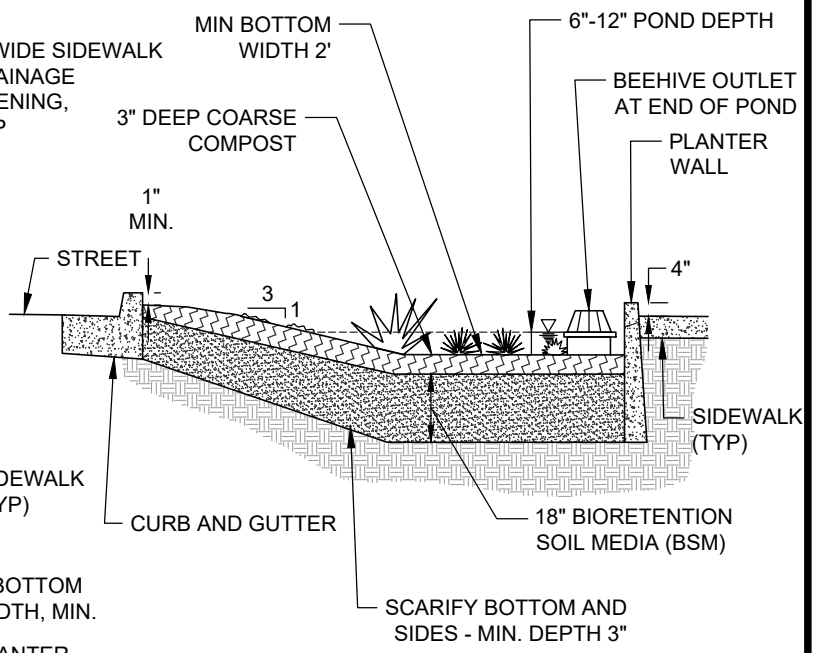
DATE:
MAY 2021

NOTES:

1. SIDEWALK ELEVATION MUST BE SET MIN 2" ABOVE INLET ELEVATIONS.
2. EXISTING UTILITY LINES MUST BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES MUST NOT BE LOCATED IN THE FACILITY.
3. LONGITUDINAL SLOPE OF CURB EXTENSION SHALL MATCH THE ROAD.
4. ADDITIONAL SIDE CURB CUT INLETS TO BE ADDED AS NECESSARY TO MEET FLOW SPREAD CRITERIA AND FULL STORMWATER CAPTURE.
5. INSTALL OPENINGS IN PLANTER WALL EVERY 6' TO ALLOW FLOW ENTRANCE.
6. SET OUTLET ELEVATION 1" BELOW INLET ELEVATION WHILE MAINTAINING GUTTER GRADES. NOTCH CURB AS NECESSARY.



PLAN VIEW
N.T.S.



SECTION A-A
N.T.S.

N.T.S.

BIORETENTION PLANTER, CURB EXTENSION

CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	CITY ENGINEER APPROVAL: Michael Kardas, P.E. ×_____	STANDARD PLAN NO. KSD-050-21 LID DATE: MAY 2021

SECTION ONE: INSTRUCTIONS TO ENGINEER/DESIGNER/HOMEOWNER

FILL OUT PLANT SELECTION AND QUANTITY IN SECTION TWO PER THESE NOTES:

1. CHOOSE PLANT PALETTE A OR B BELOW

2. CALCULATE PLANT QUANTITIES AS FOLLOWS:
   ZONE 1 EMERGENT GRASS: 115 PER 100 SF
   ZONE 2 SHRUBS: 13 PER 100 SF
   ZONE 2 GROUNDCOVER: 20 PER 100 SF
   OPTIONAL BULBS: UP TO 40 PER 100 SF
   OPTIONAL TREE: 1 PER FACILITY

3. NO HEAVY EQUIPMENT SHALL BE USED WITHIN THE PERIMETER OF THE BIORETENTION FACILITY BEFORE, DURING, OR AFTER THE PLACEMENT OF THE BIORETENTION SOIL MIX

PLANTING LEGEND

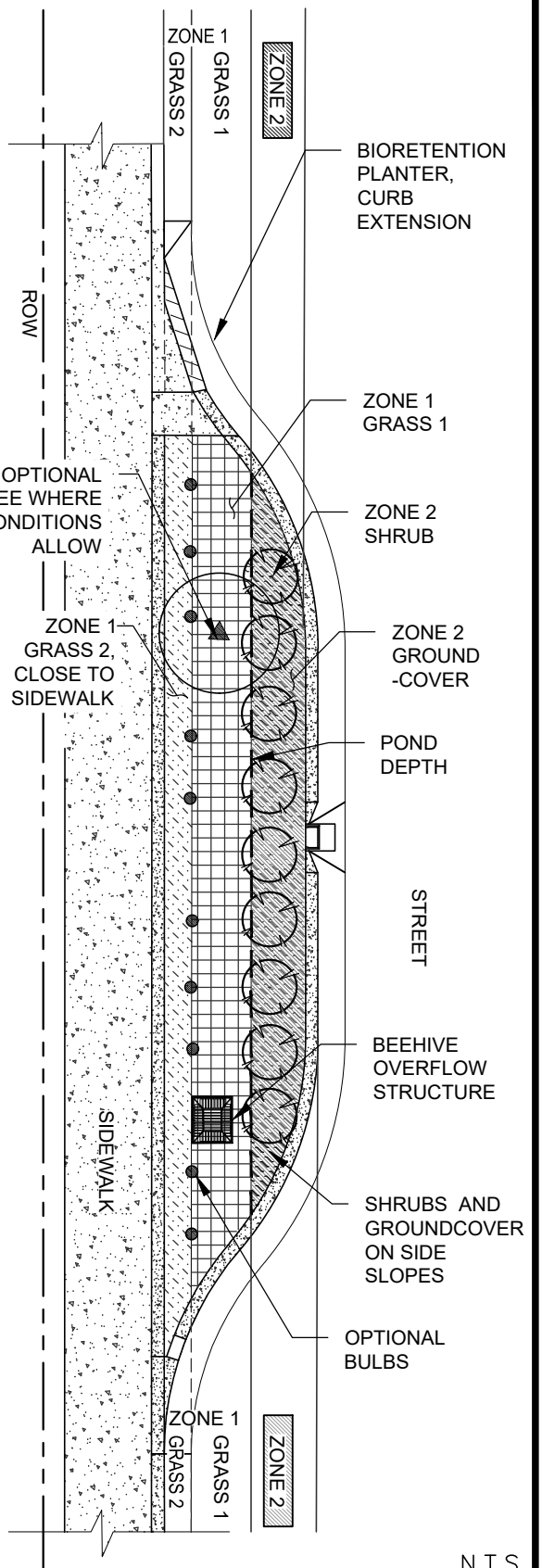
CIRCLE PREFERRED PLANT PALETTE:

	PLANT PALETTE A	PLANT PALETTE B
ZONE 1 GRASS 1 - #1 CONTAINER		
	SLOUGH SEDGE Carex obnupta	SPREADING RUSH Juncus patens
ZONE 1 GRASS 2 (CLOSE TO SIDEWALK) - #1 CONTAINER		
	DAGGER-LEAF RUSH Juncus ensifolius	ORANGE SEDGE Carex testacea
ZONE 2 SHRUB - #1 CONTAINER		
	KELSEY REDTWIG DOGWOOD Cornus sericea 'Kelseyi'	BIRCH LEAF SPIREA Spiraea betulifolia
ZONE 2 GROUNDCOVER - #1 CONTAINER		
	KINNIKINNICK (BOTH PALETTES) Arctostaphylos uva-ursi	

CIRCLE OPTIONAL PLANTS, IF USED:

GREAT CAMAS LILY / Camassia leichtlinii
(GROUP OF 3 BULBS)

TUPELO / Nyssa sylvatica
(WHERE CONDITIONS ALLOW)



N.T.S.

SECTION TWO: INSTRUCTIONS TO CONTRACTOR
PLANT SELECTION AND QUANTITIES

QUANTITY

ZONE 1 EMERGENT GRASS 1 AREA IN SF: _____
(AREA AT POND DEPTH) _____

ZONE 1 EMERGENT GRASS 2 AREA IN SF: _____ _____

ZONE 2 AREA IN SF: _____

ZONE 2 SHRUBS AT 13 PER 100 SF: _____

ZONE 2 GROUNDCOVER AT 20 PER 100 SF: _____

OPTIONAL BULBS UP TO 40 PER 100 SF: _____

INCLUDE TREE: YES NO (CIRCLE ONE)

BIORETENTION, CURB EXTENSION, PLANTING PLAN

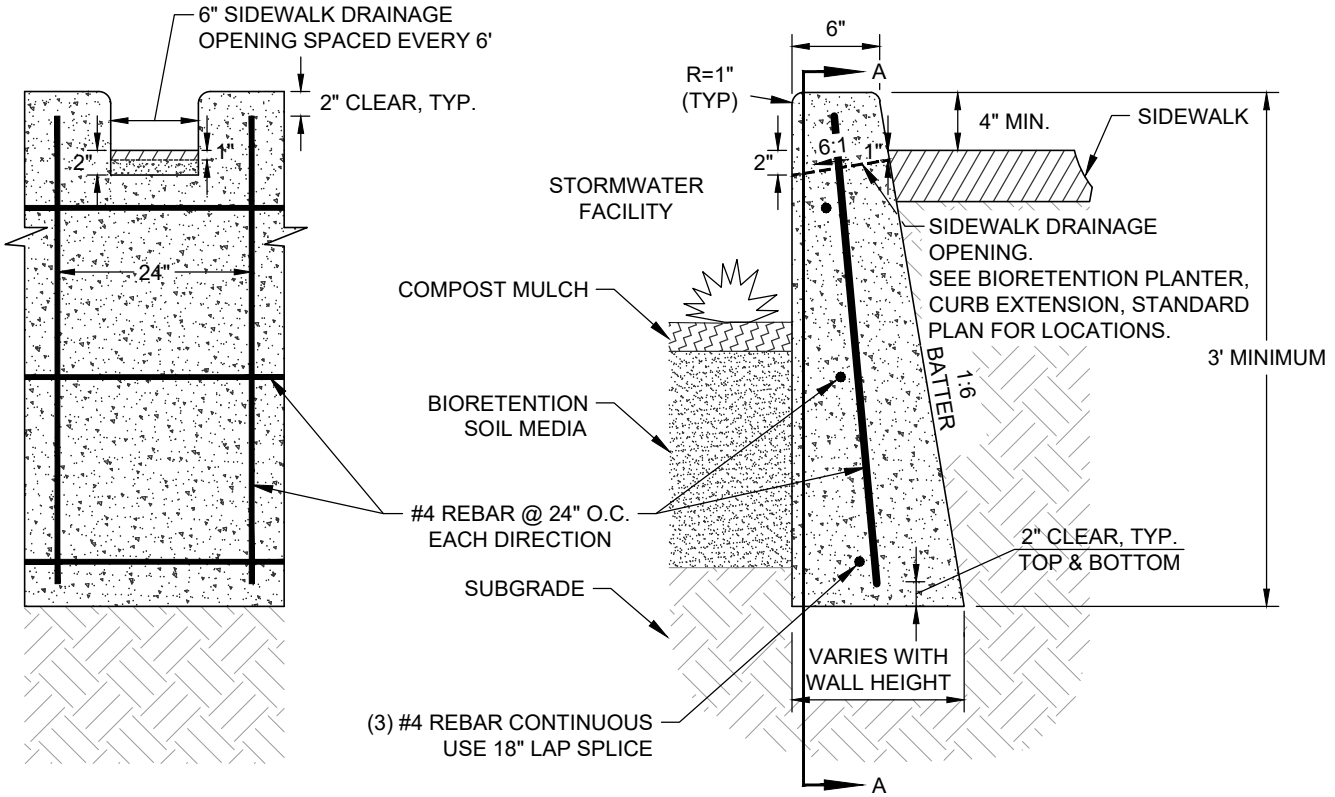
STANDARD PLAN NO.
KSD-060-21
LID

DATE:
MAY 2021

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____



SECTION A-A
N.T.S.

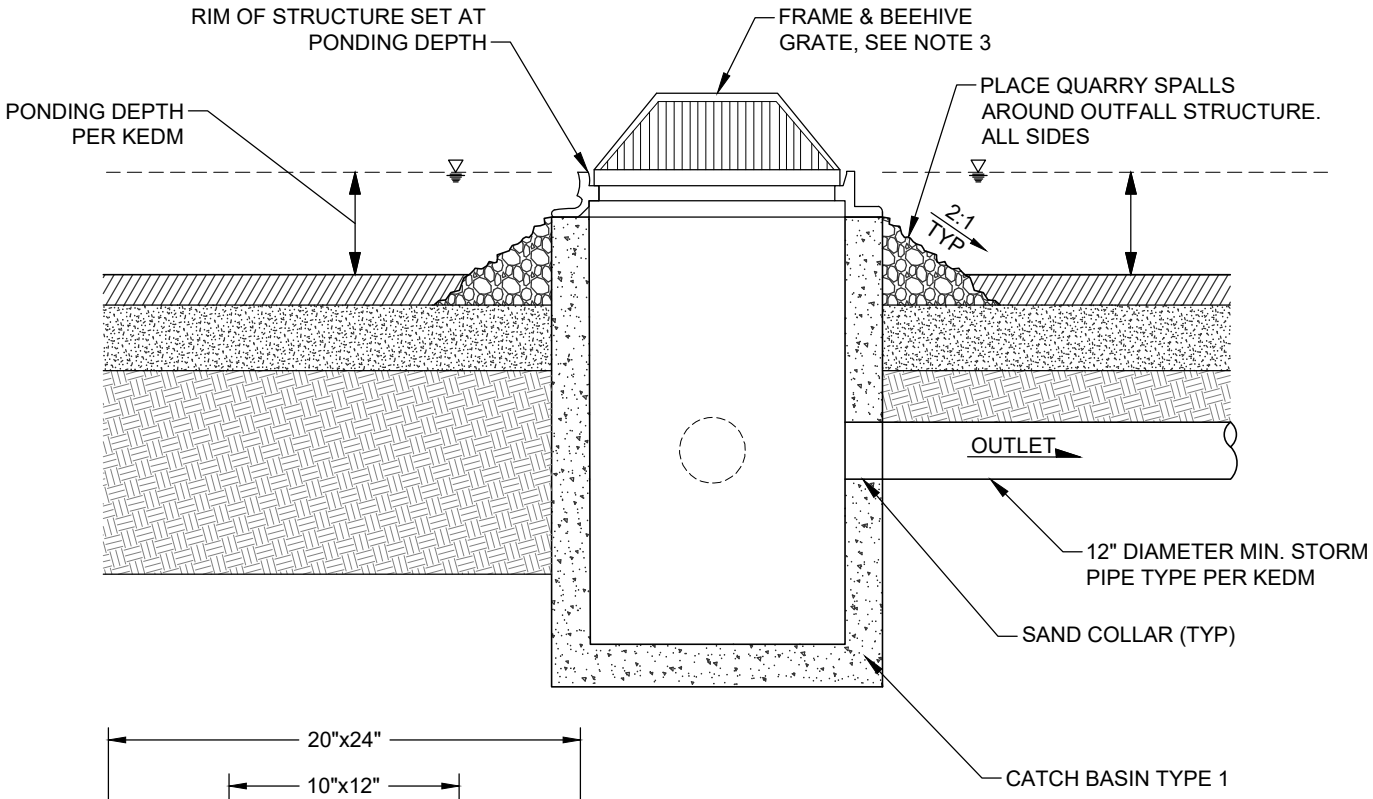
SIDE VIEW
N.T.S.

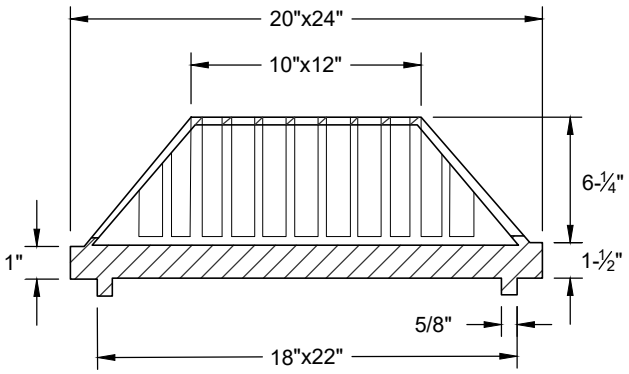
NOTES:

1. SPECIAL DESIGN CONSIDERATIONS OR STRUCTURAL REVIEW MAY BE REQUIRED FOR TALLER PLANTER WALLS. STEEL REINFORCEMENT MAY BE NEEDED FOR STABILITY.
2. MAINTAIN 1:6 BATTER FOR WALLS AND 6" MIN. TO TOP OF CURB.
3. BROOM FINISH ALL EXPOSED CONCRETE SURFACES.
4. PROVIDE CONTRACTION JOINTS AT 10' O.C. ON SIDES AND TOP. JOINT LOCATIONS SHALL MATCH WITH SIDEWALK JOINTS.

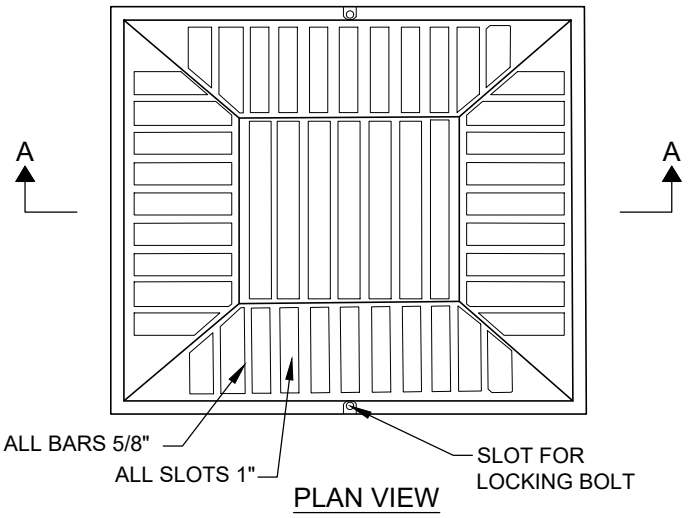
N.T.S.

CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**PLANTER WALL** **CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	STANDARD PLAN NO. **KSD-070-21** **LID** DATE: **MAY 2021**





SECTION A-A
N.T.S.



PLAN VIEW
N.T.S.

NOTES:

1. FRAME AND GRATE SHALL BE LOCKING AND GRATE SHALL BE BOLTED TO FRAME. FRAME SHALL CONFORM TO WSDOT STANDARD PLAN B-30.10-03.
2. OVERFLOW STRUCTURE SHALL BE LOCATED WITHIN 10 FEET OF ROAD EDGE FOR MAINTENANCE ACCESS, UNLESS APPROVED OTHERWISE. OVERFLOW STRUCTURE MAY BE LOCATED IN SIDE SLOPES.
3. FRAME AND GRATE SHALL CONFORM TO WSDOT STANDARD SPECIFICATIONS 9-05.15(2).
4. SPACE PLANTS WITHIN FACILITY TO ALLOW MAINTENANCE ACCESS TO STRUCTURE.

N.T.S.

BEEHIVE OUTLET STRUCTURE

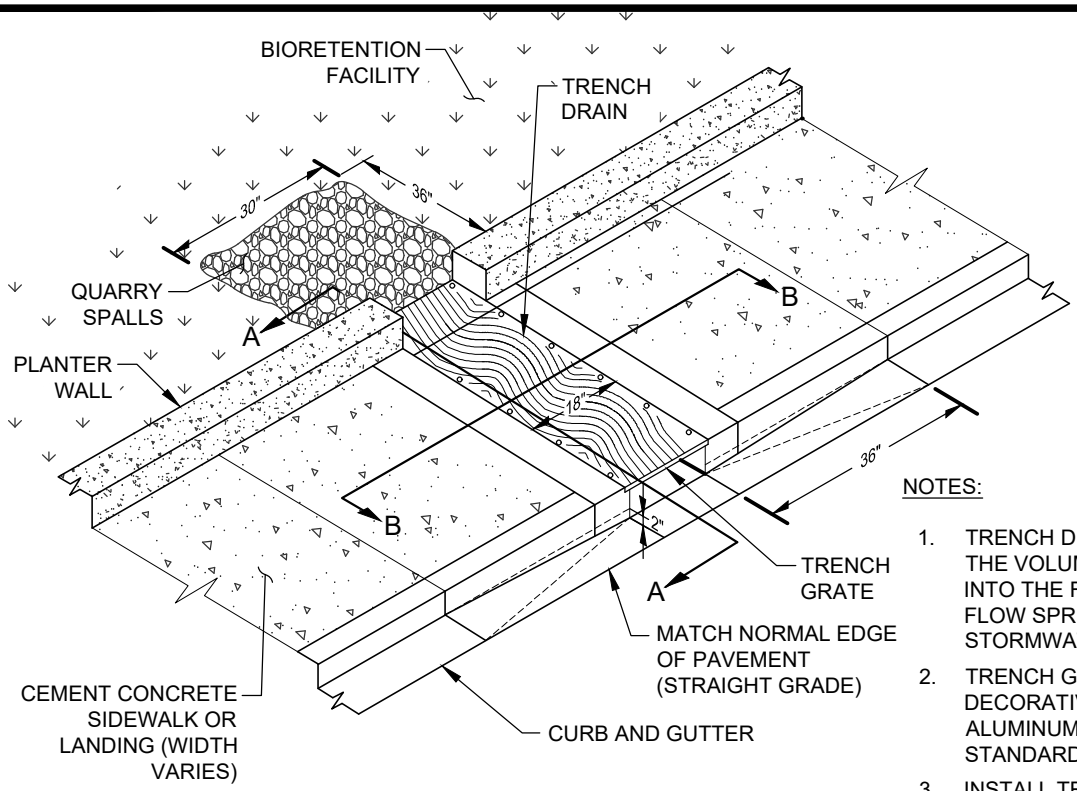
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

STANDARD PLAN NO.
KSD-080-21
LID

DATE:
MAY 2021

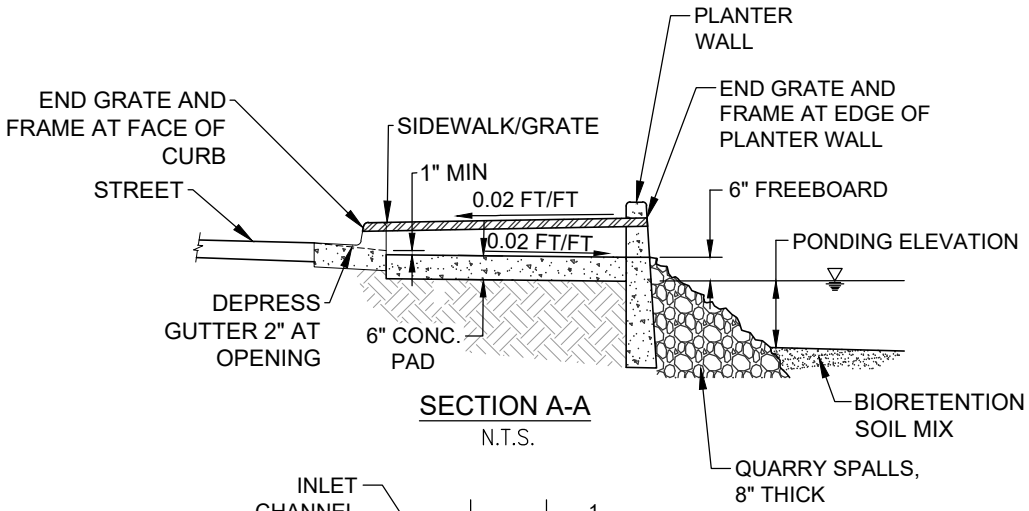


ISOMETRIC

N.T.S.

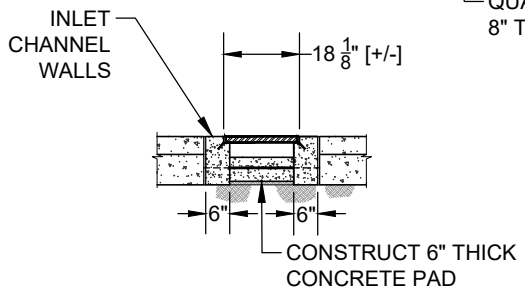
NOTES:

1. TRENCH DRAINS SHALL BE SPACED FOR THE VOLUME OF WATER CONVEYED INTO THE FACILITY, IN ORDER TO MEET FLOW SPREAD CRITERIA AND FULL STORMWATER CAPTURE.
2. TRENCH GRATE SHALL BE A DECORATIVE DESIGN OF IRON OR ALUMINUM AND CONFORM TO ADA STANDARDS.
3. INSTALL TRENCH GRATE PER MANUFACTURER INSTRUCTIONS. USE FRAME SPECIFIED BY MANUFACTURER.



SECTION A-A

N.T.S.



SECTION B-B

N.T.S.

N.T.S.

TRENCH DRAIN TO BIORETENTION FACILITY

STANDARD PLAN NO.

KSD-090-21

LID

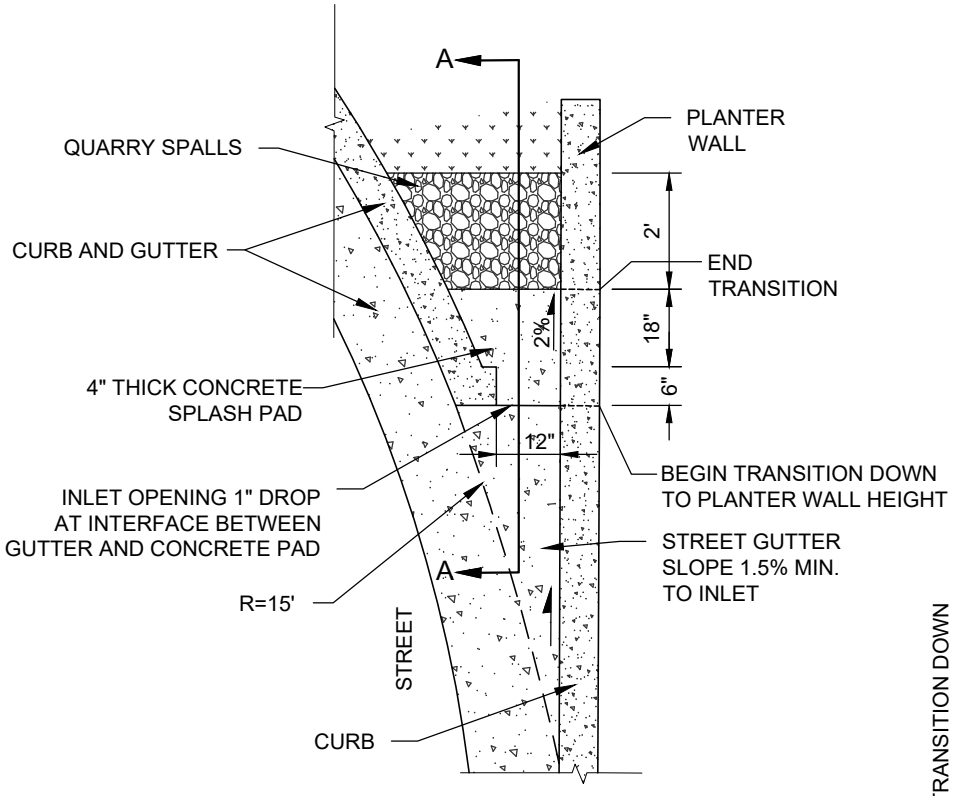
DATE:

MAY 2021

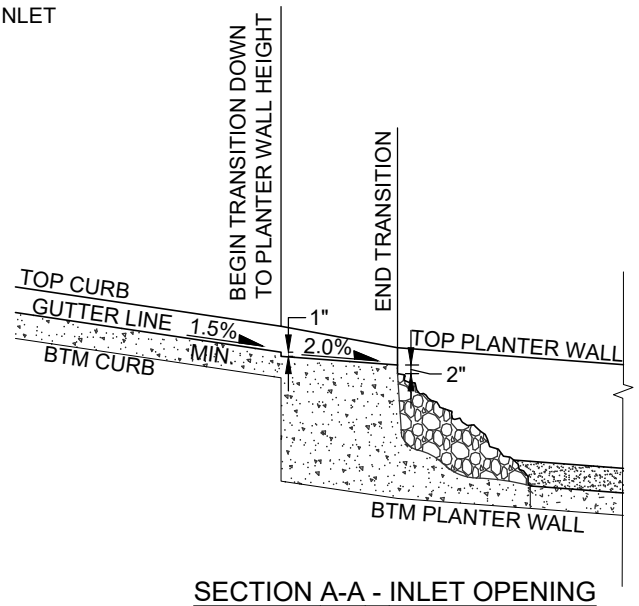
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

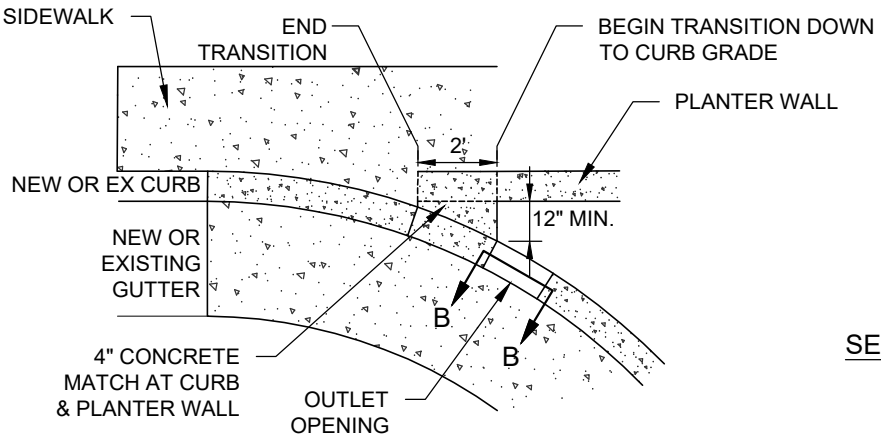
×_____



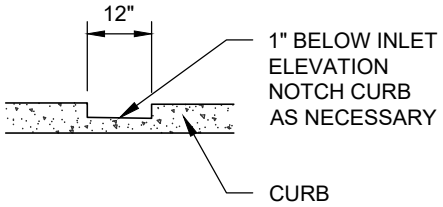
INLET PLAN VIEW
N.T.S.



SECTION A-A - INLET OPENING
N.T.S.



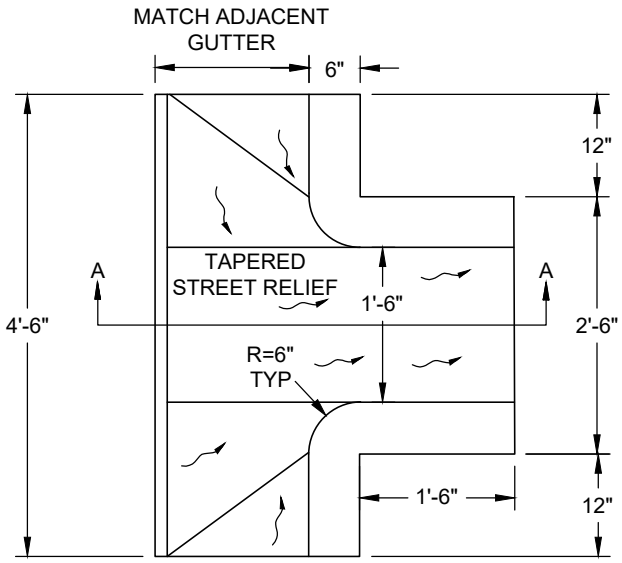
OUTLET PLAN VIEW
N.T.S.



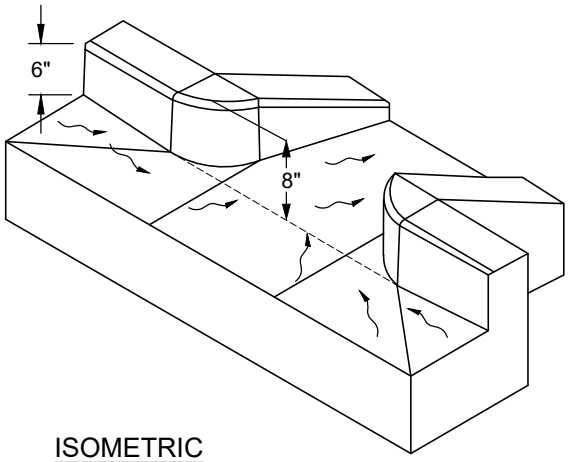
SECTION B-B - OUTLET OPENING
N.T.S.

N.T.S.

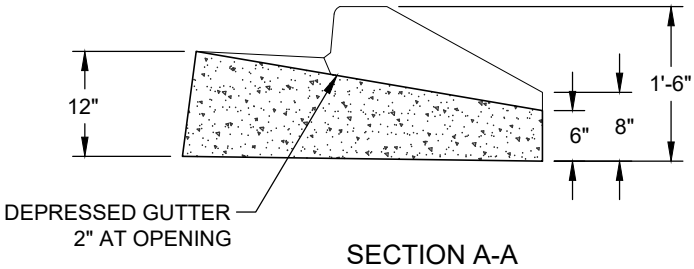
Kelso WASHINGTON	**INLET/OUTLET FOR BIORETENTION CURB EXTENSION PLANTERS**	STANDARD PLAN NO. **KSD-100-21 LID**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



PLAN
N.T.S.



ISOMETRIC
N.T.S.



SECTION A-A
N.T.S.

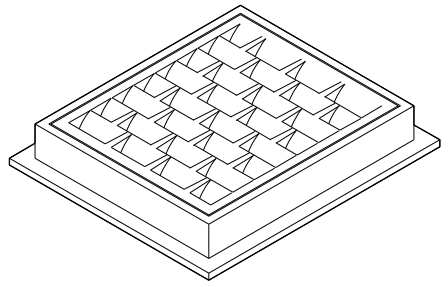
NOTES:

1. FOR USE WITH STORMWATER FACILITIES WITH SIDE SLOPES.
2. REFER TO STANDARD PLAN WSDOT F-10.16-00 FOR CURB AND GUTTER. MATCH GUTTER PAN OF ADJACENT CURB AND GUTTER.

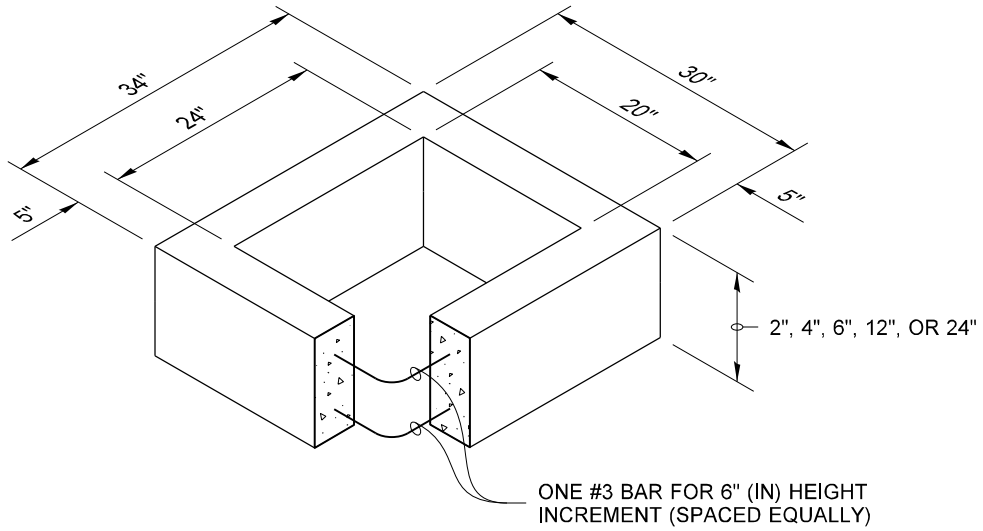
N.T.S.

Kelso WASHINGTON	**SIDE CURB CUT**	STANDARD PLAN NO. **KSD-110-21** **LID**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

DRAWN BY: LISA CYFORD



FRAME AND VANED GRATE

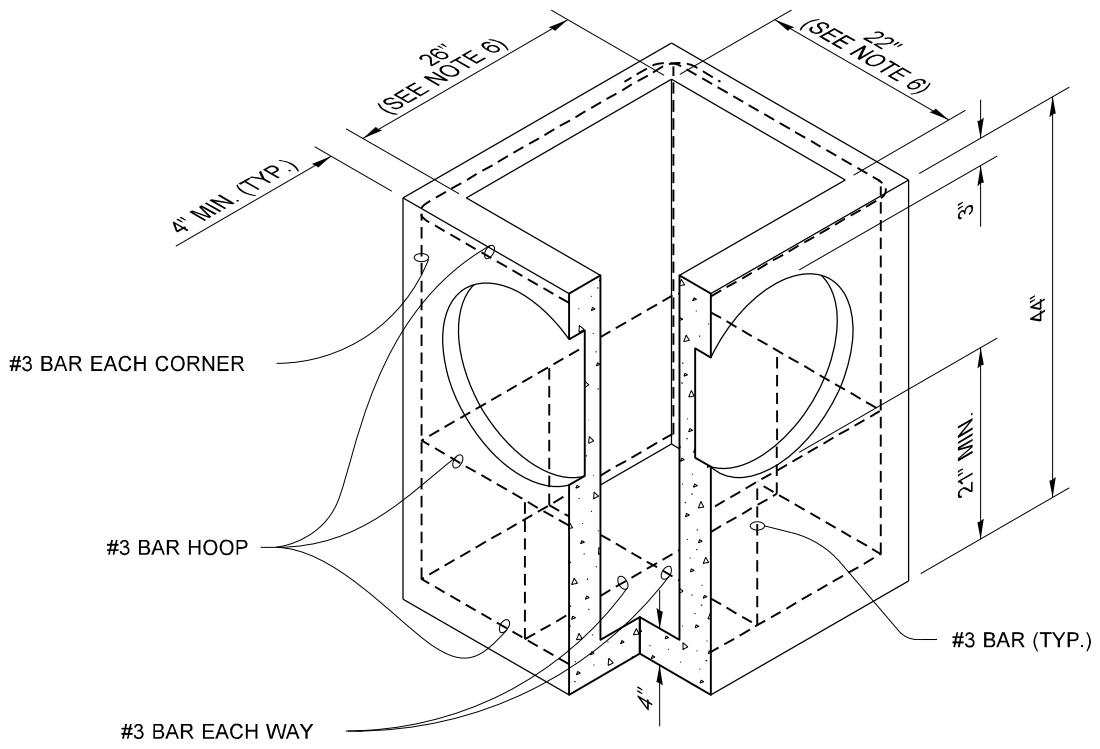


RECTANGULAR ADJUSTMENT SECTION

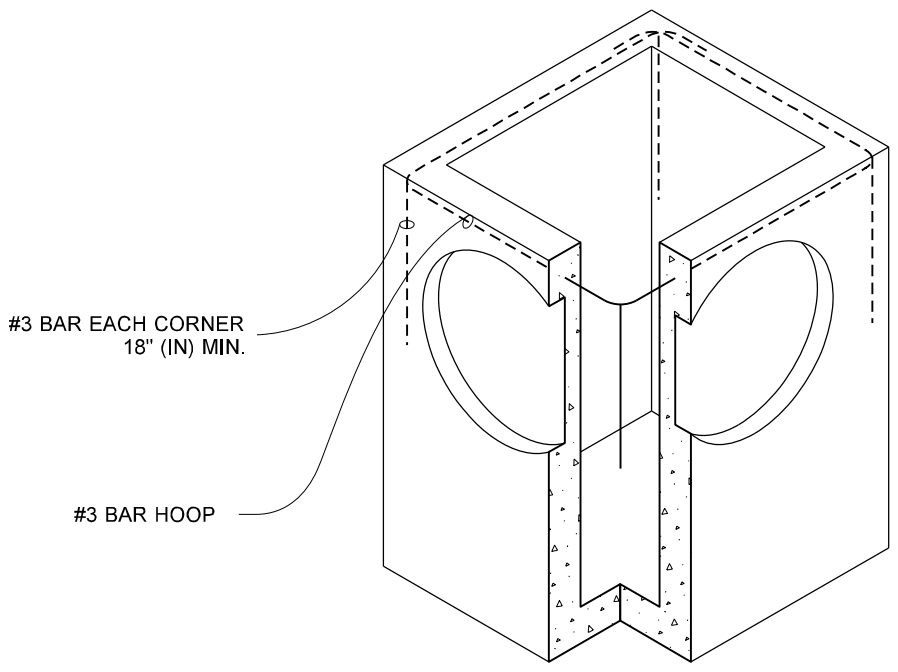
PIPE ALLOWANCES

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

* CORRUGATED POLYETHYLENE STORM SEWER PIPE



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.

3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).

4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.

5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.

6. The opening shall be measured at the top of the **Precast Base Section**.

7. All pickup holes shall be grouted full after the basin has been placed.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:53 PM
cosign

CATCH BASIN TYPE 1

STANDARD PLAN B-5.20-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:48 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-5.20-02

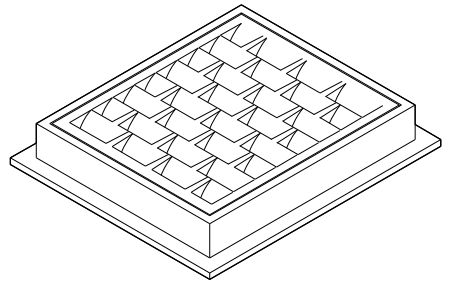
Modify the Standard Plan as follows:

Notes:

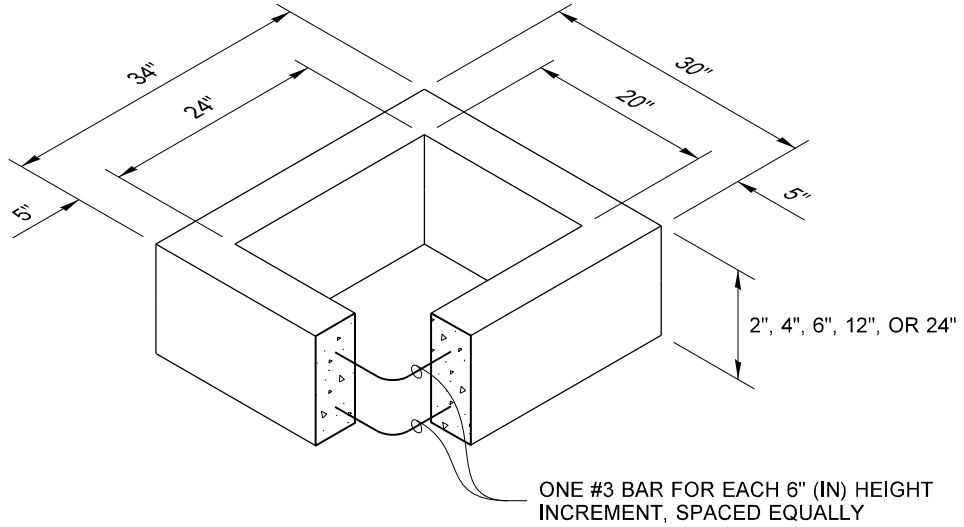
1. Grate shall be a rectangular herringbone grate per WSDOT B-30.50-03.

2. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

DRAWN BY: LISA CYFORD



FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION

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

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot, shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.

2. The knockout shall not be greater than 26" (in), in any direction. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.

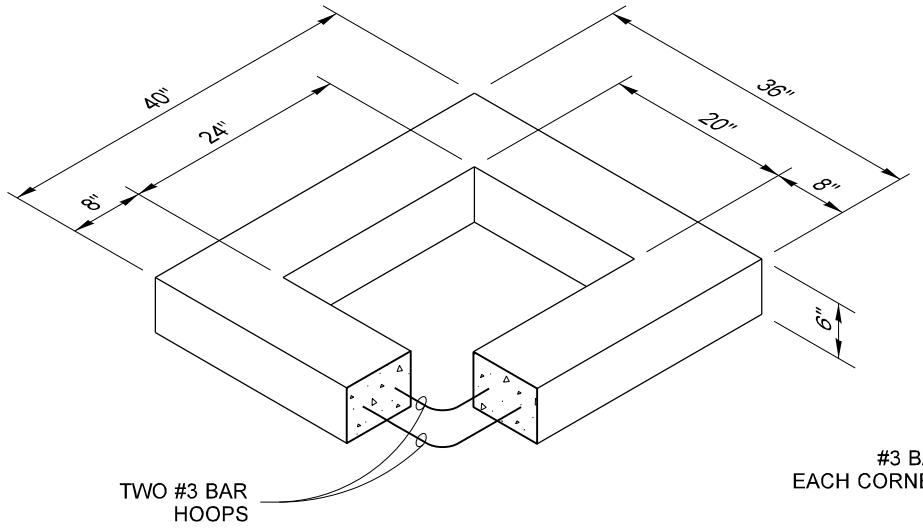
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).

4. The frame and grate may be installed with the flange down or integrally cast into the adjustment section with flange up.

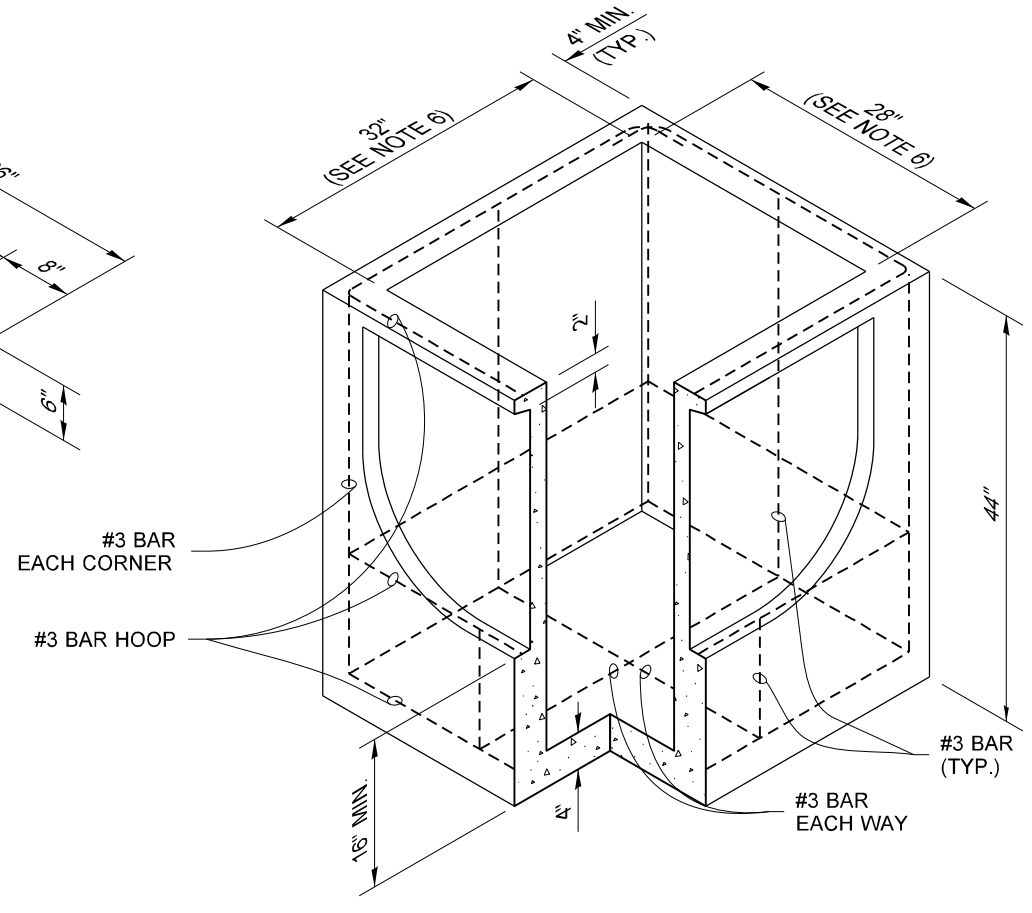
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.

6. The opening shall be measured at the top of the Precast Base Section.

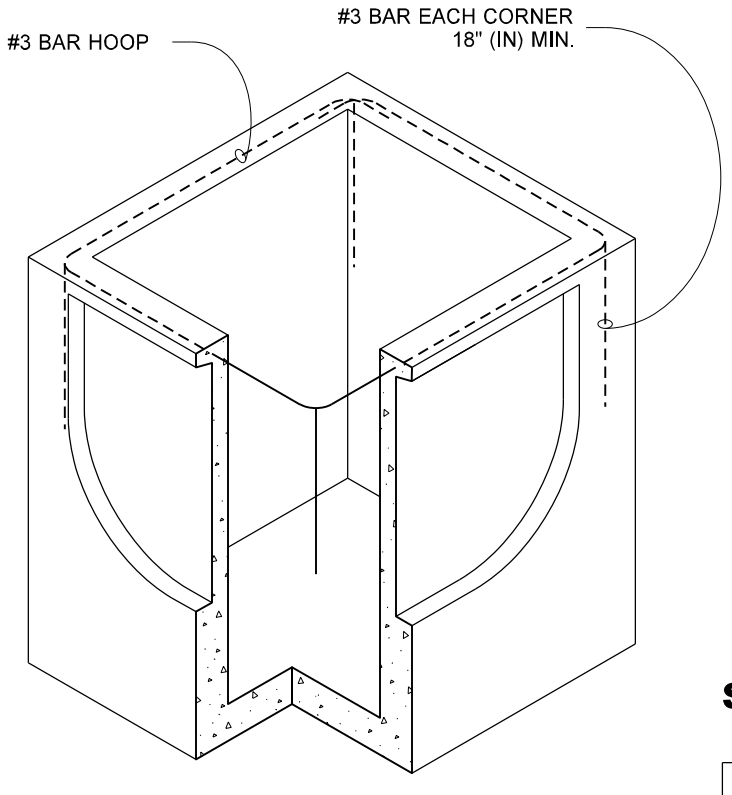
7. All pickup holes shall be grouted full after the basin has been placed.



REDUCING SECTION



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:56 PM

CATCH BASIN TYPE 1L

STANDARD PLAN B-5.40-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:49 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-5.40-02

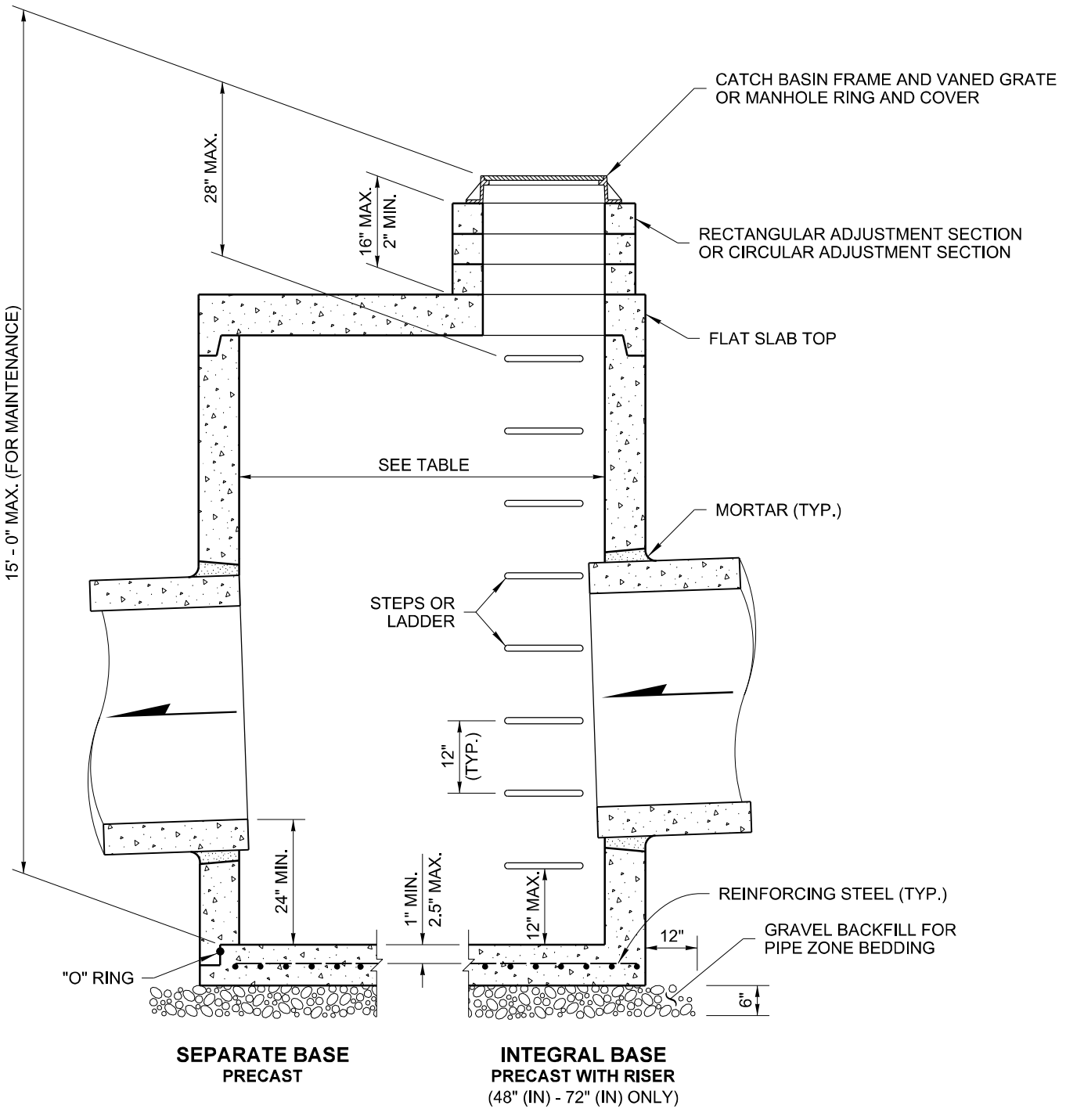
Modify the Standard Plan as follows:

Notes:

1. Grate shall be a rectangular herringbone grate per WSDOT B-30.50-03.

2. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

DRAWN BY: FERN LIDDELL



SEPARATE BASE
PRECAST

INTEGRAL BASE
PRECAST WITH RISER
(48" (IN) - 72" (IN) ONLY)

NOTES

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

CATCH BASIN DIMENSIONS

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

PIPE ALLOWANCES

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

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

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:49 PM
cosign

CATCH BASIN TYPE 2

STANDARD PLAN B-10.20-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Mar 2 2018 10:01 AM
cosign

STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-10.20-02

Modify the Standard Plan as follows:

Notes:

1. When a grate is specified, the grate shall be a rectangular herringbone grate per WSDOT B-30.50-03.

2. Catch Basin Type 2 diameter shall be 54" for Catch Basin depths up to 8'. For depths greater than 8', the diameter shall be 60".

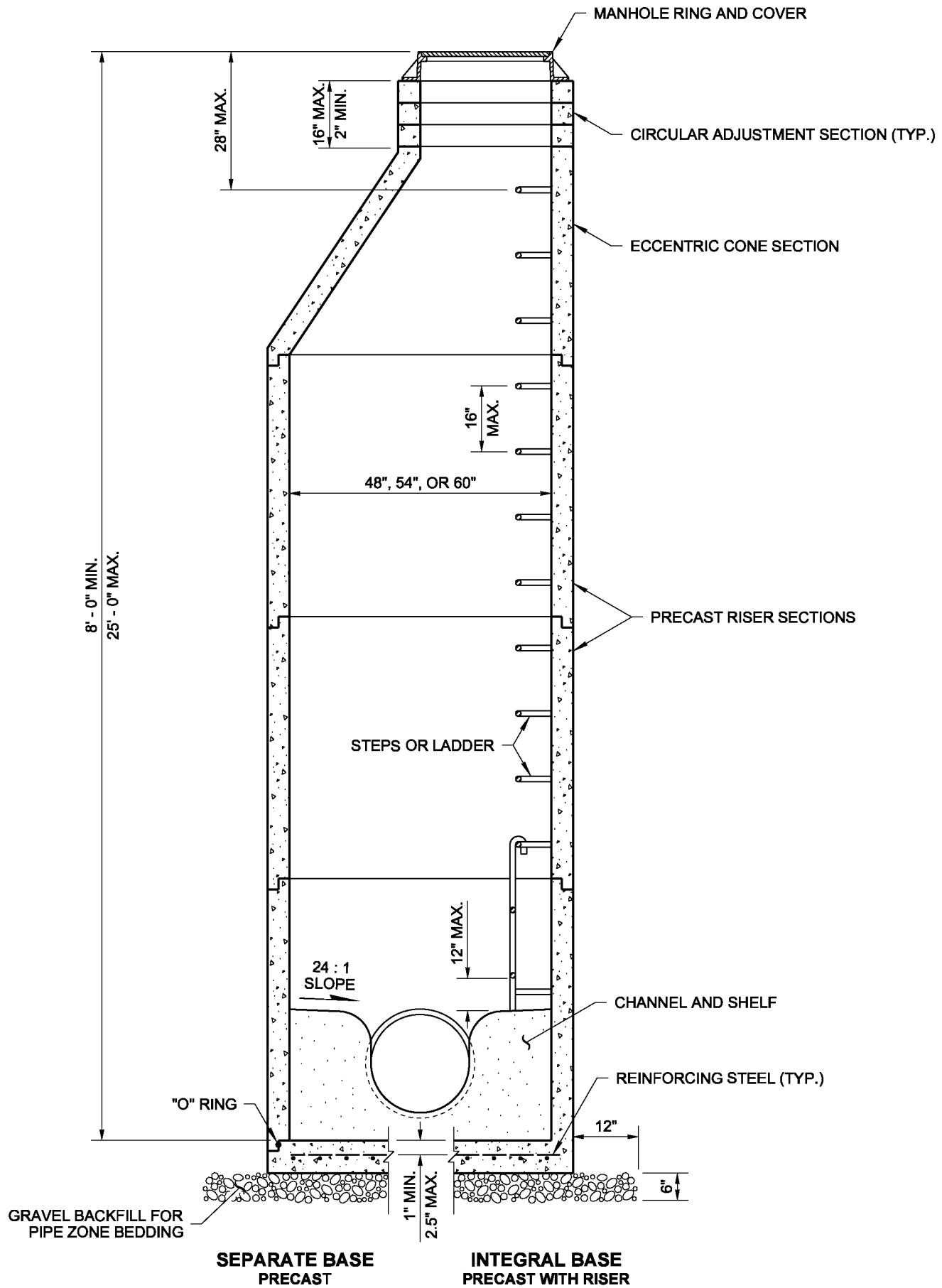
3. Steps shall be polypropylene.

4. Following backfill, vacuum test 50% of the Catch Basins, but not less than one, per the requirements stated in Supplement to Sanitary Sewer Standard Plan B-15.20-01.

5. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

6. The top of the Type 2 Catch Basin shall be adjusted to grade following paving.

DRAWN BY: LISA CYFORD



NOTES

1. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.
2. For pipe allowances, see **Standard Plan B-10.20.**

MANHOLE DIMENSION TABLE				
DIAM.	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

MANHOLE TYPE 1

STANDARD PLAN B-15.20-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

02-07-12 — DATE

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-15.20-01

Modify the Standard Plan as follows:

Notes:

1. When a Manhole Type 1 is specified for a storm drain manhole, no channel or shelf shall be poured in the manhole, and the floor of the manhole shall be a minimum of 1' below the lowest pipe invert into the manhole, creating a sump.

2. Manhole diameter shall be 54" for depths up to 8'. For manhole depths greater than 8', the diameter shall be 60".

3. Steps shall be polypropylene.

4. Delete steps in the cone and adjustment sections. Steps shall begin in the riser section of the manhole.

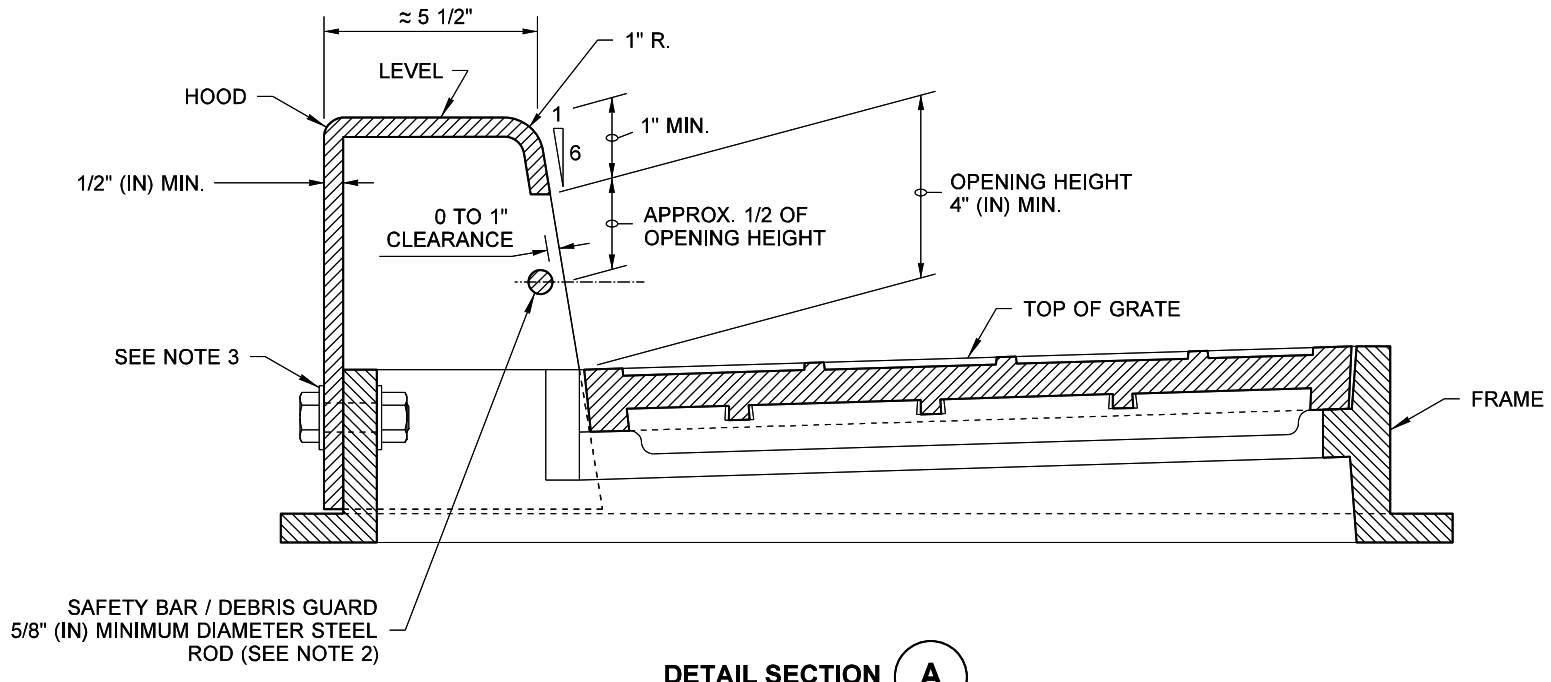
5. Modify the depth note: replace "8" with "5". Type 1 manholes may be used for manholes between 5' and 8' deep. For manholes less than 5' deep, use a Manhole Type 3, WSDOT Standard Plan B-15.60-02.

6. Following backfill, vacuum test 50% of the manholes, but not less than one, per the requirements stated in Supplement to Sanitary Sewer Standard Plan B-15.20-01.

7. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

8. The top of the manhole shall be adjusted to grade following paving.

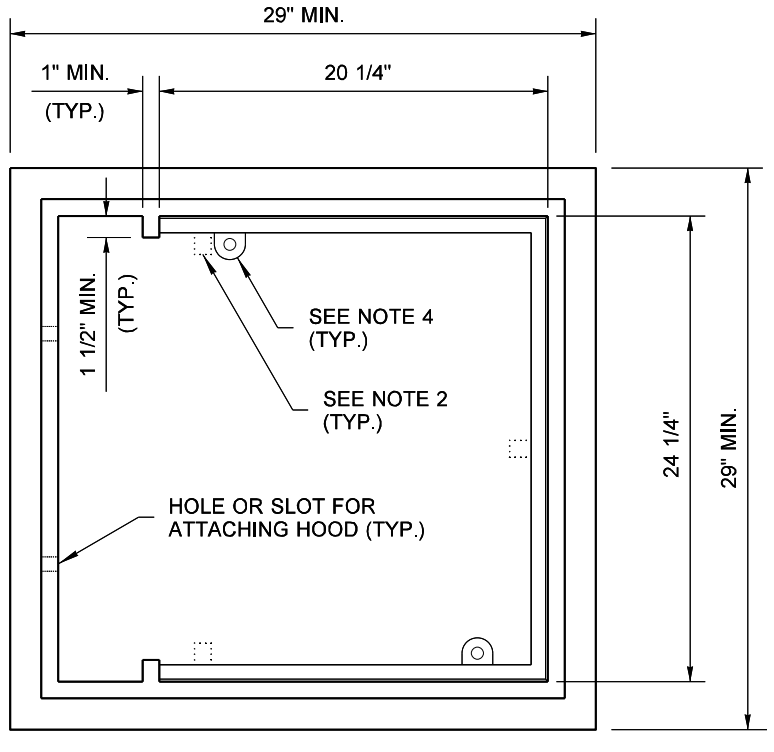
DRAWN BY: FERN LIDDELL



DETAIL SECTION A

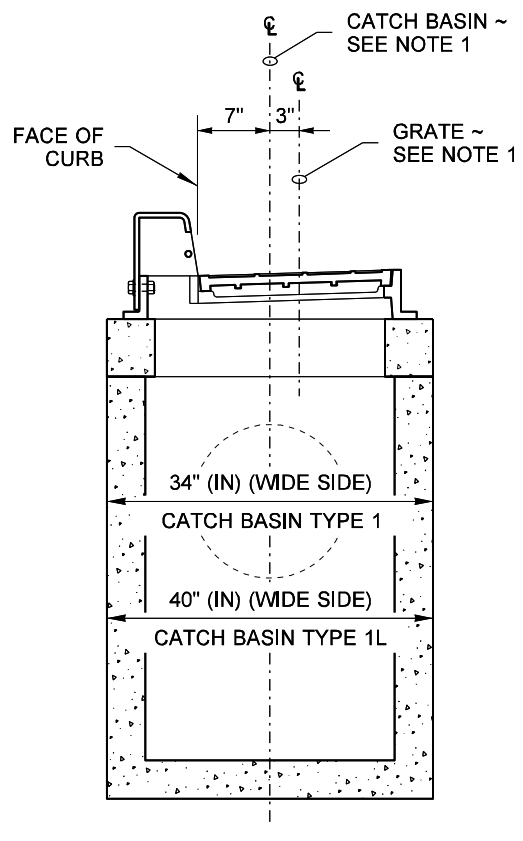
NOTES

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

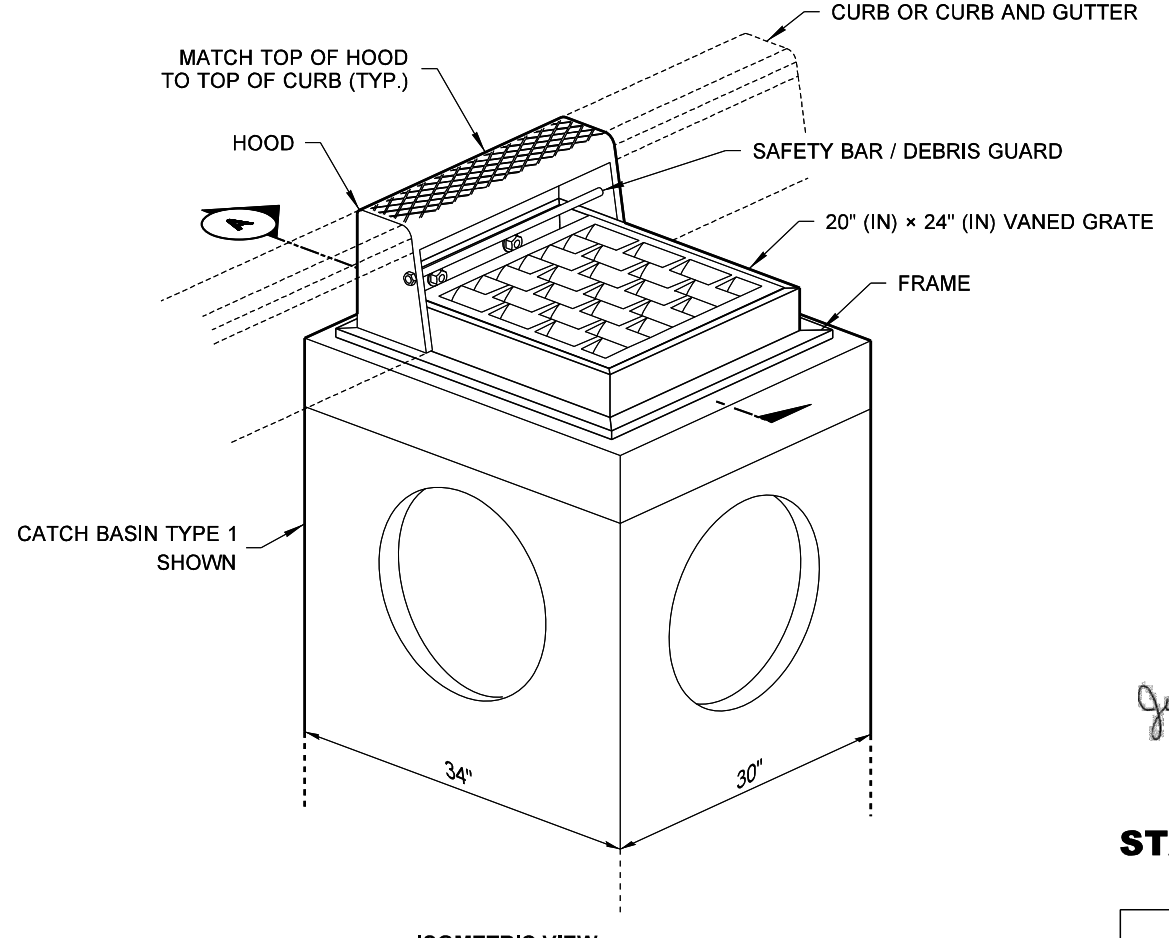


TOP VIEW

FRAME DETAIL



SECTION A



ISOMETRIC VIEW

COMBINATION INLET
FRAME, HOOD, AND VANED GRATE

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:51 PM
cosign

COMBINATION INLET

STANDARD PLAN B-25.20-02

SHEET 1 OF 1 SHEET

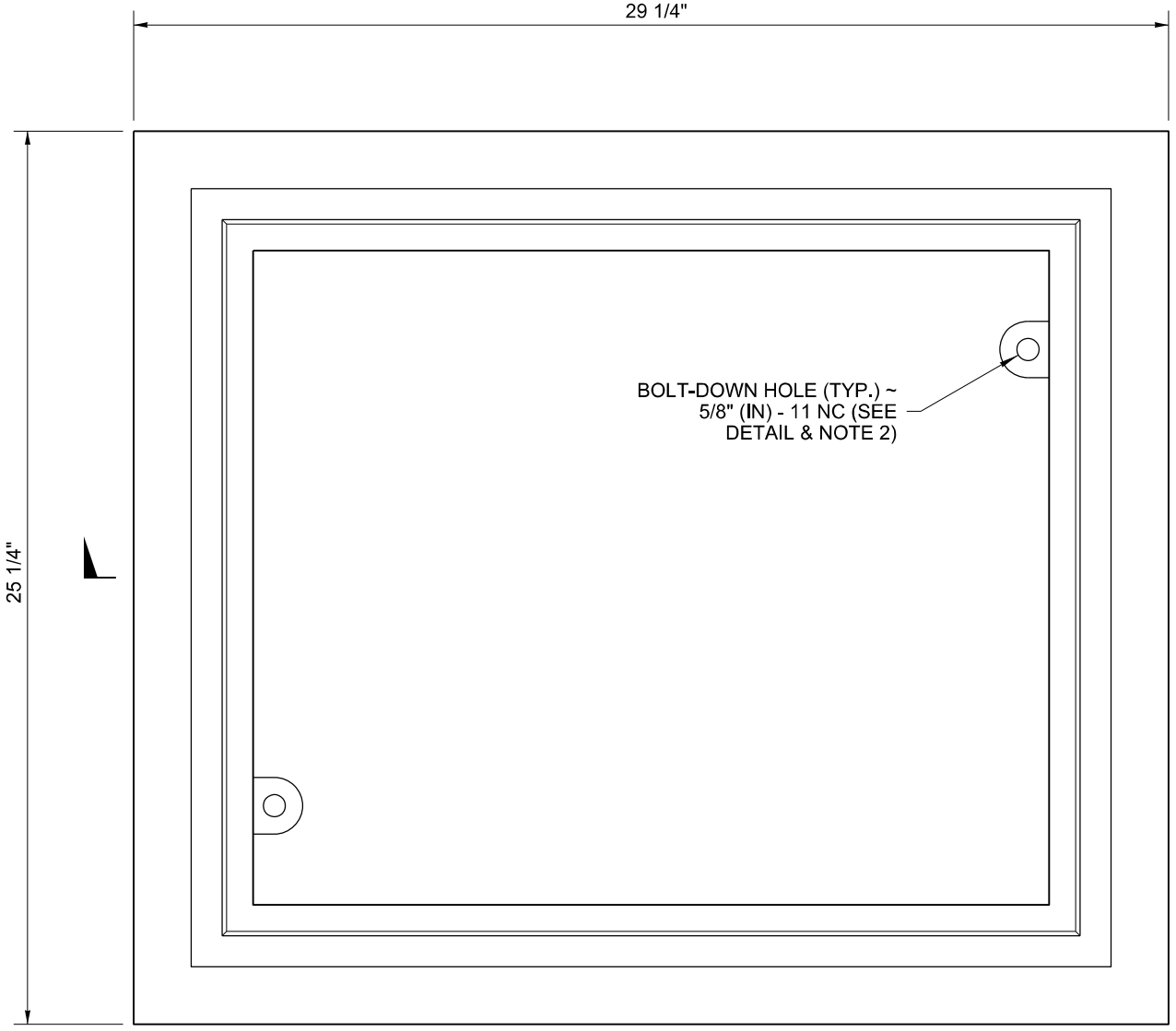
APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 27 2018 7:43 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-25.20-02

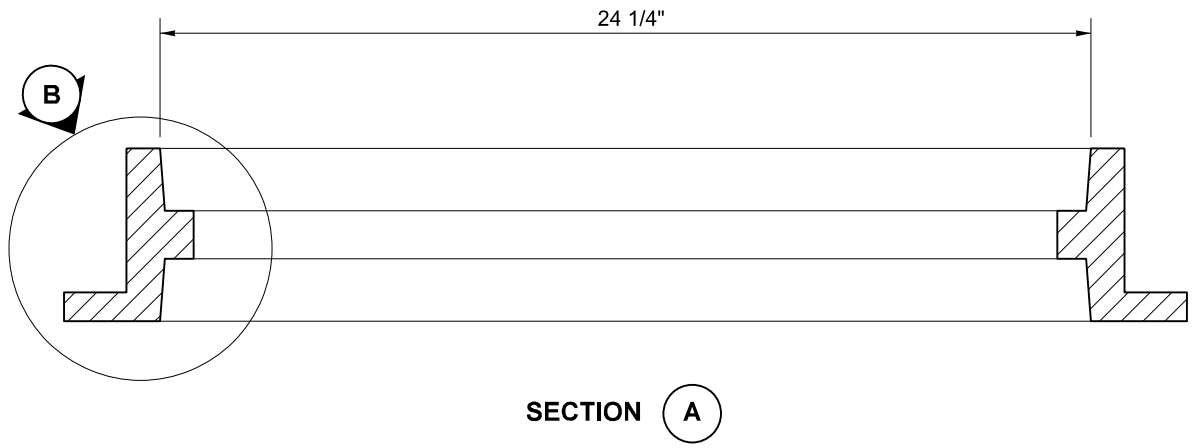
Modify the Standard Plan as follows:

Notes:

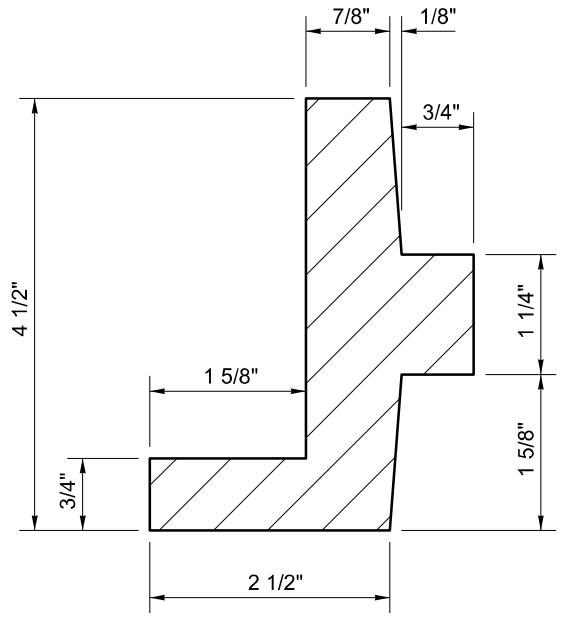
1. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.



TOP



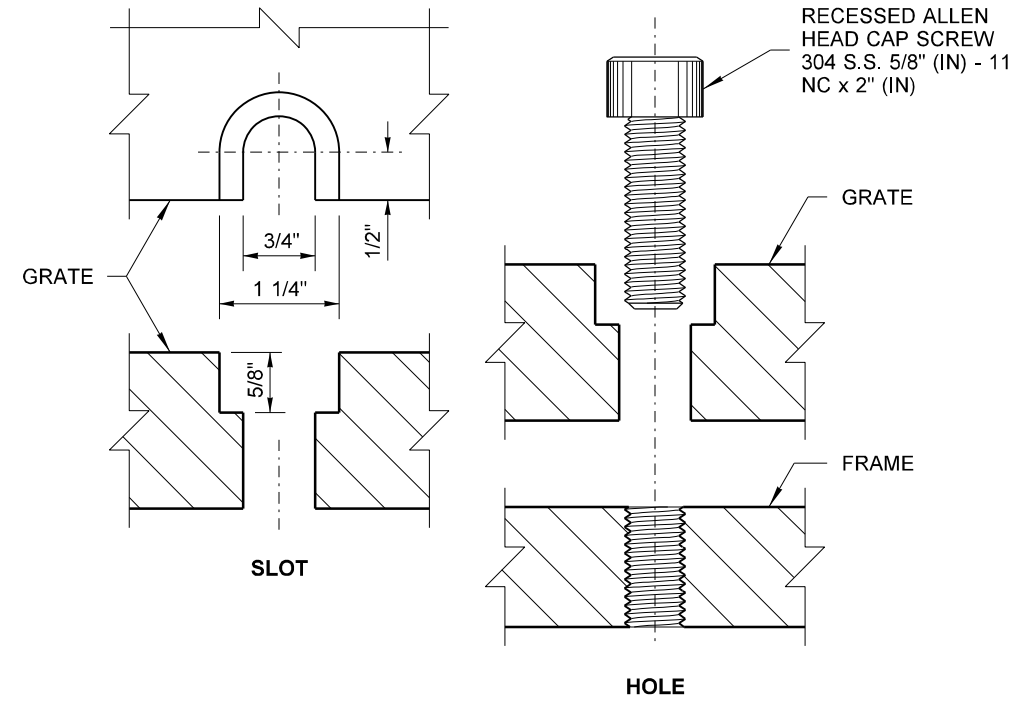
SECTION A



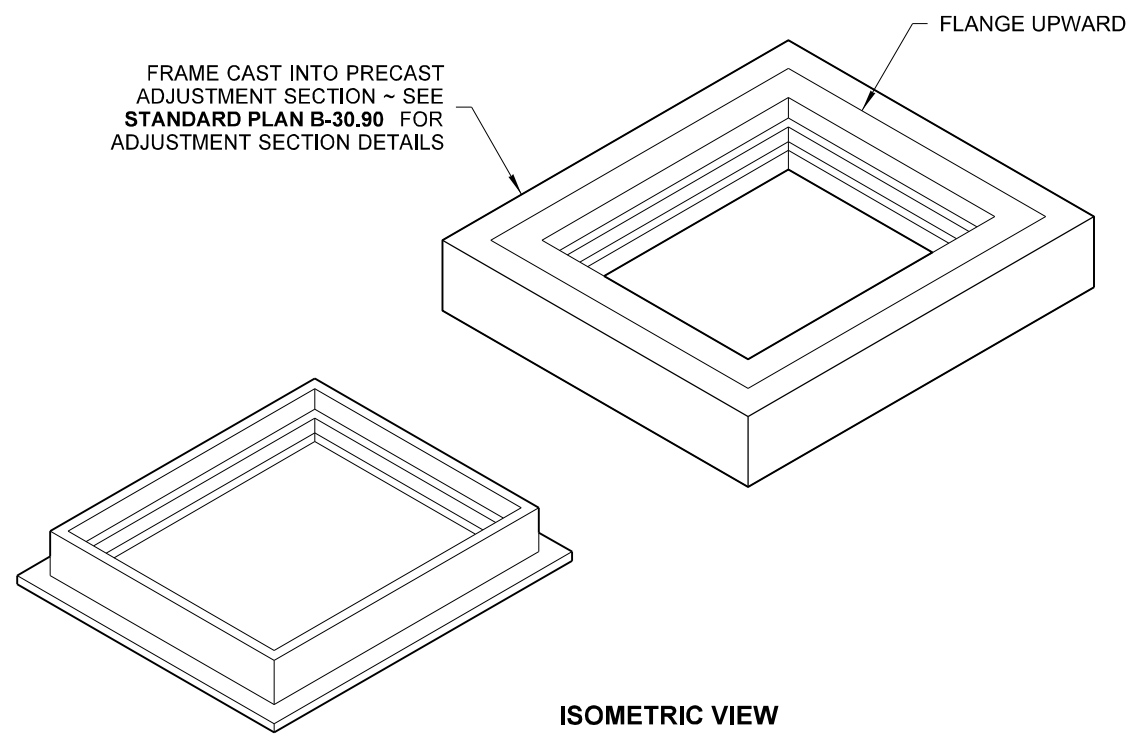
DETAIL B

NOTES

1. This frame is designed to accommodate 20" (in) × 24" (in) grates or covers as shown on **Standard Plans B-30.20, B-30.30, B-30.40,** and **B-30.50.**
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
3. Refer to **Standard Specification Section 9-05.15** and **9-05.15(2)** for additional requirements.



BOLT-DOWN DETAILS
SEE NOTE 2



ISOMETRIC VIEW
SHOWING THE VARIATIONS

DRAWN BY: FERN LIDDELL

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:52 PM
cosign

RECTANGULAR FRAME (REVERSIBLE)

STANDARD PLAN B-30.10-03

SHEET 1 OF 1 SHEET

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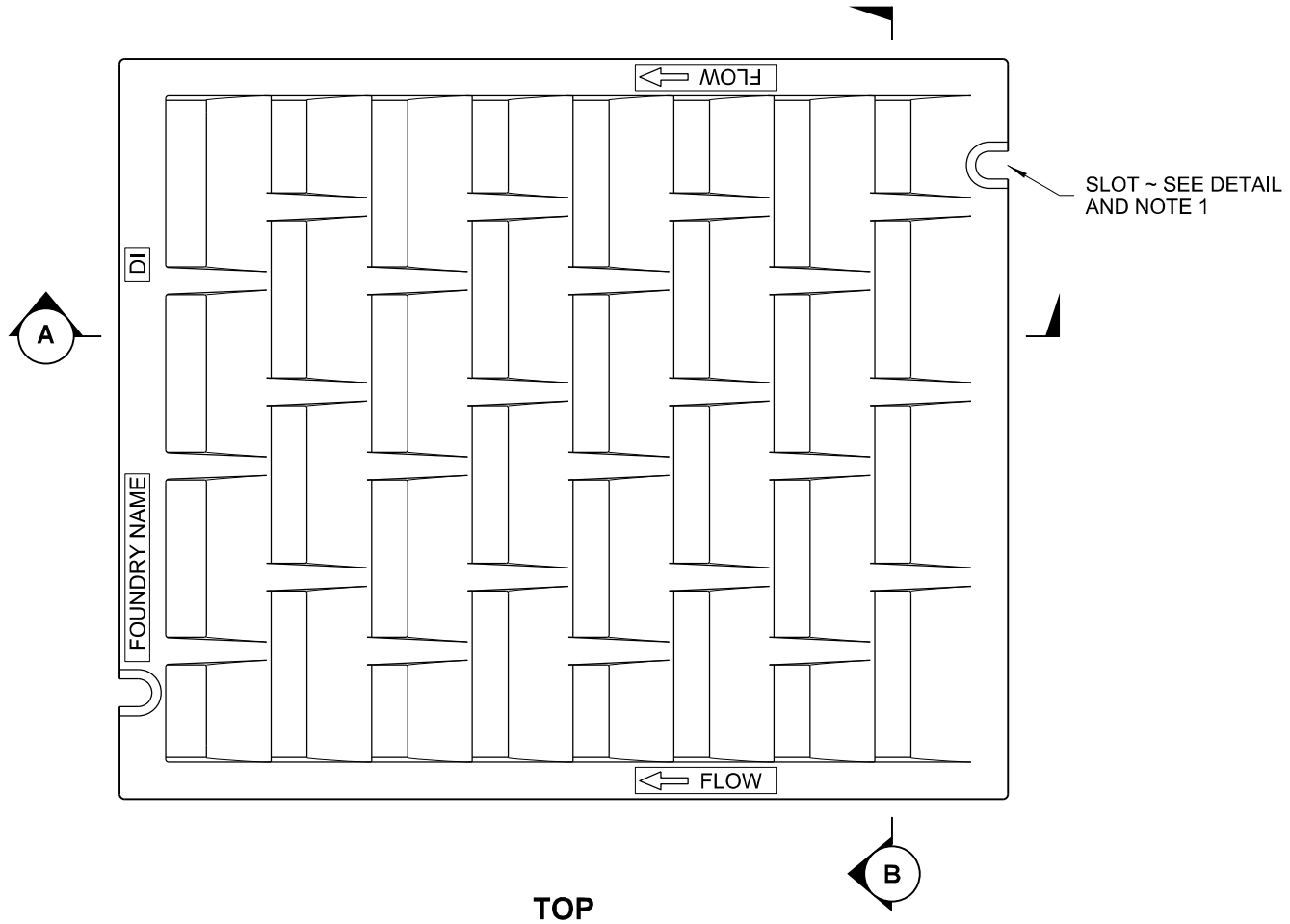

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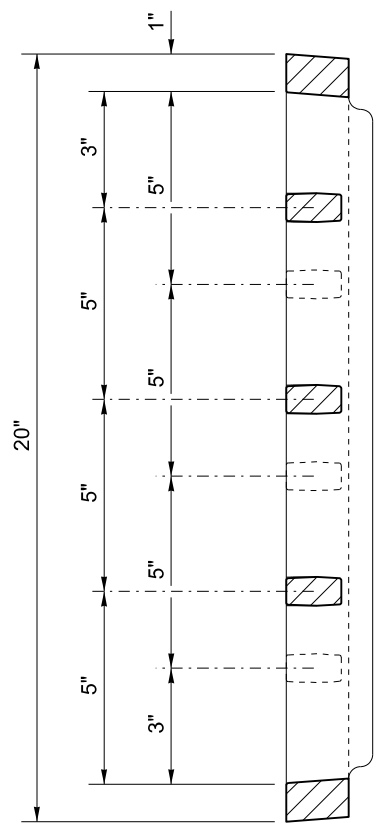
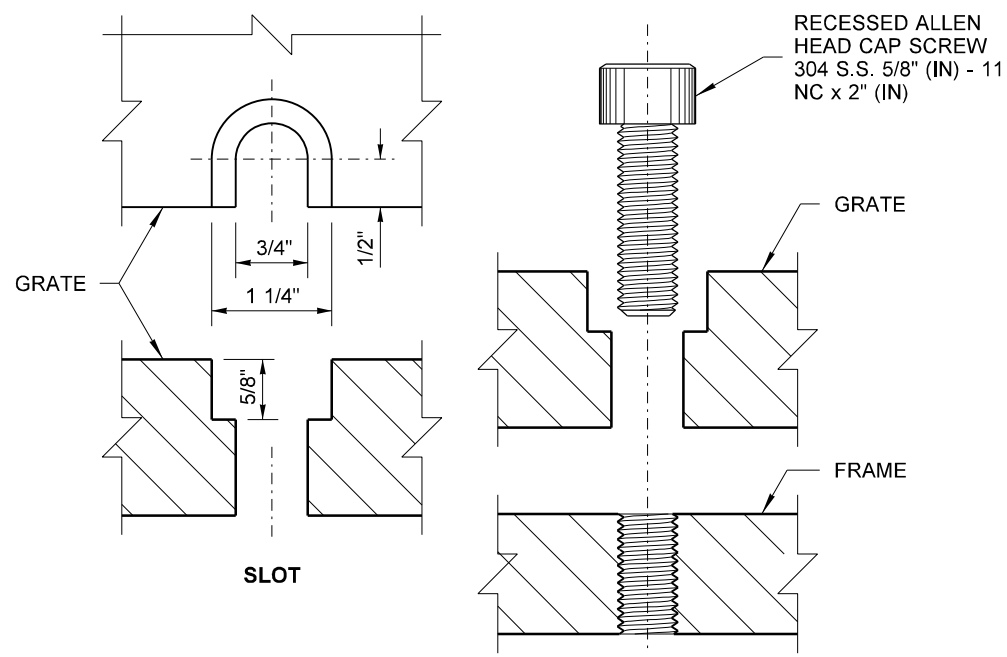


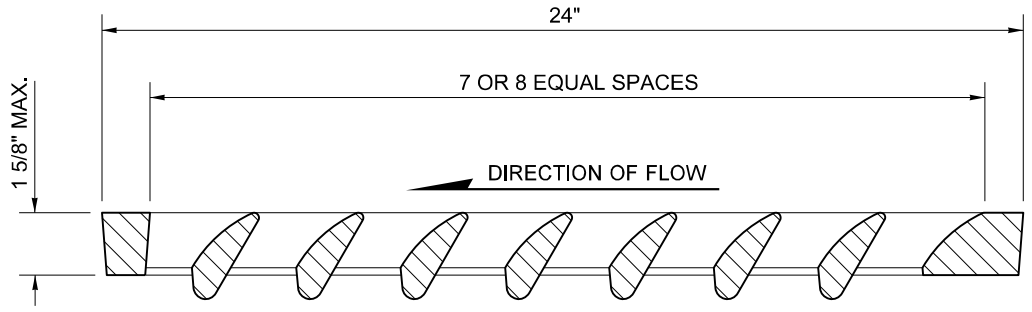
SECTION B

NOTES

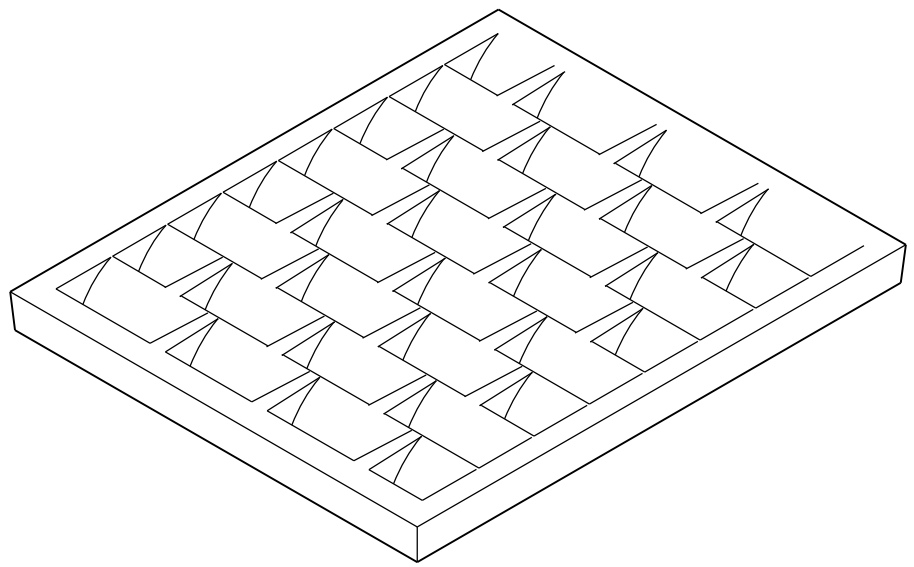
1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) allen head cap screw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



BOLT-DOWN DETAILS
SEE NOTE 1



SECTION A



ISOMETRIC

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41819
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Heilman, Julie
Feb 20 2018 12:54 PM

RECTANGULAR VANED GRATE

STANDARD PLAN B-30.30-03

SHEET 1 OF 1 SHEET

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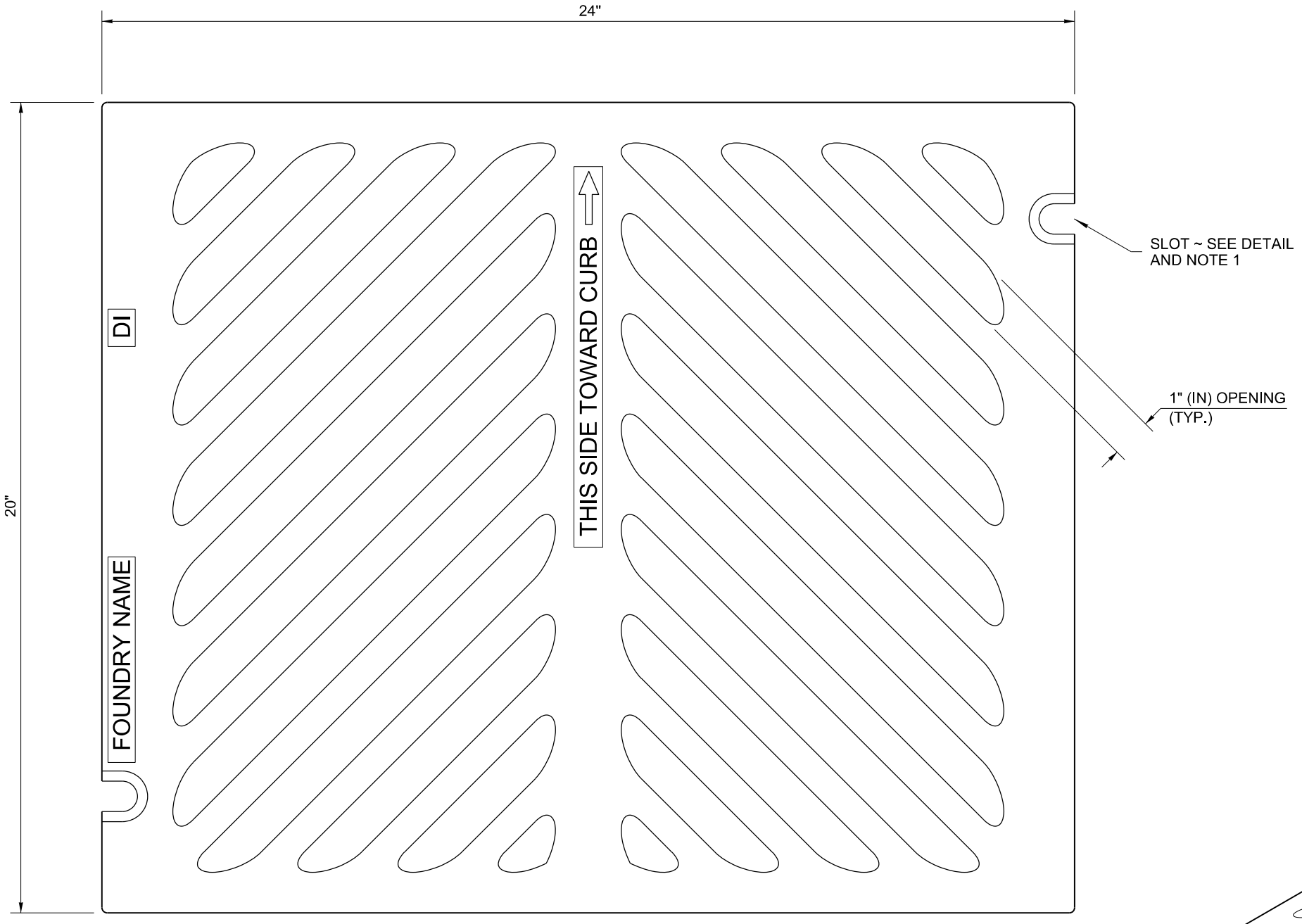
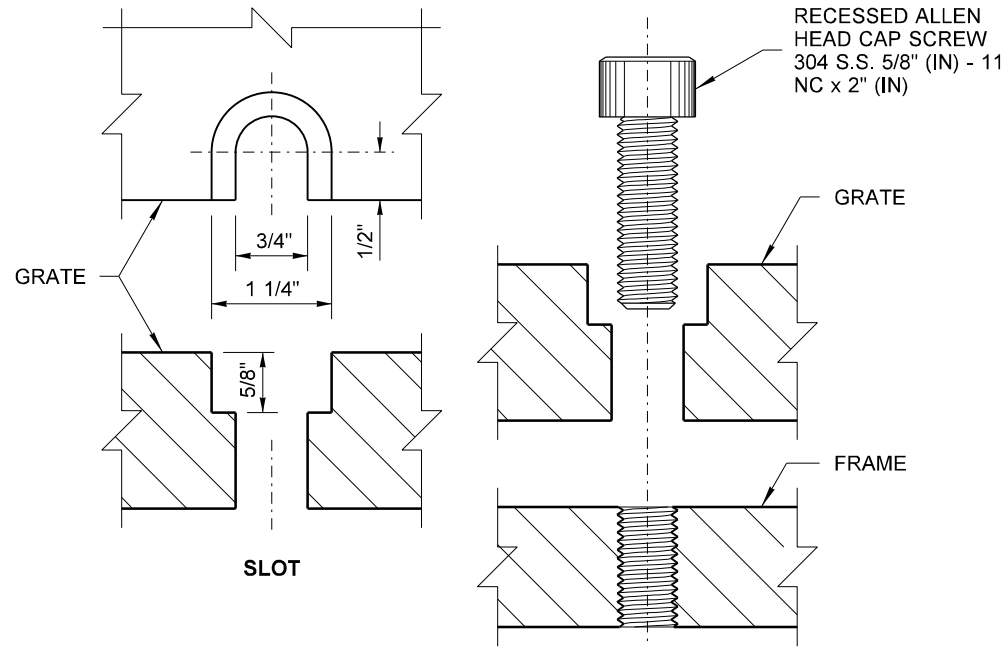


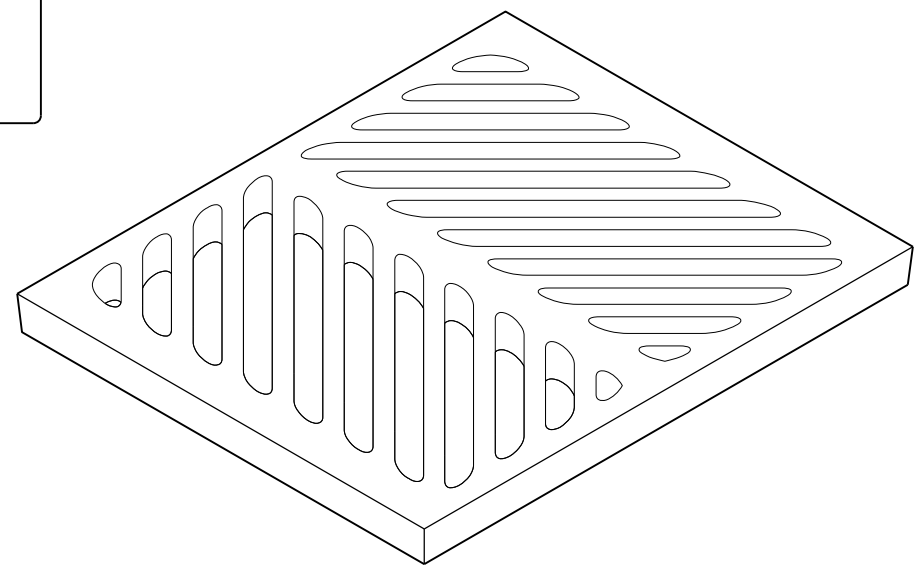
TOP

NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification section 9-05.15,** and **9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10**.
4. The thickness of the grate shall not exceed 1 5/8" (in).



BOLT-DOWN DETAILS
SEE NOTE 1



ISOMETRIC

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:55 PM
cosign

RECTANGULAR HERRINGBONE GRATE

STANDARD PLAN B-30.50-03

SHEET 1 OF 1 SHEET

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Feb 27 2018 7:59 AM
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Washington State Department of Transportation

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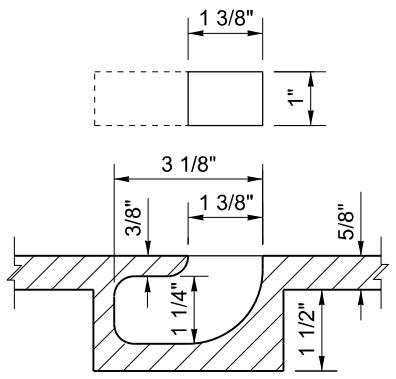
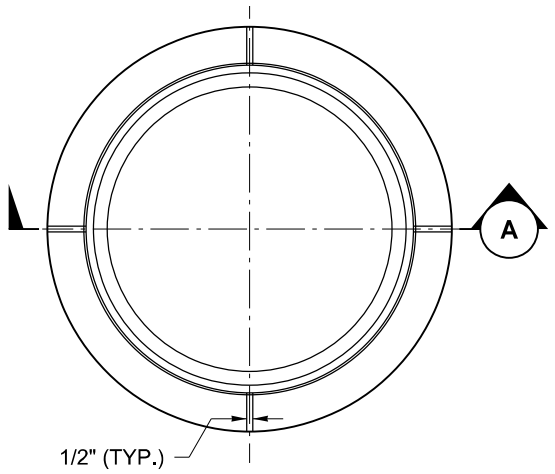
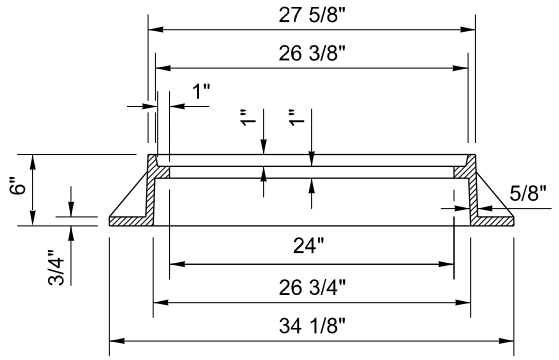


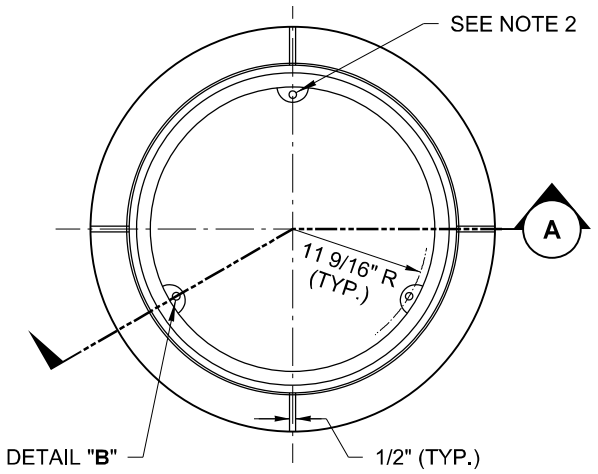
BLIND PICK NOTCH
DETAIL "A"



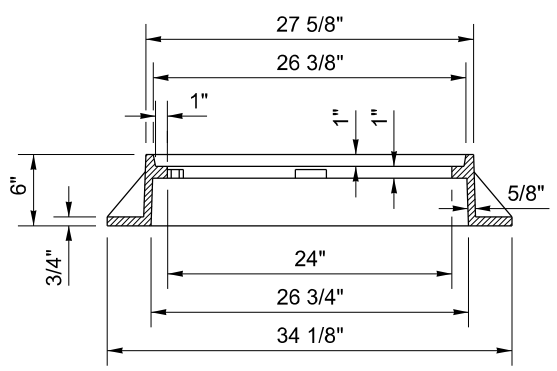
RING PLAN



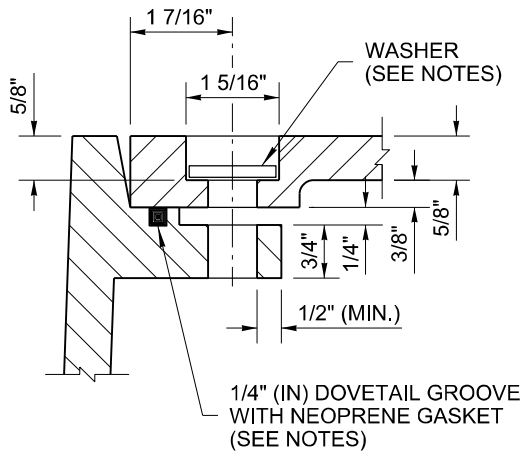
RING SECTION (A)



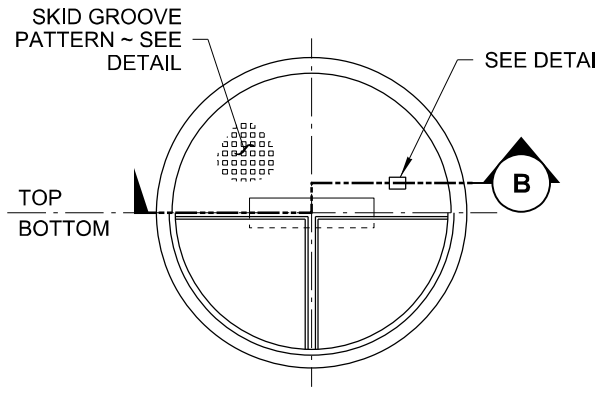
RING PLAN



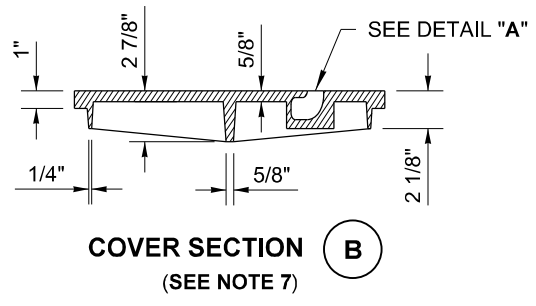
RING SECTION (A)



BOLT-DOWN / WATERTIGHT
DETAIL "B"

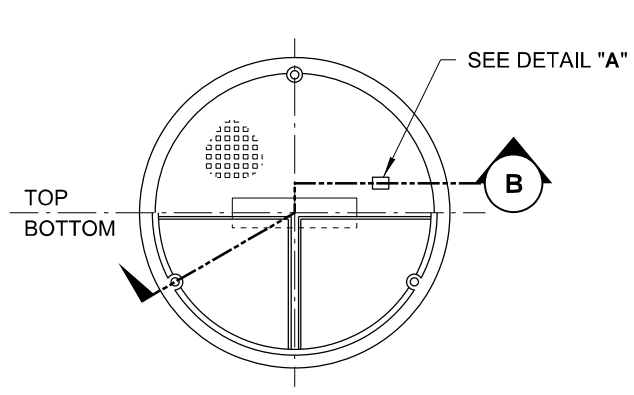


COVER PLAN

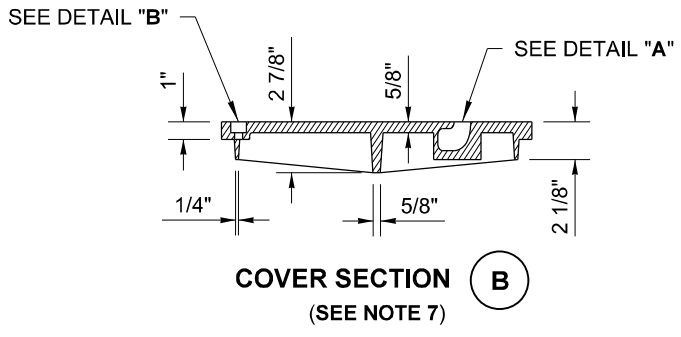


COVER SECTION (B)
(SEE NOTE 7)

STANDARD
TYPE 1



COVER PLAN

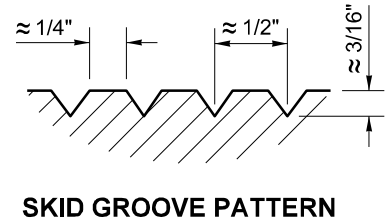


COVER SECTION (B)
(SEE NOTE 7)

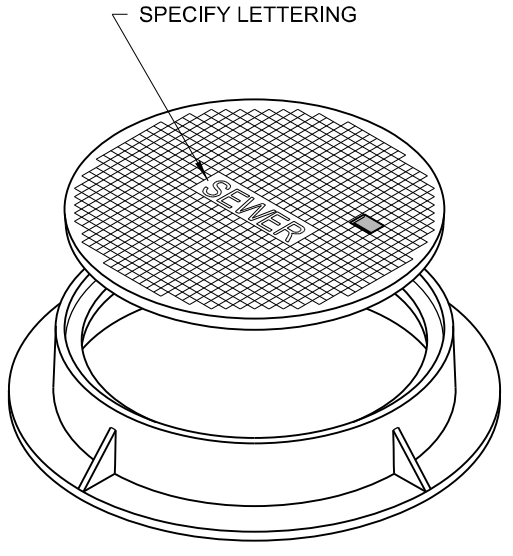
BOLT-DOWN / WATERTIGHT
TYPE 2

NOTES

1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S) 5/8" - 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.
3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.
4. Washer shall be neoprene (Detail "B").
5. In lieu of blind pick notch for manhole covers, a single 1" (in) pick hole is acceptable. Hole location and number of holes may vary by manufacturer.
6. Alternative reinforcing designs are acceptable in lieu of the rib design.
7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).



SKID GROOVE PATTERN
DETAIL



ISOMETRIC VIEW

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:55 PM

CIRCULAR FRAME (RING) AND COVER

STANDARD PLAN B-30.70-04

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 27 2018 7:59 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-30.70-04

Modify the Standard Plan as follows:

Notes:

1. Manhole covers shall have double 1" pick holes.

2. Storm sewer manhole covers shall be marked with the word "STORM"

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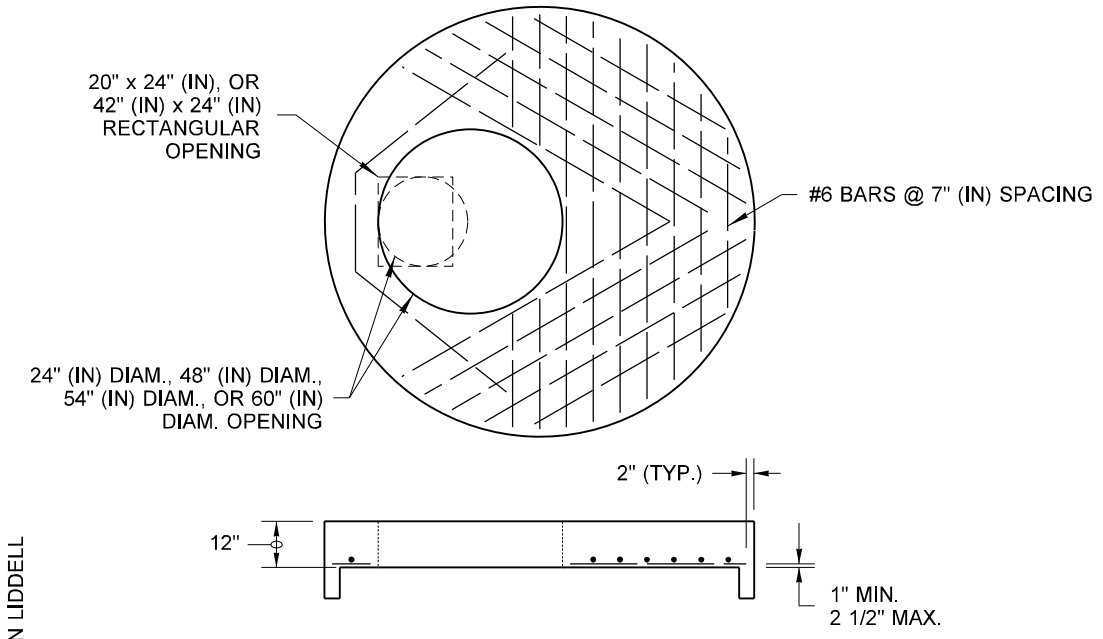
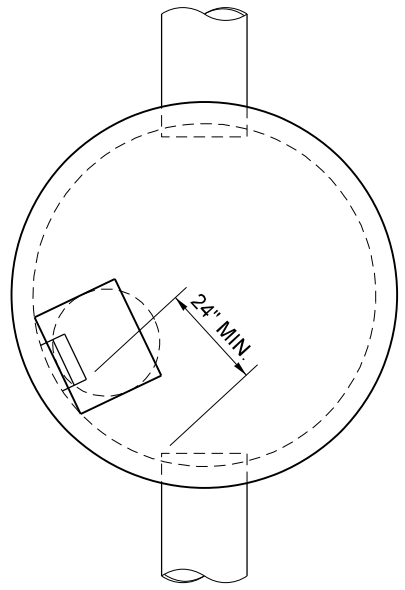
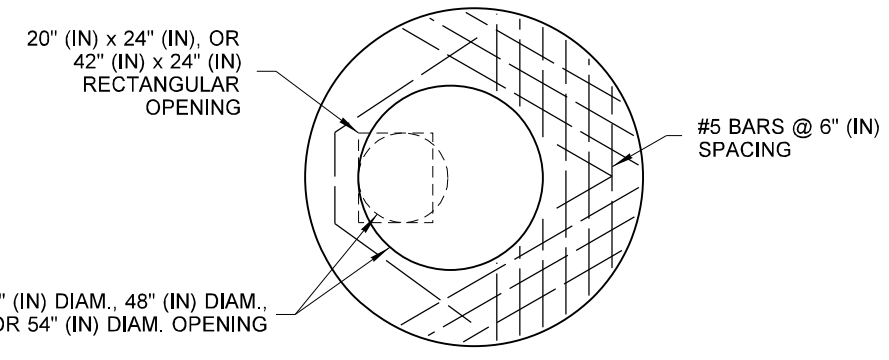


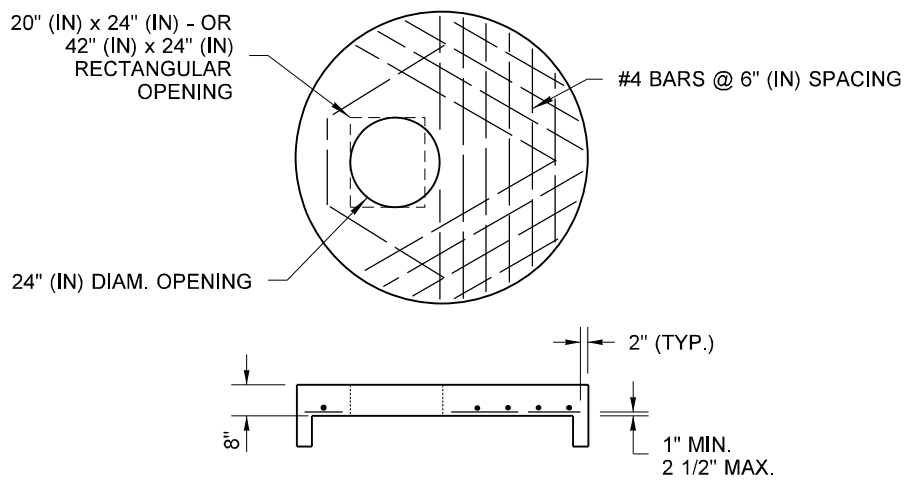
84" (IN) or 96" (IN) FLAT SLAB TOP



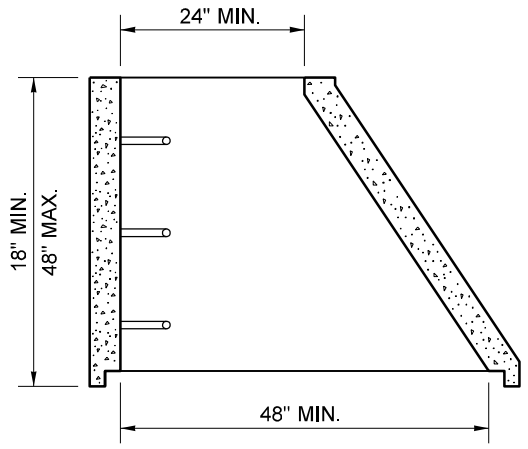
TYPICAL ORIENTATION FOR ACCESS AND STEPS



72" (IN) FLAT SLAB TOP



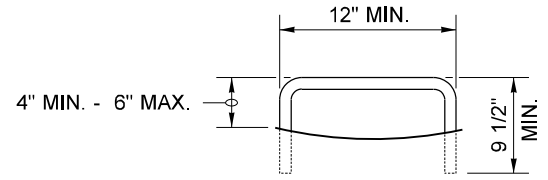
48" (IN), 54", or 60" (IN) FLAT SLAB TOP



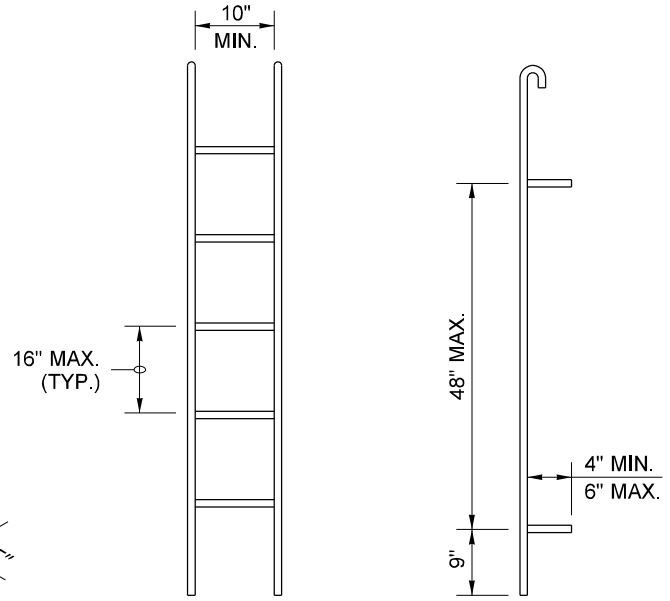
ECCENTRIC CONE SECTION

NOTE

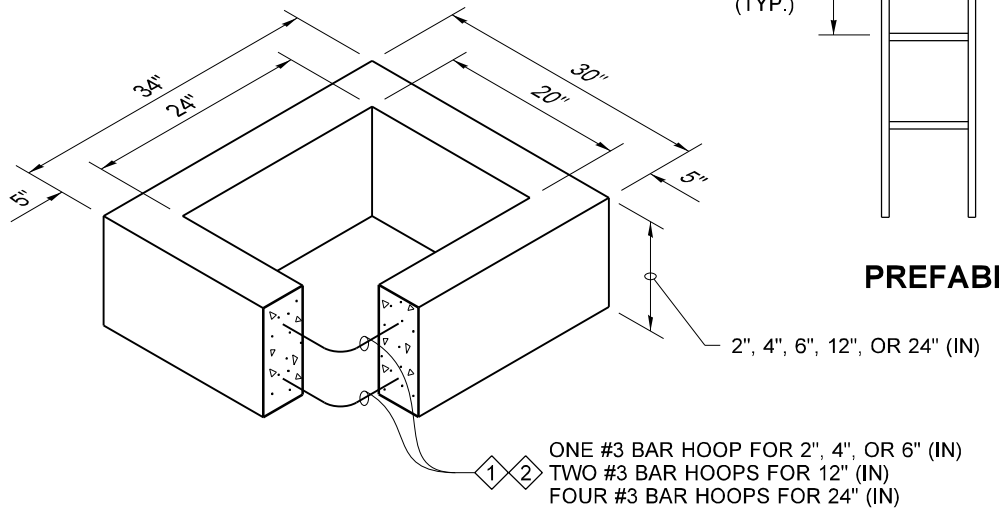
1. Ladder rungs for manholes and catch basins shall meet the requirements of **AASHTO M 199.**



STEP

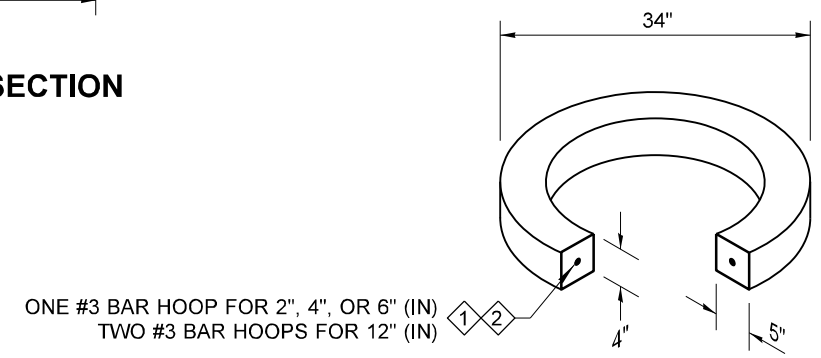


PREFABRICATED LADDER



RECTANGULAR ADJUSTMENT SECTION

1. As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.
2. As an acceptable alternative to conventional steel reinforcment, manufacturers shall use Synthetic Structural Fibers meeting the requirements of **Standard Specification Section 9-05.50(10)**.



CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs

JULIE HEILMAN
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Heilman, Julie
Jan 25 2017 3:01 PM
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MISCELLANEOUS DETAILS FOR DRAINAGE STRUCTURES STANDARD PLAN B-30.90-02

SHEET 1 OF 1 SHEET

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Carpenter, Jeff
Jan 26 2017 6:52 AM
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STATE DESIGN ENGINEER
Washington State Department of Transportation

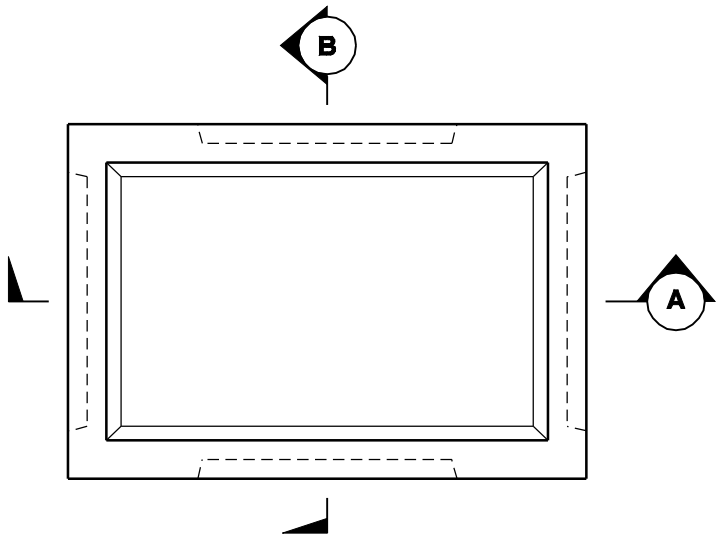
SUPPLEMENTAL TO STANDARD PLAN
B-30.90-02

Modify the Standard Plan as follows:

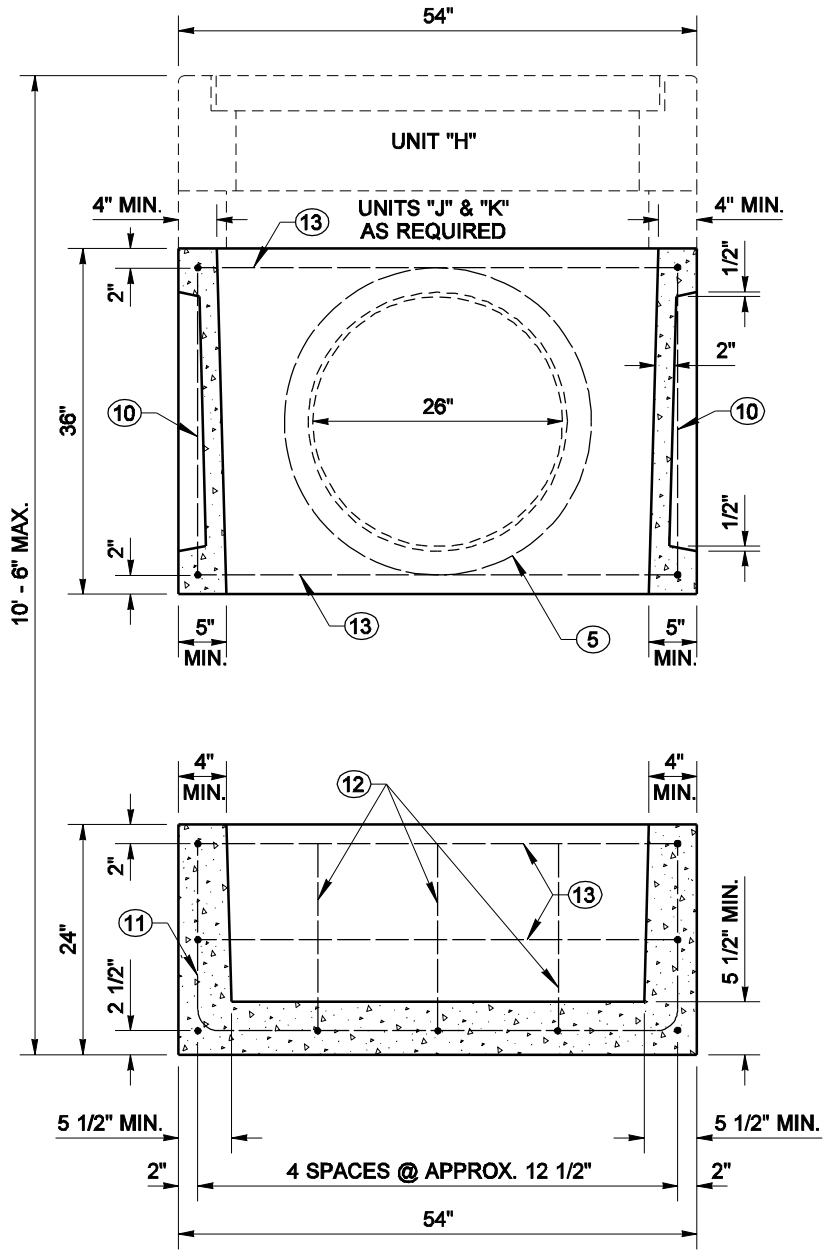
Notes:
1. No steps shall be installed within concentric manhole sections.

2. Where steps are installed, they shall be polypropylene.

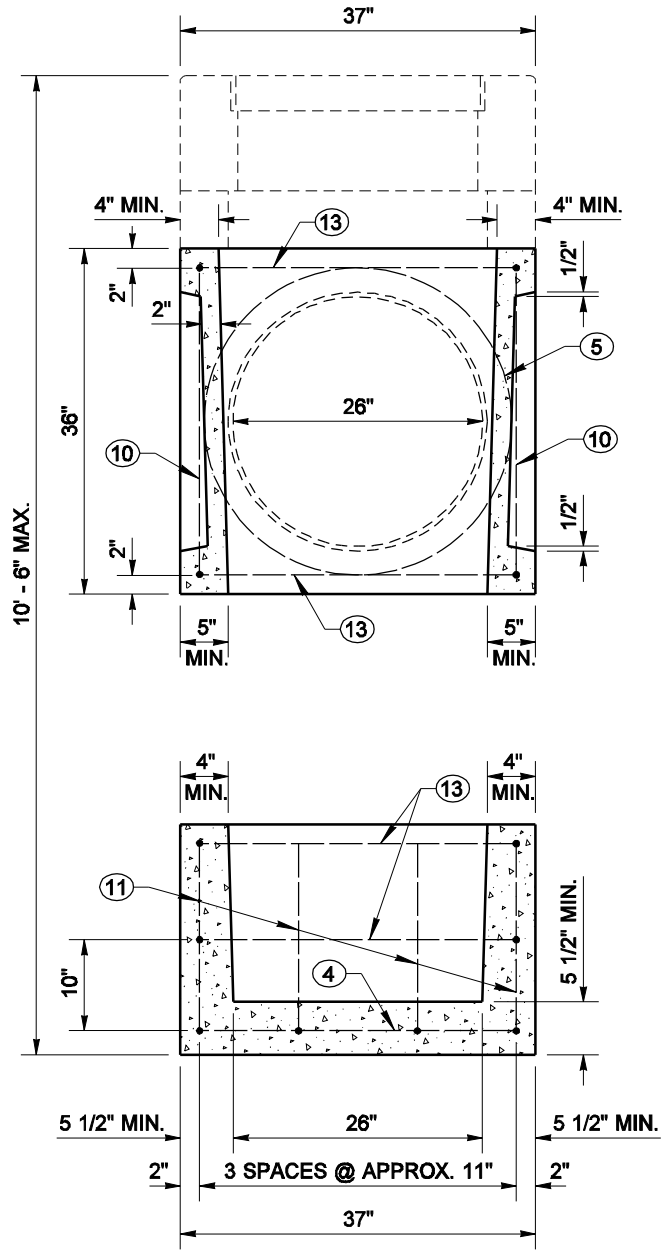
DRAWN BY: ADAM COCHRAN



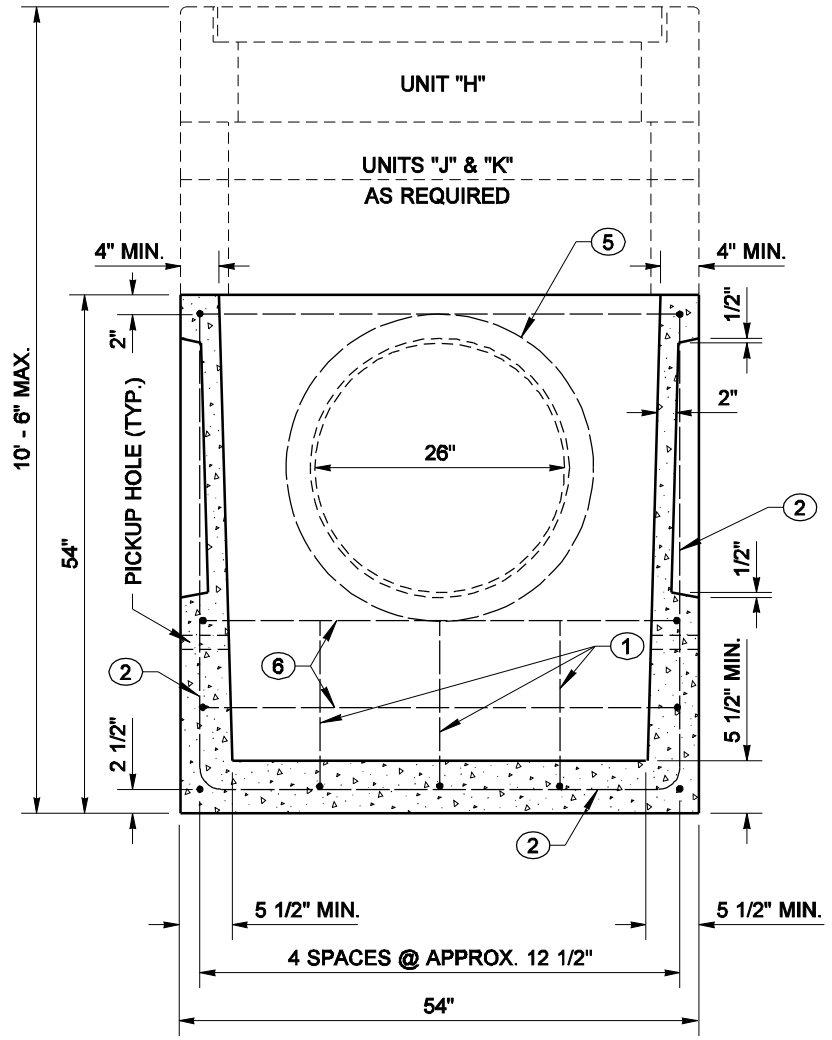
TOP VIEW



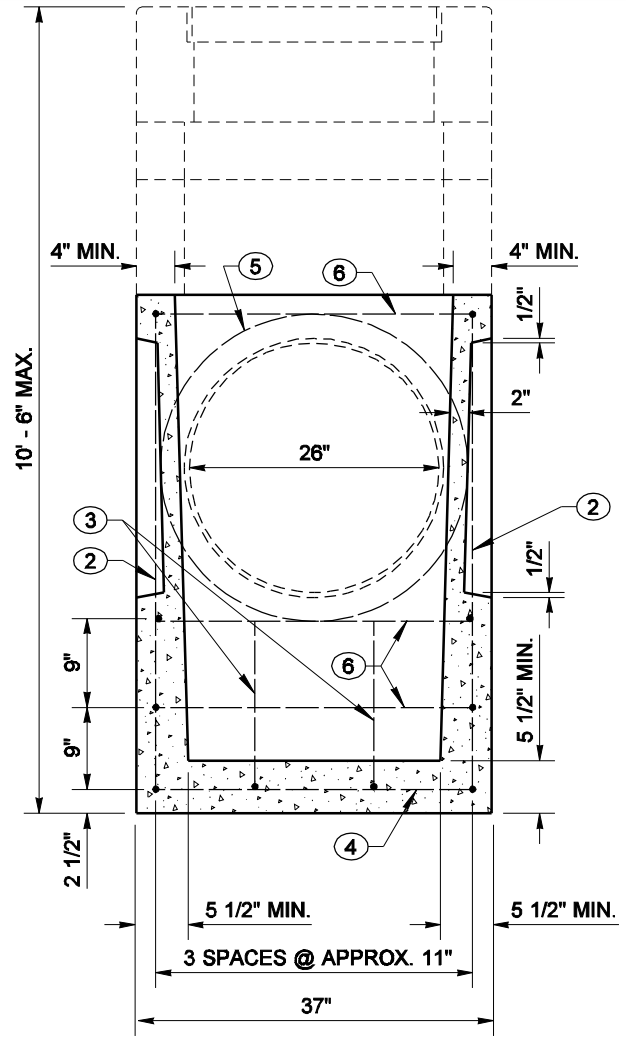
SECTION (A) TWO PIECE BASE



SECTION (B) TWO PIECE BASE



SECTION (A) ONE PIECE BASE



SECTION (B) ONE PIECE BASE

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

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

GRATE INLET TYPE 2

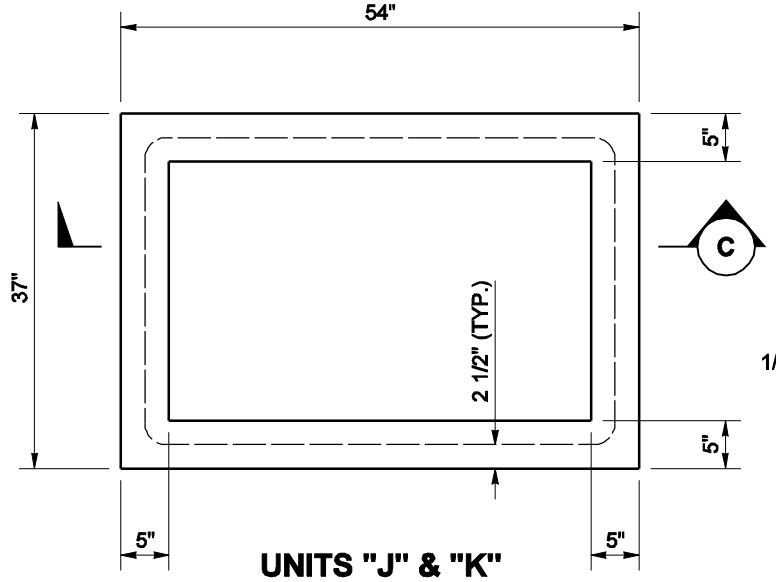
STANDARD PLAN B-35.40-00

SHEET 1 OF 2 SHEETS

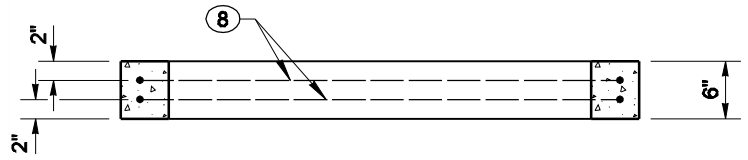
APPROVED FOR PUBLICATION

Harold J. Peterfeso — STATE DESIGN ENGINEER — *06-08-06* — DATE

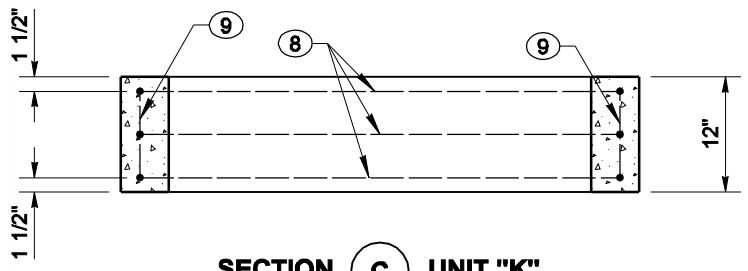
Washington State Department of Transportation



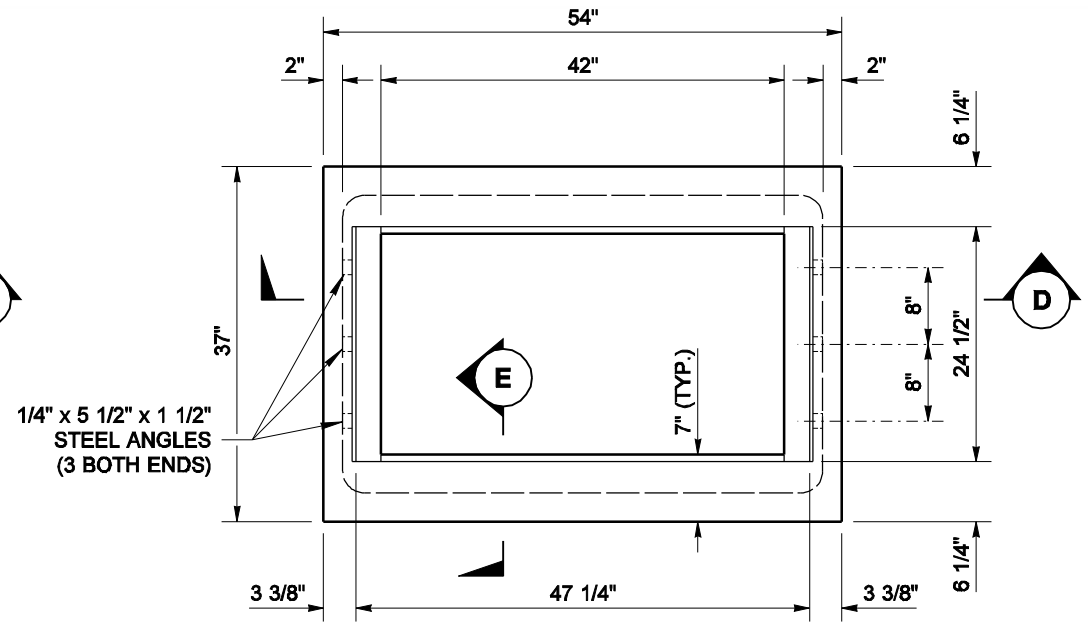
UNITS "J" & "K"



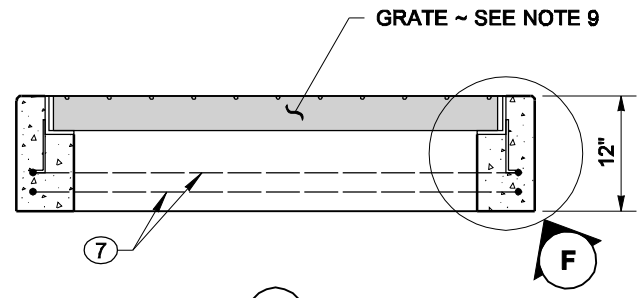
SECTION (C) UNIT "J"



SECTION (C) UNIT "K"



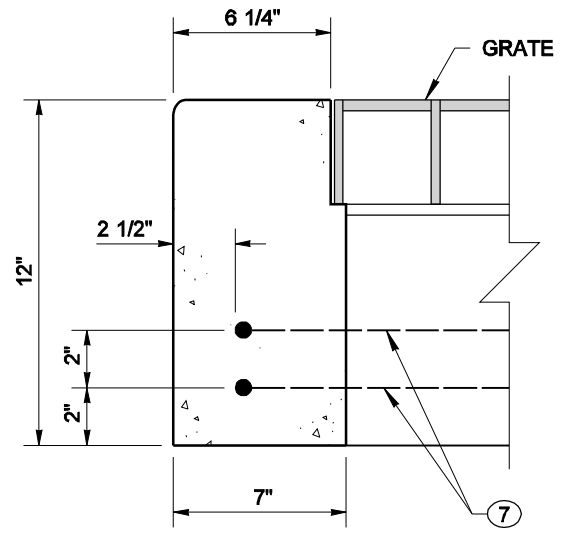
UNIT "H"



SECTION (D) UNIT "H"

NOTES

1. The Steel Angles shall be set so that each bearing bar of prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.
2. Top of inlet grate shall be placed at ground level to present an unobstructed ditch or median section.
3. All exposed concrete edges shall be finished with a 1/2" radius.
4. Pipes may enter through the knockouts on any side at any reasonable angle, provided the outside of the pipe can be contained between two opposite walls.
5. The flow line of the outlet pipe shall be 18" minimum above the inside bottom of the inlet structure.
6. The grade line of the top inside of any inlet pipe shall enter no lower than the grade line of the top inside of the outlet pipe.
7. Unit "H" and optional extension units "J" and "K" shall be grouted in place to the satisfaction of the Engineer.
8. All pickup holes shall be grouted full after the basin has been placed.
9. See contract for type of grate specified. See Standard Plan B-40.20 and B-40.40 for grate details.

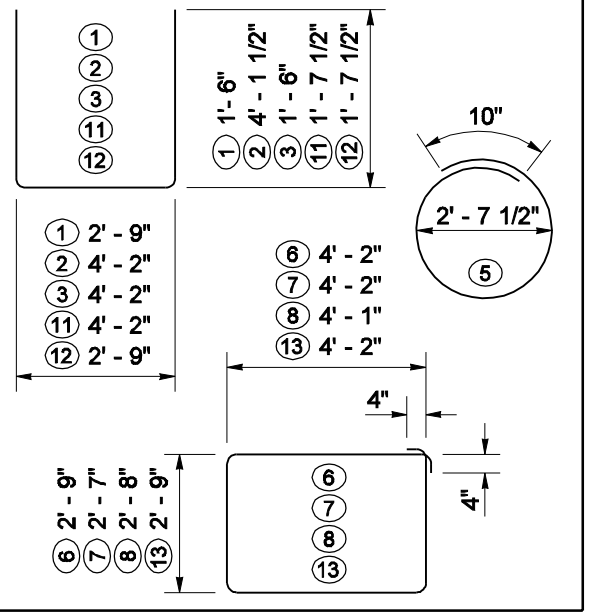


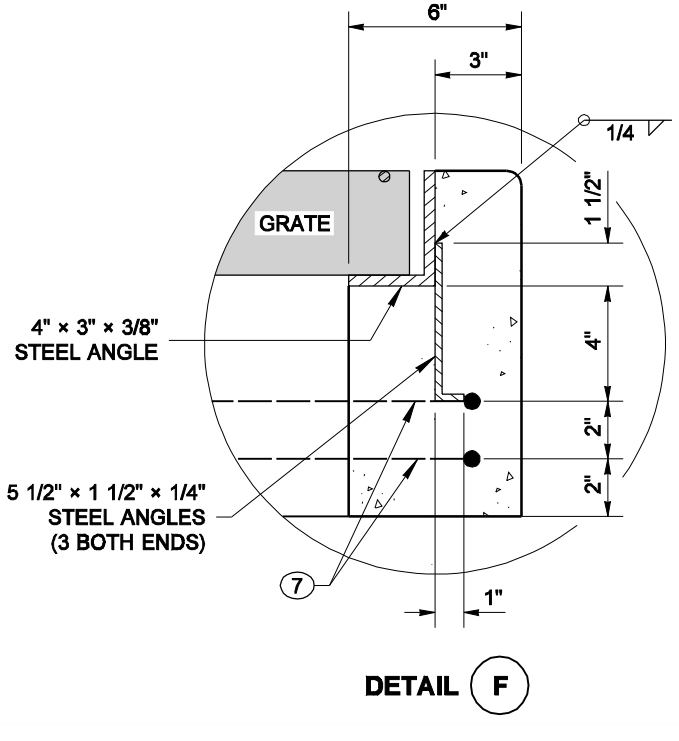
SECTION (E) UNIT "H"

BAR LIST

MARK	LOCATION	QTY.	SIZE	LENGTH	DESCRIPTION
(1)	BOTTOM SLAB AND SIDE WALL	3	3	5' - 9"	
(2)	BOTTOM SLAB AND SIDE WALL	2		12' - 5"	
(3)	BOTTOM SLAB AND SIDE WALL	2		7' - 2"	
(4)	BOTTOM SLAB AND SIDE WALL	2		2' - 9"	STRAIGHT
(5)	WALL	4		9' - 1"	HOOP
(6)	SIDE WALL	3		14' - 6"	HOOP
(7)	UNIT H	2		14' - 2"	HOOP
(8)	UNIT J	2		14' - 2"	HOOP
(8)	UNIT K	3		14' - 2"	HOOP
(9)	UNIT K	4		0' - 9"	STRAIGHT
(10)	SIDE WALL	8		2' - 8"	STRAIGHT
(11)	BOTTOM SLAB AND SIDE WALL	4		7' - 5"	
(12)	BOTTOM SLAB AND SIDE WALL	3		6' - 0"	
(13)	SIDE WALL	4		14' - 6"	HOOP

BENDING DIAGRAM
(ALL DIMENSIONS ARE OUT TO OUT)





DETAIL (F)

MATTHEW J. WITECKI
STATE OF WASHINGTON
15588
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES JULY 1, 2007

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GRATE INLET TYPE 2

STANDARD PLAN B-35.40-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Harold J. Peterfeso — STATE DESIGN ENGINEER — *06-08-06* — DATE

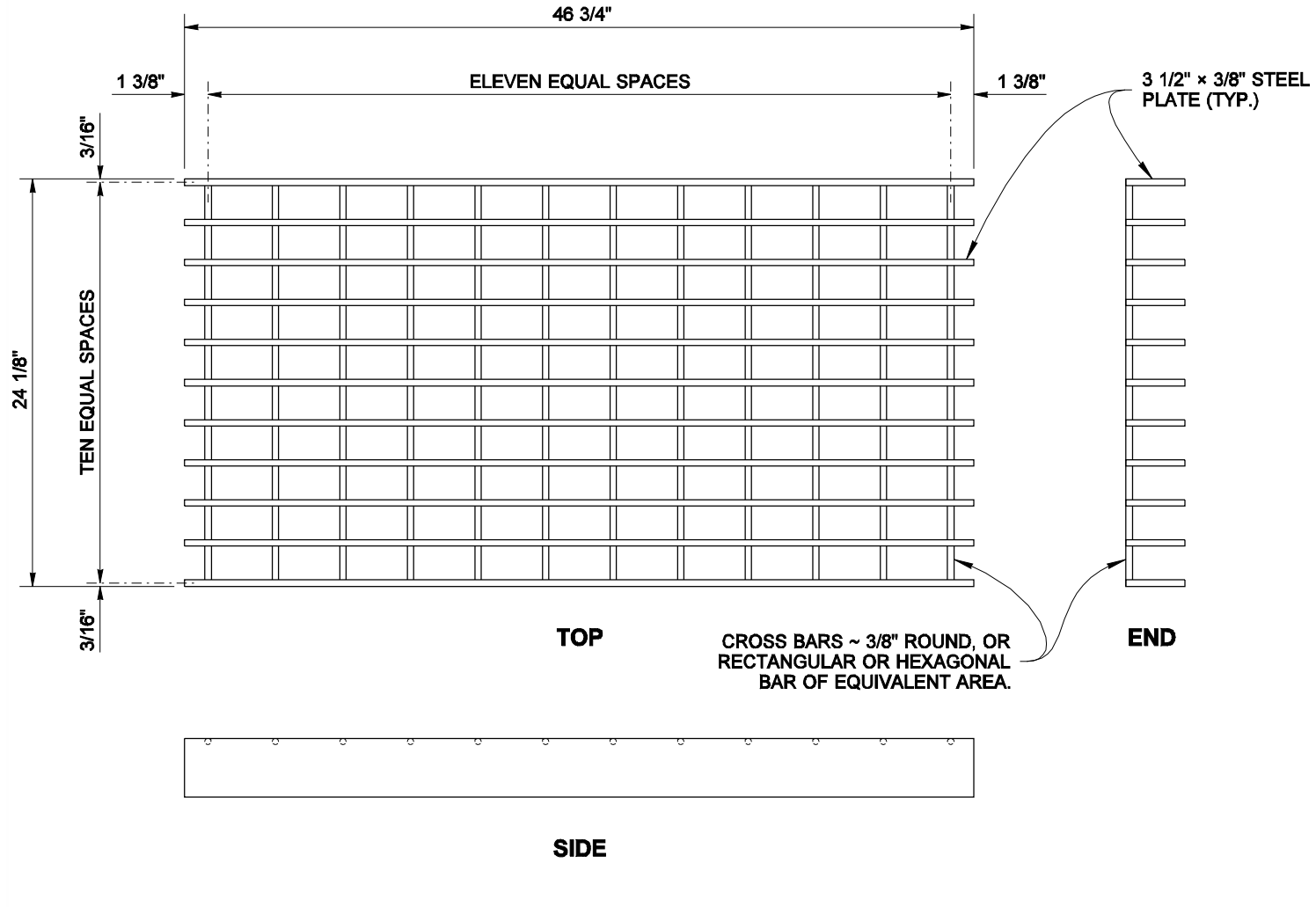
Washington State Department of Transportation

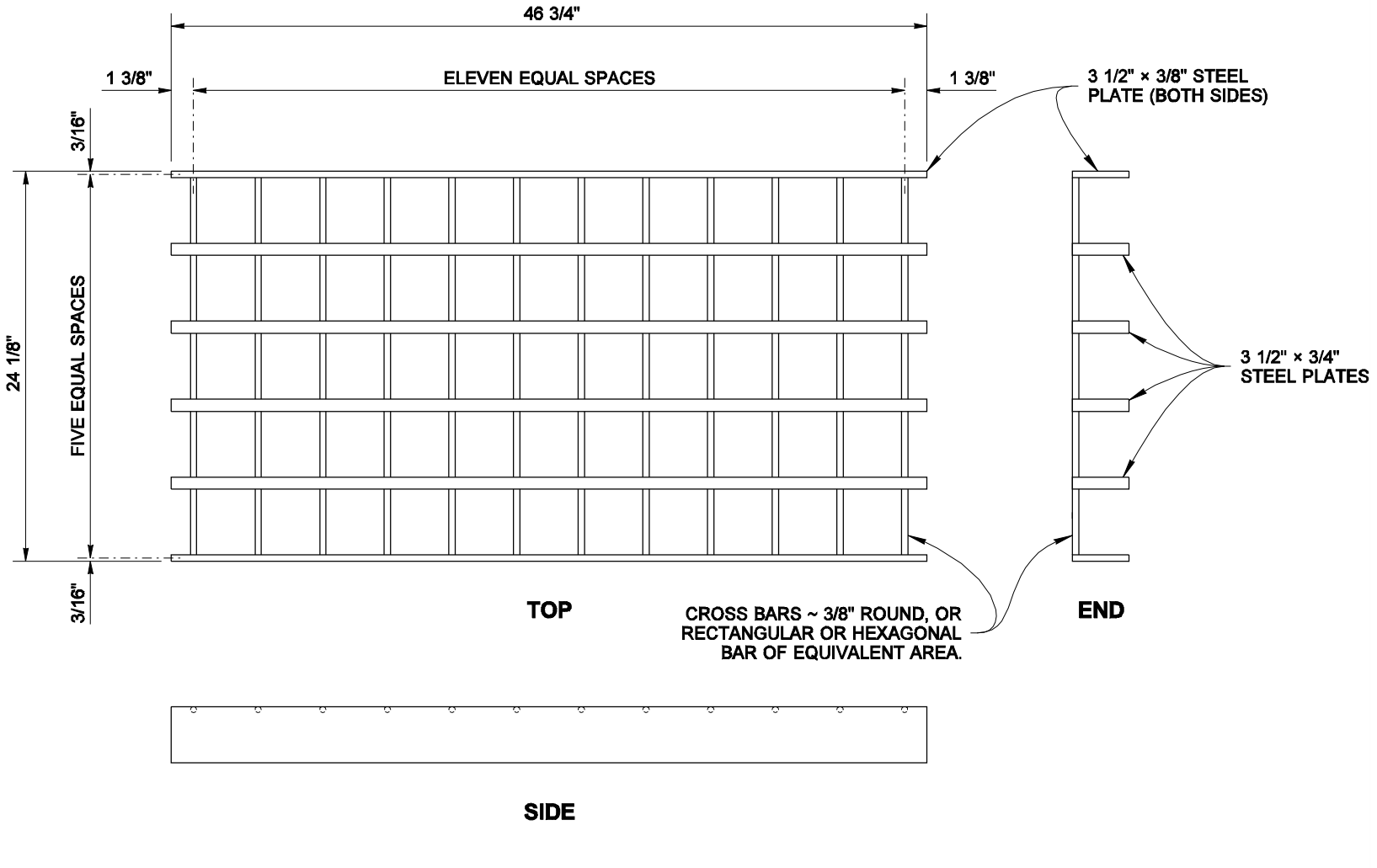
SUPPLEMENTAL TO STANDARD PLAN
B-35.40-00

Modify the Standard Plan as follows:

Notes:

1. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

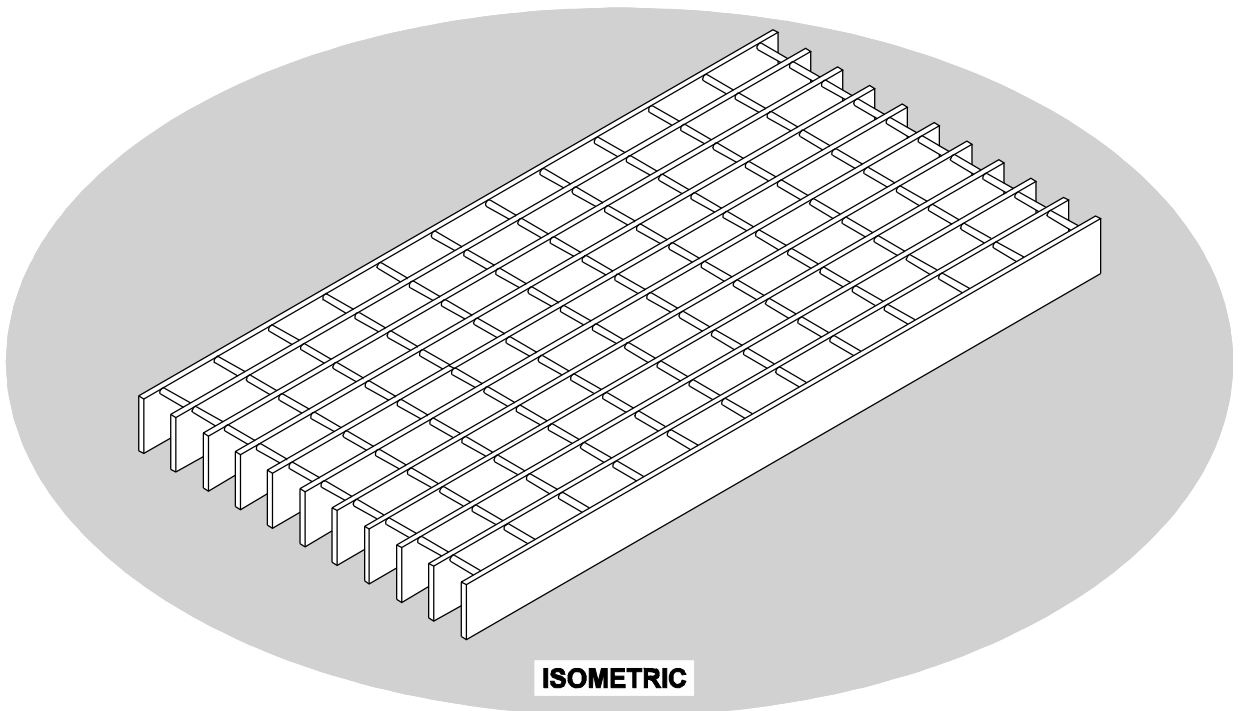




DRAWN BY: MARK SUJKA

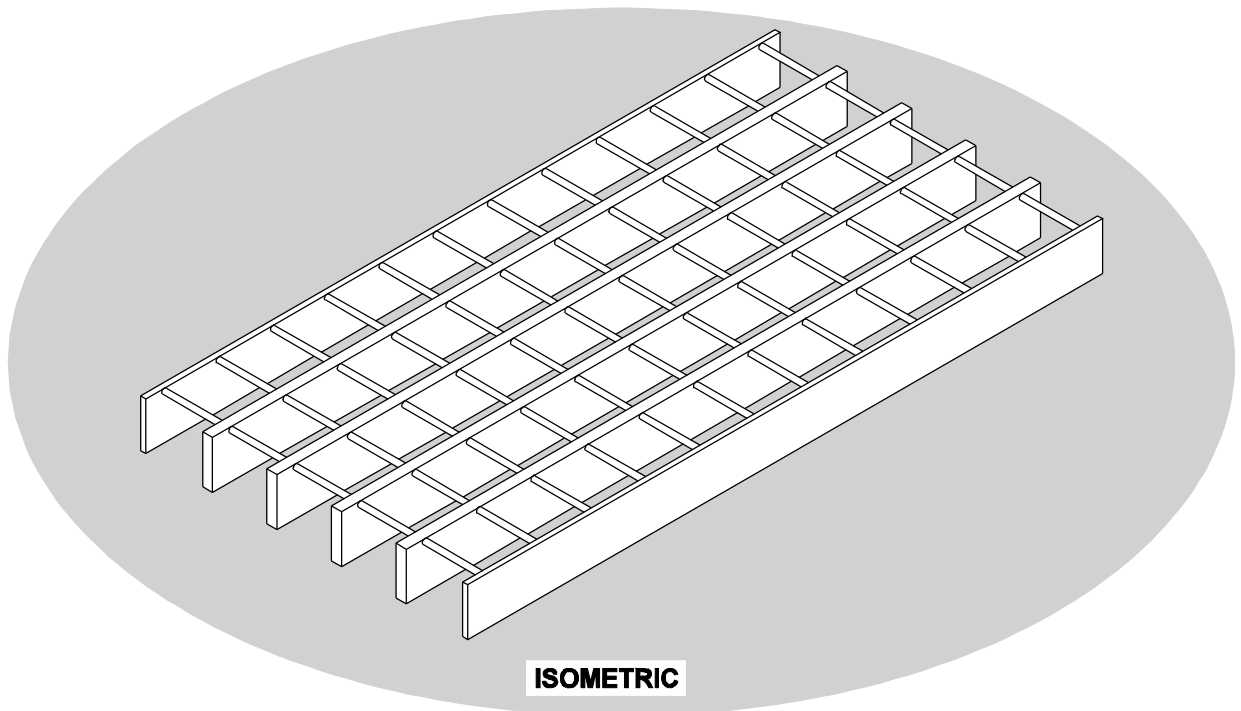
GRATE "A"

(APPROXIMATE WEIGHT 215 LBS)



GRATE "B"

(APPROXIMATE WEIGHT 215 LBS)



EXPIRES JULY 1, 2007

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WELDED GRATES FOR GRATE INLET

STANDARD PLAN B-40.20-00

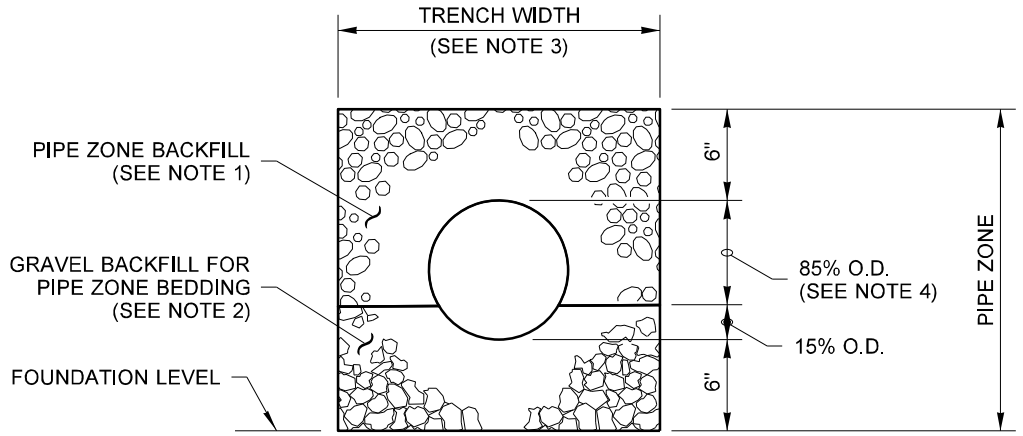
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

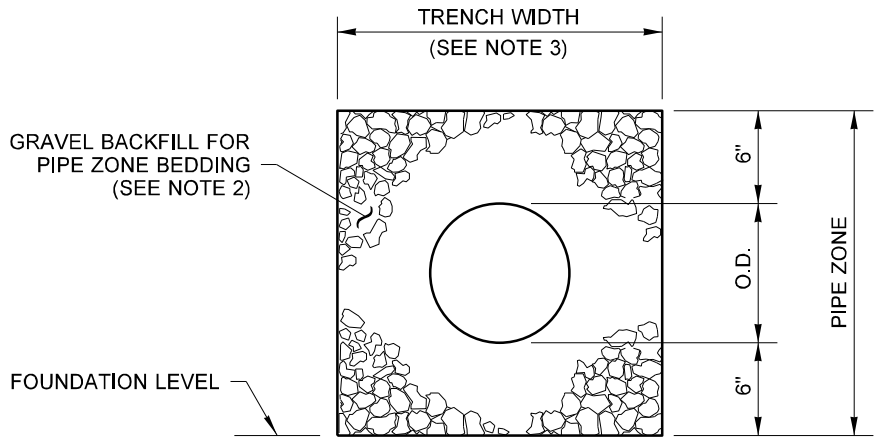
Harold J. Peterfeso — STATE DESIGN ENGINEER — *06-01-06* — DATE

Washington State Department of Transportation

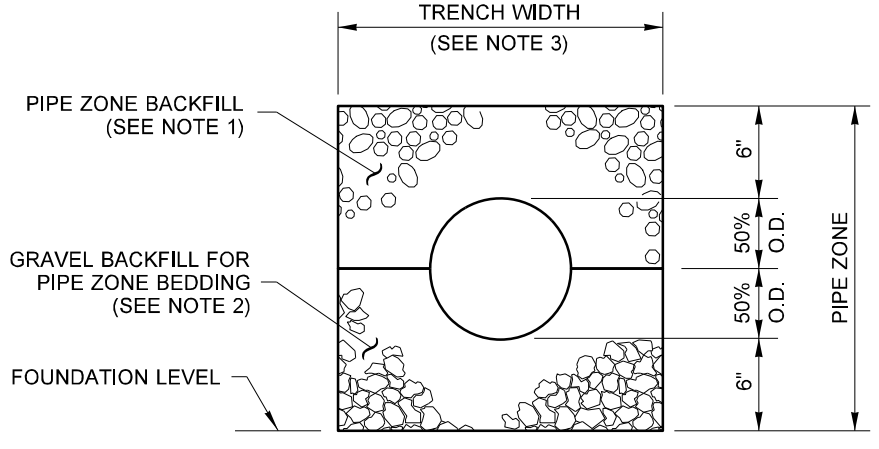
DRAWN BY: FERN LIDDELL



CONCRETE AND DUCTILE IRON PIPE



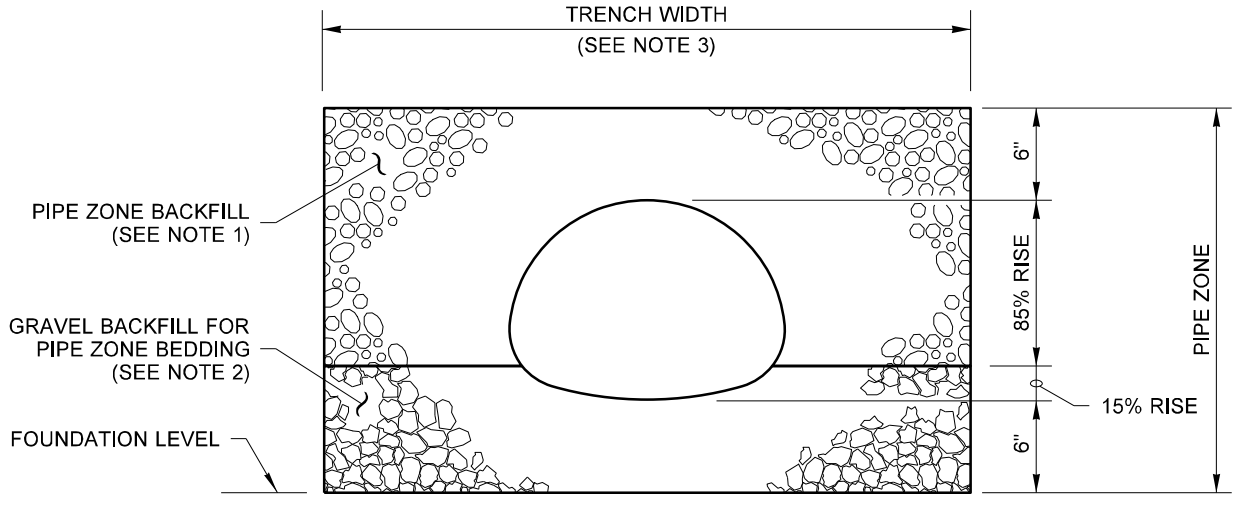
THERMOPLASTIC PIPE



METAL AND STEEL RIB REINFORCED POLYETHYLENE PIPE

NOTES

1. See **Standard Specifications Section 7-08.3(3)** for Pipe Zone Backfill.
2. See **Standard Specifications Section 9-03.12(3)** for Gravel Backfill for Pipe Zone Bedding.
3. See **Standard Specifications Section 2-09.4** for Measurement of Trench Width.
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.



PIPE ARCHES

CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS		
PIPE	**SIZE**	**MINIMUM DISTANCE BETWEEN BARRELS**
CIRCULAR PIPE (DIAMETER)	**UP TO 48"**	**24"**
METAL PIPE ARCH (SPAN)	**48" AND LARGER**	**DIAMETER/2 OR 36" WHICHEVER IS LESS**

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:56 PM

PIPE ZONE BEDDING AND BACKFILL

STANDARD PLAN B-55.20-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 27 2018 8:01 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-55.20-02

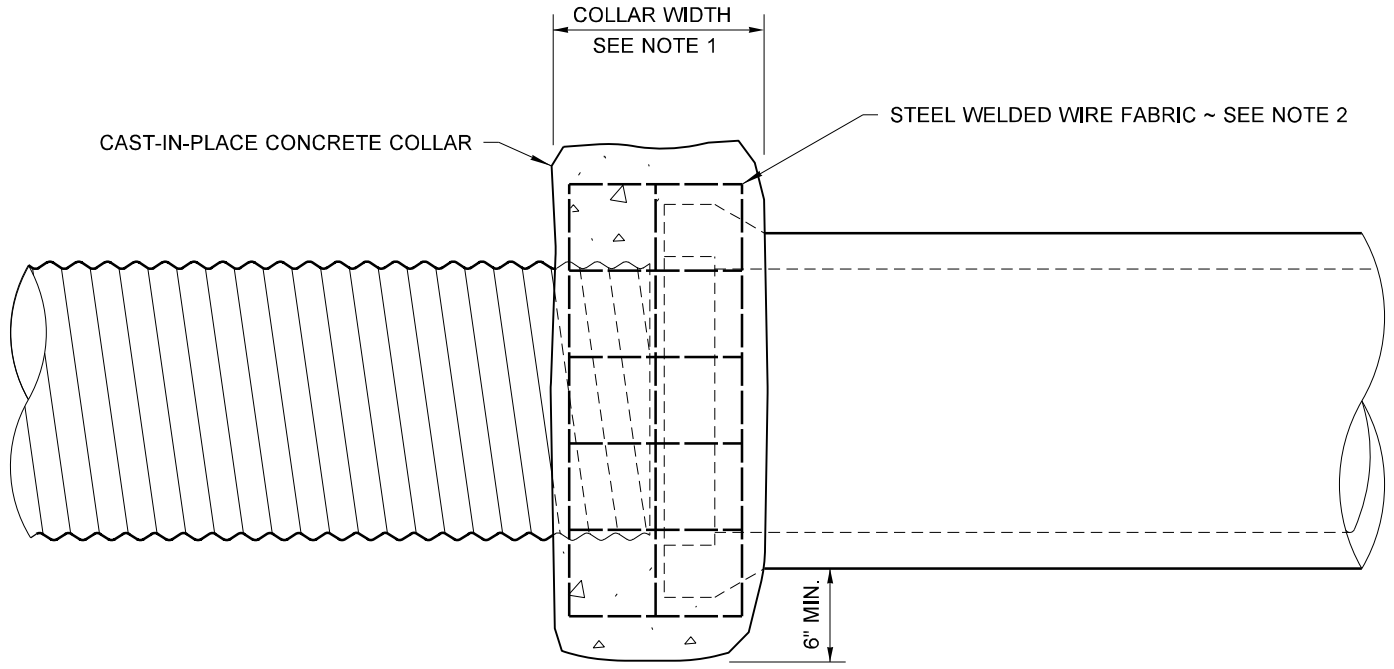
Modify the Standard Plan as follows:

Notes:

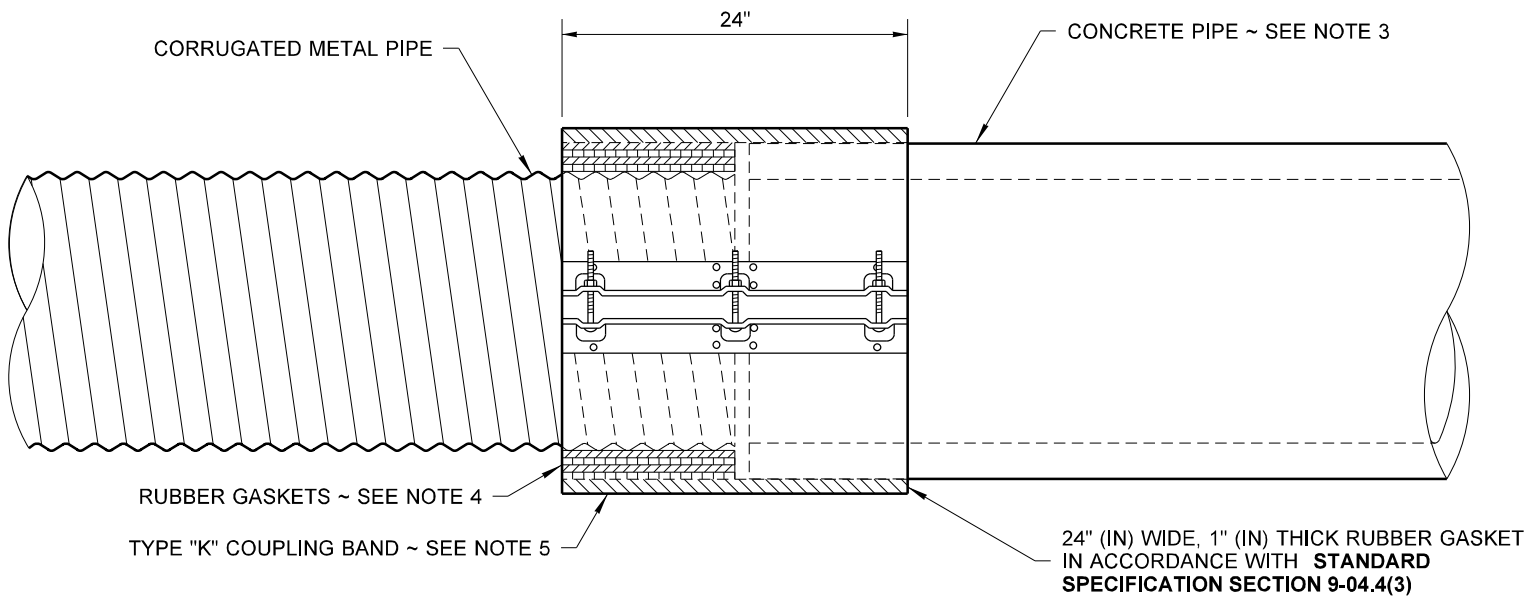
1. Delete Notes 1. and 2.

2. Pipe Zone Backfill and Pipe Zone Bedding shall be CSTC.

DRAWN BY: FERN LIDDELL



CONCRETE COLLAR OPTION



COUPLING BAND OPTION

NOTES

1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12" (in). Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes. Concrete shall be Commercial Concrete in accordance with **Standard Specification Section 6-02.3(2).**

2. Steel Welded Wire Fabric shall be in accordance with **Standard Specification Section 9-07.7**. Install two wraps for size 6 × 6 W1.4 × W1.4 (10 Gage) Steel Welded Wire Fabric or one wrap for any of the following sizes:

   6 × 6 W2.1 × W2.1 (8 Gage)
   6 × 6 W2.9 × W2.9 (6 Gage)
   4 × 4 W2.9 × W2.9 (6 Gage)
   4 × 4 W4.0 × W4.0 (4 Gage)

   Provide 1 1/2" min. covering over wire fabric.

3. When a Coupling Band connection requires attachment to the bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.

4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" (in) wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with **Standard Specification Section 9-04.4(3).**

5. Use a flat Type K Coupling Band. Type K Coupling Bands with dimples are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" (in) or less.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

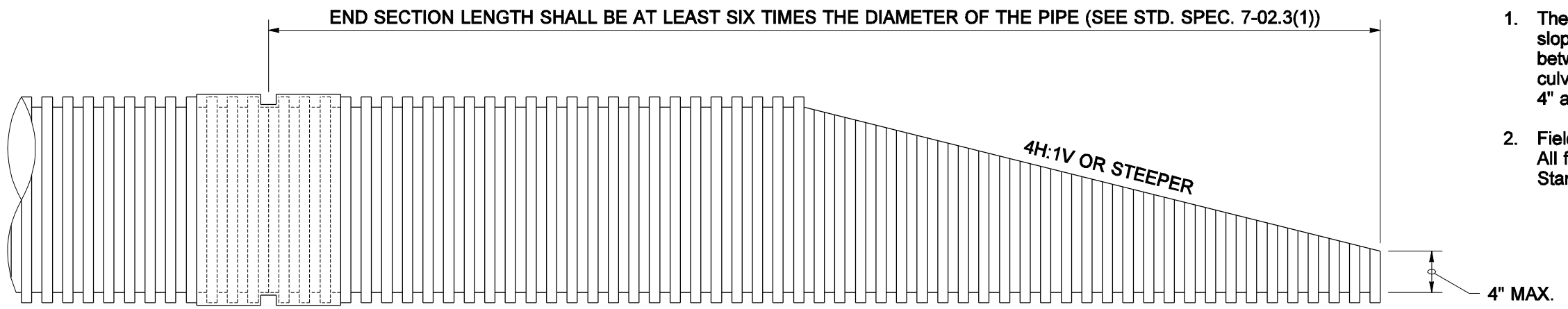
Heilman, Julie
Jun 11 2018 9:30 AM
cosign

CONNECTION DETAILS FOR DISSIMILAR CULVERT PIPE

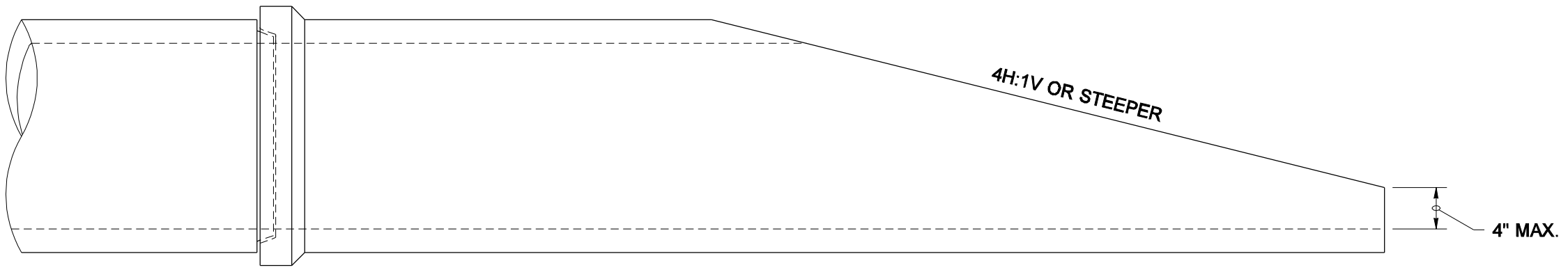
STANDARD PLAN B-60.20-01

SHEET 1 OF 1 SHEET

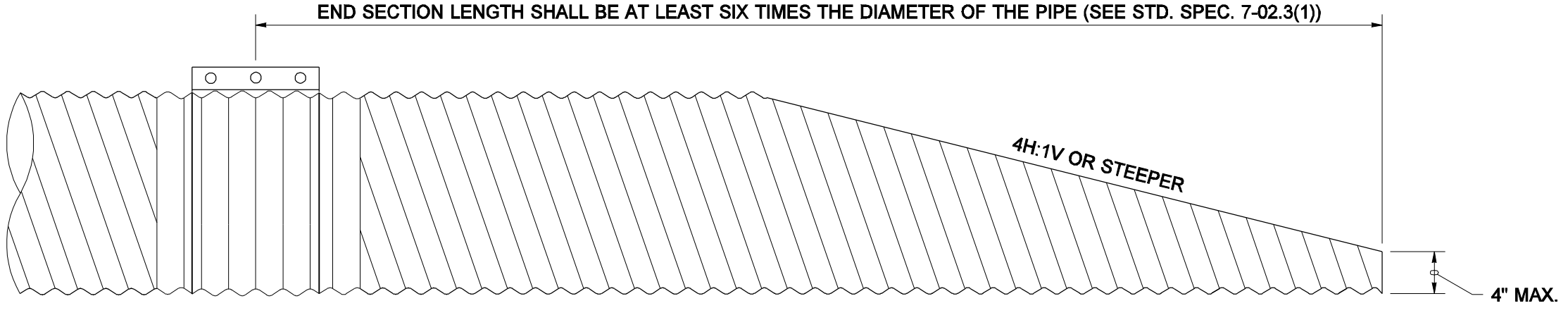
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jun 28 2018 10:44 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation



THERMOPLASTIC PIPE



CONCRETE PIPE



METAL PIPE

NOTES

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4H:1V. When slopes are between 4H:1V and 6H:1V, shape the slope in the vicintiy of the culvert end to ensure that no part of the culvert protrudes more than 4" above the ground line.

2. Field cutting of culvert ends is permitted when approved by the Engineer. All field-cut culvert pipe shall be treated with treatment as shown in the Standard Specifications or General Special Provisions.

FOR CULVERTS 30" DIAMETER OR LESS

MATTHEW J. WITECKI
STATE OF WASHINGTON
15588
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES JULY 1, 2007

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BEVELED END SECTIONS

STANDARD PLAN B-70.20-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterfeso — STATE DESIGN ENGINEER — *06-01-06* — DATE

Washington State Department of Transportation

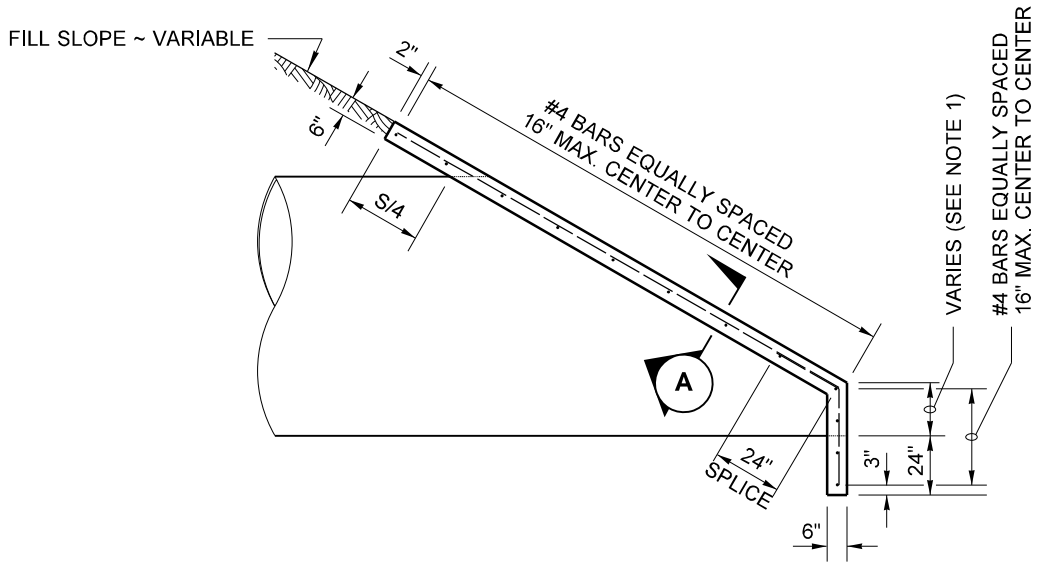
SUPPLEMENTAL TO STANDARD PLAN
B-70.20-00

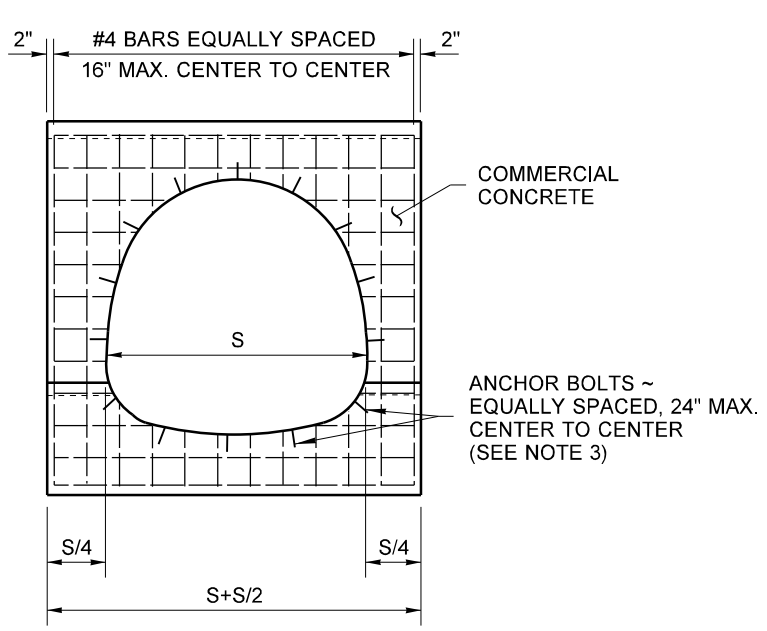
Modify the Standard Plan as follows:

Notes:

1. A concrete headwall per WSDOT B-75.20-02 and Type 2 safety bars per WSDOT B-75.60-00 shall be installed.

DRAWN BY: LISA CYFORD

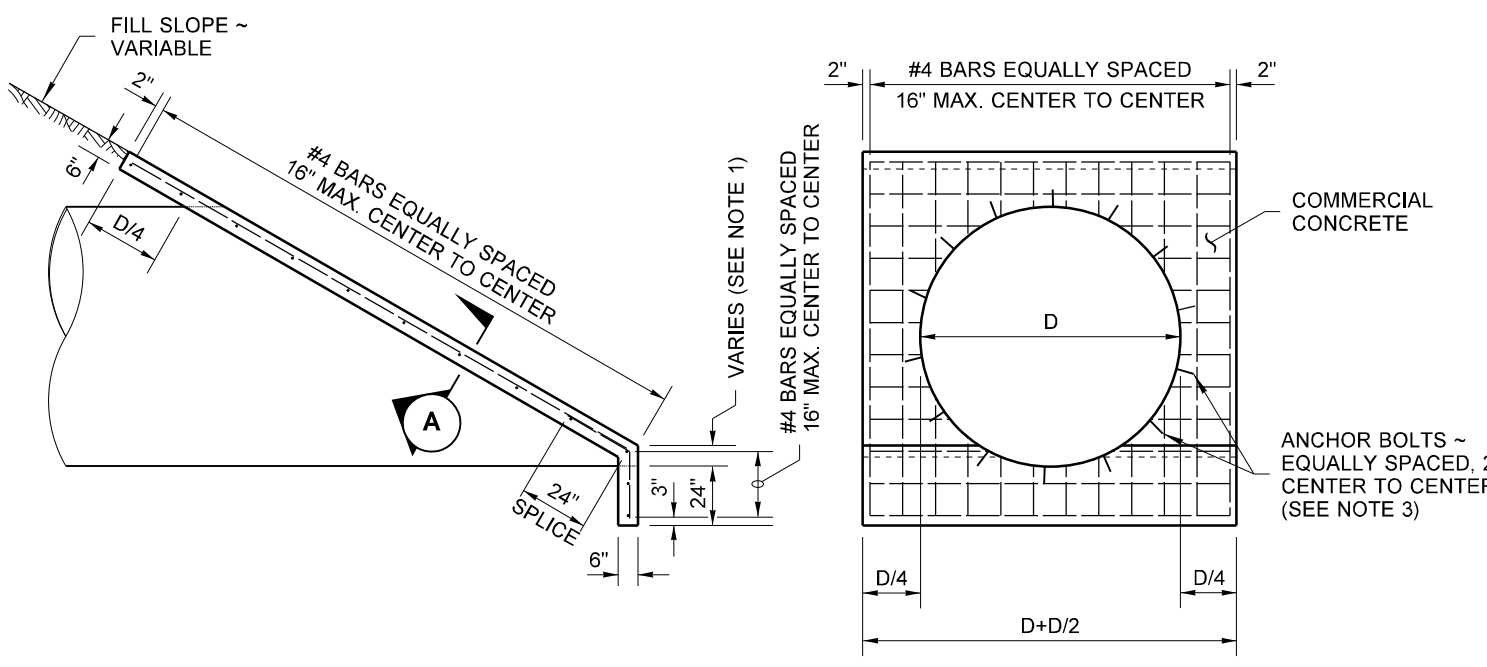




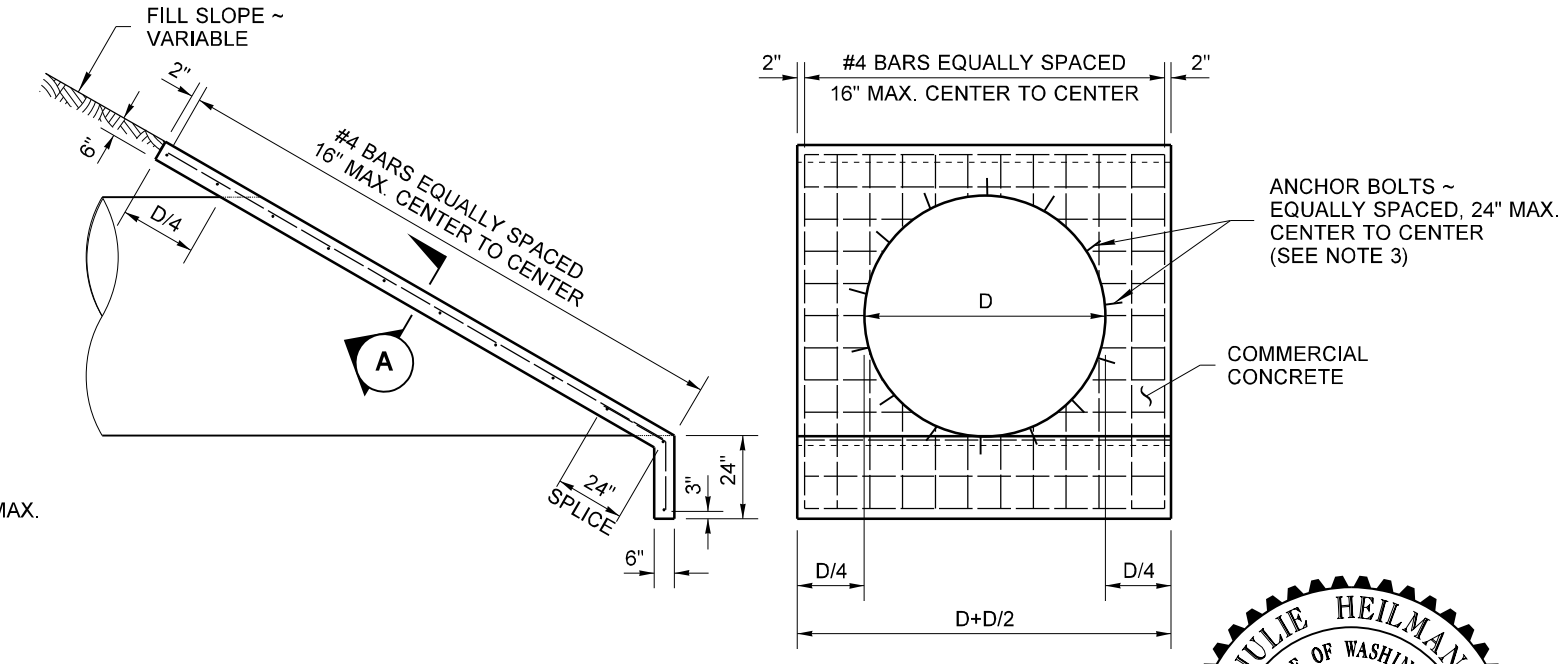
NOTES

1. The variable dimension indicated for the height of step for step mitered pipes shall conform to the manufacturers recommendations unless specified differently on the plans or in the Special Provisions.
2. Reinforcing steel shall have 1 1/2" (in) min. clear cover to all concrete surfaces.
3. Headwalls for concrete culvert pipe may omit anchor bolt attachment.
4. When steel pipe safety bars ar used, headwall thickness shall be increased to 8" (in).

STRUCTURAL PLATE PIPE ARCHES AND UNDERPASSES

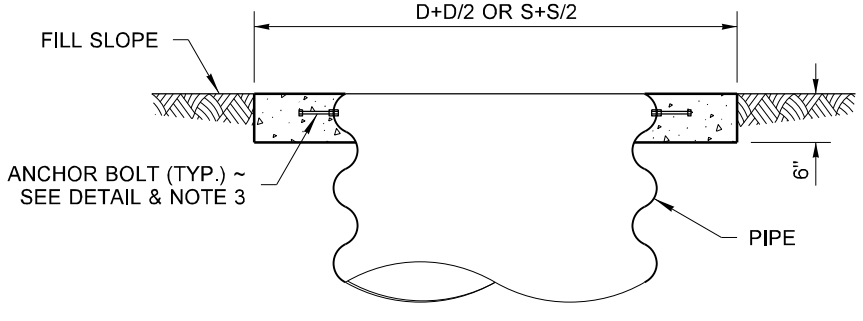


STEP MITERED PIPE

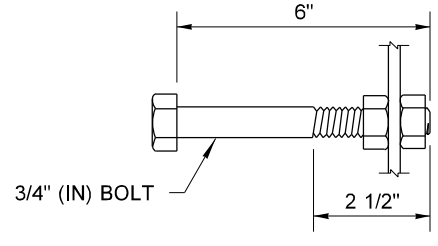


FULL MITERED PIPE

PIPES AND STRUCTURAL PLATE PIPES



SECTION (A)



ANCHOR BOLT DETAIL
SEE STANDARD SPECIFICATION SECTION 9-06.5(1)

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:57 PM

HEADWALLS FOR CULVERT PIPE AND UNDERPASS

STANDARD PLAN B-75.20-02

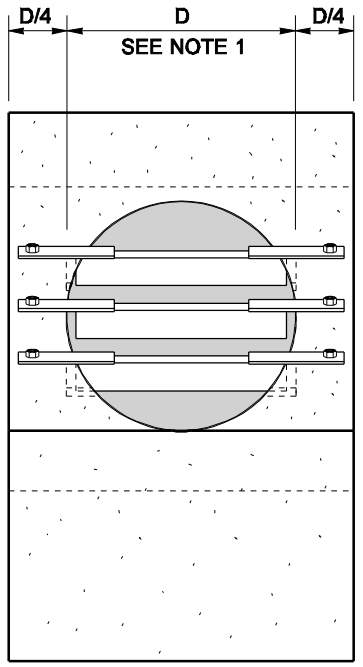
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 27 2018 8:03 AM

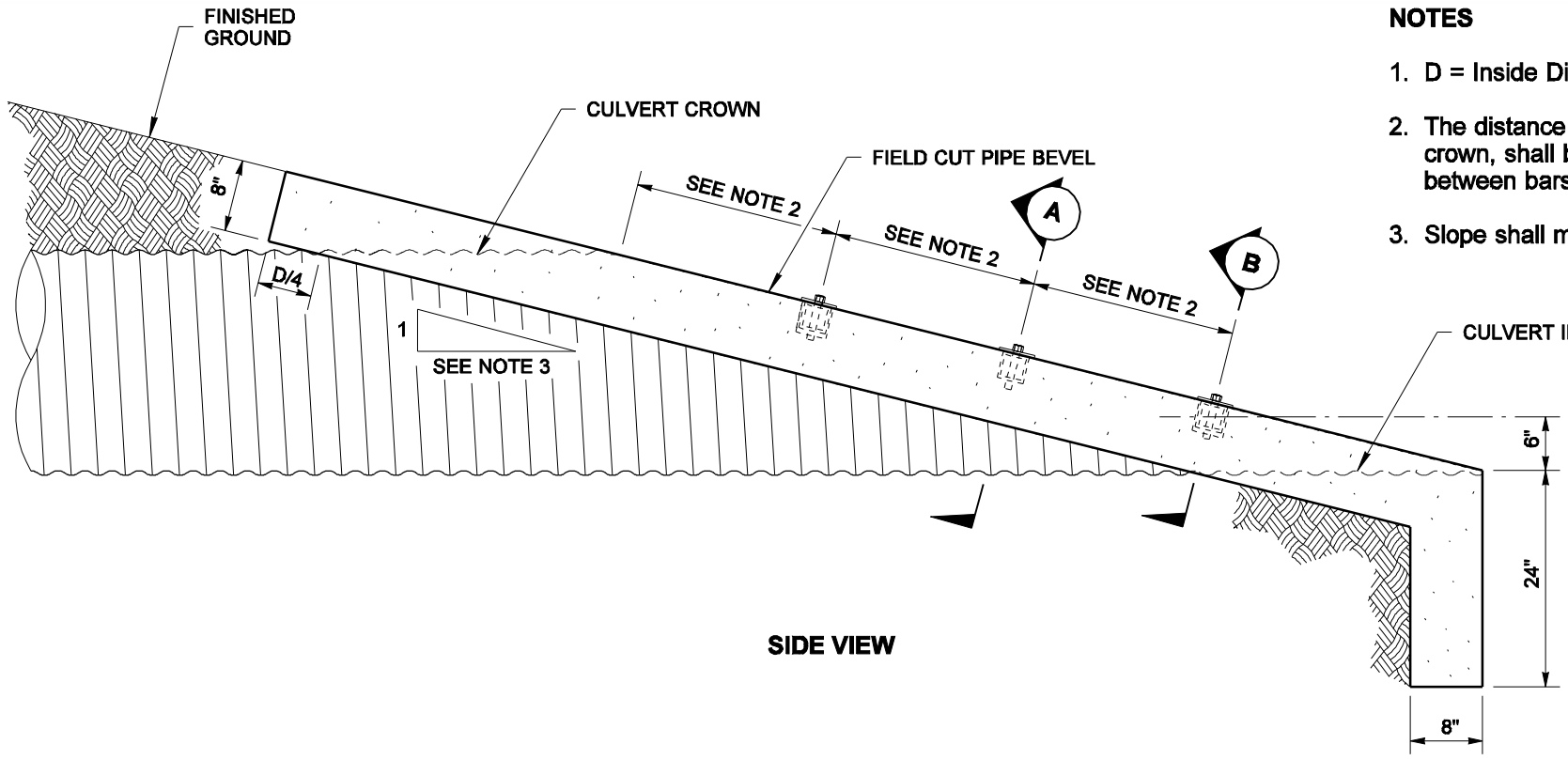
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: ADAM COCHRAN



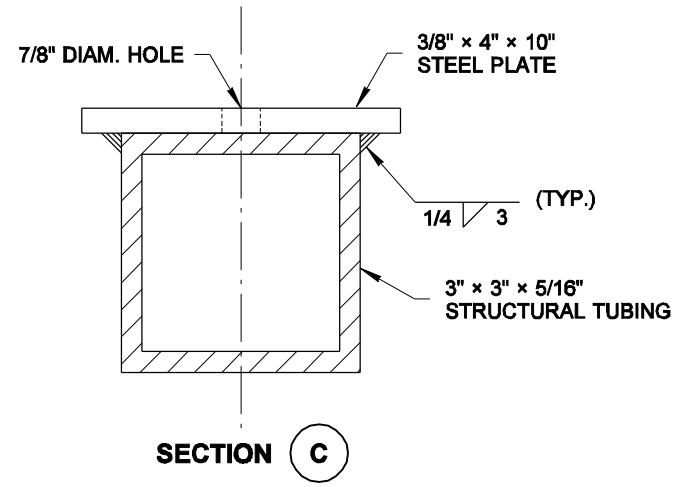
FRONT VIEW



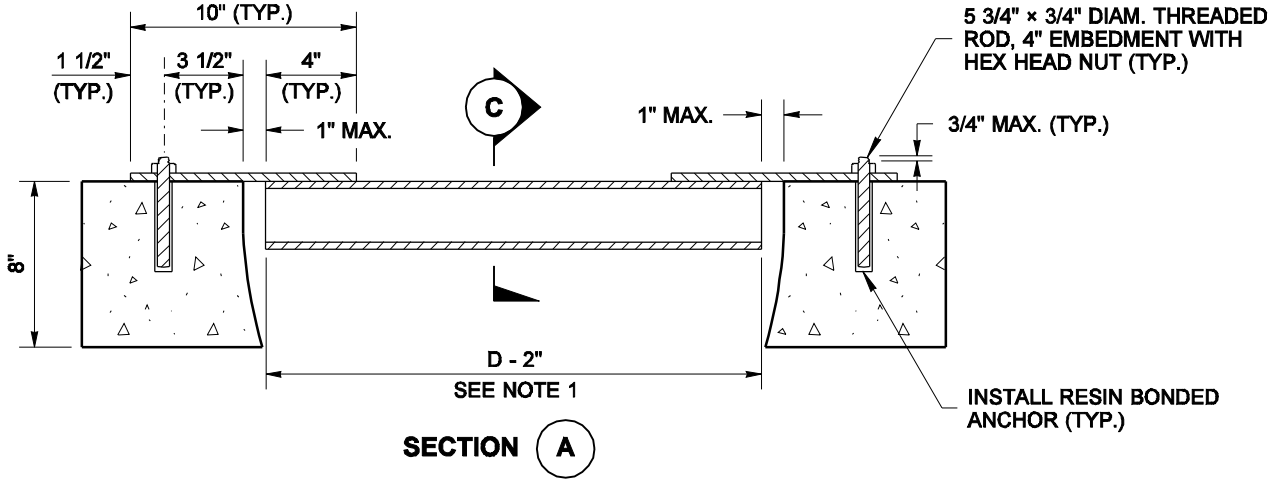
SIDE VIEW

NOTES

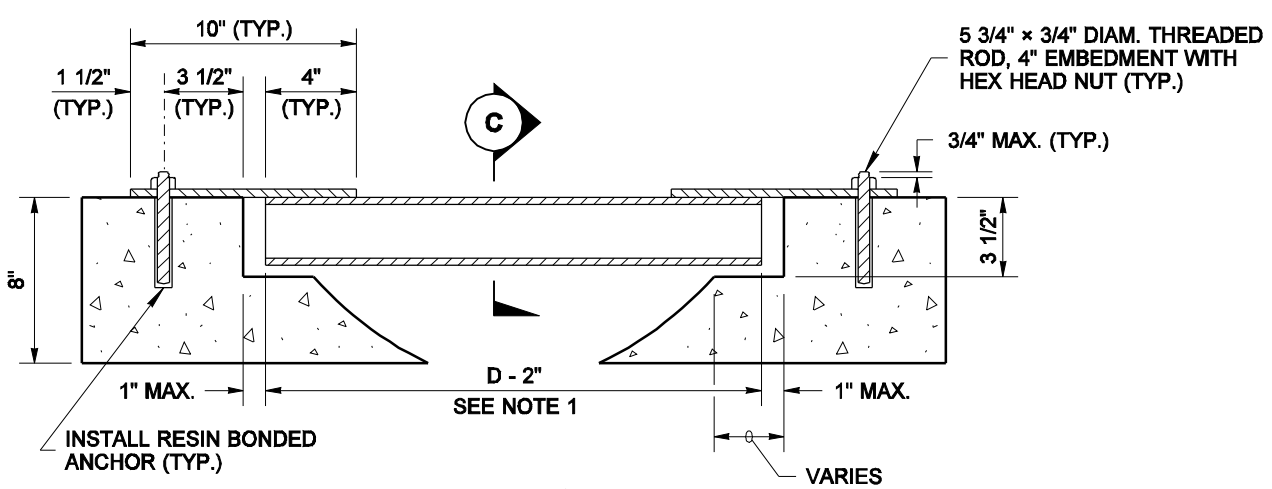
1. D = Inside Diameter of Culvert Pipe, or Pipe Arch Span Width, 36" maximum.
2. The distance between the safety bars, and between the top bar and the culvert crown, shall be equal spaces of no more than 24". The distance may vary ±1" between bars to facilitate placement.
3. Slope shall match Side Slope; 6H:1V preferred, not steeper than 4H:1V.



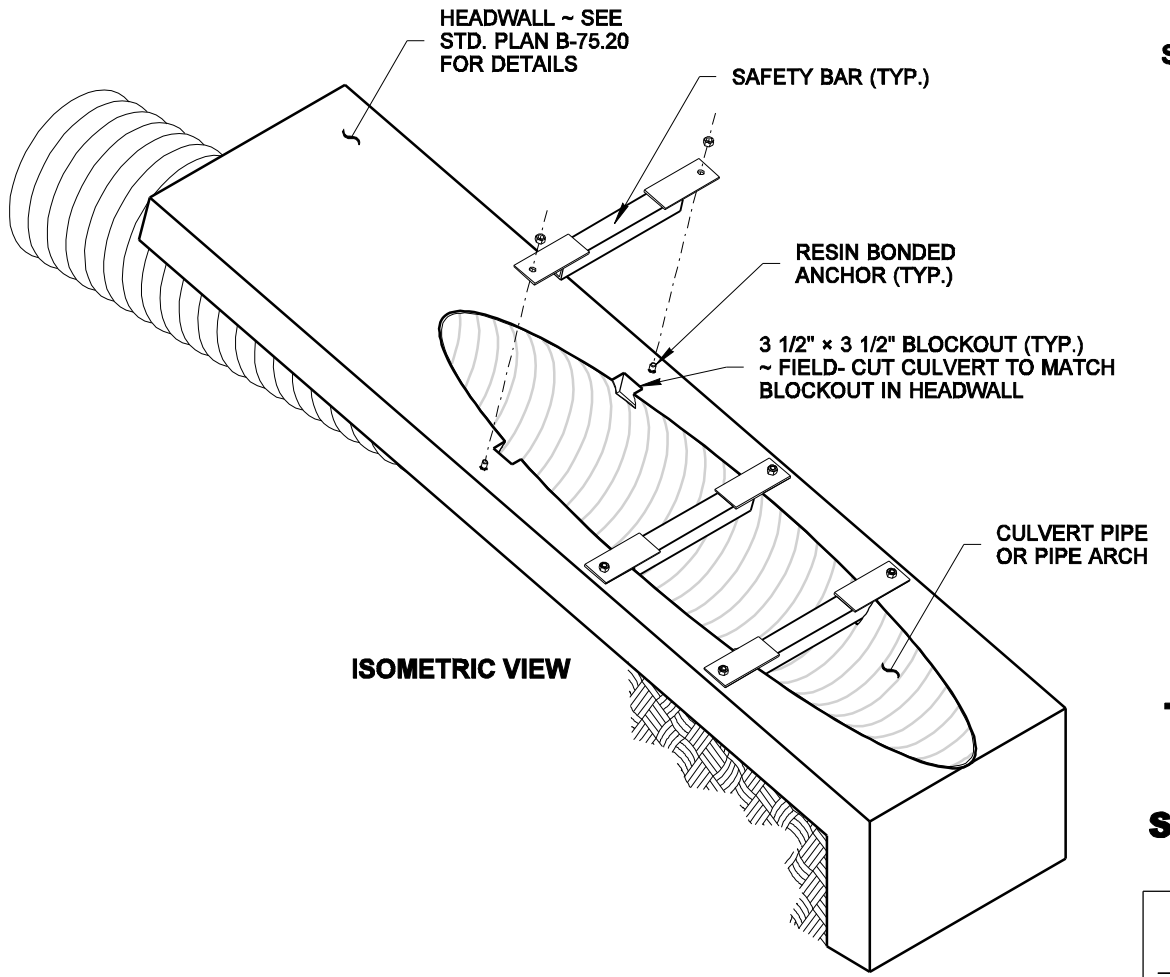
SECTION C



SECTION A



SECTION B



ISOMETRIC VIEW

MATTHEW J. WITECKI
STATE OF WASHINGTON
15588
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES JULY 1, 2007

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TYPE 2 SAFETY BARS FOR CULVERT PIPE OR PIPE ARCH (ON CROSS ROAD)
STANDARD PLAN B-75.60-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterfeso — STATE DESIGN ENGINEER

06-08-06 — DATE

Washington State Department of Transportation

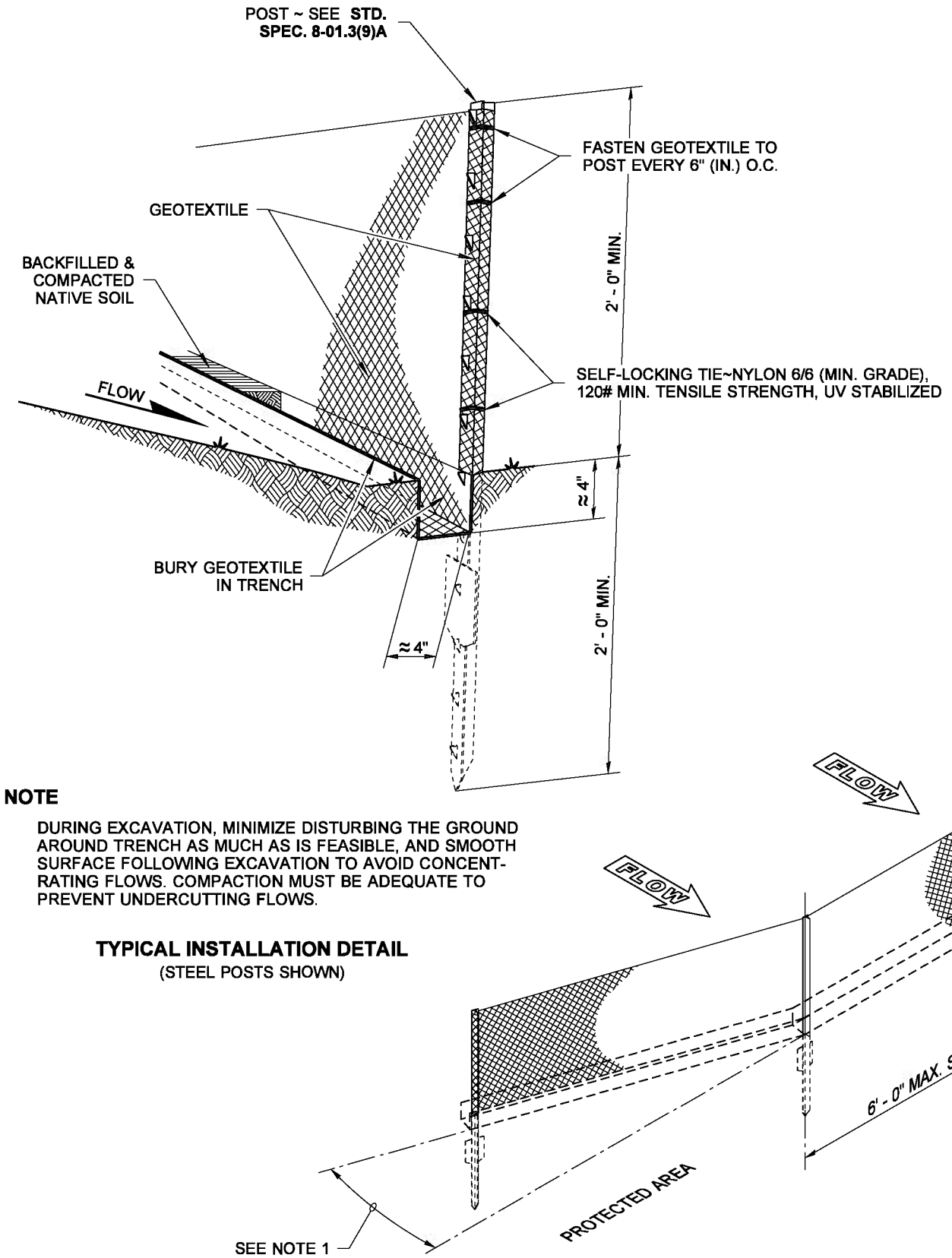
SUPPLEMENTAL TO STANDARD PLAN B-75.60-00

Modify the Standard Plan as follows:

Notes:

1. In Note 2, change the bar spacing from 24" to 12".

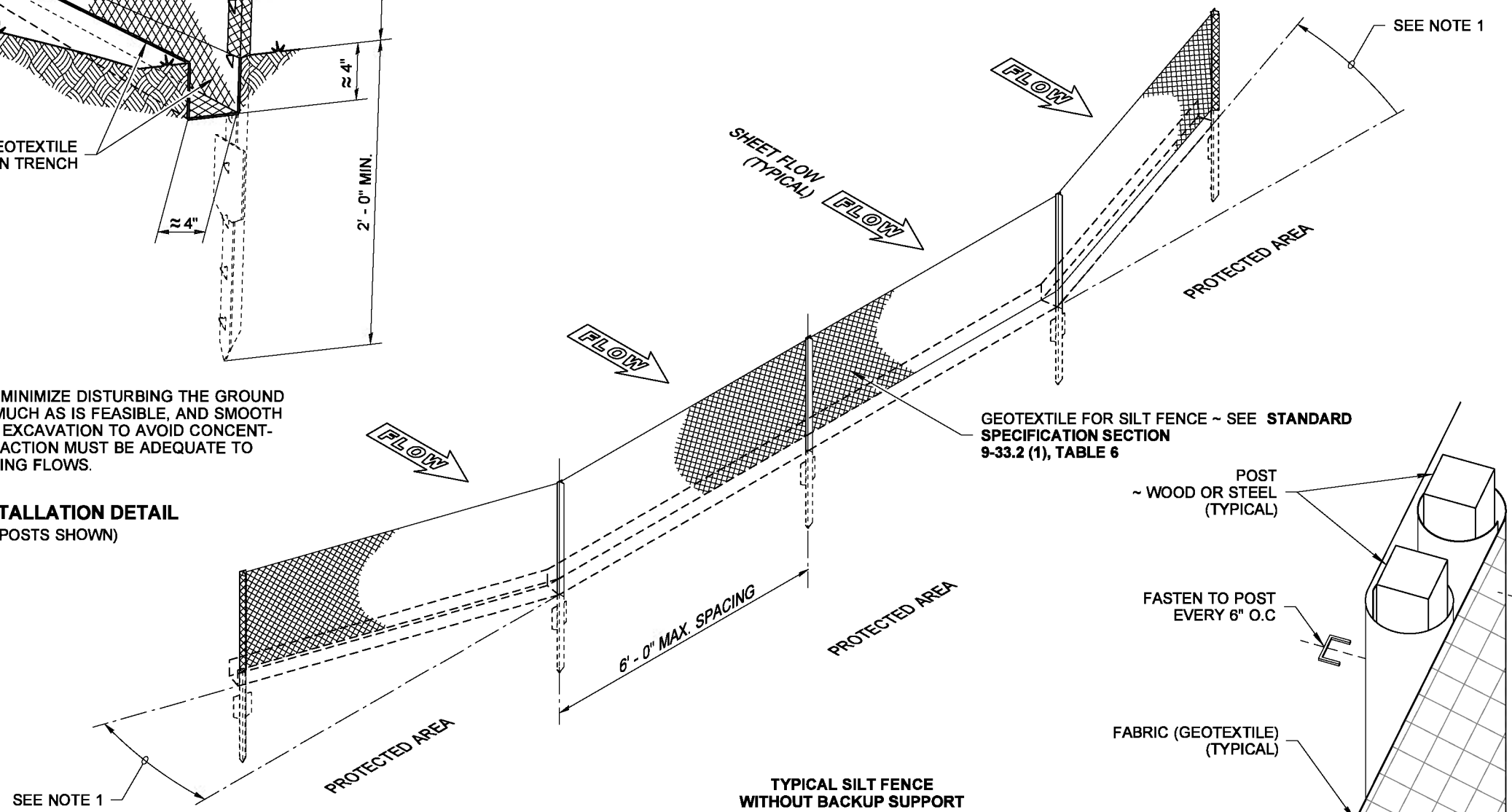
DRAWN BY: BILL BERENS



NOTE

DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.

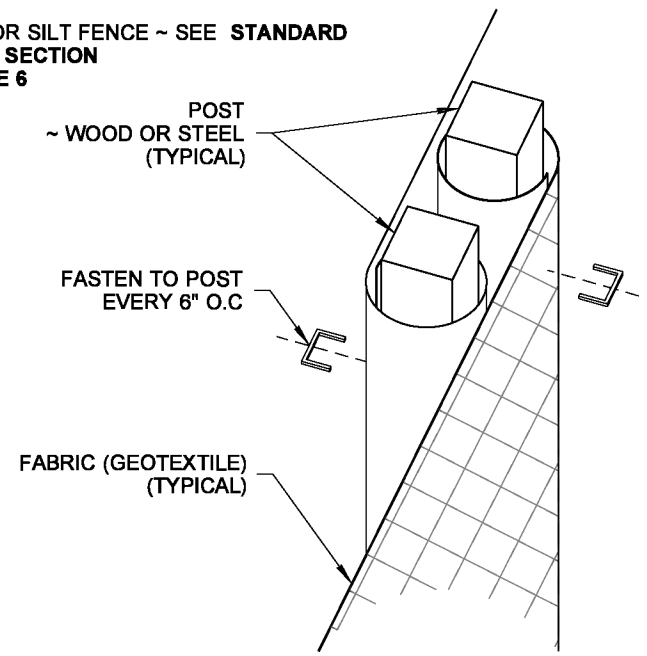
TYPICAL INSTALLATION DETAIL
(STEEL POSTS SHOWN)



TYPICAL SILT FENCE WITHOUT BACKUP SUPPORT
ISOMETRIC
(STEEL POSTS SHOWN)

NOTES

1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Perform maintenance in accordance with **Standard Specifications 8-01.3(9)A and 8-01.3(15)**.
3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.
4. Install silt fencing parallel to mapped contour lines.



SPLICED FENCE SECTIONS SHALL BE CLOSE ENOUGH TOGETHER TO PREVENT SILT LADEN WATER FROM ESCAPING THROUGH THE FENCE AT THE OVERLAP.

SPLICE DETAIL
(WOOD POSTS SHOWN)

STATE OF WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

SANDRA L. SALISBURY
CERTIFICATE NO. 000860

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SILT FENCE

STANDARD PLAN I-30.15-02

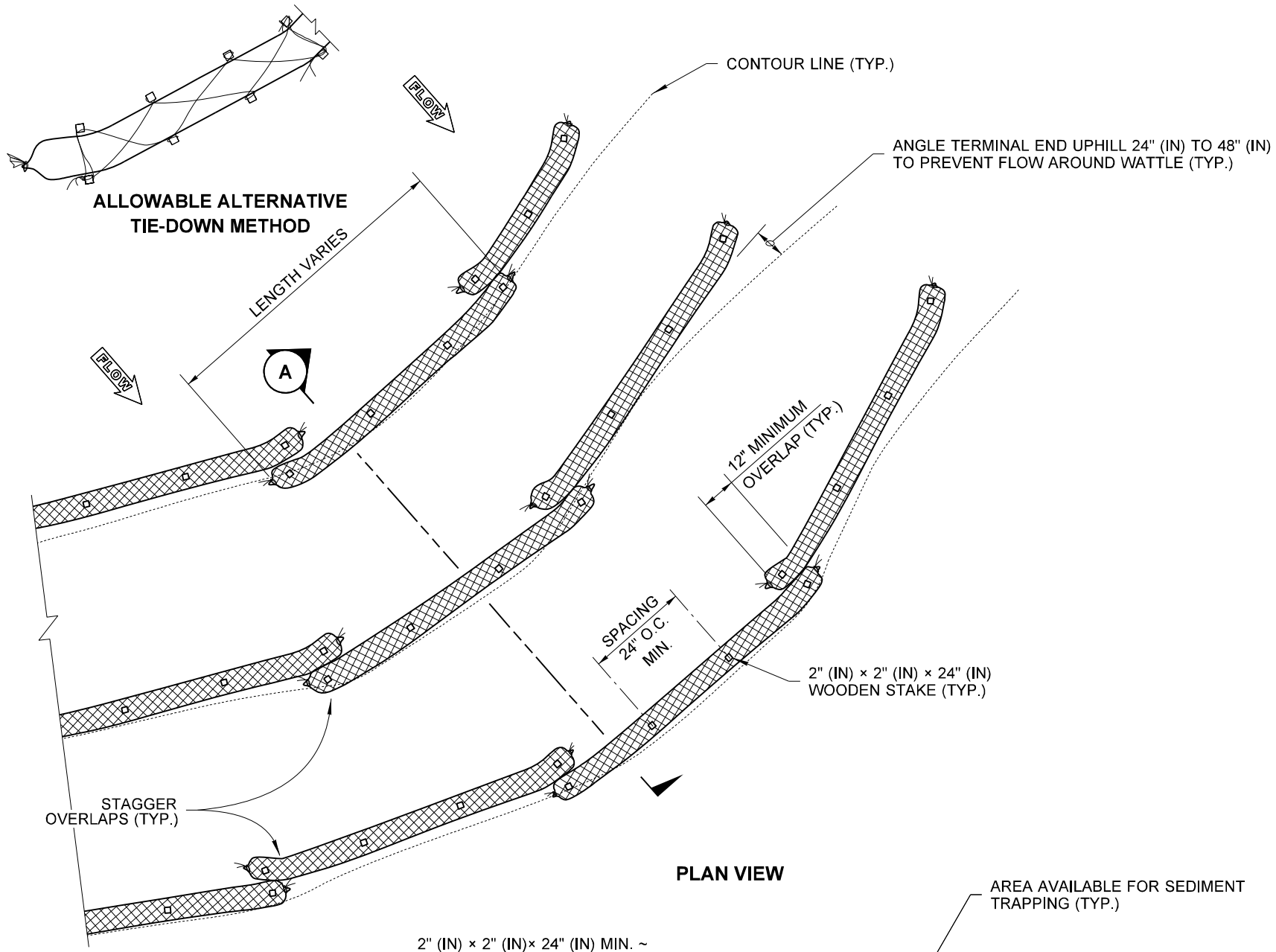
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

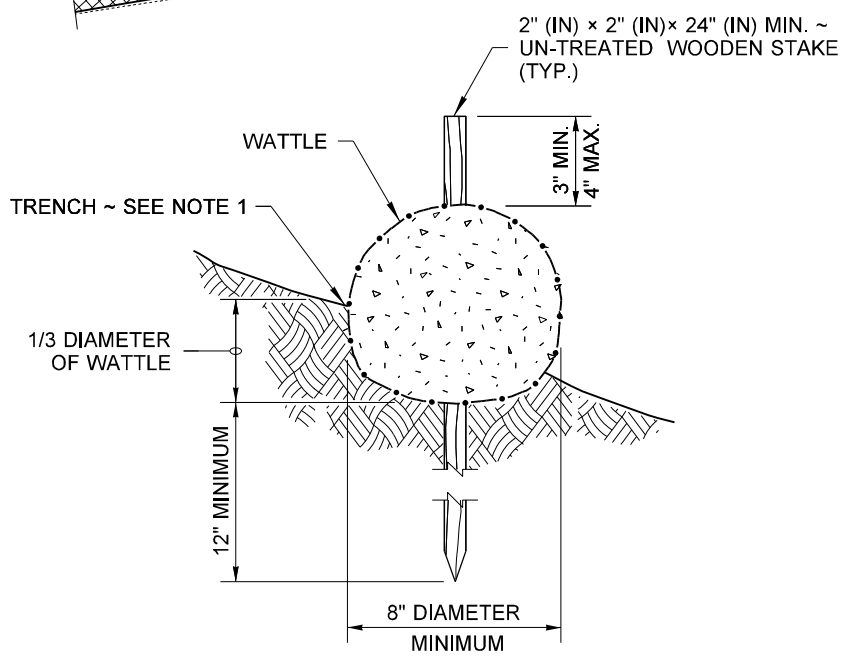
Pasco Bakotich III — STATE DESIGN ENGINEER
3/22/13 — DATE

Washington State Department of Transportation

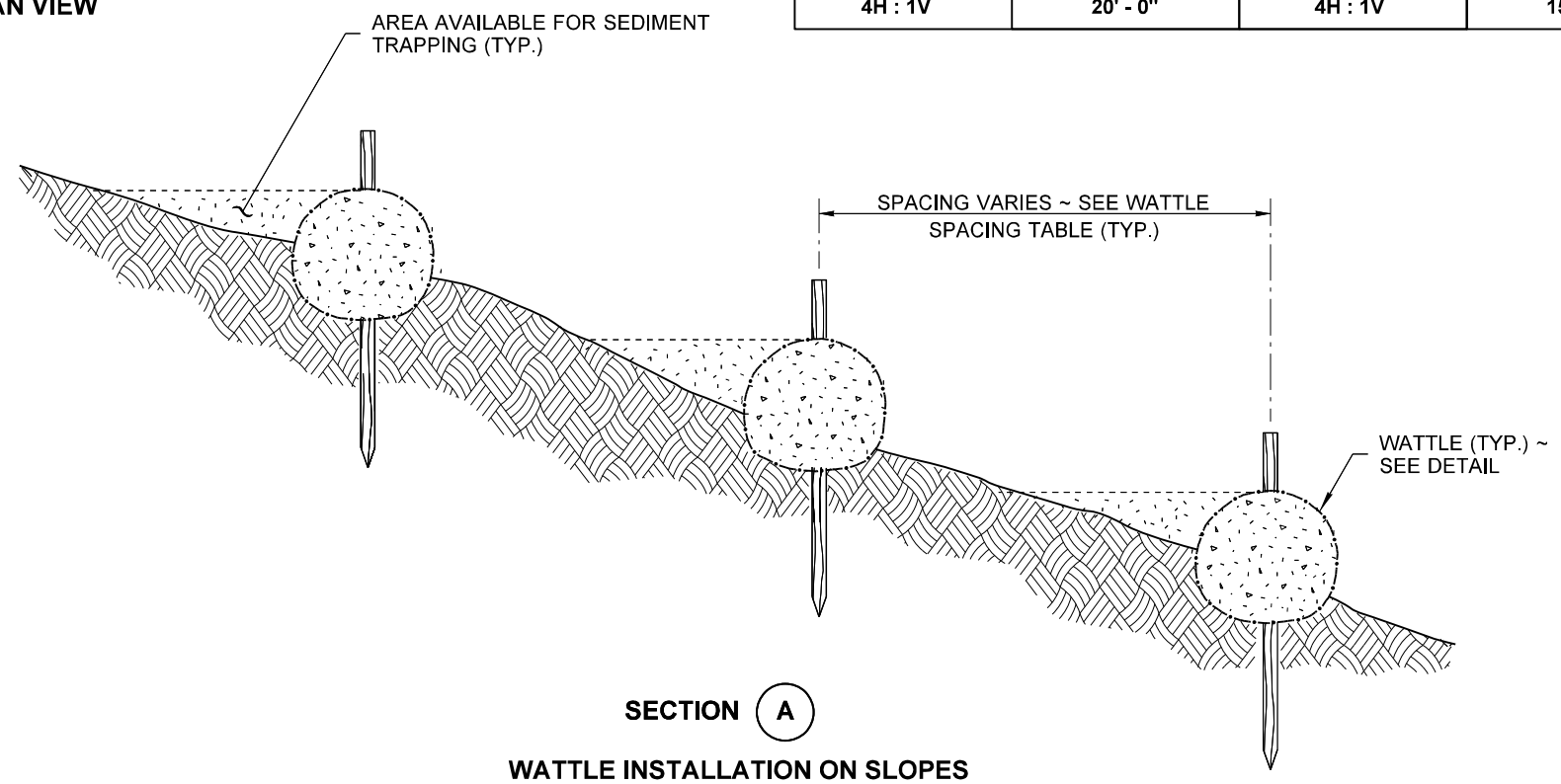
DRAWN BY: FERN LIDDELL



PLAN VIEW



WATTLE DETAIL



SECTION (A)

WATTLE INSTALLATION ON SLOPES

NOTES

1. Wattles shall be in accordance with **Standard Specification, Section 9-14.5(5).** Install Wattles along contours. Installation shall be in accordance with **Standard Specification, Section 8-01.3(10)**.
2. Securely knot each end of Wattle. Overlap adjacent Wattle ends 12" (in) behind one another and securely tie together.
3. Compact excavated soil and trenches to prevent undercutting. Additional staking may be necessary to prevent undercutting.
4. Install Wattle perpendicular to flow along contours.
5. Wattles shall be inspected regularly, and immediately after a rainfall produces runoff, to ensure they remain thoroughly entrenched and in contact with the soil.
6. Perform maintenance in accordance with **Standard Specification, Section 8-01.3(15).**
7. Refer to **Standard Specification, Section 8-01.3(16)** for removal.

WATTLE SPACING TABLE			
TEMPORARY		PERMANENT	
8" - 10" OR 10" - 12" DIAM.		10" - 12" DIAM.	
SLOPE	MAX. SPACING	SLOPE	MAX. SPACING
1H : 1V	5' - 0"	-	-
2H : 1V	10' - 0"	2H : 1V	5' - 0"
3H : 1V	15' - 0"	3H : 1V	10' - 0"
4H : 1V	20' - 0"	4H : 1V	15' - 0"

STATE OF WASHINGTON
JULI DEE HARTWIG
NO. 1422 EXP. 06/21/2021
LANDSCAPE ARCHITECT

Hartwig, Juli
Jun 4 2019 8:05 AM

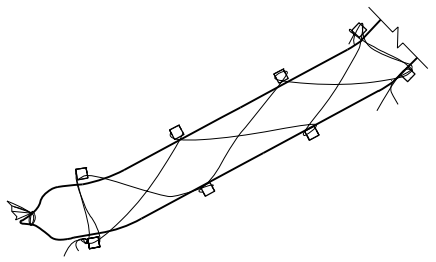
WATTLE INSTALLATION ON SLOPE

STANDARD PLAN I-30.30-02

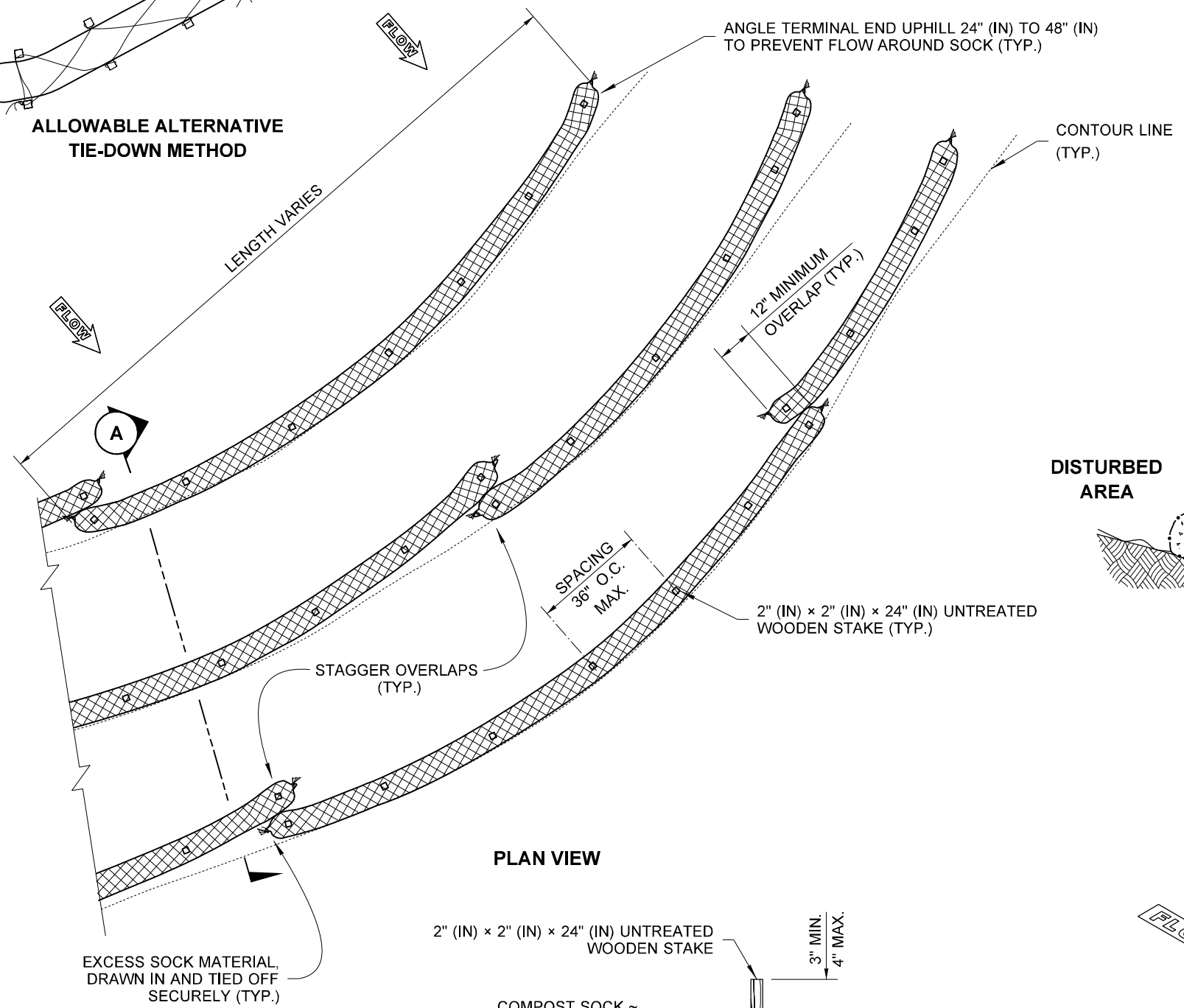
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Roark, Steve
Jun 12 2019 7:41 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

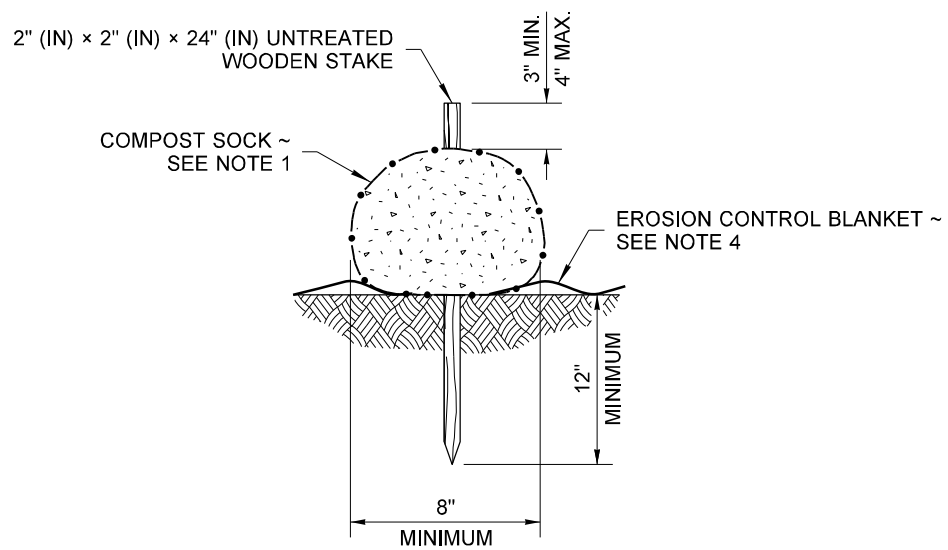


ALLOWABLE ALTERNATIVE TIE-DOWN METHOD

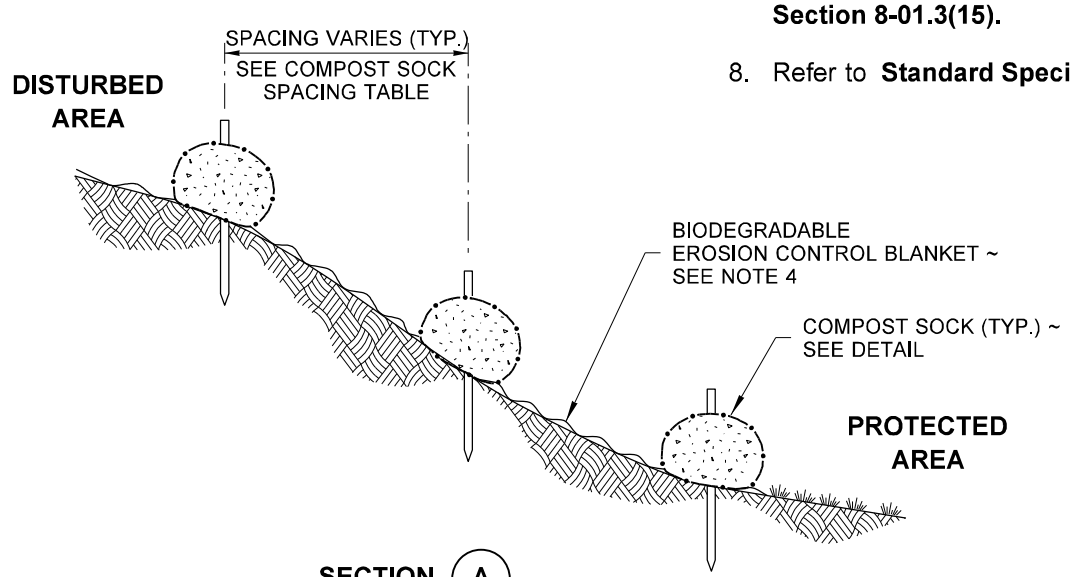


PLAN VIEW

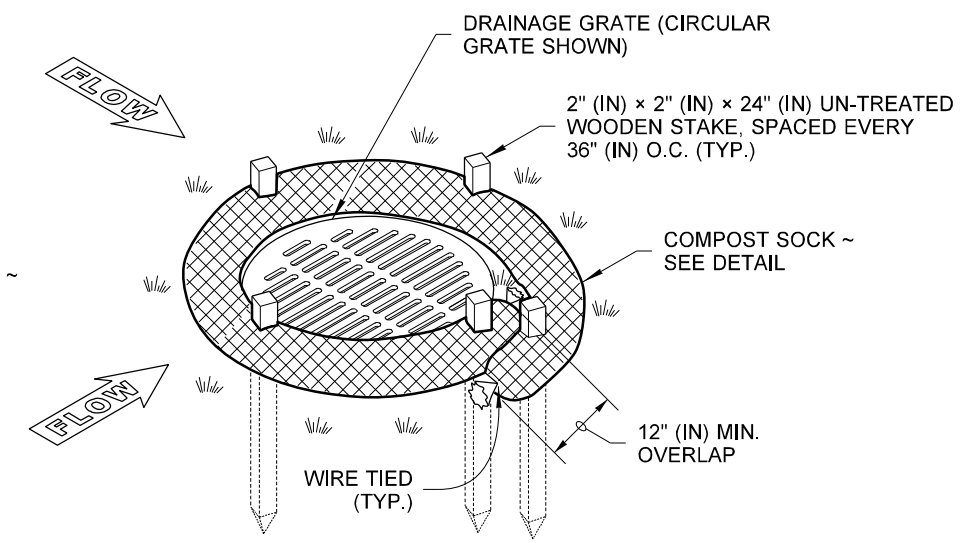
8" DIAMETER MINIMUM COMPOST SOCK SPACING TABLE	
SLOPE	**MAXIMUM SPACING**
1H : 1V	5' - 0"
2H : 1V	10' - 0"
3H : 1V	15' - 0"
4H : 1V	20' - 0"



COMPOST SOCK DETAIL



SECTION (A)



ISOMETRIC VIEW

CATCH BASIN INSTALLATION

NOTES

1. Compost Sock shall be in accordance with **Standard Specification, Section 9-14.5(6).**
2. Securely knot each end of Compost Sock. Overlap adjacent Compost Sock ends 12" (in) behind one another and securley tie together.
3. Compost to be dispersed on site as determined by the Engineer, when vegetation covers the surface.
4. If Erosion Control Blanket is specified, place Compost Sock on top of blanket. See **Standard Plan I-60.10.**
5. Install Compost Sock perpendicular to flow along contours.
6. Remove sediment from the up slope side of the Compost Sock when accumulation has reached 1/2 of the effective height of the Compost Sock without compromising the intended function of the Compost Sock per **Standard Specification, section 8-01.3(12)** as determined by the Engineer.
7. Perform maintenance in accordance with **Standard Specification, Section 8-01.3(15).**
8. Refer to **Standard Specification, Section 8-01.3(16)** for removal.

STATE OF WASHINGTON • JULI DEE HARTWIG • NO. 1422 EXP. 06/21/2021 • LANDSCAPE ARCHITECT

Hartwig, Juli
Jun 4 2019 8:06 AM
cosign

COMPOST SOCK

STANDARD PLAN I-30.40-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Roark, Steve
Jun 12 2019 7:41 AM
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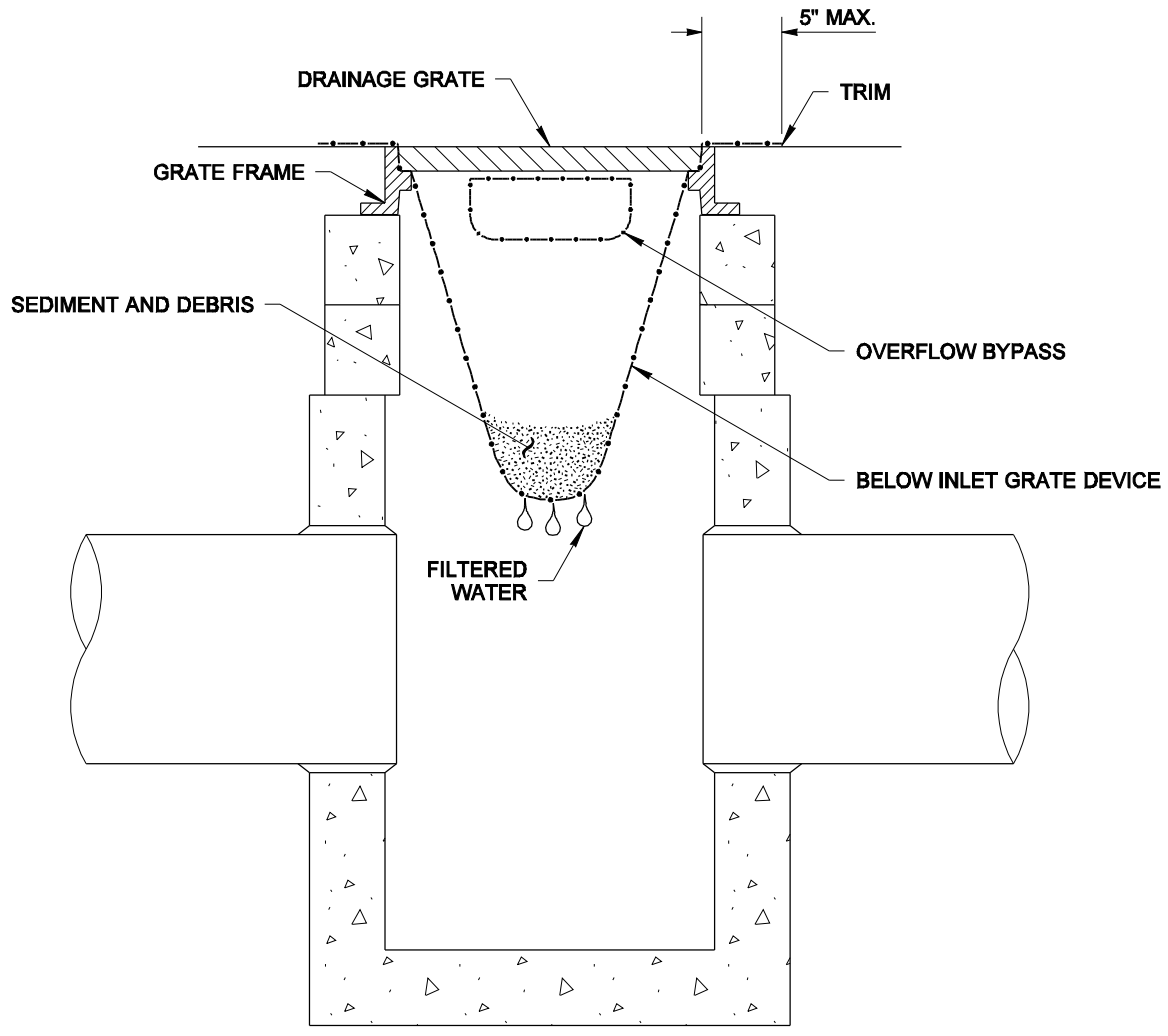
Washington State Department of Transportation

DRAWN BY: LISA CYFORD

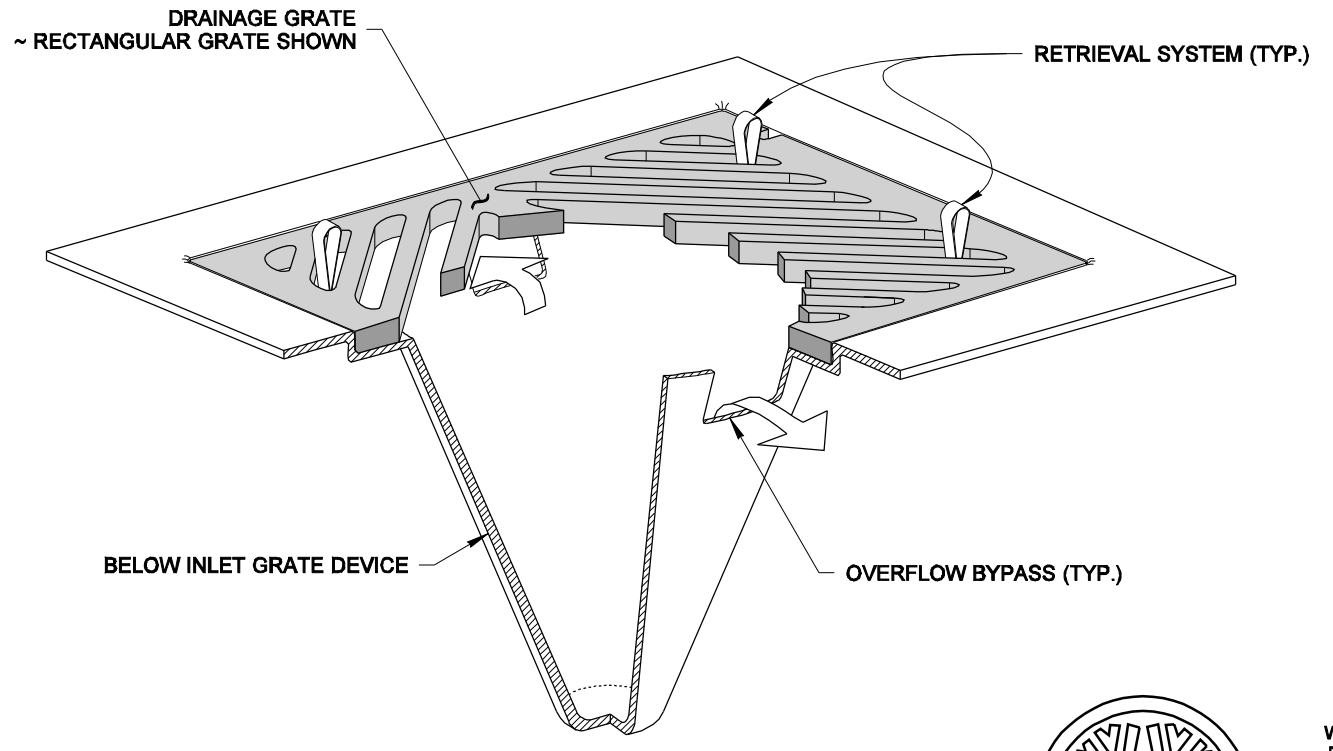


SECTION VIEW

NOT TO SCALE

NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.
2. The BIGD shall have a built-in high-flow relief system (overflow bypass).
3. The retrieval system must allow removal of the BIGD without spilling the collected material.
4. Perform maintenance in accordance with Standard Specification 8-01.3(15).



ISOMETRIC VIEW

STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

MARK W. MAURER
CERTIFICATE NO. 000598

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STORM DRAIN INLET PROTECTION

STANDARD PLAN I-40.20-00

SHEET 1 OF 1 SHEET

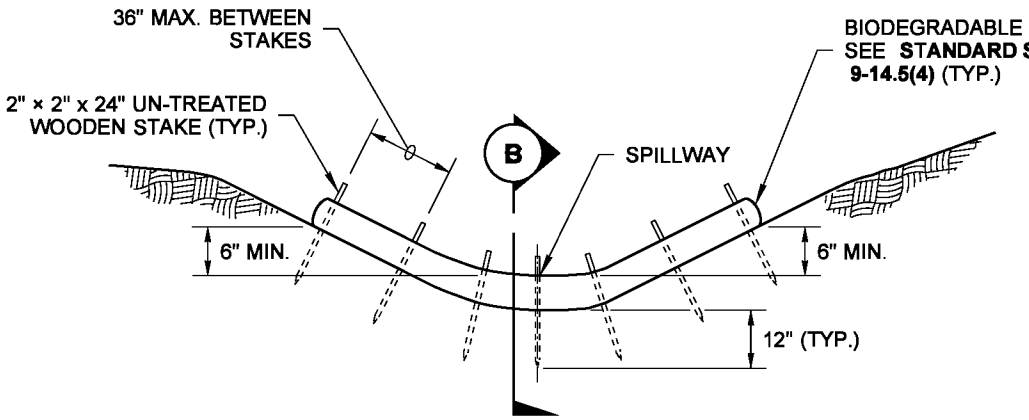
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

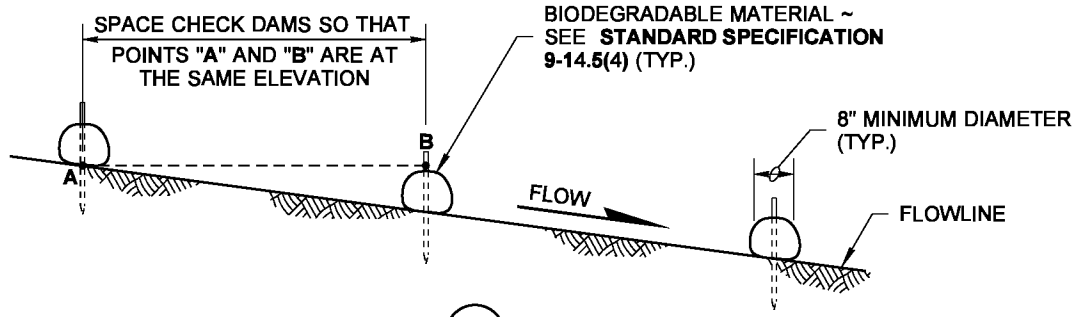
09-20-07 — DATE

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



TYPICAL CHANNEL SECTION



CHANNEL PROFILE ~ SECTION (B)

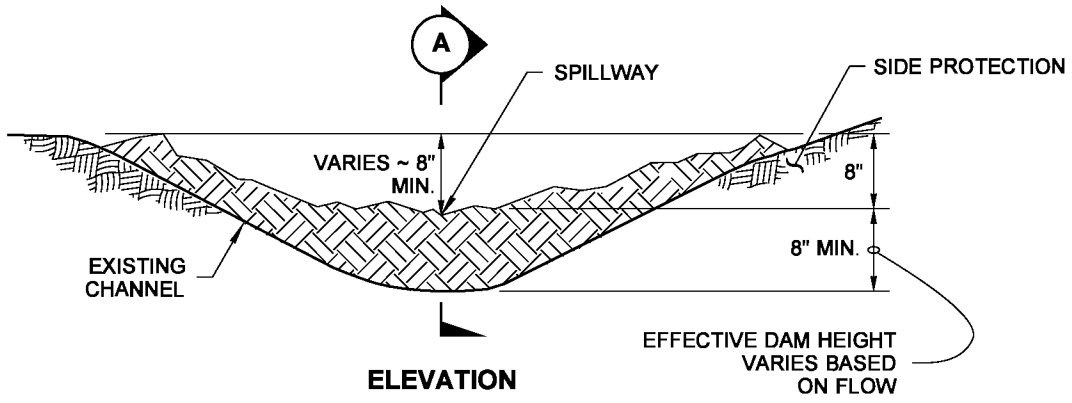
BIODEGRADABLE CHECK DAM

BIODEGRADABLE CHECK DAM NOTE

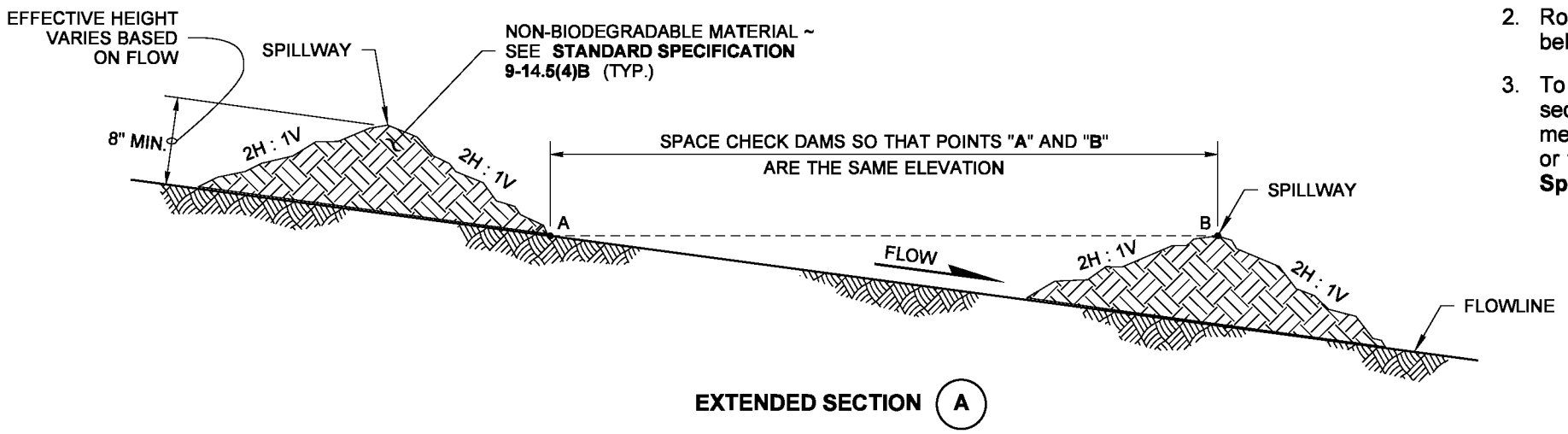
1. Biodegradable Check Dams may need additional or modified staking to prevent undercutting or scouring.

GENERAL NOTES

1. Check Dams shall meet the requirements of **Standard Specifications 8-01.3(6) and 9-14.5(4).**
2. In channels, install the sloped ends of the Check Dam a minimum of 8" higher than the spillway to ensure water flows over the dam and not around it.
3. Perform maintenance in accordance with **Standard Specification 8-01.3(15).**
4. Remove Check Dams in accordance with **Standard Specification 8-01.3(16).**



ELEVATION



EXTENDED SECTION (A)

NON-BIODEGRADABLE CHECK DAM

NON-BIODEGRADABLE CHECK DAM NOTES

1. Non-Biodegradable Manufactured Check Dam devices approved for use under **Standard Specification 9-14.5(4)** shall be installed per manufacturer's recommendations and shall perform in accordance with **Standard Specification 8-01.3(6).**
2. Rock Check Dams shall be placed outside of the clear zone or behind traffic barrier.
3. To ensure adequate damming time, Rock Check Dams used as sediment control may need to be enhanced with plastic that meets the requirements of **Standard Specification 9-14.5(3)** or fabric that meets the geotextile requirements of **Standard Specification 9-33.2(1), Table 6.**

STATE OF WASHINGTON
REGISTERED LANDSCAPE ARCHITECT
Sandra L. Salisbury
SANDRA L. SALISBURY
LICENSE NO. 860
DATE: June 6, 2013

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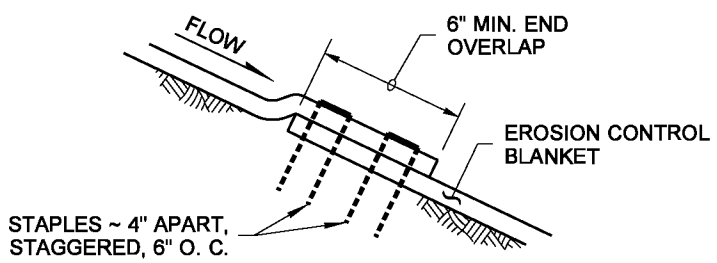
CHECK DAMS ON CHANNELS
STANDARD PLAN I-50.20-01

SHEET 1 OF 1 SHEET

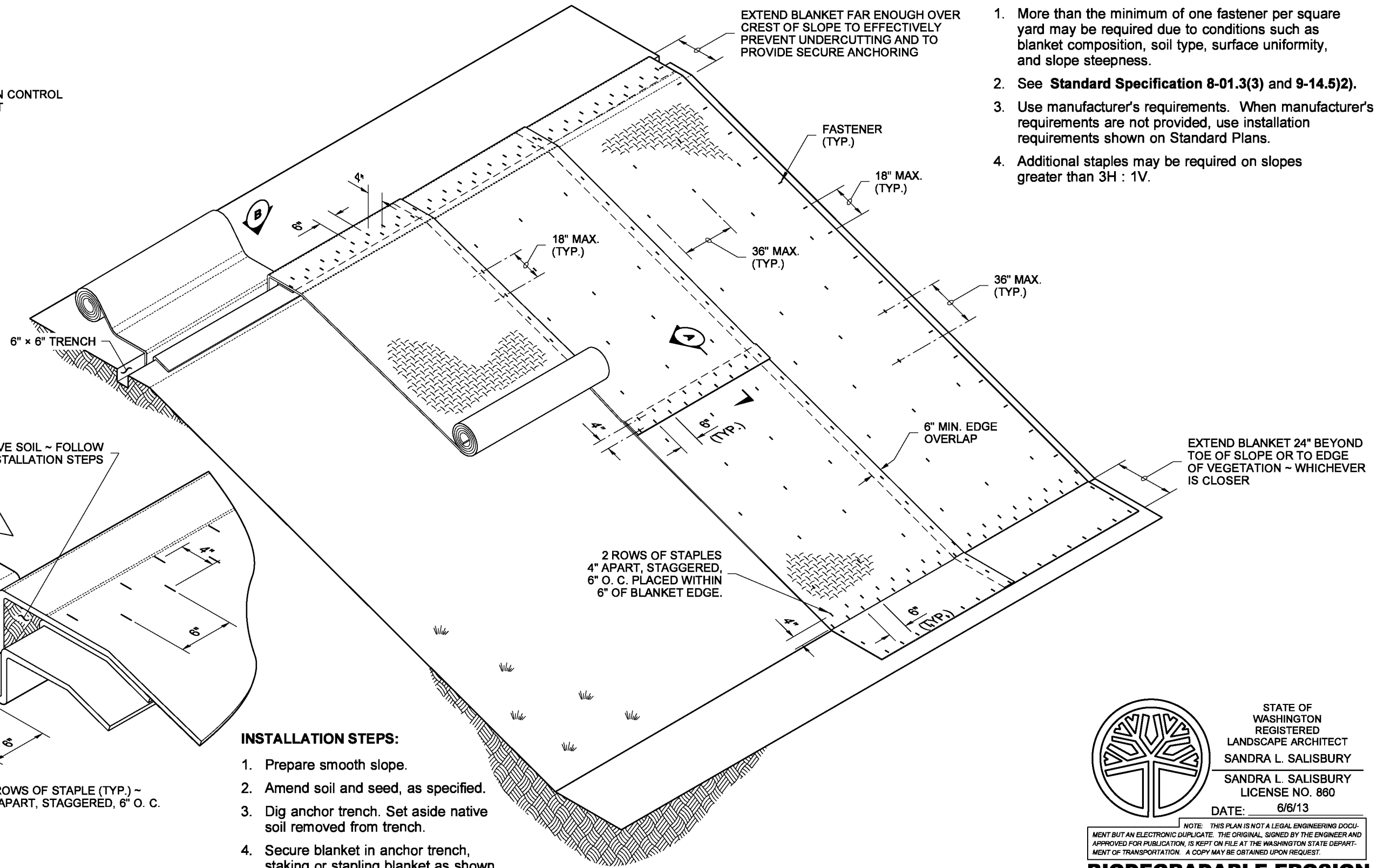
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER
6/10/13 — DATE

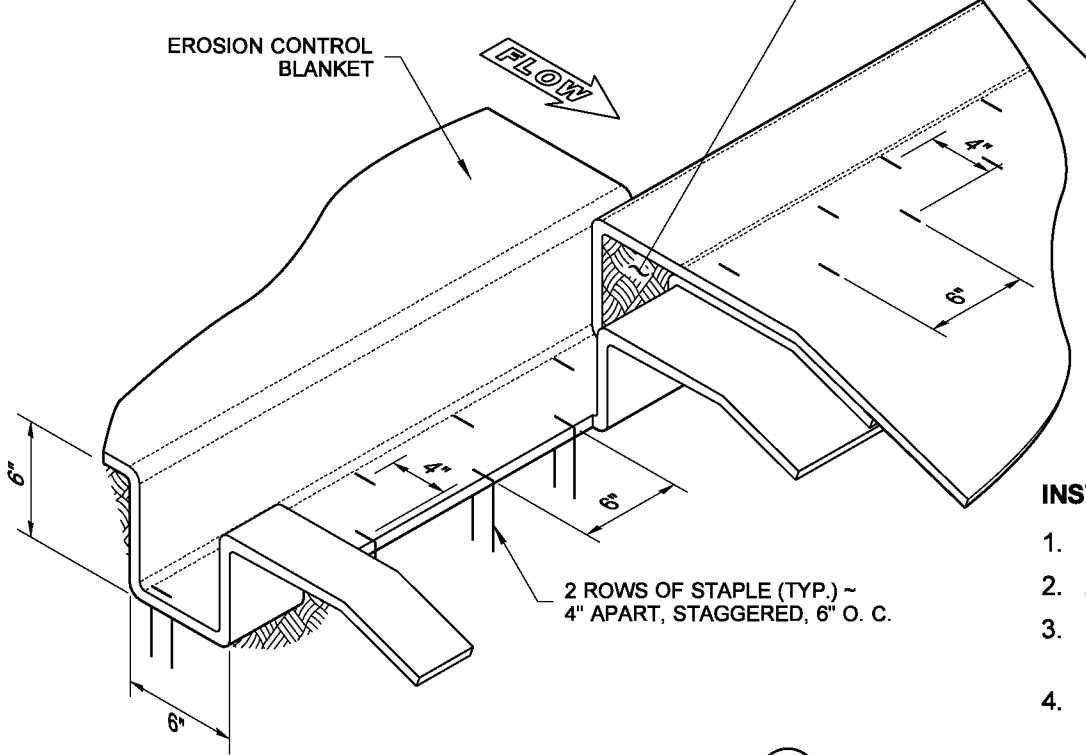
Washington State Department of Transportation



SHINGLE SPLICE ~ SECTION (A)



ISOMETRIC VIEW



INITIAL ANCHOR ~ DETAIL (B)

INSTALLATION STEPS:

1. Prepare smooth slope.
2. Amend soil and seed, as specified.
3. Dig anchor trench. Set aside native soil removed from trench.
4. Secure blanket in anchor trench, staking or stapling blanket as shown.
5. Replace native soil previously removed from trench.
6. Roll blanket down the slope in a controlled manner, taking care to remove excess slack, and taking care not to stretch blanket.
7. Stake or staple blanket as shown so there are no gaps between the blanket and the soil. Staple while unrolling blanket to minimize walking on blanket.

NOTES

1. More than the minimum of one fastener per square yard may be required due to conditions such as blanket composition, soil type, surface uniformity, and slope steepness.
2. See **Standard Specification 8-01.3(3)** and **9-14.5)2).**
3. Use manufacturer's requirements. When manufacturer's requirements are not provided, use installation requirements shown on Standard Plans.
4. Additional staples may be required on slopes greater than 3H : 1V.

DRAWN BY: LISA CYFORD

STATE OF WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT
SANDRA L. SALISBURY
SANDRA L. SALISBURY
LICENSE NO. 860
DATE: 6/6/13

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BIODEGRADABLE EROSION CONTROL BLANKET PLACEMENT FOR SLOPES STANDARD PLAN I-60.10-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

6/10/13 — DATE

Washington State Department of Transportation

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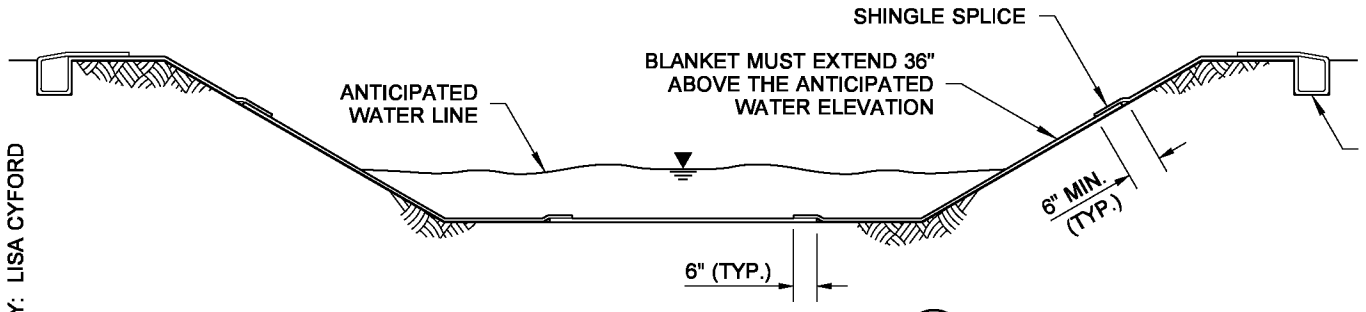
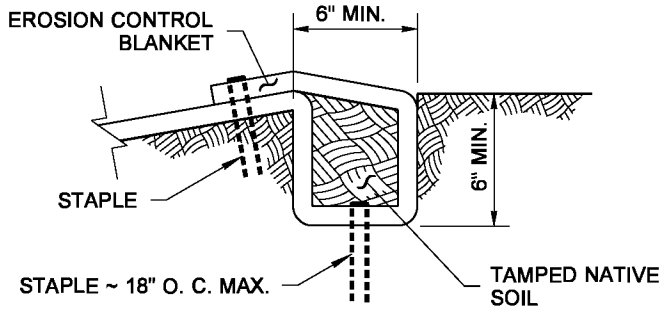
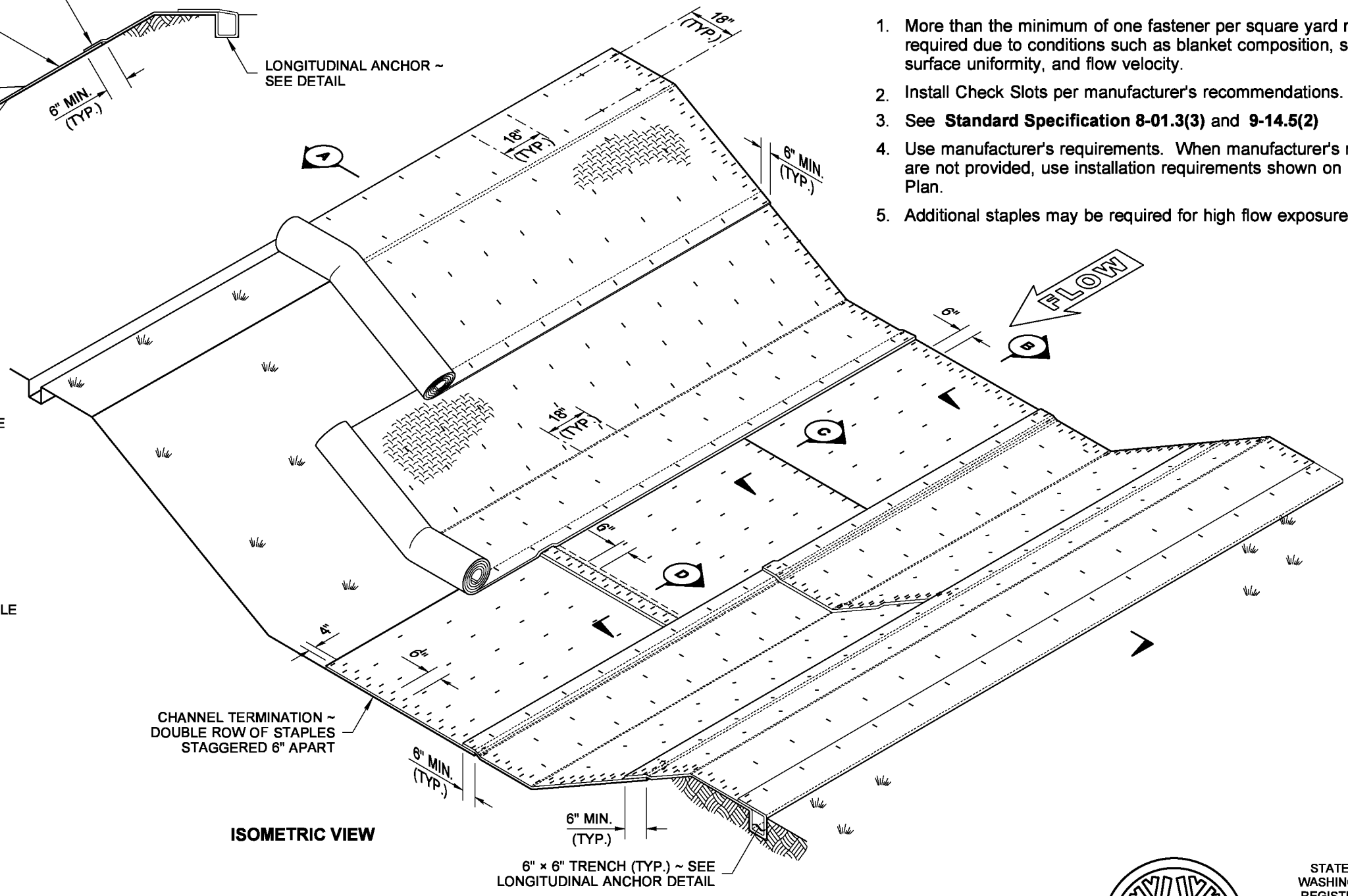


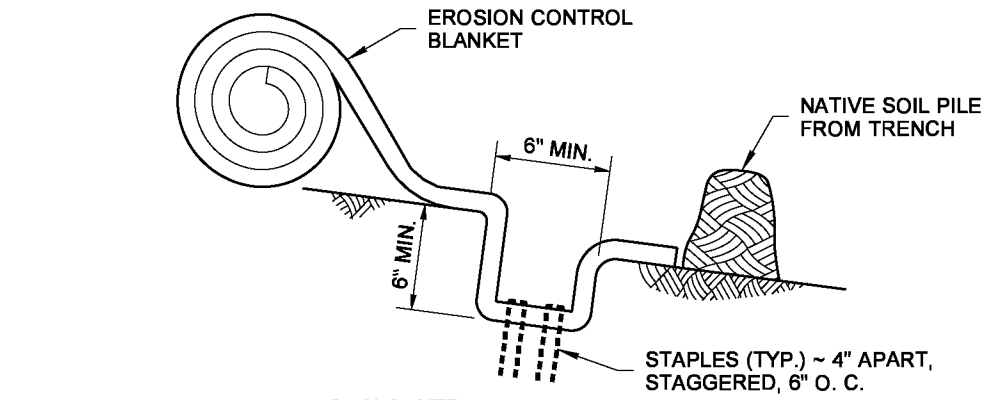
CHANNEL INSTALLATION ~ SECTION (A)



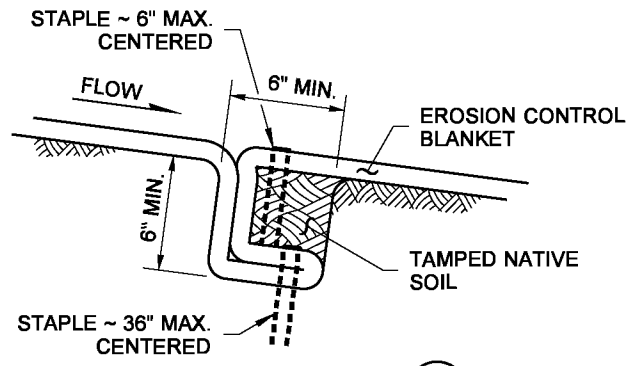
LONGITUDINAL ANCHOR DETAIL



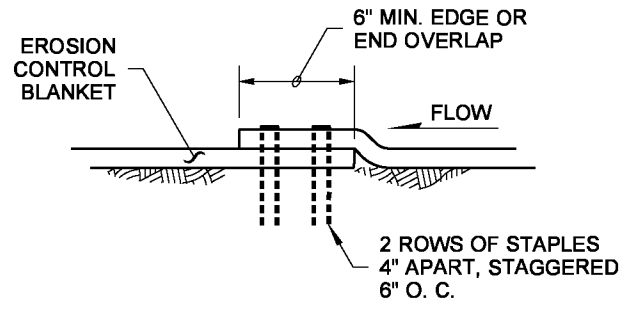
ISOMETRIC VIEW



INITIAL ANCHOR ~ SECTION (B)



CHECK SLOT ~ SECTION (C)



SHINGLE SPLICE AT END OF ROLL

SECTION (D)

NOTES

1. More than the minimum of one fastener per square yard may be required due to conditions such as blanket composition, soil type, surface uniformity, and flow velocity.
2. Install Check Slots per manufacturer's recommendations.
3. See **Standard Specification 8-01.3(3)** and **9-14.5(2)**
4. Use manufacturer's requirements. When manufacturer's requirements are not provided, use installation requirements shown on Standard Plan.
5. Additional staples may be required for high flow exposure.

INSTALLATION STEPS:

1. Prepare smooth slope.
2. Amend soil and seed, as specified.
3. Dig anchor trench. Set aside native soil removed from trench.
4. Secure blanket in anchor trench, staking or stapling blanket as shown.
5. Replace native soil previously removed from trench.
6. Roll blanket parallel to the slope in a controlled manner, taking care to remove excess slack, and taking care not to stretch blanket.
7. Stake or staple blanket as shown so there are no gaps between the blanket and the soil. Staple while unrolling blanket to minimize walking on blanket.

STATE OF WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT
SANDRA L. SALISBURY
SANDRA L. SALISBURY
LICENSE NO. 860
DATE: 6/6/13

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BIODEGRADABLE EROSION CONTROL BLANKET PLACEMENT FOR DITCHES

STANDARD PLAN I-60.20-01

SHEET 1 OF 1 SHEET

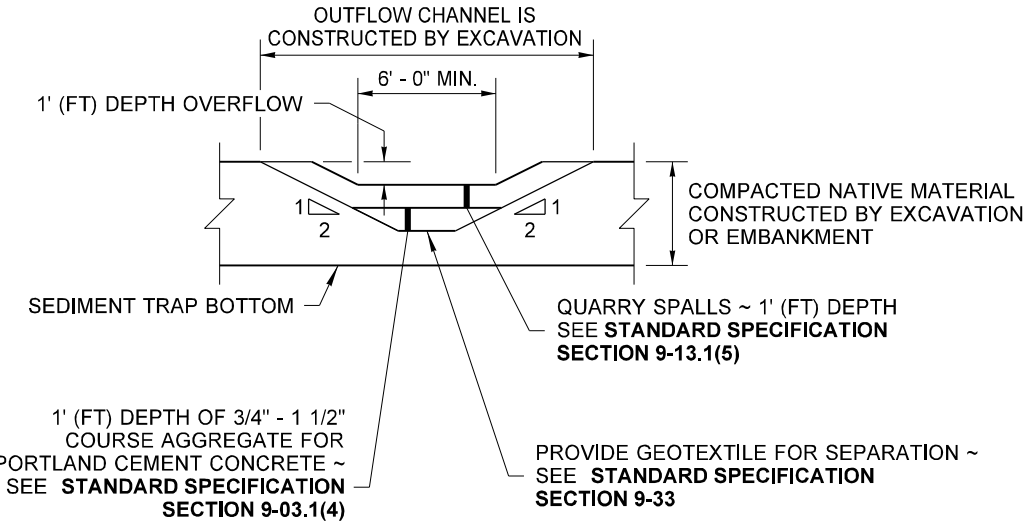
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

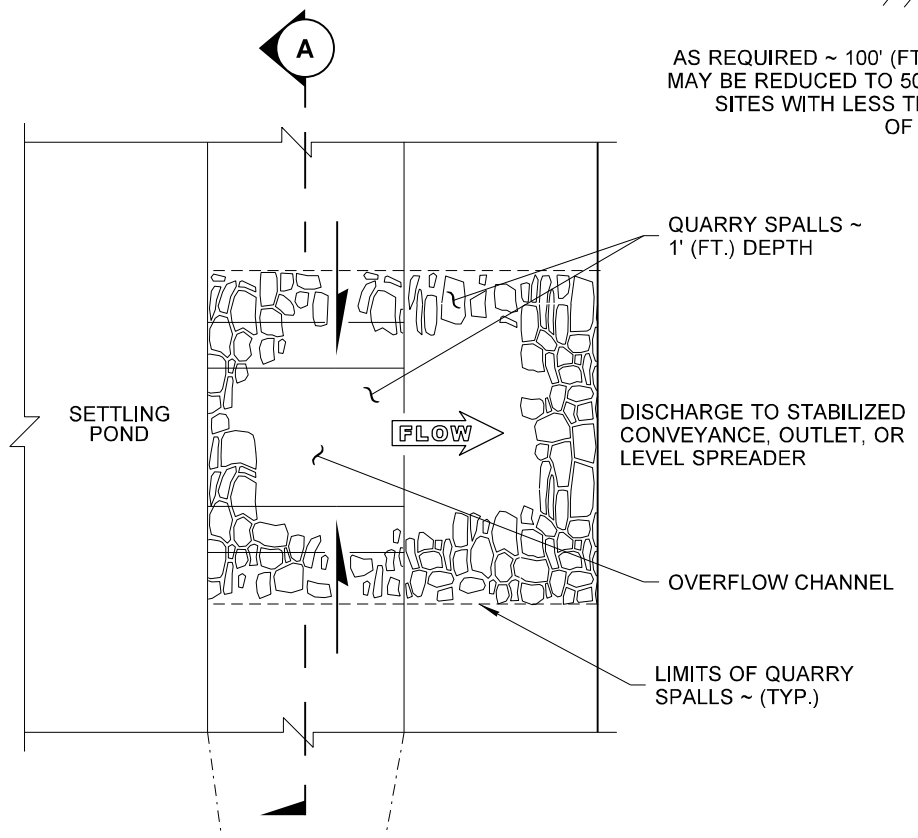
6/10/13 — DATE

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

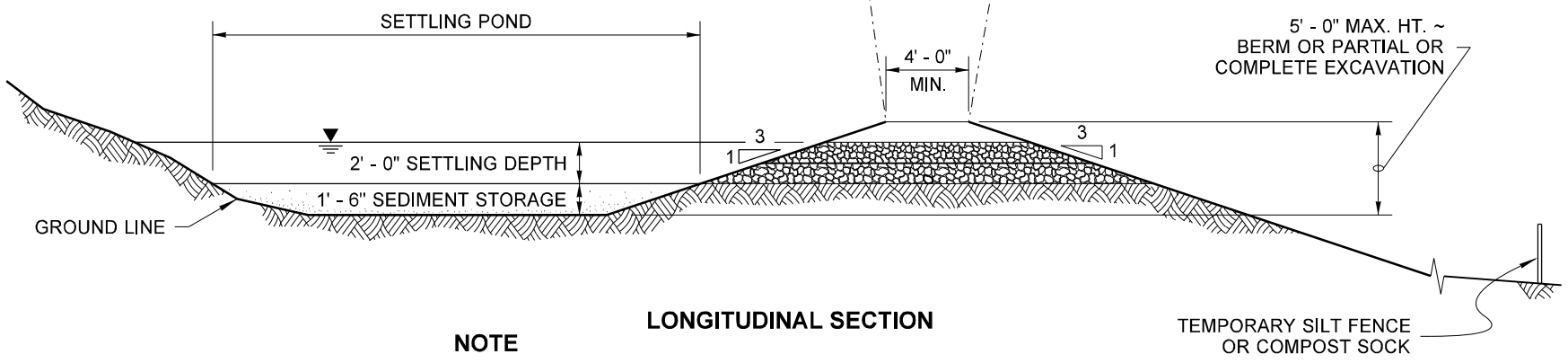


SECTION (A)



PARTIAL PLAN VIEW OF BERM

SHOWN LARGER FOR CLARITY

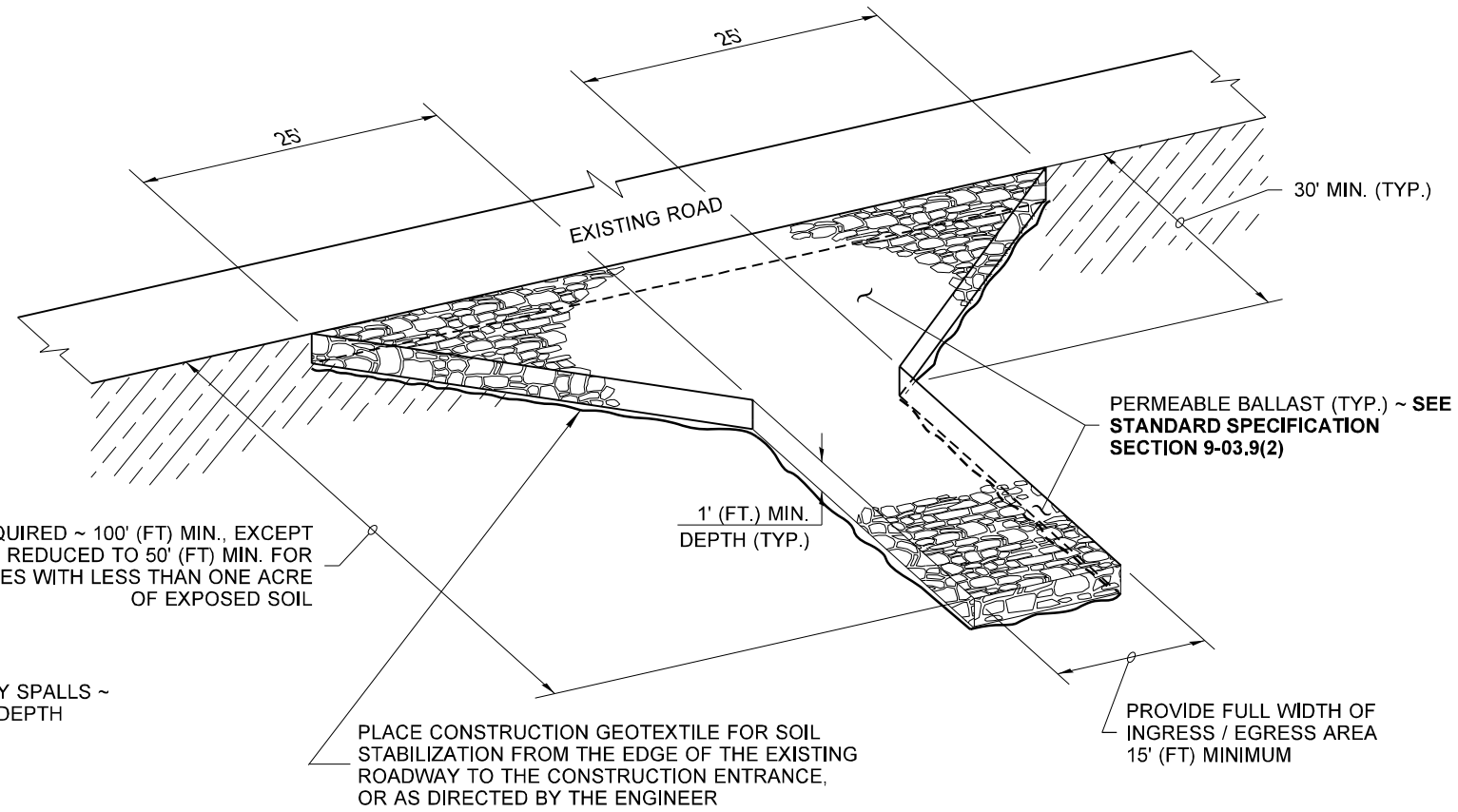


LONGITUDINAL SECTION

NOTE

PLACE GEOTEXTILE UNDER THE SPILLWAY AND SIDE SLOPES. PROVIDE A CONTINUOUS LAYER BETWEEN THE GRAVEL/ROCK AND THE NATIVE EARTHEN MATERIAL.

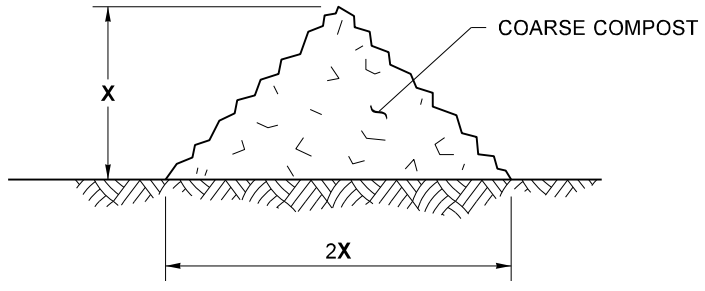
TEMPORARY SEDIMENT TRAP



ISOMETRIC VIEW

STABILIZED CONSTRUCTION ENTRANCE

STABILIZED CONSTRUCTION ENTRANCE SHALL MEET THE REQUIREMENTS OF **STANDARD SPECIFICATION SECTION 8-01.3(7).**



X = 1' - 0" FOR SLOPES 4H:1V OR FLATTER

X = 1' - 6" FOR SLOPES STEEPER THAN 4H:1V

TYPICAL SECTION

COMPOST BERM DETAIL

STATE OF WASHINGTON
REGISTERED LANDSCAPE ARCHITECT
Hartwig, Juli
Jul 14 2016 2:06 PM
JULI DEE HARTWIG
LICENSE NO. 1422
DATE: 06-21-17

MISCELLANEOUS EROSION CONTROL DETAILS

STANDARD PLAN I-80.10-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 15 2016 2:28 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

Chapter 3

Streets

City of Kelso
Engineering Design Manual
Amended May 2021
Effective Date _____

Chapter 3
Streets

City of Kelso
Engineering Design Manual

Table of Contents

Description **Page No.**

Figures

Tables

CHAPTER 3 – STREETS

3.00 General

A. Design Standards

Street infrastructure design shall comply with AASHTO, except as modified in this chapter.

B. Functional Classification

The functional classification of existing and proposed roads is established by the City on an individual basis using the existing land use and existing operational characteristics. The Director will maintain a map that classifies each roadway. Kelso classifies roads and streets as follows:

1. Principal Arterial

These facilities are the supporting elements of both the arterial routes and collector systems. Principal arterials, in combination with minor arterial routes, are intended to provide a high level of mobility for travel within the region. All trips from one sub-area through an adjacent sub-area traveling to other points in the region should occur on a Principal arterial.

Access is generally limited to intersections with other arterials and collectors; direct residential access is not permitted. Direct land access is discouraged, kept to a minimum, and controlled. The level of fixed route transit service is high.

2. Minor Arterial

The minor arterial system complements and supports the principal arterial system, but is primarily oriented toward travel within and between adjacent sub-areas. An adequate minor arterial system is needed to ensure that these movements do not occur on principal arterials. These facilities provide connections to major activity centers and provide access from the principal arterial systems into each sub-area.

They serve through traffic and provide direct access for commercial, industrial, office, and multi-family development, but generally, not for residential properties. Access to abutting lots is limited. Since minor arterials serve a more localized area, fixed route transit is moderate.

3. Collector

Collector streets connect local traffic within a subarea to arterial roads. Service to adjacent land uses is subordinate to traffic movement. Access to abutting properties and parking is controlled through the use of raised channelization, driveway spacing, bicycle and/or pedestrian lanes, and pavement markings. Typically, collector streets are not continuous for any great length, nor do they form a connected network by themselves. Since collector streets connect arterial networks

and also connect neighborhoods to commercial areas as well as each other, fixed route transit service is low. Access to abutting lots is limited.

4. Local:

Local streets serve to distribute traffic from collectors and provide direct access for abutting properties. Through trips are discouraged and parking is allowed.

5. Alleys

Alleys provide service access to adjoining properties through one-way traffic. Through trips and parking are not allowed. No fixed route transit usage and the focus is for service and localized access. Service to a very limited number of lots.

3.01 Access Standards

The Director has the authority to remove access, limit access and designate access locations on public streets under the jurisdiction of the City. Access Standards are as follows:

- One access will be permitted for each parcel zoned single family residential. Parcels with other zoning will be permitted access based on the results of an access plan prepared by the Applicant. Requests for more than one access per parcel shall be submitted with a design modification request and be supported by an analysis of traffic impacts up to and including a traffic impact study.

- When a parcel has multiple street frontages, access will be granted from the lesser classification street only.

- Where the parcel fronts multiple streets of the same classification, access will be granted to the street with the lowest volume or the street with the safest access point, at the discretion of the Director.

- Direct access onto arterial streets is not permitted if alternate access is available. If direct access to an arterial street is allowed, it shall be "right-in, right-out" only, and pavement markings and signs indicating Right Turn Only shall be installed.

- Access from Alleys. No access is permitted to alleys except where the intersecting and parallel streets are classified as Local, and the use is single family residential. When alley access is permitted, one alley access will be approved and the alley access will be the only access for the residence.

- Access requirements and conditions are further detailed in 3.02 *Intersections and Driveways.*

Access to streets and highways under Cowlitz County or State of Washington jurisdiction must be formally approved by those entities at the applicant's initiative and expense prior to approval of a Development application.

A. Street Access Request Process

1. Applications. Applicants may request a street access permit as part of an underlying Development application, or they may file separately for a street access permit if the access is being requested without relation to an underlying land use application.

2. Approval. The issuance or denial of the street access permit will be made administratively by the Director.

3. Submittal Requirements for Street Access Permit. In accordance with KEDM Section 1.04.

4. Permit Issuance. The following are required for permit issuance:

   a. The street access must comply with the design standards for the functional classification of the roadway proposed to be accessed.

   b. If the proposed access is an expansion or change of use of a pre-existing non-conforming access, the Applicant must demonstrate that the proposed access will not substantially adversely affect the safety of the street section that the proposed access will access through an interim access permit application (see below).

   c. In addition, the City may impose conditions upon the permit through the SEPA process to mitigate the specific adverse impacts created by the proposed access. The City may also further modify, restrict or eliminate the access at a future date due to change in use of the property, safety reasons, change in traffic volume, change in the accessing street configuration, or other reasons in the public interest.

5. Exceptions from Access Standards. Exceptions to the Access Standards may be approved by the Director for a street access permit upon a showing by the applicant of one or more of the following:

   a. Topography, right-of-way, existing construction or physical conditions, or other geographic conditions impose an unusual hardship on the applicant, and an equivalent alternative which can accomplish the same access management purpose is available.

   b. A minor change to a standard is required to address a specific design or construction problem, which if not enacted, will result in an unusual hardship.

   c. An alternative standard is proposed which is equal to or superior to these standards.

   d. Application of the standards of this chapter to the development would be grossly disproportional to the impacts created.

6. Suspension. The Director may suspend a street access permit, including interim access permits, where the applicant fails to comply with the conditions

and access standards of the street access permit. The street access permit can be reinstated upon compliance with conditions and access standards of the street access permit. If after 180 days the applicant has failed to comply with conditions, the Director may revoke the street access permit and cause the access to be closed.

3.02 Intersections and Driveways

A. General Requirements

1. All new development shall be served by a driveway. Standard driveway approaches and driveways, fitting the land use and complying with Kelso Standard Plans, are required for all driveways accessing onto a public (or private) right-of-way or easement. No more than two single family residences may be served by a driveway. Development of a public or private street (see section 3.10) is required when more than two single family residences are proposed to take access.

2. A private intersection opening may be used in lieu of a conventional driveway in commercial and industrial areas when traffic signalization is required, approved, warranted and provided, or where all of the following criteria are met:

   a. Projected private intersection opening usage is greater than two-thousand (2,000) vehicles per day.

   b. A minimum one-hundred (100) foot storage area is provided between the street and any turning or parking maneuvers within the development.

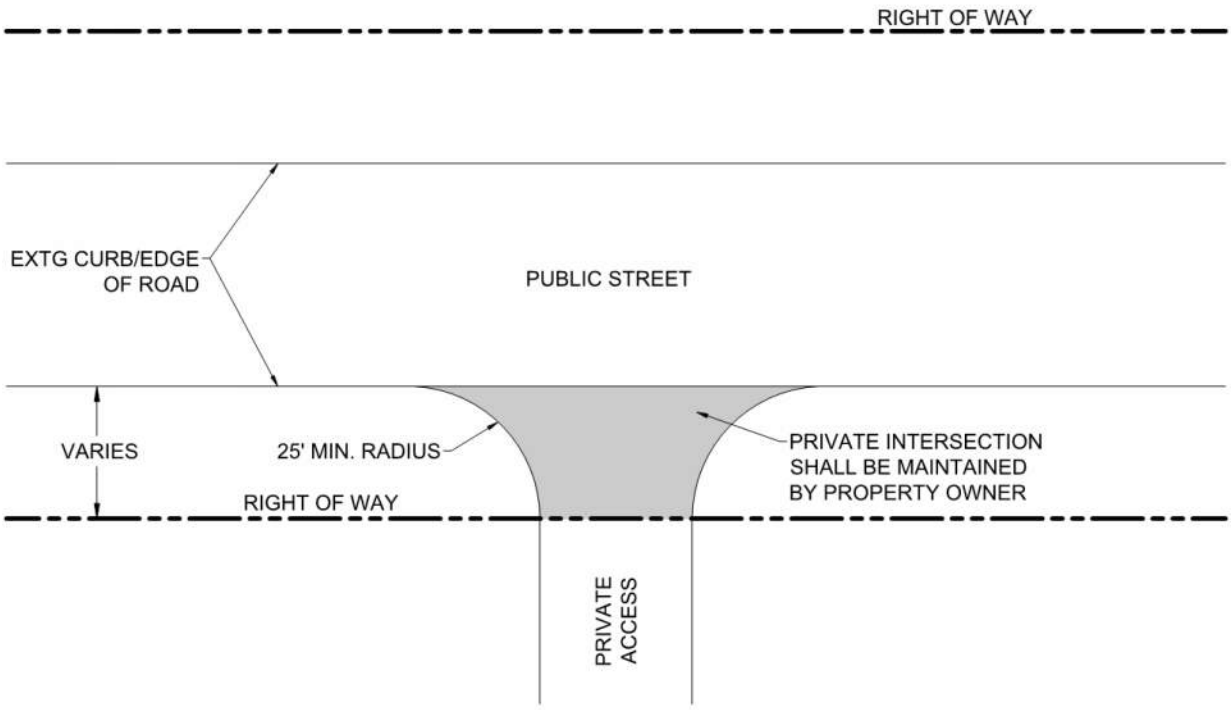
   c. The private intersection opening is at least two hundred (200) feet from any other intersection opening, including driveways on or off the property frontage, and whether the other intersection openings or driveways are under control of the applicant or not.

   d. Easement dedication for traffic control devices is provided.

   Maintenance of the private intersection curb and gutter and surfacing on the property owner's side of the public street is the property owner's responsibility.

Figure 3-1

Private Intersection on Public Street



B. Conditions of Approval

1. All abandoned driveway areas on the street frontage to be improved shall be removed and new curb, gutter, and sidewalk shall be installed.

2. No commercial, industrial or multi-family driveway will be approved where access in to or out of the driveway requires vehicles to back onto the sidewalk or street.

3. No driveway will be approved where backing onto a street might occur and the slope of the driveway is greater than ten percent (10%) within the first twenty (20) feet of the property line.

4. Left turns from and to a driveway may be restricted as a development condition, or in the future, if such maneuvers are found to be unsafe.

5. Driveways shall be aligned wherever practicable with existing driveways or intersections on the opposite side of the street.

6. All driveways shall be angled ninety-degrees (90°) to the street.

C. Intersection/Driveway Spacing. Intersections are divided into two categories for determining spacing requirements: signalized access spacing and unsignalized access spacing, which include both driveways and intersections.

1. *Signal Spacing*. Spacing for new signals shall be based on the findings of the Traffic Impact Study.

2. *Access Spacing*. Spacing of unsignalized roadway intersections and driveways, is described in Table 3.1a and 3.1b respectively, and will be measured from the centerline of the intersections or driveways. Distances from intersection corners for access driveways as described in Table 3.2 shall be measured between the nearest edges of the driveways, edge of roadway or curb line. Where the distance required from the corner is greater than the parcel frontage, the driveway shall be placed as shown in Fig. 3-2 below.

Table 3.1a
Unsignalized Intersection Spacing

When highest classification involved is:	Centerline Spacing between Intersections should be:	
	Desirable	Minimum
Arterial	≤500 feet	350 feet
Major Collector	350-500 feet	200 feet
Neighborhood Collector	250-350 feet	150 feet
Local	250-350 feet	150 feet

"Desirable" conditions shall be applied when sufficient space or street frontage is available.

Table 3.1b
Minimum Driveway Spacing
Arterials and Collectors

Speed on Adjacent Street	Desirable Conditions	Limiting Conditions
25	120	75
30	185	100
35	245	160`

"Desirable conditions" shall be applied when sufficient space or street frontage is available. If sufficient space or street frontage for desirable conditions is not available, then lesser distances, down to but not less than the numbers labeled on "limiting conditions," may be applied.

Driveways providing access to local streets must be spaced a minimum of 5 feet from the nearest property line and 10 feet from the nearest adjacent driveway measured from the

nearest edge (wing) of the driveway, except where a parcel fronts on the bulb of a cul-de-sac.

In the case of long or oddly shaped blocks, and to facilitate pedestrian access to parks, playgrounds, open space or schools, the Applicant shall construct pedestrian paths of not less than ten feet in width on a dedicated right-of-way or perpetually unobstructed easement of not less than twenty feet in width, to extend through the block(s) at location(s) deemed necessary by the Director.

D. Access from Alleys. When alley access is permitted, the driveway width to the residence shall conform to the Kelso Standard Plan for a residential driveway.

E. Corner Standards. Driveways on corner parcels shall be placed on the roadway with the lower classification. If both roadways have the same classification, the Director shall determine on which roadway the driveway shall be located. It may be necessary to perform a queuing analysis to determine if the queue on the roadway where access is being requested blocks the proposed access. Driveway locations for multi-family, commercial and industrial parcels shall be determined through the Site Plan Approval process.

Table 3.2

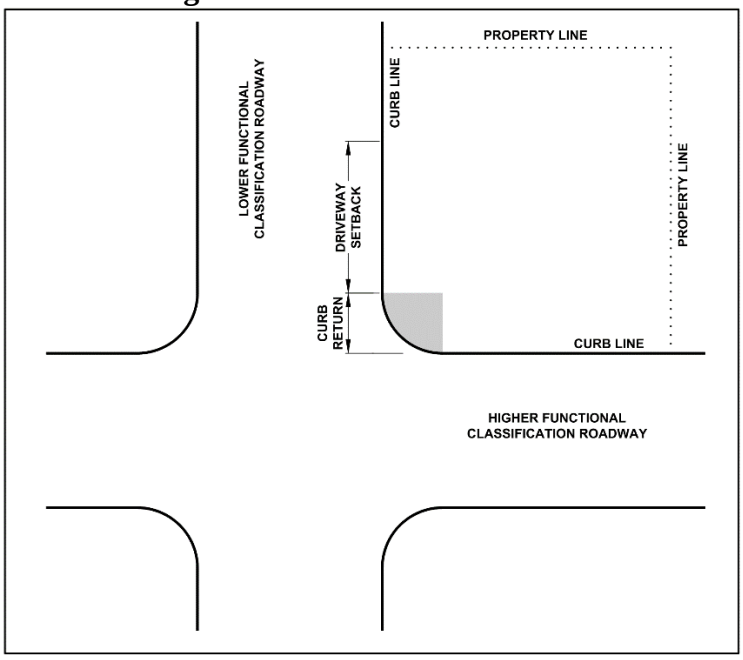
Minimum Distances from Corner Standards

Functional Classification	Minimum Access Set-back from Corner (ft)
Principal Arterial	**115**
Minor Arterial	**75**
Collector	**50**
Local	**30**

The corner point from which to measure is the curb return radius as shown in Figure 3-2. Where the distance required from the corner is greater than the parcel frontage, the driveway shall be placed at the furthermost distance from the intersection.

Additional setback, or a right-in/right-out driveway may be required to avoid interference with traffic operations from the 90th percentile queue length.

Figure 3-2: Corner Lot Setback



F. Sight Triangles for All Uses in All Zones. The corner areas of lots adjacent to street intersections as well as the corner areas adjacent to driveways and other access easements shall be kept clear of all obstructions. Sight distance shall be designed and preserved in accordance Section 3.14, *Sight Obstruction Requirements*.

G. Restrictive Median Curbs. Except for Local classified roadways, restrictive median curbs shall be used to restrict turning and crossing movements as follows, and at other locations as directed by the Director or as required by WSDOT for State highways:

1. If access spacing outlined in Tables 3.1a and 3.1b cannot be met, restrictive median curbs shall be installed of sufficient length to restrict left turn and crossing movements, or between full access intersections, whichever is greater.

2. At signalized intersections on principal arterials, the length of restrictive median curbs shall be equal to the minimum access set-back spacing distance shown in Table 3.2, regardless whether or not driveways exist.

3. At intersections with left turn lanes on principal arterials, minor arterials, and neighborhood collectors, the length of restrictive median curbs shall be equal to the left turn lane storage length, except as may be required by condition number 2 above.

H. Turn Lane Warrants

1. Turn lanes (left and right) may be warranted at unsignalized intersections, and shall be evaluated using appropriate left or right turn lane warrants standards adopted by the City or State, depending on which facility is being analyzed.

2. At signalized intersections, a TIA shall be used to determine required storage length for left or right turn lanes.

I. Driveway Design Criteria:

1. Width.

a. Two-way multi-family residential driveways shall have a minimum width of sixteen (16) feet and a maximum width of twenty-four (24) feet. Where intersection openings are approved, the width shall be as determined by the Director. One-way multi-family residential driveways shall have a minimum width of ten (10) feet and a maximum width of twelve (12) feet. Parking lots shall be designed to meet circulation needs within the parking lot without use of the public streets.

b. Two–way commercial/industrial driveways shall have a minimum width of twenty-four (24) and a maximum width of thirty-two (32) feet. Where intersection openings are approved, the width shall be as determined by the Director. One-way commercial/industrial driveways shall have a minimum driveway width of twelve (12) feet with a maximum width of sixteen (16) feet. Commercial/industrial driveways shall meet the separation requirements of Section 3.02. Parking lot circulation needs shall be met on site. The public right-of-way shall not be utilized as part of a one-way parking lot flow. A wider commercial/industrial driveway width may be approved by the Director where a substantial percentage of oversized vehicle traffic is anticipated and a written request and turning diagrams are submitted. The request shall include justification for the oversized vehicles and the design vehicle selection as well as detailed alternatives and considerations that were evaluated.

c. A single-family driveway shall have a minimum width of ten (10) feet and maximum width of twenty-four (24) feet.

d. Alley driveways shall match the width of the alley.

Driveway widths described above do not include the driveway wings or transition radius. See Kelso Standard Drawings.

2. Clearance from structures. No object (including fire hydrants, light or power poles, street trees) shall be placed or allowed within six (6) feet of the driveway wing and edge.

Where the building facade or other design element is less than ten (10) feet behind the sidewalk, both pedestrian and vehicular sight distance shall be maintained.

3. Sight Distance. Sight distance shall be designed in accordance Section 3.14, *Sight Obstruction Requirements*..

4. Surfacing. Surfacing for driveway approaches shall comply with the Standard Plans and Standard Specifications. Surfacing for driveways on private property shall be hard surfaced with permanent materials such as HMA, concrete or unit pavers.

5. Permeable Pavement. Use of permeable pavement for residential and commercial driveways is encouraged where feasible in accordance with City of Kelso stormwater requirements.

J. Angle between intersections.

The interior angle at intersecting streets shall be kept as near to ninety degrees (90°) as possible and in no case shall vary more than fifteen degrees (15°), from the ninety-degree (90°) angle. A tangent section shall be extended a minimum of fifty (50) feet each side of intersecting right-of-way lines. When possible, intersections shall align with any existing intersection on the opposite side of the street.

K. Intersection Curb returns:

Minimum curb radii at intersections shall be shown in Table 3.3 for the various functional classifications. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the upper classified street.

Sidewalk access ramps (Curb Ramps) shall be provided at all corners of all intersections, regardless of curb type.

Table 3.3
Curb Return Radii (Feet)
Edge of Pavement/Curb –Minimums

Street Classification	Arterial Street	Collector Street	Local Streets
Arterial Streets	30	25	25
Collector Streets	30	20	20
Local Streets	30	20	15

L. Intersection Sight Distance.

Intersection sight distance shall comply with Section 3.14 *Sight Obstruction Requirements*.

M. Intersection Traffic Control

Intersection traffic control shall be as specified in the Manual of Uniform Traffic Control Devices (M.U.T.C.D.) or as modified by the Engineer as a result of appropriate traffic engineering studies. Traffic signal modification, relocation, or installation is required when roadway or driveway geometrics interfere with existing signal facilities, or would result in an un-signalized driveway, or intersection that meets signal warrants.

3.03 Street Widths

The figures below show the street width standards by the functional classification. The functional classification of streets are as shown on the City's functional classification map. If a street has not been classified, the City Engineer will determine the functional classification. Public utility easements beyond the right-of-way are typically required.

Lane configuration shall be determined following the review of the TIA, if applicable, and prior to construction drawing approval.

Additional right-of-way and pavement width may be required, in addition to that shown in Figures 3-2 through 3-8, to encompass cut and fill slopes, allow parking, LID BMP's, turn lanes, bike lanes, transit bus turn outs, median strips and other public improvements. Bioretention curb extensions may be located in the parking lane with approval of the Director to reduce the need for additional right-of-way.

Figure 3-3: Principal Arterial

Design Speed: 30 mph

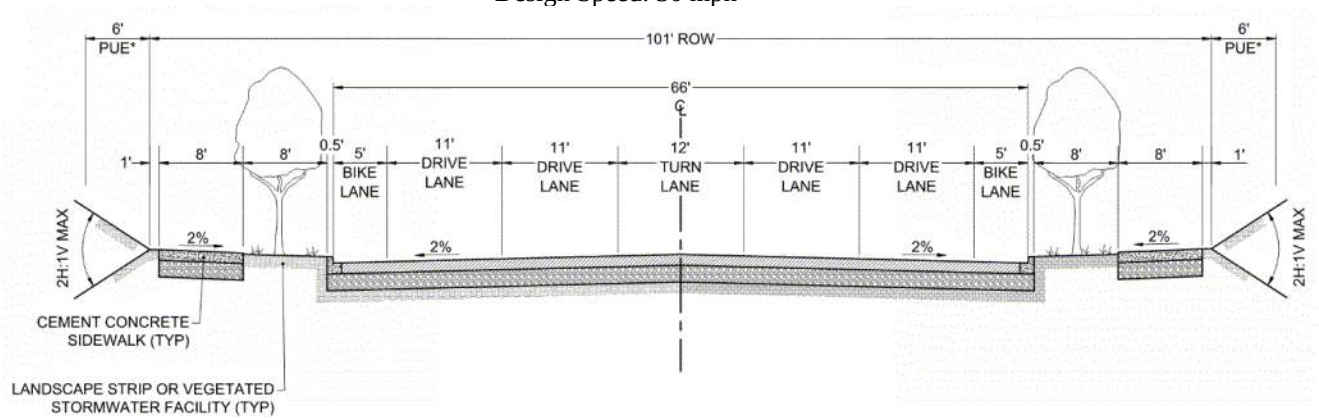


Figure 3-4: Minor Arterial

Design Speed: 30 mph

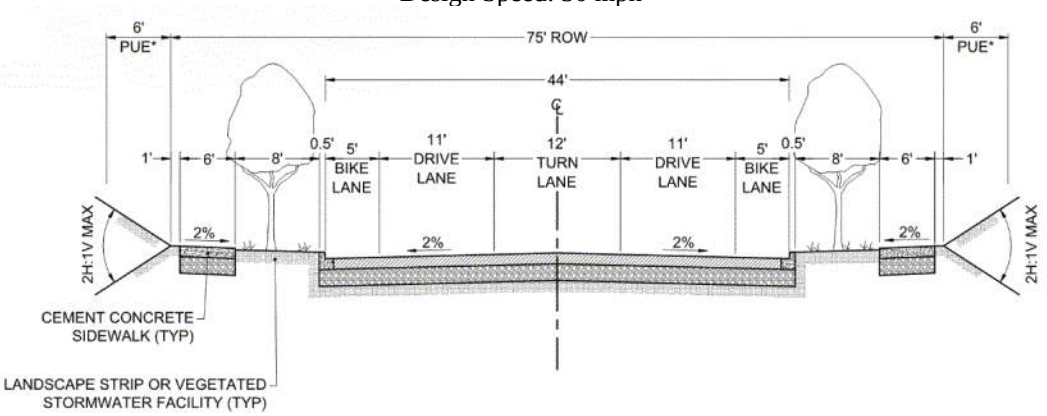


Figure 3-5: Collector

Design Speed: 25 mph

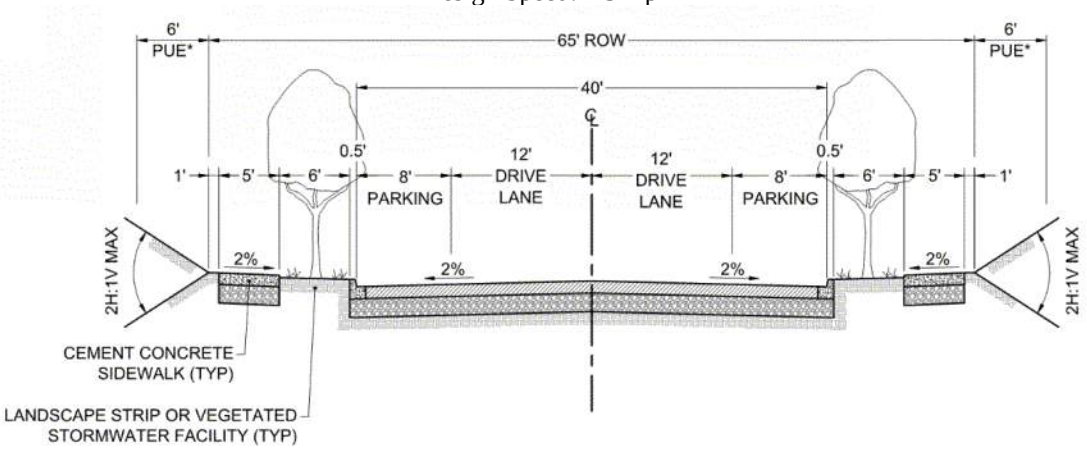


Figure 3-5a: Collector--Industrial Land Use

Design Speed: 30 mph

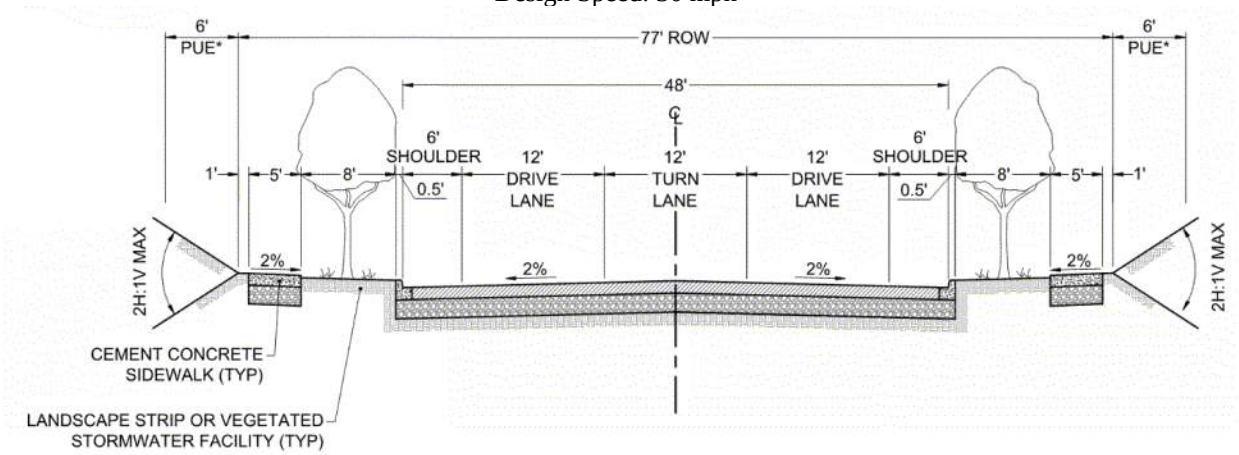


Figure 3-5b: Collector with Ditch--Industrial Land Use

Design Speed: 30 mph

* Sidewalk on only one side may be allowed pending findings of a pedestrian use study.

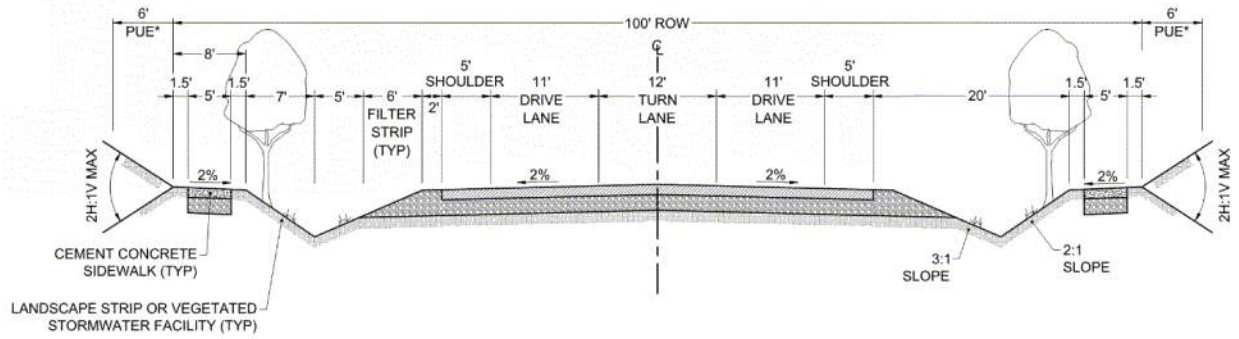


Figure 3-6: Local—Residential Area

Design Speed: 25 mph

***6' PUE. Utilities may be placed under the sidewalk in new subdivisions with approval of the Director if on-site bioretention is used to manage stormwater on residential lots.**

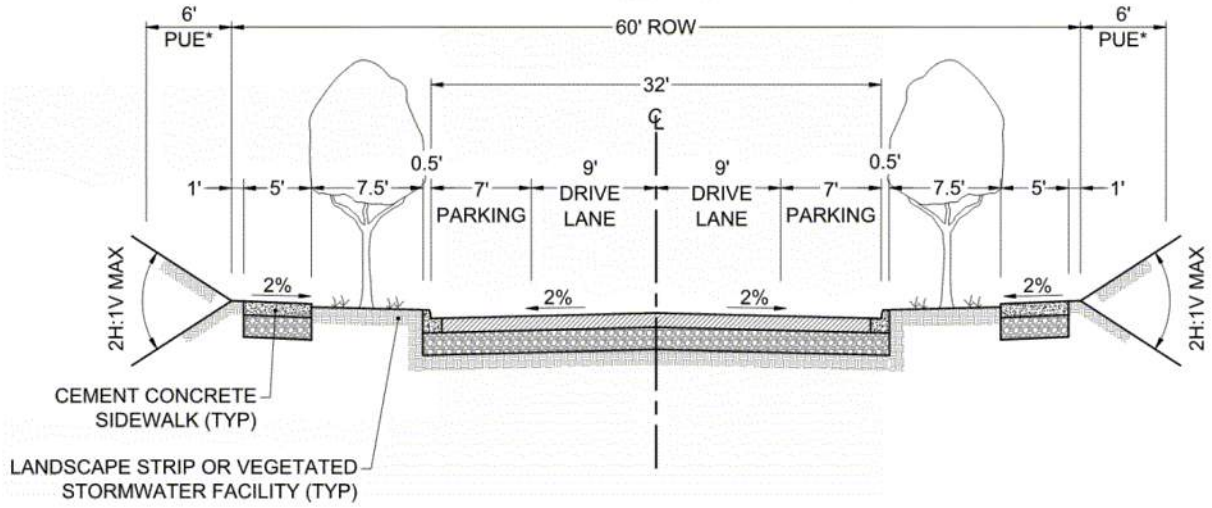


Figure 3-7: Local—Single Family Areas – 24'

Design Speed: 25 mph

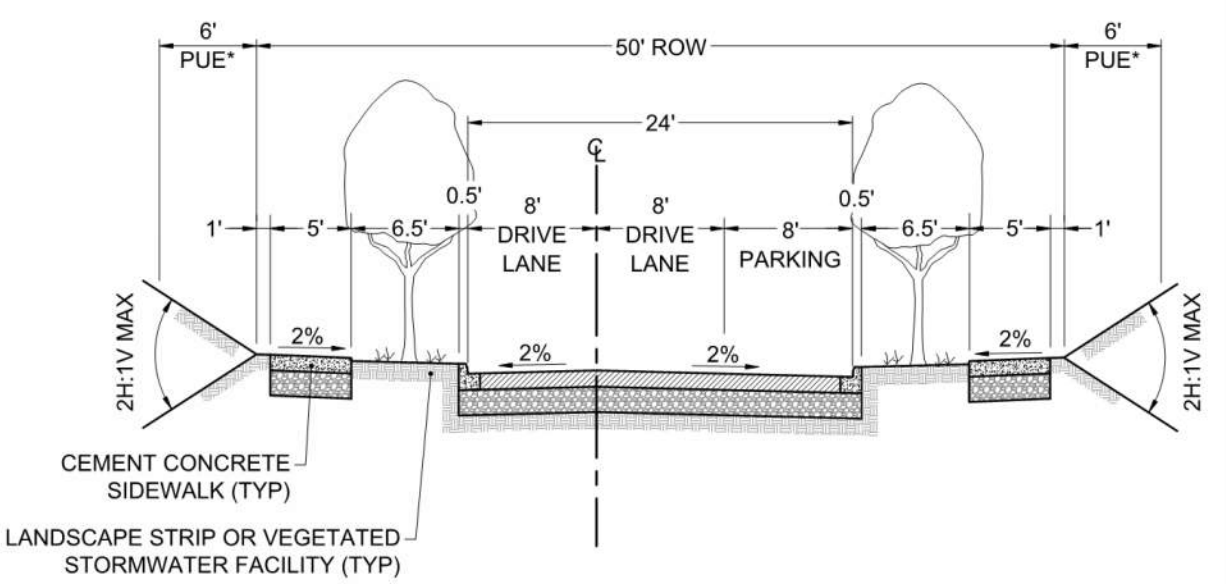
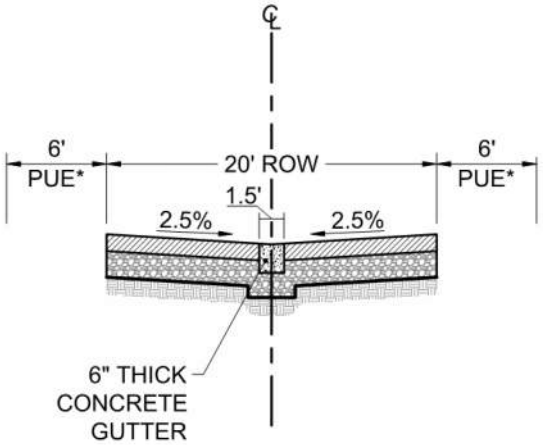


Figure 3-8: Alleys: Commercial & Industrial

Design Speed: 15 mph



3.04 Surfacing Requirements

The pavement structure thickness ("Minimum Surfacing Requirements") identified in the Tables below by street classification shall be constructed unless a site-specific pavement design is prepared. Asphalt concrete pavement shall be hot mix asphalt (HMA), Class 3/8 inch, PG 58H-22. The mix design of the HMA shall be selected using the 20 year truck volume estimate determined by the TIA converted to equivalent single axle loads (ESAL's).

Base rock shall be crushed surfacing base course. The top 4" of the base rock section may be crushed surfacing top course. Base repair to remove existing base rock and thicken the base rock section will be required if the base rock is deflecting and/or pumping under fully loaded truck traffic prior to or during paving.

The Geotextiles for subgrade stabilization shall be installed prior to constructing the base rock section.

Table 3.4
Principal Arterial
Minimum Surfacing Requirements

	Hot Mix Asphalt Thickness	**Base Rock Thickness**
	0.83'	1.50'

Table 3.5
Minor Arterial
Minimum Surfacing Requirements

	Hot Mix Asphalt Thickness	**Base Rock Thickness**
	0..67	1.50'

Table 3.6
Collector Street
Minimum Surfacing Requirements

	Hot Mix Asphalt Thickness	**Base Rock Thickness**
	0.60'*	1.50'

* 0.67 is required if the street is a bus route or fronts commercial or industrial zoned land.

Table 3.7
Local Street and Alley,
Minimum Surfacing Requirements

	Hot Mix Asphalt Thickness	**Base Rock Thickness**
	0.35'*	1.50'

***** 0.60' thickness is required if the street is a bus route or fronts commercial or industrial zoned land. Concrete street thicknesses will be as directed by the City Engineer.

3.05 Design Speed

The minimum design speed for each street classification shall be as shown in Figures 3-3 through 3-8.

3.06 Horizontal Alignment

A. General

1. Horizontal alignment shall be designed in accordance with AASHTO guidelines.

2. Superelevation may only be used with the written approval of the Director. Where superelevation is used, street curves shall be designed in accordance with AASHTO guidelines, except that a maximum superelevation rate of 0.04 shall be used.

3. Off-set crown cross-sections are not acceptable as superelevation sections.

B. Street Design in Residential Areas

1. Streets shall be aligned to promote connectivity by providing for continuation of streets in adjoining development and accommodating future opening of streets to possible adjoining development.

2. Streets shall be oriented within twenty-five degrees of east-west to the maximum extent possible to enhance solar access to residences. If other considerations such as topography and contours or connection with existing higher classification streets adversely affect this standard, then alternatives may be considered. This may include assurance that the majority of lots have their axes oriented north-south regardless of the angle of incidence of lot lines with street rights of way lines.

3. To minimize driveway access on higher volume streets, a buffer strip may be used and a separated service or marginal access road may be utilized.

3.07 Vertical Alignment

A. Vertical curves shall be designed in accordance with AASHTO and the following requirements:

1. Minimum street gradients shall be one-half percent (0.5%);

2. Maximum street gradients shall not exceed fifteen percent (15%) for local streets in residential areas. Maximum street grades shall not exceed ten percent (10%) for local streets in industrial/commercial use areas and for collector streets, and not exceed seven percent (7%) for arterial streets;

5. All streets shall be designed and constructed so that the pedestrian route crossing any new, overlaid or widened street at an intersection, whether the crosswalk is marked or not, complies with ADA Guidelines. For intersection legs where there is Stop control or a traffic signal, the longitudinal pedestrian crossing slope from street corner to street corner shall not exceed 5%, and the cross slope of the pedestrian crossing shall not exceed 2%. Where there is no Stop control or traffic signal, the longitudinal pedestrian crossing slope shall not exceed 5% and the pedestrian crossing cross slope shall not exceed 5%;

6. Commercial and industrial driveways shall not exceed two (2) feet difference in elevation for a distance of thirty (30) feet measured from the back of sidewalk, or the back of curb if no sidewalk exists, approaching an arterial street, or twenty (20) feet approaching a collector or local street.

7. Grade breaks of more than one percent (1%) shall be accommodated with vertical curves;

8. At street intersections, the crown of the major (higher classification) street shall continue through the intersection. The roadway section of the minor street will flatten to match the longitudinal grade of the major street at the projected curb line;

9. Street grades, intersections, and super elevation transitions shall be designed to not allow concentrations of storm water to flow across the travel lanes; and

10. Streets intersected by streets not constructed to full City standards shall be designed to match both present and future (as far as practicable) vertical alignments of the intersecting street. The requirements of KEDM shall be met for both present and future conditions.

B. The following standards shall govern vertical alignment with respect to flood elevations:

Table 3.8
Vertical Alignments and Flood Plains

Functional Classification	Vertical Standard
Arterial Streets	Travel lanes at or above the 50-year flood elevation but not lower than 6-inches below the 100-year flood elevation.
All other streets	Travel lanes at or above the 25-year flood elevation but not lower than 6-inches below the 50-year flood elevation.

3.08 Transitions

Street width transitions from a narrower width to a wider width shall be designed with a ten to one (10:1) taper. Street width transitions from a wider width to a narrower width shall be designed in accordance with AASHTO Standards or a ten to one (10:1) taper whichever is greater. Delineators, as defined by the MUTCD and approved by the City, shall be installed to define the configuration.

In locations where a tapered transition is infeasible, a type III barricade shall be installed at the end of the wider section of the street and a taper shall be designed and delineated as approved by the Director.

3.09 Dedications and Guarantees

A. Right-of-way shall be deeded for streets and other improvements in accordance with dimensions given in the Figures in this Chapter to accommodate motorized and non-motorized transportation, landscaping, utility, drainage, LID BMP's, and buffer requirements.

If the Fire Marshal and Director approve a narrower pavement width in accordance with Figure 3-6, right-of-way width may be reduced accordingly with Director approval.

B. Public utility tracts and/or easements for all public systems shall be provided as required. Specific requirements for sewer, water, and storm drainage easements are detailed in the relevant chapters. Particular design features of a road may necessitate slope, wall, or drainage easements. Such easements may be required by the Director in conjunction with dedication or acquisition of rights-of-way and other

standard easements (temporary construction, right-of-entry, sidewalk, pedestrian, street lighting, and traffic control devices, etc.)

C. Public Access Easements or Tracts.

Where it is necessary to facilitate pedestrian circulation between neighborhoods, schools, shopping, or other activity centers, public access easements or tracts shall be dedicated.

Improvements to Public Access easements shall include a sidewalk or trail consistent with other non-motorized facilities in the area; width as approved by the Director. Fences shall be constructed along Access easements in residential areas where buildings will be located nearer than fifty (50) feet to the edge of the easement. Traffic diverters or bollards shall be installed at the direction of the Director.

Public Access easements or tracts shall be a minimum of fifteen (15) feet wide. If the easement is over one-hundred and fifty (150) feet in length, the width shall be twenty (20) feet. Structure setbacks shall be a minimum of five (5) feet from the edge of the easement or tract.

D. All subdivisions and short plats shall deed additional right-of-way, as a condition of approval of the subdivision or short plat, where the existing right-of-way for a public street is not adequate to incorporate necessary frontage improvements for public improvements, public safety and to provide compatibility with the area's circulation system.

No buildings or other structures are allowed within the right of way, public utility tracts or public easements.

3.10 Private Streets

A. Criteria for Authorization. Private streets may be permitted only if they meet all the following conditions:

1. A design modification for the private street has been approved by the Director;

2. Covenants have been approved by the Director and recorded with the County Auditor that provide for maintenance of the private streets and associated parking areas by owners in the development. Private streets shall be maintained by a legally responsible owner(s) in the development to be served by the proposed private street or by the homeowner's association. "Maintenance" shall include, but not be limited to, cleaning, repairs, and replacement of streets, shoulders, signs, and storm drainage facilities, and vegetation control. . Covenants shall:

a. include a periodic maintenance schedule;

b. be enforceable by any property owner served by that road;

c. include a formula for assessing maintenance and repair costs and establish minimum annual assessments;

d. include remedies for noncompliance with the terms of the agreement, right of use easements and other considerations;

e. be attached to the deed of all properties served by the private road.

3. Provisions are made for the streets to be open at all times for emergency and public service vehicles;

4. The private street will not obstruct public street circulation;

5. The private street will ultimately serve no more than five (5) single family lots or the streets serve commercial or industrial facilities where no circulation continuity is necessary; and

6. The Director determines that no other access is available and the private street is adequate for the area it is to service, and

7. The private street does not connect two public roads.

B. Public Utilities. A public easement shall be provided for public utilities located within the private street.

C. Notice. The following statement is required on the face of any plat or short plat and in the CCRs for the development: "The City of Kelso has no responsibility to improve or maintain the private roads contained within, or private roads providing access to the property described in this plat."

D. Easements. Private streets shall be constructed within easements with a minimum width of thirty (30) feet. Easements shall be widened as necessary to include all cuts, fill, turnouts and turnarounds as required. Private street easements shall include provisions allowing access for public safety and public service vehicles and personnel.

E. Turnarounds. Turnarounds shall be provided at the end of all private streets longer than one-hundred and fifty (150) feet and at one-thousand feet intervals along the length of a private street where no intersecting roadway exists. Turnarounds shall accommodate a full-size fire truck.

F. Grading. All filling and grading associated with the construction of a private street shall be conducted in accordance with the requirements of the current WSDOT Standard Specifications for Roads and Bridges. A geotechnical report shall be submitted to and approved by the Director prior to beginning any land clearing, filling or grading. Such report shall identify materials to be used, compaction rates and methods, maximum allowable slopes, and erosion control methods. Where the

requirements of the Standard Specifications and those of the geotechnical report conflict, construction shall comply with the most stringent requirements.

G. Sight Distance. Private streets shall be designed and constructed so that sight distance complies with KEDM. In addition, any improvements to state, county, city or other private roadways needed to comply with sight distance requirements of the state, county or city at intersections with the proposed private street are a condition of development and shall be designed, constructed and funded by the Developer.

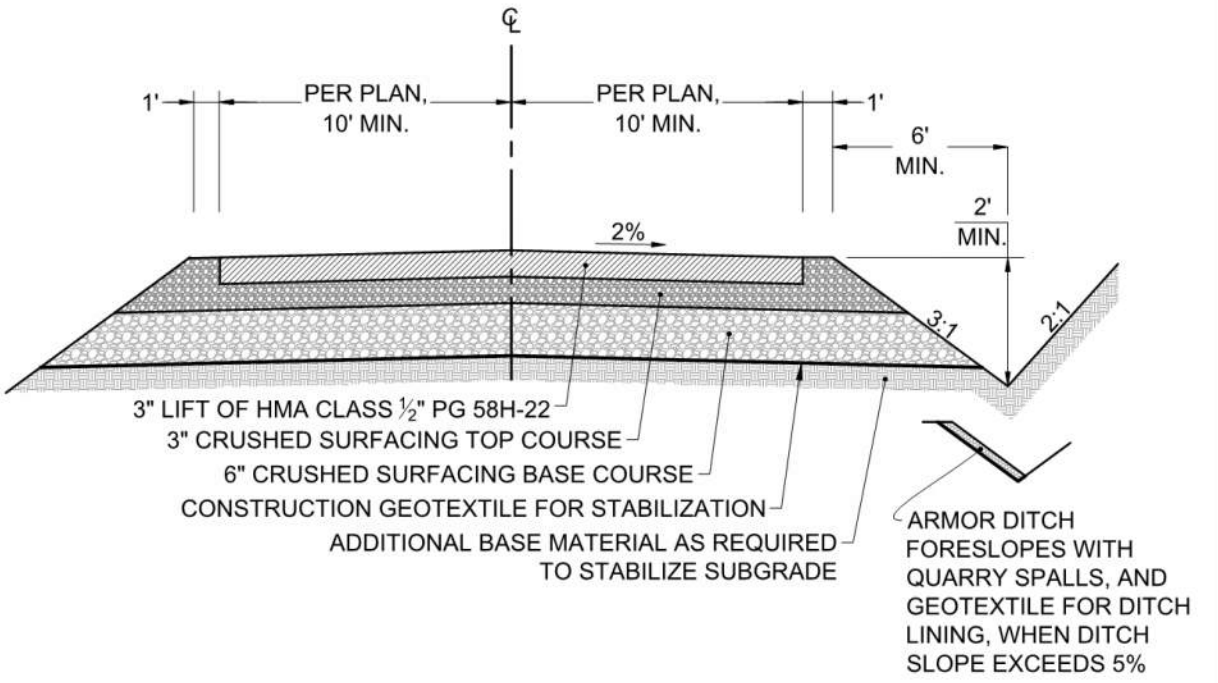
H. Horizontal and vertical design shall comply with the KEDM requirements for public streets except as noted below.

I. Typical Section. Private streets shall comply with the typical section below. The thicknesses shown below are minimum required thicknesses. Depending on soil conditions, additional base rock may be required for stabilization.

J. Construction Requirements. Private streets shall comply with the KEDM construction standards.

Figure 3-9: Private Street

2-5 Residential Units



1. The maximum grade for private streets shall be fifteen percent (15%);

2. Private streets shall be designated by a sign at each intersection complying with MUTCD standards stating the name of the road and “Private Roadway”.

3. Intersections with state roadways shall at a minimum comply with the requirements for city intersection above and shall require WSDOT approval prior to construction.

4. Any bridge or culvert on a private roadway shall be constructed to the most current AASHTO and/or WSDOT standards, whichever is more restrictive.

3.11 Street Frontage Improvements

A. Street frontage improvements may include, but are not limited to:

1. curb and gutter;

2. sidewalk and ADA ramps;

3. stormwater conveyance;

4. stormwater quality/quantity facilities;

5. street lighting system;

6. utility undergrounding (relocation may be required);

7. street construction and/or widening;

8. traffic signal modification, relocation or installation;

9. landscaping and irrigation may also be required.

Half-street improvements shall be reconstructed from the center line of the proposed street width.

B. Frontage improvements for corner parcels shall include full half street frontage improvements on arterial streets. In addition, each non-arterial street fronting the parcel will be evaluated to determine whether half street improvements will be required. .

C. Frontage improvements shall include a two (2) inch inlay of the street paving on the other side of centerline from the new development if construction invades the opposite side of the street.

D. Full half-street frontage improvements along arterial streets are required for subdivisions under 4 lots and site plans under five thousand (5,000) square feet The new frontage improvements shall at a minimum match the predominant characteristics/conditions of the existing frontage improvements of the majority of the parcels on the street.

The Director will determine the predominant characteristics/conditions of the existing frontage improvements by considering the frontage conditions of all the parcels fronting the street . If less than fifty percent (50%) of the frontage length of

the street (both sides) has full or partial frontage improvements, the subject development shall meet the predominant characteristics/conditions as determined by the Director. Where fifty percent (50%) or more of the frontage length of the street has full improvements, or the potential for development or redevelopment, full half-street frontage improvements will be required.

In situations where the Director finds that other pending or approved unconstructed developments on the same street frontage would cause the calculation described above to exceed fifty percent (50%) or where other recorded covenants requiring frontage improvements exist, or where it is determined that deferral of the requirement to build full half-street improvements will cause an adverse public impact or create unsafe conditions, the Director may require full half-street frontage improvements.

E. In addition to the requirements above, an approved half-street improvement shall conform to the following:

1. Minimum finished pavement width shall be 24 feet for arterials, collectors, and for local streets where the proposed development is industrial or commercial ("industrial/commercial streets"), and 20 feet for local streets where the proposed development is residential.

2. Intersection improvements shall be adequate to provide turn lanes, where warranted. Additional right of way may be required. Minimum pavement widths approaching the intersections shall be as follows:

   a. Arterials, collectors and industrial/commercial streets: 40 feet paved width, or the required width for the street (whichever is greater), for 250 feet as measured from centerline of the intersecting street;

   b. Local: 36 feet paved width, or the required width for the street (whichever is greater), for 150 feet as measured from centerline of the intersecting street.

F. The following minimum standards shall apply to the development of a single family residential dwelling unit on an unimproved right of way (existing plats) :

1. The existing right-of-way width, HMA width, and sidewalk status shall be extended to match that of and connect to the nearest paved street.

2. An improved turn-around shall be provided in accordance with Section 3.12 *Street Ends*, if the lot to be developed is located at the end of any road that is over 150 feet in length.

3.12 Street Ends, Cul-de-Sacs and Hammerheads

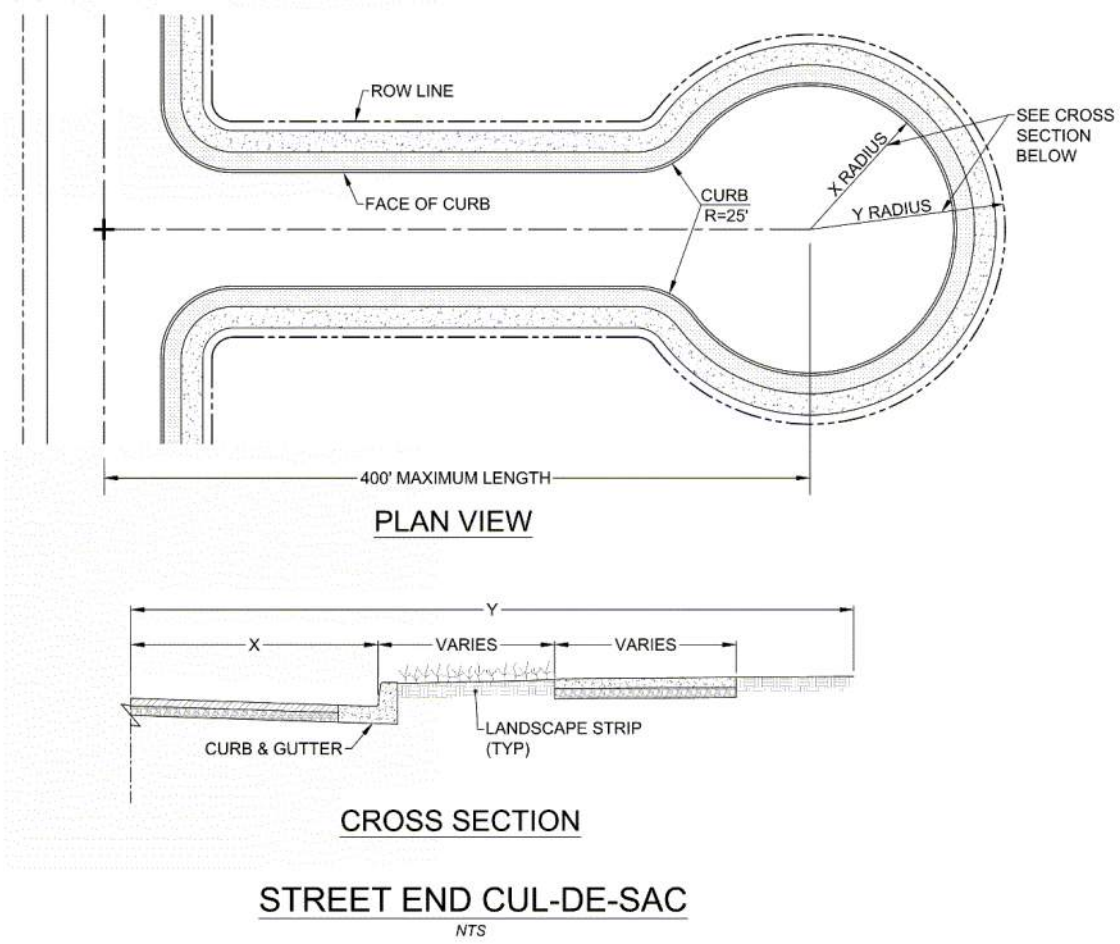
A. Street end cul-de-sacs:

Street end cul-de-sacs shall be provided at all public and private street ends on all streets that are longer than one-hundred fifty (150) feet, measured from the centerline of the

intersecting road to the center of the cul-de-sac bulb. The maximum length cul-de-sac shall be four-hundred (400) feet. Cul-de-sacs may include a planting circle in the center of the cul-de-sac bulb if the bulb radius is increased to accommodate it, and fire department vehicles can turn in the bulb without traversing over the planting circle.

1. No dead-end street will be allowed that obstructs public street circulation.
2. All street end cul-de-sacs shall be paved in accordance with local street standards.
3. All requirements for utility/landscape strips and sidewalk for the adjacent street section apply.
4. The minimum cul-de-sac bulb and right of way radius shall be as shown below. The minimum curb radius for transitions into cul-de-sac bulbs shall be as shown in the figure.
5. The minimum distance from center of the street end cul-de-sac to the subdivision boundary is one-hundred fifty (150) feet.

Figure 3-10.1: Street End Cul-de-Sac



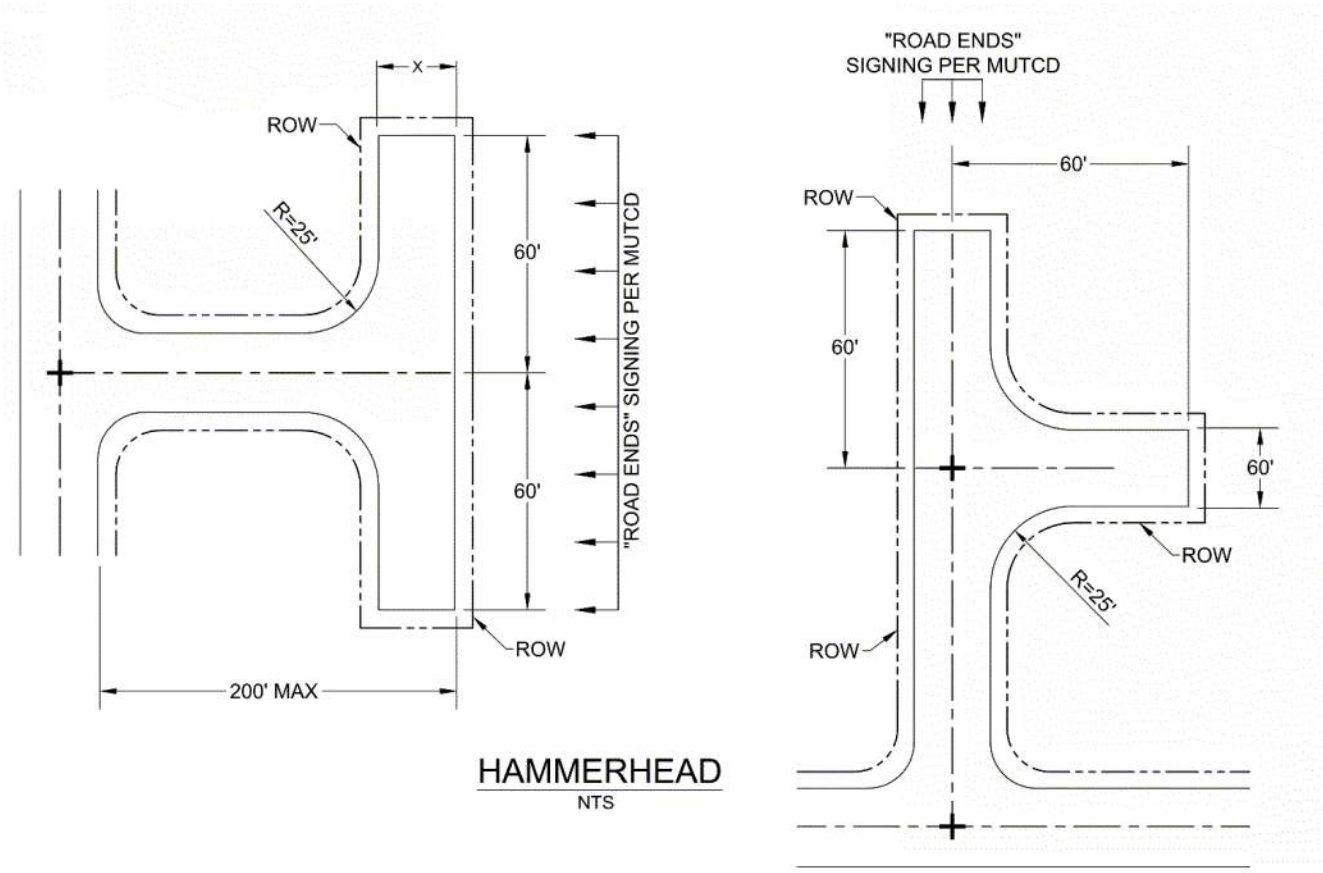
X: 40’ for local streets in residential areas
60’ for commercial and industrial areas

Y: 50’ for local streets in residential areas
75’ for commercial and industrial areas

B. Hammerheads:

Hammerheads may be used on private streets 200 feet long or less in lieu of a cul-de-sac. The hammerhead shall be signed "No Parking." A driveway shall not be used as part of the hammerhead.

Figure 3-10.2
Hammerhead



C. Temporary Dead Ends:

Where a street is temporarily dead ended, a turn-around shall be built. The turn-around shall be either a cul-de-sac or a hammerhead as directed by the Director.

A Type III barricade with signage complying with MUTCD denoting "ROAD ENDS" and "No Parking" shall be placed at the temporary street end as shown in Figure 3-14.

D. Street end cul-de-sacs and hammerheads will be allowed only on local streets and commercial/industrial streets.

E. An Eyebrow cul-de-sac or Knuckle cul-de-sac may be used on a local street in a residential area where expected ADT will not exceed five-hundred (500) vehicles per day or as otherwise approved by the Director. Minimum outside curb radius and minimum right-of-way radius for both types of cul-de-sacs is shown below.

Geometry will be evaluated and may be modified on the basis of turning requirements for Fire Department vehicles.

Figure 3-10.3
Eyebrow Cul-de-Sac

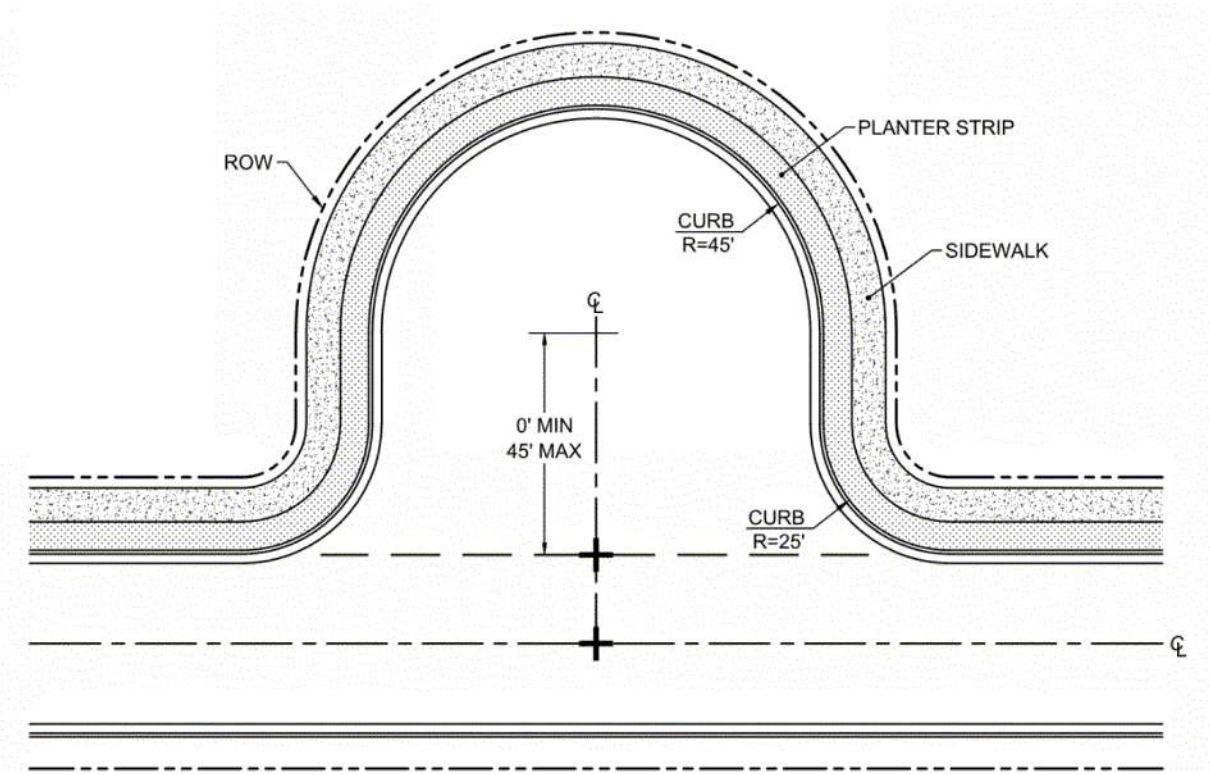
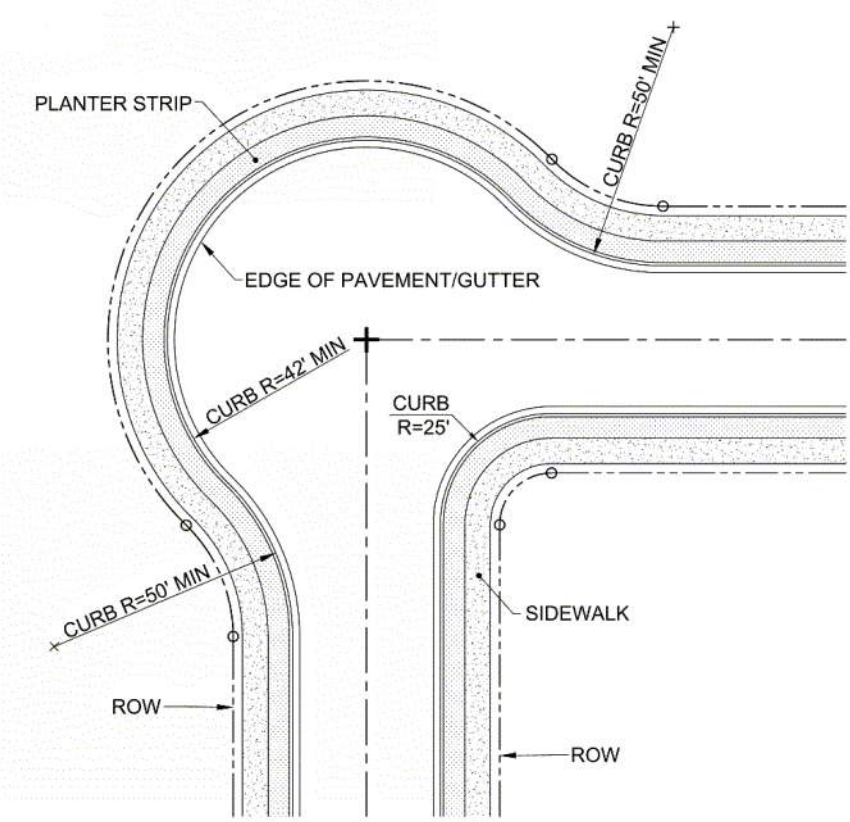


Figure 3-10.4
Knuckle Cul-de-Sac



3.13 Medians

Medians will be evaluated on an individual project basis.

3.14 Sight Obstruction Requirements

A. Sight distance shall be maintained at all driveways, buildings, or garage entrances, and where structures, wing walls, etc. are located adjacent to, or in close proximity to, a pedestrian walkway.

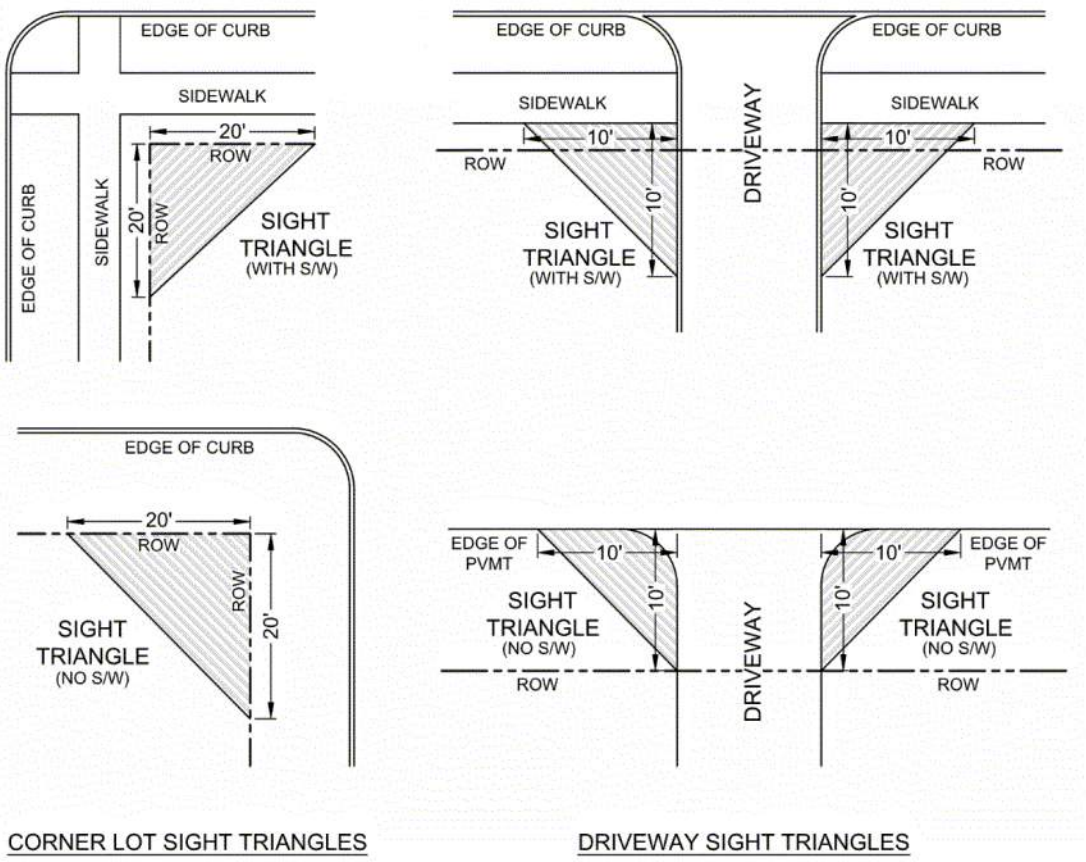
B. Sight lines to traffic control devices (signs, signals, etc.) shall not be obscured by trees, landscaping, street furniture, marquees, awnings, or other obstructions. Sightlines shall also comply with AASHTO guidelines.

C. Sight Triangles for All Uses in All Zones. The corner areas of lots adjacent to street intersections and corner areas adjacent to driveways and other access easements shall be kept clear of sight obstructions. Buildings, structures, objects or vegetation over thirty-six inches in height, measured from the gutter

grade, or edge of street grade in the absence of a gutter, adjacent to the potential sight obstruction, will be considered sight obstructions. Sight triangle dimensions and locations are as described in the Sight Triangle figure below.

Figure 3-11

Sight Triangles



Sight triangles do not apply in zoning districts with zero lot line setbacks.

3.15 Survey Monuments

Street monuments shall be placed at every intersection, centerline angle points, points of curvature and other points required by the Director. Street monuments shall be set between two (2) and four (4) inches below finished street grade with a cast iron monument case and cover complying with the requirements of WSDOT Standard Plan A-10.30-00, except use the valve box from Kelso Standard Plan KW-250 for the case, delete the concrete collar, and provide the cover with only the word “MON” engraved or molded into the surface.

3.16 Sidewalks

A. All sidewalks shall be designed and constructed in accordance with ADA Guidelines and the Kelso Standard Plans. Where there is a conflict between the ADA Guidelines and Kelso Standard Plans, the stricter standard shall prevail.

3.17 Landscaping in the Right-of-Way, Easements, and Access Tracts

A. Plantings placed in the right-of-way, including street trees, landscape strips, and bioretention facilities, shall be maintained by the abutting property owner, except plants within a bioretention curb extension in the parking lane shall be maintained by the City.

B. Any existing vegetated areas within the right-of-way that are disturbed by construction activity shall be restored to their original condition or better by the Applicant.

C. Any plantings or other improvements placed within the right-of-way by abutting property owners are subject to removal when the right-of-way is needed for public use. The property owner is responsible for removing any landscaping or other improvements upon official notice by the City. The property owners will be responsible for the relocated plantings.

D. Plantings within the right-of-way shall comply with the following provisions:

1. No trees shall be planted within thirty (30) feet of an intersection, measured from the closest curb.

2. All street trees shall be selected from Table 3.9 below.

Table 3.9
Street Tree List

Scientific Name	Common Name
Acer buergeranum	Trident Maple
Acer circinatum	Vine Maple
Acer griseum	Paperbark Maple
Acer negundo 'Flamingo'	
Acer palmatum	Japanese Maple
Acer tataricum	Tataricum Maple
Arbutus menziesii	Madrone
Arbutus unedo	Strawberry Tree
Cercis Canadensis	Eastern Redbud
Clerodendron trichotomum	Harlequin Glorybower Tree
Cornus florida	Flowering Dogwood
Cornus kousa	Korean Dogwood
Crataegus x lavallei	Lavalle Hawthorn
Crataegus phaenopyrum 'Washington'	Washington Hawthorn
Fraxinus excelsior 'Aureafolia'	Golden Desert Ash
Fraxinus pennsylvanica 'Johnson'	Leprechaun Ash
Koelreuteria paniculata 'Fastigiata'	Pyramidal Goldenrain Tree
Laburnum sp.	Goldenchain Tree
	*
Oxydendrum arboretum	Sourwood
Prunus x blireiana	Bliereana Plum
Prunus cerasifera 'Newport'	Newport Plum
Prunus cerasifera 'Thundercloud'	Thundercloud Plum
Sorbus Americana 'Dwarfcrown'	Red Cascade Mountain Ash
Styrax japonica	Japanese Snowbell
Syringa reticulate	Ivory Silk Japanese Tree Lilac
Zelkova serrata Schmidtlow	Wireless Zilkova

* Tupelo (Nyssa sylvatica) may only be used as a street tree within a bioretention BMP. See Table 3.10 for the Bioretention Plant List.

3. Where existing landscaping maintained by the City exists, every effort shall be taken to protect and preserve the existing vegetation during construction. Plants shall be relocated or removed only upon approval of the Public Works

Department. Damaged landscape areas shall be restored prior to final plat approval or issuing a final occupancy permit, whichever comes first.

4. In areas where an existing landscaping concept or pattern has been established or approved, all new landscaping shall conform to the intent of the concept. Plantings shall be of a similar variety, size, and spacing to those already established and/or approved for the area.

5. All trees planted in street rights of way with adjacent sidewalk shall be at least six (6) feet in height at the time of planting, be maintained at all times with seven (7) feet of clearance to the lowest branches above the sidewalk and 10' above the street, mature to a height less than thirty (30) feet, be centered between curb & sidewalk if located within the utility/landscape strip, and be planted and maintained in accordance with the WSDOT Standard Specifications.

6. No low growing vegetation shall extend beyond the curb or edge of pavement if there is no curb.

7. Approval from the Engineering Department must be received before trees are planted in the street rights of way.

8. Cut and fill slopes shall be hydro-seeded or seeded and mulched with tackified mulch to provide a soil holding vegetative cover.

9. Prior to final plat approval, or issuance of final occupancy, whichever comes first, the applicant shall plant the landscape strip and/or bioretention area in the right-of-way as follows:

    a. Landscaping. Plant in accordance with the landscaping plan. For grass strips, either seed or sod is acceptable;

    b. Bioretention Areas.

        i. Plants shall be selected from the Bioretention Plan List (Table 3.10), and planted in accordance with the approved landscaping/planting plan. No plants with a mature height over 3' are allowed in the sight triangles.

        ii. Plantings in bioretention areas shall be irrigated by the Applicant for the first two years. Irrigation plans shall be included in the landscaping/planting plans. If there will be automatic in-ground irrigation for the bioretention areas, show typical details in the plans. If manual watering is proposed instead, the plans shall include the watering schedule, method of watering and responsible party performing the watering. Provision of power and a water service and meter for the irrigation system is the responsibility of the Applicant.

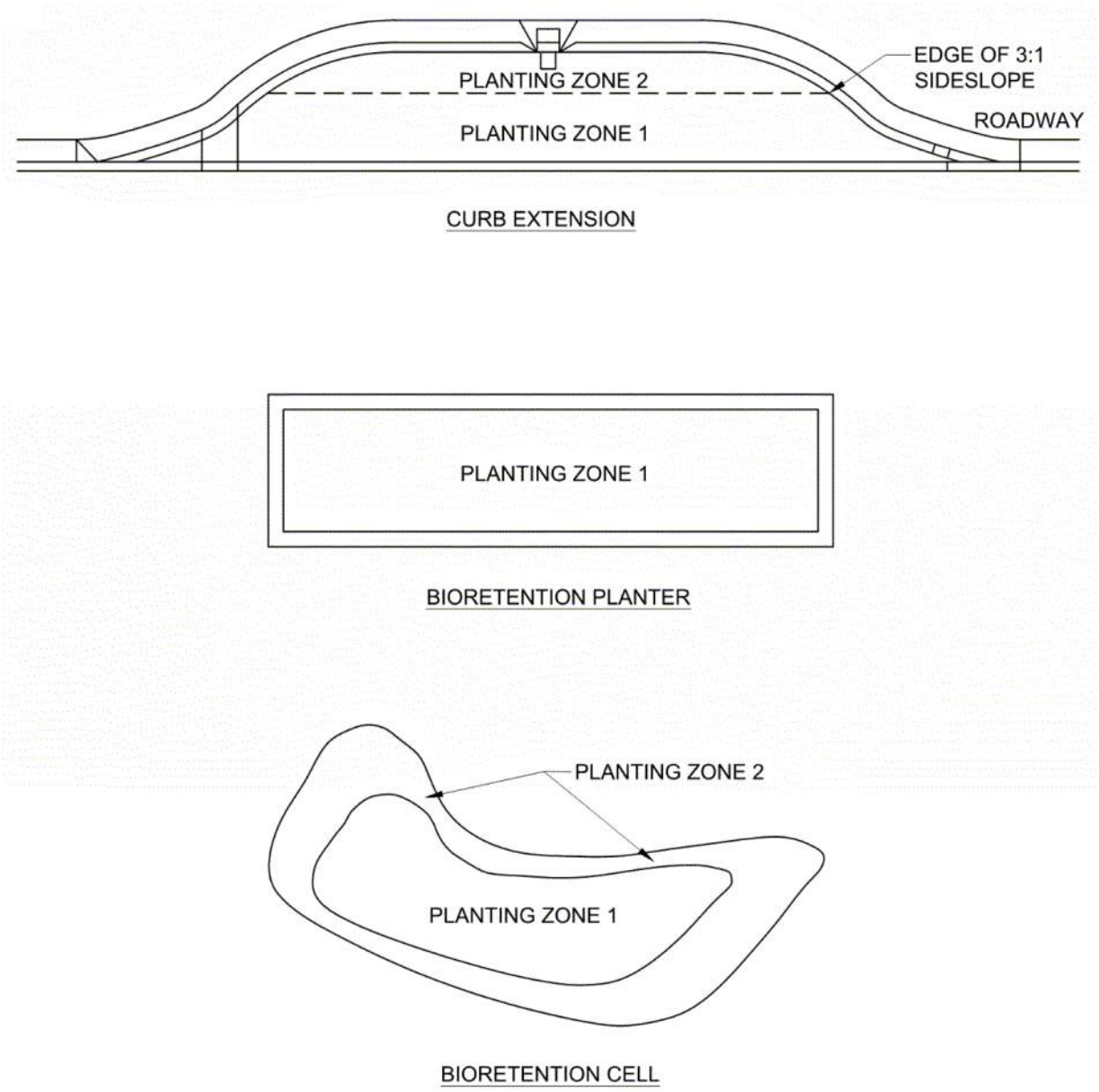
    c. 'As-builts' of the landscaping and in-ground sprinkling system shall be submitted after the last inspection but before final occupancy or plat approval is granted.

Table 3.10
Bioretention Plant List

Common Name	***Botanical Name***	**Ht.**	**Expo-sure**	**Size**	**Qty / Spacing**	**Remarks**
Select plants based on zone. See Figure 3-15 for illustration of zones.						
ZONE 1: PONDING AREAS / WET TO MOIST						
TREES Trees optional in Zone 1. Use only in 6' width minimum facilities						
Tupelo	*Nyssa sylvatica*	30'	Sun/Part Shade	1 1/2" Gal	1 per 100 sf	Brilliant and varied fall color
SHRUBS Shrubs optional in Zone 1. Use only in 6' width minimum facilities						
Redtwig Dogwood	*Cornus sericea*	6'	Sun to Shade	#1 Cont.	4 per 100 sf	
Clustered Wild Rose	*Rosa pisocarpa*	6'-8'	Sun/Part Shade	#1 Cont.	4 per 100 sf	Adaptable to drought and inundation. Fruit persists.
Hardhack	*Spiraea douglasii*	4'-7'	Sun/Part Shade	#1 Cont.	4 per 100 sf	Purple spiked flowers in summer.
EMERGENTS (GRASSES)						
Sough Sedge	*Carex obnupta*	1'-5'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	Very successful bioretention plant. Adaptable to drought and inundation.
Sawbeak Sedge	*Carex stipata*	10"-3'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Orange Sedge	*Carex testacea*	20"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	Orange-brown leaves provide color variation. Useful adjacent to curb or sidewalk where shorter plants are desired.
Fox Sedge	*Carex vulpinoidea*	24"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Soft Rush	*Juncus effusus var. pacificus*	1'-2'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Dagger-leaf Rush	*Juncus ensifoloius*	12"-18"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	Useful adjacent to curb or sidewalk where shorter plants are desired. Seed heads provide interest.
Spreading Rush	*Juncus patens*	36"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Slender Rush	*Juncus tenuis*	6"-2.5'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Small fruited Bullrush	*Scirpus microcarpus*	24"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
BULBS						

Common Name	***Botanical Name***	**Ht.**	**Expo-sure**	**Size**	**Qty / Spacing**	**Remarks**
Great Camas Lily	*Camassia leichtlinii*	12"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
Common Camas	*Camassia quamash*	24"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
ZONE 2: SIDESLOPES / MOIST TO DRY						
TREES						
Tupelo	*Nyssa sylvatica*	30'	Sun/Part Shade	1 1/2" CAL	30'	Brilliant and varied fall color
Vine Maple	*Acer circinatum*					
SHRUBS, GRASSES, HERBACEOUS						
Kelsey Redtwig Dogwood	*Cornus sericea*	20"	Sun/Part Shade	#1 Cont.	3' O.C.	
Tufted Hairgrass	*Deschampsia cespitosa*	36"	Sun/Part Shade	#1 Cont.	2' O.C.	Use where not adjacent to curb or sidewalk
Autumn Glory Hebe	*Hebe 'Autumn Glory*	18"	Sun/Part Shade	#1 Cont.	2' O.C.	
Dull Oregon Grape	*Mahonia nervosa*	24"	Part Sun/Part Shade	#1 Cont.	2' O.C.	
Creeping Oregon Grape	*Mahonia repens*	12"	Sun/Part Shade	#1 Cont.	1' O.C.	
Birchleaf Spirea	*Spiraea betulifolia*	24"	Sun/Part Shade	#1 Cont.	2' O.C.	
Snowberry	*Symphoricarpos albus*	36"	Sun/Part Shade	#1 Cont.	3' O.C.	
BULBS						
Great Camas Lily	*Camassia leichtlinii*	12"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
Common Camas	*Camassia quamash*	24"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
GROUNDCOVER						
Kinnikinnick	*Arctostaphylos uva-ursi*	6"	Sun/Part Shade	#1 Cont.	2' O.C.	
Creeping Raspberry	*Camassia quamash*	6"	Sun/Part Shade	#1 Cont.	2' O.C.	

Figure 3-12: Bioretention Planting Zones



3.18 Street Illumination

Street lighting is required for all public streets and at the intersections of public and private streets.

Street lighting is not required on private streets.

Applicant shall replace existing above ground wiring and power connections for lighting systems mounted on power poles with a new lighting system serviced by underground wiring and power connections if the system will not conflict with essential distribution lines.

The lighting design shall include a lighting analysis. The lighting design shall comply with Table 3.11.

Table 3.11

Maintained Illuminance Table

Maintained Illuminance Values (L Ave) of Candelas per Square Meter			
Street Classification – Zoning	Average Maintained Illuminance	Ave to Min	Max to Min
Arterial-Commercial/Industrial	1.7	3 to 1	5 to 1
Arterial-Residential	0.9	3 to 1	6 to 1
Collector-Commercial/Industrial	1.2	4 to 1	5 to 1
Collector-Residential	0.6	4 to 1	8 to 1
Local-Commercial/Industrial	0.9	6 to 1	10 to 1
Local-Residential	0.4	6 to 1	10 to 1

Residential local streets may use the spacing table below to layout light poles locations. The following applies to the LED fixtures.

a. For streets 28’ wide and less, the Type II distribution LED cobra head luminaire shall produce between 2400 and 3000 at no more than 29W.

b. For streets 32’ – 36’ wide, the Type II distribution LED cobra head luminaire shall produce between 3800 and 4000 lumens at no more than 42W.

Use the following placement table. The table below assumes the luminaires are placed per the Standard Plans.

Table 3.12

Local Residential Luminaire Spacing

Luminaire Placement--Alternating Sides (Preferred)				
Road Width, feet	LED Lumens	Distribution Type	Pole Height, feet	Maximum Pole Spacing, feet
28 and less	2400-3000	Type 2	20	102
32-36	3800-4000	Type 2	20	123
Luminaire Placement--One Side only				
28 and less	2400-3000	Type 2	20	109
32-36	3800-4000	Type 2	25	122

At least two street lights shall be placed at each arterial street intersection. On all other streets, at least one street light is required at each intersection. Street light poles shall be placed to meet IES lighting requirements or approved spacing table. Poles shall be staggered on each side of the street and located on the inside of curves to the greatest extent practicable.

Street lights shall be centered on lot lines whenever possible, so long as required illumination levels and uniformity ratios can also be achieved.

Lighting design shall be adjusted to minimize conflicts with existing and/or planned street trees.

The street light system shall be accessible for public maintenance by a wheeled vehicle weighing at least twenty-thousand pounds (20,000 lbs.).

All wiring, conduit, and power connections shall be located underground. Exceptions to allow above ground installation of wiring and power connections may be considered in residential areas where the existing lighting system is overhead, or in the absence of lighting, the existing power system is overhead. .

3.19 Traffic Control and Special Service Signs

The Applicant shall design and install permanent traffic control and temporary work zone traffic control. Traffic control includes signing, delineation and traffic signals.

Permanent and temporary work zone traffic control shall comply with MUTCD. See below for Special Service signing provisions.

A. Signing.

Sign types may include, but are not be limited, to street name, parking, stop, dead end, regulatory speed and pedestrian advisory.

B. Delineation:

Delineation includes, but is not limited to, painted and thermoplastic pavement markings, raised pavement markers and flexible guide posts for travel and turn lanes, parking, and pedestrian and bicycle facilities.

C. Traffic Signals.

Where warranted, traffic signal improvements may include new traffic signals or modifications to existing signals. The design shall be performed by a licensed civil engineer experienced in traffic signal design. Qualifications and applicable experience of the engineer shall be submitted and approved by the Director prior to beginning the design work.

E. Specific Service Signs. A Specific Service sign is a guide sign complying with MUTCD chapter 2F which provides road users with business identification and directional information for services and for eligible attractions.

1. Application for a Specific Service Sign. Any entity wishing the City to place a Specific Service sign for the business within the city limits of the City of Kelso must be a legal owner of an active/open business located in the City of Kelso. Application for a Specific Service sign may be made by the business owner with the Director on a form provided by the City. The application shall state the owner of the business, identify the business by its official corporate name or name under which it is doing business, state the directional information for services or attractions provided by the business, state the arterial or state route within the confines of city limits upon which the sign is requested to be placed. Failure to provide the required information shall result in a denial of the application. If the sign is proposed to be located on a State Route, the Applicant must also apply for a permit from WSDOT. The WSDOT permit for the sign must be approved prior to City approval of the Specific Service sign application.

2. Application and Maintenance Fees. Fees for Special Service Signs shall be in accordance with the Kelso Master Fee Schedule. The Maintenance fee shall be paid to the City on the anniversary of the installation of the Specific Service sign. Failure to make timely payment of the annual Maintenance fee may result in the removal of the Specific Service sign by the City.

3. Limitations on Specific Service Signs. Each business owner shall be limited to two Specific Service signs per business. Specific Service signs shall be placed only along arterial roadways in the City limits.

3.20 Right of Way Obstructions

Right of way obstructions are above ground objects located between the edge of the street and the right of way line that could be unsafe to motorists when struck.

A. All obstructions shall be located a minimum of two and one half (2.5) feet behind the face of the curb to the face of the object. Where no curb exists the distance from the edge of the street to the face of the object shall be at least six (6) feet.

B. Obstructions shall not be located in the sidewalk area except where the sidewalk is widened around the obstruction to the satisfaction of the Director.

3.21 Non-City Owned Utilities

A. Non-City owned utilities shall relocate their existing facilities at City expense when a conflict results between their facilities and proposed public infrastructure improvements funded by the City. Utility installation and relocation costs needed as part of, or as a result of, required public infrastructure improvements are the responsibility of the Applicant. Power, telephone, cable TV, illumination and other wired or cabled infrastructure shall be installed underground.

B. Utilities required for development shall be installed and/or relocated prior to paving.

C. New single-family plats and short plats shall include common or individual non-exclusive perpetual utility easements a minimum six (6) foot wide to serve each lot. Additional easements for distribution and transmission lines or utility facilities may be required.

D. The Applicant shall make the necessary arrangements with utility providers and other appropriate persons for utility installations and relocations.

3.22 Speed Humps

For the purposes of this section, the term “applicant” shall mean the person who files the application for the proposed speed humps.

Installation of speed humps on city streets is subject to the following policy and approval process:

A. Where Speed Humps May Be Installed

Speed humps may be installed only on streets having all of the following characteristics:

1. No more than two travel lanes

2. Overall pavement width not greater than 28 feet;

3. In street sections having grades of 3 percent or less at the location of each hump;

4. On streets where the speed limit is 25 miles per hour or less;

5. The street is functionally classified as local;

6. The street is residential in nature;

7. The street section proposed for speed humps has an average daily traffic volume of 750 vehicles or less;

8. In street sections where the minimum safe stopping sight distance can be provided at 25 mph or the posted speed limit whichever is less;

9. Where 85% of the vehicles during a 24-hour period are traveling at a speed 5 mph or greater over the speed limit.

10. In street sections where no raised crosswalks exist, and the nearest raised crosswalk is not less than 400 feet away ;

10. On existing streets only with the documented approval of at least sixty percent (60%) of the property owners within the approval area, which is defined as adjacent to the series of speed humps or within 500 lineal feet of the outermost speed humps as measured along each roadway centerline, including connecting roadways;

11. On new streets in new subdivisions at the direction of the City Engineer when approved during the development review process; and

12. On critical or frequent emergency vehicle response routes that meet all of the above criteria, only a modified speed hump, referred to as a speed cushion that reduces emergency vehicle delay, may be installed.

B. Deviation from Speed Hump Criteria

Deviations from the criteria under Where Speed Humps may be Installed may be made by the City Engineer upon completion of a site-specific traffic study and consultations with the Fire Department and Police Department

C. Location Limitations

1. Speed humps shall not be placed within a severe horizontal or vertical curve; wherever possible, speed humps shall be placed on tangent rather than curved sections of the roadway.

2. Speed humps shall not be placed on streets where long wheel-base trucks constitute greater than 5% of the total vehicle volume.

3. Speed humps shall be 250’-400’ apart.

4. Speed humps shall not be placed at locations or in streets where there are other traffic safety factors that discourage the use of speed humps, as determined by the City Engineer. The City Engineer, or designee, shall have the sole discretion to deny requests for speed humps.

5. Speed humps shall not be placed at or near locations where previously existing speed humps were removed by the petition method defined in this Resolution, within a preceding three-year period.

D. Placement, Location and Design of Speed Humps

The placement, location and design of speed humps shall be as determined by the City Engineer or designee.

E. Cost of and Payment for Speed Humps

The actual full cost of preliminary investigation, traffic study, design and construction of the speed humps, including but not limited to, permit fees, design costs and construction costs, shall be paid by the Applicant. The cost of construction shall be estimated by the City Engineer at the time the application is approved.

In the case of new streets in new subdivisions, the Developer shall be responsible to pay for the actual full cost of the speed humps.

All speed humps shall be constructed and maintained by the City.

F. Process for Speed Hump Installation

1. Prior to submittal of a permit application, the Applicant must request a preapplication conference with the City Engineer. The date, time, and place of the conference shall be at the mutual agreement of the participants. Such conferences are intended as an informal discussion and review to assist the applicant in the applicable city standards and the review process and to evaluate if the request meets the City’s speed hump policy.

2. The City Engineer shall review the request to determine if the proposed location(s) for the speed humps meets the speed hump policy.

3. If the policy criterion appears to be met, the City Engineer shall meet with the requestor to discuss and refine, as necessary, the locations and number of speed humps.

4. Based on the proposed location of the speed humps, the City Engineer shall determine the area requiring property owner approval (approval area). Typically, the approval area shall be an area including properties adjacent to the humps and at least 500 feet beyond the outermost speed humps, and including properties with residents on connecting roadways who reside within

500 lineal feet of the speed humps, as measured along the roadway centerlines. The City Engineer will provide a letter of interest for the requestor to circulate to property owners in the approval area, which will also include the estimated cost of construction of the speed humps. The City will provide the requestor a map of the approval area. It will be the requestor's responsibility to determine the identity and location of the property owners in the approval area and to obtain signatures of sixty percent (60%) prior to submittal of the application.

5. The person requesting a speed hump ("Applicant") shall submit an application for a permit to construct a public improvement as required under KMC 12.10. The City Engineer may amend the permit application and process as set forth in this Chapter for speed humps. Application for speed humps shall be submitted in writing to the City Engineer of forms prepared by the City along with payment of a $1000 permit fee. An Applicant must be a property owner of property on the street(s) proposed for speed humps and must submit with the application signed letters of interest dated within six (6) months of the date of application from property owners representing at least sixty percent (60%) of the properties in the approval area indicating their approval of a speed hump in that location. Only one signature is required from each property ownership, and that signature shall be presumed to represent the entire property.

6. If the City finds the application complete and the letters of interest sufficient, the City Engineer will gather and review traffic data for the requested location, including vehicle speeds, traffic volume, and crash history and process the permit application.

7. If traffic data supports the request for speed humps and the criteria of this policy is met, the City Engineer shall approve the permit and prepare an agreement between the City and the Applicant wherein the Applicant agrees to pay the full actual cost of constructing the speed humps within 30 days of billing and agrees to a lien on their property for the unpaid balance should full payment not be made. The City Engineer will send the permit approval and agreement to the Applicant. The Applicant shall have 60 days to accept the permit, sign the agreement and submit payment to the City of the estimated construction cost of the speed humps. In the case of new development, payment shall be submitted to the City prior to final plat approval, project acceptance, or issuance of the certificate of occupancy.

8. After payment has been made to the City, construction of the speed humps will be scheduled and completed. The schedule for construction of the speed humps shall be determined at the sole discretion of the City Engineer, contingent upon weather, staff workload, traffic considerations, and contractor availability.

9. Following completion of construction of the speed humps, the City will refund any funds paid in excess of the actual cost or will bill the Applicant for the remainder of the actual construction cost. The Applicant will be given 30 days to pay the full amount of the bill after which time a lien will be placed on the property of the Applicant for any unpaid balance due.

10. The City's construction of the speed humps and the Applicant's payment therefore shall not create any duty of the City to maintain the speed hump at that location or any right of the applicant to have a speed hump at that location. The City retains the right to remove any speed humps installed at any location if it determines, in the sole discretion of the City Engineer, that the speed hump is harming the public health, safety or welfare.

G. Speed Hump Removal

Speed humps must be in place for at least twelve months before they become eligible for removal by request.

Speed humps may be removed by the City with the documented approval of such removal request by at least sixty (60%) of the property owners of the approval area, as defined previously in this Chapter.

Speed humps may be removed by the City as traffic volume increases and exceeds an average traffic volume of 2000 vehicles per day, or the street's functional classification is changed to a higher functional classification from residential or collector street, at the location of the speed humps.

After a speed hump is installed, applicants or petitioners who paid for installation of the speed hump shall not be eligible for any refund of their monies paid, regardless of the reason for removal of the speed hump(s).

H. Process for Speed Hump Removal

1. Requests for speed hump(s) removal shall be submitted to the City Engineer by a property owner living on the street with the speed humps and in the "property owner area of approval" as described above.

2. The City Engineer shall determine the area requiring property owner approval of the removal request (approval area), as defined previously in this Chapter..

3. The City shall prepare a letter of interest for speed hump removal for the requestor to circulate for signatures and will provide the requestor a map of the approval area. It will be the requestor's responsibility to determine the identity and location of the property owners in the approval area.

4. The requestor shall then circulate such letter of interest and obtain signatures from property owners representing at least sixty percent (60%) of the properties in the approval area indicating their approval of the removal of the speed hump in that location. Only one signature is required from each property ownership, and that signature shall be presumed to represent the entire property.

5. If sixty percent (60%) or more of the owners of the approval area sign the petition in support of removing the speed hump(s), the City shall remove the speed hump(s), signs, and pavement markings. Removal of speed hump(s), signs and pavement markings shall be at the City's expense.

3.23 Parking Facilities

A. Access Standards

1. One access to the public right-of-way is allowed for a parking lot. Joint use of required access ways may be permitted at the discretion of the City.

2. Parking lots shall have direct access to the public right of way.

3. Access and parking spaces shall be designed so that no backing movement by a vehicle is necessary to access the public right-of-way. Single family and duplex lots are exempt from this requirement.

4. Tandem parking may be approved for a single-family residence, individual dwelling units of a multifamily structure or in limited single-tenant office-type applications.

B. Design Standards

1. All driveways and other parking areas shall be hard surfaced with permanent materials such as HMA, concrete or unit pavers, and shall be designed to dispose of surface water and pollutants from motor vehicles in accordance with the provisions of the Kelso Municipal Code and the KEDM. Use of permeable pavement is encouraged where feasible.

2. Please note that the Downtown Design Overlay and the West Kelso Overlay contain additional parking design standards unique to those specific areas.

3. Parking lots shall be designed according to the following table. Space depth shall be measured exclusive of access drives and aisles, and car overhangs.

Table 3.13

Parking Stall and Aisle Dimensions

Parking Angle	Curb Length	Space Width	Space Depth	Paved Aisle Width	Direction of Travel
0 degrees	20 feet	8.5 feet	N/A	24 feet	Two-way
45 degrees	12 feet	8.5 feet	18 feet	13 feet	One-way
45 degrees	13 feet	8.5 feet	18 feet	24 feet	Two-way
60 degrees	9.8 feet	8.5 feet	18 feet	18 feet	One-way
60 degrees	9.8 feet	8.5 feet	18 feet	24 feet	Two-way
90 degrees	8.5 feet	8.5 feet	18 feet	24 feet	Two-way

5. Where parking stalls are marked, grades shall not exceed six percent. Driveways and driving lanes between separate groups of parking shall not exceed fourteen percent. Parking lots on sloping lots shall be laid out so that parked cars lie perpendicular to the slope. Where existing grades on property proposed for a parking lot exceed ten percent, the City may require a topographic survey to show existing and proposed grades. In no case shall grades be less than one-half of one percent.

6. Driveways and parking lots may be provided with lighting that is mounted on poles or building surfaces with lamp positions not exceeding twenty feet in height. All light fixtures shall be hooded or shielded so that the lamp is not visible from adjacent properties or public rights-of-way.

7. Where properties abut lots with a dissimilar use ie: industrial next to a single-family home, a sight obscuring fence shall be installed. The fence must either be blocked on the more intensive use side with vegetation and or a solid fence must be installed. The vegetation element is not required for fencing between similar uses such as industrial next to industrial unless required elsewhere in the code.

8. Parking and loading areas within the LI and GI zones shall comply with the following additional standards:

    a. On-street parking or staging of trucks, equipment or goods on public streets is prohibited.

    b. Where practicable, primary vehicular access shall avoid streets or easements that primarily serve residential uses.

    c. No new access shall be allowed onto public streets if it is possible for a development to share an access drive an existing facility.

    d. Entrances and exits to and from parking and loading facilities shall be clearly marked with appropriate directional signage where multiple access points are provided.

    e. Internal circulation shall be designed for safety and efficiency by reducing conflicts between vehicular and pedestrian traffic, combining circulation and access areas where possible, providing adequate truck maneuvering, stacking, and loading areas and accommodating emergency vehicle access.

    f. To reduce noise and visual conflicts with neighboring properties and public streets, loading facilities shall be located internal to the site or where conflict with neighboring properties will be reduced. Loading facilities shall not face nonindustrial properties.

    g. Loading docks and doors facing a public street shall be offset from the access drive and shall be screened from the street.

9. Circulation and Walkways in Multifamily and Nonresidential Development.

a. Parking lots and driveways shall provide well-defined, safe and efficient circulation for motor vehicles, bicycles and pedestrians.

b. Landscaped islands with raised curbs shall be used to define entrances from public rights-of-way, define pedestrian walkways from the public rights-of-way to all buildings, define ends of parking aisles and indicate the pattern of circulation. Raised curbs may be cut to allow runoff to enter bioretention facilities where used in the landscape design.

c. Pedestrian walkways, complying with ADA, shall be provided around buildings to the extent necessary to assure safe access to the building from parking areas and the public right-of-way. Where appropriate, as determined by the Director, pedestrian walkways may be required to assure safe access to adjacent properties.

d. Internal walkways shall be surfaced with nonskid hard surfaces, meet ADA accessibility requirements and be designed to provide a minimum of five feet of unobstructed width. Where walkways cross vehicular driving lanes, the walkways shall be constructed of contrasting materials or with maintained painted markings. Walkways shall be curbed and raised six inches above adjacent vehicular surface grade, except where the walkway crosses vehicular driving lanes or as needed to meet ADA accessibility standards.

C. Landscape Standards. Onsite parking areas shall be landscaped in accordance with the following provisions:

1. All parking lot landscaping will be designed in accordance with the provisions of the Kelso Municipal Code and the KEDM and may contribute to the required landscaped area requirement.

2. All required landscaping for the parking lot may be used to manage on-site stormwater with bioretention facilities or dispersion BMPs, if feasible, in accordance with the Chapter 2 of the KEDM. Where bioretention is used, required tree and plant spacing may be relaxed to accommodate the facilities so long as public safety is not compromised.

3. Parking lot landscaping shall be designed in such a manner so as to:

a. Divide and break up large expanses of paving;

b. Guide traffic flow and direction;

c. Promote pedestrian and vehicular safety;

d. Preserve existing trees and vegetation, when practical.

4. Landscape islands shall be installed to break up the parking lot into rows of not more than 20 contiguous parking spaces or 10 spaces in one row.

a. A landscape island is required at the end of each row of parking spaces .

b. The minimum width for a landscape island that is parallel to a parking space shall be at least 9' x 18'. Each landscape island or area shall contain a minimum of one (1) shade tree and a combination of five (5) deciduous and evergreen shrubs or groundcover.

c. Each row of parking spaces shall be separated from one another by a minimum six (6) foot landscape island that extends the entire length of the row of parking spaces. Such landscape island shall contain two (2) shade trees and ten (10) shrubs distributed per 45 linear feet.

d. Six (6) foot wide pedestrian walkways, running parallel or perpendicular to the landscape islands shall be provided for convenient pedestrian access to the building entry(s) and throughout the parking lot.

5. All parking areas, drives, or other vehicular areas shall be bounded by a continuous landscape border a minimum of five (5') feet wide. The landscape border shall provide breaks, as necessary, to allow for access by pedestrians to the site and to sidewalk via the walkways referred to above. The landscaped border shall consist of at least one (1) shade tree or one (1) ornamental tree and ten shrubs distributed per 25 linear feet of perimeter, or 1 evergreen tree and 5 shrubs distributed per 25 linear feet of perimeter

a. Parking lots and drives or other vehicular areas that extend to within 50 feet of a public right-of-way shall be provided with a landscape screen between the parking lot, drive, or other vehicular area and the right-of-way a minimum of ten (10') feet in width and containing a minimum of one (1) shade tree and ten (10) shrubs distributed per 25 linear feet of street frontage or 1 evergreen tree and 5 shrubs distributed per 25 linear feet of street frontage.

3.24 Traffic Impact Analysis (TIA)

1. Purpose. The TIA is an analysis prepared to determine the traffic impacts of a given development.

2. Timing. A TIA shall be submitted with the land use application as required in KEDM Section 1.04.

3. Contents. The TIA will typically include the following, however, the Director may require more or less depending on the size and/or anticipated impacts of the development as required in KEDM, Section 3.01:

a. Analysis approach and methods - The TIA approach and methods shall be guided by the following criteria:

(i) Study Area – As a rule, the analysis must include any intersection or roadway segment, regardless of jurisdictional boundaries, to which at least 50 project trips would be added during the peak hour of trip generation . Projects just meeting the minimum threshold for traffic impact analysis will normally require analysis of only the intersection(s) or roadway segment(s) adjacent to the site. Larger developments will require the analysis of more

intersections. Some larger developments will require application of the urban area traffic model which is developed and maintained by the Cowlitz-Wahkiakum Council of Governments. In addition to off-site intersections, it is important that the TIA address the intersections/driveways proposed to provide access to the site. The Director must approve the study intersections and roadways.

(ii) Study Horizon Years – The study horizon year shall be the year the project is to be completed and operational. If the project requires a zone change, the horizon year shall be five (5) years from the date of the study, and include a "no-build" analysis for comparative purposes.

(iii) Analysis Time Period – Both the morning and evening weekday peak hours, 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., shall be analyzed, unless the proposed project is expected to generate no trips, or a very low number of trips, during either the morning or evening peak periods. If this is the case, the requirement to analyze one or both of these periods may be waived by the Director. Where the peak traffic hour in the study area occurs during a different time period than the normal morning or afternoon peak travel periods (for example mid-day), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, it is up to the discretion of the Director if those time periods should be included for analysis.

(iv) Geometrics and Traffic Control – Existing roadway geometric conditions within the study area shall include, but not be limited to, intersection and driveway spacing, roadway width, traffic lanes, turn lanes, medians, curb and gutter, speed limits, horizontal and vertical curvature, traffic control devices, and traffic signal phasing (if traffic signals are present). The discussion of existing geometric conditions shall include locations of driveways and intersections across the street from the development, and how this may impact traffic operations.

(v) Sight Distance – To identify potential safety issues associated with site access and egress, sight distance at intersections (stopping sight distance and corner sight distance) measurements shall be conducted at the proposed site driveway(s). The measured sight distance shall be compared to minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO). A summary of sight distance analysis should be presented in tabular form and included in the TIA.

(vi) Traffic Volumes – Where seasonal traffic data is available and when directed by the City's representative, the traffic volumes for the analysis hours shall be adjusted for the peak season .

(A) Data Collection Requirements – All data shall be collected in accordance with the latest edition of the ITE Manual of Traffic Engineering Studies.

(B) Turning Movement Counts – Manual turn movement counts shall be collected at all study area intersections and driveways to determine the base traffic conditions. These turning movement counts shall be conducted during the weekday (Tuesday through Thursday) between 7:00 a.m. – 9:00 a.m. and 4:00 p.m. – 6:00 p.m. and for other periods depending upon the proposed and/or surrounding land uses. Historical turning movement counts may be used if the data is not more than 12 months old at the time of the TIA. In high traffic locations where congestion is present or traffic peaks early or late, extended or altered count periods may be required. Turning movement counts may be required during other periods as directed by the City's representative.

(C) Daily Traffic Volumes – Daily traffic volumes shall be provided as 24-hour volumes (one hour increments), and peak period volumes (15 minute increments). The analysis shall be based on traffic counts that are no more than 12 months old (or less if there are significant changes in traffic patterns). If current traffic volume data is not available from the City, the consultant shall be responsible to collect all necessary data. The estimation of existing peak hour turning movements based on automatic machine counts is not acceptable.

(D) Pedestrian and Bicycle Volumes – Pedestrian and bicycle data shall be included with all peak period intersection turn movement counts. Pedestrian data shall be collected for each crossing movement of each leg of the intersection, while bicycle data shall be collected by approach leg of the intersection.

(vii) Crash Data – Within the study area for each TIA, a crash history evaluation shall be conducted for the most recent three-year period. The intent of the evaluation is to identify any apparent trends in the data that reflect a safety issue that may be exacerbated by the proposed development and to identify mitigation(s) to resolve the issue(s). At a minimum, the analysis shall summarize the number of crashes per year, location of crash (intersection), direction of the vehicles, type of crash, severity and fatalities. Any pedestrian

and/or bicycle collisions within the corresponding analysis period shall be identified separately. Calculate intersection crash rates at each intersection using the formula below.

The intersection crash rate based on vehicles entering the intersection is calculated as:

$$R = \frac{1{,}000{,}000 \times C}{365 \times N \times V}$$

Where:

R = Crash rate for the intersection expressed as crashes per million entering vehicles (MEV)

C = Total number of intersection-related crashes in the study period

N = Number of years of data

V = Traffic volumes entering the intersection daily

The Director shall assess the overall results of the safety analysis and may request a crash diagram be drawn.

(viii) Traffic Volume Forecasts – Future traffic volumes, including an estimate of the percentage of trucks, shall be estimated using information from traffic models, or applying an annual growth rate to the base-line traffic volumes. The future traffic volumes shall be representative of the horizon year for project development. If the annual growth rate method is used, the Director must give prior approval to the growth rate. In addition, any nearby proposed approved development projects shall be taken into consideration when forecasting future traffic volumes. The increase in traffic from proposed approved projects shall be compared to the increase in traffic by applying an annual growth rate. This information will be provided by the Director. If modeling information is unavailable, the greatest traffic increase from either the approved developments, the application of an annual growth rate, or a combination of an annual growth rate and approved developments, shall be used to forecast the future traffic volumes. It is up to the discretion of the Director to select the appropriate methodology from information provided for all methods from the applicant.

(ix) Analysis Scenarios – To determine the potential traffic impacts of a proposed development the following scenarios shall be analyzed in the TIA when appropriate:

(A) *Existing Conditions* - Existing traffic operations based on recent traffic count data.

(B) *Existing + Approved Conditions* - Projected traffic operations reflecting changes to existing traffic volumes due to relevant approved developments. Approved development traffic is defined as traffic generated by all developments approved by local jurisdictions or submitted to local jurisdictions for approval within the development vicinity at the time of the TIA submittal.

(C) *Existing + Approved Conditions + Project* - This scenario is similar to scenario B with the addition of the proposed project traffic at study area intersections. If the development is expected to be completed beyond 12 months after the TIA is submitted, the Director may require an additional scenario of analysis, which would include regional growth on traffic beyond existing levels. This scenario would have an appropriate growth applied to existing traffic volumes to forecast the planning horizon (build-out) year.

(x) Trip Generation – To determine the impacts of a proposed development on the surrounding transportation network, the trip generation characteristics of that development must be estimated. Trip generation characteristics should be obtained from one of the following acceptable sources:

(A) Institute of Transportation Engineers (ITE) *Trip Generation* manual (latest edition).

(B) Specific trip generation studies that have been conducted for the particular land use for the purposes of estimating peak hour trip generating characteristics, subject to approval by the Director prior to their inclusion in the TIA.
In addition to new site generated trips, several land uses typically generate additional trips that are not added to the adjacent traffic network. These trips include pass-by, diverted and internal trips, and are considered to be separate from the total number of net new trips generated by the proposed development. The procedures listed in the (ITE) *Trip Generation Handbook* should be used where appropriate to account for pass-by, diverted and internal trips. The Traffic Engineer shall not use any pass-by, diverted or internal trip

reductions without prior approval of the method or data sources by the Director.

(xi) Trip Distribution and Assignment – Projected trips shall be distributed and added to the projected non-site traffic on the roadways and intersections under study. The specific assumptions and data sources used in deriving trip distribution and assignment shall be documented in the TIA and approved by the Director prior to submittal of the TIA. The site-generated traffic shall be assigned to the street network in the study area based on the approved trip distribution percentages. Trip assignments shall be rounded to the nearest five percent (5%). Graphic presentations, as well as discussions in text, of the trip assignment shall be documented in the TIA.

(xii) Capacity Analysis – An intersection capacity analysis is required as part of the TIA submittal. The software used for this analysis shall be the latest edition of the Highway Capacity Software (HCS), or a comparable software analysis program that is based on the *Highway Capacity Manual* methodology.

Peak hour Level-of-Service (LOS) shall be calculated for each study intersection (existing and proposed). In most cases, the weekday morning (AM) and weekday evening (PM) peak hours shall be included in the analysis. For certain types of development (e.g., recreation facilities, churches, some retail uses) some peak hours may be added (e.g., midday or weekends) or eliminated (e.g., AM peak hour for low traffic generators) from the analysis, if approved by the Director. Unless determined otherwise by the Director, compliance with the LOS standards will be based solely on weekday AM and PM peak hour traffic analysis results. For unsignalized intersections, appropriate MUTCD (*Manual on Uniform Traffic Control Devices*, FHWA) peak hour signal warrants must also be checked for each scenario.

The results of the above analysis shall be summarized in tabular form identifying the average delay, Level-of-Service (LOS), and volume-to-capacity (V/C) ratios for the study intersection. All intersections and specific turning movements with a LOS D or worst shall be clearly identified.

(xiii) Queue Analysis – Queue lengths shall be calculated for each lane of all approaches to signalized intersections for the 95^{th} percentile queue during the peak hour of analysis. Queue lengths shall also be calculated for unsignalized locations, such as site driveways, where standing queues can interfere with other movements, especially if such interference can contribute to safety deficiencies. Appropriate analysis methods should be used that account for the actual arrivals

of vehicles at an intersection. The methodology for queuing at unsignalized intersections or driveways must be approved by the Director prior of the TIA.

(xiv) Left/Right Turn Storage Analysis – Left-turn and right-turn storage bay analyses must be performed at all study intersections and project driveways identified in the traffic study scope. Storage at signalized intersections shall be calculated utilizing the Poisson method with 95% confidence and a 150 second wait. Storage at unsignalized intersections and driveways with either a dedicated left turn lane or a two-way-left-turn-lane shall be calculated utilizing the graphs found in the Washington State Department of Transportation's Design Manual.

For signalized intersections, queue lengths shall be based on average vehicle length of twenty-five (25) feet, or longer where appropriate.

(xv) Traffic Simulation – For a major development, a simulation using SimTraffic or other approved software shall be performed to show existing traffic flows and future traffic flows if directed by the Director.

(xvi) Access and Site Circulation Analysis – Describe the proposed access to the site for all travel modes. This includes identifying the existing and/or proposed access locations from the public street system and the expected use of each access (pedestrian/bicycle entrance, truck delivery access, etc.). Also describe any proposed roadways within the site and the internal street system configuration.

Summarize the access spacing evaluation of the proposed site driveways. Provide the applicable City standards for each frontage roadway and site driveways. This analysis shall be conducted for both existing and proposed site access locations.

Provide a detailed evaluation of the proposed site plan associated with on-site circulation needs for all modes of travel. Include the following elements:

- Determine if the number of driveways can adequately and safely accommodate the peak hour vehicle demand.
- Evaluate driveway and cross street alignment and possible conflicts of movement.

- Evaluate the need for separate turn lanes to accommodate vehicles exiting the site and the potential for on-site vehicle queues to impact internal circulation.

- Review the internal roadway system to verify that emergency vehicles and trucks (potential demand based on land use) can be accommodated. For developments with a potential for generating large trucks, provide a turn template analysis of the site plan in the technical appendix.

- Identify how pedestrian and bicycle trips are accommodated between building entrances and parking lot areas. Delineate internal pedestrian and bicycle circulation clearly on the site plan. Discuss potential conflicts between pedestrians, bicycles and motor vehicles and how they will be minimized and mitigated. Identify any land uses (if within one-half mile of site) that would likely generate pedestrian and bicycle trips in association with the proposed project. For example, a proposed subdivision located near a park. Clearly show pedestrian and bicycle connections to off-site destinations on the site plan.

(xvii) Mitigation Requirements – For every significant impact, the TIA must identify and discuss mitigation measures at conceptual level that will be implemented by the proposed development. The TIA may identify a mitigation measure or develop a range of mitigation measures for each impact to improve the performance of the transportation system. Mitigation measures shall be specific and feasible actions that will actually improve adverse traffic conditions, and shall comply with the City's design standards. The mitigation measures shall improve conditions or correct capacity deficiencies to acceptable levels of service. The TIA shall discuss whether the measure reduces the impact to a less-than-significant level, and report the conditions after the implementation of the mitigation measure.

An effective measure shall adequately avoid, minimize, rectify, or compensate an impact. It shall be consistent with local plans and policies.

Mitigation measures may include traffic control devices and roadway design features. The Consultant shall determine the need for new traffic control devices, and roadway design features based on the City's engineering policies and procedures.

In addition, mitigation measures shall address vehicular queues, progression quality, and other factors that affect traffic conditions

that are not part of the LOS analyses. They shall consider traffic operations at intersections and driveways.

b. Report Format –

(i) The consultant shall provide a flash drive which contains the following:

(A) A PDF version of the TIA

(B) A separate folder containing graphic files (i.e. JPG, BMP, TIFF format) of all graphics included in the TIA

(C) A separate folder containing the electronic files (i.e. SYNCHRO, HCS) for all analysis.

(D) A separate folder containing the electronic files for new traffic counts. The file format shall be .CSV. The count interval for both daily and peak counts shall be 15 minutes.

(ii) The consultant shall furnish three (3) paper copies of the TIA report stamped by the Traffic Engineer to the City. The following is the order and format for the TIA report.

1. EXECUTIVE SUMMARY
- a. Purpose of Report and Study Objectives
- b. Site Location and Study Area
- c. Development Description
- d. Principal Findings
- e. Conclusions including mitigations

2. TABLE OF CONTENTS

3. LIST OF FIGURES

4. INTRODUCTION
- a. Explanation of the project
- b. Area map showing development site location
- c. Complete project site plan, with buildings identified as to proposed use. Driveways located on adjacent property and across the street from the proposed project shall be shown on the site plan.
- d. Project schedule, and stages or phases, if applicable

5. EXISTING CONDITIONS
- a. Study Area
- b. Existing Land Use Map. As a minimum, general land uses identified shall include residential, industrial, and commercial.
- c. Roadway System
- d. Pedestrian/Bicycle Facilities
- e. Transit
- f. Sight Distance

g. Existing Land Use

6. EXISTING TRAFFIC DATA

a. Traffic Counts
b. Pedestrian Counts (if necessary)
c. Bicycle Counts (if necessary)
d. Times Collected
e. Locations
f. Types - Daily, Morning, and Afternoon Peak Periods (two hours minimum, and others as required)
g. Crash analysis
   1. Analysis Years
   2. Tabular Crash Report containing the following information:
      a. Types of Crashes
      b. Severity (Fatal, Injury, Property Damage Only)
      c. Vehicular direction of travel
      d. Time of Day
      e. Day of Week
   3. Crash diagrams

7. EXISTING TRAFFIC OPERATIONS

a. Level of Service -.Morning Peak Hour, Evening Peak Hour (and other as required)
b. Traffic Signal Warrant Analysis
c. Queue Analysis

8. EXISTING TRAFFIC OPERATIONS + APPROVED CONDITIONS

a. Level of Service -.Morning Peak Hour, Evening Peak Hour (and other as required)
b. Traffic Signal Warrant Analysis
c. Queue Analysis

9 TRIP GENERATION

a. Trip Generation
b. Pass-by Traffic (if applicable)

10. TRIP DISTRIBUTION AND ASSIGNMENT

a. Trip Distribution
b. Trip Assignment

11. EXISTING TRAFFIC OPERATIONS + APPROVED CONDITIONS + PROPOSED PROJECT

a. Level of Service – Morning Peak Hour, Evening Peak Hour (and other as required)
b. Traffic Signal Warrant Analysis
c. Queue Analysis
d. Left/Right Turn Storage Analysis
e. Traffic Simulation

12. ACCESS AND SITE CIRCULATION ANALYSIS

a. Site access

b. Site access sight distance
c. Access spacing
d. Internal site circulation

13. SUGGESTED TRAFFIC MITIGATIONS

a. Traffic Control Needs
b. Intersection Channelization Mitigation
c. Pedestrian/Bicycle Considerations
d. Neighborhood Traffic Mitigation

14. CONCLUSION AND RECOMMENDATIONS

15. TECHNICAL APPENDIX

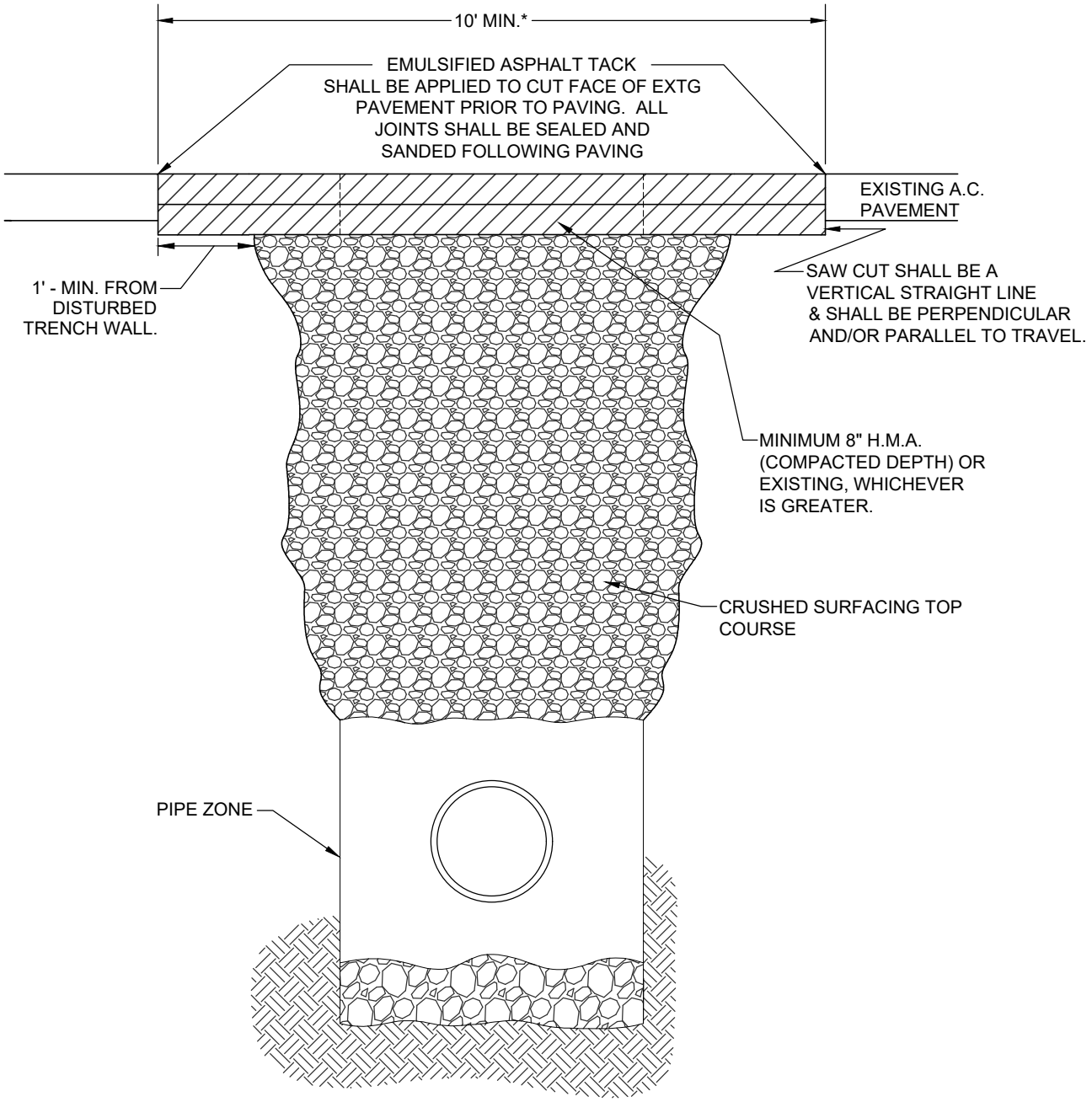
a. Traffic Volume Counts
    1. Average Daily 24 Hour Traffic Volumes
    2. Peak Hour Turning Movement Volumes (AM, PM and other as required)
b. Capacity Analyses Worksheets
    1. Existing Condition
    2. Existing + Approved Conditions
    3. Future +Existing + Approved Conditions
    4. Future +Existing + Approved Conditions + Proposed Project
c. Traffic Signal Warrant Analysis
d. Accident Data and Summaries
e. Miscellaneous Addendum

Appendix 1: Standard Plans

Standard Plan Index

Title	Standard Plan No.
Standard Street Plans	
Trench Backfill and Restoration – Arterial Streets	KST-010-21
Trench Backfill and Restoration – Local and Collector Streets	KST-020-21
Trench Backfill and Restoration – Cement Concrete Pavements	KST-030-21
Trench Backfill and Restoration - Unpaved Areas	KST-040-21
Types of Joints For Concrete Sidewalks, Curb Ramps, and Pavements	KST-050-21
Cut-in Curb Drain	KST-060-21
Sidewalks	KST-070-21
Cement Concrete Driveway Approach	KST-080-21
Asphalt Driveway Approach, No Curb	KST-090-21
Sidewalk Widening Around Obstructions	KST-100-21
Cement Concrete Valley Gutter	KST-110-21
PCC Pavement Isolation Joints	WSDOT A-40.15-00
Supplemental to Standard Plan WSDOT A-40.15-00	
Cement Concrete Curbs	WSDOT F-10.12-04
Supplemental to Standard Plan WSDOT F-10.12-04	
Cement Concrete Curb and Gutter Pan	WSDOT F-10.16-00
Supplemental to Standard Plan WSDOT F-10.16-00	
Parallel Curb Ramp	WSDOT F-40.12-03
Combination Curb Ramp	WSDOT F-40.14-03
Perpendicular Curb Ramps	WSDOT F-40.15-04
Single Direction Curb Ramp	WSDOT F-40.16-03
Supplemental to Standard Plans WSDOT F-40.12-03, F40.14-03, F40.15-04, F-40.16-03	
Detectable Warning Surface	WSDOT F-45.10-02

Title	Standard Plan No.
Standard Traffic Plans	
Street Name Sign	KTR-010-21
Ground-Mounted Sign Placement	WSDOT G-20.10-02
Supplement to WSDOT G-20.10-02	
Steel Sign Support Types ST-1 - ST-4 Installation Details	WSDOT G-24.50-05
Supplemental to WSDOT G-24.50-05	
Steel Light Standard	WSDOT J-28.10-02
Steel Light Standard Placement (Fixed Base)	WSDOT J-28.24-01
Steel Light Standard Placement Miscellaneous	WSDOT J-28.26-01
Steel Light Standard Foundation Types A & B	WSDOT J-28.30-03
Supplemental to WSDOT J-28.30-03	
Steel Light Standard Base Mounting	WSDOT J-28.40-02
Steel Light Standard Pole Base and Hand Hole Details	WSDOT J-28.50-03
Steel Light Standard Wiring Details	WSDOT J-28.70-03
Locking Lid Standard Duty Junction Box Types 1 & 2	WSDOT J-40.10-04



NOTES:

1. BACKFILL SHALL BE COMPACTED IN 6" LIFTS TO 95% DENSITY PER WSDOT T606.
2. TRENCH SHALL BE PLATED OR PATCHED THE SAME DAY AS TRENCHING.
3. PLATE SHALL BE SECURED BY METHOD APPROVED BY ENGINEER.
4. ALL TEMP COLD PATCHING SHALL BE 1-1/2" MINIMUM DEPTH.
5. USE OF PAVING MACHINE AND ROLLER FOR PERMANENT PATCH IS REQUIRED.
6. RESTORE PAVEMENT MARKINGS.
7. SEAL FOR PAVEMENT JOINTS SHALL BE HOT POURED SEALANT FOR BITUMINOUS PAVEMENT, TYPE 1, PER WSDOT 9-04.2(1)A2

* RESTORATION WIDTH SHALL BE DOUBLED FOR STREETS THAT HAVE BEEN REHABILITATED WITHIN 5 YEARS. RESTORATION FOR TRENCHING CONDUCTED LONGITUDINAL TO THE STREET SHALL BE HALF STREET WIDTH. INCREASED RESTORATION WIDTH MAY BE REQUIRED WHEN MULTIPLE UTILITIES ARE PROPOSED.

N.T.S.

TRENCH BACKFILL AND RESTORATION
ARTERIAL STREETS

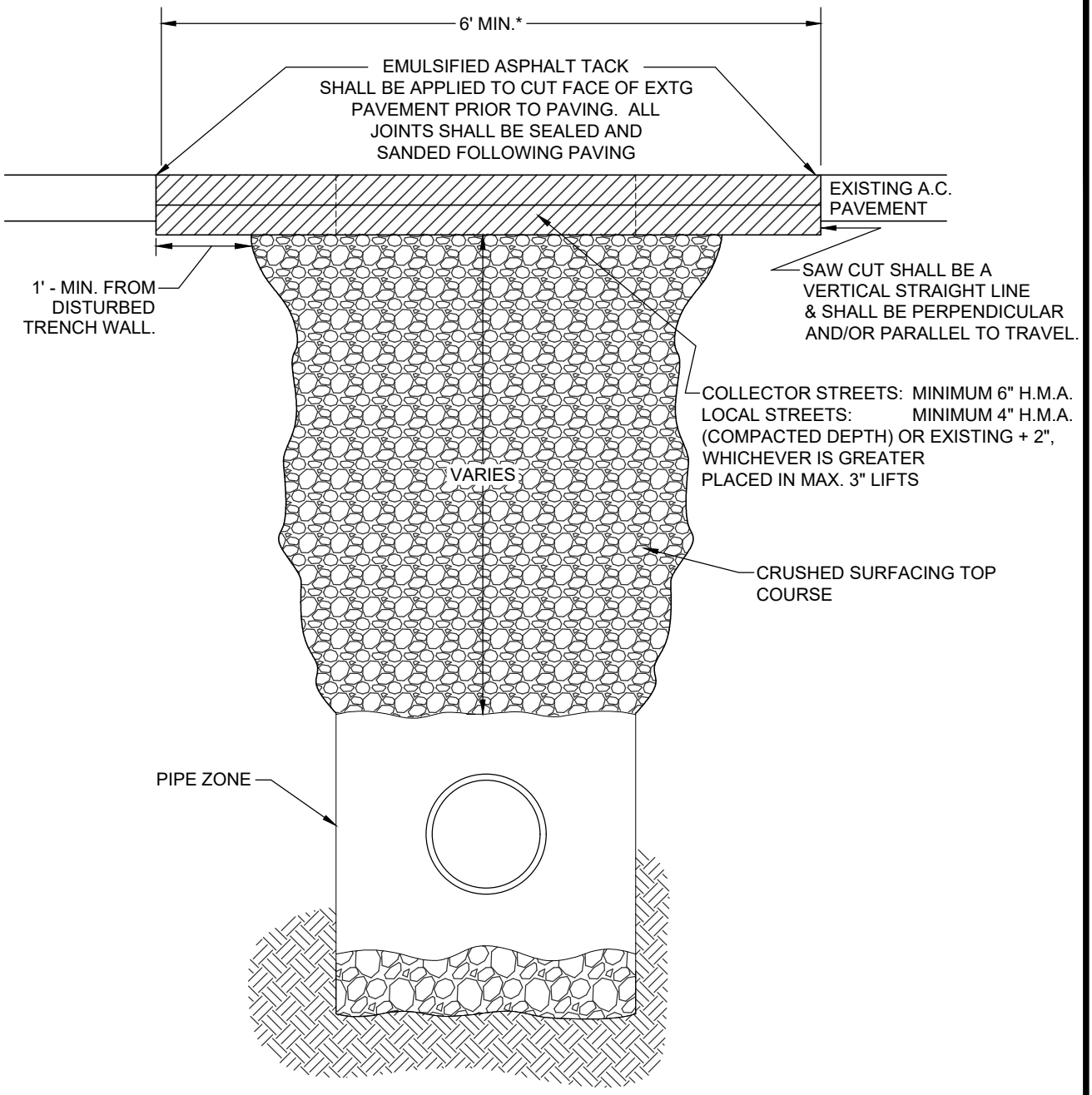
STANDARD PLAN NO.
KST-010-21

CITY OF KELSO
DEPARTMENT OF
COMMUNITY DEVELOPMENT
& ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

DATE:
MAY 2021



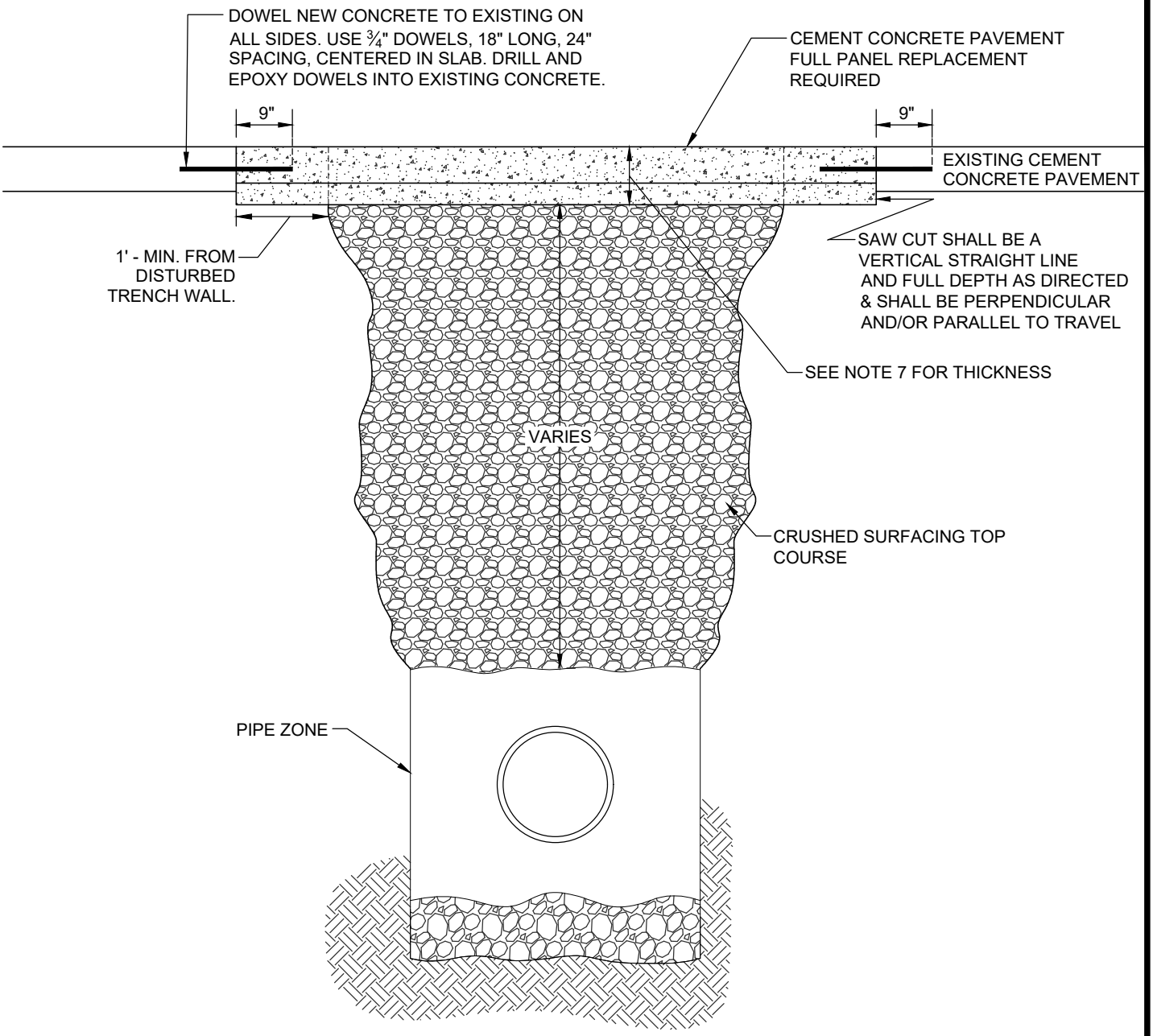
NOTES:

1. BACKFILL SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY PER WSDOT T606.
2. TRENCH SHALL BE PLATED OR TEMPORARILY PAVED WITH COLD MIX, 1 1/2 INCHES THICK, UNTIL PAVED.
3. PLATE SHALL BE SECURED BY METHOD APPROVED BY ENGINEER.
4. PLACE ADVANCE WARNING SIGNS UNTIL PERMANENT PATCH IS COMPLETED.
5. RESTORE PAVEMENT MARKINGS.
6. SEAL FOR PAVEMENT JOINTS SHALL BE HOT POURED SEALANT FOR BITUMINOUS PAVEMENT, TYPE 1, PER WSDOT 9-04.2(1)A2

* RESTORATION WIDTH SHALL BE DOUBLED FOR STREETS THAT HAVE BEEN REHABILITATED WITHIN 5 YEARS. RESTORATION FOR TRENCHING CONDUCTED LONGITUDINAL TO THE STREET SHALL BE HALF STREET WIDTH. INCREASED RESTORATION WIDTH MAY BE REQUIRED WHEN MULTIPLE UTILITIES ARE PROPOSED.

N.T.S.

Kelso WASHINGTON	**TRENCH BACKFILL AND RESTORATION** **LOCAL AND COLLECTOR STREETS**	STANDARD PLAN NO. **KST-020-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



NOTES:

1. BACKFILL SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY PER WSDOT T606.
2. TRENCH SHALL BE PLATED UNTIL PAVED AND CONCRETE IS CURED TO DESIGN STRENGTH.
3. PLATE SHALL BE SECURED BY METHOD APPROVED BY ENGINEER.
4. SPALLED OR DAMAGED CONCRETE SHALL BE RE-SAWN AND REPLACED TO LIMITS DIRECTED BY ENGINEER.
5. CEMENT CONCRETE SHALL BE CL 4000, 3 DAY MIX.
6. PLACE ADVANCE WARNING SIGNS UNTIL PERMANENT TRENCH RESTORATION IS COMPLETED.
7. MINIMUM CONCRETE THICKNESS SHALL BE EXISTING THICKNESS, BUT NOT LESS THAN 8". EXCEPT FOR MINOR AND PRINCIPAL ARTERIALS, MINIMUM THICKNESS SHALL BE 10" THICK, AND FOR COLLECTORS WITH BUS ROUTES, MINIMUM THICKNESS SHALL BE 9" THICK.
8. RESTORE PAVEMENT MARKINGS.

N.T.S.

TRENCH BACKFILL AND RESTORATION
CEMENT CONCRETE PAVEMENT

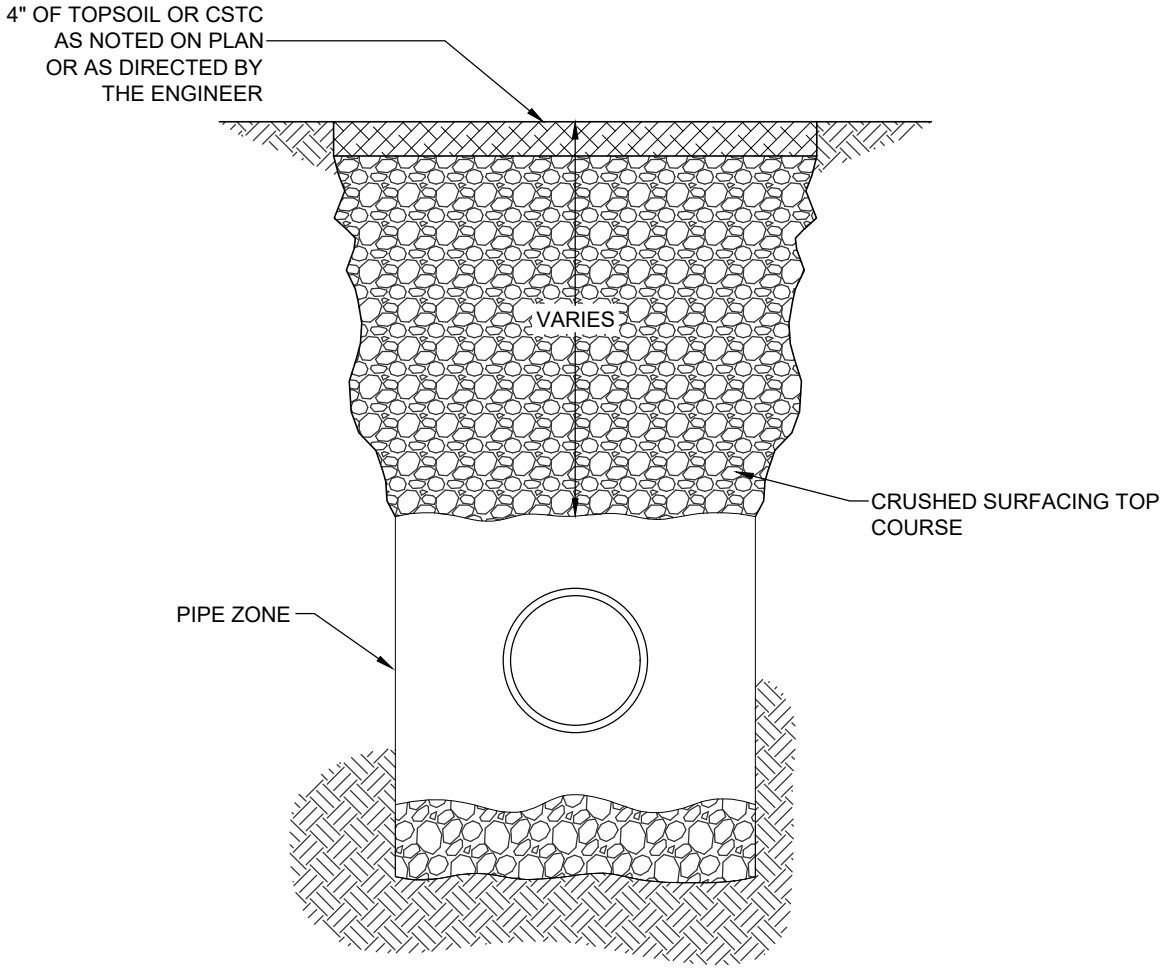
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

STANDARD PLAN NO.
KST-030-21

DATE:
MAY 2021



N.T.S.

TRENCH BACKFILL AND RESTORATION

UNPAVED AREAS

CITY OF KELSO
DEPARTMENT OF
COMMUNITY DEVELOPMENT
& ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

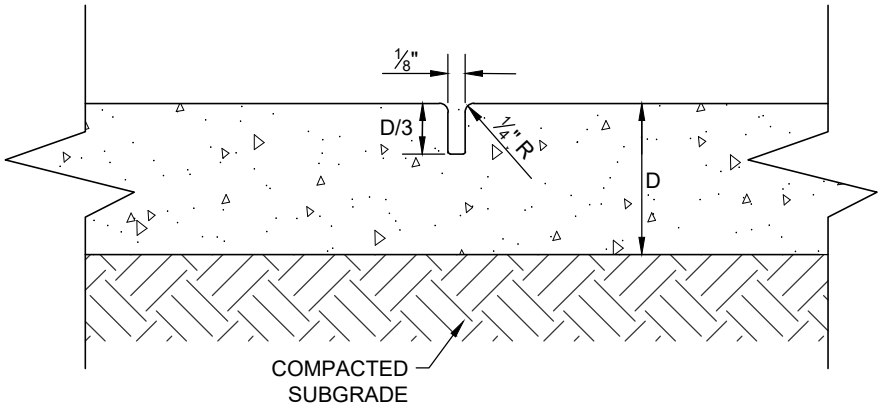
×_____

STANDARD PLAN NO.

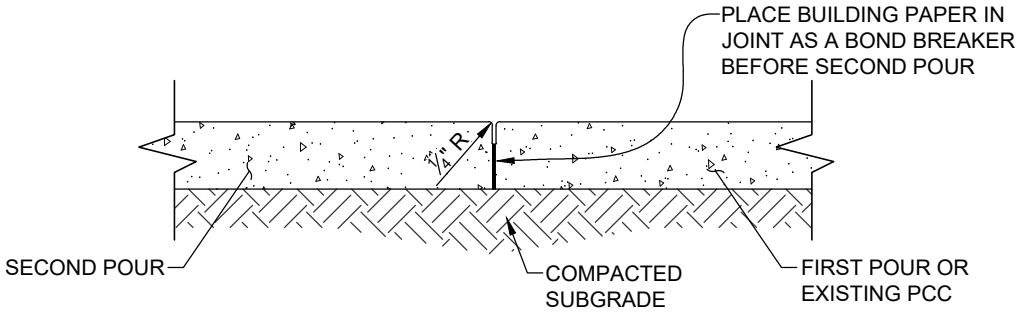
KST-040-21

DATE:

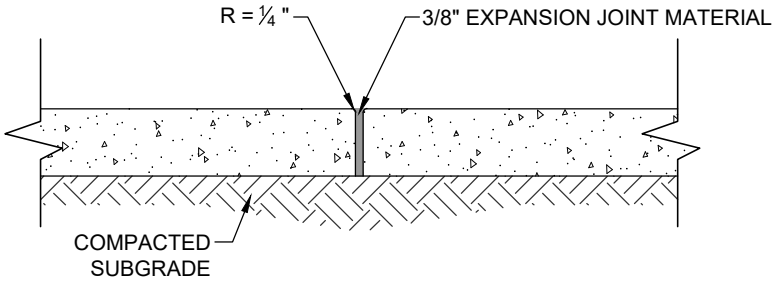
MAY 2021



CONTRACTION JOINT
LONGITUDINAL OR TRANSVERSE



CONSTRUCTION JOINT
LONGITUDINAL OR TRANSVERSE
(SEPARATE POURS)



EXPANSION JOINT

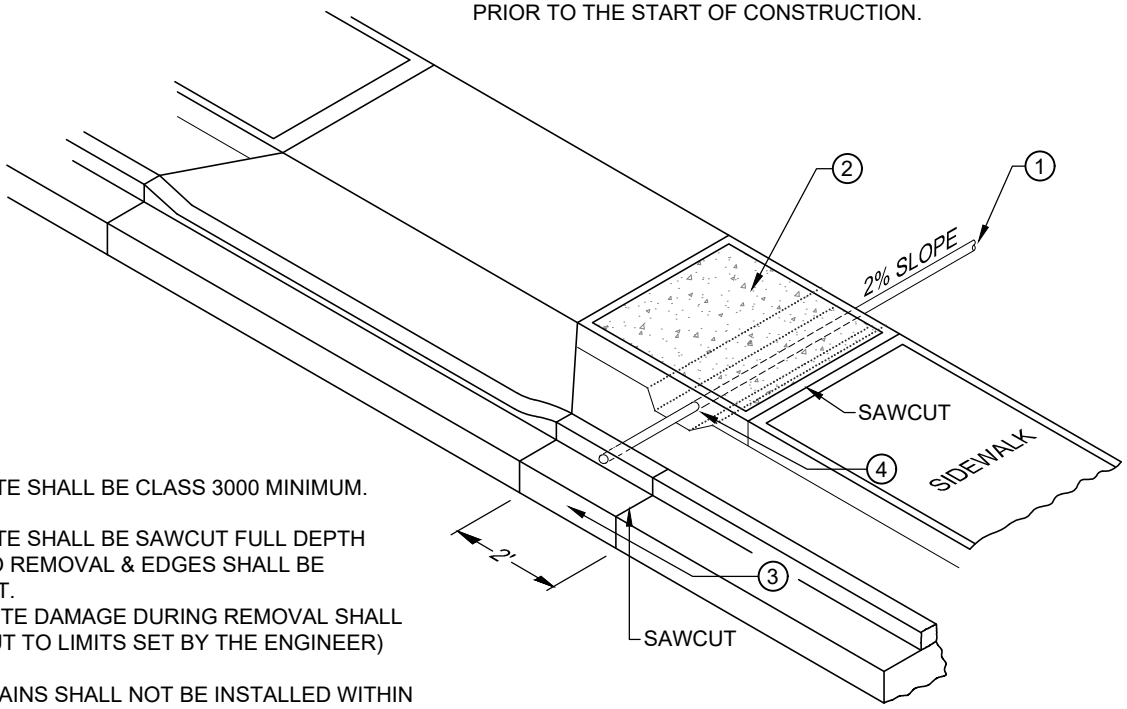
NOTE:

JOINT MATERIAL SHALL MEET THE REQUIREMENTS OF SECTION 9-04.1 OF THE STANDARD SPECIFICATIONS

N.T.S.

	TYPES OF JOINTS FOR CONCRETE SIDEWALKS, CURB RAMPS AND PAVEMENTS	STANDARD PLAN NO. **KST-050-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

OBTAIN A PERMIT FROM THE OFFICE OF THE CITY ENGINEER PRIOR TO CONSTRUCTION IN THE CITY RIGHT-OF-WAY. THE ENGINEERS OFFICE MUST BE NOTIFIED PRIOR TO THE START OF CONSTRUCTION.



CONCRETE SHALL BE CLASS 3000 MINIMUM.

CONCRETE SHALL BE SAWCUT FULL DEPTH PRIOR TO REMOVAL & EDGES SHALL BE STRAIGHT.
(CONCRETE DAMAGE DURING REMOVAL SHALL BE RE-CUT TO LIMITS SET BY THE ENGINEER)

CURB DRAINS SHALL NOT BE INSTALLED WITHIN THE DRIVEWAY WING AREA.

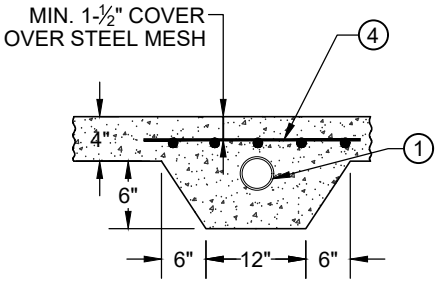
(1) 3" DIA. P.V.C. OR ABS PIPE FOR RESIDENTIAL APPLICATIONS
3" DIA. DUCTILE IRON PIPE FOR COMMERCIAL & INDUSTRIAL APPLICATIONS

(2) SIDEWALK SHALL BE SAWCUT AND REMOVED TO EXISTING SCORE MARKS (FULL PANEL) OR AS DIRECTED BY THE ENGINEER. BROOM FINISH & MATCH EXISTING EDGE TREATMENT.

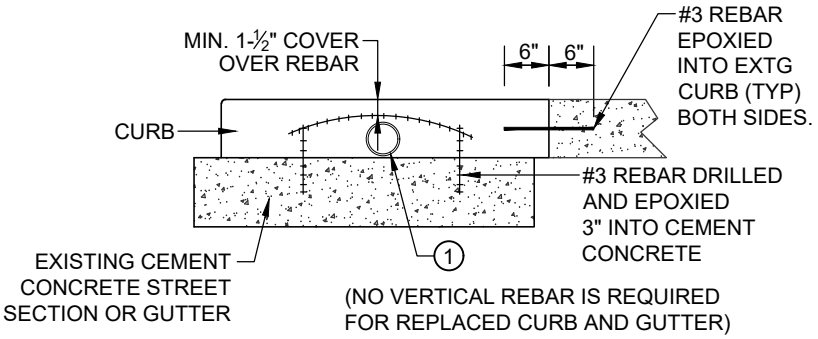
(3) SAW & REMOVE 2' LENGTH OF CURB & GUTTER (FOR CONRETE STREET REMOVE CURB ONLY). INSTALL REINFORCING STEEL & DRAIN AS SHOWN BELOW. DRAIN PIPE SHALL BE CUT FLUSH WITH FACE OF CURB. CURB MAY BE CORE DRILLED IN LIEU OF REMOVAL. GROUT ALL VOIDS.

(4) STEEL MESH: 6" X 6" X 10 GAUGE

SIDEWALK SECTION



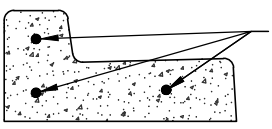
CURB SECTION & CONCRETE STREET



(NO VERTICAL REBAR IS REQUIRED FOR REPLACED CURB AND GUTTER)

CURB AND GUTTER REPLACEMENT: REBAR LOCATION

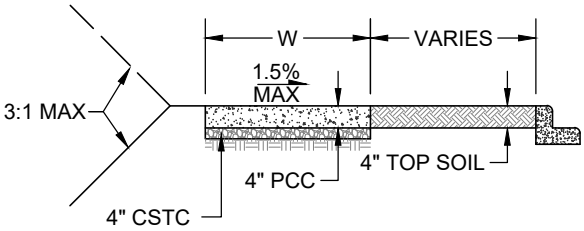
USE #3 REBAR TO TIE NEW CURB & GUTTER TO EXTG AS SHOWN

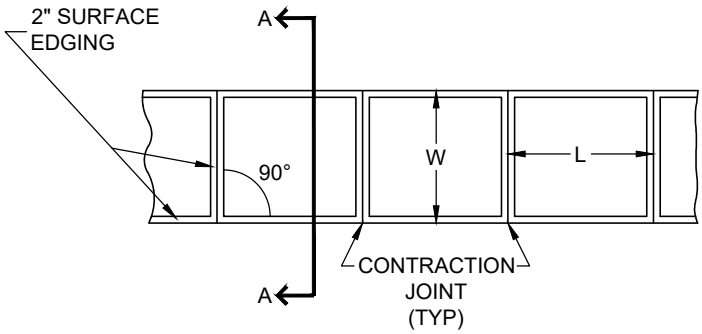


3x #3 REBAR, 12" LONG, DRILLED AND EPOXIED 6" INTO EXTG C&G

N.T.S.

Kelso WASHINGTON	**CUT-IN CURB DRAIN**	STANDARD PLAN NO. **KST-060-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**





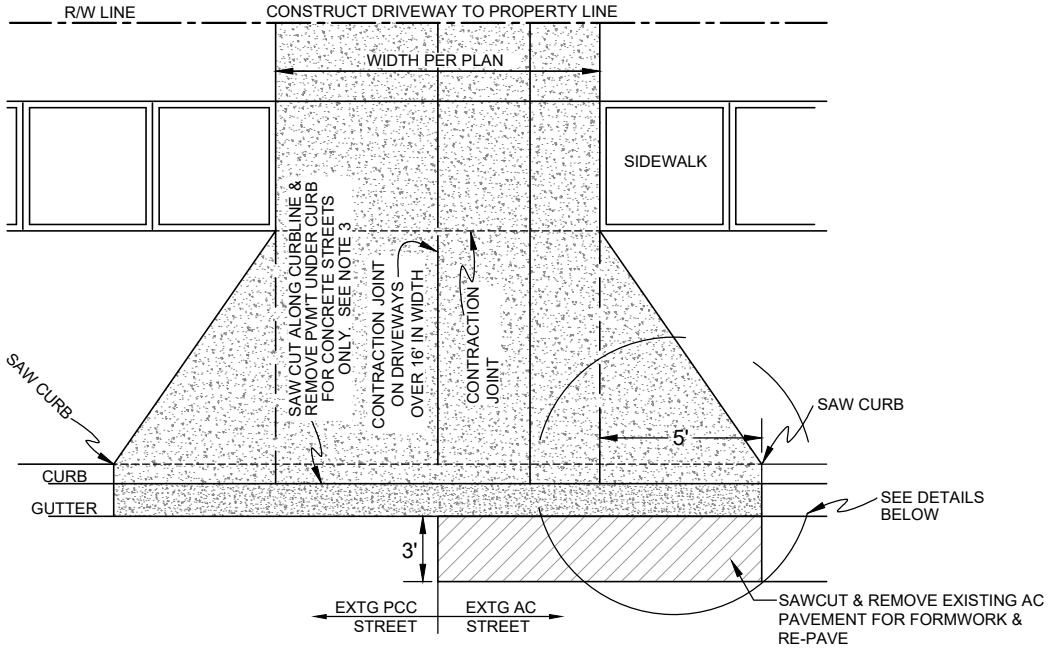
W, SIDEWALK WIDTH = WIDTH PER PLANS, 5' MIN.
L, SIDEWALK PANEL LENGTH = W

NOTES:

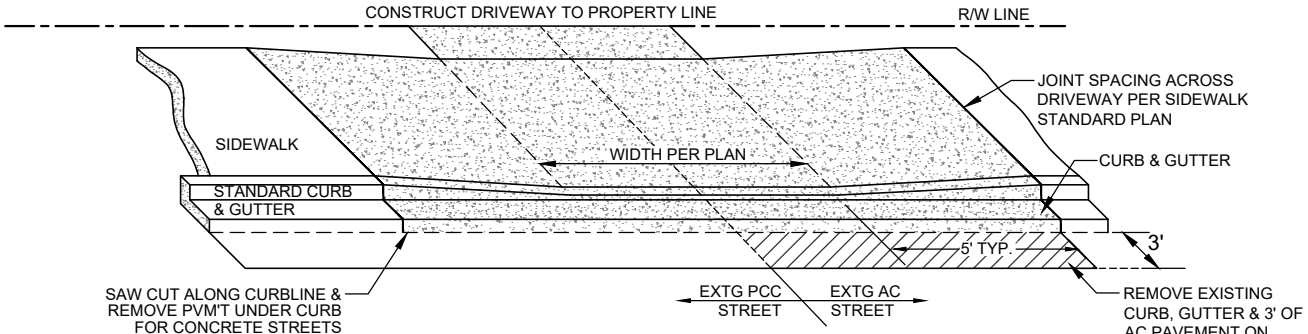
1. CONCRETE MIX SHALL BE 3000 PSI COMMERCIAL GRADE.
2. CLEAR CONCRETE SEALER SHALL BE APPLIED WITHIN (2) TWO HOURS AFTER FINISHING IS COMPLETE.
3. JOINTS IN SIDEWALK MUST ALIGN WITH JOINTS IN CURB.
4. PLACE TRANSVERSE CONTRACTION JOINTS AT INTERVALS EQUAL TO THE WIDTH OF THE SIDEWALK.
5. SURFACE EDGING (SHINER) SHALL BE 3" WIDE SMOOTH BORDERS EITHER FOLLOWING EXISTING PATTERN OR AS SHOWN . (ALSO USED ON ALL JOINTS).
6. MATCH EXISTING SCORE AND SHINER MARKS WITH SURROUNDING SIDEWALK IN AREA OR AS DIRECTED BY INSPECTOR.
7. FINISH SHALL BE BROOMED TRANSVERSE TO THE RUN OF THE SIDEWALK.
8. FOR WIDENING AROUND MAILBOXES AND OTHER OBSTRUCTIONS IN THE SIDEWALKS SEE ST-100.
9. FULL PANEL REPLACEMENT REQUIRED FOR ALL DAMAGED OR VANDILIZED CONCRETE. NO GRAFFITI DAMAGE OR REPAIRS WILL BE ACCEPTED.

N.T.S.

Kelso WASHINGTON	**SIDEWALKS**	STANDARD PLAN NO. **KST-070-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



APPROACH FOR PROPERTY LINE SIDEWALK



APPROACH FOR CURB LINE SIDEWALK

GENERAL INSTRUCTIONS:

1. SIDEWALK PORTION OF DRIVEWAY APPROACH SHALL COMPLY WITH SIDEWALK STANDARD DRAWING EXCEPT THICKNESS SHALL BE AS SPECIFIED BELOW.

2. REMOVE A 3' WIDE STRIP OF PAVEMENT AND BASE ROCK IN FRONT OF THE NEW GUTTER A MINIMUM OF 8" DEEP TO PROVIDE ROOM FOR FORMS. REPLACE BASE ROCK AND RE-PAVE AFTER THE CONCRETE HAS CURED SUFFICIENTLY TO ALLOW WORK BUT MITIGATE DAMAGE TO THE NEW CONCRETE. HMA PATCH SHALL MATCH EXISTING THICKNESS, BUT NOT LESS THAN 4" FOR LOCAL STREETS, AND NOT LESS THAN 6" FOR COLLECTORS AND ARTERIALS.

3. WHERE A DRIVEWAY APPROACH EXCEEDS 16' IN WIDTH, A CONTRACTION JOINT SHALL BE PLACED ALONG ITS CENTER LINE.

4. FOR ASPHALT STREETS, REMOVE EXISTING CURB & GUTTER SECTIONS, FOR CONCRETE STREETS, THE EXISTING STREET SHALL BE SAWED FULL DEPTH ALONG THE GUTTER LINE & THE CURB & ALL PAVEMENT UNDER THE CURB REMOVED.

5. A 1/2" MAXIMUM LIP SHALL BE PROVIDED AT THE GUTTER LINE OF THE APPROACH.

6. DRIVEWAY APPROACH WIDTHS:
   RESIDENTIAL: 10' MIN TO 24' MAX.
   MULTI-FAMILY:
   TWO WAY: 16' MIN TO 24' MAX.
   ONE WAY: 10' MIN TO 12' MAX.
   COMMERCIAL/INDUSTRIAL:
   TWO WAY: 24' MIN TO 32' MAX.
   ONE WAY: 12' MIN TO 16' MAX.
   ALLEY: WIDTH AS DIRECTED.

7. DRIVEWAY APPROACH SHALL BE CEMENT CONCRETE WHERE CURB AND GUTTER EXISTS. CONCRETE STRENGTH SHALL BE 4000 PSI FOR ALLEYS, COMMERCIAL, INDUSTRIAL AND MULTI-FAMILY UNITS, AND 3000 PSI FOR ALL OTHERS.

8. DRIVEWAY THICKNESS SHALL BE 8" FOR ALLEYS, COMMERCIAL, INDUSTRIAL AND MULTI-FAMILY 4 UNITS AND GREATER, AND 6" FOR ALL OTHERS.

9. BASE ROCK FOR DRIVEWAYS SHALL BE CSTC, 4" THICK, EXCEPT BASE ROCK FOR ALLEYS SHALL BE 8" THICK.

A PERMIT MUST BE OBTAINED FROM THE OFFICE OF THE CITY ENGINEER PRIOR TO CONSTRUCTION IN THE CITY RIGHT-OF-WAY. THE ENGINEERING OFFICE MUST BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION.

N.T.S.

CEMENT CONCRETE DRIVEWAY APPROACH

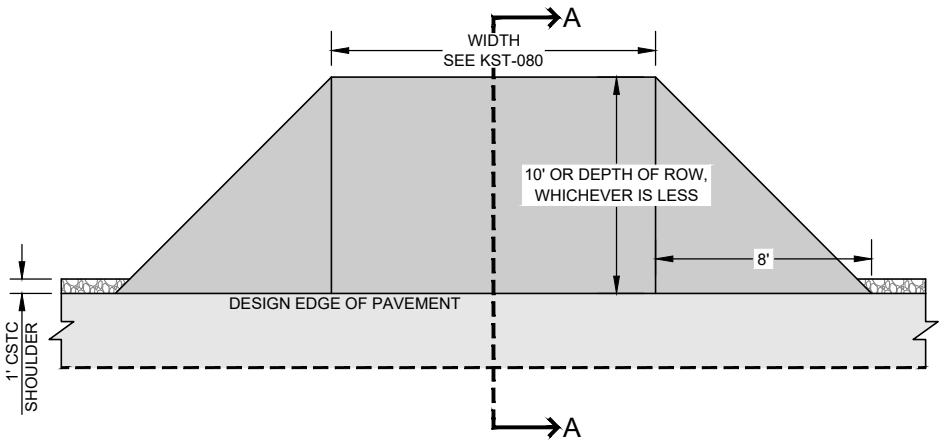
STANDARD PLAN NO.
KST-080-21

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

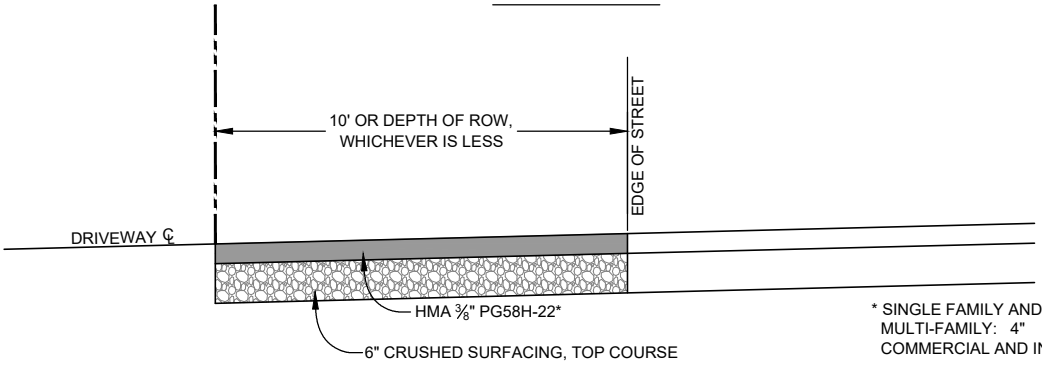
CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

DATE:
MAY 2021

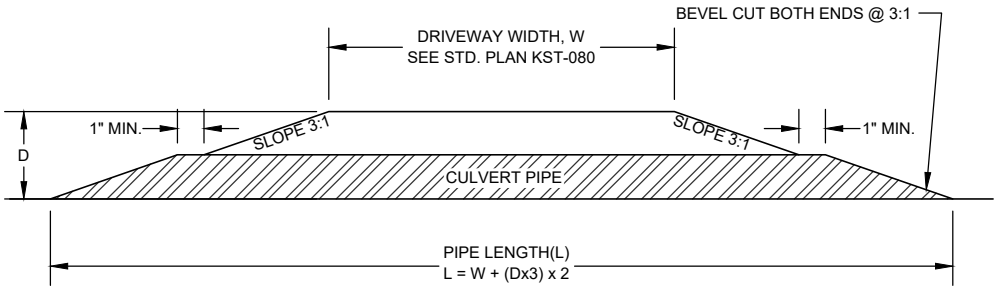


PLAN VIEW



* SINGLE FAMILY AND DUPLEX: 3"
MULTI-FAMILY: 4"
COMMERCIAL AND INDUSTRIAL: 7"

SECTION "A-A" - ASPHALT



L = LENGTH OF CULVERT
D = DEPTH (DRIVEWAY SURFACE TO BOTTOM OF PIPE)
W = WIDTH OF DRIVEWAY

CULVERT PIPE INSTALLATION

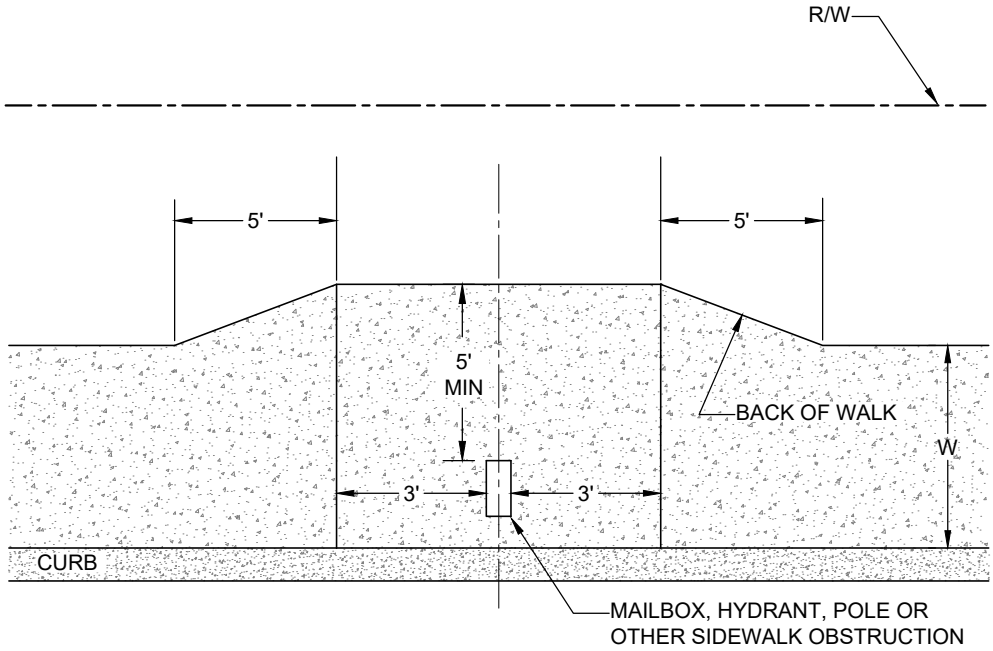
SECTION VIEW

NOTES:

1. CULVERT SHALL BE PLACED IN ROADSIDE DITCH ALIGNMENT, MATCHING DITCH ELEVATIONS AT ENDS OF PIPE.
2. CULVERT PIPE SIZE PER DESIGN, 12" DIAMETER MIN.
3. CULVERT PIPE MATERIAL SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) - DOUBLE WALL, CORRUGATED EXTERIOR / SMOOTH INTERIOR

N.T.S.

Kelso WASHINGTON	**ASPHALT DRIVEWAY APPROACH, NO CURB**	STANDARD PLAN NO. **KST-090-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



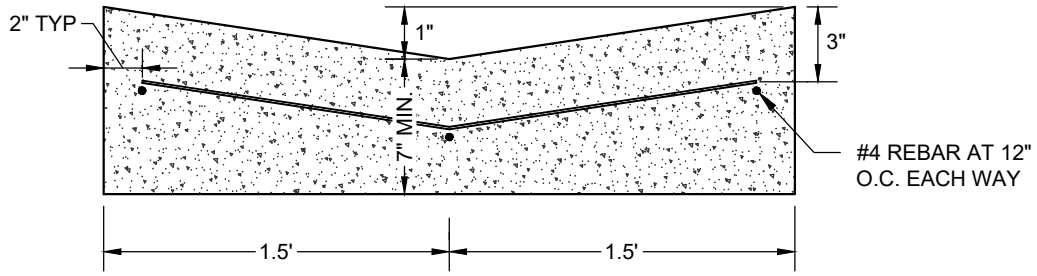
PLAN VIEW

NOTES:

1. MAILBOX LOCATION IS SUBJECT TO APPROVAL BY THE POSTMASTER.
2. THE SIDEWALK WIDENING SHOWN IS REQUIRED AROUND MAILBOXES, POLES, HYDRANTS AND OTHER OBSTRUCTIONS IN THE SIDEWALK.
3. W = WIDTH PER CITY OF KELSO STANDARD PLAN KST-070.

N.T.S.

Kelso WASHINGTON	**SIDEWALK WIDENING AROUND OBSTRUCTIONS**	STANDARD PLAN NO. **KST-100-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



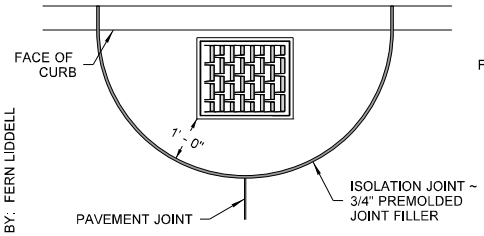
NOTES:

1. CONCRETE SHALL BE CLASS 4000.
2. CONSTRUCT CONTRACTION JOINTS AT 10' INTERVALS.

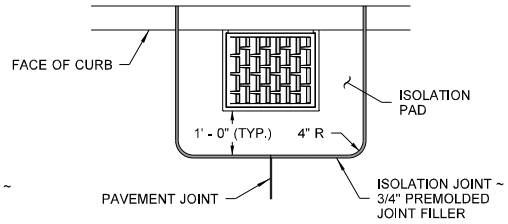
N.T.S.

Kelso WASHINGTON	**CEMENT CONCRETE VALLEY GUTTER**	STANDARD PLAN NO. **KST-110-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

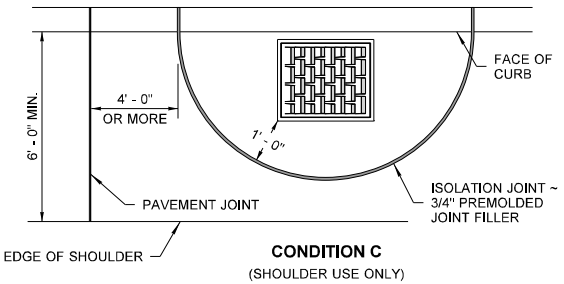
DRAWN BY: FERN LIDDELL



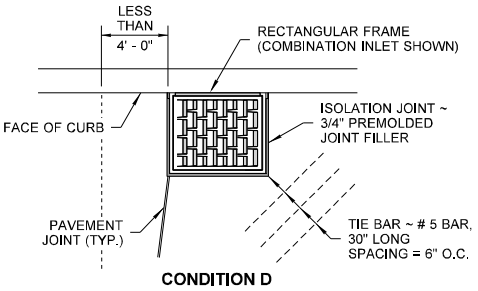
CONDITION A



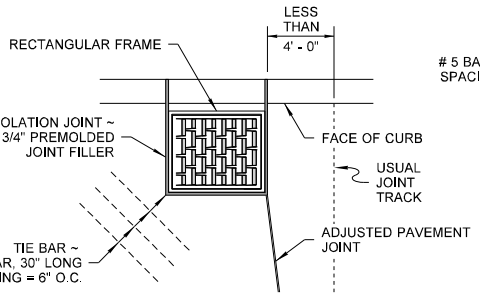
CONDITION B



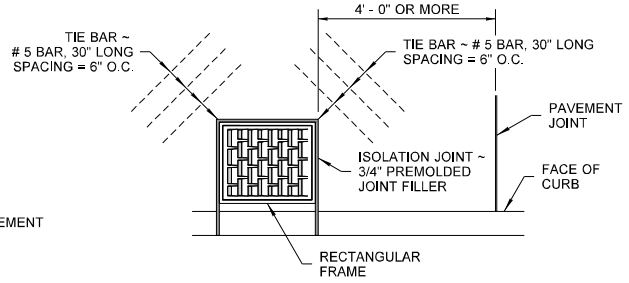
CONDITION C
(SHOULDER USE ONLY)



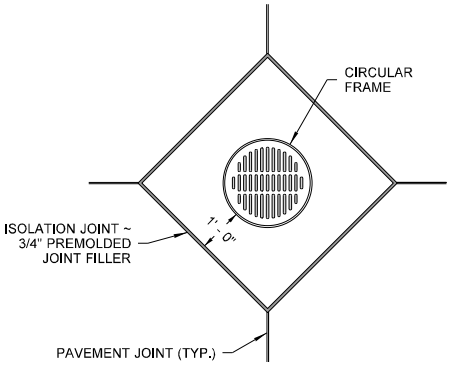
CONDITION D



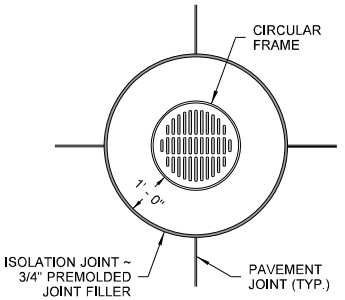
CONDITION E



CONDITION F



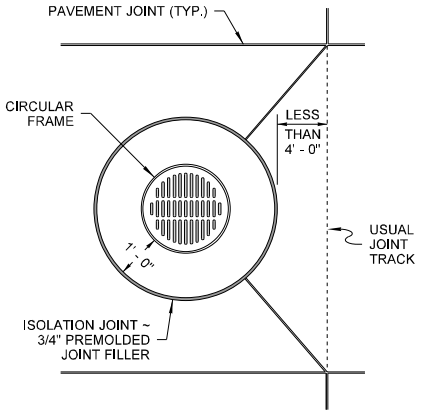
CONDITION G

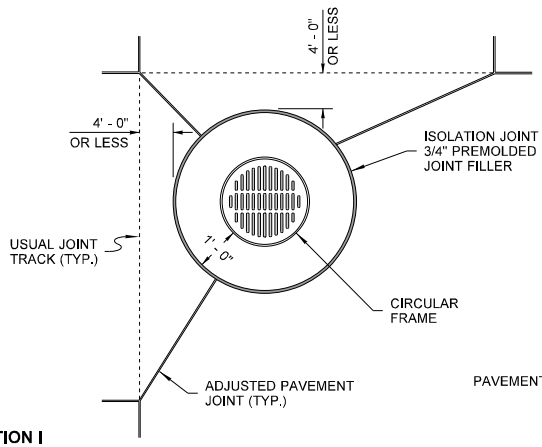


CONDITION H

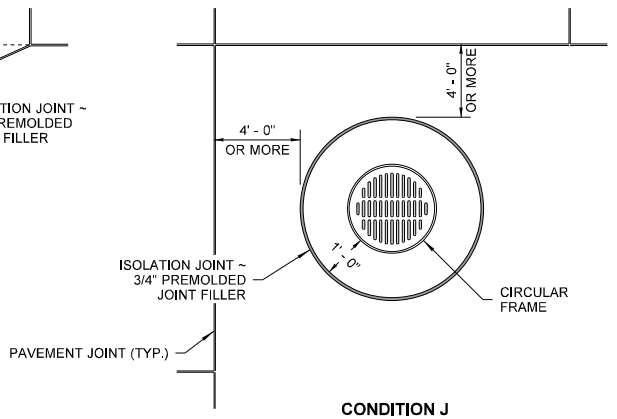
NOTE

ALL CONDITIONS ARE SHOWN IN PLAN VIEW.

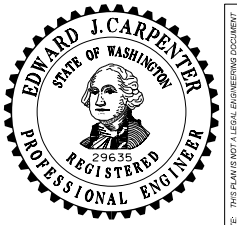




CONDITION I



CONDITION J



PCC PAVEMENT ISOLATION JOINTS

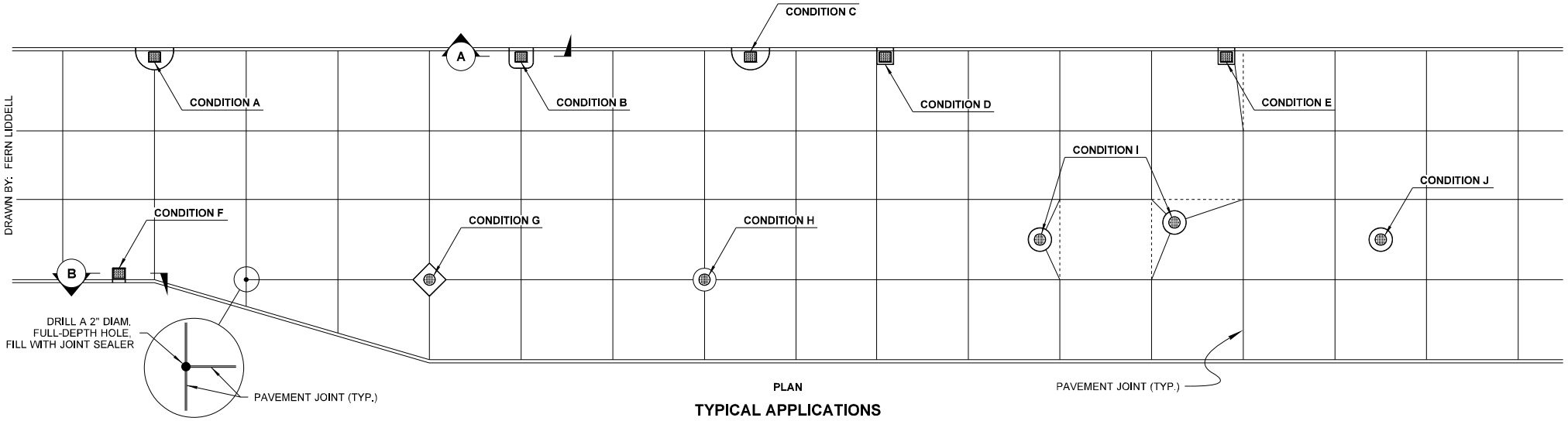
STANDARD PLAN A-40.15-00

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER — *08-11-09* — DATE

Washington State Department of Transportation

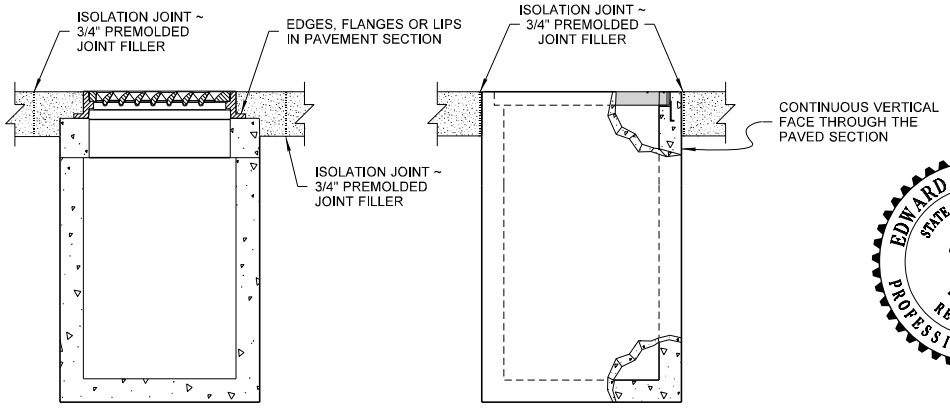


T - JOINT DETAIL

TYPICAL APPLICATIONS

TYPICAL ISOLATION JOINT GUIDELINES				
CONDITION	FEATURE	EDGES, FLANGES OR LIPS IN THE PAVEMENT SECTION ①	CONTINUOUS VERTICAL FACE THROUGH THE PAVEMENT SECTION ②	DISTANCE FROM NEAREST TRANSVERSE JOINT
A	CATCH BASIN OR COMBINATION GRATE	USE	---	---
B	CATCH BASIN OR COMBINATION GRATE	USE	---	---
C	CATCH BASIN OR COMBINATION GRATE	USE	---	> 4 FT FROM JOINT
D	GRATE INLET, CATCH BASIN OR CONCRETE INLET ✶	---	USE	< 4 FT FROM JOINT
E	GRATE INLET, CATCH BASIN OR CONCRETE INLET ✶	---	USE	< 4 FT FROM JOINT
F	GRATE INLET, CATCH BASIN OR CONCRETE INLET ✶	---	USE	> 4 FT FROM JOINT
G	MANHOLE OR CATCH BASIN TYPE 2	USE	---	---
H	MANHOLE OR CATCH BASIN TYPE 2	USE	---	---
I	MANHOLE OR CATCH BASIN TYPE 2	USE	---	< 4 FT FROM JOINT
J	MANHOLE OR CATCH BASIN TYPE 2	USE	---	> 4 FT FROM JOINT

✶ WITH RECTANGULAR GRATE CAST INTO ADJUSTMENT SECTION.



SECTION (A)

SECTION (B)

EDWARD J. CARPENTER
STATE OF WASHINGTON
29635
REGISTERED
PROFESSIONAL ENGINEER

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER, AUTHENTICATED AND DATED, IS ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

PCC PAVEMENT ISOLATION JOINTS

STANDARD PLAN A-40.15-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

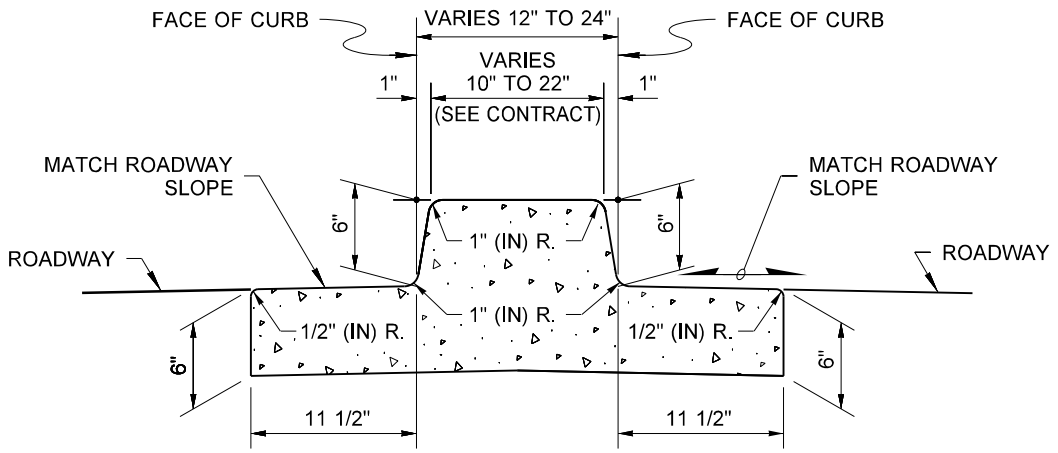
08-11-09 — DATE

Washington State Department of Transportation

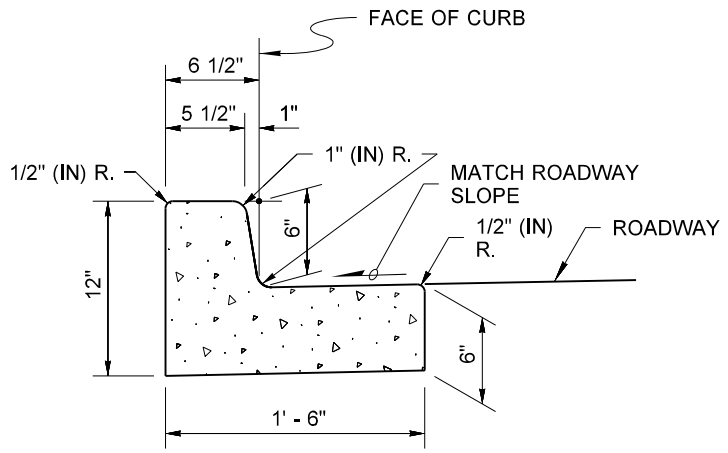
SUPPLEMENTAL TO STANDARD PLAN
A-40.15-00

Modify sheets 1 and 2 of the Standard Plan as follows:

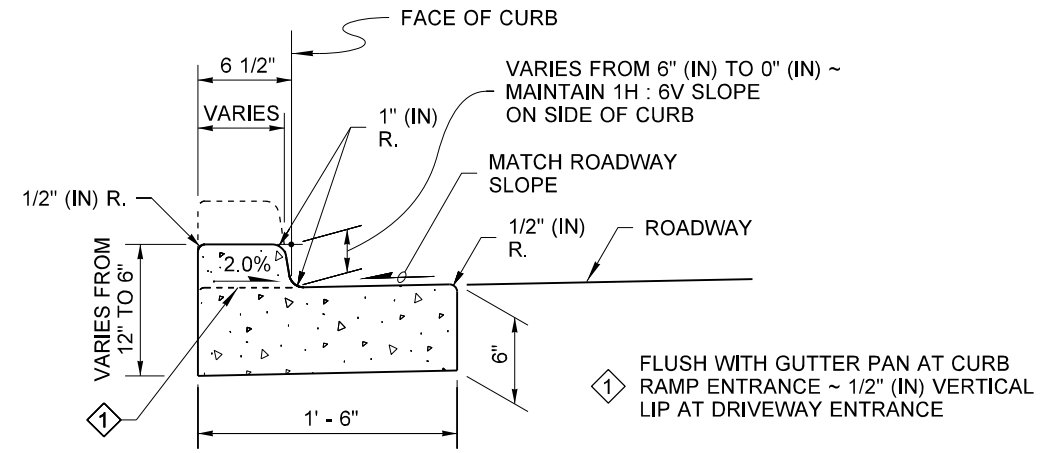
Notes:
1. Delete reference to premolded joint filler in the Standard Plan. Where joints with premolded joint filler are shown on the Standard Plan, construct a contraction joint, except, when the isolation area is constructed as a separate pour, construct a construction joint.



DUAL-FACED CEMENT CONCRETE TRAFFIC CURB AND GUTTER



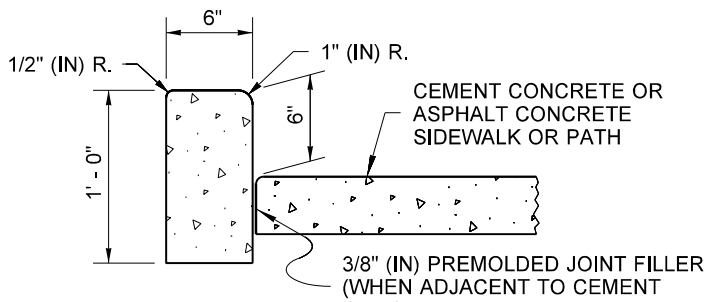
CEMENT CONCRETE TRAFFIC CURB AND GUTTER



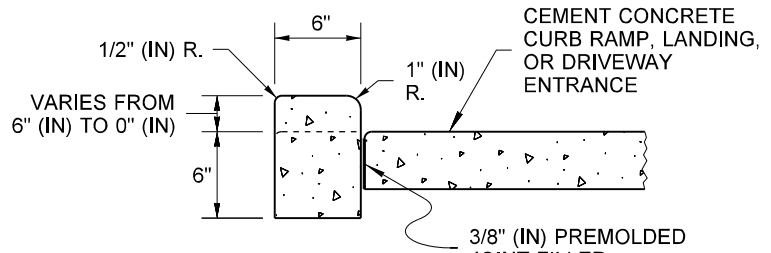
DEPRESSED CURB AND GUTTER SECTION

AT CURB RAMPS AND DRIVEWAY ENTRANCES

DRAWN BY: FERN LIDDELL



CEMENT CONCRETE PEDESTRIAN CURB

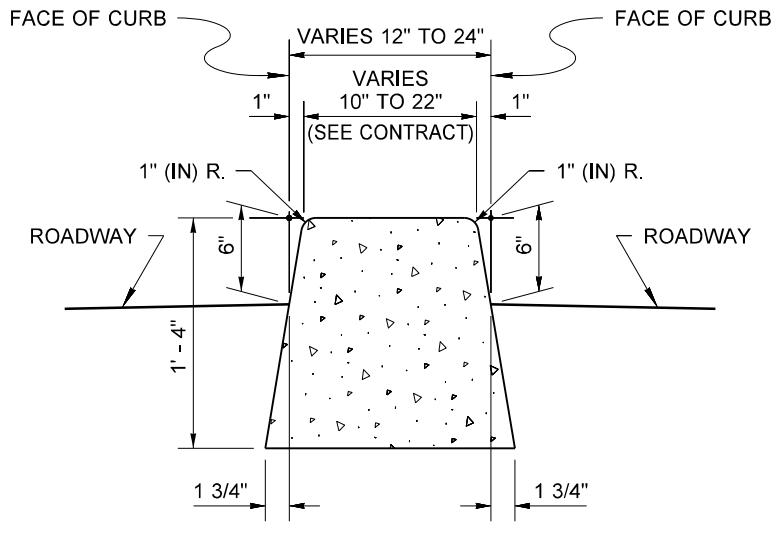


CEMENT CONCRETE PEDESTRIAN CURB

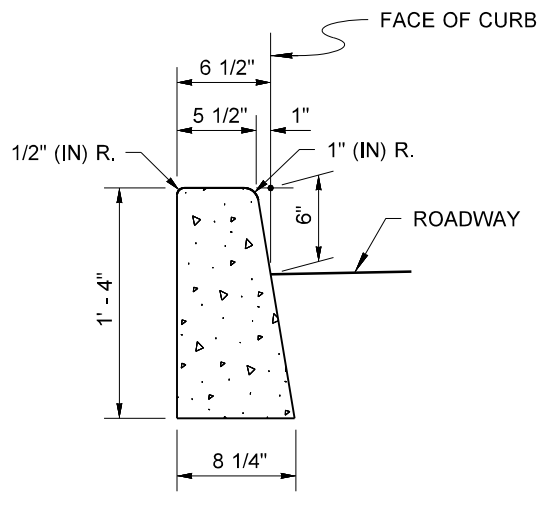
AT CURB RAMPS, LANDINGS, AND DRIVEWAY ENTRANCES

NOTE

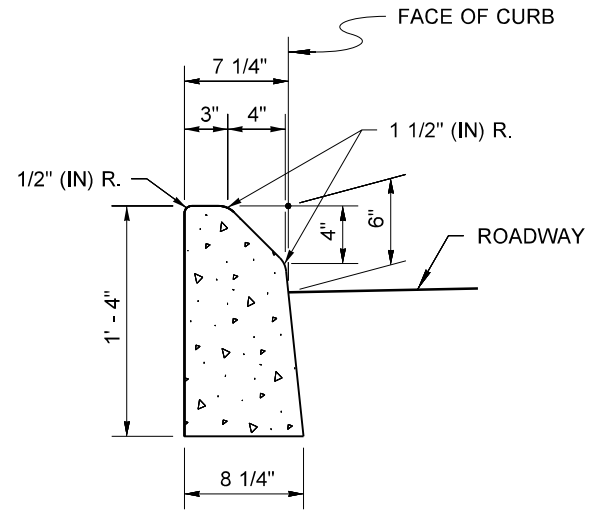
1. See **Standard Plan F-30.10** for Curb Expansion and Contraction Joint spacing. See **Standard Specification, Sections 8-04 and 9-04** for additional requirements.



DUAL-FACED CEMENT CONCRETE TRAFFIC CURB



CEMENT CONCRETE TRAFFIC CURB



MOUNTABLE CEMENT CONCRETE TRAFFIC CURB

Michael S Fleming

Digitally signed by Michael S Fleming
Date: 2020.09.24 07:39:38 -07'00'

CEMENT CONCRETE CURBS

STANDARD PLAN F-10.12-04

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Date: 2020.09.24 07:57:43 -07'00'
STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
F-10.12-04

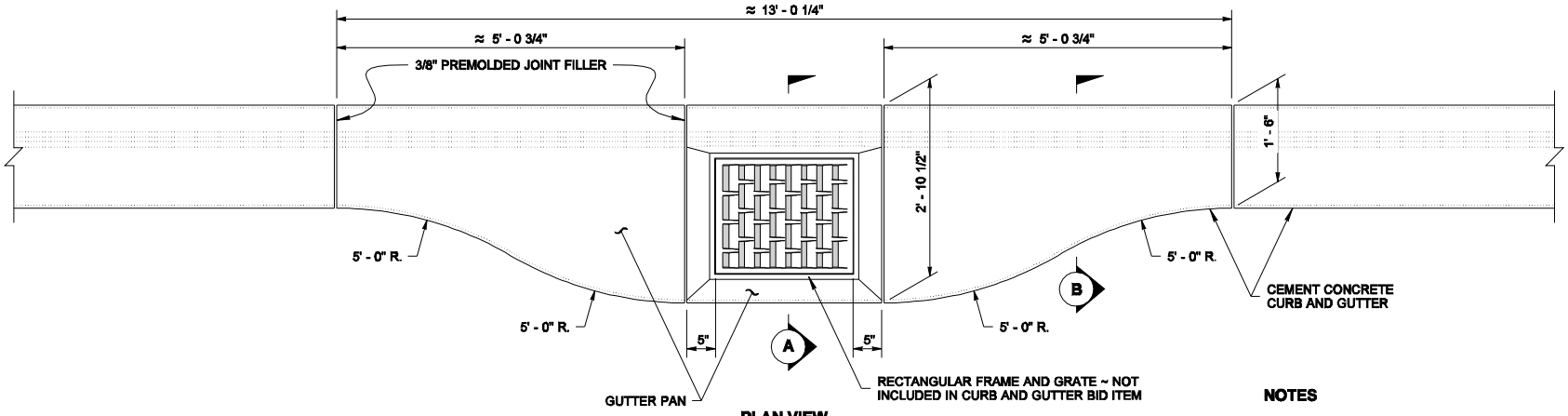
Modify the Standard Plan as follows:

Notes:

1. Construct a 6" thick layer of compacted CSTC under all curbs and gutters.

2. Delete reference to premolded joint filler and expansion joints in the Standard Plan. Where premolded joint filler or expansion joints are shown on the Standard Plan, construct a contraction joint, except where the new concrete abuts existing concrete, construct a construction joint.

DRAWN BY: MARK SUJKA

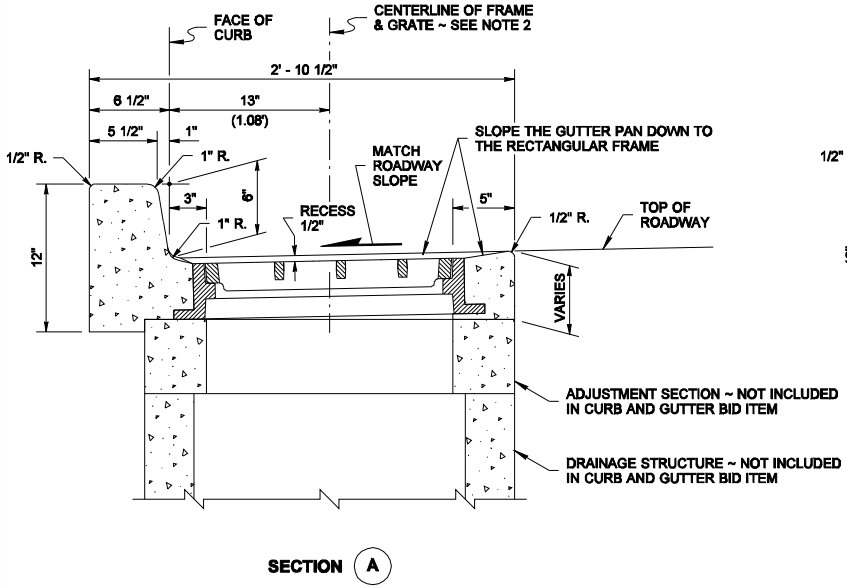


PLAN VIEW

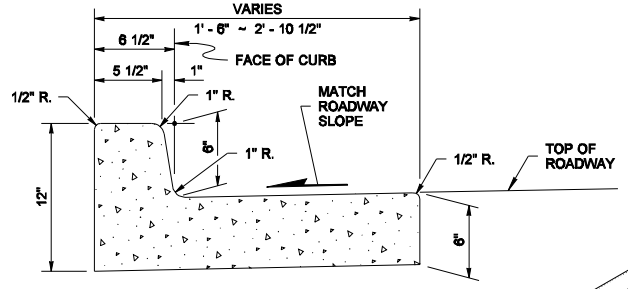
CATCH BASIN GUTTER PAN

NOTES

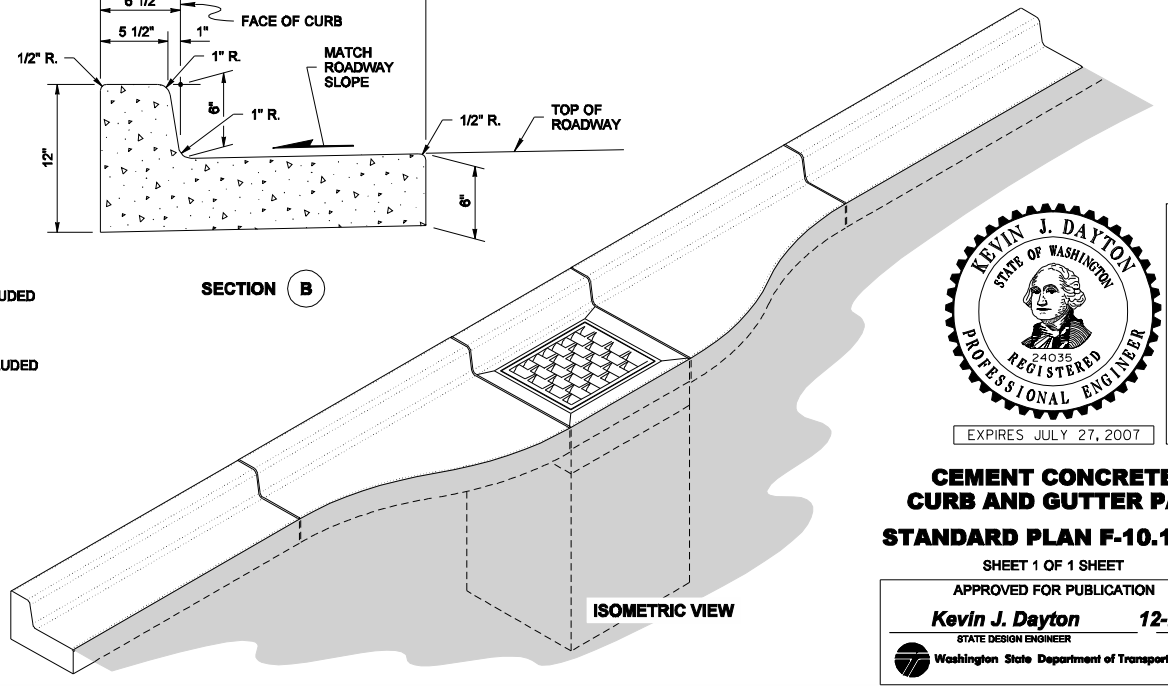
1. The intent of this design is to facilitate the compaction of Hot Mix Asphalt pavement adjacent to a drainage structure.
2. The centerline of the drainage structure may differ from the centerline of the frame and grate.



SECTION A



SECTION B



KEVIN J. DAYTON
STATE OF WASHINGTON
24035
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES JULY 27, 2007

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER, AND DATED, IS AVAILABLE FOR INSPECTION ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

CEMENT CONCRETE CURB AND GUTTER PAN

STANDARD PLAN F-10.16-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Kevin J. Dayton — STATE DESIGN ENGINEER — *12-20-06* — DATE

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
F-10.16-00

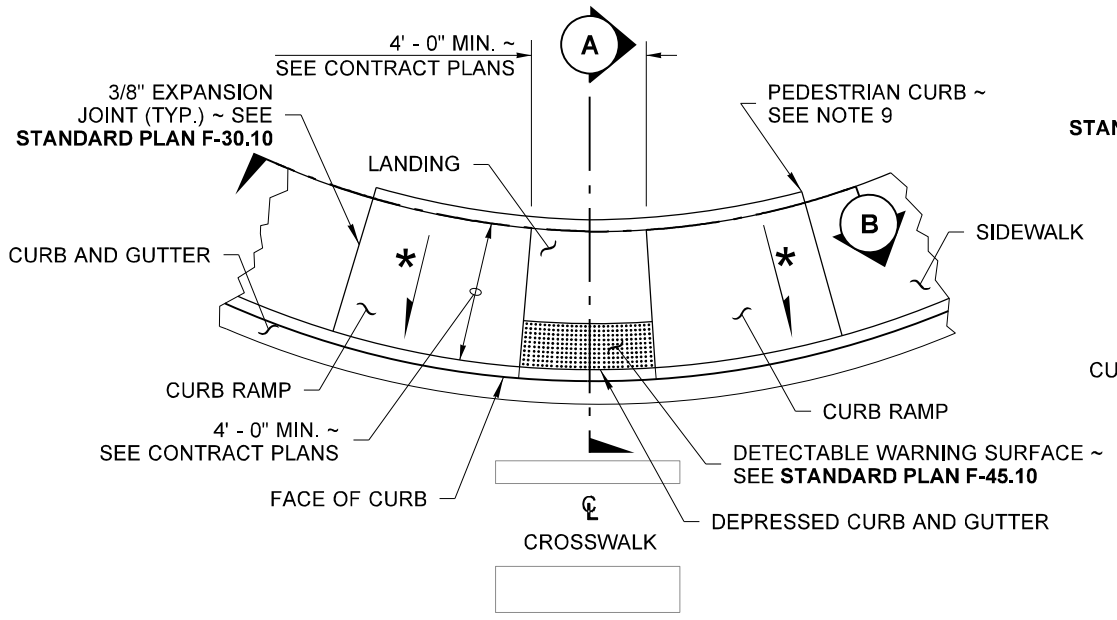
Modify the Standard Plan as follows:

Notes:

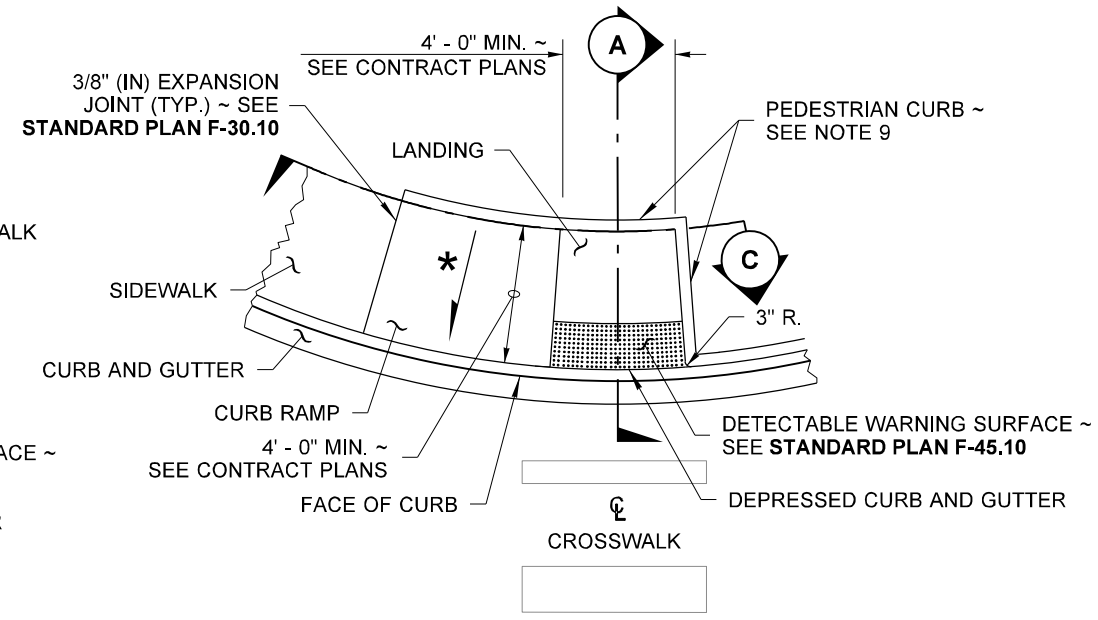
1. Construct a 6" thick layer of compacted CSTC under all curbs and gutters.

2. Delete reference to premolded joint filler and expansion joints in the Standard Plan. Where premolded joint filler or expansion joints are shown on the Standard Plan, construct a contraction joint, except where the new concrete abuts existing concrete, construct a construction joint.

3. Catch basin and grate type shall be as shown in the project specific plans and special provisions.

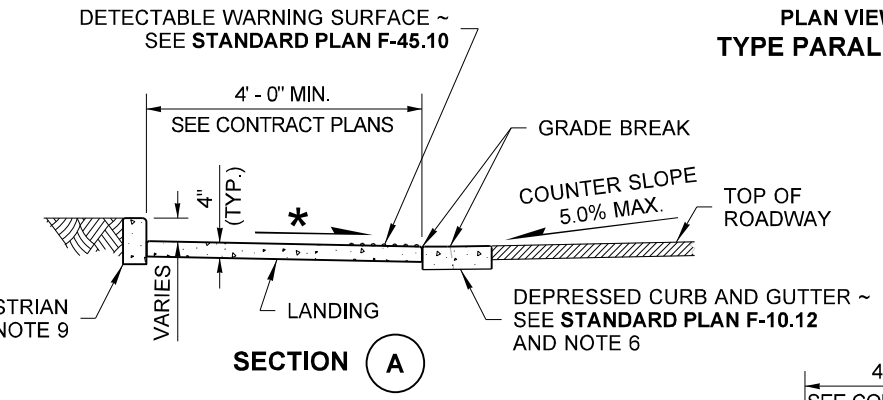


PLAN VIEW
TYPE PARALLEL A

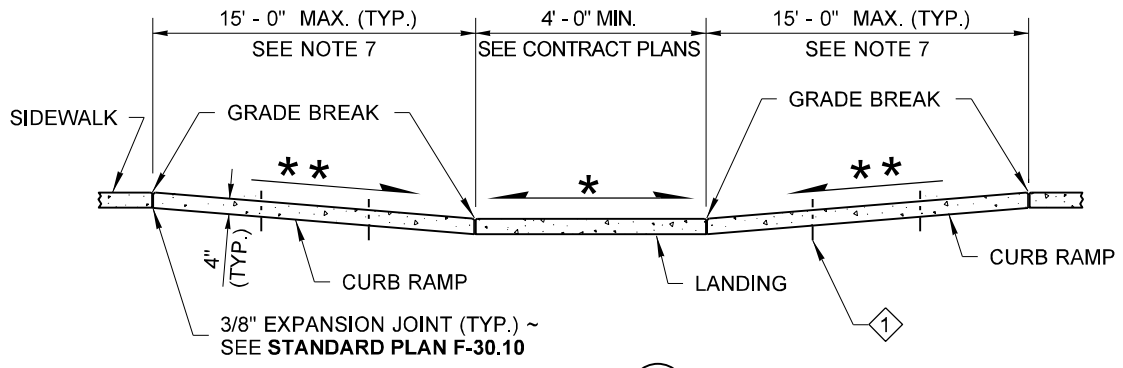


PLAN VIEW
TYPE PARALLEL B

① CONTRACTION JOINT (TYP.) ~ SEE **STANDARD PLAN F-30.1** FOR CURB RAMP LENGTHS GREATER THAN 8' - 0"PROVIDE CONTRACTION JOINT EQUALLY SPACED 4' - 0" MIN. OC.

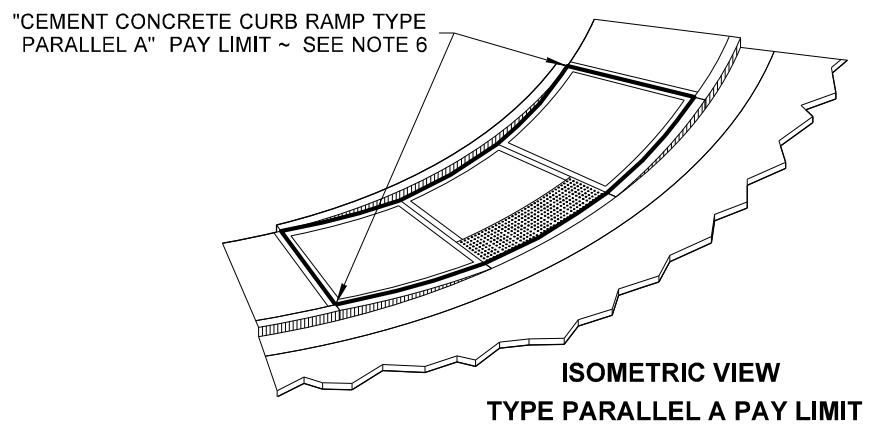


SECTION (A)

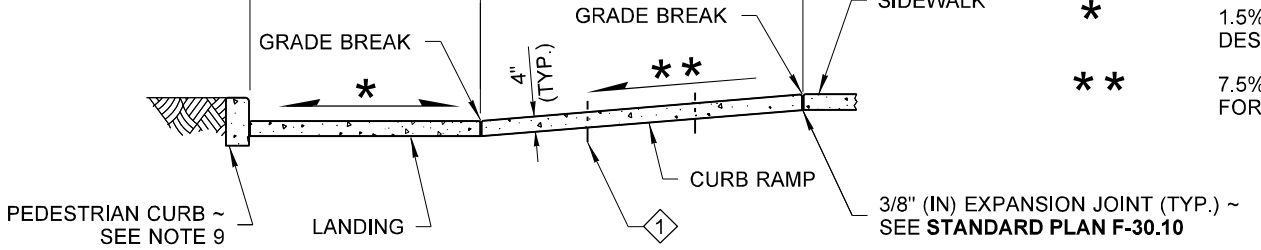


SECTION (B)

(ALONG INSIDE RADIUS AT BACK OF WALKWAY)

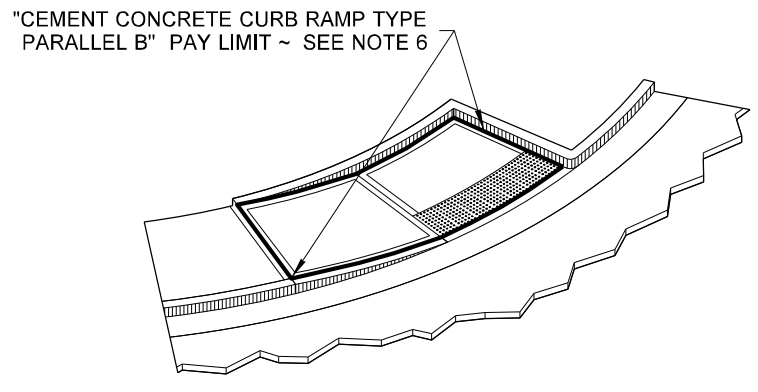


ISOMETRIC VIEW
TYPE PARALLEL A PAY LIMIT



SECTION (C)

(ALONG INSIDE RADIUS AT BACK OF WALKWAY)



ISOMETRIC VIEW
TYPE PARALLEL B PAY LIMIT

NOTES

1. At marked crosswalks, the connection between the landing and the roadway must be contained within the width of the crosswalk markings.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in the Depressed Curb and Gutter where the Landing connects to the roadway.
4. See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb and Gutter, and Pedestrian Curb details.
5. See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
6. The Bid Item "Cement Concrete Curb Ramp Type __" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
7. The Curb Ramp length is not required to exceed 15 feet (unless otherwise shown in the Contract Plans). When applying the 15-foot max. length, the running slope of the curb ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet. Do not include abutting landing(s) in the15-foot max. measurement. When a ramp is constructed on a radius, the 15-foot max. length is measured on the inside radius along the back of the walkway.
8. Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14.**
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will be no material to retain.

LEGEND

SLOPE IN EITHER DIRECTION

* 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)

** 7.5% OR FLATTER RECOMMENDED FOR DESIGN/ FORMWORK (8.3% MAX.) ~ SEE NOTE 7

R. SCOTT ZELLER
STATE OF WASHINGTON
28680
REGISTERED
PROFESSIONAL ENGINEER

Zeller, Scott
Jun 24 2016 7:19 AM

PARALLEL CURB RAMP

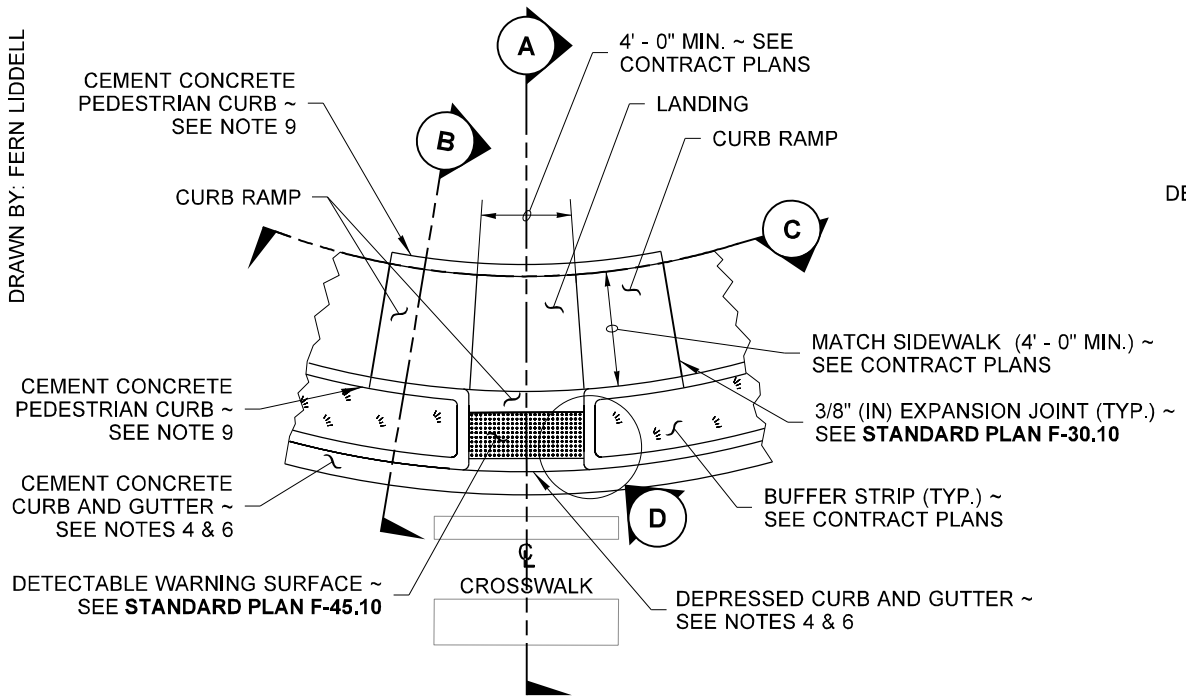
STANDARD PLAN F-40.12-03

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jun 29 2016 2:27 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

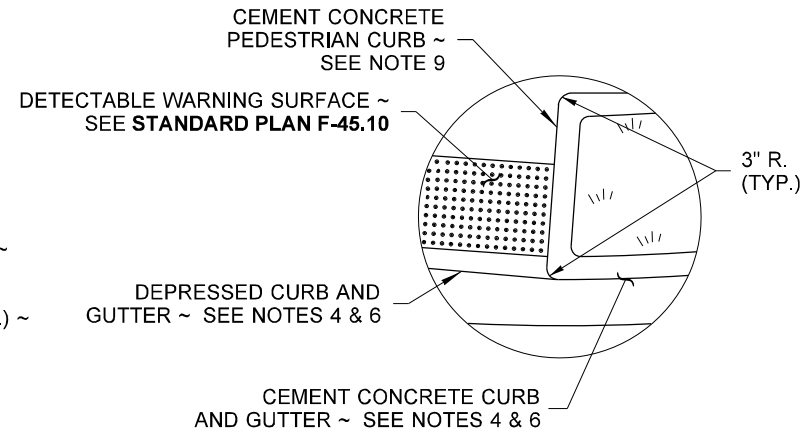
DRAWN BY: FERN LIDDELL



PLAN VIEW

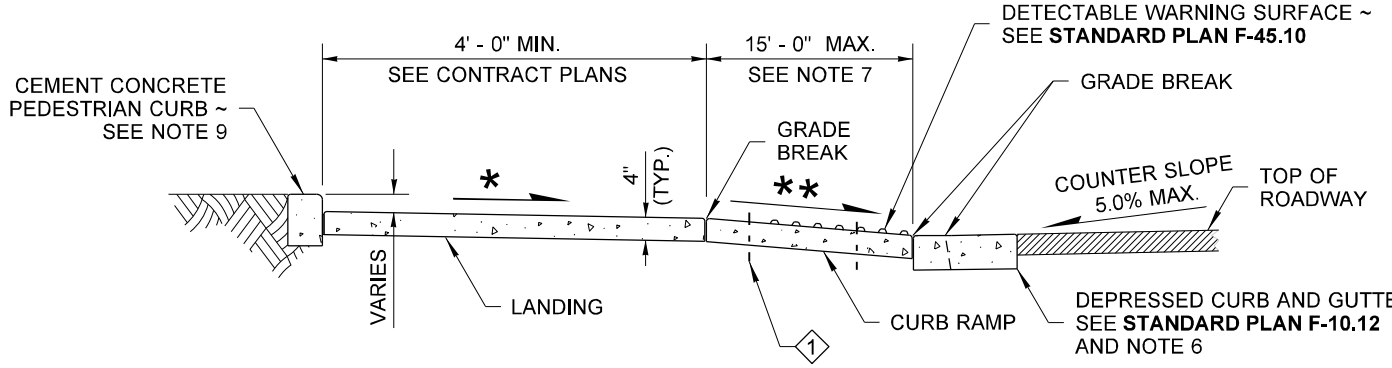
TYPE COMBINATION

WITH BUFFER

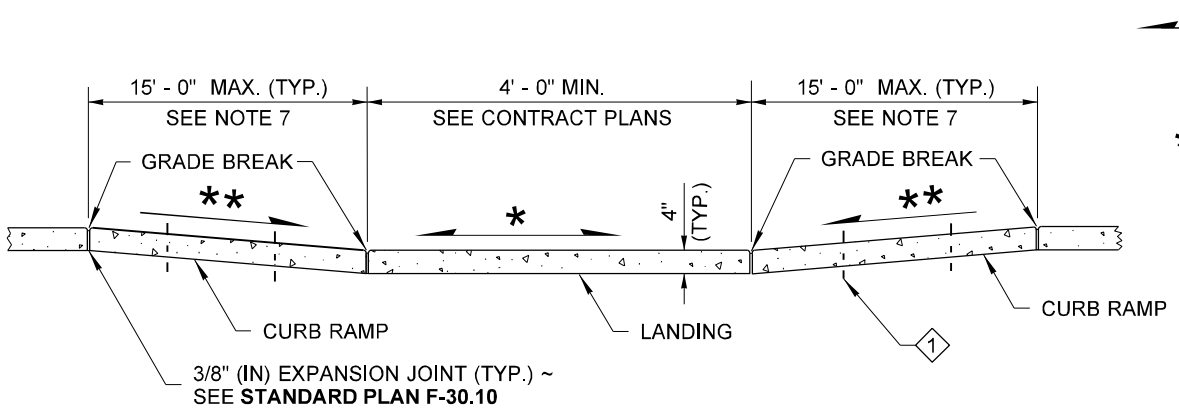


DETAIL (D)

CURB RADIUS DETAIL



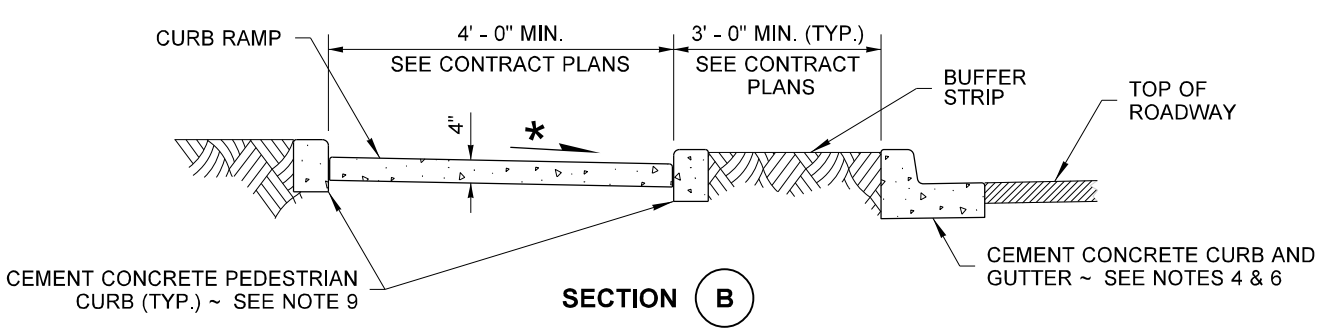
SECTION (A)



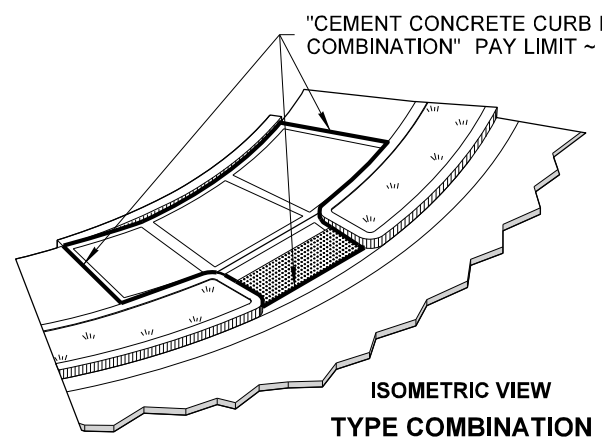
SECTION (C)

(ALONG INSIDE RADIUS AT BACK OF WALKWAY)

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



SECTION (B)



ISOMETRIC VIEW

TYPE COMBINATION PAY LIMIT

NOTES

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

LEGEND

SLOPE IN EITHER DIRECTION

* 1.5 OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)

** 7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.)

R. SCOTT ZELLER
STATE OF WASHINGTON
28680
REGISTERED
PROFESSIONAL ENGINEER

Zeller, Scott
Jun 24 2016 7:20 AM

COMBINATION CURB RAMP

STANDARD PLAN F-40.14-03

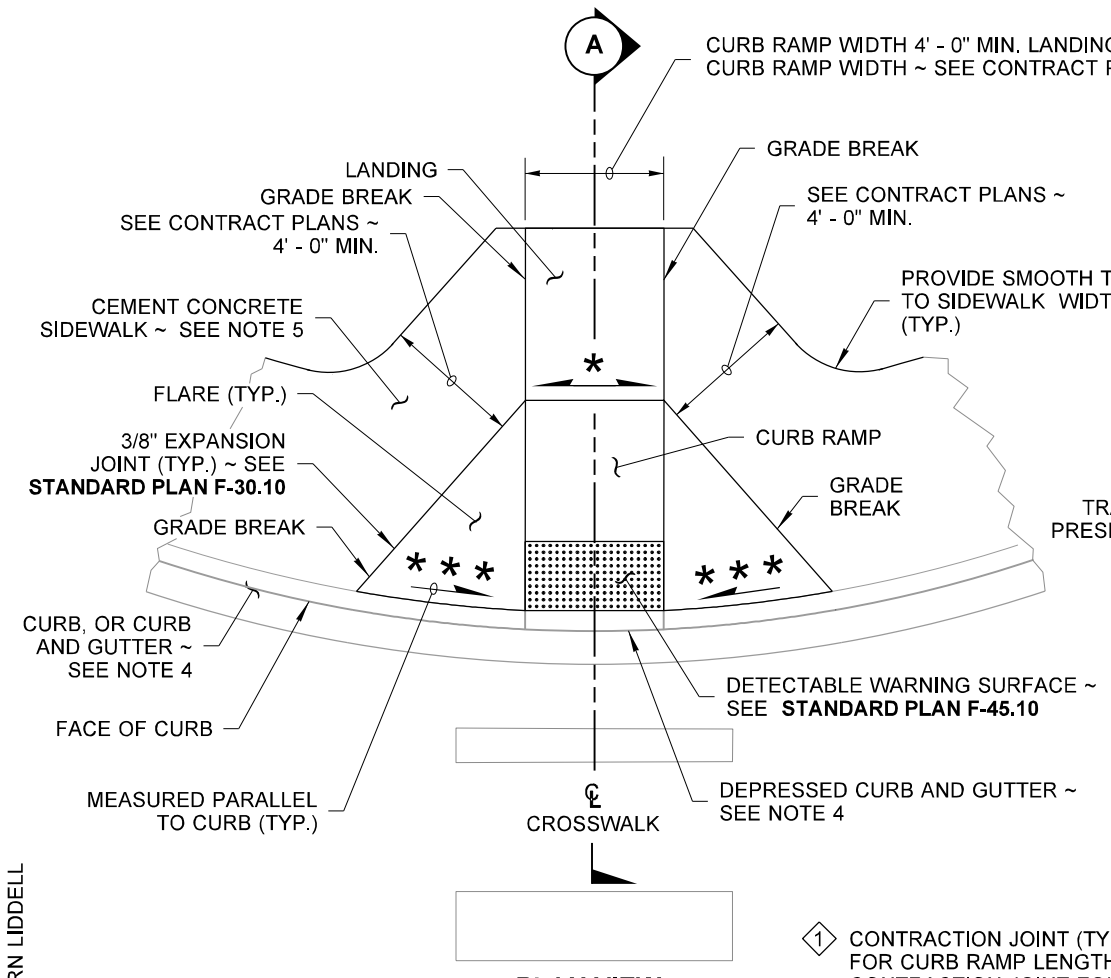
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Carpenter, Jeff
Jun 29 2016 2:28 PM

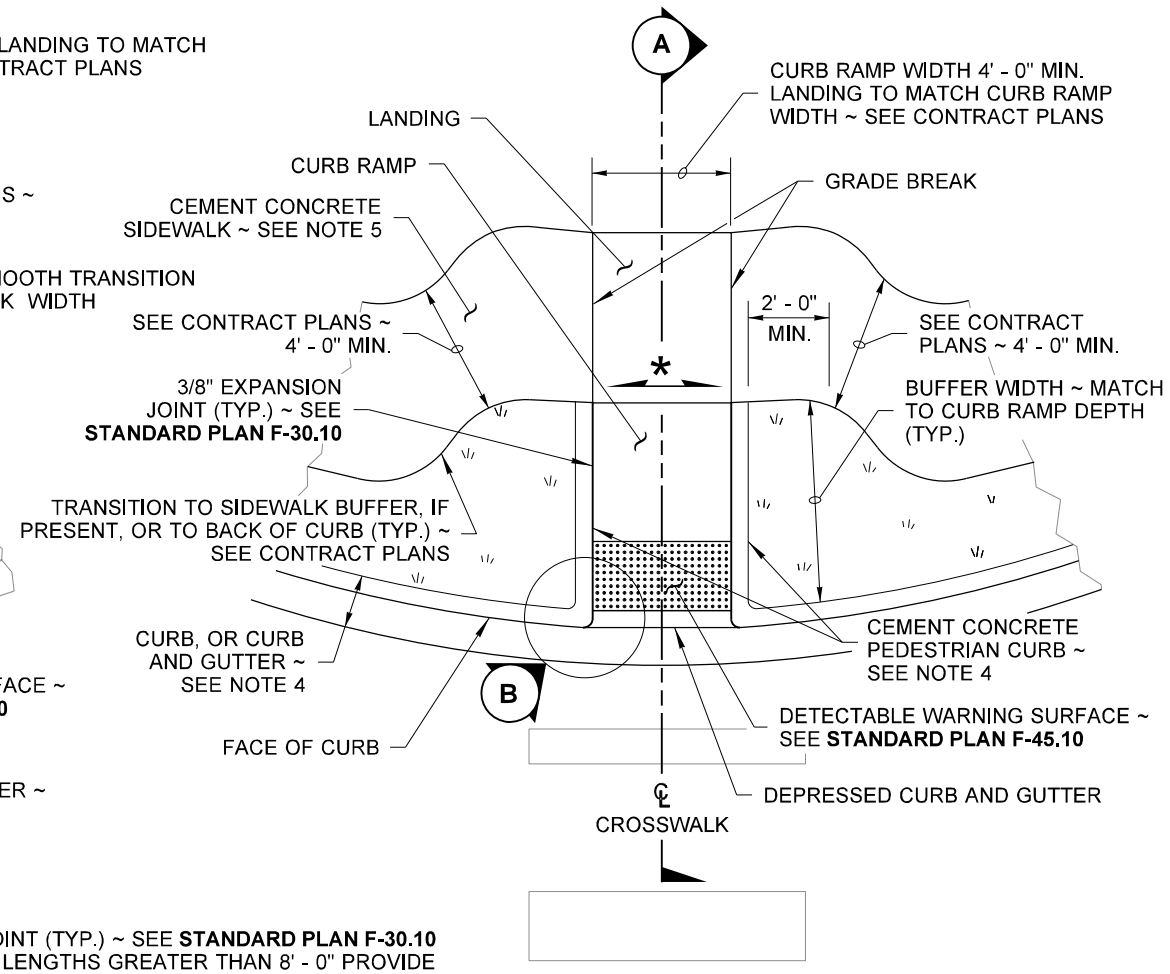
STATE DESIGN ENGINEER

Washington State Department of Transportation



PLAN VIEW

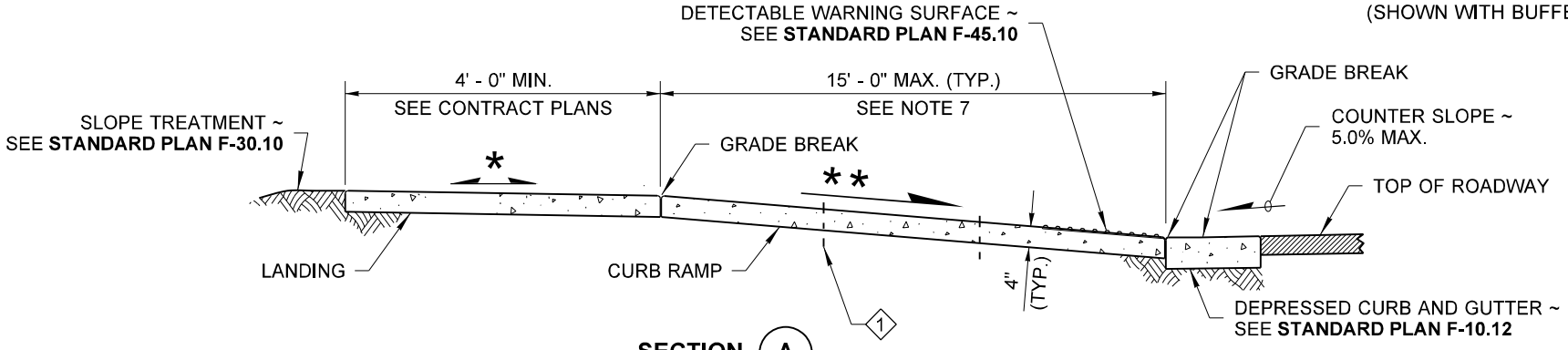
TYPE PERPENDICULAR A



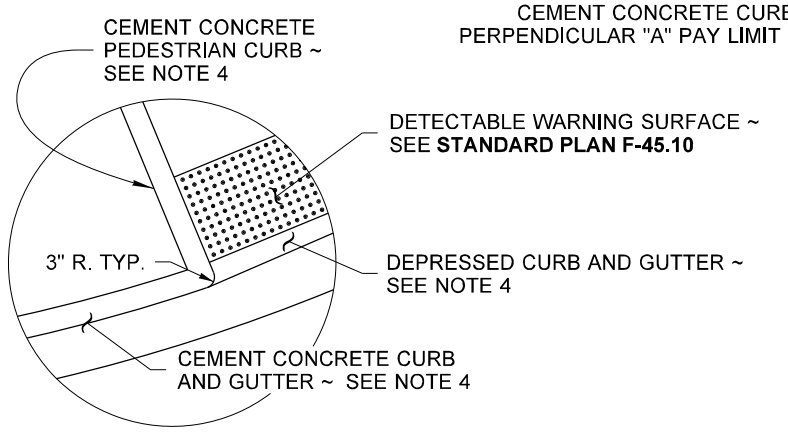
PLAN VIEW

TYPE PERPENDICULAR B
(SHOWN WITH BUFFER)

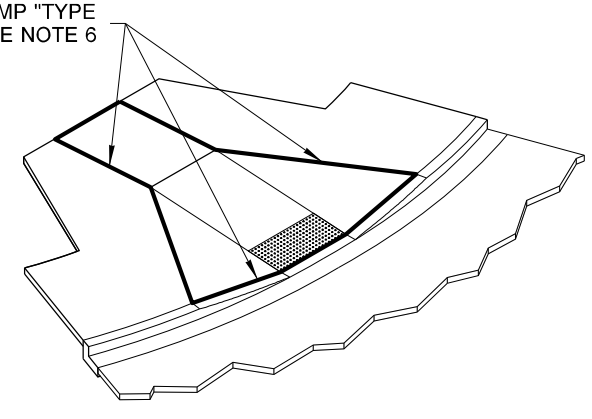
① CONTRACTION JOINT (TYP.) ~ SEE **STANDARD PLAN F-30.10** FOR CURB RAMP LENGTHS GREATER THAN 8' - 0" PROVIDE CONTRACTION JOINT EQUALLY SPACED 4' - 0" MIN. OC.



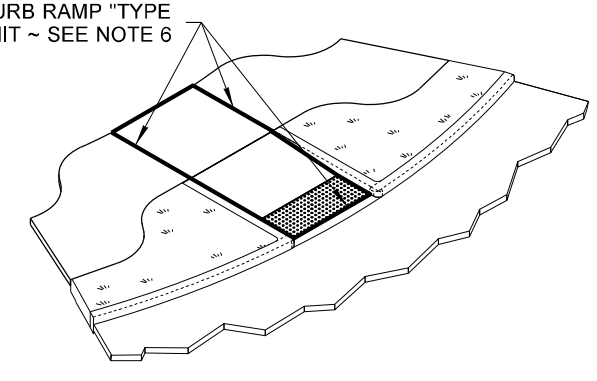
SECTION (A)



CURB RADIUS DETAIL (B)



ISOMETRIC VIEW
TYPE PERPENDICULAR A PAY LIMIT



ISOMETRIC VIEW
TYPE PERPENDICULAR B PAY LIMIT

NOTES

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

LEGEND

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

R. SCOTT ZELLER
STATE OF WASHINGTON
28680
REGISTERED
PROFESSIONAL ENGINEER

Digitally signed by R. Scott Zeller
Date: 2020.09.22 13:23:53 -07'00'

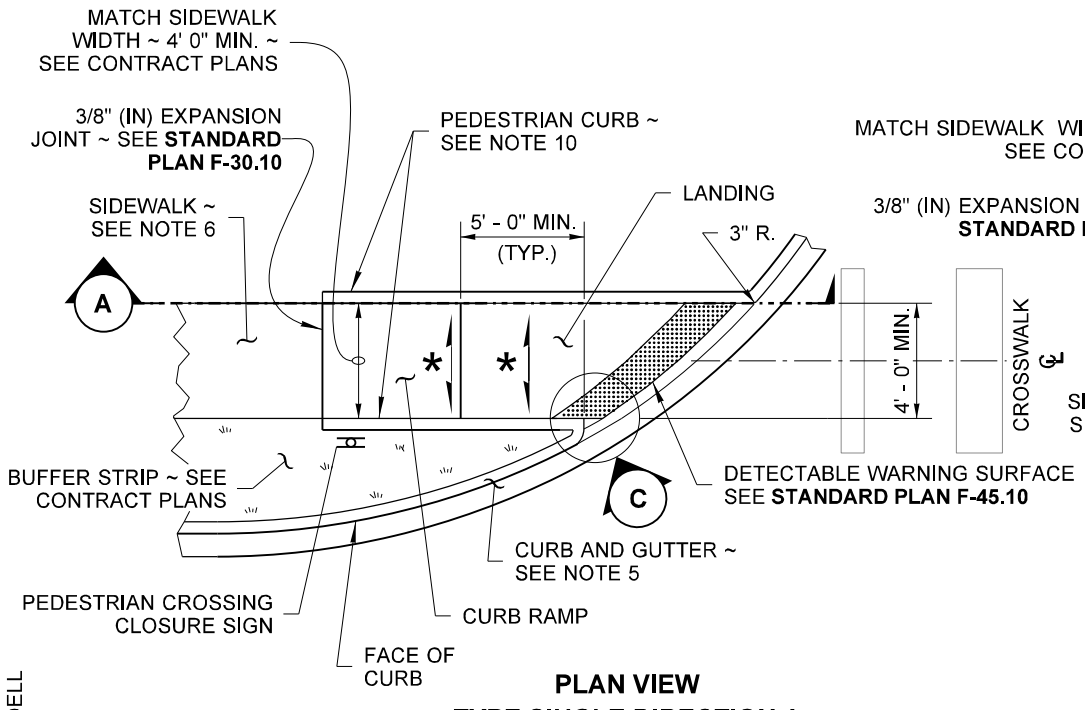
PERPENDICULAR CURB RAMP

STANDARD PLAN F-40.15-04

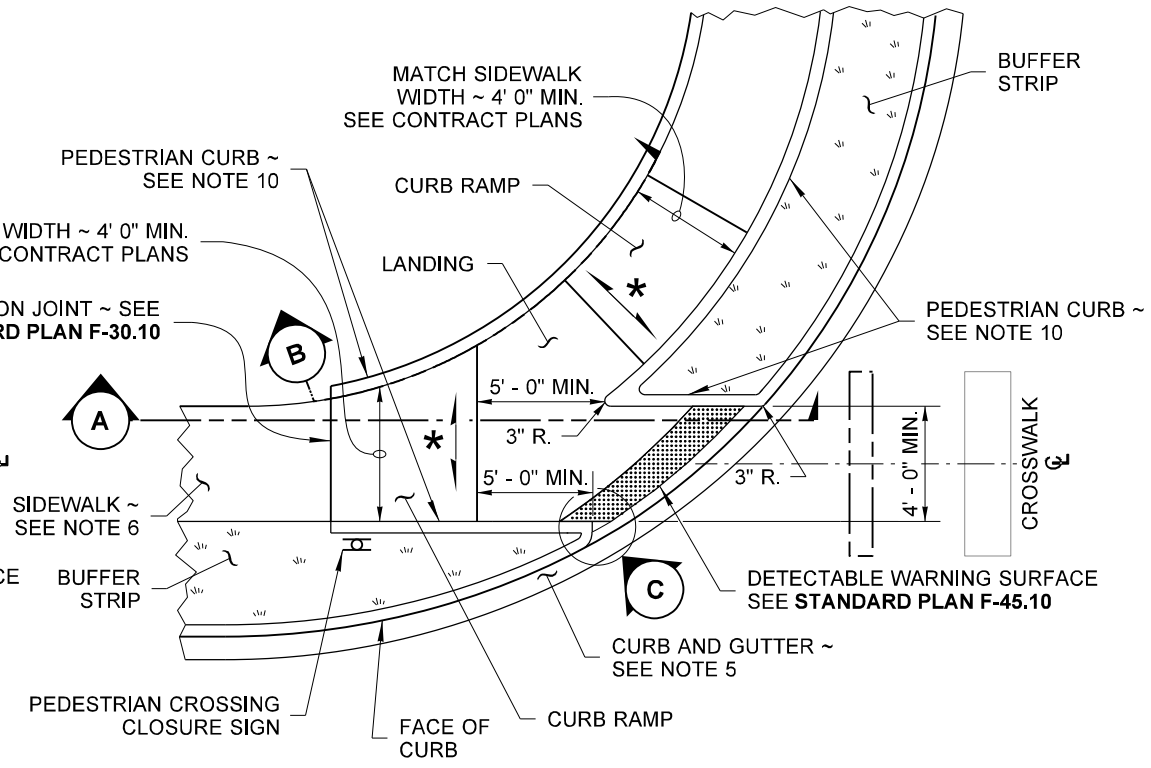
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Date: 2020.09.25 14:44:37 -07'00'
STATE DESIGN ENGINEER
Washington State Department of Transportation

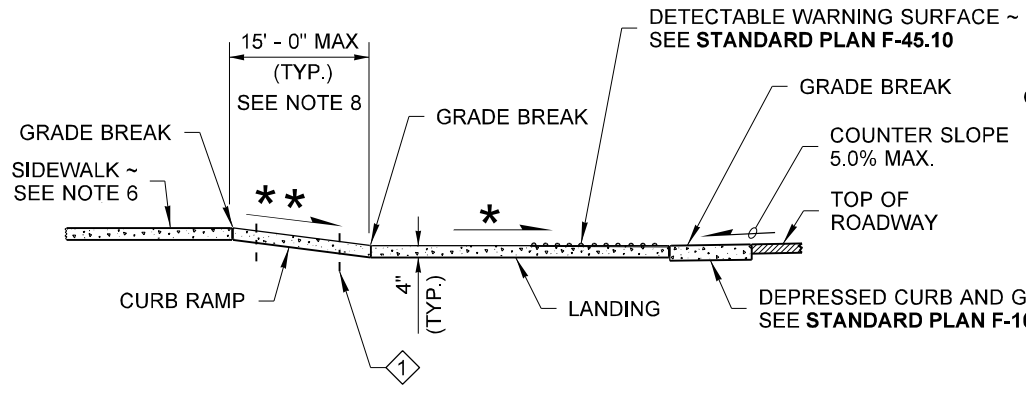
DRAWN BY: F
ERN LIDDELL



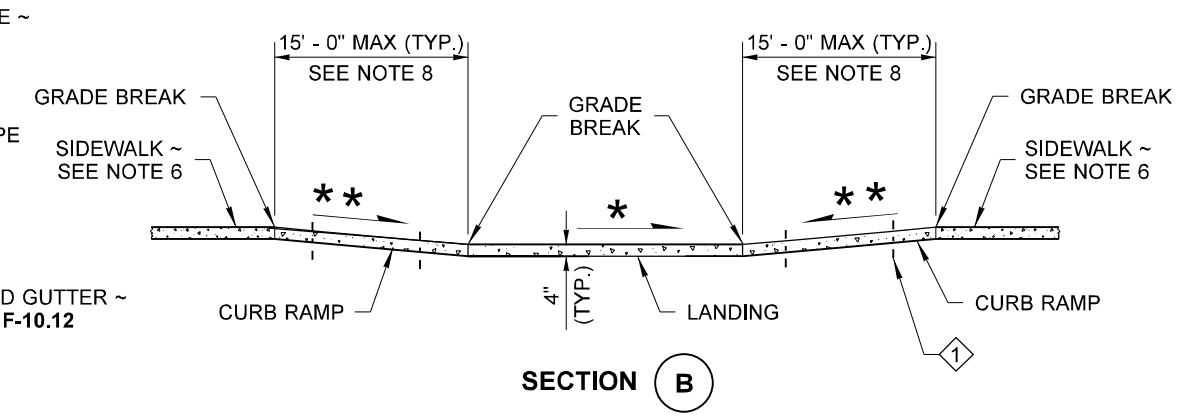
PLAN VIEW
TYPE SINGLE DIRECTION A



PLAN VIEW
TYPE SINGLE DIRECTION B



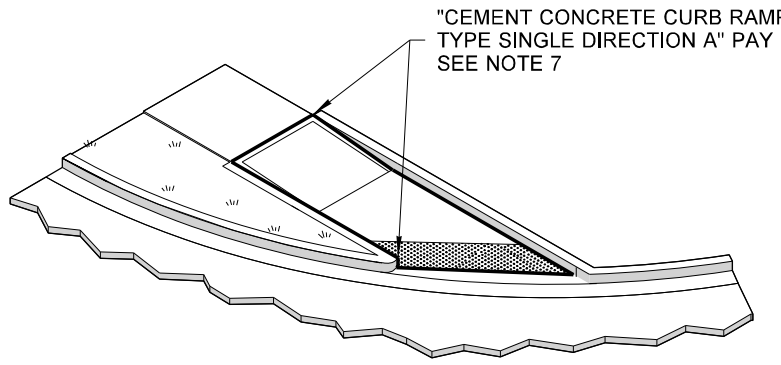
SECTION (A)



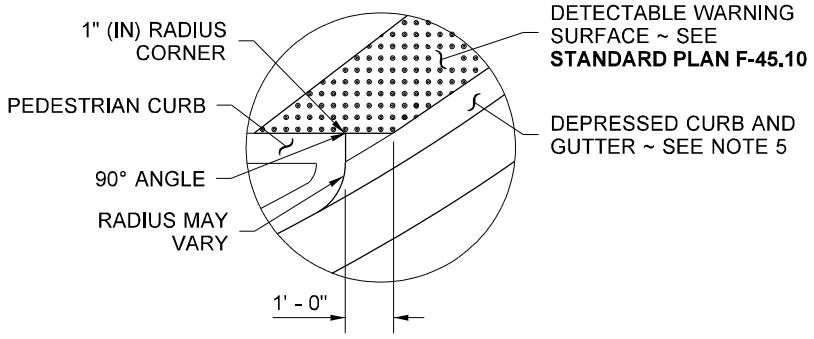
SECTION (B)

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

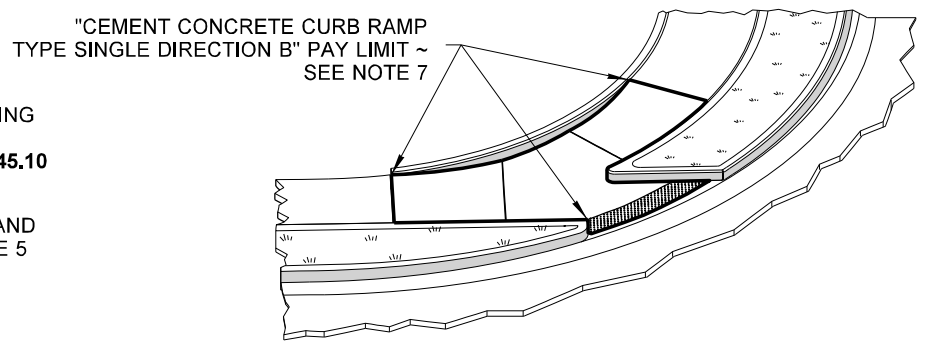
(ALONG INSIDE RADIUS AT BACK OF WALKWAY)



ISOMETRIC VIEW
TYPE SINGLE DIRECTION A
PAY LIMIT



DETAIL (C)



ISOMETRIC VIEW
TYPE SINGLE DIRECTION B
PAY LIMIT

NOTES

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

LEGEND

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

R. SCOTT ZELLER
STATE OF WASHINGTON
28680
REGISTERED
PROFESSIONAL ENGINEER

Zeller, Scott
Jun 24 2016 7:21 AM

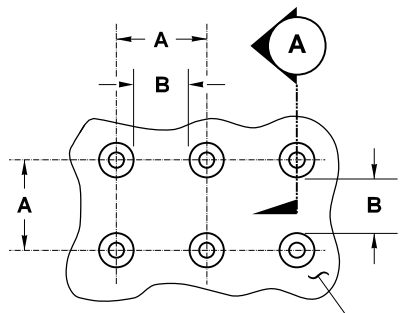
SINGLE DIRECTION CURB RAMP

STANDARD PLAN F-40.16-03

SHEET 1 OF 1 SHEET

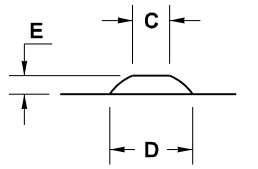
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jun 29 2016 2:29 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: F
ERN LIDDELL



TRUNCATED DOME SPACING
SEE NOTE 3

SEE STANDARD SPECIFICATIONS FOR COLOR OF SURFACE

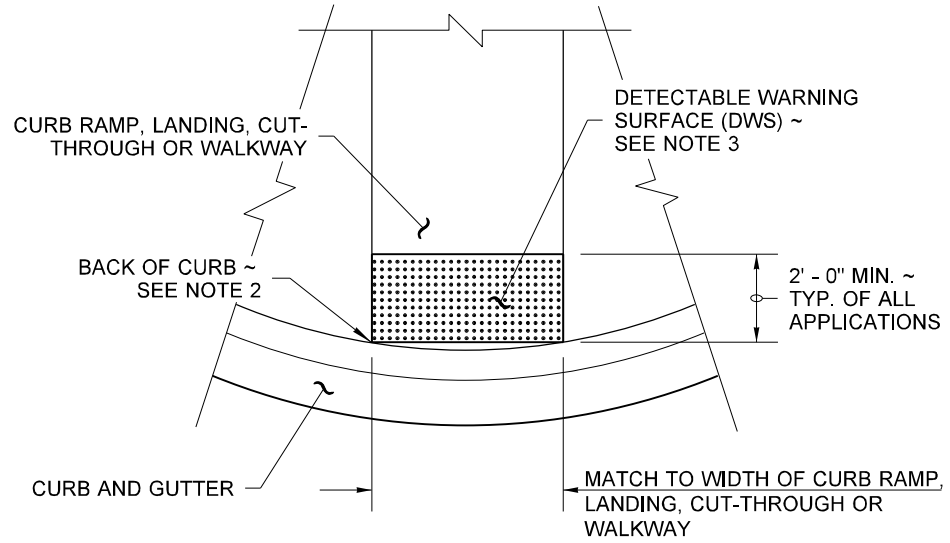


TRUNCATED DOME

SECTION (A)

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

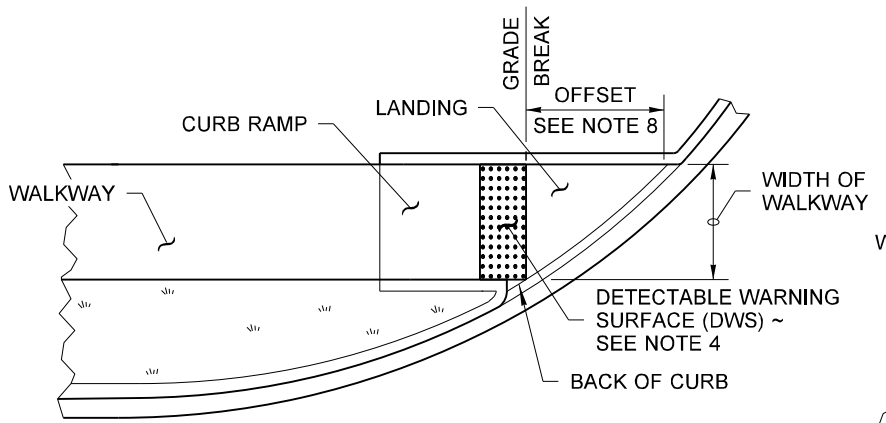
TRUNCATED DOME DETAILS



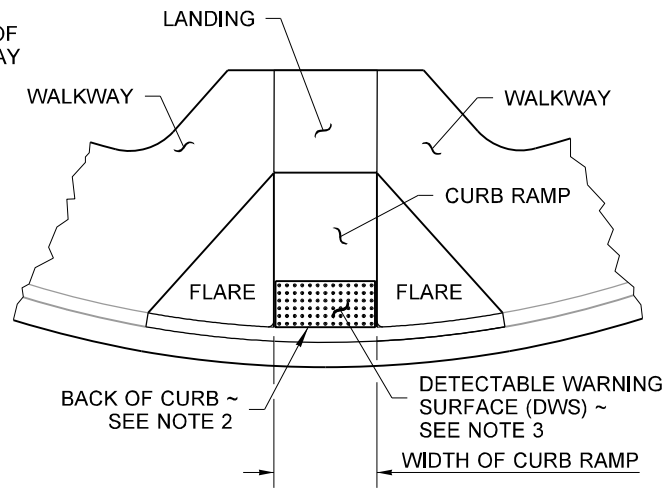
DETECTABLE WARNING SURFACE DETAIL

NOTES

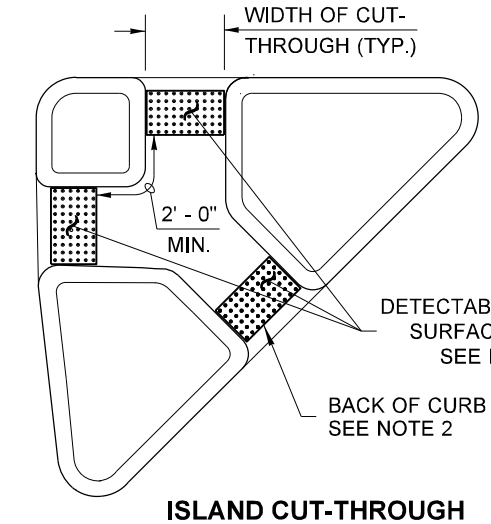
1. The Detectable Warning Surface (DWS) shall extend the full width of the curb ramp, landing, or other roadway entrance as applicable. Exception: If the Manufacturer of the DWS requires a concrete border around the DWS, a variance of up to 2 inches on each side of the DWS is permitted.
2. The Detectable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



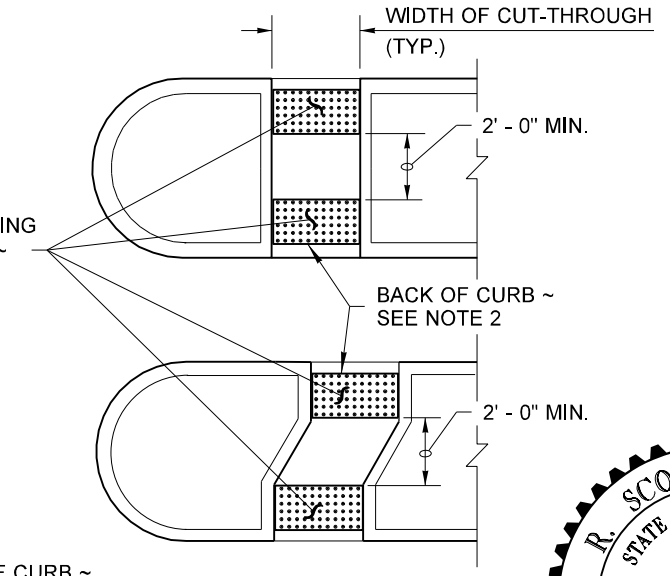
SINGLE DIRECTION CURB RAMP
(GRADE BREAK BETWEEN CURB AND LANDING ≤ 5 FT. FROM BACK OF CURB)
(SEE NOTE 6)



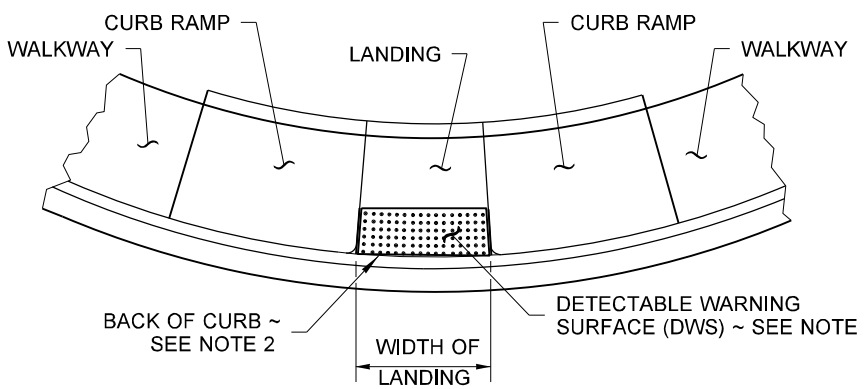
PERPENDICULAR CURB RAMP
(SEE NOTE 6)



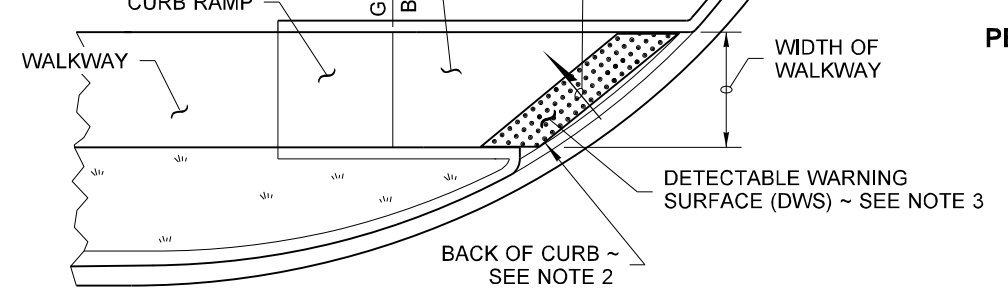
ISLAND CUT-THROUGH



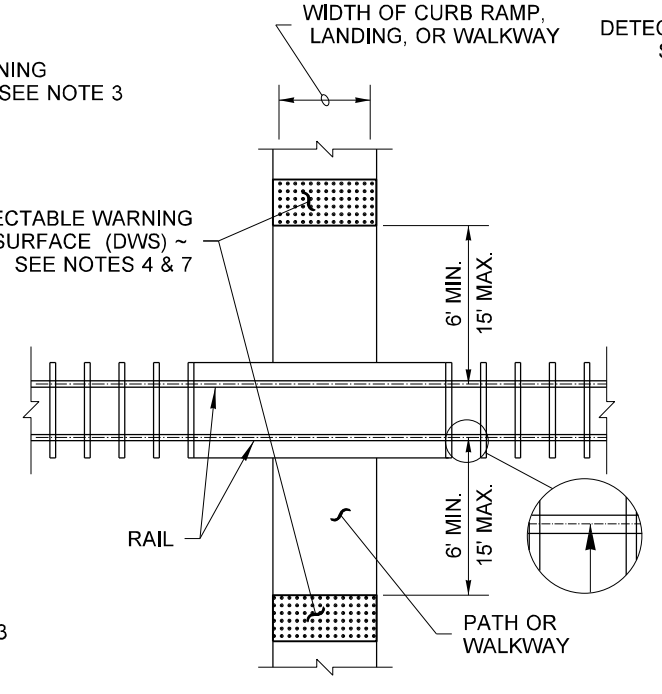
MEDIAN CUT-THROUGH



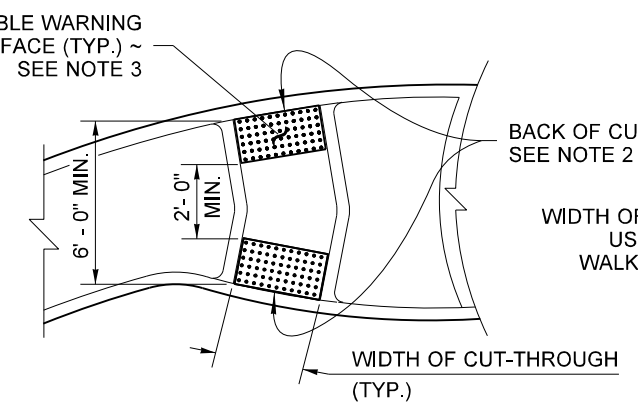
PARALLEL CURB RAMP
(SEE NOTE 6)



SINGLE DIRECTION CURB RAMP
(GRADE BREAK BETWEEN CURB AND LANDING > 5 FT. FROM BACK OF CURB)
(SEE NOTE 6)

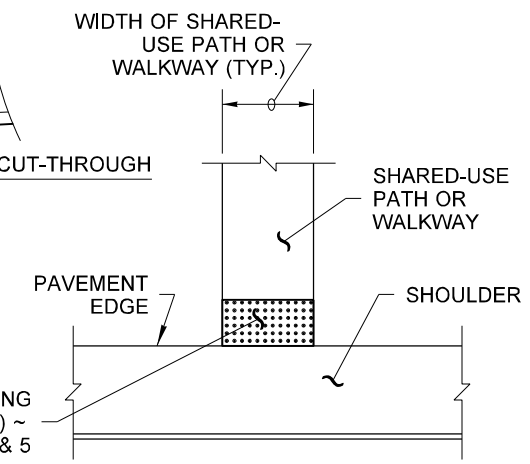


PEDESTRIAN RAILROAD CROSSING



ROUNDABOUT SPLITTER ISLAND

PLACEMENT GUIDELINES



SHARED-USE PATH CONNECTION

R. SCOTT ZELLER
STATE OF WASHINGTON
28680
REGISTERED
PROFESSIONAL ENGINEER

Zeller, Scott
Jul 12 2016 4:25 PM

DETECTABLE WARNING SURFACE

STANDARD PLAN F-45.10-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 15 2016 2:26 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

SUPPLEMENTAL TO STANDARD PLANS
F-40.12-03, F40.14-03, F40.15-04, F40.16-03

Modify the Standard Plan as follows:

Notes:

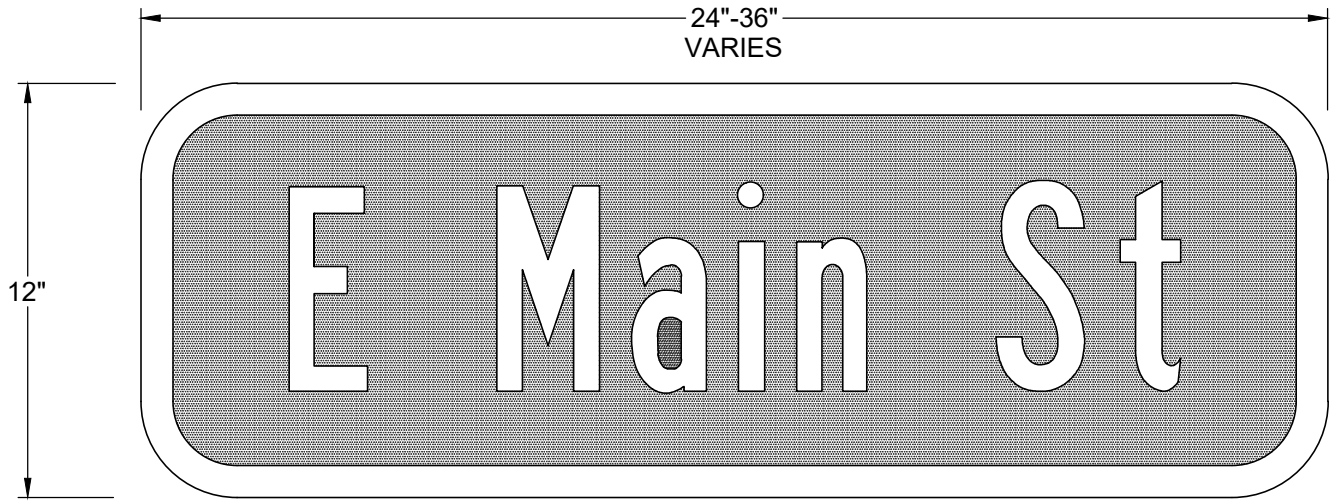
1. Construct a 4" thick layer of compacted CSTC under all concrete.

2. Delete reference to expansion joints in the Standard Plan. Where expansion joints are shown on the Standard Plan construct a contraction joint, except where the new concrete abuts existing construct a construction joint.

3. A raised edge per WSDOT Standard Plan F-30.10-03 may be constructed instead of pedestrian curb.

4. The depressed curb and gutter abutting the width of the curb ramp shall have 0" height.

5. Pay limits for curb ramps are modified to include the pedestrian curb/raised edge, where shown in the plans. The measurement of the area of pedestrian curb/raised edge included in the pay limits will be limited to the surface area of the top of the pedestrian curb/raised edge. Modify note 6 to delete "Pedestrian Curb".

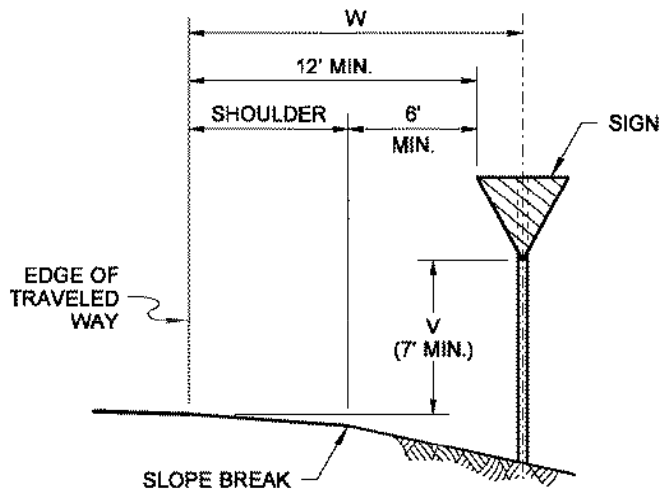


NOTES:

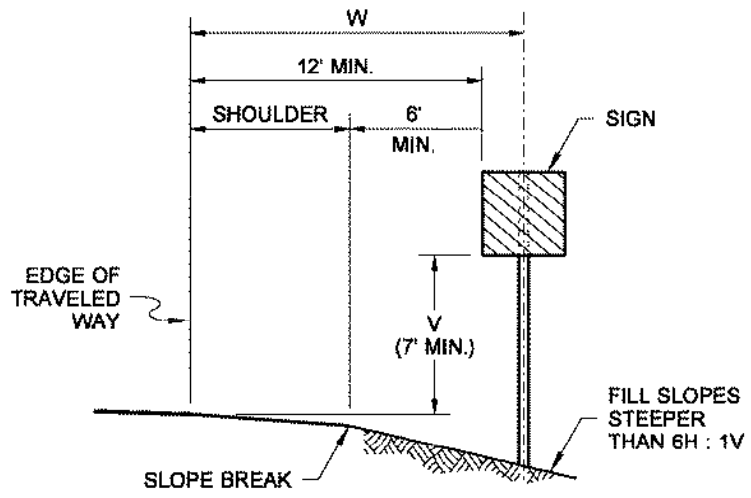
1. SIGNS SHALL COMPLY WITH MUTCD W16-8P AND W16-8aP. THE LENGTH OF THE SIGN WILL DEPEND ON THE LENGTH OF THE STREET NAME.
2. SHEETING SHALL BE HIGH INTENSITY GRADE.
3. LETTERING SHALL BE WHITE AND BACKGROUND SHALL BE GREEN. LETTERING AND BACKGROUND SHALL BE HIGH INTENSITY OR BETTER.
4. MOUNT ON TYPE ST-2 SIGN SUPPORT PER WSDOT STANDARD PLAN G-24.50-05.

N.T.S.

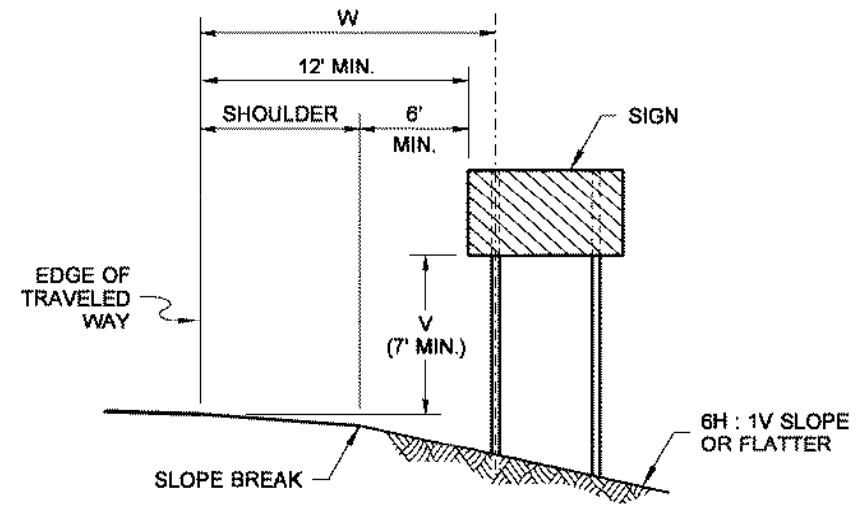
Kelso WASHINGTON	**STREET NAME SIGN**	STANDARD PLAN NO. **KTR-010-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**



SIGN INSTALLATION IN FILL SECTION



SIGN INSTALLATION ON STEEP FILL SLOPES

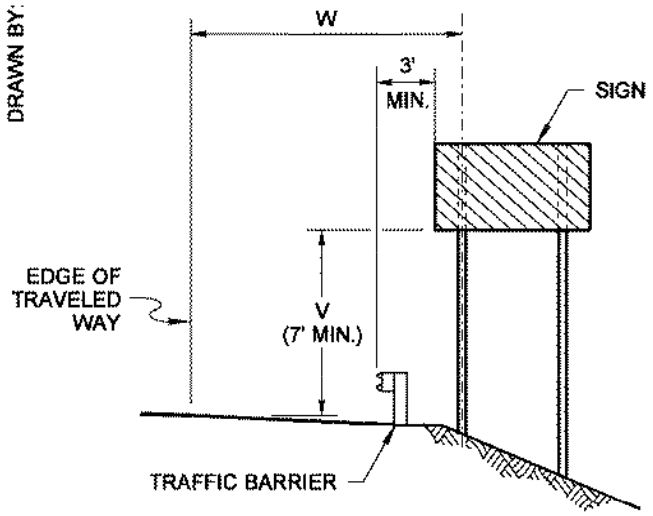


MULTIPLE SIGN POST INSTALLATION IN FILL SECTION

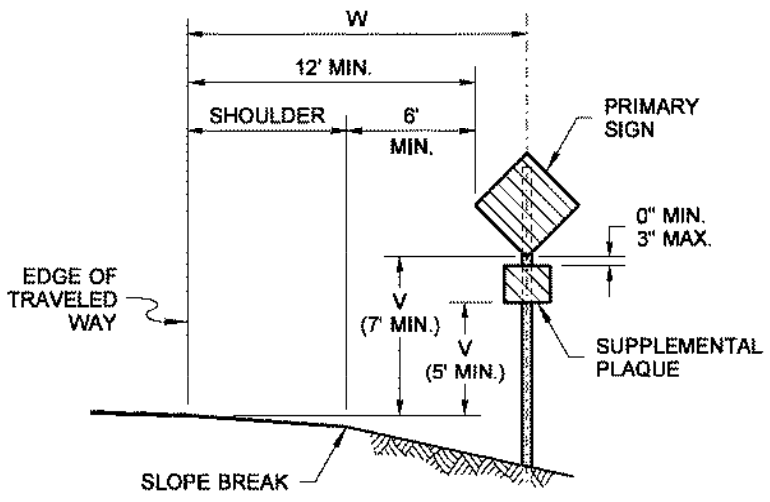
NOTES

1. Refer to the Sign Specification Sheet of the Contract for the 'V' and 'W' distances.
2. The minimum vertical distance from the bottom of the sign to the ground shall not be less than 7' (ft) for signs located within the Design Clear Zone.

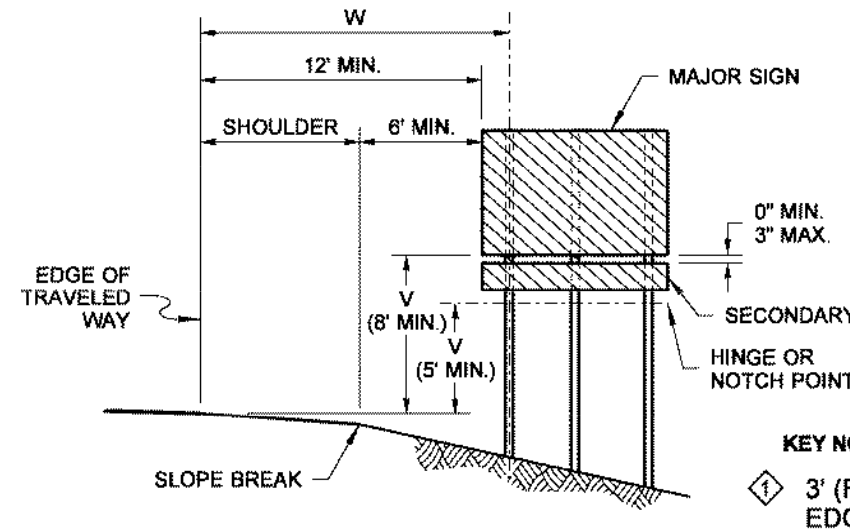
DRAWN BY: FERN LIDDELL



SIGN INSTALLATION BEHIND TRAFFIC BARRIER



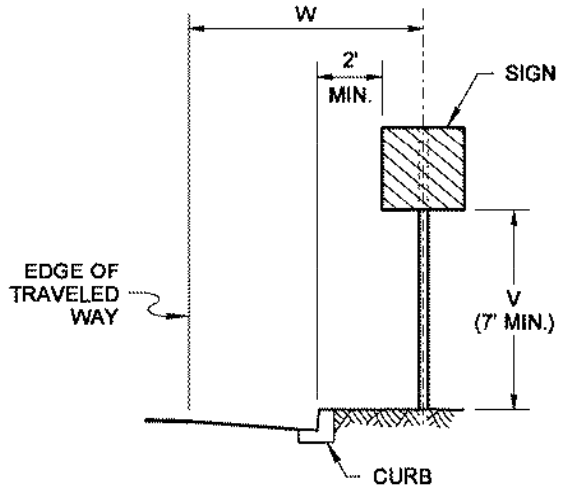
SIGN WITH SUPPLEMENTAL PLAQUE INSTALLATION IN FILL SECTION



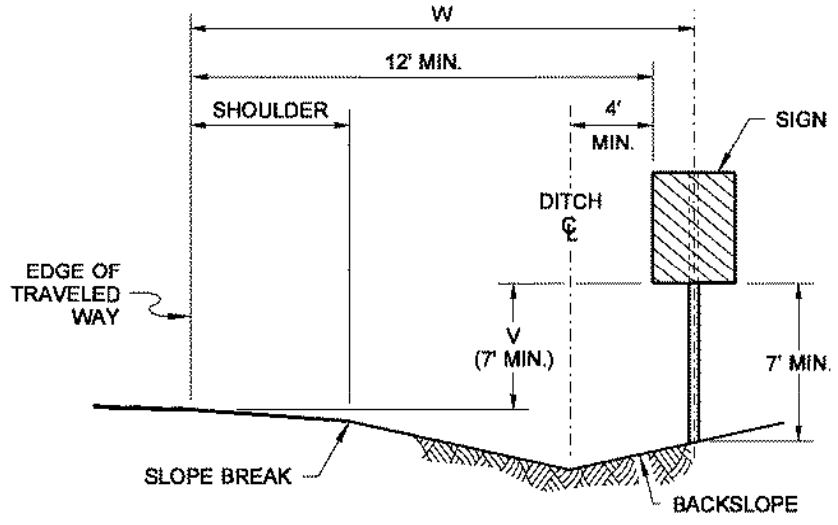
KEY NOTE

① 3' (FT) MIN. FROM ANY POINT ALONG BOTTOM EDGE OF SIGN PANEL TO THE GROUND

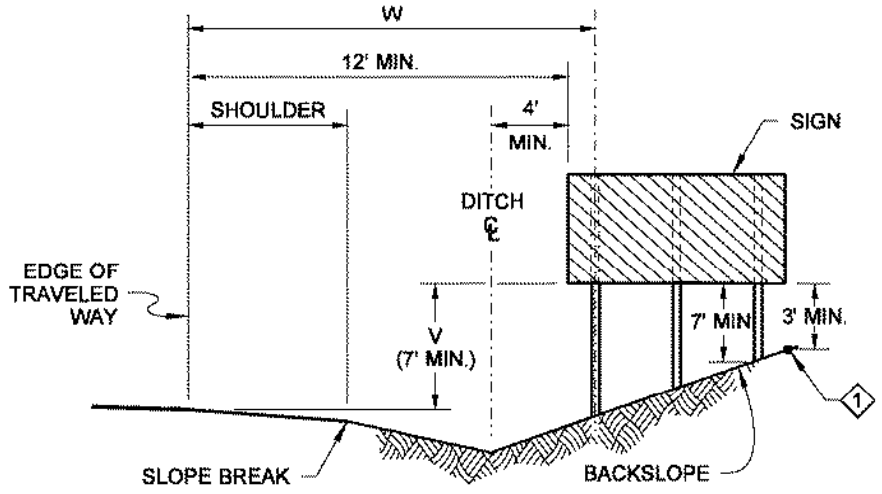
GUIDE OR DIRECTIONAL SIGN WITH SECONDARY SIGN INSTALLATION ON EXPRESSWAYS AND FREEWAYS



SIGN INSTALLATION IN CURB SECTION



SIGN INSTALLATION IN DITCH SECTION



MULTIPLE SIGN POST INSTALLATION IN DITCH SECTION

JOHN C. NISBET
STATE OF WASHINGTON
29115
REGISTERED
PROFESSIONAL ENGINEER

Nisbet, John
Jun 22 2015 9:43 AM
cosign

GROUND-MOUNTED SIGN PLACEMENT

STANDARD PLAN G-20.10-02

SHEET 1 OF 1 SHEET

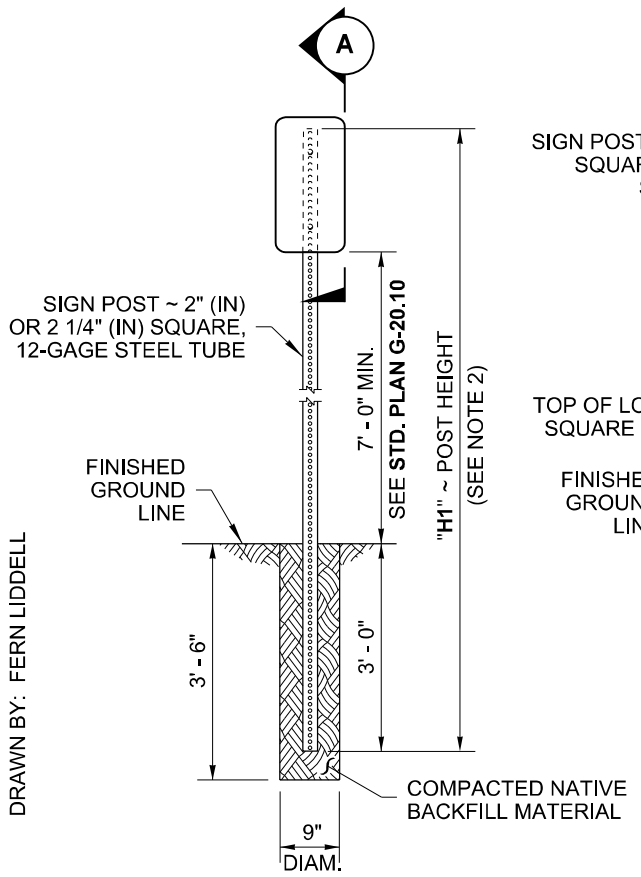
APPROVED FOR PUBLICATION
Jun 23 2015 7:35 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
G-20.10-02

Modify the Standard Plan as follows:

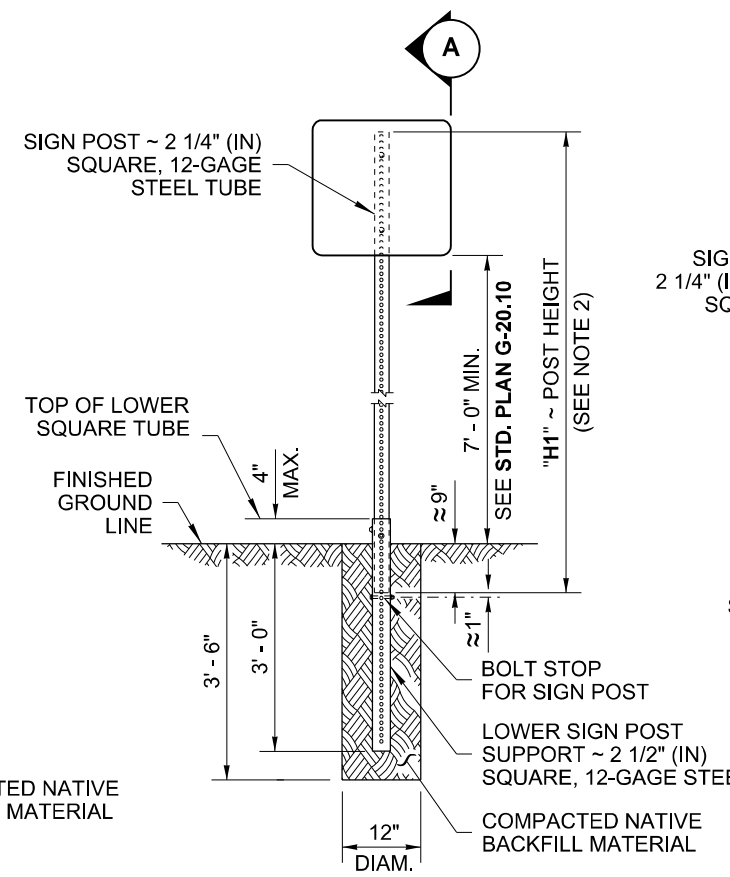
Notes:

1. Delete the "7' min" dimension, where shown, to the bottom of the signs and replace it with "7'0" min to 8'0" max".



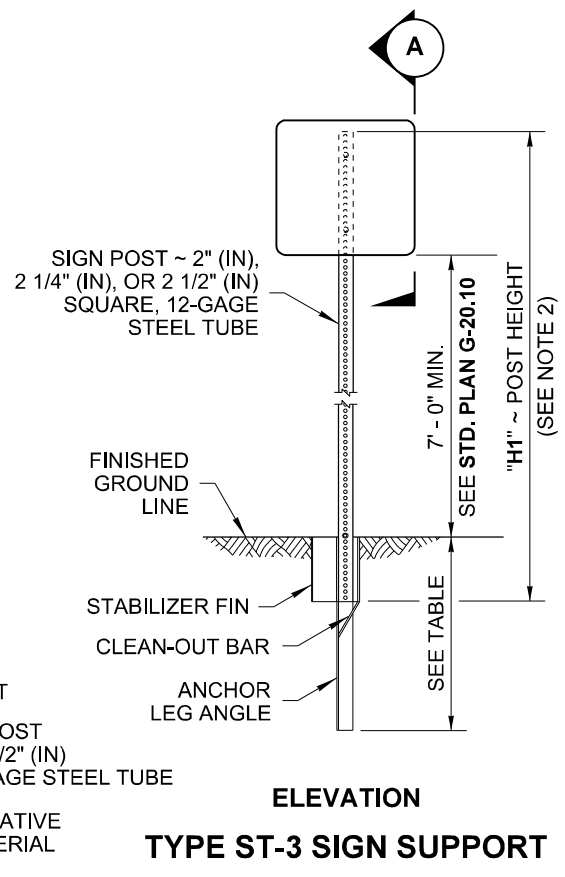
ELEVATION

TYPE ST-1 SIGN SUPPORT



ELEVATION

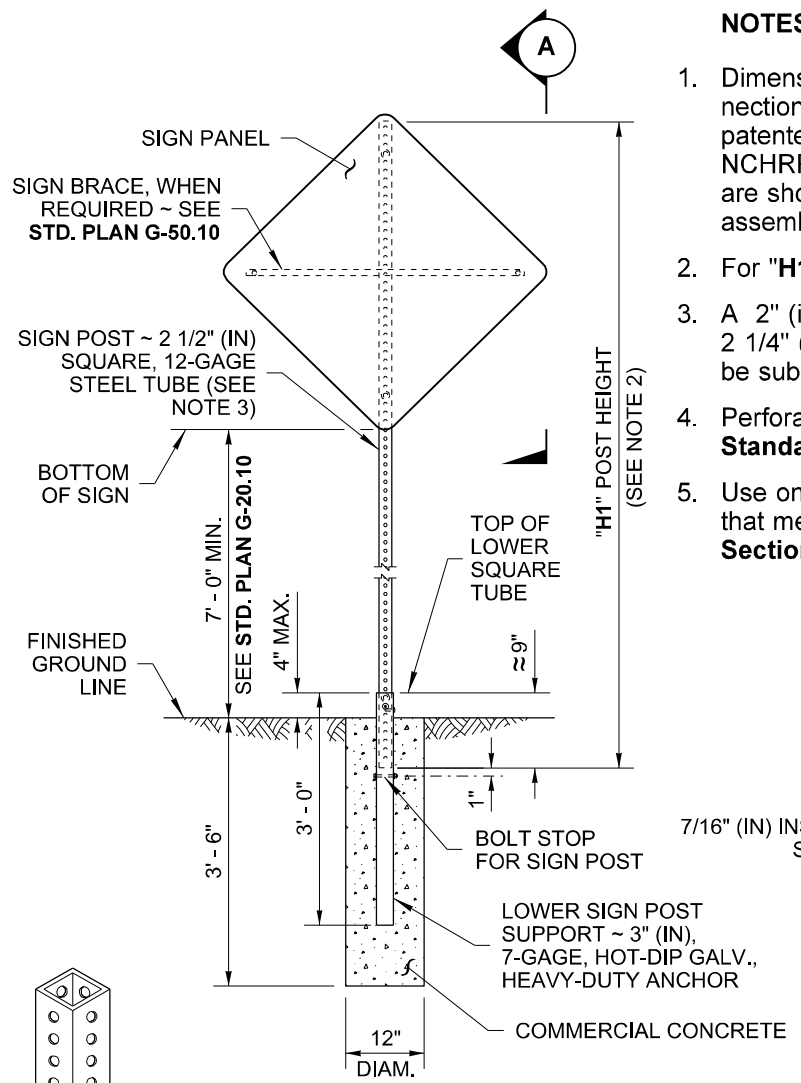
TYPE ST-2 SIGN SUPPORT



ELEVATION

TYPE ST-3 SIGN SUPPORT

BURIED DEPTH	POST SIZE
2' - 6"	2", 2 1/4"
3' - 0"	2 1/2"

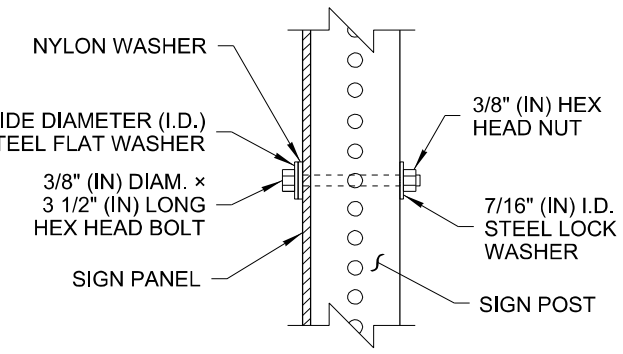


ELEVATION

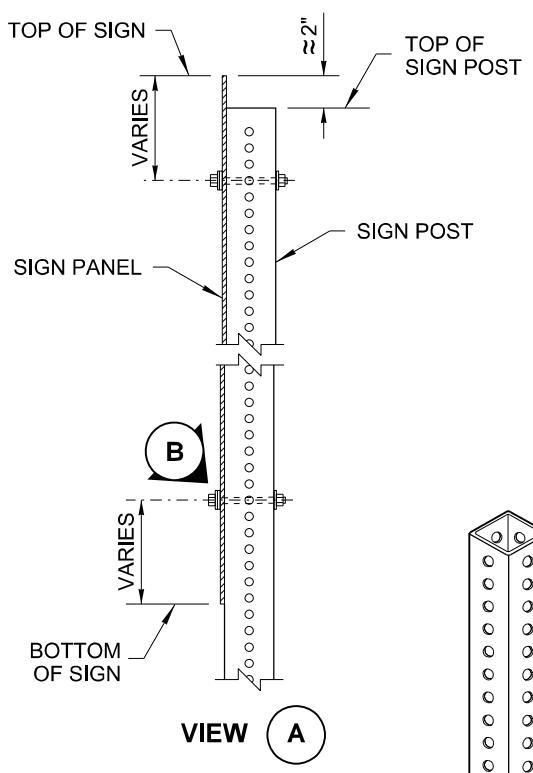
TYPE ST-4 SIGN SUPPORT

NOTES

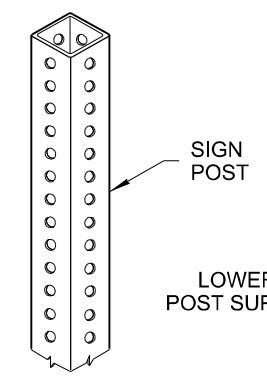
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are shown on this plan only to illustrate how the parts are assembled.
2. For "**H1**", refer to the Sign Specification Sheet in the Contract.
3. A 2" (in) post with a 2 1/4" (in) PSST anchor or a 2 1/4" (in) post with a 2 1/2" (in) PSST anchor may be substituted. See Contract Plans.
4. Perforated square steel post shall meet the requirements of **Standard Specification, Section 9-06**.
5. Use only base connection manufacturer supplied hardware that meets the requirements of **Standard Specification**, **Sections 9-06** and **9-28**.



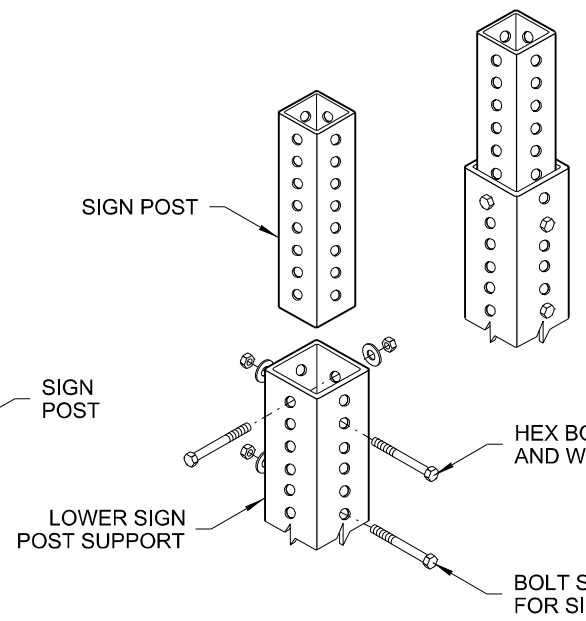
DETAIL B



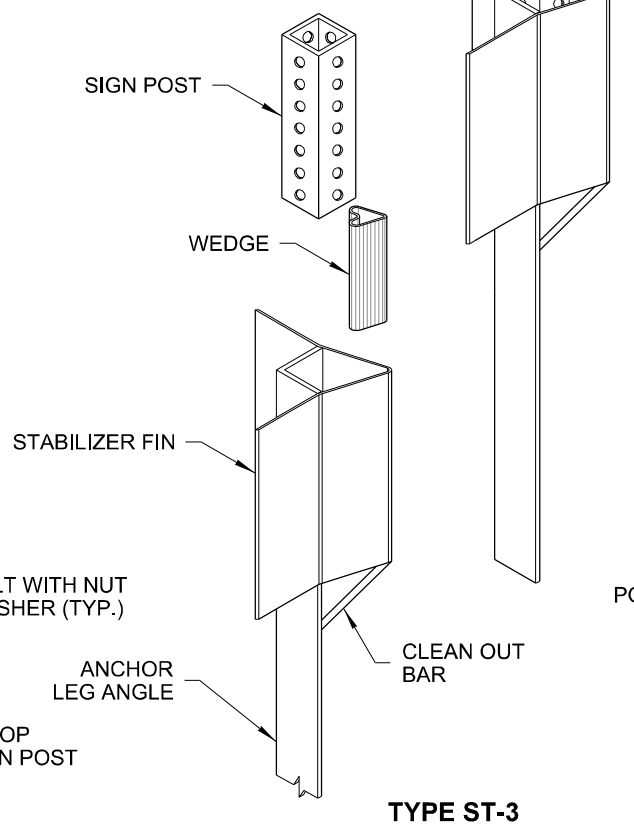
VIEW A



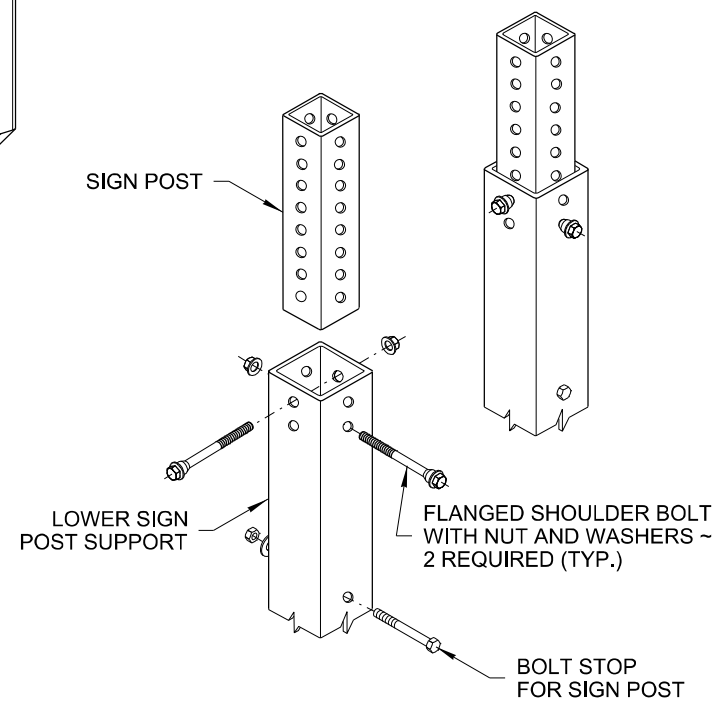
TYPE ST-1



TYPE ST-2



TYPE ST-3



TYPE ST-4

DRAWN BY: FERN LIDDELL

JOHN C. NISBET
STATE OF WASHINGTON
29115
REGISTERED
PROFESSIONAL ENGINEER

Nisbet, John
Aug 5 2019 1:46 PM

STEEL SIGN SUPPORT TYPES ST-1 - ST-4 INSTALLATION DETAILS STANDARD PLAN G-24.50-05

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Roark, Steve
Aug 7 2019 11:54 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
G-24.50-05

Modify the Standard Plan as follows:

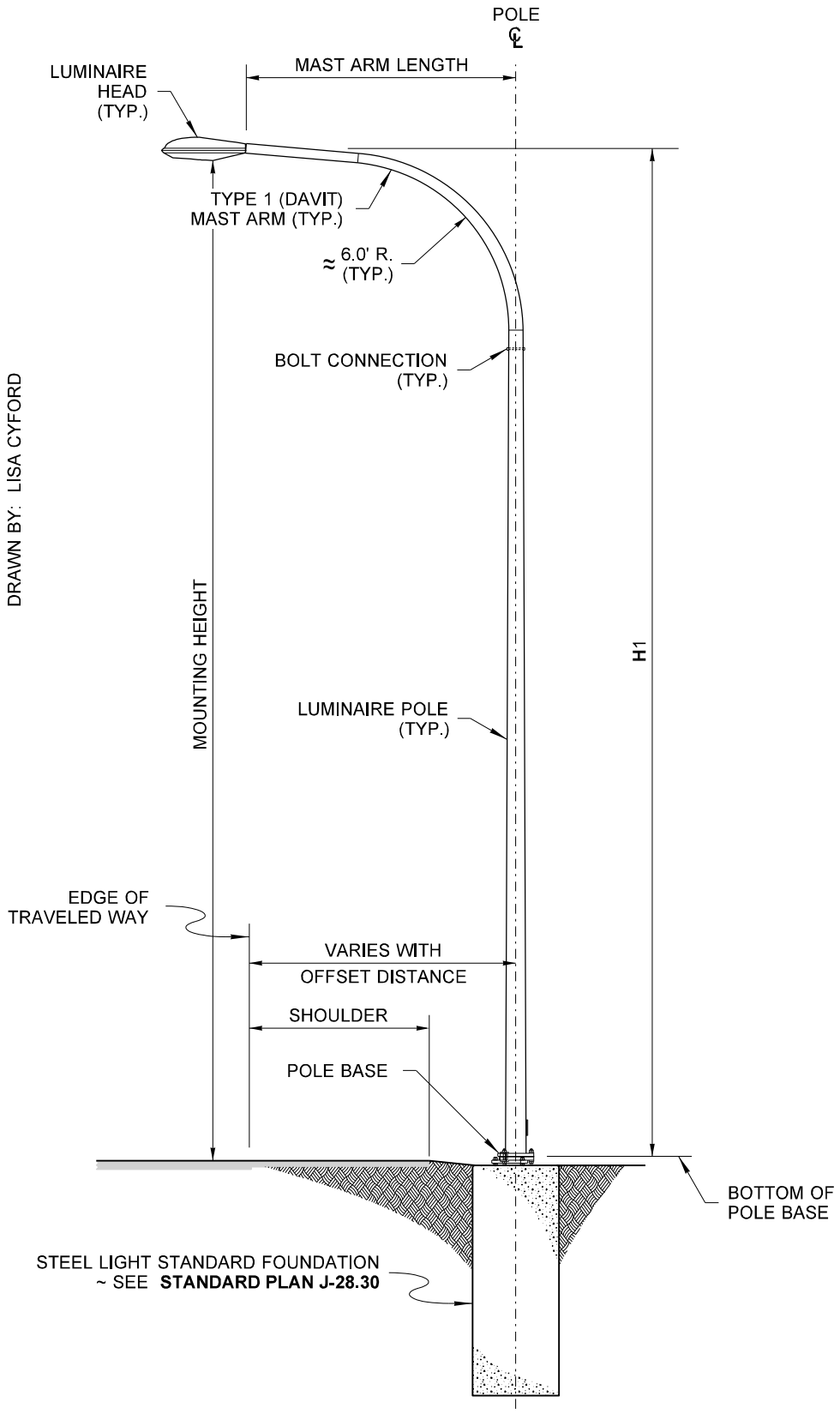
Notes:

1. Type ST-2 Sign Support with 2" square PSST and 2 1/4" Lower Sign Post Support shall be used.

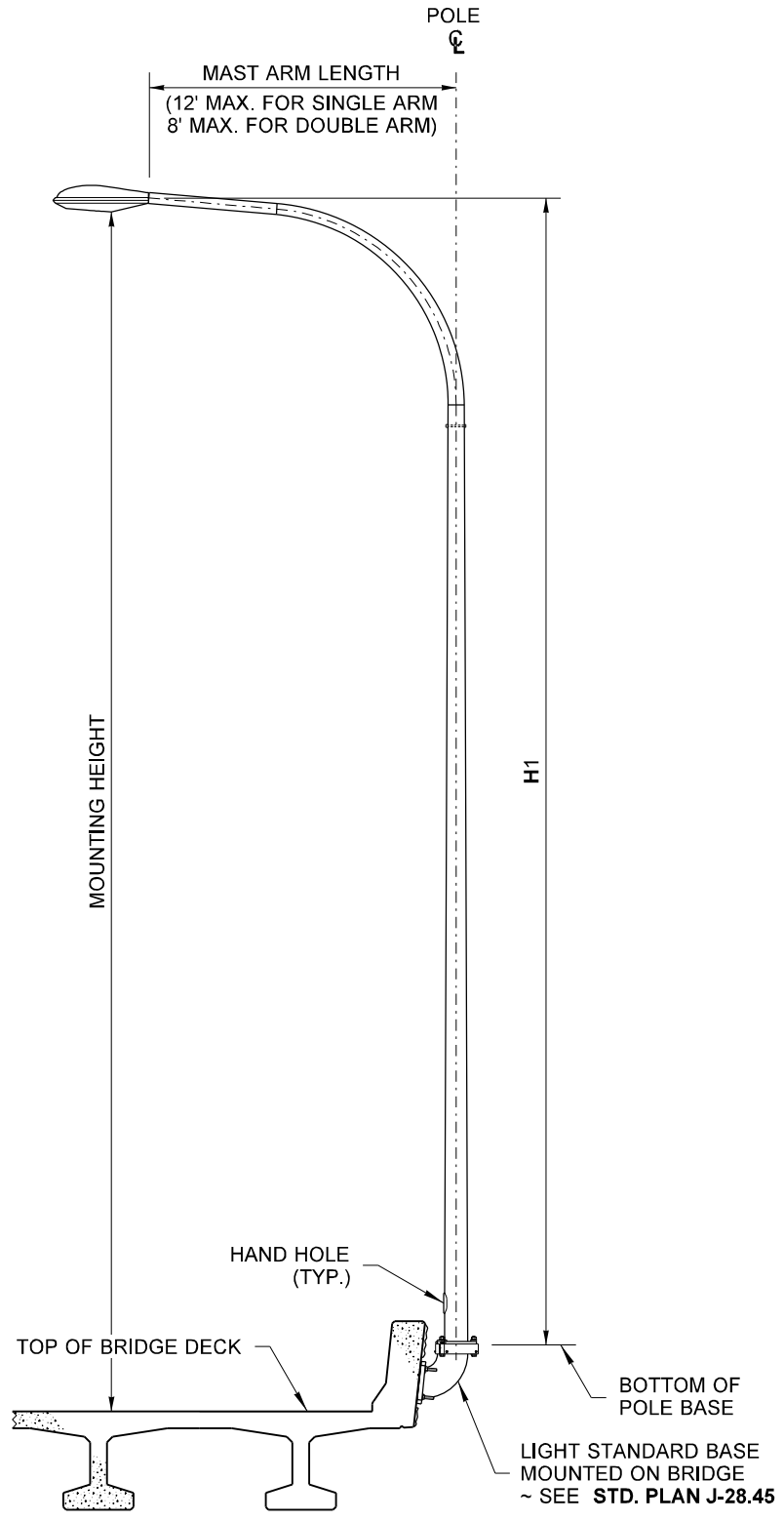
2. Where shown on the plans, signs shall be mounted with a surface mount base anchor. The base anchor shall be perforated 12 gauge galvanized steel with minimum base dimensions of 7"x7", and with a square sign post support stem height of 8" or greater. The base anchor stem shall be perforated with perforation size and spacing matching the post.

3. Delete the "7' min" dimension, where shown, to the bottom of the signs and replace it with "7'0" min to 8'0" max".

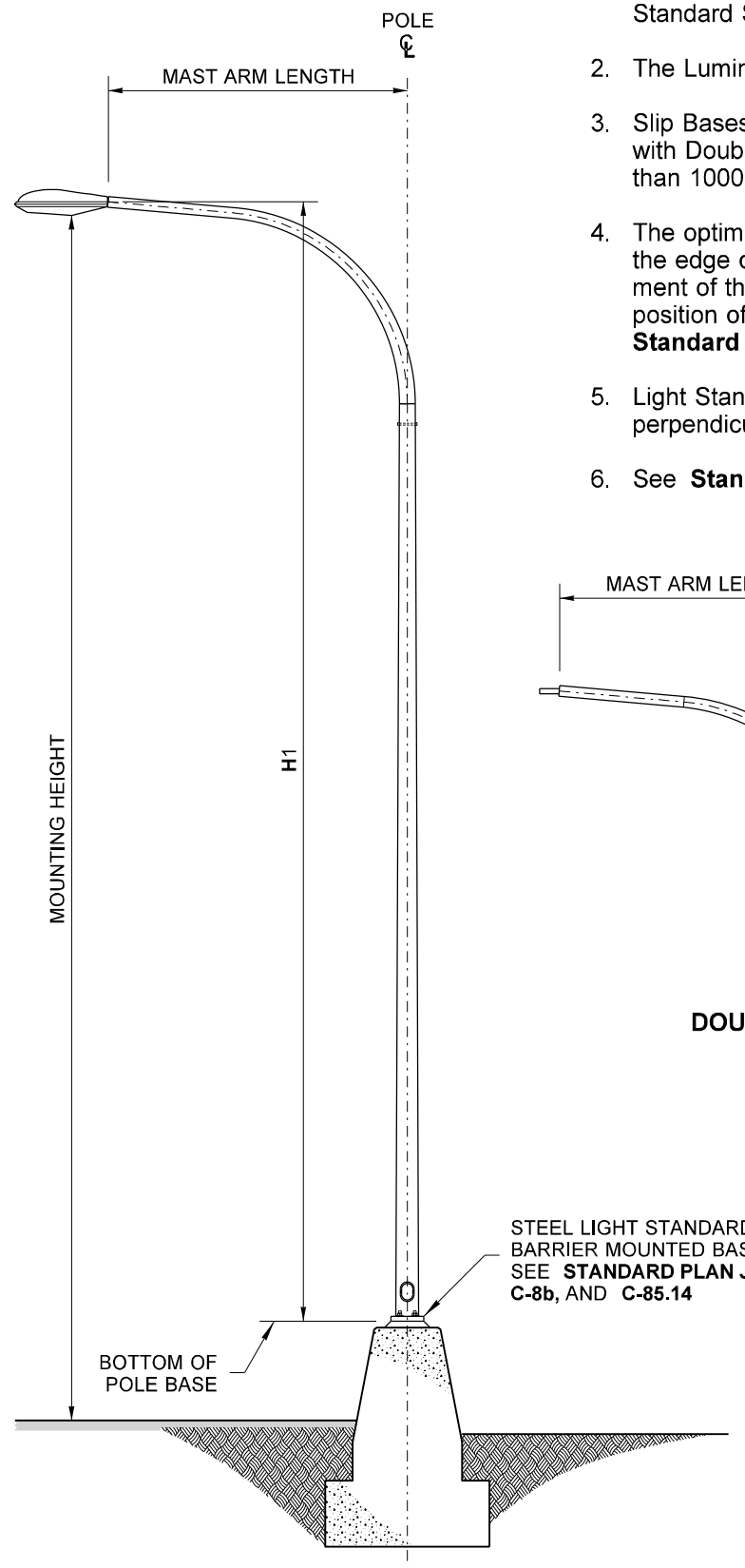
DRAWN BY: LISA CYFORD



STANDARD GROUND MOUNT
(SLIP BASE SHOWN)



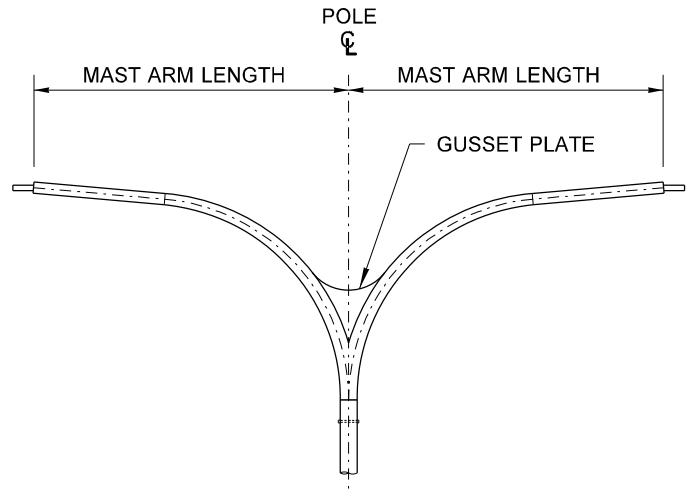
BARRIER ELBOW MOUNT
(BRIDGE BARRIER SHOWN)



TOP OF BARRIER MOUNT

NOTES

1. This plan depicts the Steel Light Standard types and terms commonly referred to in the Contract. All Steel Light Standards are fabricated in accordance with the Standard Specifications and the Contract Provisions.
2. The Luminaire Pole height shall not exceed 50' (ft)(H1).
3. Slip Bases shall not be installed on 50' (ft)(H1) poles with Double Mast Arms, nor on poles weighing more than 1000 lbs.
4. The optimal location of the Luminaire head is over the edge of the traveled way. Based on the placement of the Steel Light Standard foundation, the position of the Luminaire head may vary. See **Standard Plan J-28.22**.
5. Light Standard mast arm orientation is typically perpendicular to roadway centerline.
6. See **Standard Plan J-28.50** for Hand Hole details.



DOUBLE TYPE 1 MAST ARM

WILLIAM FLINT JACKSON
STATE OF WASHINGTON
48821
REGISTERED
PROFESSIONAL ENGINEER

Jackson, Flint
Jul 31 2019 4:13 PM
cosign

STEEL LIGHT STANDARD

STANDARD PLAN J-28.10-02

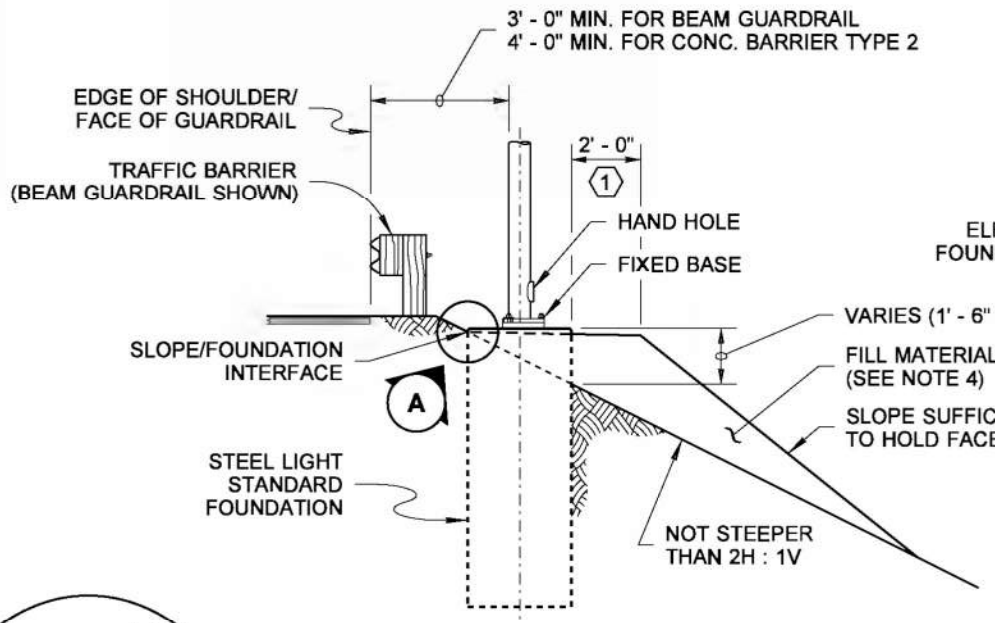
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Roark, Steve
Aug 7 2019 11:54 AM
cosign
STATE DESIGN ENGINEER

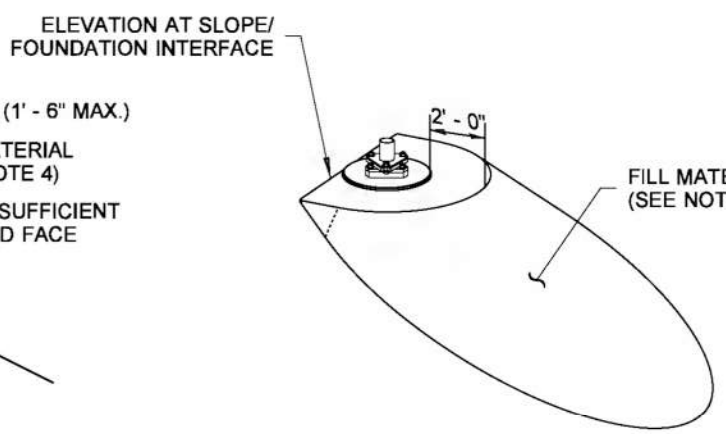
Washington State Department of Transportation

DRAWN BY: COLBY FLETCHER

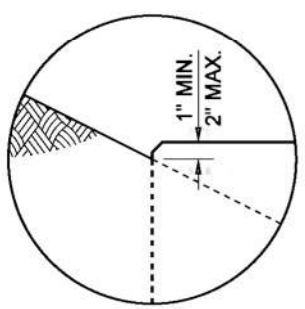
MAXIMUM CONCRETE EXPOSURE TABLE (CASE F ONLY)	
SLOPE	**HEIGHT (SEE NOTE 3)**
1.75H : 1V	1' - 8 1/2"
1.50H : 1V	2' - 0"
1.25H : 1V	2' - 4 3/4"



SECTION VIEW



PERSPECTIVE VIEW



CASE E

SLOPES 2H : 1V OR FLATTER BEHIND TRAFFIC BARRIER

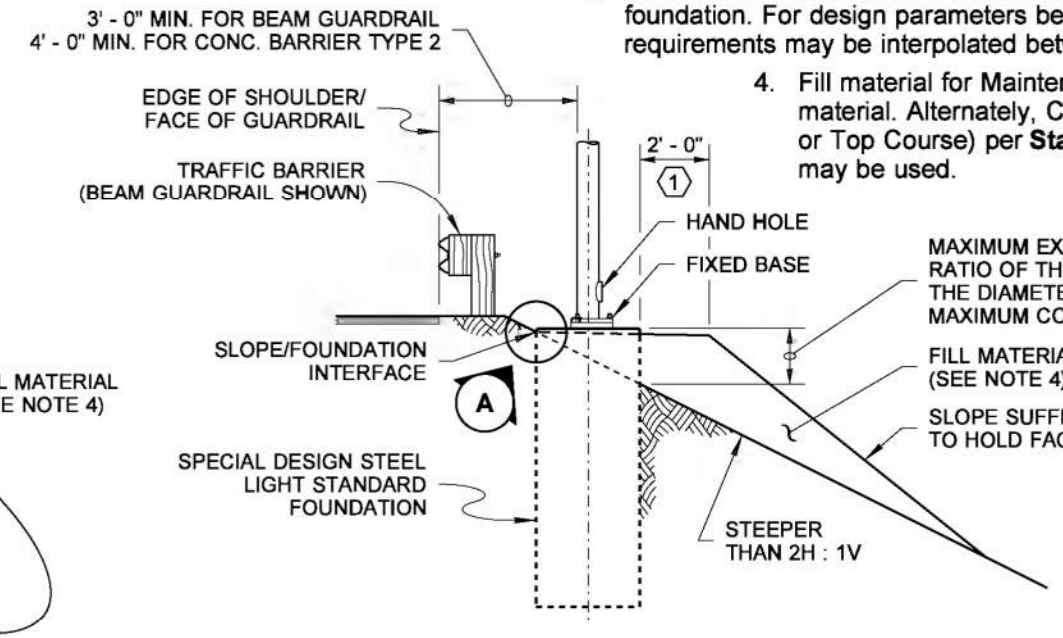
CASE E & CASE F

MAINTENANCE PAD

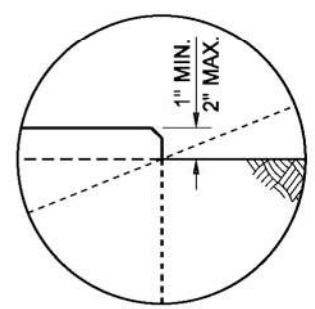
EMBANKMENTS

NOTES

1. See **Standard Plan J-28.30** for foundation details and construction methods.
2. See **Standard Plan J-28.50** for pole base and hand hole details.
3. Values listed in the Table were determined using a 3' - 0" diameter foundation. For design parameters between the values listed, exposure requirements may be interpolated between the values provided.
4. Fill material for Maintenance Pad shall be granular material. Alternately, Crushed Surfacing (Base Course or Top Course) per **Standard Specification 9-03.9(3)** may be used.



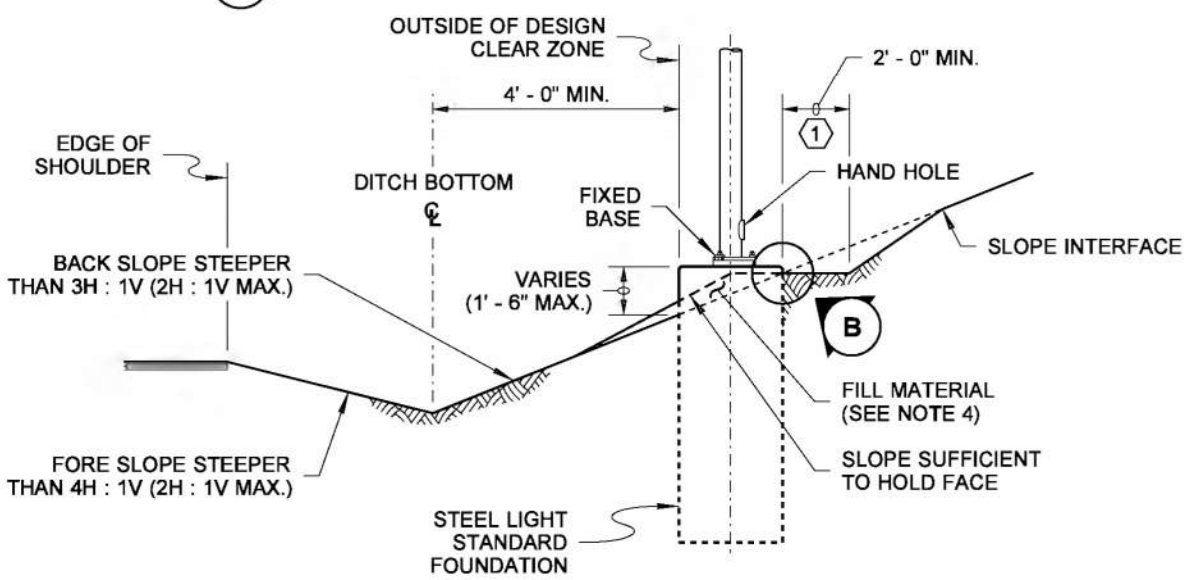
SECTION VIEW



CASE F

SLOPES STEEPER THAN 2H : 1V BEHIND TRAFFIC BARRIER (SPECIAL DESIGN FOUNDATION)

DETAIL A

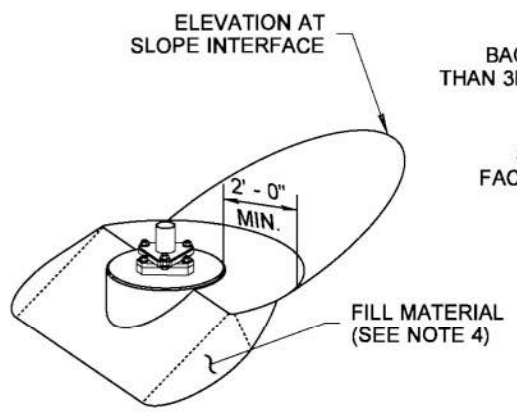


SECTION VIEW

CASE G

ROADSIDE DITCH WITH FORE SLOPE STEEPER THAN 4H : 1V (2H : 1V MAX.)

1 MAINTENANCE PAD ~ SLOPE TO DRAIN AWAY FROM THE FOUNDATION ~ NOT STEEPER THAN 5%



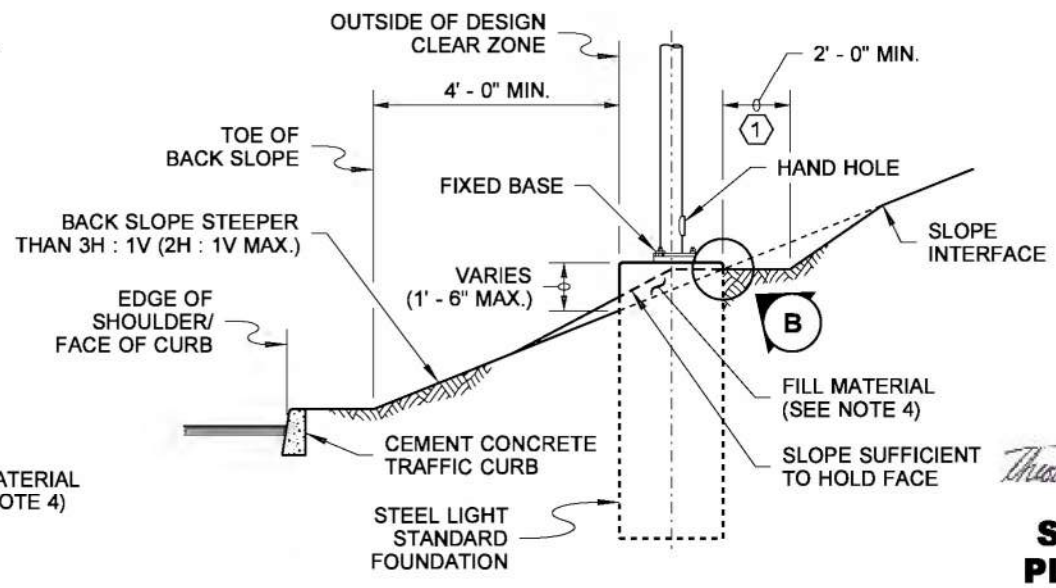
PERSPECTIVE VIEW

CASE G & CASE H

MAINTENANCE PAD

BACK SLOPES

DETAIL B



SECTION VIEW

CASE H

CUT SECTION WITH BACK SLOPE STEEPER THAN 3H : 1V (2H : 1V MAX.)

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
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PROFESSIONAL ENGINEER

Bailey, Ted
May 28 2015 10:11 AM

STEEL LIGHT STANDARD PLACEMENT (FIXED BASE)

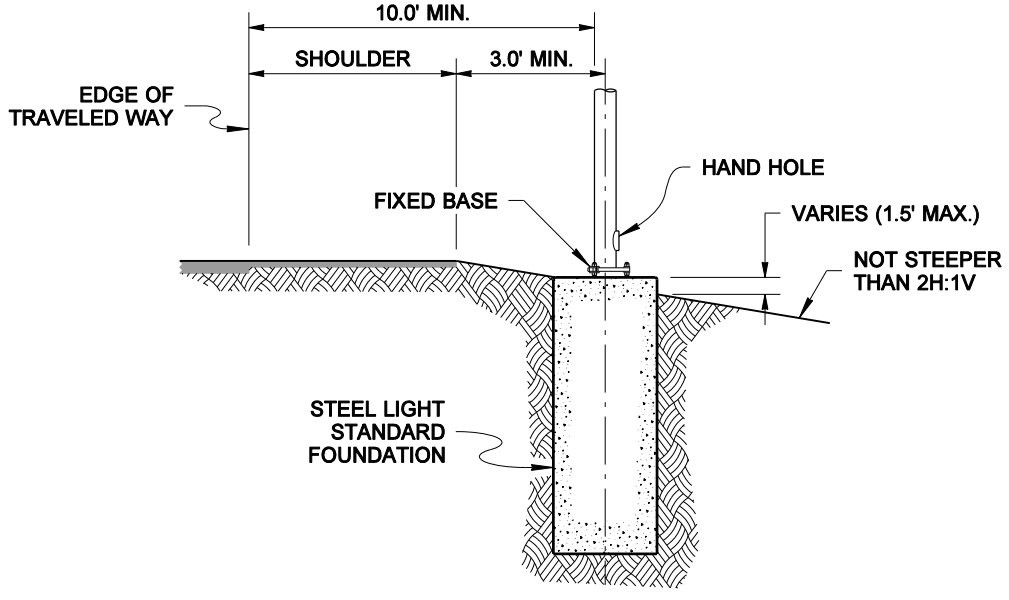
STANDARD PLAN J-28.24-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 3 2015 4:23 PM
STATE DESIGN ENGINEER

Washington State Department of Transportation

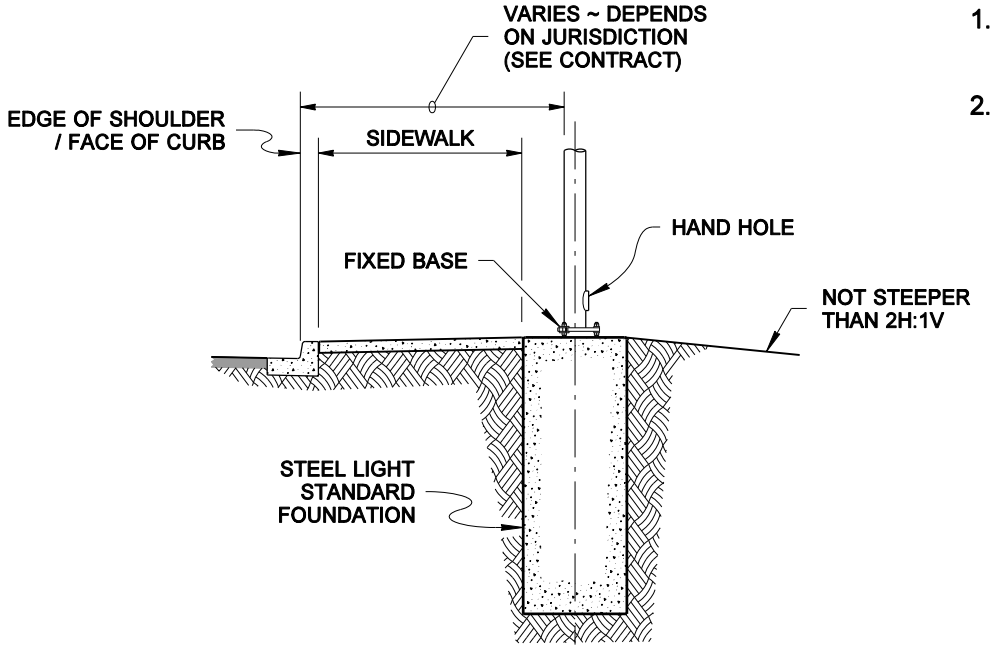
DRAWN BY: BILL BERENS



SECTION VIEW

CASE I

POSTED SPEED LIMIT LESS THAN 35 MPH



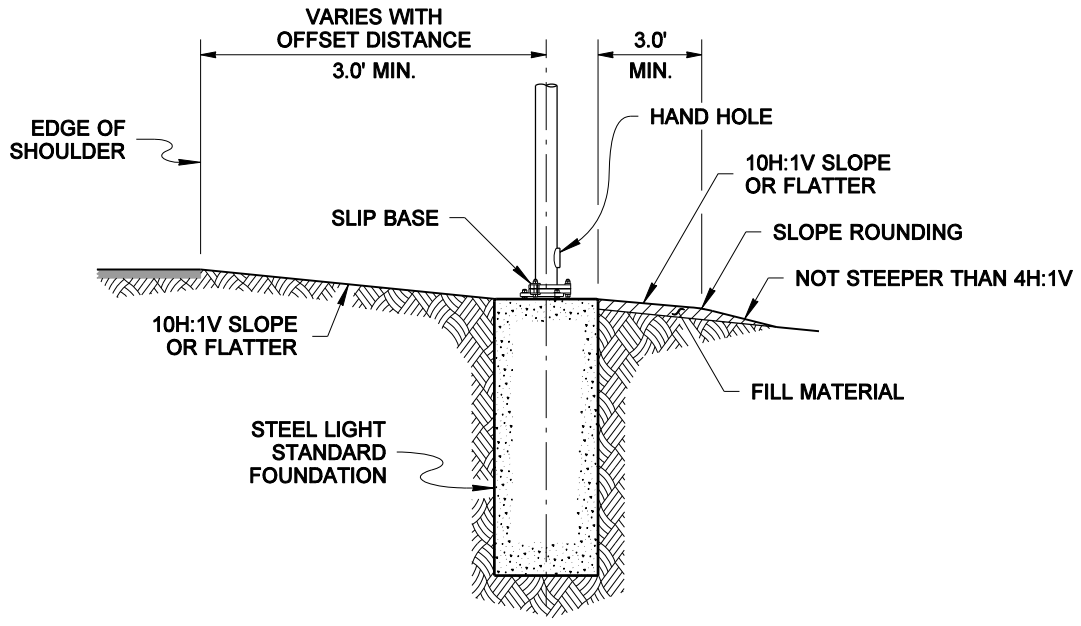
SECTION VIEW

CASE J

POSTED SPEED LIMIT LESS THAN 35 MPH

NOTES

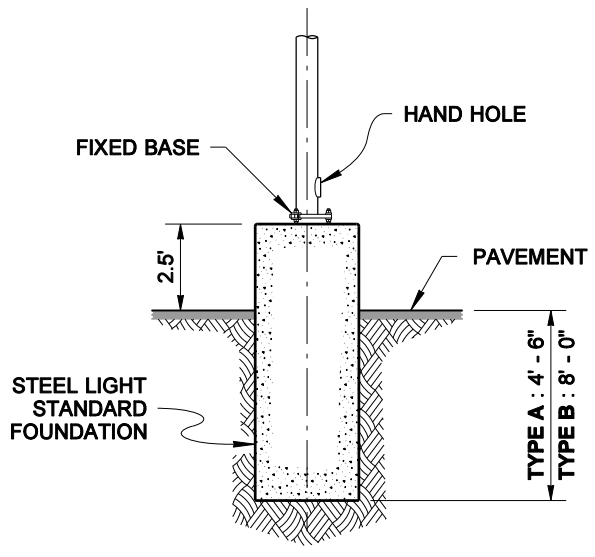
1. See **Standard Plan J-28.30** for foundation details and construction methods.
2. See **Standard Plan J-28.50** for pole base and hand hole details.



SECTION VIEW

CASE K

ROADWAYS WITH 10H:1V OR FLATTER SIDE SLOPES



SECTION VIEW

CASE L

PARKING LOTS

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

STEEL LIGHT STANDARD PLACEMENT MISCELLANEOUS

STANDARD PLAN J-28.26-01

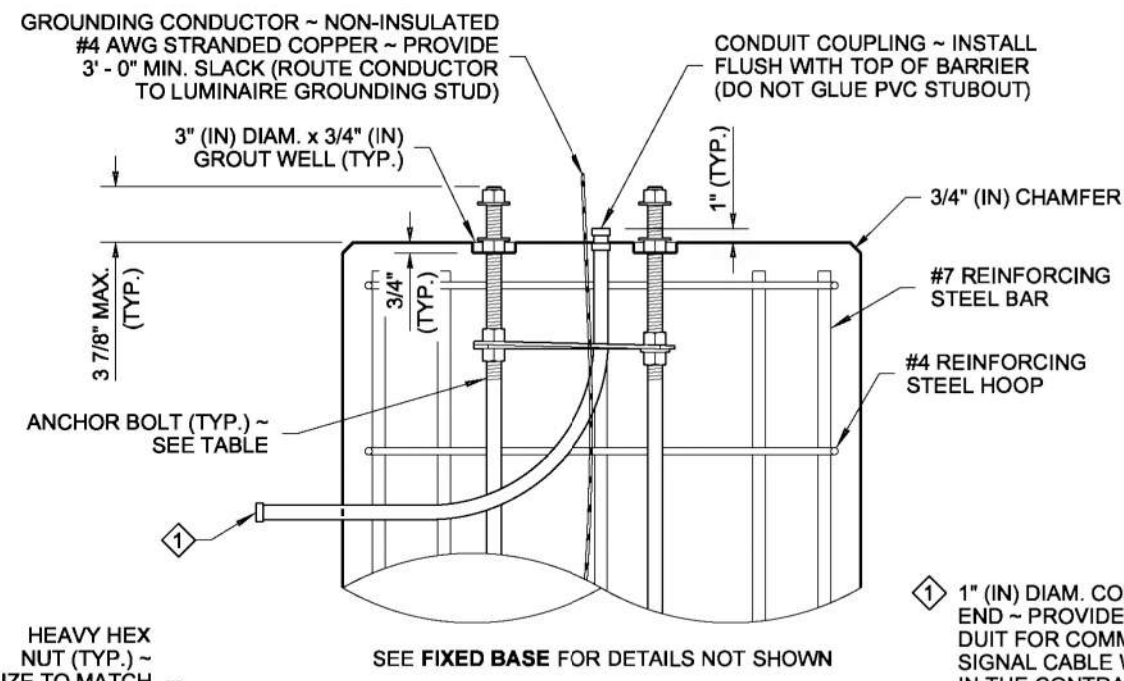
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

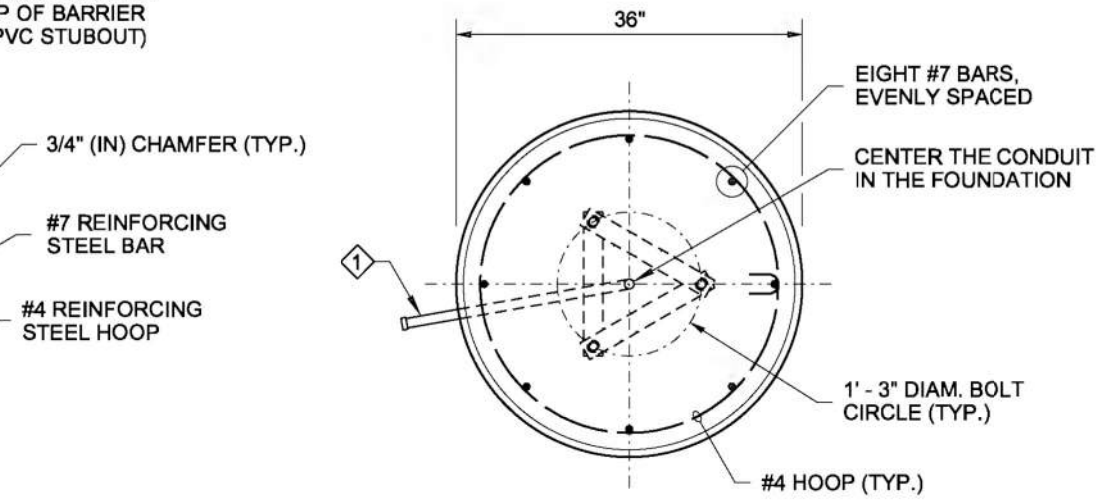
12-02-08 — DATE

Washington State Department of Transportation



PARTIAL ELEVATION VIEW

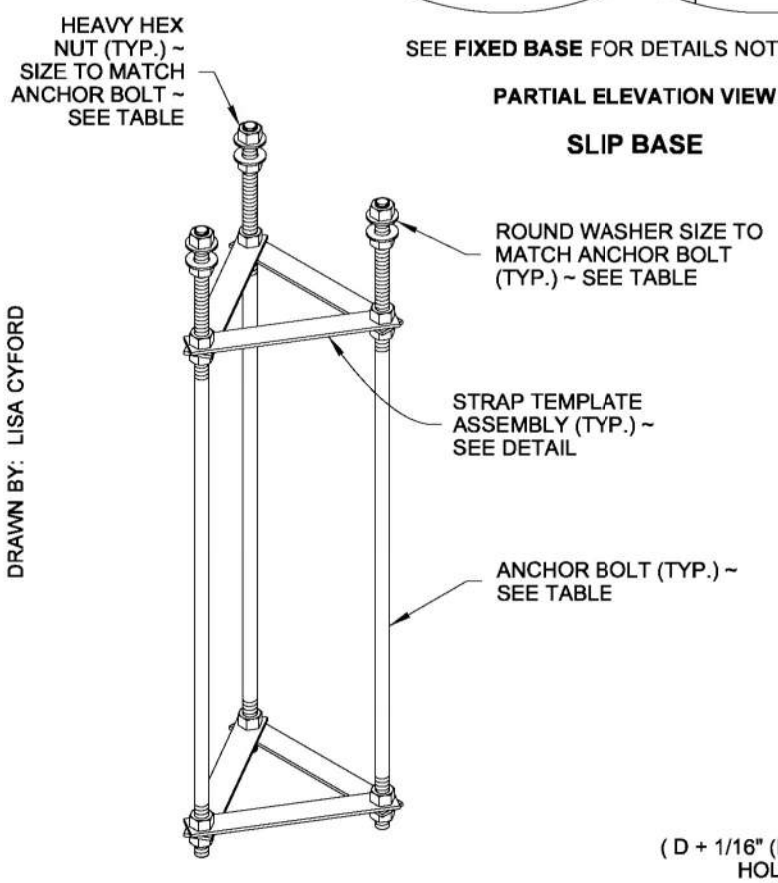
SLIP BASE



TOP VIEW

FIXED BASE

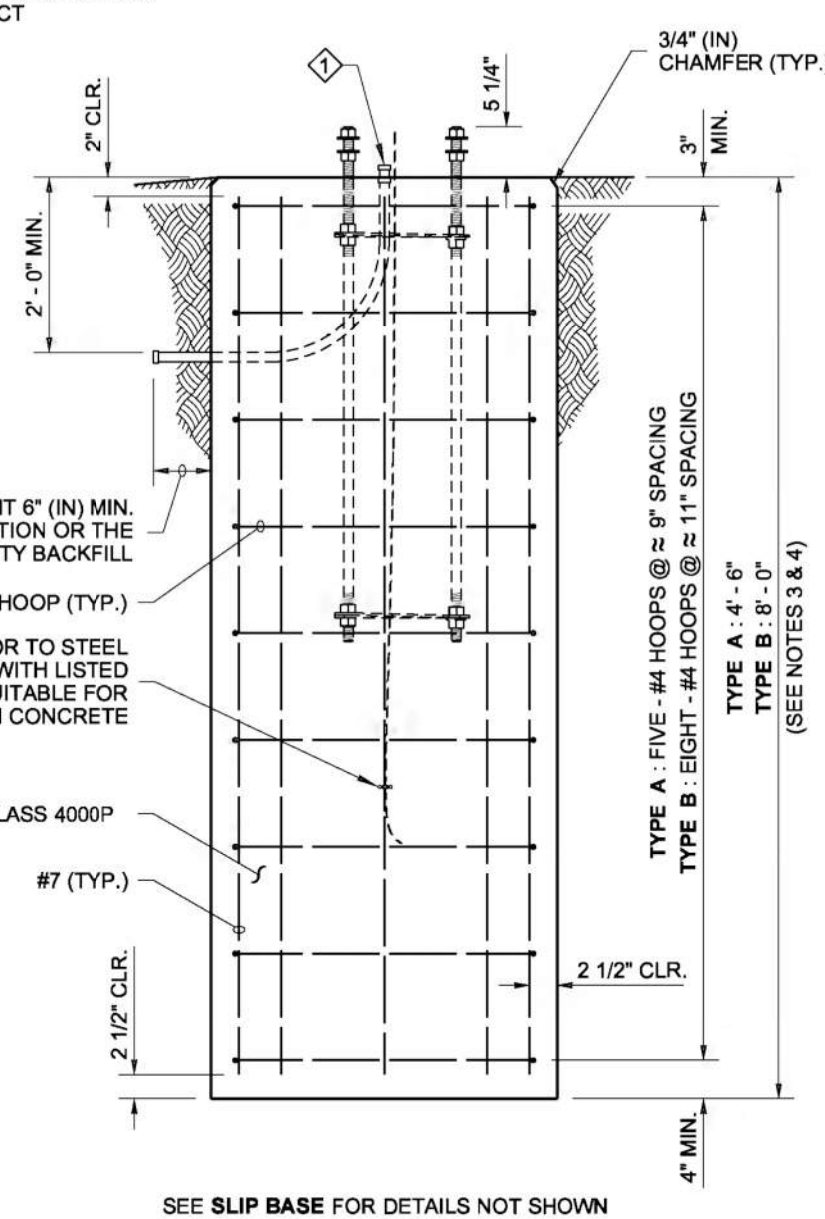
1 1" (IN) DIAM. CONDUIT ~ CAP EACH END ~ PROVIDE ADDITIONAL CONDUIT FOR COMMUNICATION OR SIGNAL CABLE WHERE SHOWN IN THE CONTRACT



ISOMETRIC VIEW

ANCHOR BOLT ASSEMBLY

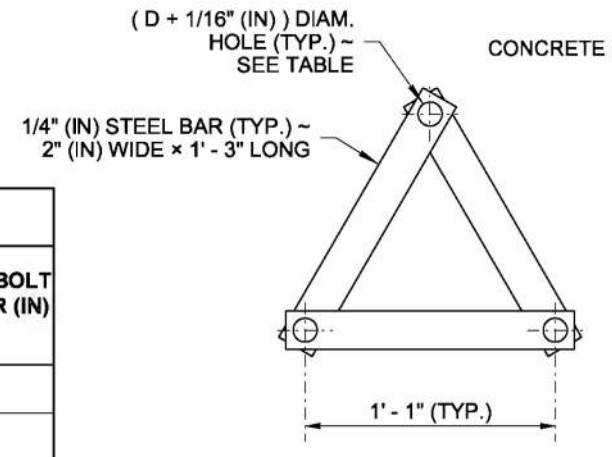
(SLIP BASE SHOWN)



SEE **SLIP BASE** FOR DETAILS NOT SHOWN

ELEVATION VIEW

FIXED BASE



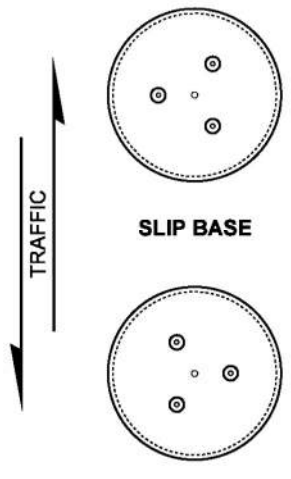
TOP VIEW

STRAP TEMPLATE ASSEMBLY

ANCHOR BOLT TABLE			
LUMINAIRE HEIGHT (FT) (H1)	MAST ARM TYPE	MAST ARM LENGTH (FT)	ANCHOR BOLT DIAMETER (IN) "D"
20' TO 50'	SINGLE	6' TO 16'	1"
20' TO 50'	DOUBLE	6' TO 8'	1"
20' TO 45'	DOUBLE	10' TO 16'	1"
46' TO 50'	DOUBLE	10' TO 16'	1 1/8"

NOTES

1. See **Standard Plan J-28.40** for Luminaire Pole base mounting details.
2. The Strap Templates shall be held in place by nuts, 6" (in) from the top of the foundation and 3" (in) from the bottom of the anchor bolts. Eighteen heavy duty hex nuts and six round washers are required for a slip base assembly. Eighteen heavy duty hex nuts and six plate washers are required for a fixed base assembly.
3. Use Steel Light Standard Foundation **Type A** on level ground or slopes not exceeding 4H : 1V. Use **Type B** for slopes steeper than 4H : 1V, but not exceeding 2H : 1V. Slopes steeper than 2H : 1V shall require a special design.
4. These foundations are designed for a minimum of 2000 PSF **(TYPE A)** or 1500 PSF **(TYPE B)** allowable lateral bearing pressure for the soil. A special foundation shall be required for soil with allowable lateral bearing pressure lower than 1500 PSF.
5. The Luminaire Pole height shall not exceed 50' (ft) (**H1**).
6. Slip bases shall not be installed on 50' (ft) (**H1**) poles with Double Mast Arms, nor on poles weighing more than 1000 lbs.
7. Slip bases are required on poles installed inside the Design Clear Zone, and on poles installed behind traffic barrier that are within the traffic barrier deflection zone.
8. Foundations constructed within Media Filter Drains shall be increased in depth by the depth of the Media Filter Drain.
9. Exposed portions of the foundation shall be formed to create a Class 2 surface finish. All forming shall be removed upon completion of foundation construction.
10. For excavation, concrete placement, and backfill options, see METHOD 1 and METHOD 2 on Sheet 2 of 2.
11. The anchor bolts shall be high-strength steel, manufactured from ASTM F1554 Grade 105, with heavy hex nuts and hardened washers. Galvanize the anchor bolts according to ASTM F2329.
12. The foundation shall be grounded in accordance with the requirements of **Standard Specification 8-20.3(4).**
13. See **Standard Plans C-8b** and **C-85.14** for steel light standards on traffic barrier.



SLIP BASE

FIXED BASE

ANCHOR BOLT LAYOUT

RICHARD P. ZELDENRUST
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25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:37 AM

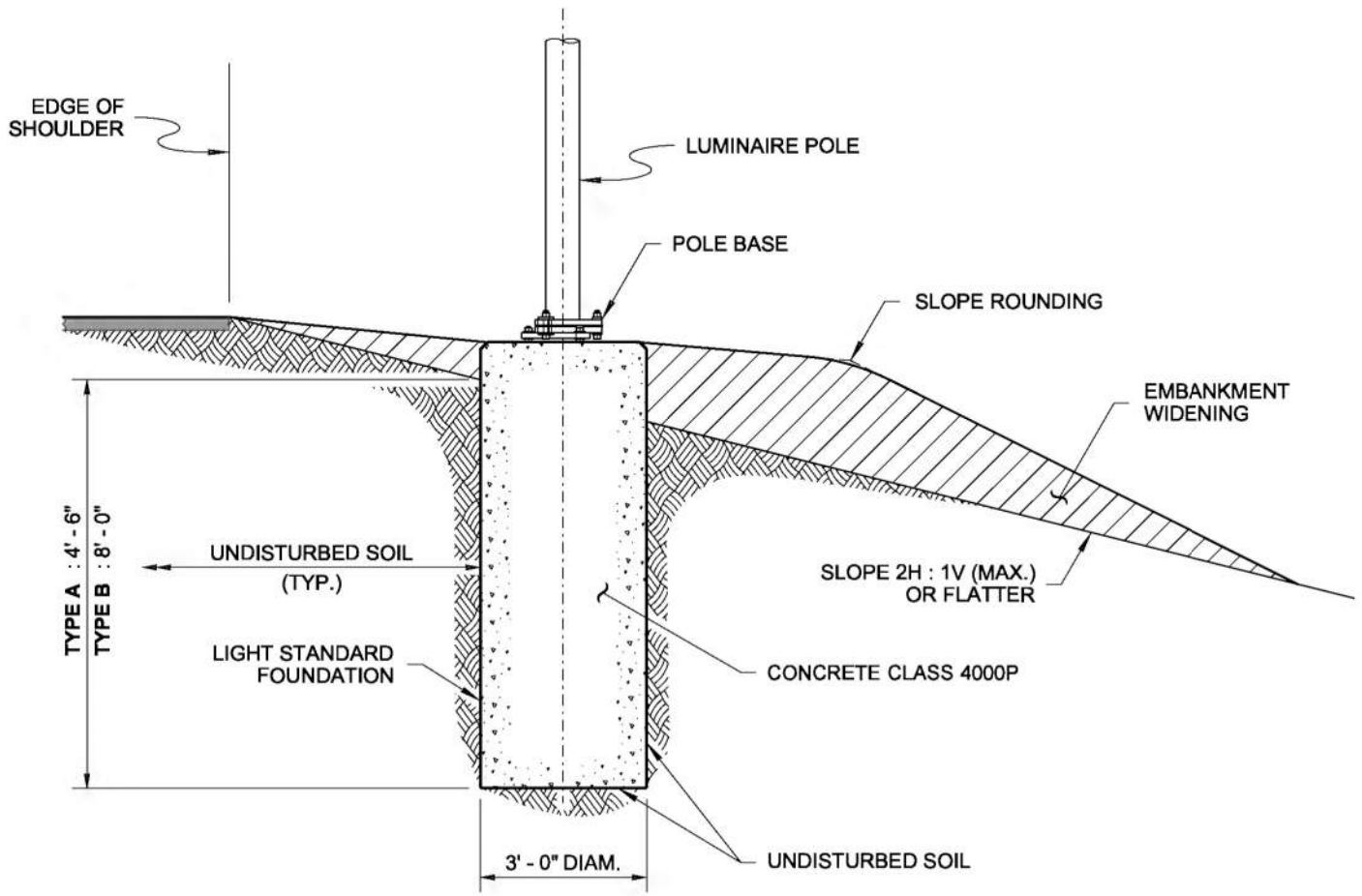
STEEL LIGHT STANDARD FOUNDATION TYPES A & B

STANDARD PLAN J-28.30-03

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:33 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



(CASE A SHOWN)

METHOD 1

NO SUBSURFACE FORM

This option is used only when the existing soil in the hole will remain standing and the cement concrete can be placed without causing the soil to collapse. Concrete shall be cast directly against undisturbed soil.

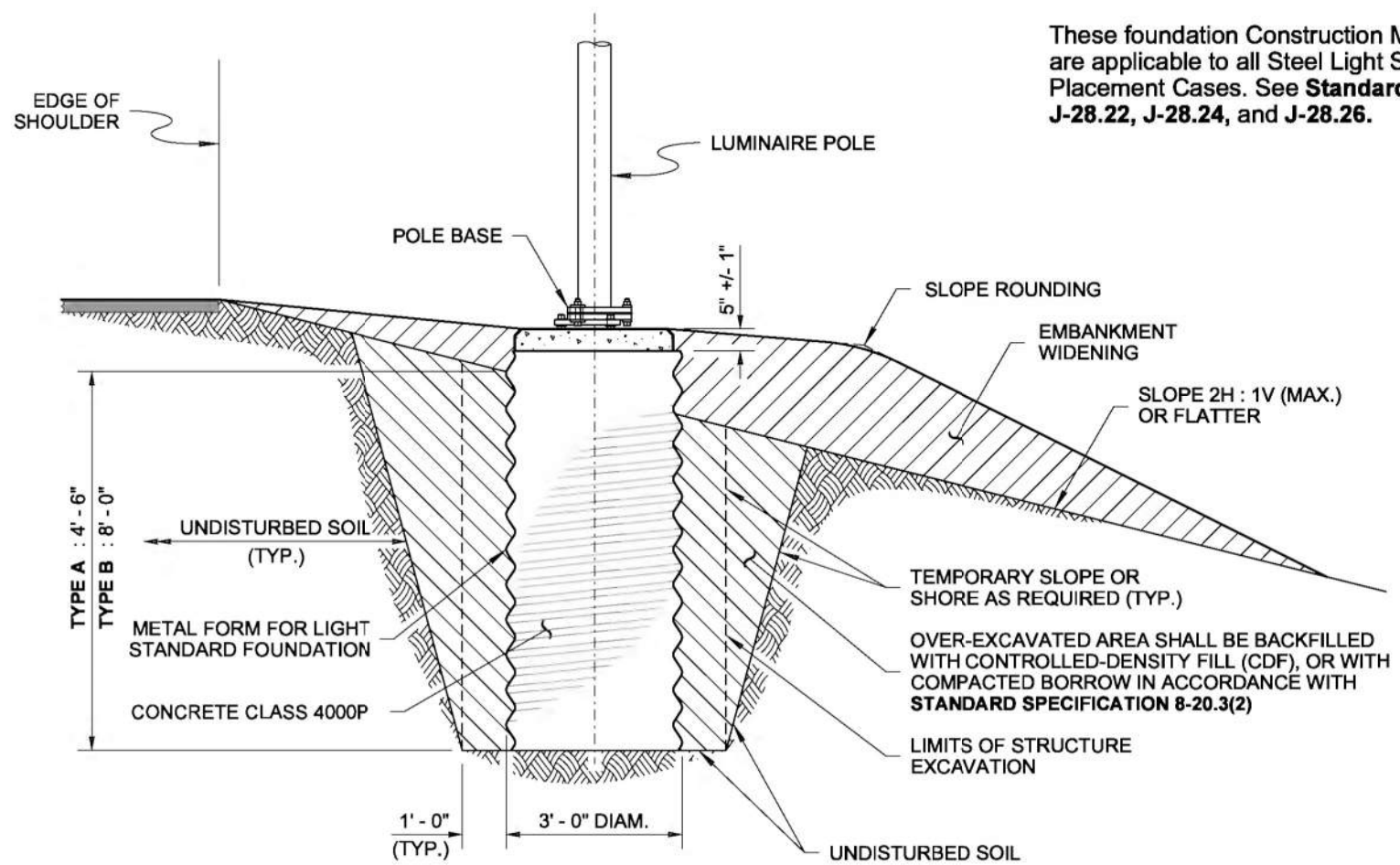
Auger the hole for the foundation. Use a paper or cardboard form to achieve a smooth finish on the final exposed cement concrete. Support the form as necessary to remain plumb.

See **Standard Plans J-28.24** and **J-28.26** for maximum heights of exposed foundation when no embankment widening is to be installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form portion.

Construct the embankment widening (if required).



(CASE A SHOWN)

METHOD 2

METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not retain a vertical face, over-excavate the foundation area and install a 36" (in) diameter corrugated metal (pipe) form. The corrugated metal form shall not extend more than 5" (in) +/- 1" (in) below any portion of the foundation that will remain exposed upon final grading. Continue forming to full height using a paper or cardboard form to achieve a smooth finish on final exposed cement concrete. Support the form as necessary to remain plumb.

See **Standard Plans J-28.24** and **J-28.26** for maximum heights of exposed foundation when no embankment widening is to be installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form portion.

Backfill with controlled-density fill or compacted borrow in accordance with **Standard Specification 8-20.3(2).**

Construct the embankment widening (if required).

CONSTRUCTION METHODS

NOTE

These foundation Construction Methods are applicable to all Steel Light Standard Placement Cases. See **Standard Plans J-28.22, J-28.24,** and **J-28.26.**

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:38 AM

STEEL LIGHT STANDARD FOUNDATION TYPES A & B

STANDARD PLAN J-28.30-03

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:33 PM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: L. ISA CYFORD

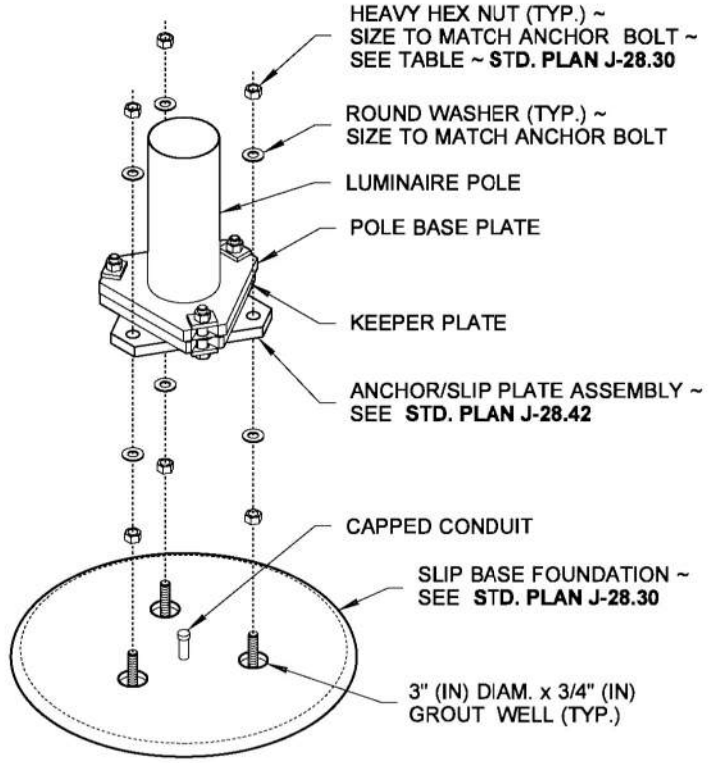
SUPPLEMENTAL TO STANDARD PLAN J-28.30-03

Modify the Standard Plan as follows:

Notes:

1. Anchor bolt lengths shall be as recommended by the manufacturer.

DRAWN BY: FERN LIDDELL



EXPLODED VIEW

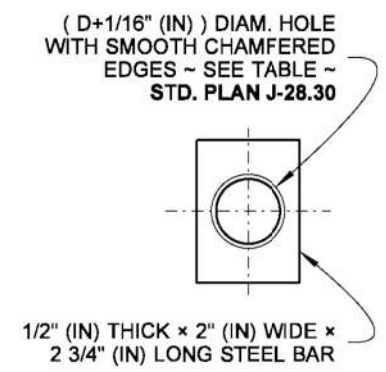
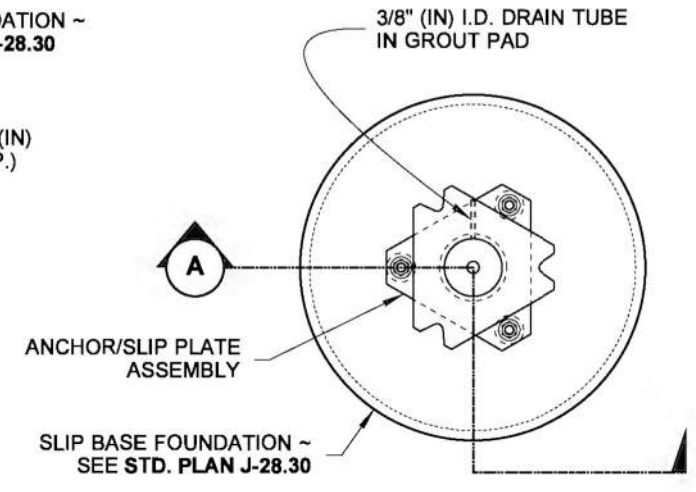
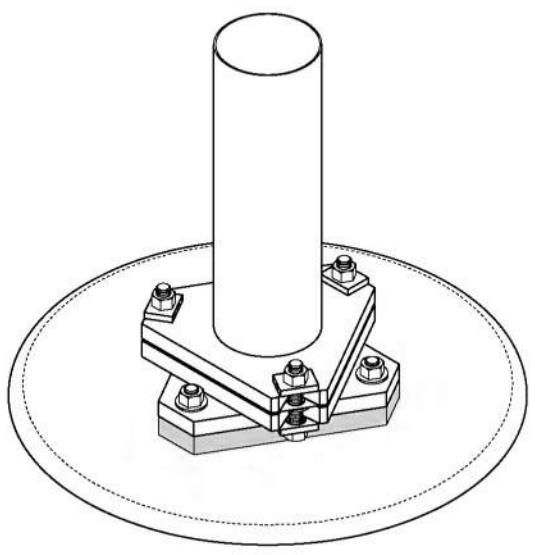


PLATE WASHER DETAIL



PLAN VIEW

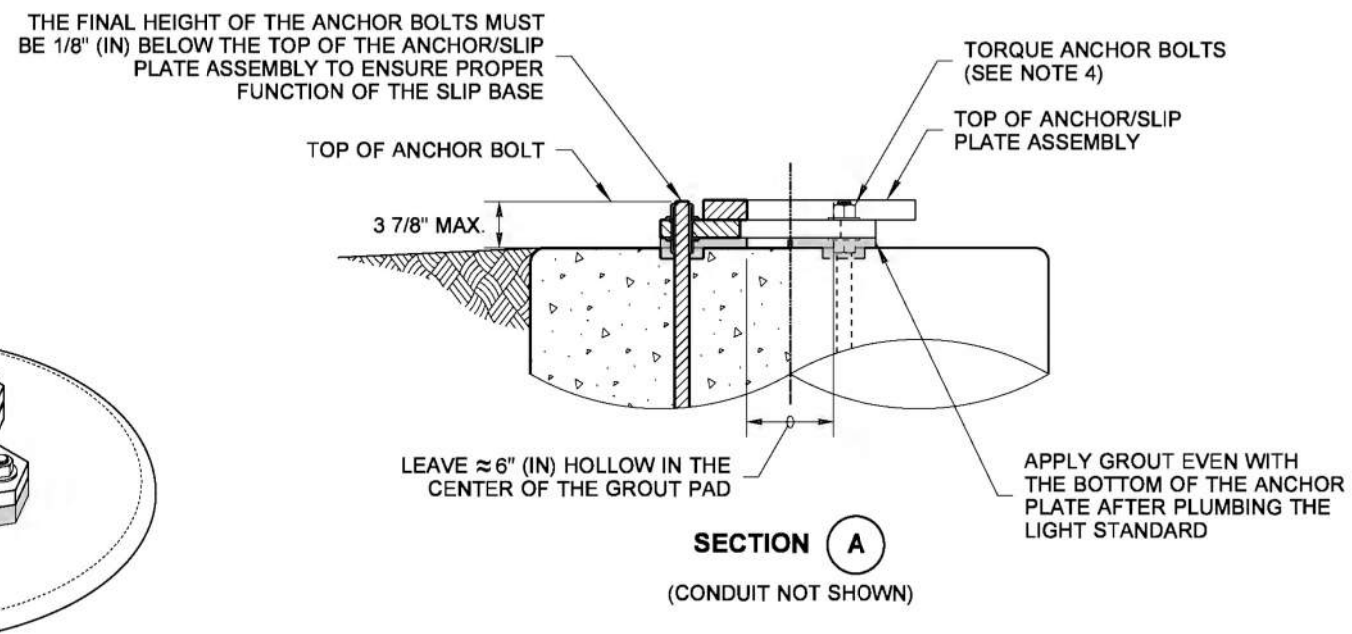
SLIP BASE



ASSEMBLED

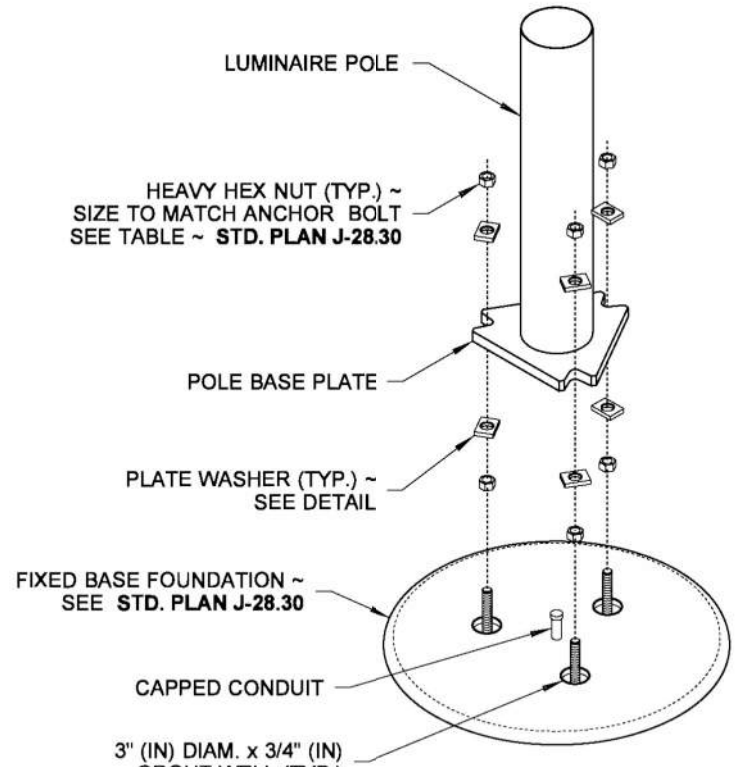
ISOMETRIC VIEW

SLIP BASE



SECTION (A)

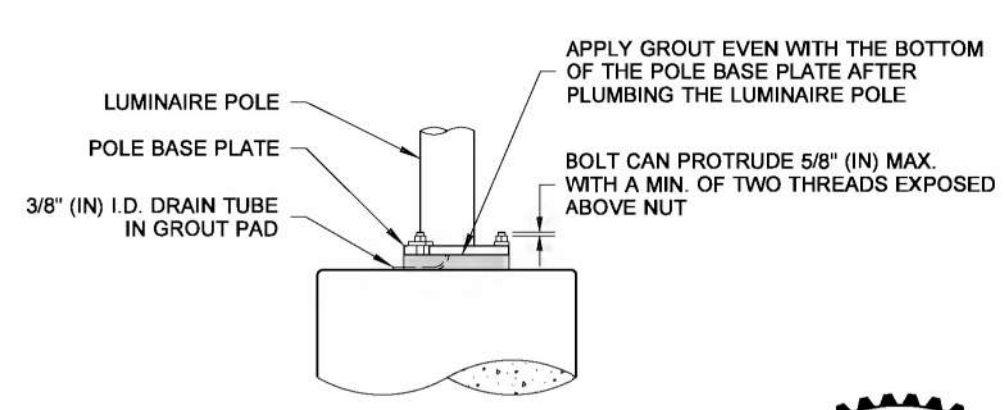
(CONDUIT NOT SHOWN)



EXPLODED VIEW

NOTES

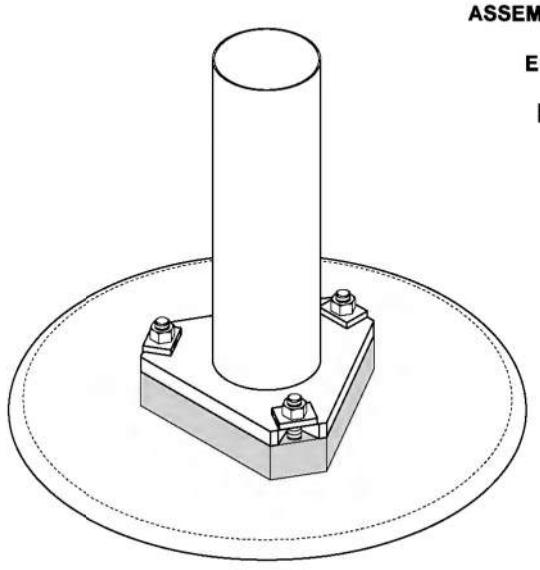
1. 50' (ft) (**H1**) poles with double mast arms or poles weighing in excess of 1000 LBS shall not be installed on a slip base.
2. Galvanizing shall be in accordance with AASHTO M 111.
3. See **Standard Plans C-8b, C-85.15,** and **J-28.60** for foundation and base plate requirements when light standards are mounted on cement concrete traffic barrier.
4. See **Standard Specification Sections 6-03.3(33)** and **8-20.3 (4)** for the torque requirements for all of the anchor bolt installations. Install 1" (in) diameter clamping bolts in all slip bases to **a torque of 95 Foot-Pounds -** See **Standard Specification Section 8-20.3 (13)A. DO NOT OVERTIGHTEN.** After state inspection, burr threads to prevent nut rotation.
5. For anchor bolt Diameter " **D** ", see table, **Standard Plan J-28.30**.



ASSEMBLED AND GROUTED

ELEVATION VIEW

FIXED BASE



ASSEMBLED

ISOMETRIC VIEW

FIXED BASE

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:39 AM

STEEL LIGHT STANDARD BASE MOUNTING

STANDARD PLAN J-28.40-02

SHEET 1 OF 1 SHEET

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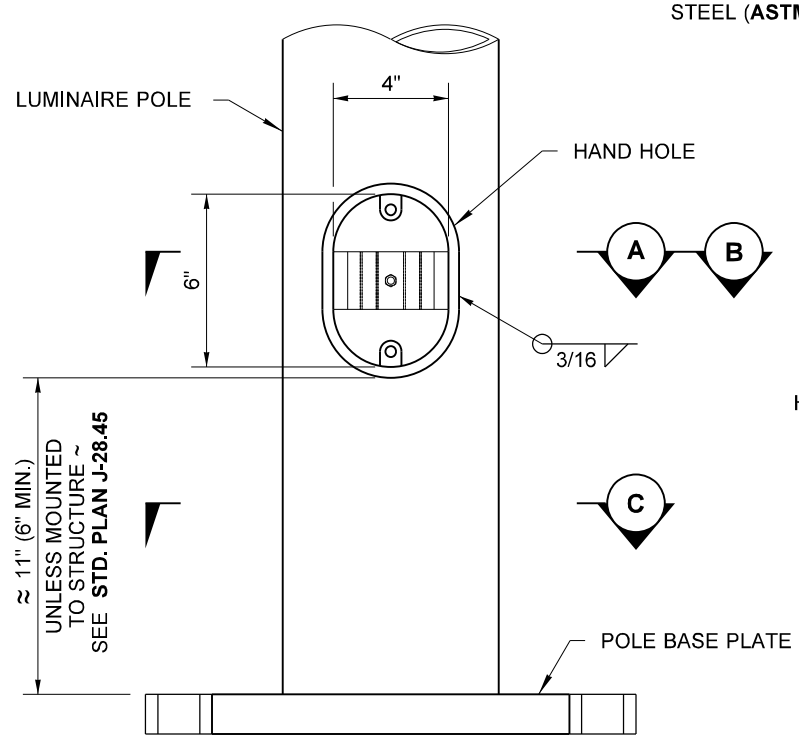
Bakotich, Pasco
Jun 11 2014 1:33 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

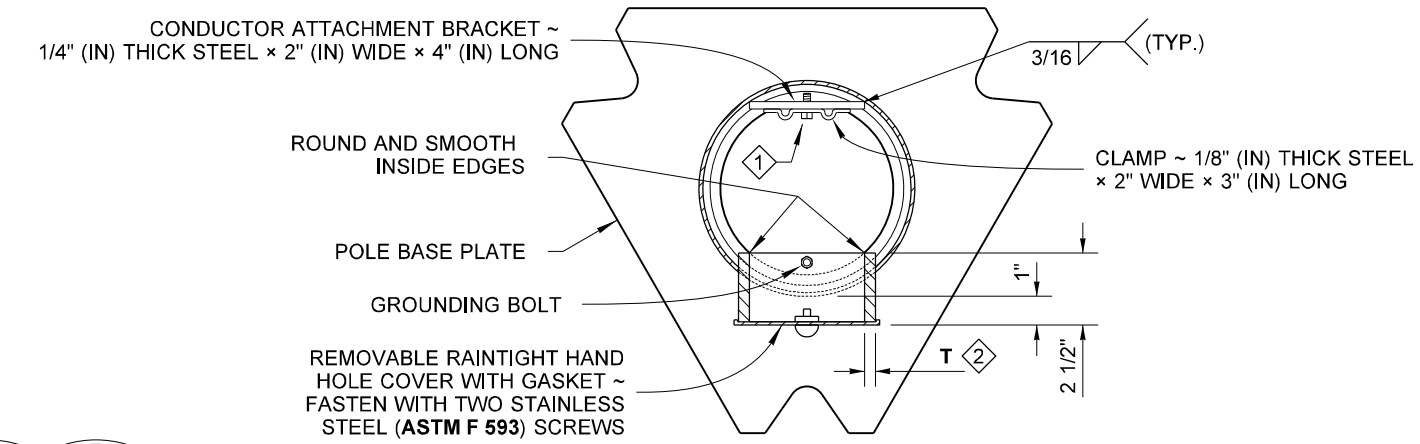
DRAWN BY: FERN LIDDELL



(COVER NOT SHOWN FOR CLARITY)

ELEVATION VIEW

CONFIGURATION AND LOCATION OF THE HAND HOLE VARIES AMONG MANUFACTURERS ~ MINIMUM SIZE OPENING SHOWN

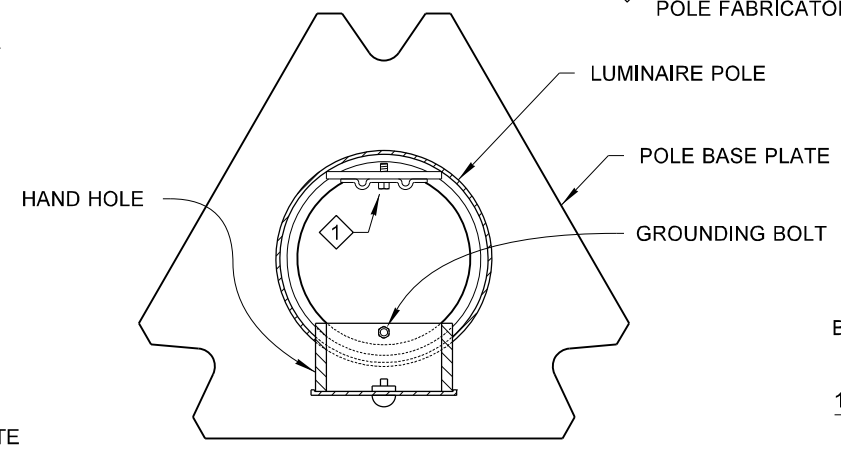


TYPICAL HAND HOLE ORIENTATION

VIEW A

1 THE **CONDUCTOR ATTACHMENT** CONFIGURATIONS VARY AMONG DIFFERENT MANUFACTURERS. CONDUCTOR ATTACHMENTS ARE REQUIRED ON ALL POLES, FIXED OR SLIP BASE.

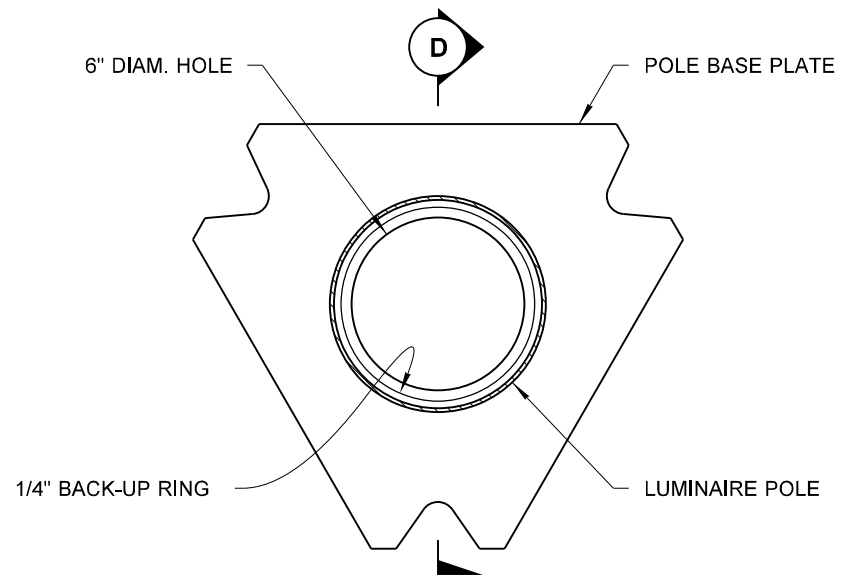
2 **T** = RIM PLATE THICKNESS BY LUMINAIRE POLE FABRICATOR .



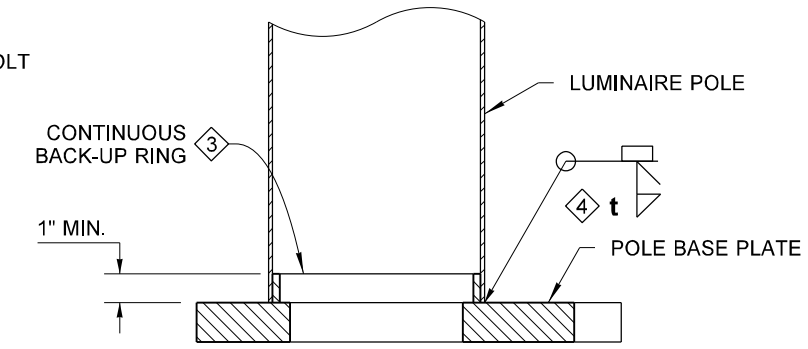
FOR DETAILS NOT SHOWN, SEE VIEW A ABOVE

ORIENTATION FOR INSTALLATION ON BRIDGE OR RETAINING WALL ~ SEE **STANDARD PLAN J-28.45**

VIEW B



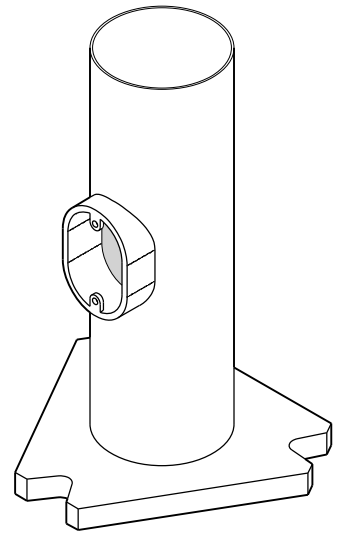
VIEW C



3 1/4" (IN) THICK, OR NO THINNER THAN POLE WALL THICKNESS. TACK WELD IN ROOT OR CONTINUOUS SEAL WELD TO BASE PLATE OR POLE WALL.

4 **t** = SIZE OF FILLET WELD BY LUMINAIRE POLE FABRICATOR.

SECTION D



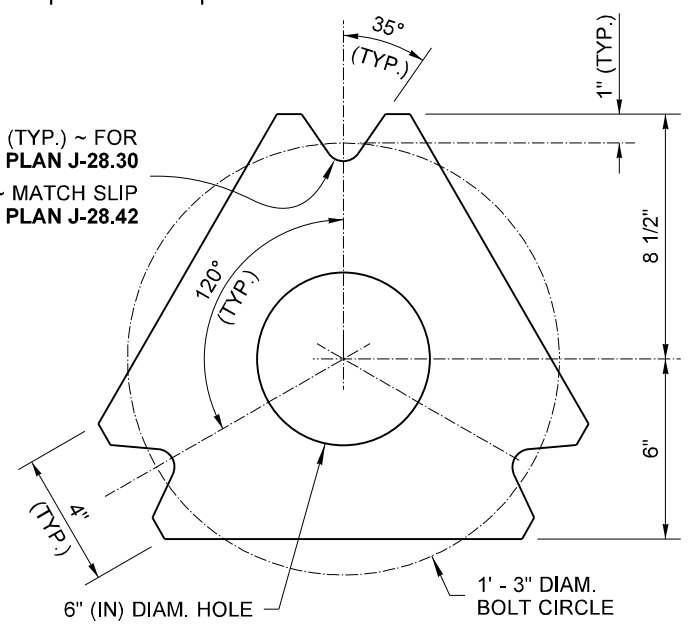
ISOMETRIC VIEW

NOTES

1. Pole Base Plate for a Slip Base design shall be 1 1/4" (in) steel manufactured from **ASTM A572 GR.50** or **ASTM A588.** Pole Base Plate for a Fixed Base design shall be either 1 1/4" (in) steel manufactured from **ASTM A572 GR. 50, ASTM A588,** or 1 1/2" (in) manufactured from **ASTM A36.** All Pole Base Plate notched surfaces shall be finished smooth.
2. Round and smooth all edges along wire-way to protect conductors. See **Standard Plan J-28.70** for wiring details.
3. Galvanizing shall be in accordance with **AASHTO M 111.**
4. See **Standard Plans C-8b, C-85.14,** and **J-28.60** for foundation and base plate requirements when steel light standards are mounted on concrete traffic barrier.
5. See **Standard Plan J-28.42** for details when Slip Base is required.

FIXED BASE: RADIUS = (D/2+1/16") (TYP.) ~ FOR "**D**," SEE TABLE ON **STANDARD PLAN J-28.30**

SLIP BASE: RADIUS = 9/16" (TYP.) ~ MATCH SLIP PLATE, **STANDARD PLAN J-28.42**



FOR PLATE THICKNESS, REFER TO NOTE 1

TOP VIEW

POLE BASE PLATE DETAIL

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STEEL LIGHT STANDARD POLE BASE AND HAND HOLE DETAILS

STANDARD PLAN J-28.50-03

SHEET 1 OF 1 SHEET

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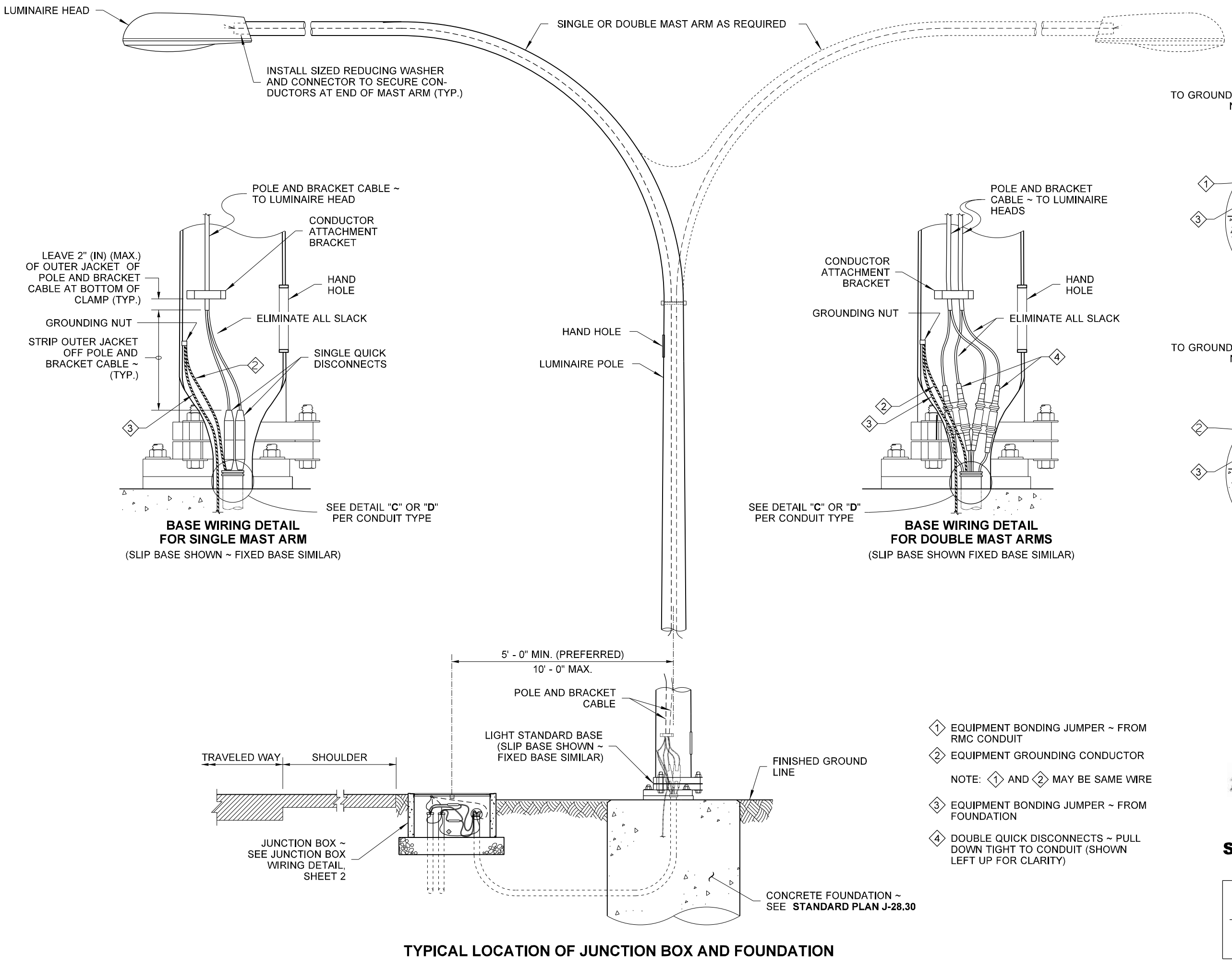


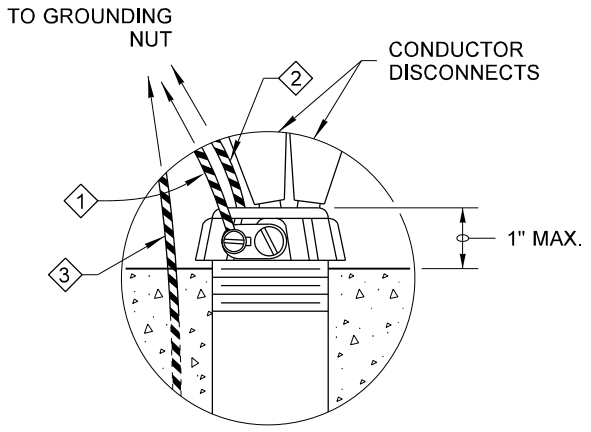
TYPICAL LOCATION OF JUNCTION BOX AND FOUNDATION

BASE WIRING DETAIL FOR SINGLE MAST ARM

(SLIP BASE SHOWN ~ FIXED BASE SIMILAR)

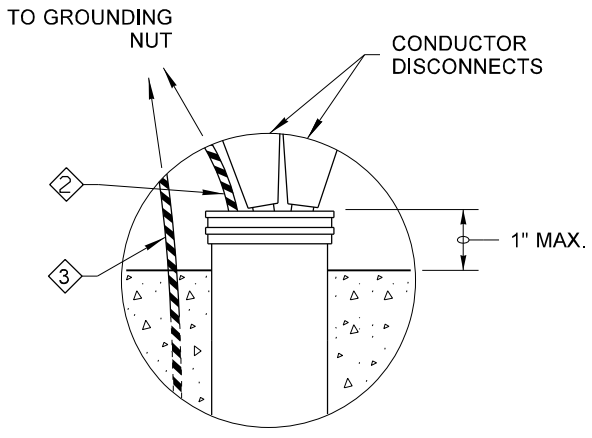
BASE WIRING DETAIL FOR DOUBLE MAST ARMS

(SLIP BASE SHOWN FIXED BASE SIMILAR)



DETAIL "C"

RMC CONDUIT



DETAIL "D"

PVC CONDUIT

1. EQUIPMENT BONDING JUMPER ~ FROM RMC CONDUIT
2. EQUIPMENT GROUNDING CONDUCTOR

   NOTE: 1 AND 2 MAY BE SAME WIRE
3. EQUIPMENT BONDING JUMPER ~ FROM FOUNDATION
4. DOUBLE QUICK DISCONNECTS ~ PULL DOWN TIGHT TO CONDUIT (SHOWN LEFT UP FOR CLARITY)

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Bailey, Ted
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STEEL LIGHT STANDARD WIRING DETAILS

STANDARD PLAN J-28.70-03

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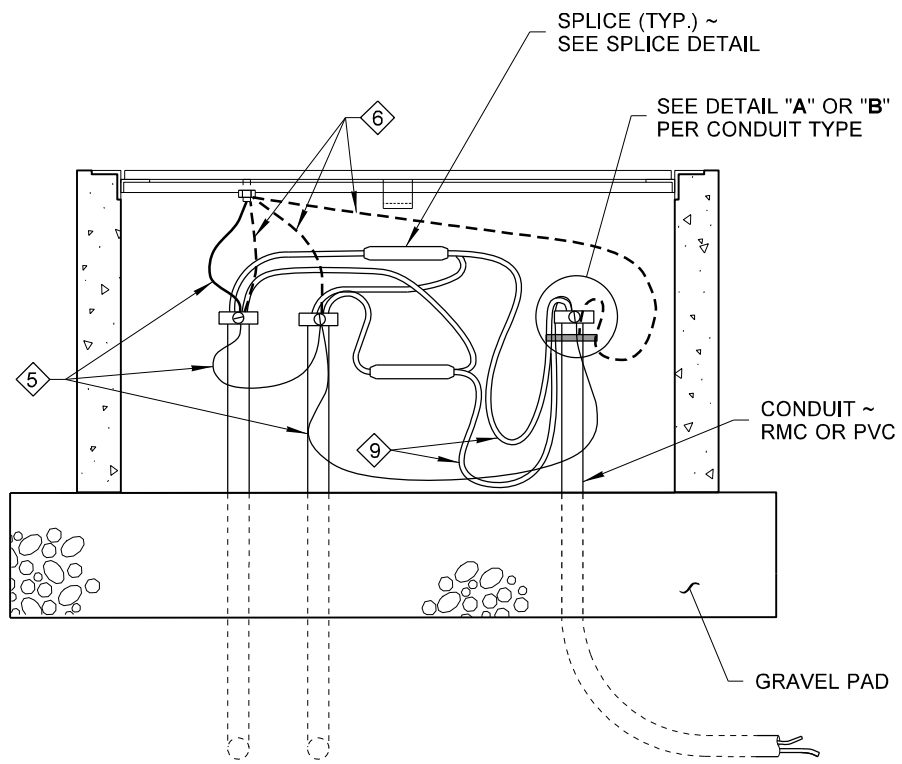
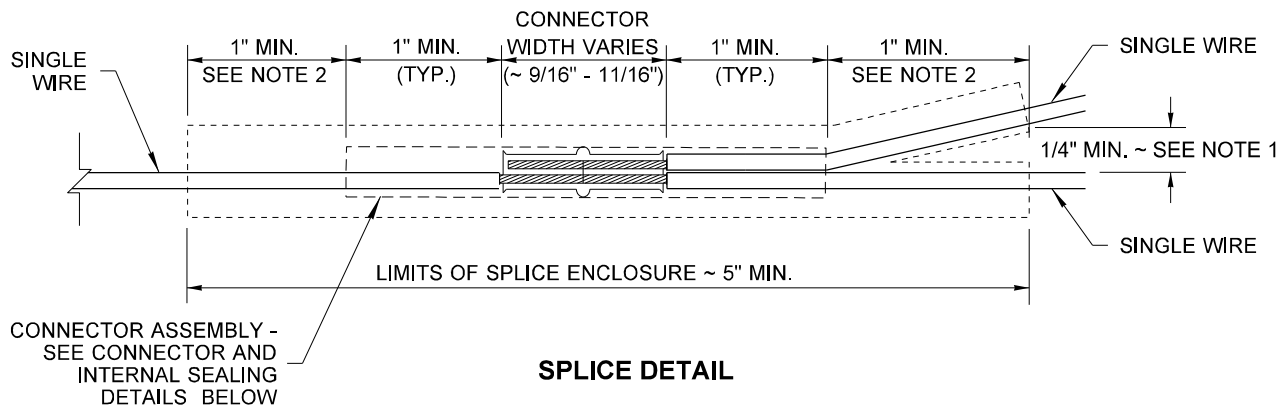


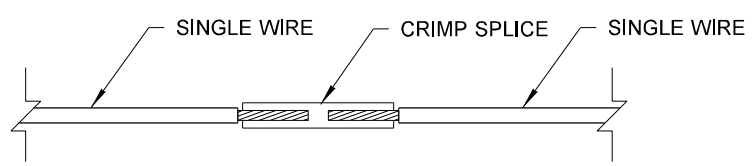
JUNCTION BOX WIRING DETAIL

FOR GROUNDING REQUIREMENTS, SEE **STANDARD PLAN J-60.05**

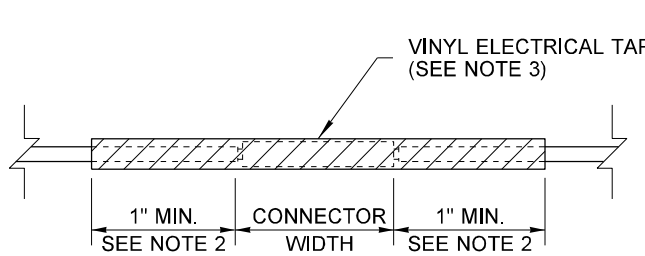


SPLICE DETAIL

STEP 1 - CRIMP CONNECTION



STEP 2 - WRAP CONNECTION



NOTES

1. Each wire shall be physically separated by at least 1/4" (in) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:

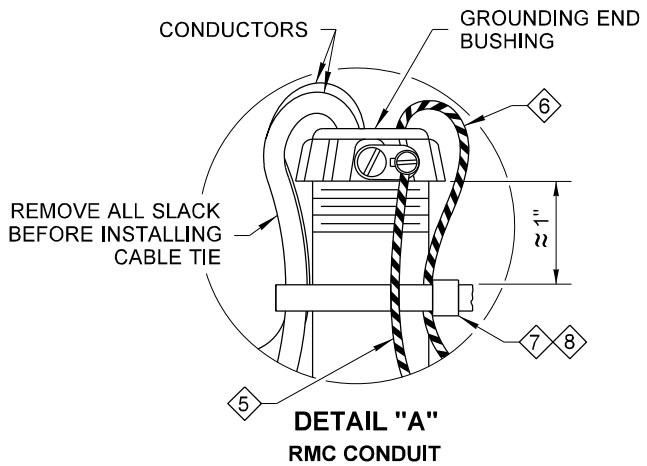
   a. Have separate ports for each conductor ("WYE" or "X" shaped tubing). ~ or ~

   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a weather-proof seal. See Rubber Electrical Mastic Tape Installation Detail, **Standard Plan J-50.05**.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the crimped connection.

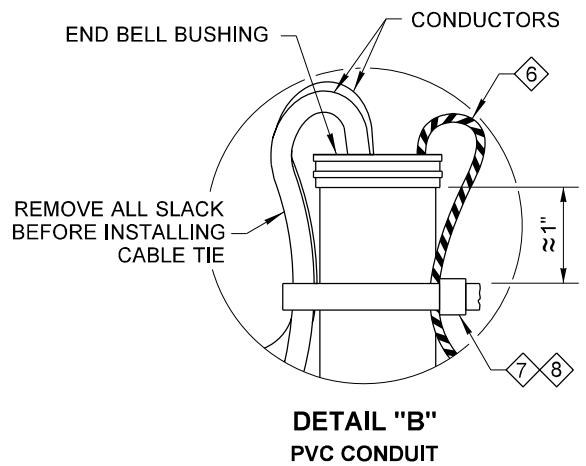
3. Electrical tape used in splicing applications shall be 3/4" (in) wide, be UL listed under UL 510, and be CSA Certified under C22.2 NO. 197-M1983.

4. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Pliers and similar multi-purpose tools may not be used.



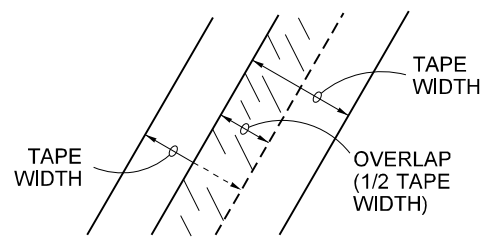
DETAIL "A"

RMC CONDUIT



DETAIL "B"

PVC CONDUIT



TAPE OVERLAP DIAGRAM

WHEN USING WRAPPED VINYL ELECTRICAL TAPE:

- INSTALL TWO LAYERS OF SPIRAL WRAPPED TAPE.
- EACH SPIRAL LAYER SHALL HAVE AN OVERLAP OF 1/2 OF THE TAPE WIDTH (SEE DIAGRAM ABOVE).

CONNECTOR AND INTERNAL SEALING DETAILS

5 EQUIPMENT BONDING JUMPER ~ FROM RMC CONDUIT

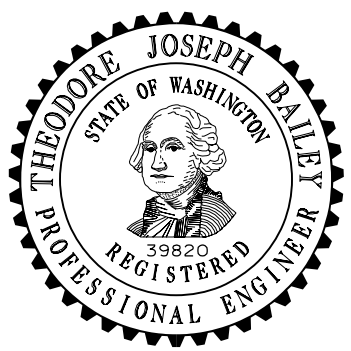
NOTE: 5 AND 6 MAY BE SAME WIRE

6 EQUIPMENT GROUNDING CONDUCTOR

7 CABLE TIE ~ 120 POUND TENSILE STRENGTH, BLACK

8 APPLICATION FOR FIXED BASE SIMILAR, EXCEPT NO CABLE TIE IS REQUIRED AT JUNCTION BOX

9 24" (IN) MIN. SLACK REQUIRED TO ALLOW QUICK DISCONNECTS TO BE PULLED OUTSIDE HAND HOLE 6" (IN) MIN.



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STEEL LIGHT STANDARD WIRING DETAILS

STANDARD PLAN J-28.70-03

SHEET 2 OF 2 SHEETS

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Washington State Department of Transportation

DRAWN BY: LISA CYFORD

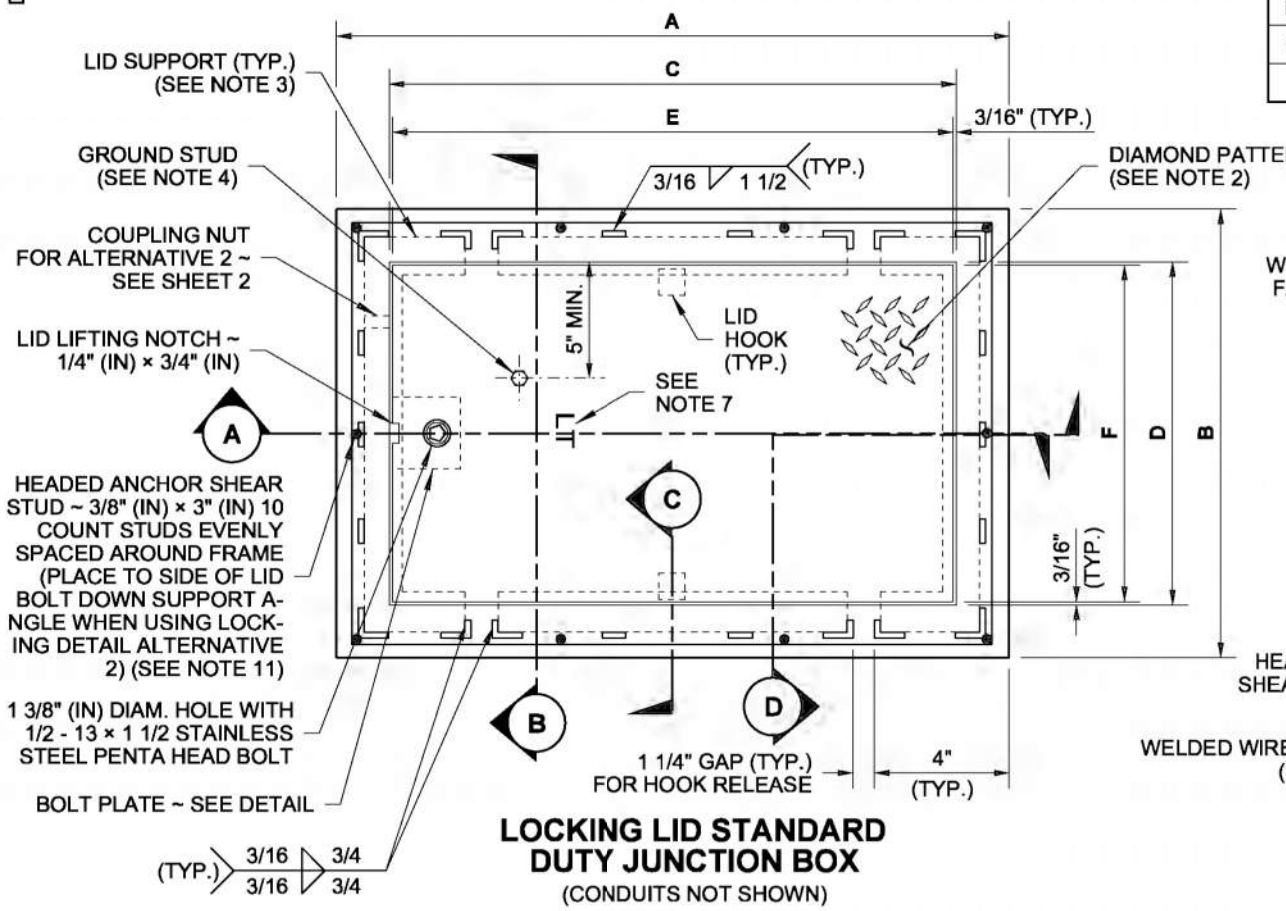
DIVIDER PLATE
ELEVATION VIEW
(FOR TYPE 2 JUNCTION BOX ONLY)

JUNCTION BOX DIMENSION TABLE

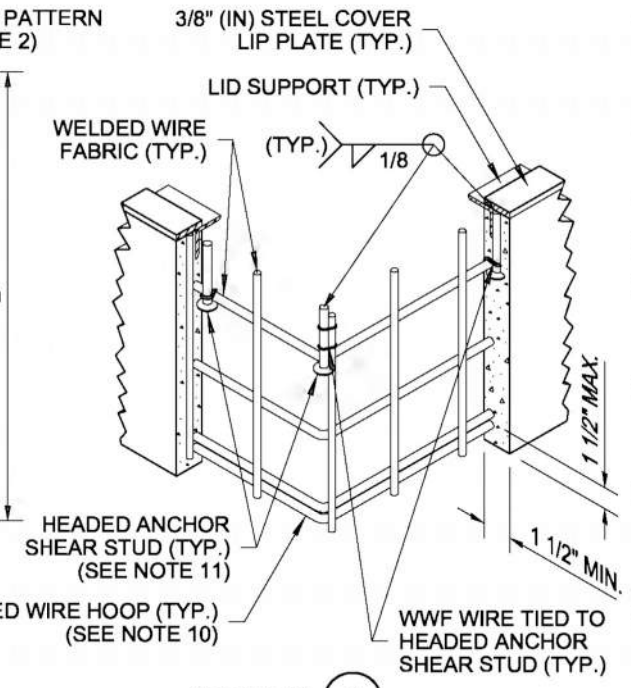
MARK	ITEM	BOX TYPE	
		TYPE 1	TYPE 2
A	OUTSIDE LENGTH OF JUNCTION BOX	22"	33"
B	OUTSIDE WIDTH OF JUNCTION BOX	17"	22 1/2"
C	INSIDE LENGTH OF JUNCTION BOX	18" ~ 19"	28" ~ 29"
D	INSIDE WIDTH OF JUNCTION BOX	13" ~ 14"	17" ~ 18"
E	LID LENGTH	17 5/8"	28 5/8"
F	LID WIDTH	12 5/8"	18 1/8"
	CAPACITY ~ CONDUIT DIAMETER	6"	12"

NOTES

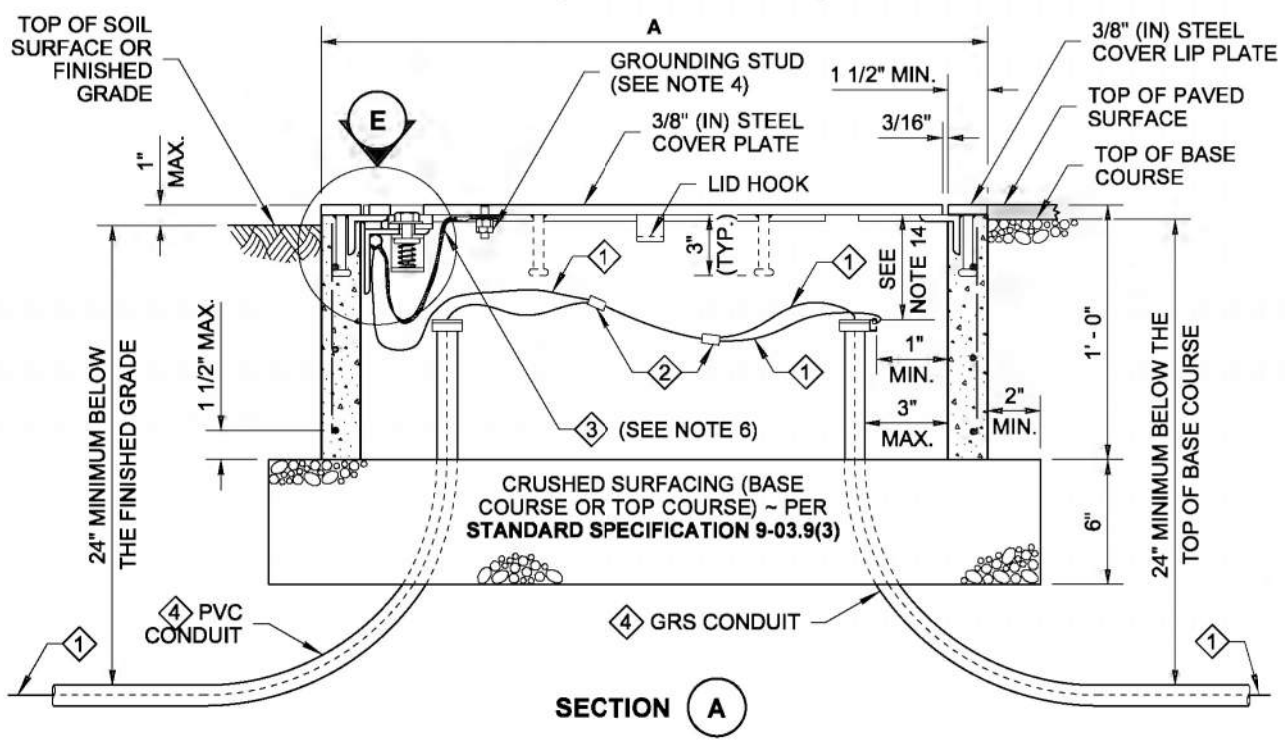
1. All box dimensions are approximate. Exact configurations vary among manufacturers.
2. Minimum lid thickness shown. Junction Boxes installed in sidewalks, walkways, and shared-use paths shall have a slip-resistant coating on the lid and lip cover plate, and shall be installed with the surface flush with and matched to the grade of the sidewalk, walkway, or shared-use path. The non-slip lid shall be identified with permanent markings on the underside, indicating the type of surface treatment (see Contract Documents for details) and the year of manufacture. The permanent marking shall be 1/8" (in) line thickness formed with a mild steel weld bead and shall be placed prior to hot-dip galvanizing.
3. Lid support members shall be 3/16" (in) minimum thick steel C, L, or T shape, welded to the frame.
4. A 1/4-20 NC × 3/4" (in) stainless steel ground stud shall be welded to the bottom of the lid; include (2) stainless steel nuts and (2) stainless steel flat washers.
5. Bolts and nuts shall be liberally coated with anti-seize compound.
6. Equipment Bonding Jumper shall be # 8 AWG min. × 4' (ft) of tinned braided copper.
7. The System Identification letters shall be 1/8" (in) line thickness formed with a mild steel weld bead. See Cover Marking detail. Grind off diamond pattern before forming letters. For System Identification details, see **Standard Specification 9-29.2(4)**.
8. When required in the Contract, provide a 10" (in) x 27 1/2" (in), 10 gage divider plate, complete, with fasteners, in each Type 2 Junction Box where specified.
9. When required in Contract, provide a 12" (in) deep extension for each Type 2 Junction Box where specified.
10. See the **Standard Specifications** for alternative reinforcement and class of concrete.
11. Headed Anchor Shear Studs must be welded to the Steel Cover Lip Plate and wire tied in two places to the vertical Welded Wire Fabric when in contact with each other. Wire tie all other Headed Anchor Shear Studs to the horizontal Welded Wire Fabric.
12. Lid Bolt Down Attachment **T**ab provides a method of retrofitting by using a mechanical process in lieu of welding. Attachment Tab shown depicts a typical component arrangement; actual configurations of assembly will vary among manufacturers. See approved manufacturers' shop drawings for specifics.
13. Unless otherwise noted in the plans or approved by the Engineer, Junction Boxes, Cable Vaults, and Pull Boxes shall not be placed within the sidewalks, walkways, shared use paths, traveled ways or paved shoulders. All Junction Boxes, Cable Vaults, and Pull Boxes placed within the traveled way or paved shoulders shall be Heavy-Duty.
14. Distance between the top of the conduit and the bottom of the Junction Box lid shall be 6" (in) min. to 8" (in) max. for final grade of new construction only. See **Standard Specification 8-20.3(5)**. Where adjustments are to be made to existing Junction Boxes, or for interim construction stages during the contract, the limits shall be from 6" (in) min. to 10" (in) max. See **Standard Specification 8-20.3(6)**.



LOCKING LID STANDARD DUTY JUNCTION BOX
(CONDUITS NOT SHOWN)



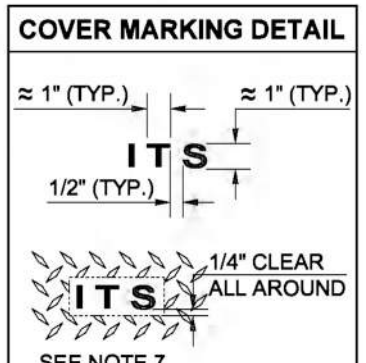
SECTION (D)
PERSPECTIVE VIEW

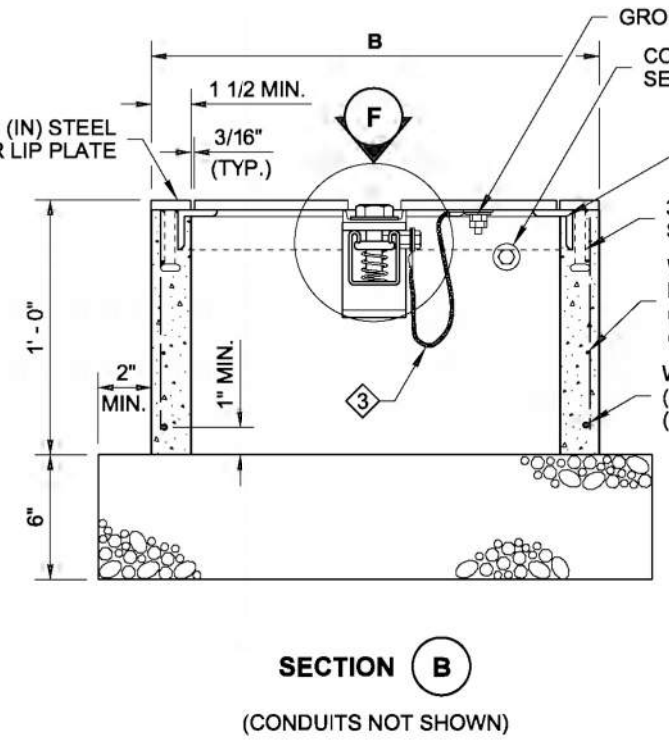


SECTION (A)

1. Equipment Grounding Conductor
2. Copper Solderless Crimp Connector
3. Equipment Bonding Jumper (See Note 6)
4. See Contract for conduit size and number

COVER MARKING DETAIL





SECTION (B)
(CONDUITS NOT SHOWN)

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Bailey, Ted
Apr 25 2016 9:32 AM

LOCKING LID STANDARD DUTY JUNCTION BOX TYPES 1 & 2
STANDARD PLAN J-40.10-04

SHEET 1 OF 2 SHEETS

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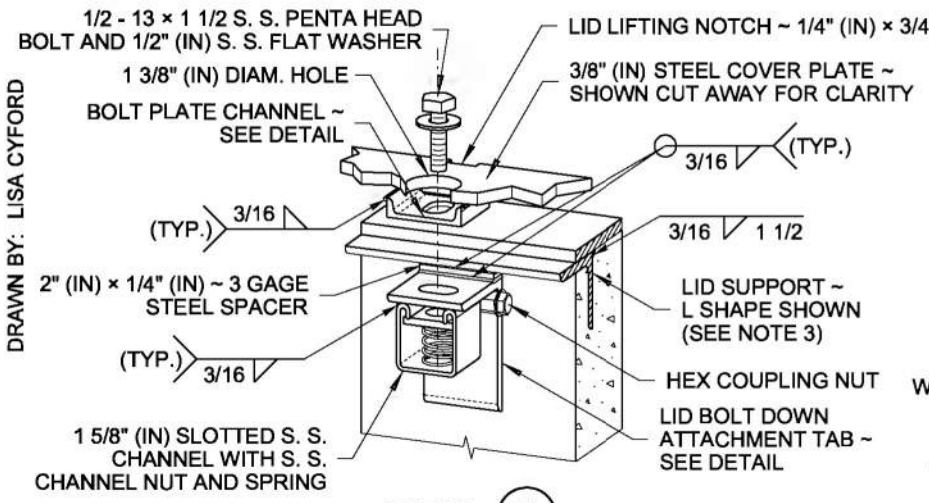
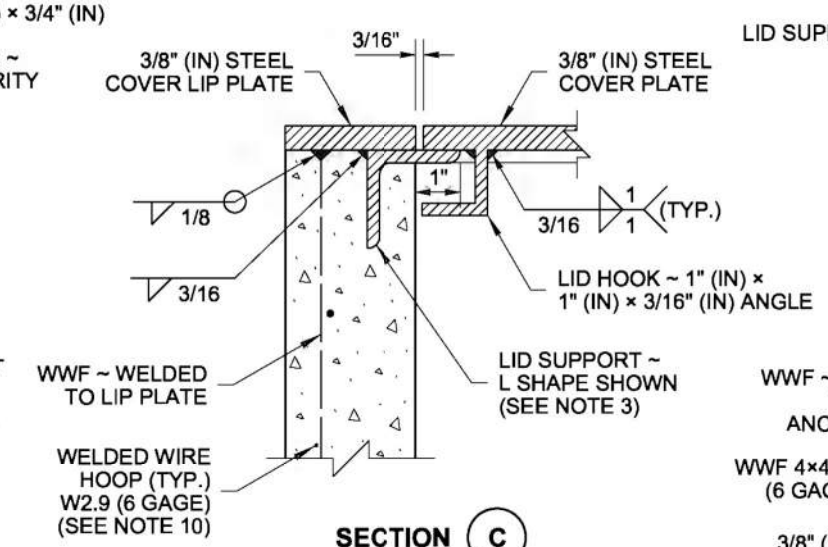


DETAIL (F)

ALTERNATIVE 1 SHOWN
PERSPECTIVE VIEW



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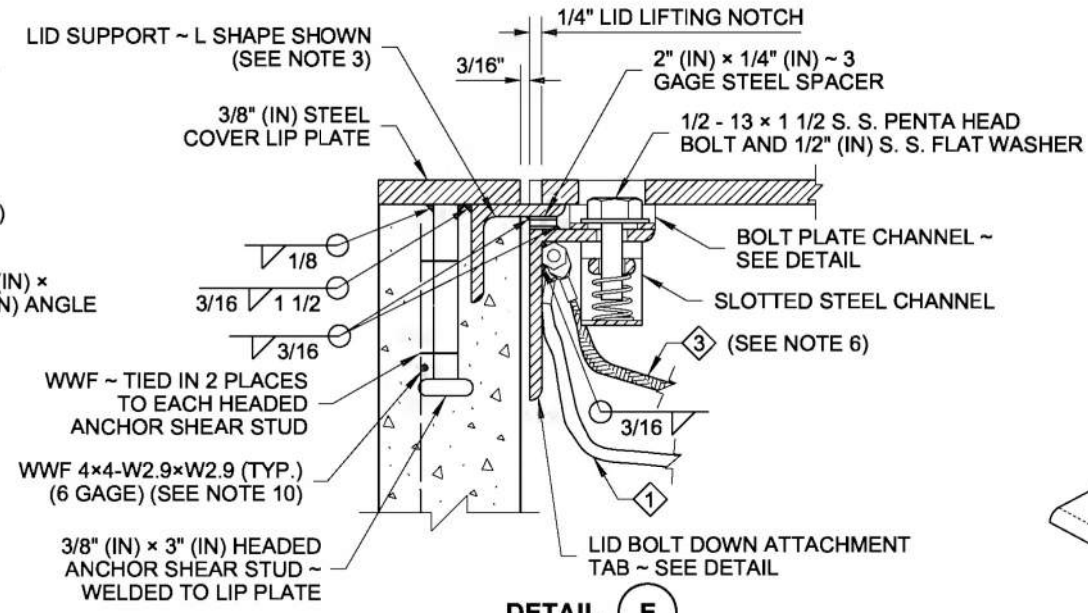
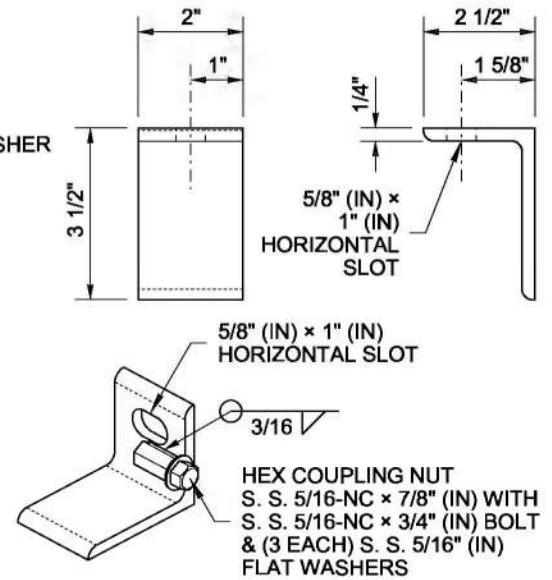
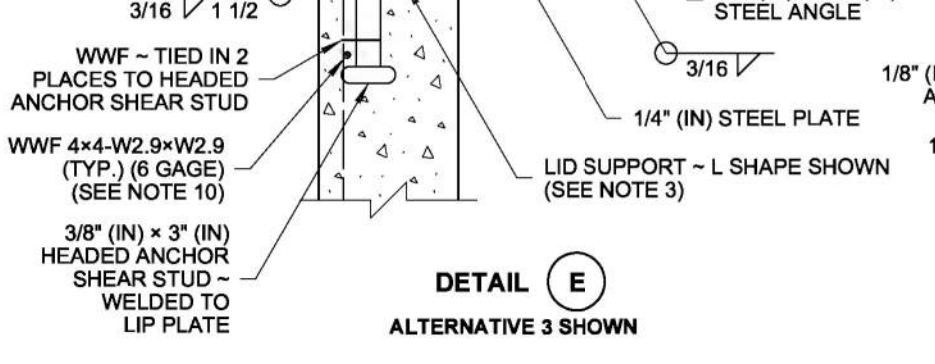


DETAIL (E)

ALTERNATIVE 1 SHOWN



ALTERNATIVE 1
LID BOLT DOWN ATTACHMENT TAB
(SEE NOTE 12)



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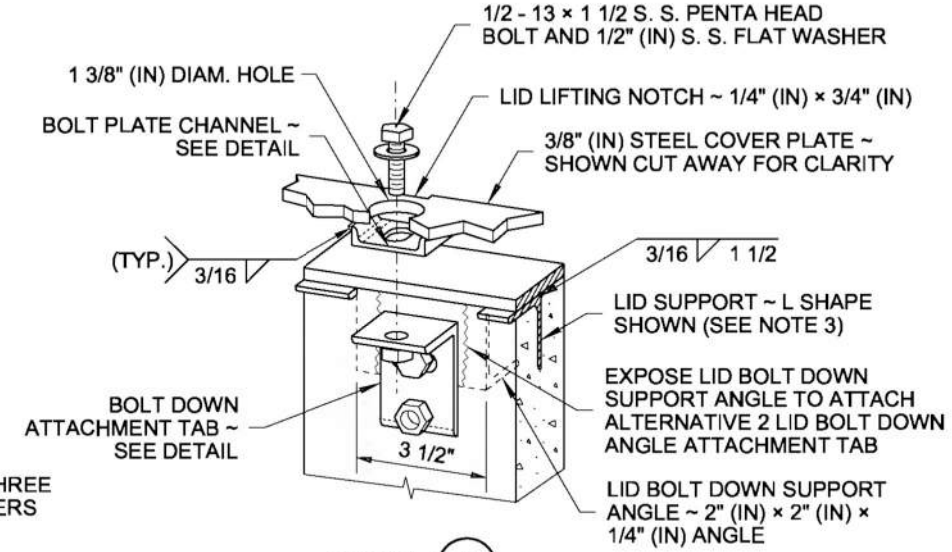
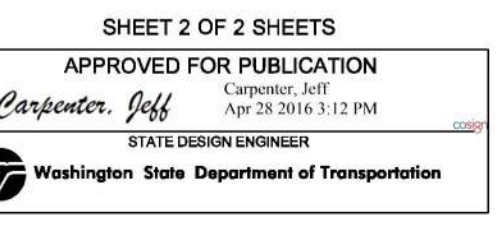


DETAIL (F)

ALTERNATIVE 2 SHOWN
PERSPECTIVE VIEW

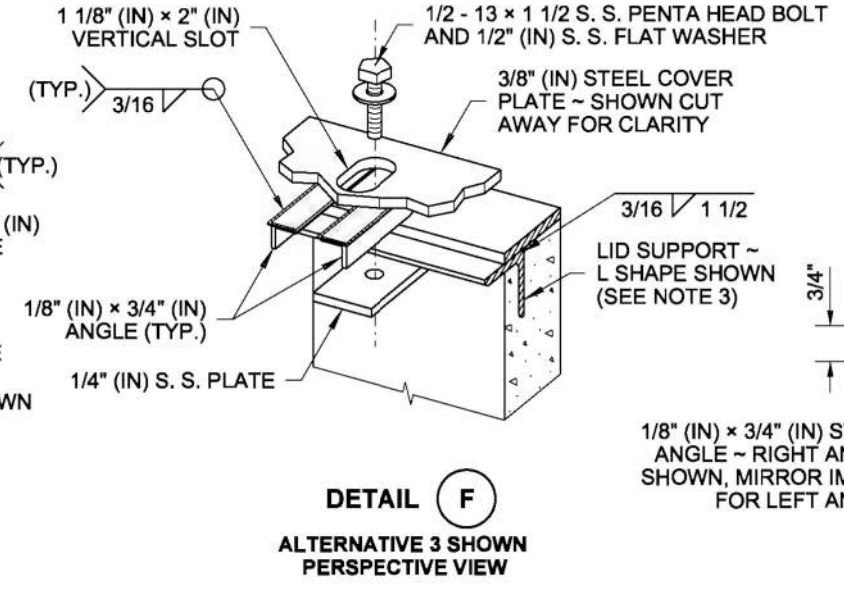
ALTERNATIVE 2
LID BOLT DOWN ATTACHMENT TAB
(SEE NOTE 12)



BOLT PLATE CHANNEL

DETAIL (E)

ALTERNATIVE 3 SHOWN



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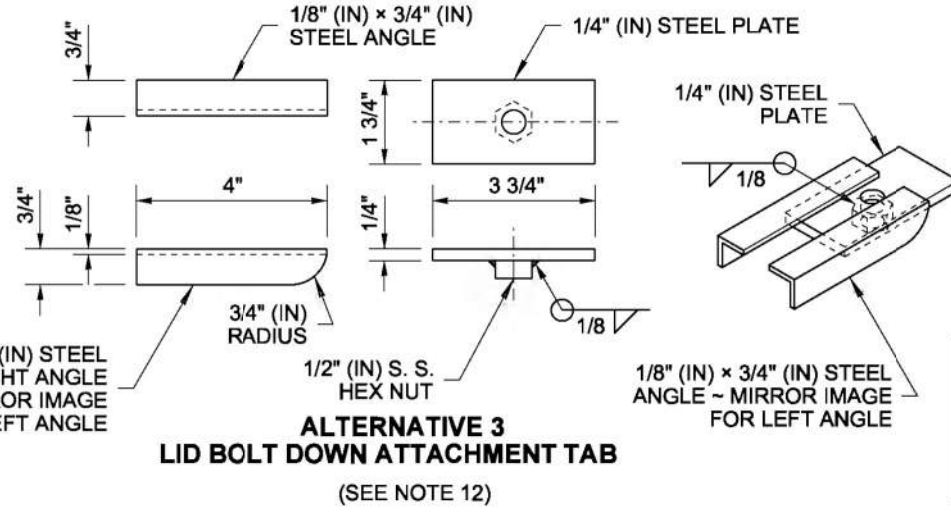
ALTERNATIVE 3 SHOWN
PERSPECTIVE VIEW



ALTERNATIVE 3
LID BOLT DOWN ATTACHMENT TAB
(SEE NOTE 12)

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LOCKING LID STANDARD DUTY JUNCTION BOX TYPES 1 & 2 STANDARD PLAN J-40.10-04

SHEET 2 OF 2 SHEETS

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Washington State Department of Transportation

Chapter 4

Vacant

Chapter 5

Drinking Water

City of Kelso
Engineering Design Manual
Amended May 2021
Effective Date _____

Chapter 5
Drinking Water
City of Kelso
Engineering Design Manual

Table of Contents

CHAPTER 5 – DRINKING WATER

5.010 General

Any extension, modification of, or connection to, the water system must be approved by the City, and design must conform to the requirements and standards of the Department of Health, the most current version of the Kelso Water System Plan, the KEDM and AWWA. Applicant shall pay the cost for any Water System Plan amendments required by the Washington State Department of Health, or City Engineer.

All proposed water main extensions shall comply with the City's requirements for development, water quality and pressure zones, and fire protection. It is the Applicant's responsibility to determine that adequate water for both domestic use and fire protection is attainable. The Applicant must show in the proposed plans how water will be supplied and whether adequate water volumes at acceptable pressure and velocity will be attained in case of fire. A hydraulic analysis of the system may be required if it appears that the system might be inadequate. A meeting with the City Engineer will be required prior to completion of the hydraulic analysis to help determine minimum requirements for the report. When directed by the City Engineer, the Applicant's Engineer shall provide a "pressure available" chart on the water system plan sheet of the construction plans. This sheet shall indicate the calculated pressures theoretically available to each lot during static and peak demand periods based upon an analysis of the system.

Anyone who wishes to extend or connect to the City's water system may contact the City for an estimate of water extension/connection fees. All fees and charges related to development will be in accordance with the latest requirements of the KMC.

Prior to issuing building permits and the setting of any water meters, all public improvements for the development must be completed and approved, right-of-way or easements conveyed to the City, as-built record drawings submitted and approved and all applicable fees paid.

Building permits will not be issued for any project until the required fire protection facilities, minimum required fire flows and emergency access, meeting the International Fire Code Requirements are completed and accepted.

5.020 Main Line

A. Sizing. All water mains shall be sized according to the most recent Water System Plan. The minimum water main size shall be 6 inches in diameter where looped. Larger-sized mains are required for dead-end lines and in specific areas outlined in the current Water System Plan. Nothing will preclude the City from requiring the installation of a larger-sized main than shown in the Water System Plan if the City determines a larger size is needed to meet fire protection and domestic requirements or for future service.

B. Blow-offs for Dead End Lines. Dead-end mains, when permitted, shall be 8 inches in diameter to the final hydrant. A blow off assembly will be required at the end of the line unless terminated at a hydrant.

C. No Additional Service Allowed on Two (2) Inch Mains. Additional units may not connect to existing 2-inch diameter lines.

D. All water main and fire service connection pipe shall be cement mortar-lined ductile iron pipe conforming to AWWA C151 Class 50, or HDPE pipe meeting the requirements of AWWA Class 200, C901, and C906. Cement mortar lining shall meet the requirements of AWWA C104. Non-restrained joints shall be rubber gasketed, push-on type or mechanical joint, conforming to AWWA C111.

E. Water mains shall be extended through and to the extremes of the development. Looping may be required to meet fire flow requirements or provisions of the most current Water System Plan. All water mains that may be extended or looped shall end with an approved gate valve and MJ plug.

F. Water mains shall be designed so that flow velocities do not exceed 7 feet per second during any flow condition to reduce the chance of water hammer. Pressures of not less than thirty (30) psi or greater than ninety (90) psi shall be maintained in the main during peak demands.

H. Rights-of-way or easements within the Development site shall be conveyed to the City for access and maintenance of all water systems, and other related facilities which will be maintained by the City. The minimum widths of rights-of-way or easements shall be as follows, although the City Engineer may require increased widths when necessary to insure adequate area for equipment access and maintenance:

1. All easements for water mains shall be a minimum of twenty (20) feet wide for pipes less than 10 feet deep.

2. For pipes ten feet deep and greater, the width of easements shall be equal to or greater than the numerical value of twice the depth of the pipe invert measured from finish grade plus the outside bell diameter of the pipe, but not less than 20 feet.

3. Pipes shall be centered within the right-of-way or easement;

4. Easements for lift stations, vaults or other facilities shall be dimensioned as directed by the Director.

   No buildings or other structures that prevent access are permitted within rights-of-way or easements. Gates of sufficient width to provide access by maintenance vehicles shall be provided in fences crossing rights-of-way, but not less than twelve (12) feet wide.

   When possible, easements for apartment complexes or commercial/industrial developments shall be in parking lots, private drives, or similar areas that allow unobstructed vehicle access for maintenance.

I. Within easements outside of City ROW, at each bend in the water main a bend marker shall be placed indicating the angle of the bend and direction of the water main each way. Bend marker posts shall be 4-inch Carsonite CWV-116 posts stamped with “Caution Water Main.”

5.025 Required Separation Between Water Lines and Sanitary Sewers

A. Horizontal and vertical separation (parallel). A minimum horizontal separation of 10 feet between sanitary sewers and any existing potable water line and a minimum vertical separation of 18 inches between the bottom of the water line and the crown of the sewer shall be maintained. The distance shall be measured edge to edge. See Figure 6-1 below.

B. Unusual conditions (parallel). When local conditions prevent the separations described above, a sewer may be laid closer than 10 feet horizontally or 18 inches vertically to a water line provided:

1. It is laid in a separate trench from the water line.

2. The elevation of the crown of the sewer line must be at least 18 inches below the bottom of the water line. When this vertical separation cannot be obtained, the sewer shall be constructed of materials and joints that are equivalent to water main standards of construction and shall be pressure tested to ensure water-tightness prior to backfilling. Adequate restraint should be provided to allow testing to occur.

3. If sewers must be located in the same trench as a potable water line, special construction and mitigation is required. Both water lines and sewer lines shall be constructed with pressure-rated pipe material designed to withstand a minimum static pressure of 150 psi. The water line shall be placed on a bench of undisturbed earth with the bottom of the water pipe at least 18 inches above the crown of the sewer and shall have at least 5 feet of horizontal separation at all times.

Figure 5-1
Required Separation Between Water Lines and Sanitary Sewers, Parallel Construction

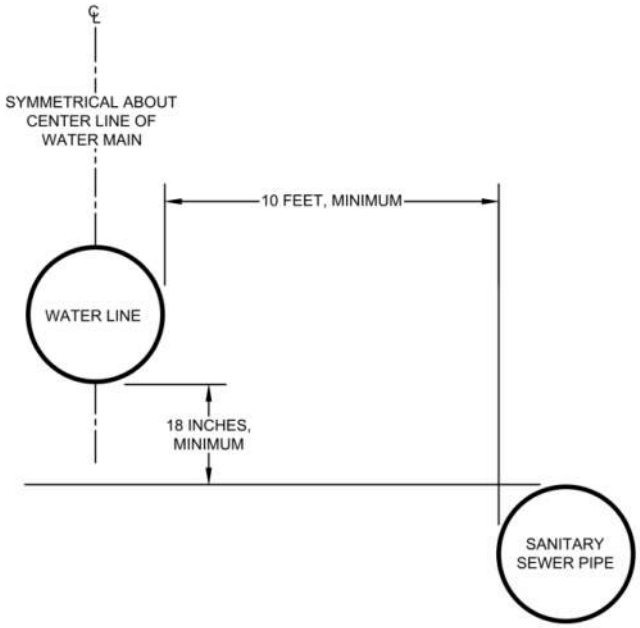
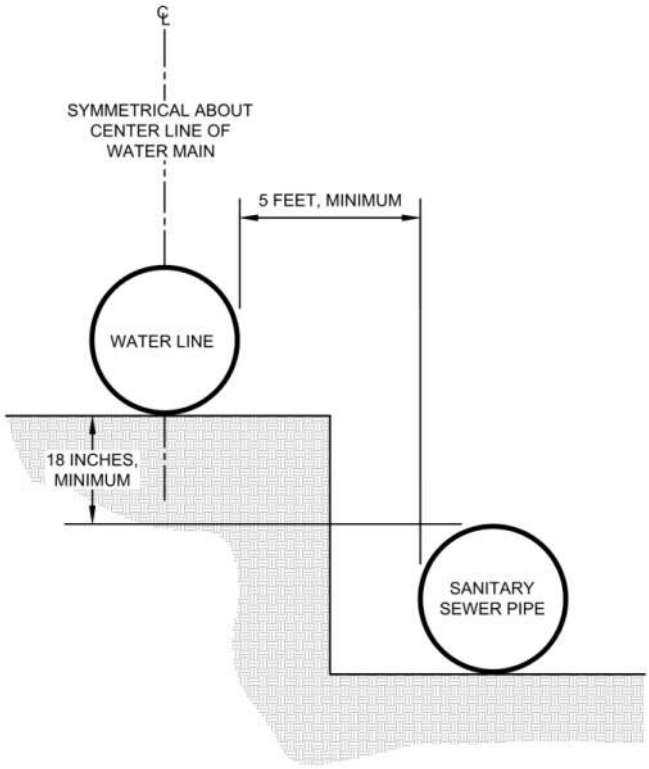


Figure 5-2

Required Separation Between Water Lines and Sanitary Sewers, Unusual Conditions Parallel Construction



C. Vertical separation (perpendicular). Sewer lines crossing water lines shall be laid below the water lines to provide a separation of at least 18 inches between the invert of the water line and the crown of the sewer.

D. Unusual conditions (perpendicular). When local conditions prevent a vertical separation as described above, construction shall be used as follows:

1. Gravity sewers constructed to pass over or under water lines. These gravity sewers shall be:

a. Constructed of material described in Table 1.

b. The maximum standard length of pipe available from the manufacturer (but not less than 18 feet long) shall be used, with the pipes centered at the point of crossing to maximize joint separation.

Table 1: Water Main Standard Pipe Material

Type of Pipe	AWWA (ASTM) Standard		
	Pipe	Joint	Fittings
Ductile Iron	C 151 and C 104	C 111	C 110
HDPE 3408	C901 and C 906	Fused per C901 and C 906	C901 and C 906
PVC	C900 and C905	Per AWWA	Per AWWA

2. Water lines constructed to pass under gravity sewers. Water lines shall be protected by providing:

a. A vertical separation of at least 18 inches between the invert of the sewer and the crown of the water line.

b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water lines.

c. The sewer shall be constructed of the material described in Table 1. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.

d. A water line casing equivalent to that specified above in D(1) above.

5.030 Service Interruption

The Contractor shall make every effort to schedule water main construction with a minimum interruption of water service. In all situations, the City will dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

Following approval of the proposed schedule for water main shutdown, and at least four (4) business days prior to the shutdown, the Contractor shall give written notice to the City. In addition, the Contractor shall provide written notice to affected customers at least 48-hours prior to the shutdown. Written notice to affected customers shall consist of, at a minimum, door hangers, as well as signs posted at the entrance to the customer's streets of the impacted area.

5.040 Valves

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case will there be less than one valve every 600 feet. Three (3) valves shall be installed on all tees and 4 valves on all crosses in each intersection. Specific requirements for valve spacing will be made at the plan review stage.

A. Valves 8-inches and smaller shall be resilient seat gate valves, NRS (Non-Rising Stem), with O-ring seals. Valve ends shall be mechanical joint or ANSI flanges. Valves will conform to AWWA 509-80 or AWWA C-515. System gate valves will be M&H, Kennedy, AVK, Meuller, or Clow.

B. Valves greater than 8-inches shall be butterfly valves. Butterfly valves. Butterfly valves shall conform to AWWA C504-87, Class 150B, with cast iron short body and O-ring stem seals. Butterfly valves shall be Mueller, M&H, Clow, Kennedy, or American Flow.

5.050 Air and Vacuum Release Valve

Air/Vac valve installation shall be set at the high point of the line, when required. Where possible, pipes shall be graded to prevent the need for an air release valve. All Air-Vac, Air Evacuation, and Vacuum Prevention Valves of sizes two (2) inches and larger shall vent to the outside of the vault.

5.060 Blowoff Assembly

If a fire hydrant is not located at the end of a dead-end main, a blowoff assembly will be required. On water mains that will be extended in the future, the valve that operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block.

5.070 Meters and Service Connections

A. Water meters sized up to 2-inches shall be furnished and set by the City and installed by the Applicant.

B. Meters larger than 2-inches will be furnished by the City and installed by the Applicant. The cost of the meters shall be reimbursed to the City by the Applicant.

C. Water meters may be set only after the Applicant completes the following:

- Installs the water service connection and it has been inspected and approved.
- Installs a sanitary sewer or septic system and it has been inspected and approved.
- Has completed a water use questionnaire.
- Has paid all fees.

D. All meters are the property of the City.

E. Meters located within county right-of-way shall be placed within two (2) feet of the property line.

F. Installation of a State certified backflow device and final acceptance of the water system by the City shall be completed prior to installation of irrigation meters.

G. The City will not accept a water system until all the requirements of the Extension Agreement have been completed and all the fees have been paid.

H. Water services shall be single runs from the main line to each meter. Manifolds with multiple meters shall be allowed in multi-family units with a single property owner or on commercial/industrial sites with a single owner as approved by the City Engineer.

5.080 Pressure Reducing Valve

A pressure-reducing valve (PRV) is required on the customer's side of the meter for all water services that have a static water pressure above 80 psi. PRV's shall be installed in a vault (see

Standard Plan) adjacent to and outside of the meter box. All PRVs shall be owned and maintained by the property owner.

5.090 Hydrants

A. The number and locations of fire hydrants and fire flow requirements shall comply with the requirements of the International Fire Code Appendix C. Plans showing fire hydrant locations and available fire flows shall be provided by the Applicant and will be reviewed by Cowlitz 2 Fire & Rescue. The Fire Marshall may require additional hydrants per International Fire Code (IFC) requirements.

B. When a fire department connection (FDC) is installed in conjunction with an automatic sprinkler system, a fire hydrant shall be located within fifty (50) feet of the FDC.

C. Fire hydrants shall not be connected to mains less than 8-inch diameter. Connection of a fire hydrant to a dead-end line is allowed only for lines less than 300 feet long. Applicant shall provide verification of available fire flow capacity for dead end hydrant locations.

D. Fire hydrants shall be located to allow a 5-foot clear space surrounding the hydrant, and where no obstructions are directly in line with any of the ports.

E. The lateral line from the main to the fire hydrant shall be a maximum of 50 feet in length.

F The size, and location of fire department connections (FDC) and/or post indicator valves will be determined by the Building Official and the Fire Department. The location of the FDC shall be shown on the water plans for the development.

G. Protection may be required for fire hydrants, per the requirements of IFC, determined to be proposed in vulnerable locations.

H. Fire hydrants shall be installed, tested, and accepted prior to the issuance of a building permit.

5.100 Fire Services

A. No more than one (1) structure shall be served by any one (1) fire service.

B. Fire service lines shall be ductile iron.

C. Fire service line plans shall be submitted to the City for approval prior to construction. A Record Drawing for the fire service line shall be submitted prior to issuance of the Certificate of Occupancy for the building.

D. Double Check Detector Assemblies shall be installed on all fire services where hydrants are installed.

E. Fire Service Double Check Detector Assemblies shall be installed at the property line or edge of the public water line easement.

F. Fire services shall be metered at the expense of the Owner. Water meters for Double Check

Detector Assemblies shall be the size and type approved by the City. The meter on the bypass detector shall read in cubic feet.

G. Fire Line Flow and Tamper Switches installed, as required by UBC sec. 3803, shall be connected to a monitored Fire Detection System approved by the Fire Marshal. The tamper switches are required on the rising stem gate valves in the vault, as well as any other indicating control valves on the fire protection system. Electrical inspection and permit are required.

H. The remote reader (if allowed) shall be rigidly mounted on an exterior building wall (near the domestic meter), enclosed in a metal box with a slot opening which allows reading the remote without opening the box, and at an elevation of five (5) feet above the finish grade level.

The remote reader shall have the same number configuration as the metering device itself, and read in cubic feet. All wires to the remote reader shall be enclosed in a heavy plastic or rigid metal conduit. All wiring shall be in conformance with appropriate sections of the National Electric Code.

The City shall maintain the portion of the fire service line up to the wall of the Double Check Detector Assembly vault. The property owner shall own and maintain the fire service line beyond this point.

5.110 Vaults

To ensure proper operation and accessibility of all assemblies within vaults, the following requirements shall apply to the vaults and installation of these assemblies.

A. The vault shall be sealed with an asphalt base foundation coating on the outside of the vault. Vault penetrations shall be sealed with non-shrink grout from the outside. Apply waterproof coating over grout. Backfill around vault per the manufacturer's specifications.

B. Access to the vault shall be provided by an H-20 rated hydraulic assist locking hatch with a minimum size of 36” x 60” locking open at 90°. The hatch shall be leak proof, gasketed, double raised and made of aluminum.

C. Provide an approved ladder if the vault or chamber depth is 5’0” or greater and entry is through the vault or chamber roof. Ladders shall include a Model 1 Bilco LadderUP safety post or approved equal.

D. Adequate drainage for the vault or chamber shall be provided. (Drainage to piped storm systems allowed with check valve).

E. Vaults shall be equipped with a moisture proof light fixture if adequate lighting is not available.

F. Vaults shall have no other use, except for the use described by these Standards.

G. The vault shall be installed on undisturbed base or compacted 5/8"-0" crushed rock base.

H. No piping shall be installed in excess of three (3) feet above the vault floor.

I. The assembly shall be adequately supported from the floor, and suitably restrained from movement. Supports shall consist of steel supports or approved equal; no wood supports shall be used.

J. All electrical wiring shall be inspected by the Washington State Electrical Inspector (Permit is required).

K. The assembly shall be readily accessible with adequate room for maintenance.

5.120 Cross Connection Control and Backflow Prevention Assemblies

All water system connections to serve buildings or properties with domestic water, fire sprinkler systems, or irrigation systems shall comply with the minimum backflow prevention requirements as established by the Department of Health (DOH), WAC 246-290-490, and the City.

Backflow prevention devices shall comply with and be installed in accordance with the requirements of the current Washington State Department of Health regulations, AWWA manual "Backflow Prevention and Cross-Connection Control Recommended Practices" (published 2015), and the current version of the International Plumbing Code.

An approved backflow prevention assembly, as listed in "Backflow Prevention Assemblies for Installation in Washington State" (DOH PUB 331-137), is required on all fire service line systems, domestic water services larger than 2-inches, and/or buildings in excess of thirty (30) feet above the water main. The assembly shall be installed at the location normally established for water meters, usually at the property line. A water service shall not be turned on until all required backflow prevention assemblies are installed, inspected, tested, approved, and registered with the City of Kelso. The backflow prevention assembly will remain the property of the customer. The Applicant will be responsible for all maintenance and testing of the assembly and vault for the life of the assembly.

The type of backflow prevention assembly required is based on the type of premises to which water service is being provided. The approved types of assemblies are listed below with some of the types of premises that must be protected by each type of assembly. However, these lists are not complete, they are only intended to provide some basic guidelines.

A. Reduced Pressure Backflow Prevention Assembly

An approved Reduced Pressure Backflow Prevention Assembly shall be installed on the service connection above ground to the following:

1. Any parcel or structure that has an auxiliary water supply on or available to it. This will include any above or below ground water source. (The most commonly encountered type of auxiliary water supply is a private well);

2. Structures which are located within an industrial zone;

3. Hospitals, medical centers, and clinics;

4. Mortuaries and nursing homes;

5. Gas stations;

6. Car washes;

7. Sewage pump and lift stations;

8. Dry cleaners and commercial laundries;

9. Any water system which has a pump to supplement pressure; and

10. Irrigation systems, which are designed to use chemical injection.

B. Double Check Assembly or Double Check Detector Assembly

An approved double check assembly or an approved double check detector assembly shall be required (provided that all internal plumbing is installed and maintained in accordance with the International Plumbing Code), on the service connection to structures where there is:

1. Any fire system or water line to a private fire hydrant (Double Check Detector Assembly required);

2. Multi-story buildings which are in excess of thirty (30) feet above the water main at the service connection;

3. Shopping centers or large retail stores; and

4. Restaurants or fast food establishments.

C. Installation and Testing

Backflow vaults shall be located on private property and outside of public easements

Backflow prevention assemblies shall be installed at the water service connection on the customer side of the meter.

No part of the backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. In a vault or chamber, adequate drainage shall be provided; and test cocks shall be plugged. The plugs shall not be of dissimilar metals.

The backflow assembly shall be protected from freezing and other severe weather conditions.

All backflow assemblies shall have a minimum twelve (12) inch clearance on the back side, twenty-four (24) inch clearance on the test-cock side and twelve (12) inch clearance below the assembly.

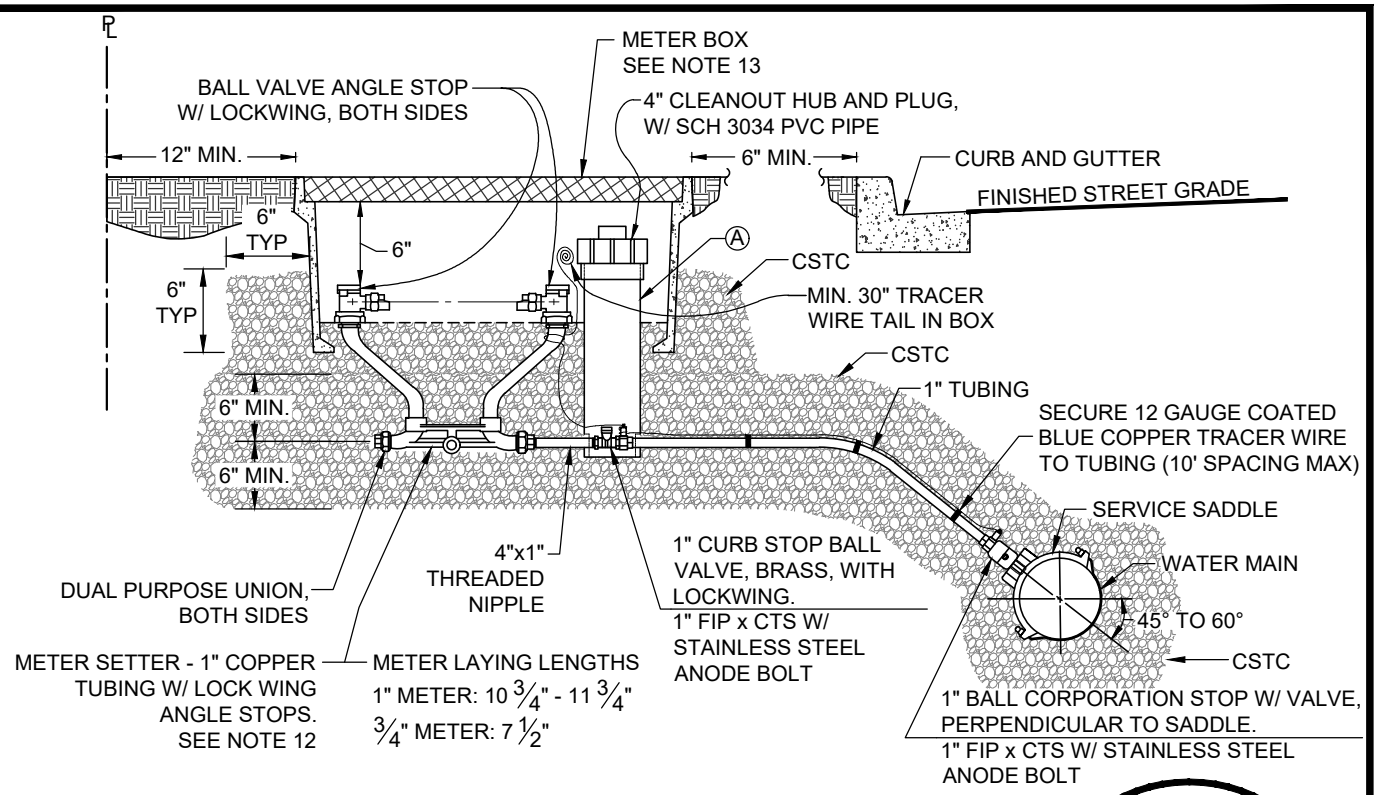
A clearance of at least six (6) inches shall be maintained above the gate-valve stem at full extension. A minimum headroom of six (6) feet is required in vaults without a full opening top. Access to the device and to any vault or chamber shall remain clear at all times.

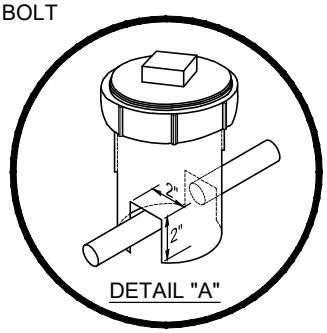
After installation, all backflow prevention assemblies shall be tested by a State of Washington certified tester. The results of the testing shall be submitted to and approved by the City prior to issuance of "final occupancy."

Appendix 1: Standard Plans

Standard Plan Index

Title	Standard Plan No.
Standard Water Plans	
¾” and 1” Water Service Connection	KW-010-21
Double Service Connection – 1” Residential	KW-020-21
1 ½” and 2” Water Service	KW-030-21
2” Irrigation Water Service	KW-040-21
3” and Larger, Above Ground, Water Meter Assembly and Vault	KW-050-21
3” and Larger, Below Ground, Water Meter Assembly and Vault	KW-060-21
4” – 12” Typical Pressure Regulation Station	KW-070-21
Hydrant Assembly	KW-080-21
2” Blowoff Assembly	KW-090-21
1” Manual Air Release Assembly	KW-100-21
2” Air/Vacuum Release Valve	KW-110-21
Valve Box Assembly	KW-120-21
Connection to Existing Water Main	KW-130-21
Double Check Valve Assembly – 2” and Smaller	KW-140-21
Concrete Thrust Block	WSDOT B-90.40-01
Supplemental to WSDOT B-90.40-01	
Concrete Thrust Block For Convex Vertical Bends	WSDOT B-90.50-00
Supplemental to WSDOT B-90.50-00	





DETAIL "A"

NOTES:

1. CLEARANCES:
   MIN. 5' FROM EDGE OF DRIVEWAY - METERS SHALL BE PLACED OUTSIDE OF DRIVEWAY
   MIN. 10' FROM TREES
   MIN. 5' FROM OTHER UTILITIES, EXCEPT SEWER AT 10' MIN.
   MIN. DEPTH AT RIGHT OF WAY IS 18"
2. COMPRESSION FITTINGS SHALL BE U.S. BRASS - NO GALVANIZED OR PLASTIC.
3. THE SERVICE LINE SHALL BE CONTINUOUS WITHOUT SPLICES, JOINTS OR COUPLINGS OF ANY KIND BETWEEN THE CORPORATION STOP AND CURB STOP VALVE UNLESS APPROVED BY THE CITY.
4. NO DIRECT TAPS SHALL BE ALLOWED.
5. METER LOCATION SHALL BE 12" MIN. FROM PROPERTY LINE. LOCATION TO BE CONFIRMED BY CITY.
6. SADDLES SHALL BE DUCTILE IRON, STAINLESS STEEL, OR BAND-TYPE WITH I.P. STANDARD TAPPING.
7. BALL CORPORATION STOPS FOR USE WITH SADDLES SHALL BE OF BRASS WITH INLET I.P. STANDARD THREAD AND COMPRESSION OUTLET COMPATIBLE WITH CONNECTION PIPING, WITH NO ADAPTERS.
8. SERVICE TUBING SHALL BE 1" HDPE (200 PSI RATING, CTS, BLUE) OR 1" TYPE K COPPER TUBING.
9. COMPRESSION COUPLING FOR USE IN CONNECTING PLAIN END WATER SERVICE TUBING SHALL BE APPLICABLE FOR THE TYPE OF TUBING BEING COUPLED. COMPRESSION COUPLINGS SHALL HAVE ARMORED GASKETS WHEN DIS-SIMILAR METAL TUBING IS JOINED.
10. CORPORATION STOPS AND COUPLINGS SHALL BE OF THE FOLLOWING MANUFACTURER BRANDS AND BE COMPRESSION DESIGN:
    MUELLER
    McDONALD
    FORD
11. 3/4" AND 1" WATER METERS SHALL BE PROVIDED BY THE CITY.
12. METER SETTERS SHALL BE FORD70 SERIES VBB74-12W-11-44-NL OR APPROVED EQUAL. INSTALLATION OF 3/4 " METERS REQUIRES ADAPTORS. ADAPTORS SHALL BE BRASS, FORD A24-NL OR APPROVED EQUAL.
13. METER BOXES SHALL BE ARMORCAST A6001419-KO WITH A A6001420DW-H7 COVER AND 00361020 CAST IRON DROP IN LID, OR APPROVED EQUAL.
14. ALL FITTINGS CONNECTING TO METER SETTER SHALL BE GASKETED (FIBER FOR DUAL PURPOSE NUTS, RUBBER FOR BALL VALVE ANGLE STOPS).
15. ADJACENT METER BOXES SHALL BE LOCATED SUCH THAT THERE IS A MINIMUM OF 16" SPACE BETWEEN OUTSIDE WALLS.

N.T.S.

3/4" AND 1" WATER SERVICE CONNECTION

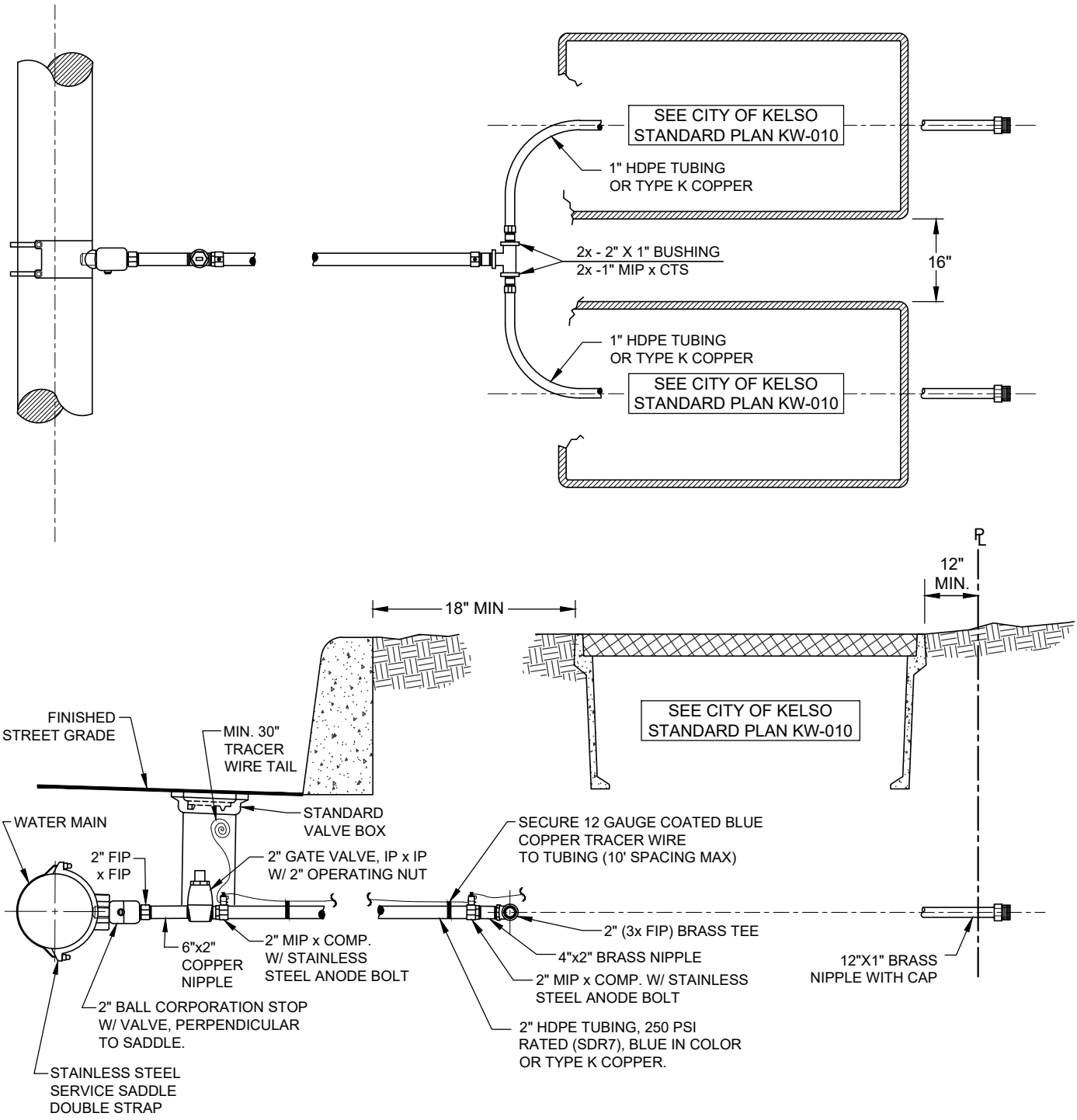
STANDARD PLAN NO.
KW-010-21

CITY OF KELSO
DEPARTMENT OF
COMMUNITY DEVELOPMENT
& ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

DATE:
MAY 2021



NOTES:

1. CORPORATION STOPS AND COUPLINGS SHALL BE OF THE FOLLOWING MANUFACTURER BRANDS AND BE COMPRESSION DESIGN: MUELLER, McDONALD, FORD.
2. STAINLESS STEEL INSERTS REQUIRED FOR ALL PACK JOINTS AND GRIP JOINTS.
3. ALL SERVICE SADDLES SHALL HAVE RUBBER GASKET, I.P. THREADS, AND STAINLESS STEEL DOUBLE STRAPS. TORQUE TO MANUFACTURE'S SPECS.
4. ALL FITTINGS SHALL BE ALL U.S. BRASS.
5. SEE CITY OF KELSO STANDARD PLAN KW-010 FOR ADDITIONAL NOTES.

N.T.S.

DOUBLE SERVICE CONNECTION - 1" RESIDENTIAL

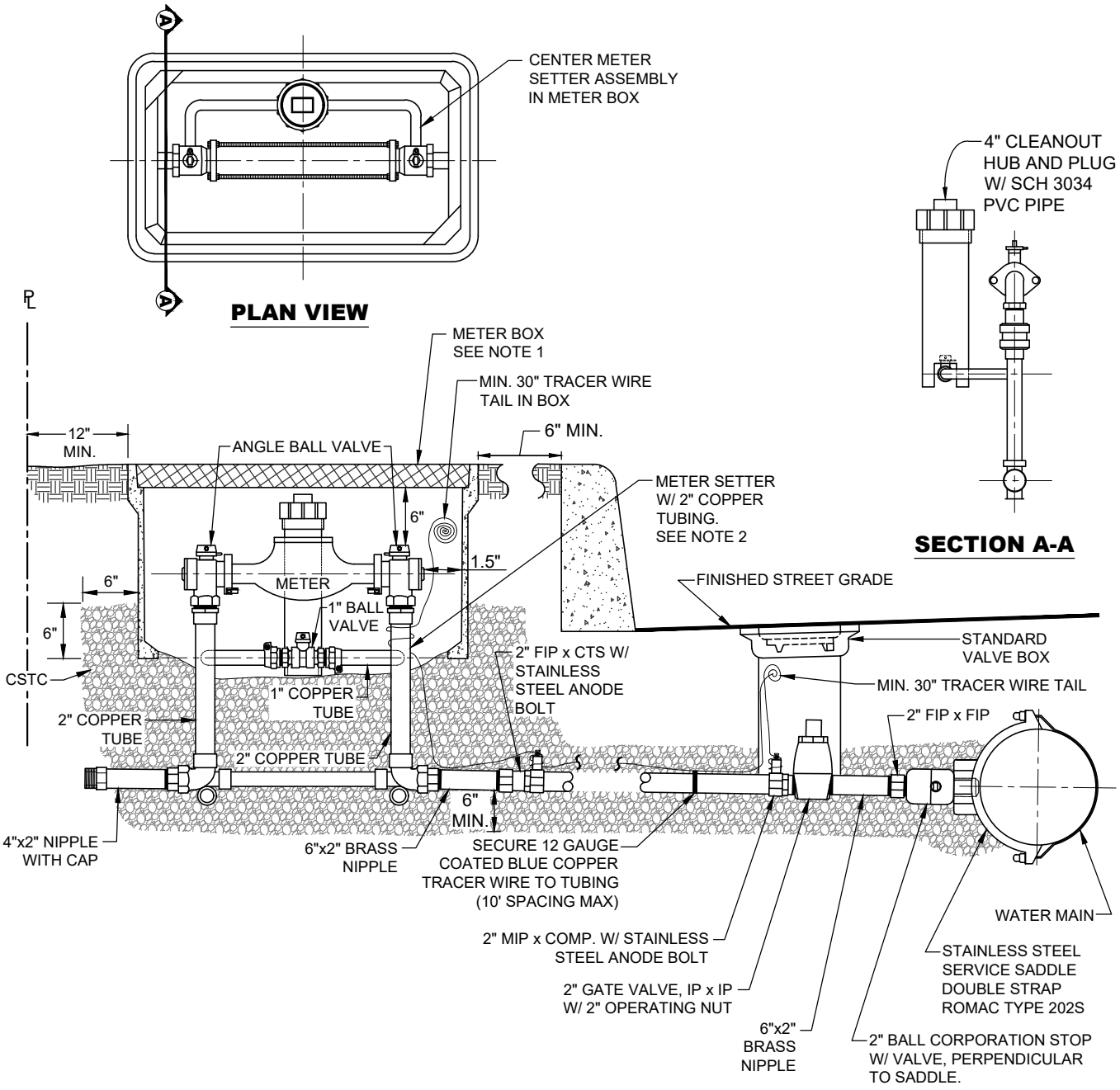
CITY OF KELSO
DEPARTMENT OF
COMMUNITY DEVELOPMENT
& ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

STANDARD PLAN NO.
KW-020-21

DATE:
MAY 2021



NOTES:

1. METER BOX SHALL BE ARMORCAST A6001640PCX12-KO WITH A A6001947TDZ-H7 COVER AND 00361121 CAST IRON DROP IN LID, OR APPROVED EQUAL.
2. METER SETTERS SHALL BE FORD VBB77-18HB-11-77-15-5-NL OR APPROVED EQUAL.
3. ALL FITTINGS SHALL BE U.S. BRASS.
4. THE SERVICE LINE SHALL BE CONTINUOUS WITHOUT ANY ADDITIONAL SPLICES, JOINTS OR COUPLINGS.
5. METER LAYING LENGTH:

   1 ½" = 13"
   2" = 17"

   PLUS ½" FOR GASKETS
6. 1 ½" METERS REQUIRE 2" x 1 ½" METER FLANGE REDUCERS.
7. FINAL GRADE ADJUSTMENT SHALL BE PERFORMED BY MODIFYING & STACKING BOXES.
8. SERVICE TUBING SHALL BE 250 PSI RATED (SDR7), BLUE, HDPE OR TYPE K COPPER.
9. ALL FITTINGS CONNECTING TO METER SETTER SHALL BE GASKETED.
10. CITY SHALL PROVIDE WATER METER.

N.T.S.

1-½" AND 2" WATER SERVICE

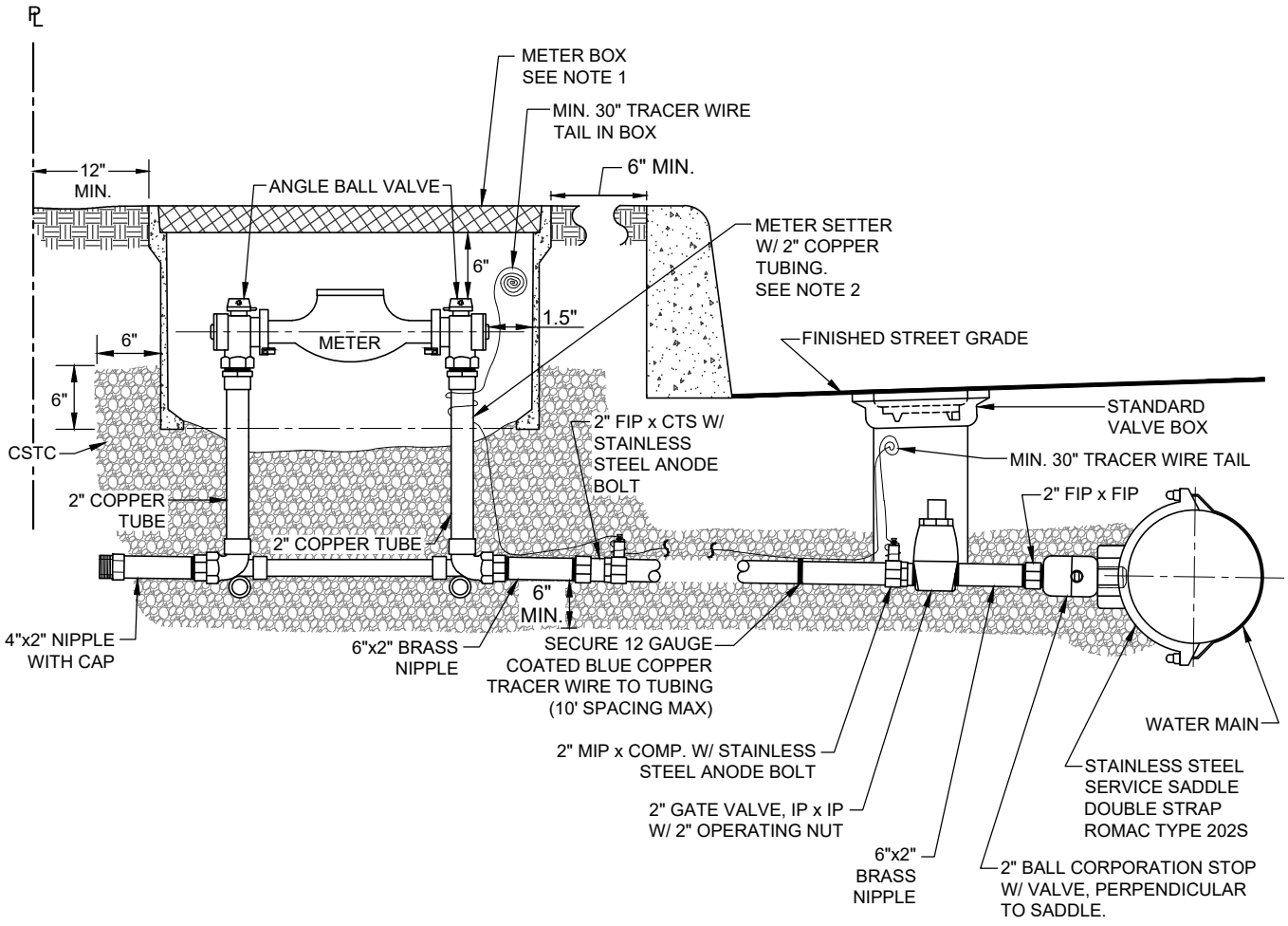
STANDARD PLAN NO.
KW-030-21

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

DATE:
MAY 2021



NOTES:

1. METER BOX SHALL BE ARMORCAST A6001640PCX12-KO WITH A A6001947TDZ-H7 COVER AND 00361121 CAST IRON DROP IN LID, OR APPROVED EQUAL.
2. METER SETTERS SHALL BE FORD VBB77-18-11-77-NL OR APPROVED EQUAL.
3. ALL FITTINGS SHALL BE U.S. BRASS.
4. THE SERVICE LINE SHALL BE CONTINUOUS WITHOUT ANY ADDITIONAL SPLICES, JOINTS OR COUPLINGS.
5. METER LAYING LENGTH:

   1 ½" = 13"
   2" = 17"

   PLUS ½" FOR GASKETS
6. 1 ½" METERS REQUIRE 2" x 1 ½" METER FLANGE REDUCERS.
7. FINAL GRADE ADJUSTMENT SHALL BE PERFORMED BY MODIFYING & STACKING BOXES.
8. SERVICE TUBING SHALL BE 250 PSI RATED (SDR7), BLUE, HDPE OR TYPE K COPPER.
9. ALL FITTINGS CONNECTING TO METER SETTER SHALL BE GASKETED.
10. CITY SHALL PROVIDE WATER METER.

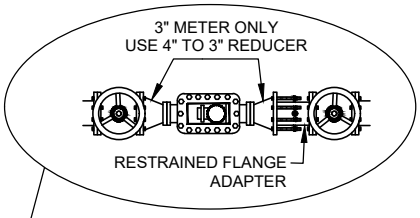
N.T.S.

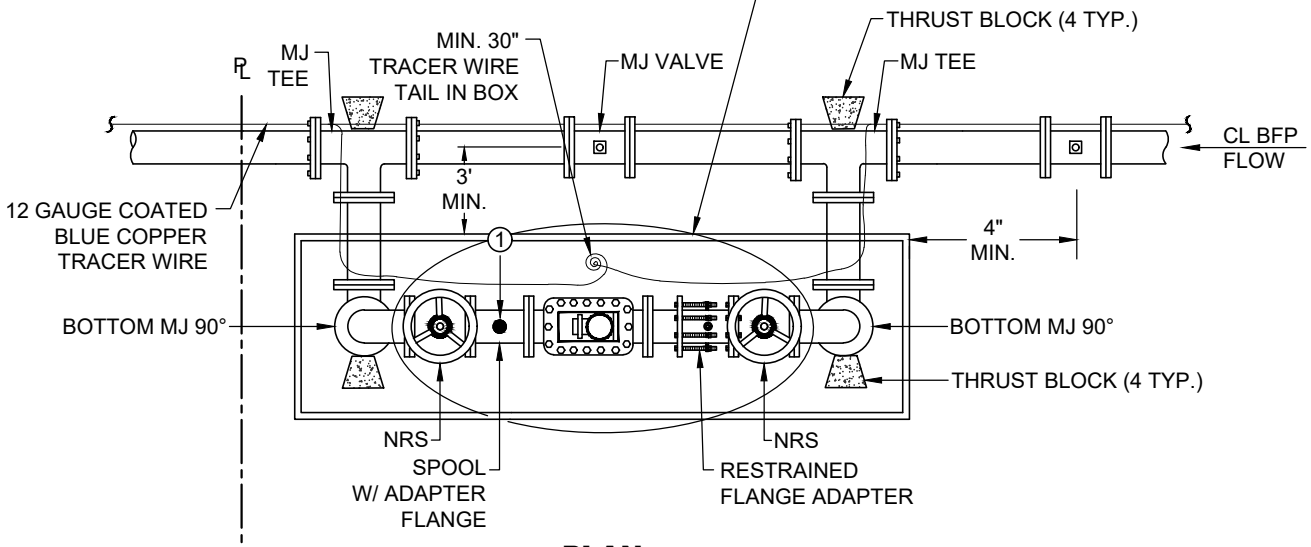
Kelso WASHINGTON	**2" IRRIGATION WATER SERVICE**	STANDARD PLAN NO. **KW-040-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

NOTES:

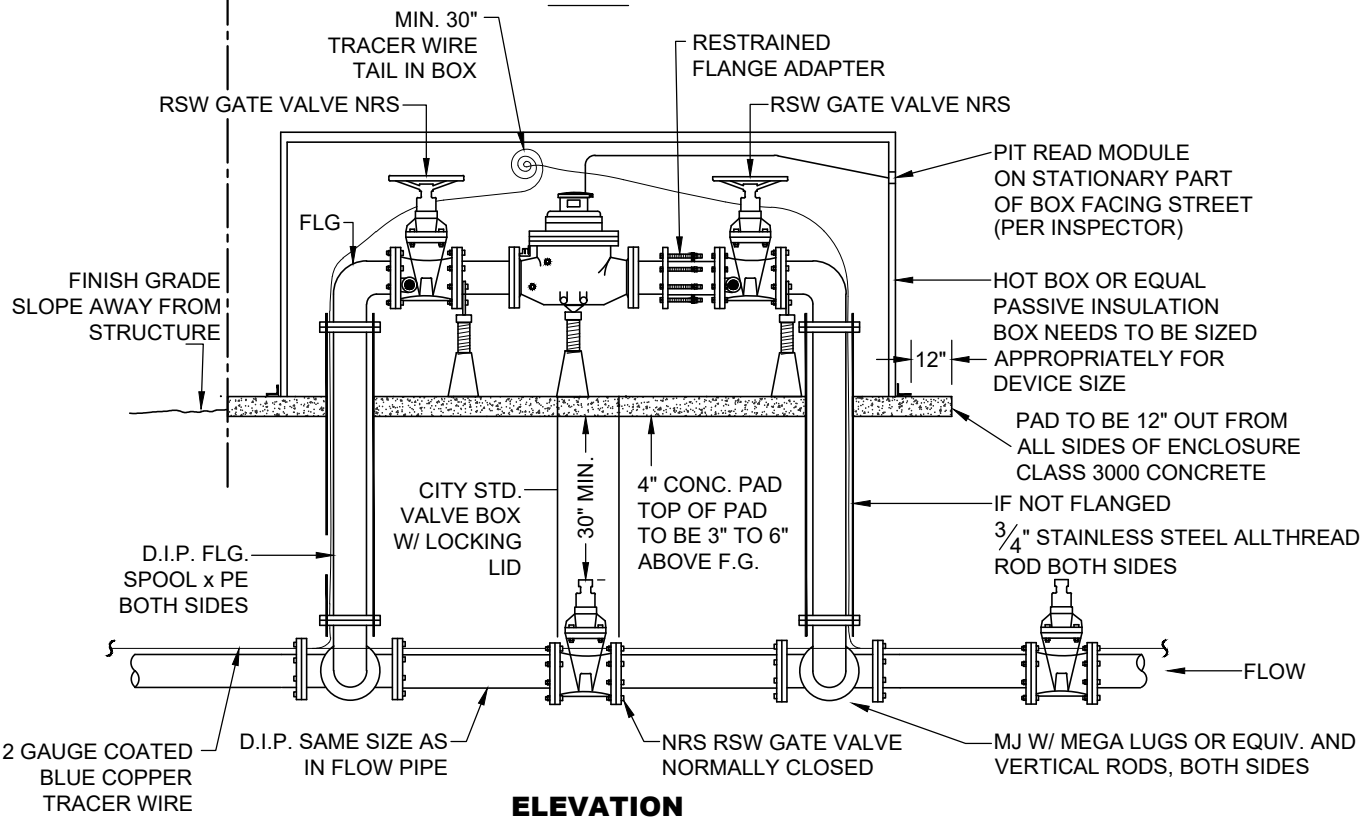
1. INSULATED ENCLOSURE INTERIOR CLEARANCE SHALL BE 12" MINIMUM TO ALL SURFACES AND PER MANUFACTURERS SPECIFICATIONS.
3. 5" PIPE DIAMETER MIN. PRIOR TO THE STRAINER AND AFTER THE METER.
4. CITY SHALL PROVIDE WATER METER WITH STRAINER.
5. RESTRAINED FLANGE ADAPTER SHALL BE MEGAFLANGE - SERIES 2100 OR APPROVED EQUAL.

① 2" TEST PLUG, 4" BRASS NIPPLE, WITH 2" BALL VALVE AND PLUG WITH ROMAC SST SADDLE.





PLAN



ELEVATION

N.T.S.

WATER METER ASSEMBLY AND VAULT

3" & LARGER, ABOVE GROUND

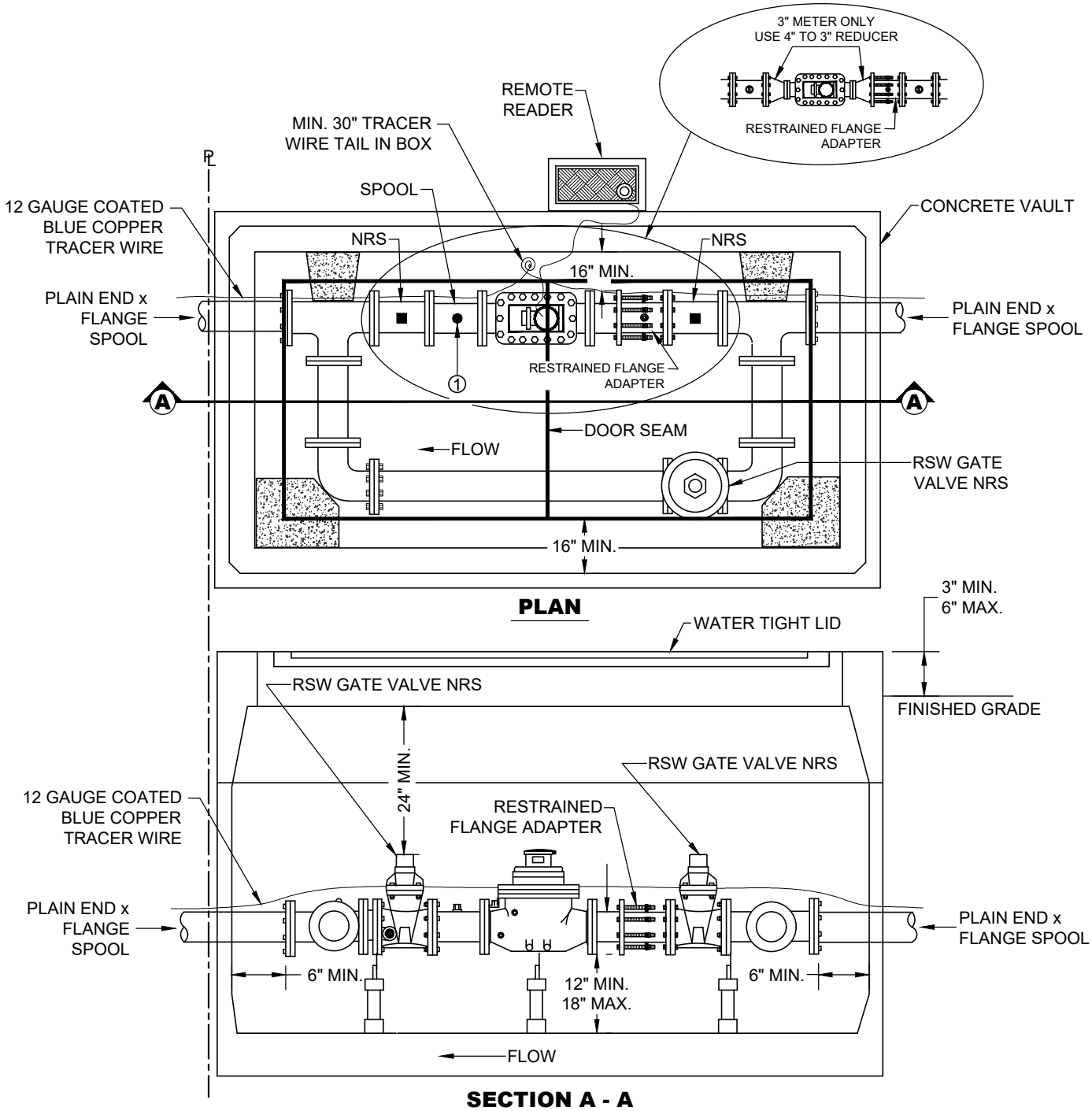
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	STANDARD PLAN NO. **KW-050-21** DATE: **MAY 2021**

NOTES:

1. VAULT SHALL NOT BE LOCATED IN TRAFFIC AREAS OR PARKING LOTS.
2. USE DOUBLE RAISE ALUMINUM LW PRODUCTS HHD-1 HYDRAULIC ASSIST LOCKING HATCH (MIN. 36" x 60") (HS20 LOADING), OR APPROVED EQUAL, WITH LEAK PROOF GASKET.
3. HATCH DRAINS SHALL BE PLUMBED TO DAYLIGHT.
4. BYPASS VALVE AND PIPE SHALL BE SUPPORTED.
5. CITY SHALL PROVIDE WATER METER WITH STRAINER.
6. RESTRAINED FLANGE ADAPTER SHALL BE MEGAFLANGE - SERIES 2100 OR APPROVED EQUAL.

RSW = RESILIENT SEAT WEDGE
NRS = NON-RISING STEM
KNOCKOUTS ARE PERMISSIBLE

① 2" TEST PLUG, 4" BRASS NIPPLE, WITH 2" BALL VALVE WITH PLUG



N.T.S.

Kelso WASHINGTON	**WATER METER ASSEMBLY AND VAULT** **3" & LARGER, BELOW GROUND**	STANDARD PLAN NO. **KW-060-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

4" - 12" TYPICAL PRESSURE REGULATION STATION

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

X_____

STANDARD PLAN NO. **KW-070-21**

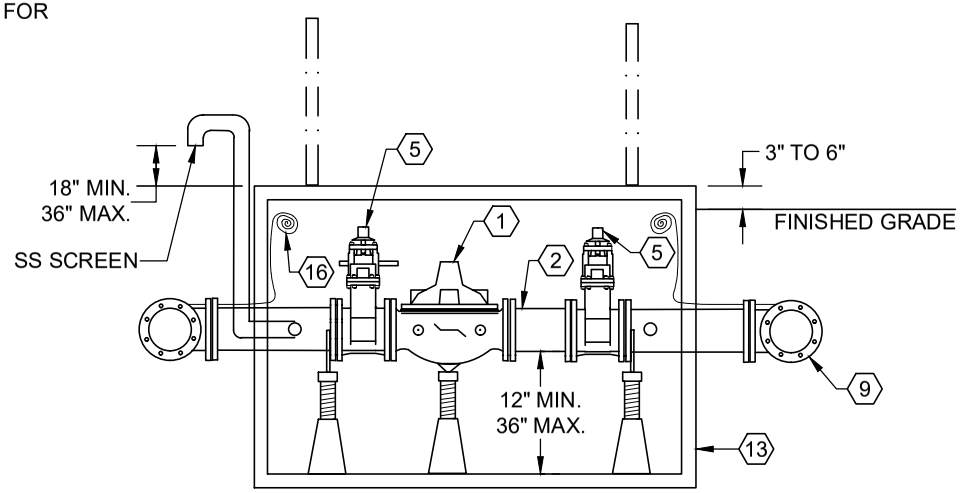
DATE: **MAY 2021**

N.T.S.

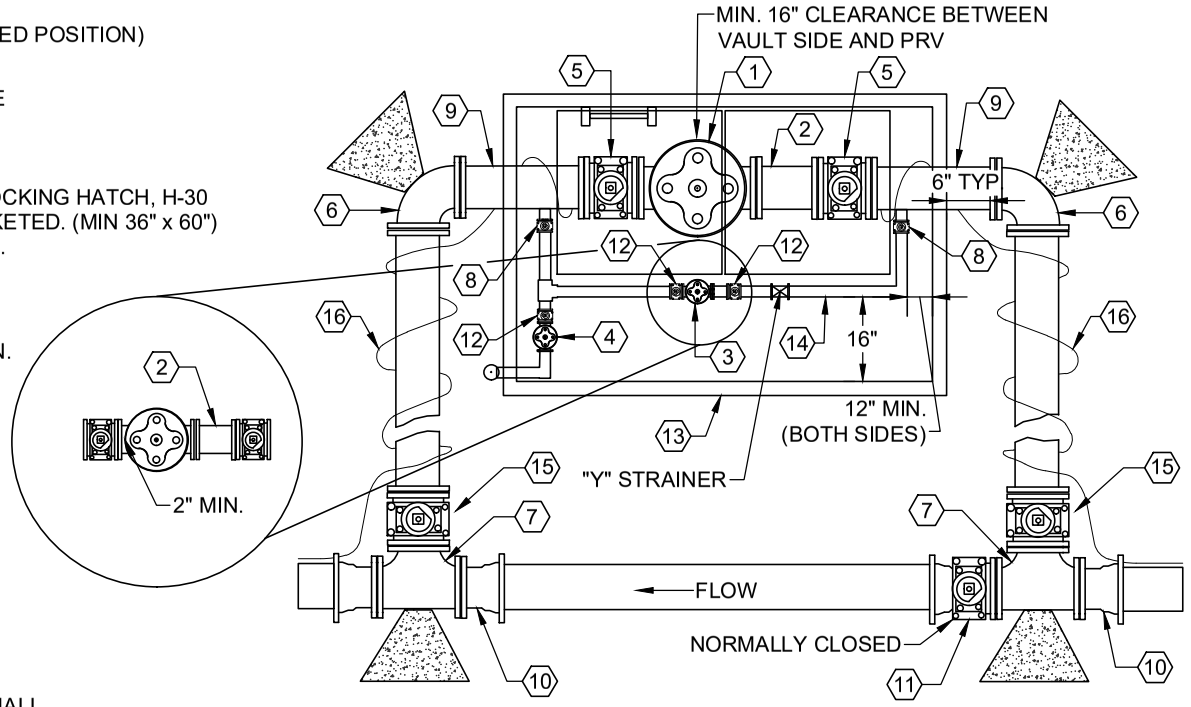
1. PRESSURE REDUCING VALVE WITH STEM INDICATOR RATED FOR FIRE AND PEAK DEMAND.
2. "Y" STRAINER FLG x MJ
3. LOW FLOW PRESSURE REDUCING VALVE WITH STEM INDICATOR RATED FOR DOMESTIC AND PEAK DEMAND.
4. PRESSURE RELIEF VALVE & DISCHARGE PIPE SHALL BE SIZED FOR FIRE AND PEAK DEMAND.
5. RSWGV FLG x MJ
6. FLG x MJ 90d BEND
7. FLG x FLG TEE
8. RESILIANT SEAT WEDGE GATE VALVE
9. FLG x MJ D.I. SPOOL
10. FLG x MJ ADAPTOR. USE ROMAC FLG COUPLING ADAPTOR FOR INSTALLING IN EXISTING PIPE.
11. MJ x FLG RSWGV (ZONE VALVE CLOSED POSITION) FLG TO UPSTREAM TEE ONLY.
12. RESILIANT SEAT WEDGE GATE VALVE
13. CONCRETE VAULT
14. ALUMINUM HYDRALIC LIFT ASSIST LOCKING HATCH, H-30 RATED, LW HDD-1 LEAK PROOF GASKETED. (MIN 36" x 60") HARDWARE TO BE STAINLESS STEEL.
15. FLG x MJ VALVE
16. INSTALL TRACER WIRE INTO STATION. MIN. 30" TRACER WIRE TAIL IN BOX.

NOTES:

1. PRV SHALL BE SIZED TO RELIEVE TOTAL CAPACITY OF STATION IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATION.
2. ALL THRUST BLOCKS TO BE CLASS 4000 CONCRETE.
3. HATCH TO DRAIN OUTSIDE VAULT.
4. ALL MJ FITTINGS TO BE RESTRAINED.
5. LARGE VALVE TO HANDLE FIRE FLOW, SMALL VALVE TO HANDLE DOMESTIC MAX DA.
6. SHOP DRAWING APPROVAL REQUIRED PRIOR TO ORDERING MATERIALS.



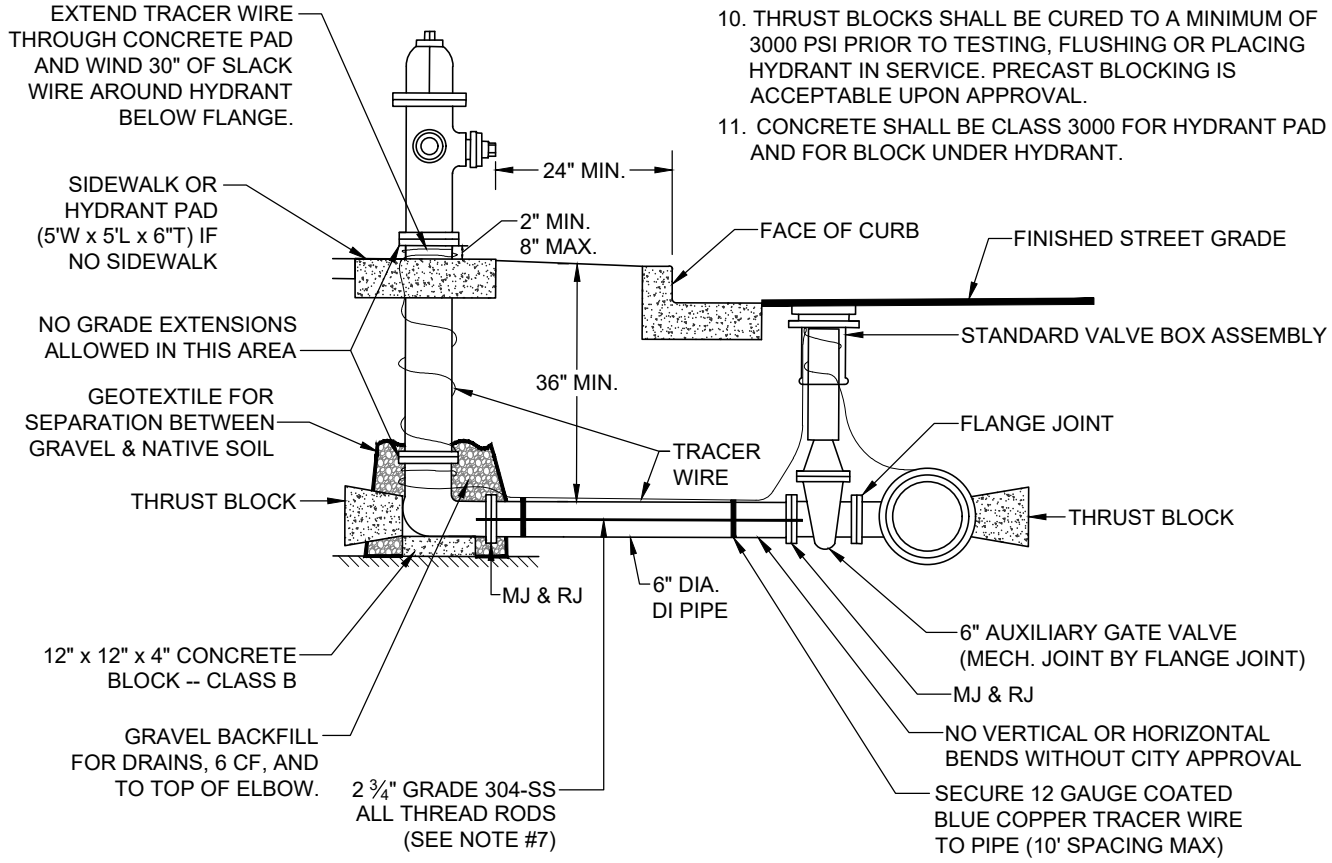
SECTION



PLAN

NOTES:

1. HYDRANTS SHALL BE 5 ¼" MUELLAR CENTURION, WATEROUS PACER 90, CLOW MEDALLION OR KENNEDY K81D GUARDIAN, WITH 16" TOP SECTION OR APPROVED EQUAL.
2. ALL HYDRANTS SHALL HAVE NATIONAL STANDARD THREAD OUTLETS, TWO 2 ½" PORTS AND SHALL BE EQUIPPED WITH ONE 4 ½" PUMPER CONNECTION WHICH FACES THE MAIN ROADWAY.
3. ALL HYDRANTS SHALL STAND PLUMB WITH THE LOWEST OUTLET OF THE HYDRANT NO LESS THAN 18" ABOVE FINISHED GRADE.
4. 10 MIL. PLASTIC SHEETING SHALL BE USED AS A BOND BREAKER BETWEEN CONCRETE BLOCKING AND PIPE FITTING AS WELL AS BETWEEN HYDRANT BARREL AND HYDRANT PAD.
5. INCLUDE VALVE BOX IN HYDRANT PAD WHEN BOX IS WITHIN 3' OR LESS OF HYDRANT OR BETWEEN SIDEWALK AND CURB.
6. ALL HYDRANTS SHALL BE BAGGED UNTIL SYSTEM IS APPROVED.
7. ASSEMBLY SHALL BE RODDED OR SHALL HAVE RESTRAINED JOINTS INCLUDING THRUST BLOCKS.
8. LOCATION OF HYDRANT SHALL COMPLY WITH ADA REQUIREMENTS.
9. CHAINS SHALL REMAIN ATTACHED TO HYDRANT.
10. THRUST BLOCKS SHALL BE CURED TO A MINIMUM OF 3000 PSI PRIOR TO TESTING, FLUSHING OR PLACING HYDRANT IN SERVICE. PRECAST BLOCKING IS ACCEPTABLE UPON APPROVAL.
11. CONCRETE SHALL BE CLASS 3000 FOR HYDRANT PAD AND FOR BLOCK UNDER HYDRANT.



N.T.S.

HYDRANT ASSEMBLY

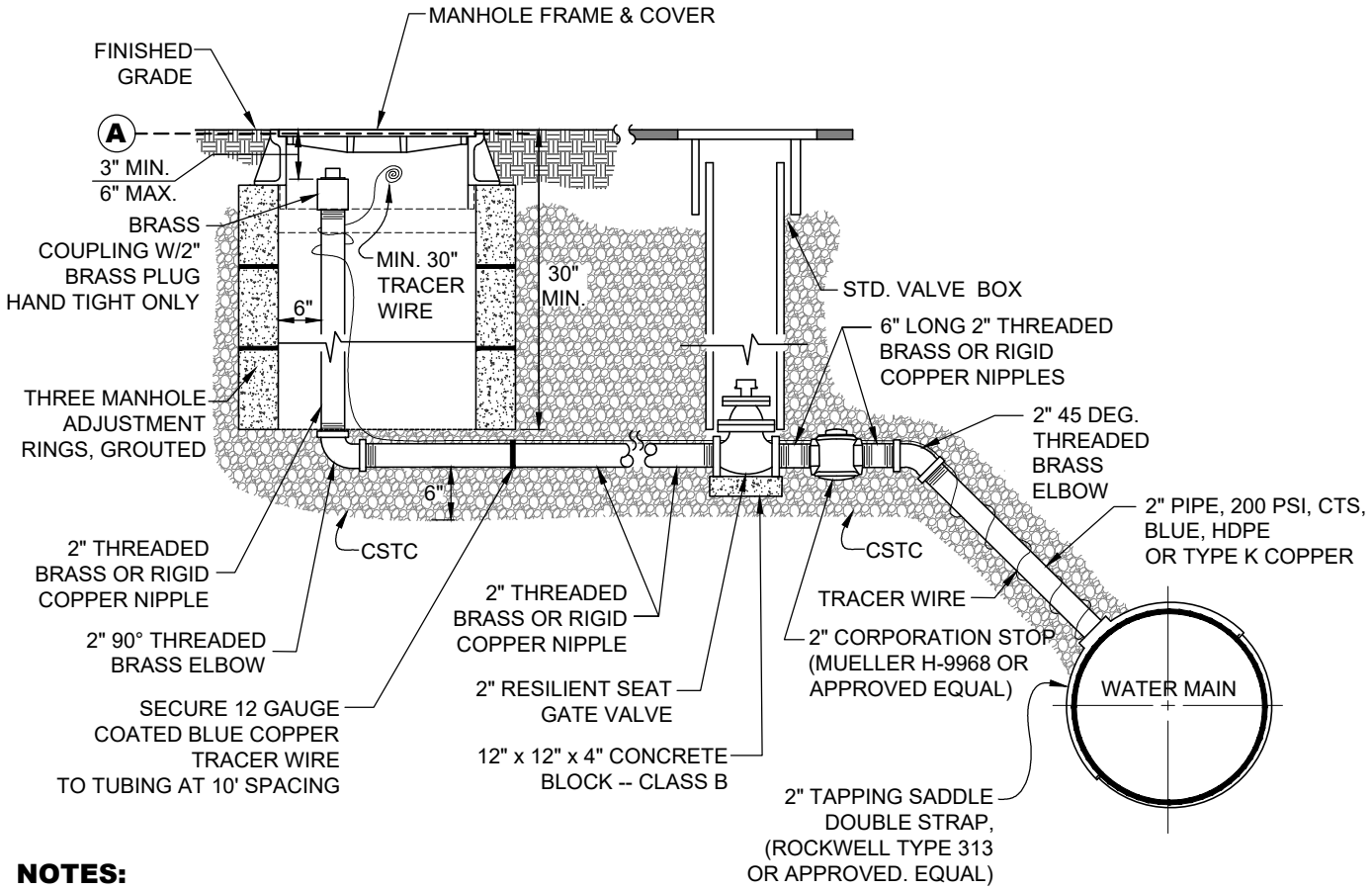
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

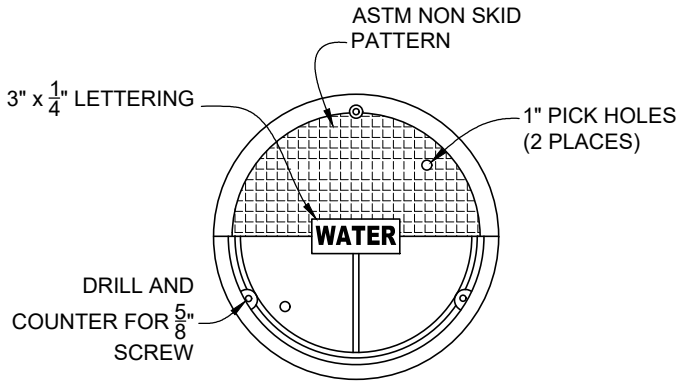
STANDARD PLAN NO.
KW-080-21

DATE:
MAY 2021



NOTES:

1. BLOWOFFS SHALL BE INSTALLED 1' FROM THE END OF THE MAIN.
2. COVER FOR CONCRETE BLOWOFF ENCLOSURE SHALL HAVE TITLE "WATER"
3. MIN. 6" CSTC UNDER BLOWOFF PIPE AND MANHOLE



DETAIL A - MANHOLE COVER

N.T.S.

2" BLOWOFF ASSEMBLY

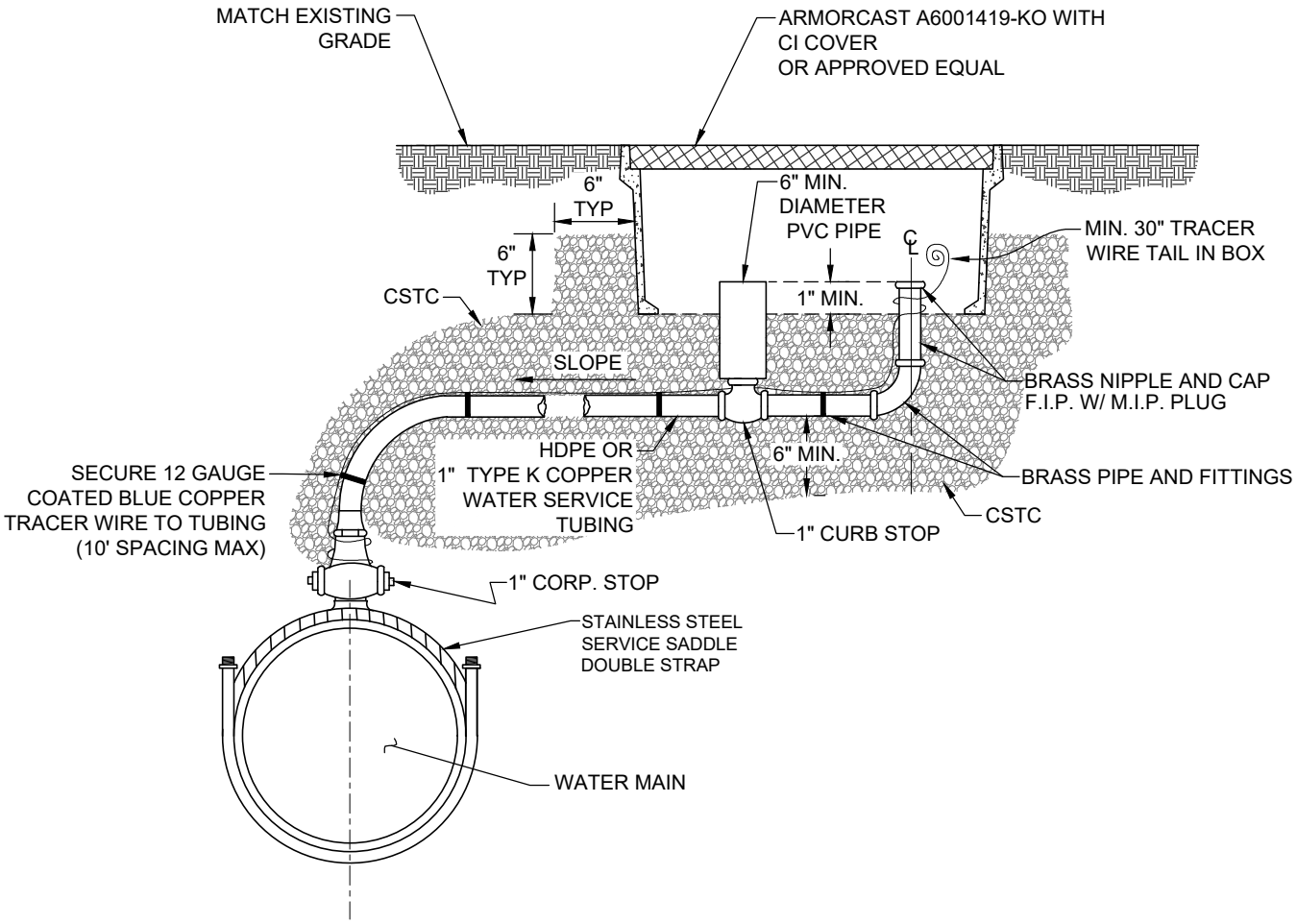
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

STANDARD PLAN NO.
KW-090-21

DATE:
MAY 2021



NOTES:

1. LOCATE AT HIGH POINT OF MAIN.
2. TAP TOP OF MAIN.
3. USE FOR 4" AND SMALLER MAINS ONLY.

N.T.S.

1" MANUAL AIR RELEASE ASSEMBLY

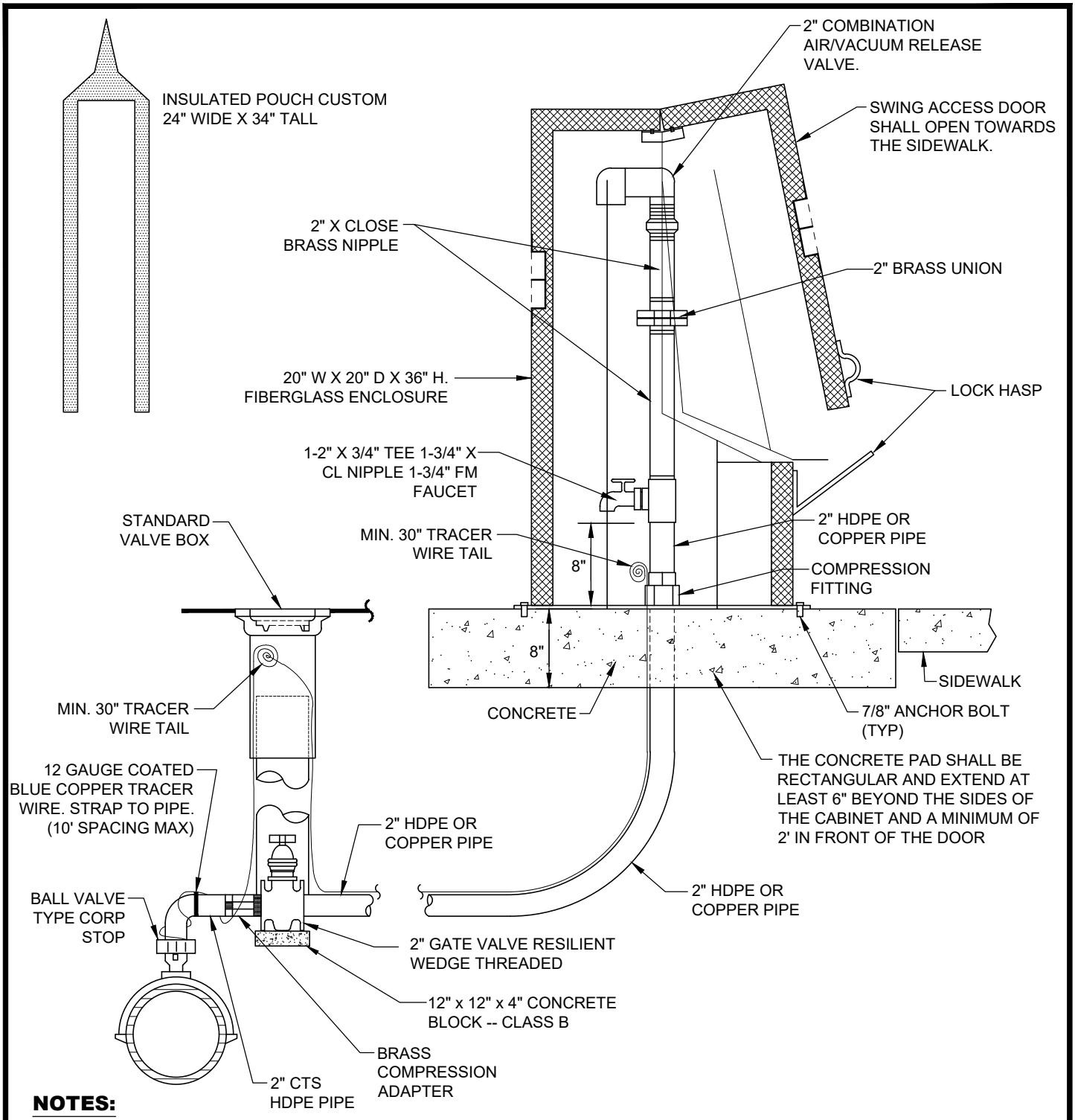
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

STANDARD PLAN NO.
KW-100-21

DATE:
MAY 2021



NOTES:

1. VALVE ASSEMBLY SHALL BE SET AT THE HIGH POINT OF THE LINE.
2. AIR/VACUUM RELEASE VALVE SHALL BE INSTALLED BEHIND THE SIDEWALK AT THE NEAREST PROPERTY CORNER AND NOT IN FRONT OF A RESIDENCE.
3. AIR/VACUUM RELEASE VALVES SHALL BE 2" ARI D-040, OR APPROVED EQUAL, WITH THERMO PROTECTION ENCASEMENT.
4. ALL FITTINGS AND PIPING SHALL BE DOMESTIC BRASS.
5. INSULATED POUCH SHALL BE DEKORRA PRODUCTS PART NO. 610 OR APPROVED EQUAL. INSTALL THE INSULATED POUCH OVER THE AIR/VACUUM RELEASE VALVE ASSEMBLY UNIT TO PROTECT IT FROM FREEZING.
6. CONCRETE SHALL BE 3000 PSI COMMERCIAL GRADE.
7. ALL PIPE, VALVES AND FITTINGS SHALL HAVE A 200 PSI PRESSURE RATING MIN.
8. AIR/VACUUM RELEASE VALVE ENCLOSURE SHALL BE HOT BOX-VENT GUARD MODEL #AVG2036, BEIGE EXTERIOR, FIBERGLASS OR APPROVED EQUAL.

N.T.S.

2" AIR/VACUUM RELEASE VALVE

CITY OF KELSO
DEPARTMENT OF
COMMUNITY DEVELOPMENT
& ENGINEERING

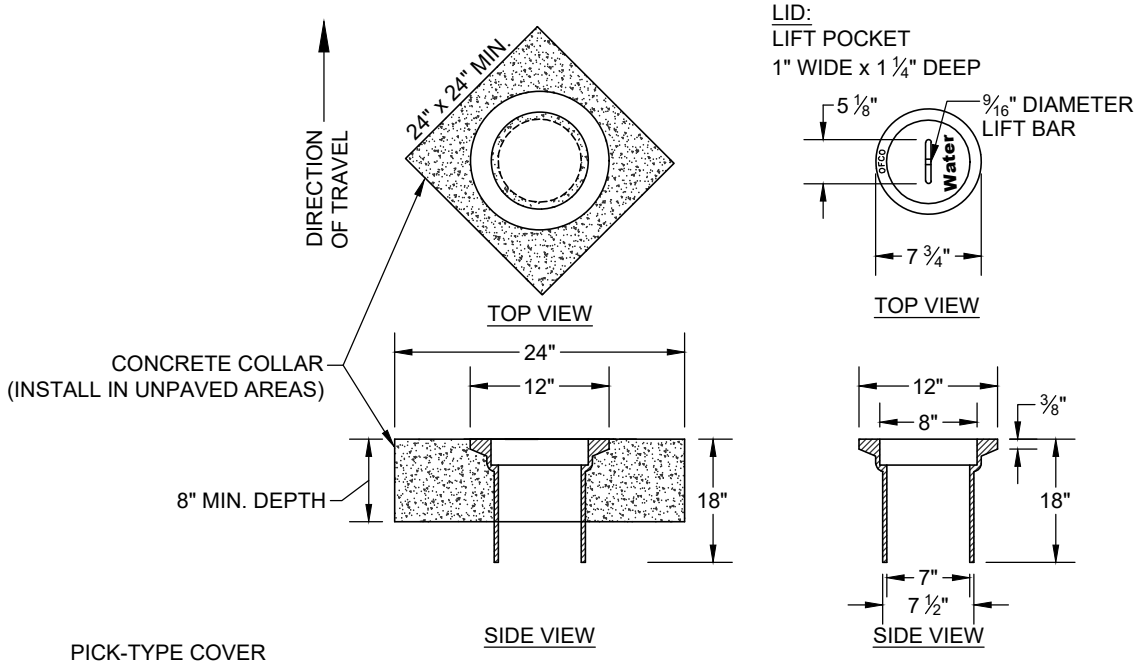
CITY ENGINEER APPROVAL: Michael Kardas, P.E.

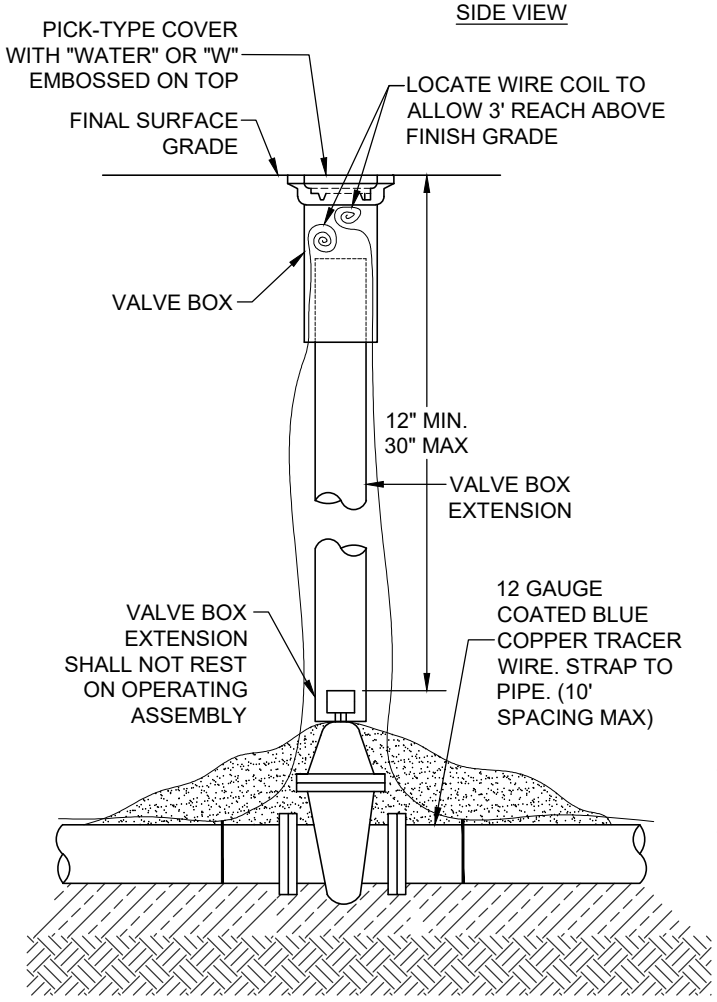
×_____

STANDARD PLAN NO.
KW-110-21

DATE:
MAY 2021

VALVE BOX & CONCRETE COLLAR





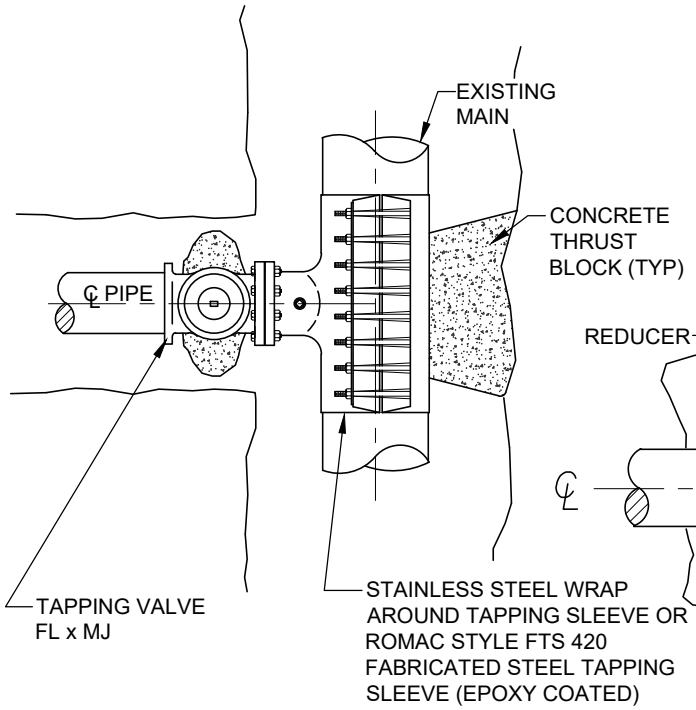
NOTES:

1. THE VALVE BOX ASSEMBLY SHALL CONSIST OF THE ADJUSTABLE VALVE BOX (FRAME AND COVER), VALVE BOX EXTENSION, OPERATOR EXTENSION IF NEEDED, AND CONCRETE COLLAR IF NEEDED.
2. VALVE BOXES SHALL BE SUPPLIED WITHOUT BOTTOM FLANGES.
3. THE VALVE BOX, AND EXTENSION SHALL BE INSTALLED PLUMB AND CENTERED OVER THE OPERATING NUT ON THE VALVE.
4. VALVE BOX EXTENSION SHALL EXTEND FROM TOP OF VALVE BONNET TO MIDDLE OF VALVE BOX AND BE ONE PIECE.
5. CONCRETE COLLAR SHALL BE 3000 PSI COMMERCIAL GRADE CONCRETE.
6. FOR THE PURPOSES OF THE PLANS AND SPECIFICATIONS THE VALVE BOX ASSEMBLY IS ALSO CALLED OUT AS A "VALVE BOX".
7. TOLERANCE = ⅛".
8. EXTENSIONS SHALL BE 3034 PVC PIPE (THICK WALL).
9. VALVE BOXES SHALL MEET SECTION 9-30.3(4) OF THE STD. SPECS.
10. VALVE BOX MATERIAL SHALL BE CAST IRON ASTM A-48, CL 30.
11. VALVE BOX SHALL BE OLYMPIC FOUNDARY PART NO. VB910, OR EQUAL.

N.T.S.

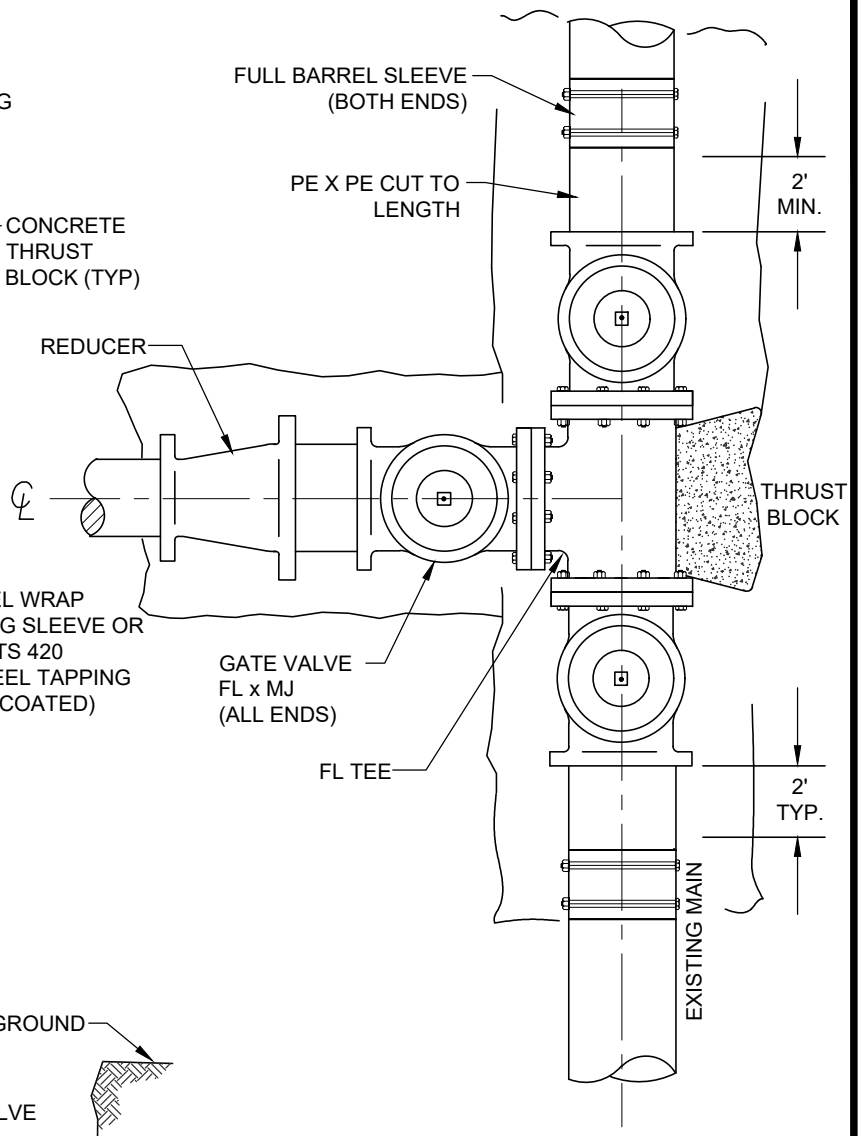
Kelso WASHINGTON	**VALVE BOX ASSEMBLY**	STANDARD PLAN NO. **KW-120-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

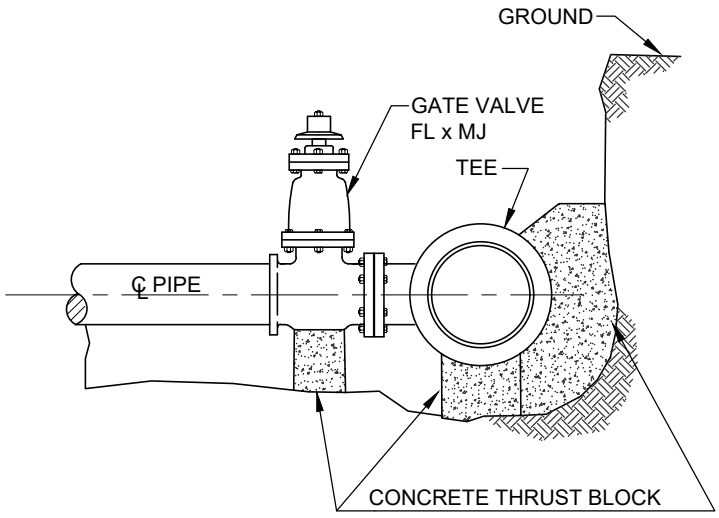
LIVE TAP



VALVE AND SLEEVE SHALL BE SUPPORTED AND BACKFILLED AS SHOWN BELOW-RIGHT.

CUT-IN TEE





NOTES:

1. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCKS ARE POURED.
2. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.
3. THRUST BLOCKS MAY BE PRECAST IF APPROVED.

N.T.S.

CONNECTION TO EXISTING WATER MAIN

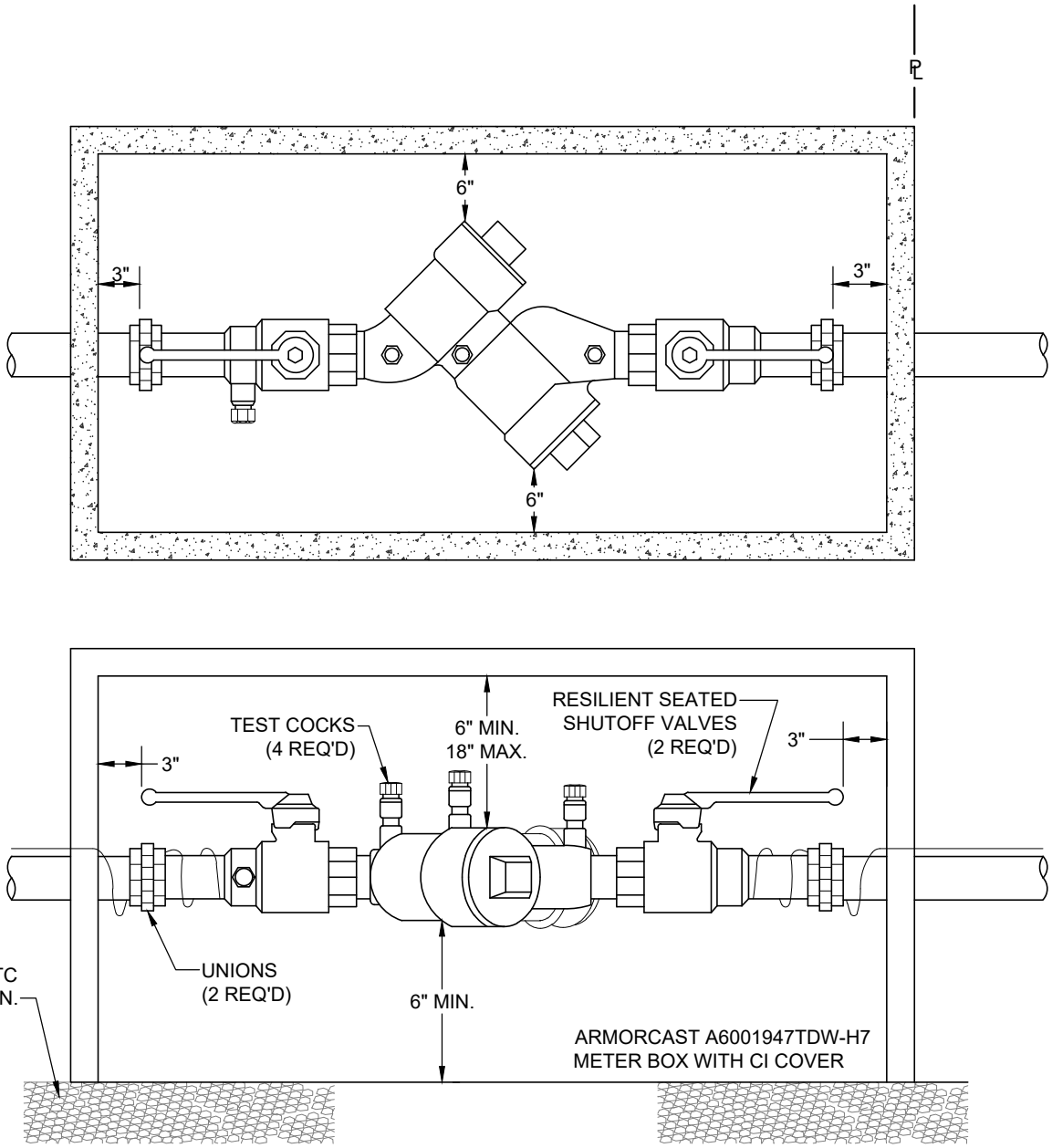
CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

STANDARD PLAN NO.
KW-130-21

DATE:
MAY 2021



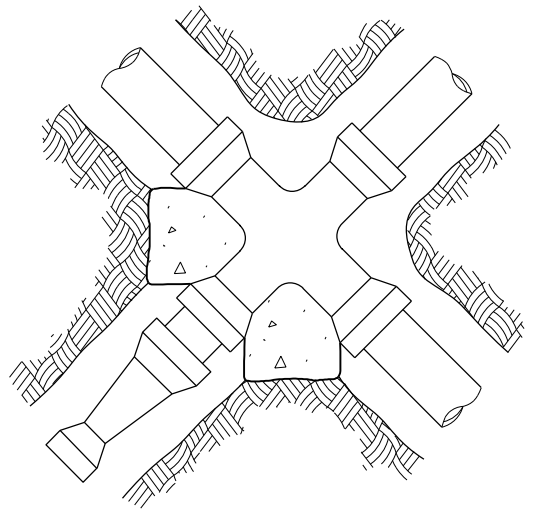
NOTES:

1. APPROVED DOUBLE CHECK VALVE ASSEMBLY TO LAY HORIZONTAL WITH GROUND.
2. DESIGNED FOR BACK SIPHONAGE AND BACK PRESSURE.
3. TEST COCKS TO EITHER FACE OUTWARDS OR UPWARDS FROM ASSEMBLY.
4. THOUGHOUGHLY FLUSH LINES PRIOR TO INSTALLATION OF BACKFLOW PREVENTER.
5. THE DCVA MAY BE INSTALLED ABOVE OR BELOW THE GROUND PROVIDED ALL CLEARANCES ARE MET.
6. DO NOT INSTALL IN AN AREA SUBJECT TO FLOODING.
7. MUST BE PROTECTED FROM FREEZING CONDITIONS.
8. THE BACKFLOW ASSEMBLY SHALL BE A STATE APPROVED MODEL.
9. FINAL GRADE ADJUSTMENT SHALL BE PERFORMED BY MODIFYING & STACKING BOXES.

N.T.S.

Kelso WASHINGTON	**DOUBLE CHECK VALVE ASSEMBLY - 2" & SMALLER**	STANDARD PLAN NO. **KW-140-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

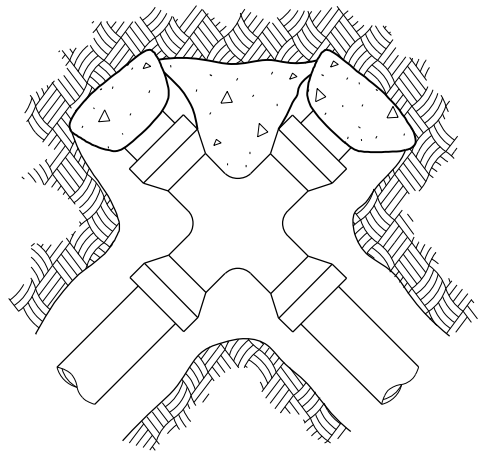
DRAWN BY: FERN LIDDELL



PLAN VIEW

UNBALANCED CROSS

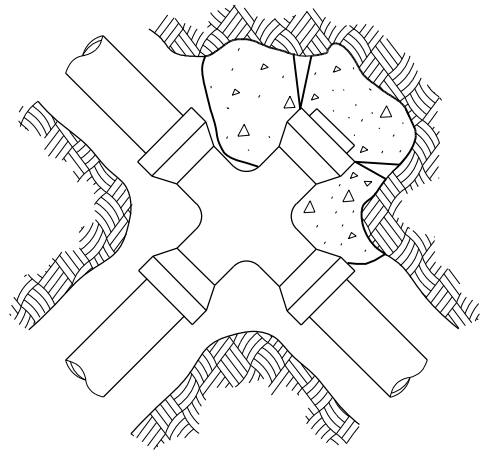
(USE COLUMN **A**)



PLAN VIEW

PLUGGED CROSS

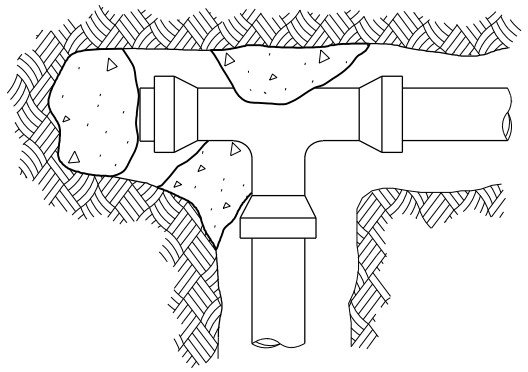
(USE COLUMN **B**)



PLAN VIEW

PLUGGED CROSS

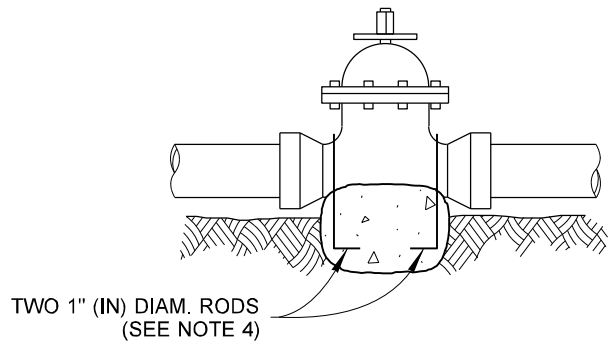
(USE COLUMN **A**)



PLAN VIEW

PLUGGED TEE

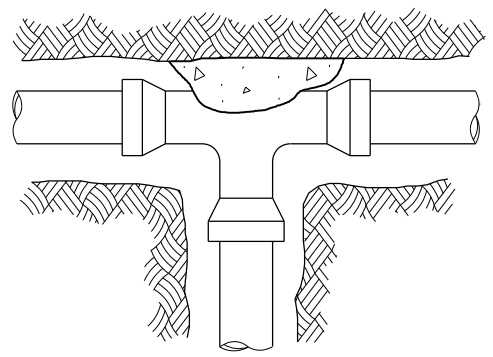
(USE COLUMN **B**)



PROFILE VIEW

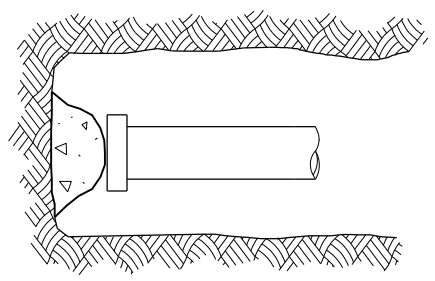
VALVE

(USE COLUMN **A**)



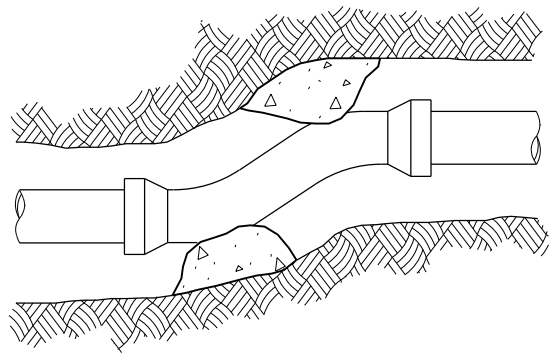
PLAN VIEW

TEE



PLAN VIEW

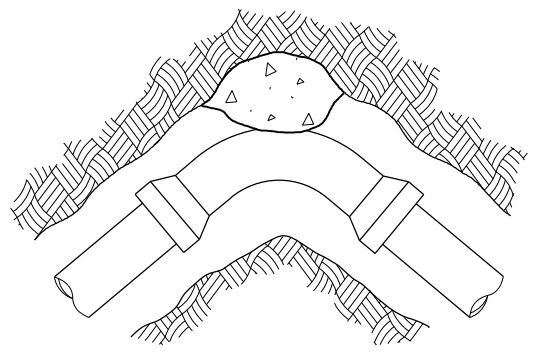
DEAD END



PLAN VIEW

OFFSET

(USE COLUMNS **B ~ E**)



PLAN VIEW

BEND

NOTES

1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area (in square feet) of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two 1" (in) minimum diameter rods on valves up through 10" (in) diameter. Valves larger than 10" (in) require special tie rod design.

SIZE	TEST PRESSURE (PSI)	THRUST AT FITTINGS IN POUNDS				
		A	B	C	D	E
		TEE AND DEAD ENDS	90° BEND	45° BEND	22.5° BEND	11.25° BEND
4"	250	3,140	4,440	2,405	1,225	615
6"	250	7,070	9,995	5,410	2,760	1,385
8"	250	12,565	17,770	9,620	4,905	2,465
10"	250	19,635	27,770	15,030	7,660	3,850
12"	250	28,275	39,985	21,640	11,030	5,545
14"	250	38,485	54,425	29,455	15,015	7,545
16"	250	50,265	71,085	38,470	19,615	9,855

SOIL TYPE	SAFE BEARING LOAD (PSF)
MUCK, PEAT, ETC.	0
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:02 PM

CONCRETE THRUST BLOCK

STANDARD PLAN B-90.40-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:53 AM

STATE DESIGN ENGINEER

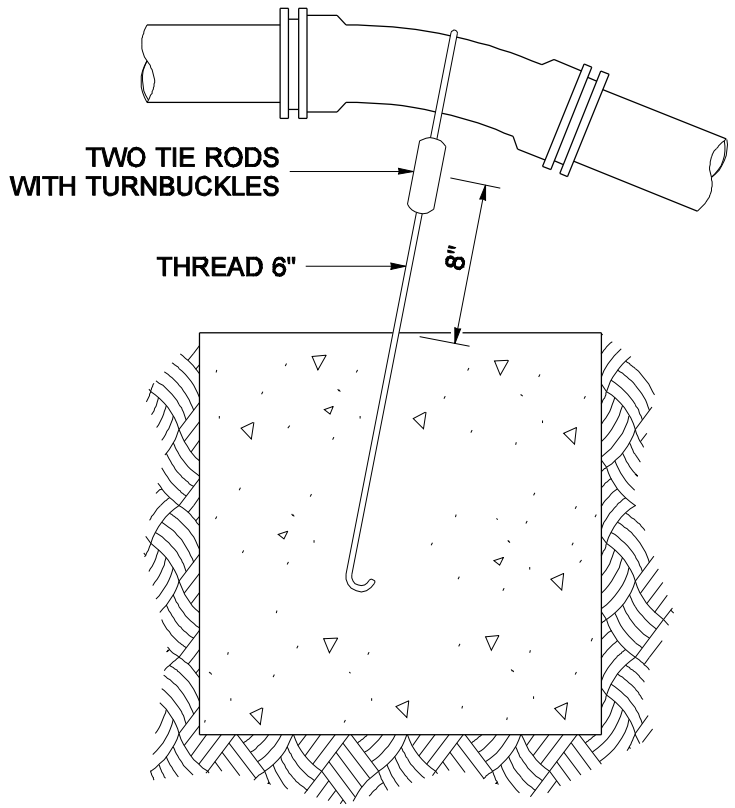
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
A-90.40-01

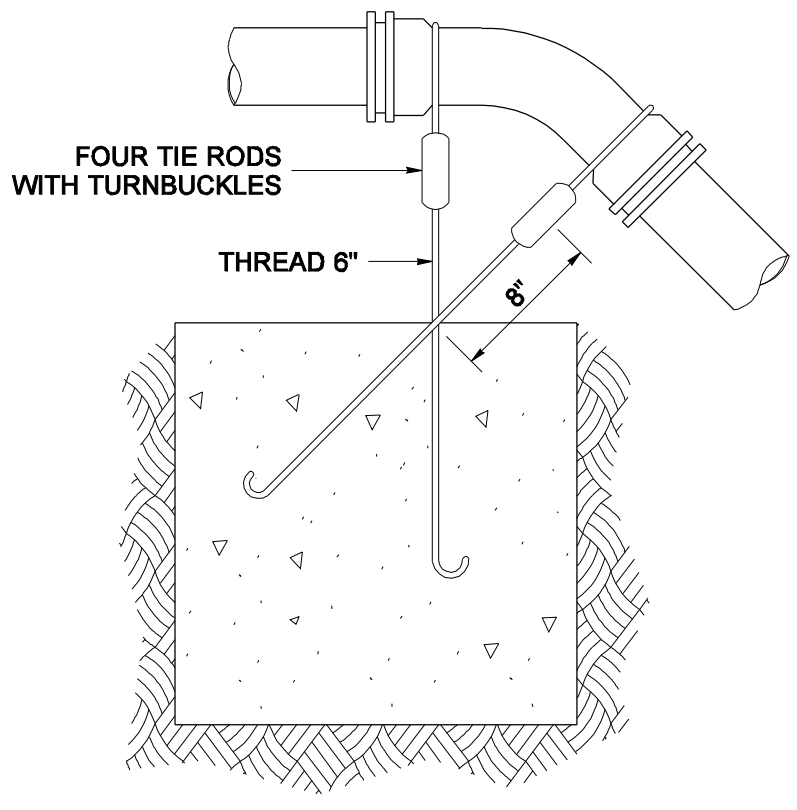
Modify the Standard Plan as follows:

Notes:
1. Forms for thrust blocking must be approved by the City prior to pouring the concrete.

2. Obtain approval from the Engineer for precast thrust blocking prior to use. Submit catalog sheets and manufacturer's specifications for approval. Allow a minimum of three (3) Business Days for review of submittals.



BLOCKING FOR 11.25° OR 22.5° VERTICAL BENDS



BLOCKING FOR 45° VERTICAL BENDS

NOTE

Steel tie rods to be heavily coated with asphalt after installation.

DIMENSION TABLE

PIPE DIAM.	TEST PRESSURE (PSI)	BEND ANGLE	CONCRETE VOLUME (Ft^3)	CUBE SIZE (Ft)	TIE ROD DIAM.	TIE ROD EMBEDMENT
4"	250	11.25°	6	1.8	5/8"	17"
		22.5°	12	2.3		
		45°	22	2.8		
6"	250	11.25°	14	2.4	5/8"	17"
		22.5°	27	3.0		
		45°	50	3.7		
8"	250	11.25°	25	2.9	5/8"	17"
		22.5°	48	3.6		
		45°	89	4.5		
10"	250	11.25°	38	3.4	5/8"	17"
		22.5°	75	4.2		
		45°	139	5.2		
12"	250	11.25°	55	3.8	5/8"	17"
		22.5°	108	4.8		
		45°	200	5.8	7/8"	24"
14"	250	11.25°	75	4.2	5/8"	17"
		22.5°	147	5.3	3/4"	20"
		45°	272	6.5	1"	27"
16"	250	11.25°	98	4.6	5/8"	17"
		22.5°	192	5.8	7/8"	24"
		45°	355	7.1	1 1/8"	30"

MATTHEW J. WITECKI
STATE OF WASHINGTON
15588
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES JULY 1, 2007

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

CONCRETE THRUST BLOCK FOR CONVEX VERTICAL BENDS STANDARD PLAN B-90.50-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterfeso — STATE DESIGN ENGINEER

06-08-06 — DATE

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
A-90.50-00

Modify the Standard Plan as follows:

Notes:
1. Forms for thrust blocking must be approved by the City prior to pouring the concrete.

2. Obtain approval from the Engineer for precast thrust blocking prior to use. Submit catalog sheets and manufacturer's specifications for approval. Allow a minimum of three (3) Business Days for review of submittals.

Chapter 6

Sanitary Sewer

City of Kelso
Engineering Design Manual
Amended May 2021
Effective Date _____

Chapter 6
Sanitary Sewer
City of Kelso
Engineering Design Manual

Table of Contents

CHAPTER 6 – SANITARY SEWER

6A GENERAL CONSIDERATIONS

6A.010 General

Sanitary sewerage refers to waste water derived from domestic, commercial, and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. The standards established by this chapter are intended to represent the minimum standards for the design wastewater facilities. Except as otherwise stated herein, these standards apply to all sanitary sewer and facilities, regardless of whether final ownership is private or public.

Sanitary sewer design shall comply with the most current edition of the following, and as stated below:

- Kelso master plans;
- KEDM;
- Department of Ecology (ECY)'s Criteria for Sewage Works Design; and
- Washington State Department of Health (DOH) requirements.

Where there is a conflict between any of these documents, the most stringent standard will apply.

6B GRAVITY SEWER

6B.010 General

All sewers shall be designed as gravity sewers whenever physically feasible.

6B.020 Flow Criteria

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. Sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet the requirements for future service. Sewer lift stations shall be designed and located to optimize the service area to provide regional service. Temporary or interim lift stations will not be permitted.

New gravity sewer systems shall be designed for capacity as specified in ECY *Criteria for Sewage Works Design (Orange Book)*. When an Exception from these flow rates is requested, the submittal shall include a description of the procedure used for the sewer design, in addition to the criteria described in Chapter 1, Design Exception Process.

6B.030 Minimum Size, Location and Slopes

A. Minimum size. The minimum size for gravity sewer mains shall be 8-inch nominal diameter. The minimum size for a side sewer within the street right-of-way shall be 6 inches.

B. Gravity sewer shall be designed with a minimum depth of 5 feet and to provide gravity service to adjoining parcels and future areas to be served, and vertical clearance between water and sewer lines. For sewer mains located where grading is anticipated for future development, the sewer shall be designed such that the minimum cover over the pipe is three (3) feet to

finished grade or existing grade, whichever is greater. Gravity sewer mains and associated manholes shall not exceed a maximum depth of 20 feet at any point along its length.

C. All sewers shall be designed to provide mean flow velocities of not less than 2.0 feet per second. However, sewer slopes shall not be less than the minimum slopes for gravity sewer main as set forth in the Washington State Department of Ecology's *Criteria for Sewage Works Design*, most current edition. Larger pipe size will not be allowed to achieve lesser slopes.

The last segment in a dead-end sewer main shall be designed at a minimum slope of 1%.

Sewers shall be designed with uniform slope between manholes.

D. Gravity sewers shall be designed with straight alignment between manholes. A new manhole is required where new mains connect to existing mains, if the connection is not made at an existing manhole.

E. The layout of sewer extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extensions shall be extended to and across the side of the affected property fronting the main.

F. Sanitary Sewer and Water Main spacing. See KEDM Chapter 5.

G. Sewers shall be located in the street along the center of a travel lane, outside of the wheel tracks, and within public right of way whenever possible. Sewers located within public utility tracts or easements shall be centered within the easement.

6B.040 Easements

When sewer or sewer facilities are proposed to be located outside of street rights-of-way, an easement shall be granted to the City for access and maintenance. The minimum widths of easements shall be as follows:

A. Sewer mains of all diameters less than ten feet deep: twenty (20) feet, except additional width may be required for pipes larger than thirty-six (36) inches diameter.

B. For pipes ten feet deep and greater, the width of easements shall be equal to or greater than the numerical value of twice the depth of the pipe invert measured from finish grade plus the outside bell diameter of the pipe, but not less than 20 feet.

C. Easements for lift stations, vaults or other facilities shall be dimensioned as directed by the Director.

D. A minimum 10' wide road with an all-weather surface shall be provided along the length of the easement.

The City Engineer may require increased easement widths when necessary to insure adequate area for equipment access and maintenance.

Gates to provide access by City maintenance vehicles shall be built into fences crossing easements. Gates shall be a minimum of 12' wide.

When possible, easements for sewers or sewer facilities serving apartment complexes or commercial/industrial developments shall be in parking lots, private drives, or similar areas that allow unobstructed vehicle access for maintenance.

6B.050 Manholes

A. Manholes shall be placed at:

- Intersections with other sewers;
- Angle points in the line;
- Changes in slope, and
- At the end of the line, except cleanouts may be used where the distance to the next downstream manhole is 150 feet or less.

B. Manholes shall be spaced no further than four-hundred (400) feet apart for pipes smaller than twenty-four (24) inches, and shall be located outside of wheel travel paths. A two tenths (2/10) foot drop from manhole inlet to outlet shall be provided. The crown of all upstream pipes shall not be lower than the crown of the downstream pipe.

C. Manholes in unimproved surfaces in easements shall be two (2) feet higher than surrounding grade.

D. Connections to manholes shall not be greater than two (2) feet above the outlet invert. Drop connections are not approved.

E. Sizing

1. Minimum manhole size is 54-inch diameter.

2. 54-inch and 60-inch Manholes
   a. Two (2) connecting pipes, 8-inch to 12-inch with more than forty-five degree (45°) deflection, 15-inch to 18-inch diam. with forty-five degree (45°) or more deflection.
   b. Three (3) connecting pipes, 10-inch to 12-inch diam., perpendicular.
   c. Four (4) connecting pipes, 10-inch to 12-inch diam., perpendicular.

3. 72-inch Manhole
   a. Two (2) connecting pipes, 15-inch to 18-inch diam. with less than forty-five degree (45°) deflection.
   b. Three (3) connecting pipes, 15-inch diam., perpendicular.
   c. Four (4) connecting pipes, 15-inch diam., perpendicular.

4. In the above criteria "deflection" refers to the angle <u>between</u> any two (2) pipe channels in the manhole. Channels shall be centered in manhole with ladder rungs placed on the side with the larger shelf. A minimum of one (1) foot separation is required between the outside walls of pipes penetrating the manhole wall.

   For other pipe configurations, the size of the manhole shall be as approved by the

City.

F. Locking manhole covers shall be provided in areas outside of the public right-of-way.

6B.060 High-Velocity Protection

Where velocities will exceed 7 feet per second, special measures will be required as directed by the City Engineer.

6B.070 Side Sewer

A. A side sewer refers to the extension of a line from the sewer main to the right of way line or easement line to serve a property. A sewer service line refers to the line that runs from two (2) feet outside the foundation to where the side sewer ends at the right of way line.

B. Each building served by potable water shall be served by a separate side sewer. The following exceptions may apply—an application for design exception is required:

1. A single-family residence with an accessory dwelling unit (ADU) may share a side sewer if they are in the same building. If they are in separate buildings, a separate side sewer is required from each building to the cleanout at the right-of-way line.

2. A duplex may have a shared side sewer for both units of the building. Alternatively, at the applicant's option, the units may have either (a) separate side sewers from each unit to the cleanout at the right-of-way line or (b) separate side sewers with separate connection at the sewer main.

C. If an existing sewer main with stubout(s) is located along one or more of the frontages of a proposed building requiring sewer service, then the building must be connected to the sewer system at an existing stubout.

D. Where the Applicant proposes to connect new development to an existing side sewer, the City may require the Applicant to perform physical inspection, TV inspection and testing to determine the materials, configuration and condition of the existing side sewer. If, after reviewing the results of the inspection and testing, the Director determines the existing side sewer does not comply with the KEDM, the Applicant will be required to construct a new side sewer.

E. Side sewers shall be a minimum of six (6) inch diameter.

F. Side sewers slopes shall be designed to provide a minimum flow velocity of two (2) feet per second and as shown on the Standard Plan and in the *Criteria for Sewage Works Design*.

G. Side sewers shall be laid in straight horizontal alignments.

6B.080 Crossings of non-City Rights of way, Easements, and Railway Crossings

Where the sewer is proposed to be built across a roadway not within City of Kelso jurisdiction, across an easement, or across a rail line, the Applicant shall obtain design approval and permits from the Agency with jurisdiction for the roadway, or the rail line company, or the easement

owner, if applicable. Written documentation of design approval and permit issuance shall be provided to the City prior to the City granting construction approval.

6B.090 Sewer Crossings of Asbestos Cement (A.C.) Water Lines

Where a sewer main crosses under an A.C. water main the Contractor shall replace the existing A.C. water main with Ductile Iron Pipe Class 52 between points a minimum of three (3) feet beyond each side of the sewer trench walls. Not less than full lengths of the A.C. pipe shall be removed.

6B.100 Pipe in Fill Areas

Where pipe is proposed to be constructed in previously filled areas, the Director may require a review of the fill and the proposed sewer design by a licensed geotechnical engineer hired by the Applicant. Special mitigation measures recommended by the geotechnical engineer and as directed by the City for pipe materials, horizontal and vertical design and construction means and methods may be required at the discretion of the Director.

6B.110 Industrial Connections

Applicants desiring to make a new connection to the public sewer, or use an existing connection, for the purpose of discharging industrial waste may be required to pretreat the waste prior to discharge in conformance to the City's Discharge Pretreatment Policy. The Applicant shall prepare and file with the Director and the Three Rivers Wastewater Authority General Manager a report that includes the actual and/or predicted data relating to the quantities, and the physical, chemical and biological characteristics of the waste generated. Applicant shall also provide detailed information regarding the proposed pretreatment of the waste, and the predicted physical, chemical and biological characteristics of the treated waste proposed to be discharged, and such other information as the Director may require. No permit will be issued until the report is approved by the Director and the General Manager.

6C FORCE MAINS AND LIFT STATIONS

6C.010 General

This section provides design standards applicable to force mains. If the applicant proposes a lift station or force main, design requirements will be provided as a part of the developer agreement.

6D LATECOMER AGREEMENTS

Should the Applicant believe that the utility extension is an undue hardship that will benefit other property owners, the Applicant may request a latecomer agreement.

Appendix 1: Standard Plans

Standard Plan Index

Title	Standard Plan No.
Standard Sanitary Sewer Plans	
Sanitary Sewer General Notes	KSS-000-21
Manhole Adjustment	KSS-010-21
6” Sanitary Side Sewer	KSS-020-21
Manhole Type 1	WSDOT B-15.20-01
Supplemental to Standard Plan B-15.20-01	
Manhole Type 3	WSDOT B-15.60-02
Supplemental to Standard Plan B-15.60-02	
Circular Frame (Ring) and Cover	WSDOT B-30.70-04
Supplemental to Standard Plan B-30.70-04	
Miscellaneous Details For Drainage Structures	WSDOT B-30.90-02
Supplemental to Standard Plan WSDOT B-30.90-02	
Pipe Zone Bedding and Backfill	WSDOT B-55.20-02
Supplemental to Standard Plan B-55.20-02	
8 Inch Sewer Clean-out	WSDOT B-85.40-00
Supplemental to Standard Plan WSDOT B-85.40-00	

SANITARY SEWER CONSTRUCTION NOTES

TRACER WIRE SHALL BE INSTALLED ALONG THE TOP OF ALL PIPE. EXTEND THE TRACER WIRE INTO MANHOLES AND ALL OTHER STRUCTURES, THEN UP THE INSIDE WALL OF STRUCTURES AND ATTACH THE WIRE TO THE TOP INSIDE OF THE STRUCTURE. PROVIDE 3 FEET OF COILED TRACER WIRE SLACK ATTACHED TO THE TOP INSIDE OF THE STRUCTURE.

MANHOLES SHALL BE ADJUSTED TO GRADE FOLLOWING PAVING. ADJUST USING AN APPROVED FOUR-POINT ADJUSTMENT SYSTEM SUCH AS THE RIMRISER SHIMLESS ADJUSTMENT SYSTEM, OR APPROVED EQUAL.

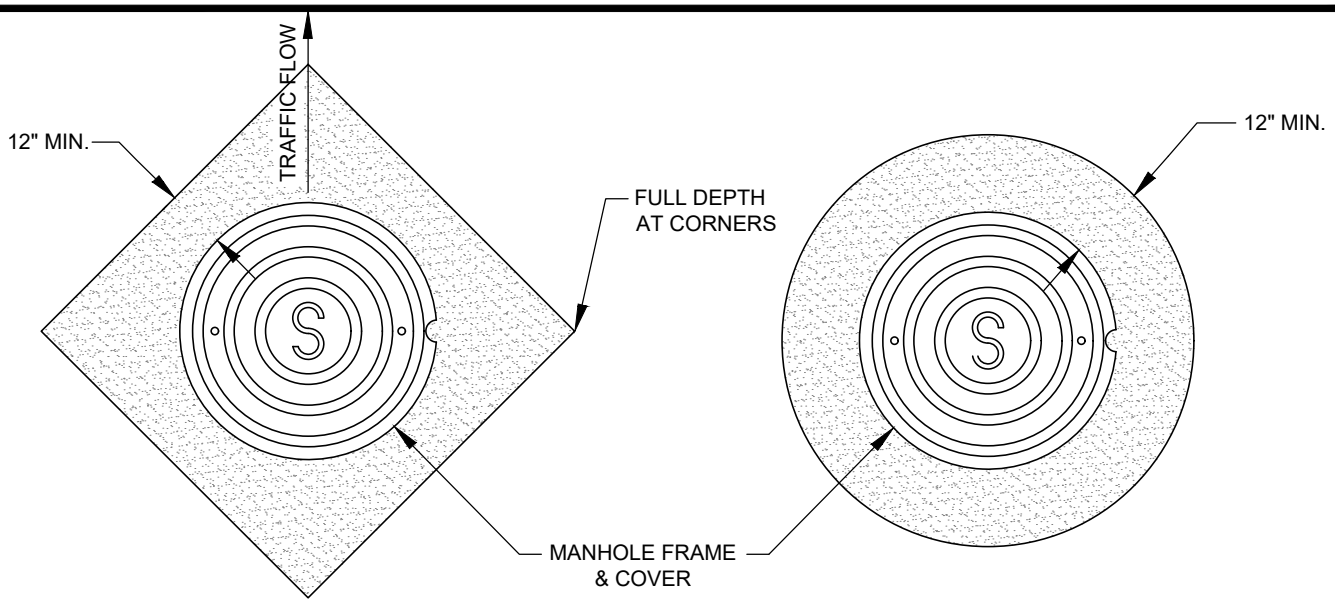
SANITARY SEWERS AND APPURTENANCES SHALL BE CLEANED, AIR TESTED AND DEFLECTION TESTED AFTER BACKFILLING. THE LOW PRESSURE AIR TEST METHOD SHALL BE USED. TV INSPECTION SHALL BE PERFORMED AFTER CLEANING, TESTING AND CORRECTIONS ARE COMPLETE. CLEANING, AIR TESTING, INFILTRATION TESTING, DEFLECTION TESTING, AND TV INSPECTION SHALL BE COMPLETED PRIOR TO PAVEMENT RESTORATION OF THE TRENCH. AN ELECTRONIC COPY OF THE TV INSPECTION VIDEO AND THE TV INSPECTION REPORT SHALL BE PROVIDED TO THE INSPECTOR. TOP LIFT OF PAVING SHALL NOT BE PLACED UNTIL THE INSPECTOR HAS APPROVED THE TV INSPECTION.

ALL MANHOLES SHALL BE WATERTIGHT. FOLLOWING BACKFILL AND PRIOR TO FINAL PAVING, PERFORM VACUUM TESTING ON MANHOLES PER THE REQUIREMENTS OF THE SUPPLEMENT TO STANDARD PLAN B-15.20-01.

AS-BUILT DRAWINGS AND TV REPORTS SHALL BE PROVIDED PRIOR TO FINAL ACCEPTANCE.

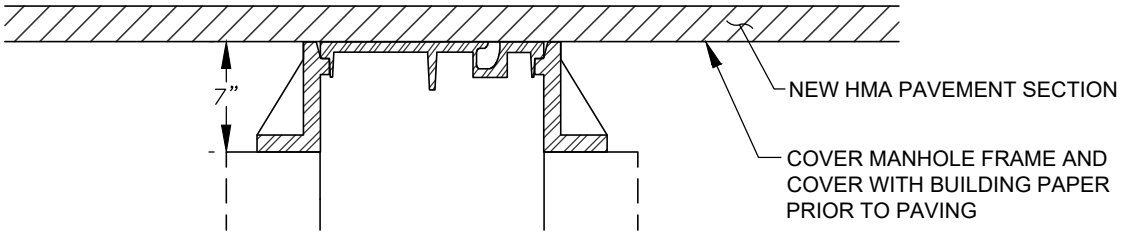
N.T.S.

Kelso WASHINGTON	**SANITARY SEWER GENERAL NOTES**	STANDARD PLAN NO. **KSS-000-21**
CITY OF KELSO DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING	**CITY ENGINEER APPROVAL: Michael Kardas, P.E.** ×_____	DATE: **MAY 2021**

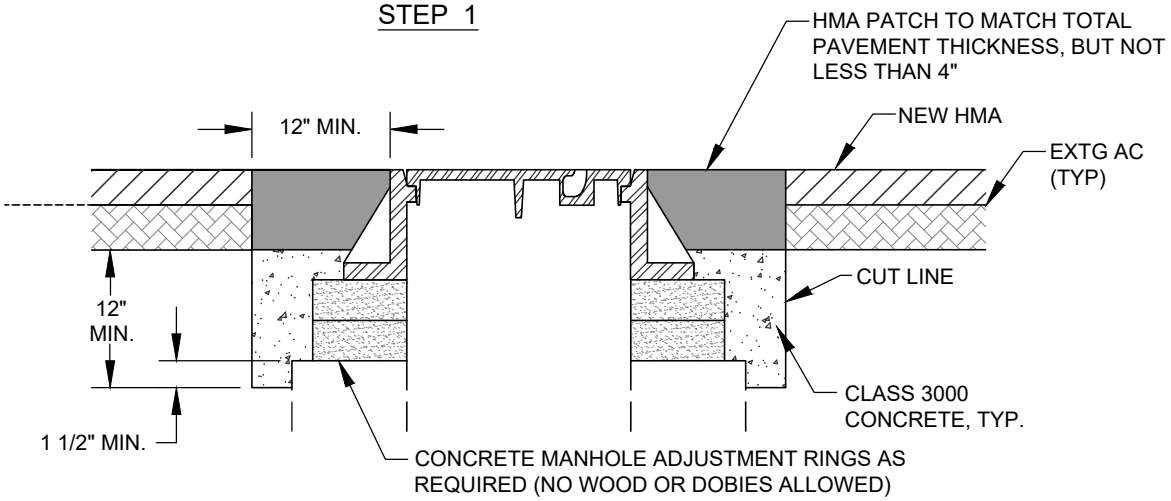


PLAN VIEW
SQUARE CUT

PLAN VIEW
CIRCLE CUT



STEP 1



STEPS 2, 3, 4 & 5

STEP 1 COVER EXISTING MANHOLE WITH BUILDING PAPER AND CONSTRUCT NEW HMA OVER TOP OF MANHOLE.
STEP 2 SAW CUT AND REMOVE PAVEMENT AROUND MANHOLE 12" MIN. FROM MANHOLE FRAME.
STEP 3 RAISE MANHOLE FRAME AND COVER USING CONCRETE RINGS AND/OR APPROVED MECHANICAL ADJUSTMENT DEVICES TO FINISH GRADE MATCHING PROFILE AND CROSS SLOPE.
STEP 4 BACKFILL WITH CLASS 3000 CONCRETE AND PROTECT FROM TRAFFIC UNTIL CONCRETE HAS CURED TO ALLOW HMA PATCHING WITHOUT DAMAGE TO CONCRETE. PAVE WITH HMA.
STEP 5 APPLY SAND SEAL ON SURFACE AND SURFACE JOINT.

N.T.S.

MANHOLE ADJUSTMENT

STANDARD PLAN NO.
KSS-010-21

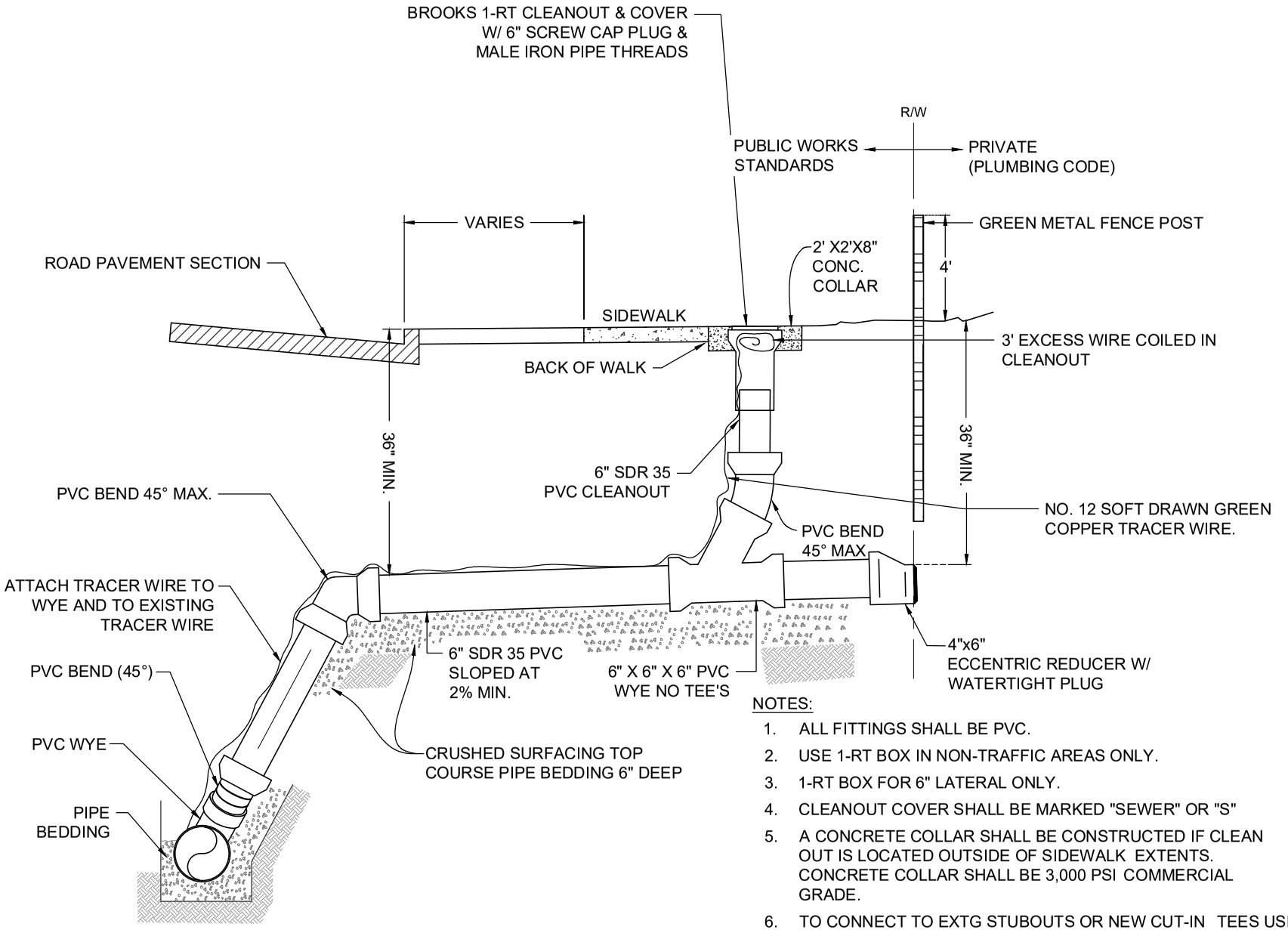
CITY OF KELSO
DEPARTMENT OF
COMMUNITY DEVELOPMENT
& ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

×_____

DATE:
MAY 2021

6" SANITARY SIDE SEWER



NOTES:

1. ALL FITTINGS SHALL BE PVC.
2. USE 1-RT BOX IN NON-TRAFFIC AREAS ONLY.
3. 1-RT BOX FOR 6" LATERAL ONLY.
4. CLEANOUT COVER SHALL BE MARKED "SEWER" OR "S"
5. A CONCRETE COLLAR SHALL BE CONSTRUCTED IF CLEAN OUT IS LOCATED OUTSIDE OF SIDEWALK EXTENTS. CONCRETE COLLAR SHALL BE 3,000 PSI COMMERCIAL GRADE.
6. TO CONNECT TO EXTG STUBOUTS OR NEW CUT-IN TEES USE FERNCO STRONGBACK RC 1000 REPAIR COUPLINGS OR APPROVED EQUAL.
7. TAPS ARE ONLY PERMITTED ON EXISTING, 8" OR LARGER, MAINLINES. TAPS SHALL BE WITH ROMAC SADDLE OR EQUIVALENT.

CITY OF KELSO
DEPARTMENT OF COMMUNITY DEVELOPMENT & ENGINEERING

CITY ENGINEER APPROVAL: Michael Kardas, P.E.

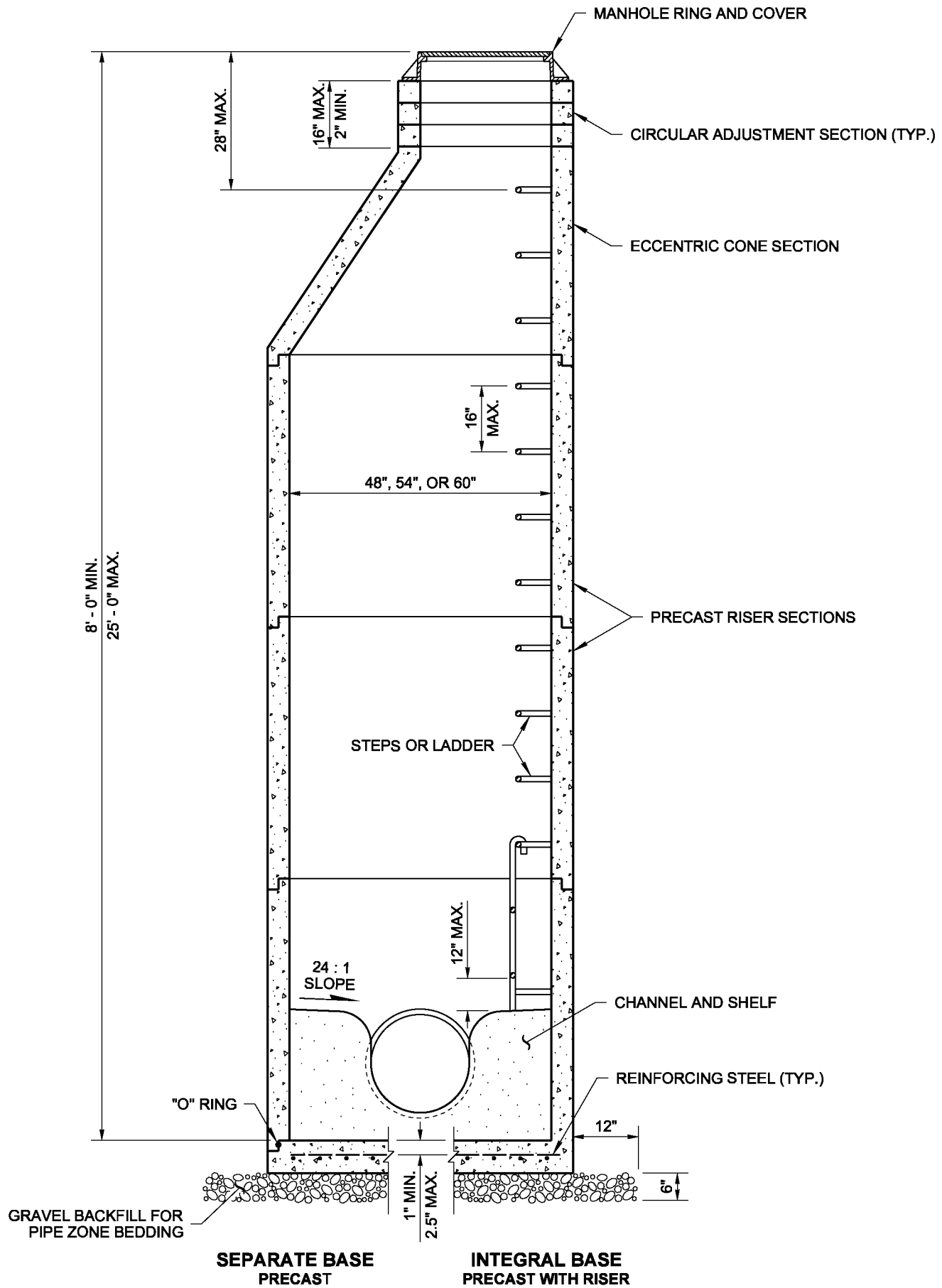
X_____

STANDARD PLAN NO. **KSS-020-21**

DATE: **MAY 2021**

N.T.S.

DRAWN BY: LISA CYFORD



NOTES

1. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.
2. For pipe allowances, see **Standard Plan B-10.20.**

MANHOLE DIMENSION TABLE				
DIAM.	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

MANHOLE TYPE 1

STANDARD PLAN B-15.20-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

02-07-12 — DATE

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN B-15.20-01

Modify the Standard Plan as follows:

Notes:

1. Manhole diameter shall be 54" for depths up to 8'. For manhole depths greater than 8', the diameter shall be 60".
2. Steps shall be polypropylene.
3. Delete steps in the cone and adjustment sections. Steps shall begin in the riser section of the manhole.
4. Modify the depth note: replace "8" with "5". Type 1 manholes may be used for manholes between 5' and 8' deep. For manholes less than 5' deep, use a Manhole Type 3, WSDOT Standard Plan B-15.60-02.
5. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.
6. KOR-N-SEAL Boot Assemblies or approved equal are required for manhole connections. Grout boot flush to manhole wall.
7. Grout all joints inside manhole.
8. The top of the manhole shall be adjusted to grade following paving.
9. Following backfill, vacuum test 50% of the manholes, but not less than one.

Vacuum Test Procedure (comply with ASTM C1244)

a. Plug all pipes and securely brace each plug from being drawn into the structure.

b. Place test head at the top of the manhole in accordance with the manufacturers' recommendations.

c. Draw a vacuum of 10 inches of mercury. Close the valve on the vacuum line. Measure the time for the vacuum to drop by 1 inch to 9 inches. The manhole passes the test if the time is greater than the time shown in Table 1.

d. If the manhole fails the test, make repair and retest until it passes.

Table 1 below gives the maximum allowable time loss in seconds for vacuum to drop below 9 inches;

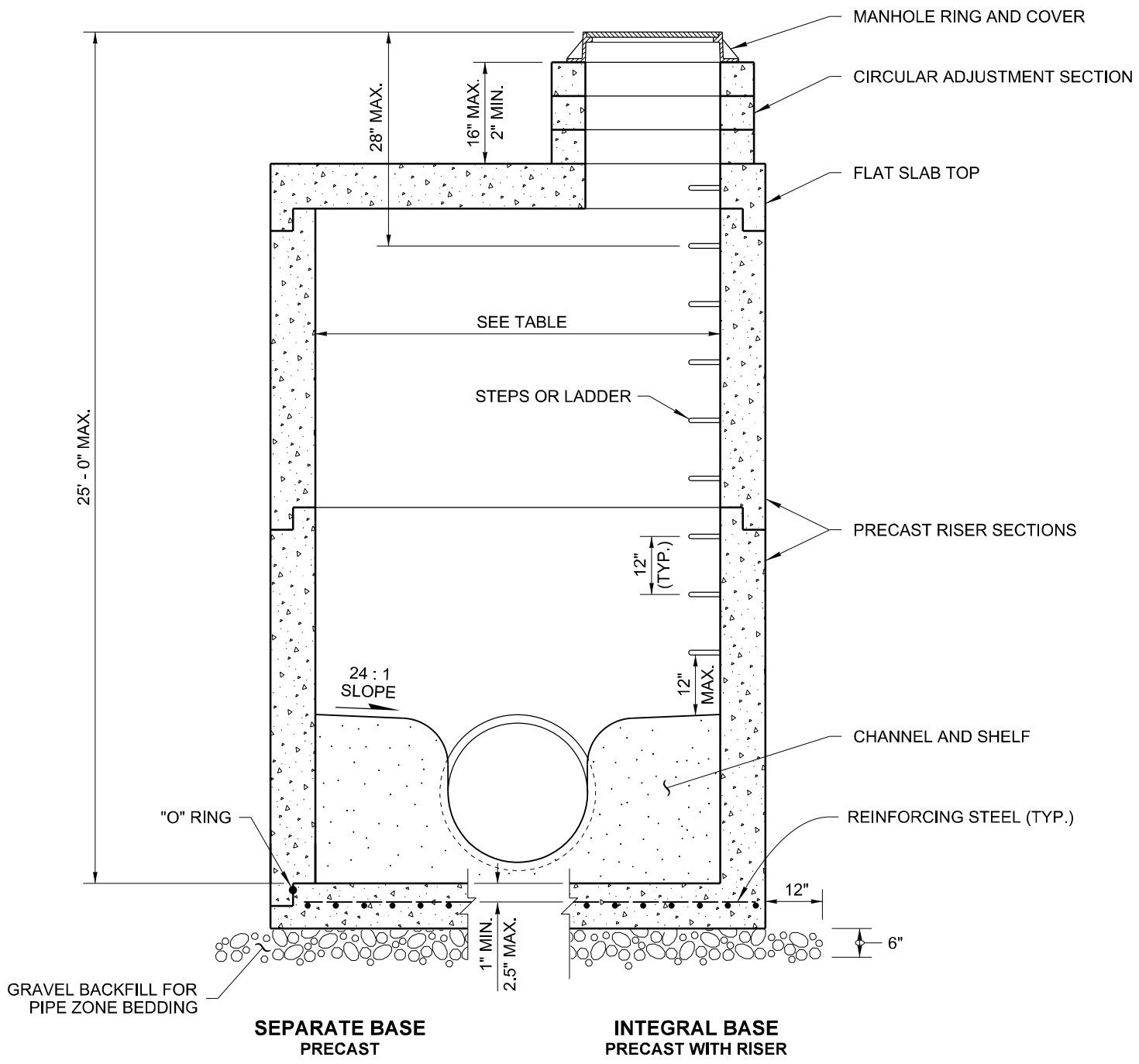
Table 1: Minimum Test Times for Various Manhole Diameters

Manhole	Manhole Diameter in Inches						
Depth*	48	54	60	66	72	84	96
	Test Time (sec.)**						
8' or less	20	23	26	29	33	38	44
10'	25	29	33	36	41	47	55
12'	30	35	39	43	49	53	66
14'	35	41	48	51	57	62	77
16'	40	46	52	58	67	71	88
18'	45	52	59	65	73	80	99
20'	50	53	65	72	81	89	110

*Depth is measured from the top of the manhole to the lowest invert.

**Test times for manhole depths between those shown in this table may be calculated by interpolation.

DRAWN BY: LISA CYFORD



NOTES

1. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum.
2. For pipe allowances, see **Standard Plan B-10.20.**
3. No steps are required when height is 4' (ft) or less.

MANHOLE DIMENSION TABLE				
DIAM.	**MIN. WALL THICKNESS**	**MIN. BASE THICKNESS**	**MAXIMUM KNOCKOUT SIZE**	**MINIMUM DISTANCE BETWEEN KNOCKOUTS**
48"	**4"**	**6"**	**36"**	**8"**
54"	**4.5"**	**8"**	**42"**	**8"**
60"	**5"**	**8"**	**48"**	**8"**
72"	**6"**	**8"**	**60"**	**12"**
84"	**8"**	**12"**	**72"**	**12"**
96"	**8"**	**12"**	**84"**	**12"**
120"	**10"**	**12"**	**96"**	**12"**
144"	**12"**	**12"**	**108"**	**12"**

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:58 PM
cosign

MANHOLE TYPE 3

STANDARD PLAN B-15.60-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:50 AM
cosign

STATE DESIGN ENGINEER

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-15.60-02

Modify the Standard Plan as follows:

Notes:

1. Manhole Type 3 shall be used for manhole depths less than 5'. Type 3 shall also be used for deeper manholes where a flat top manhole is called out.

2. Manhole diameter shall be 54" for manholes up to 8' deep, and 60" for manholes deeper than 8'.

3. Delete note 3. No steps shall be installed for manholes less than 5' deep.

4. For manholes greater than 5' deep, steps shall be installed as shown, except no steps in the flat top slab or above. Where steps are installed, they shall be polypropylene.

5. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

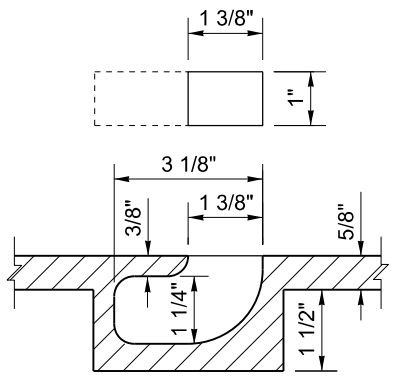
6. KOR-N-SEAL Boot Assemblies or approved equal are required for manhole connections. Grout boot flush to manhole wall.

7. Grout all joints inside manhole.

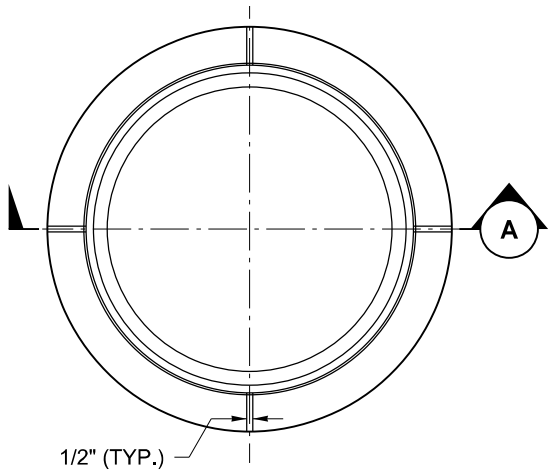
8. The top of the manhole shall be adjusted to grade following paving.

9. Following backfill, vacuum test 50% of the manholes, but not less than one, per the requirements stated in Supplement to Sanitary Sewer Standard Plan B-15.20-01.

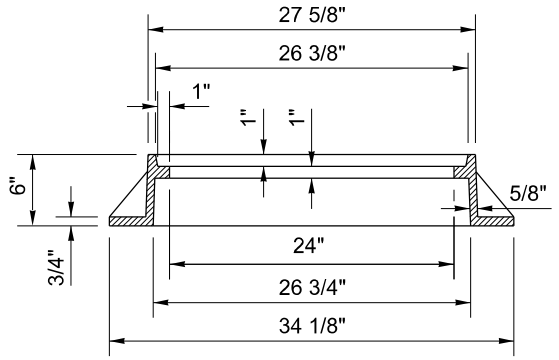
DRAWN BY: FERN LIDDELL



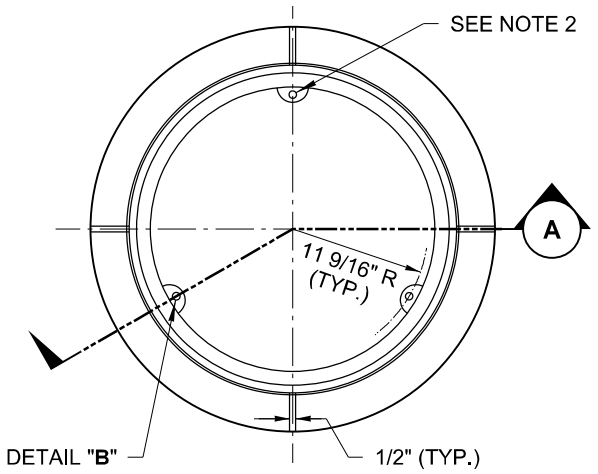
BLIND PICK NOTCH
DETAIL "A"



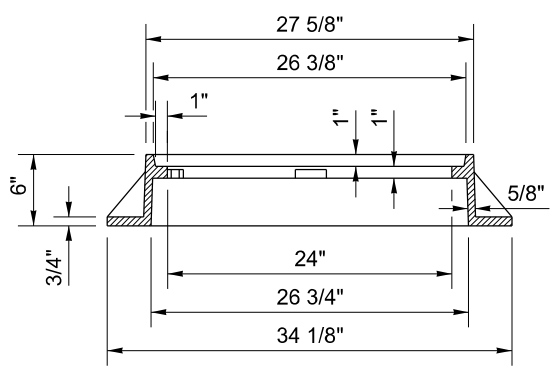
RING PLAN



RING SECTION (A)



RING PLAN



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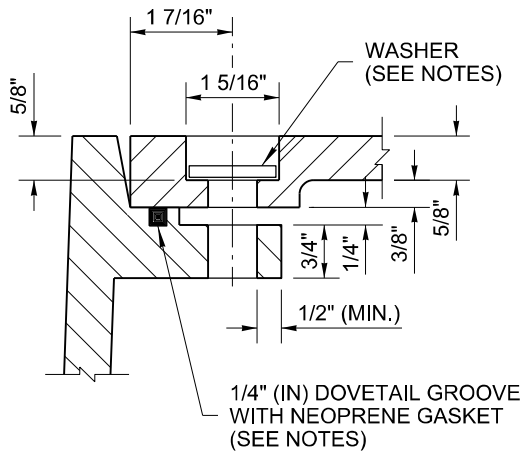
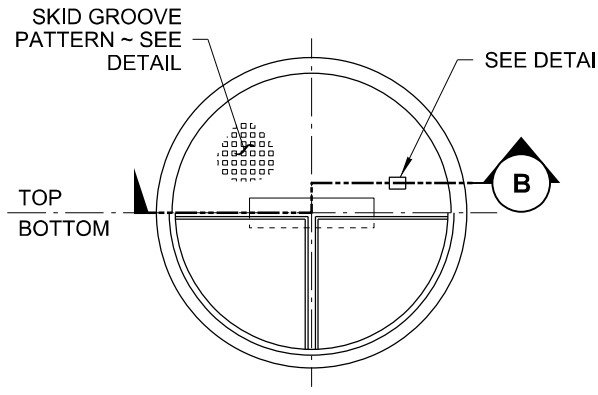
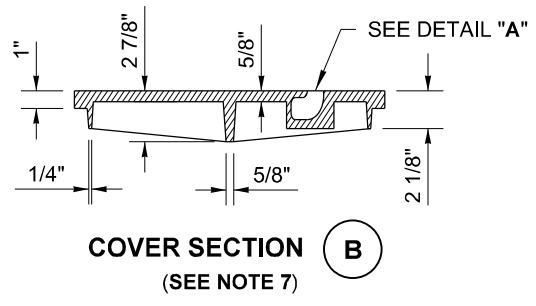


BOLT-DOWN / WATERTIGHT
DETAIL "B"

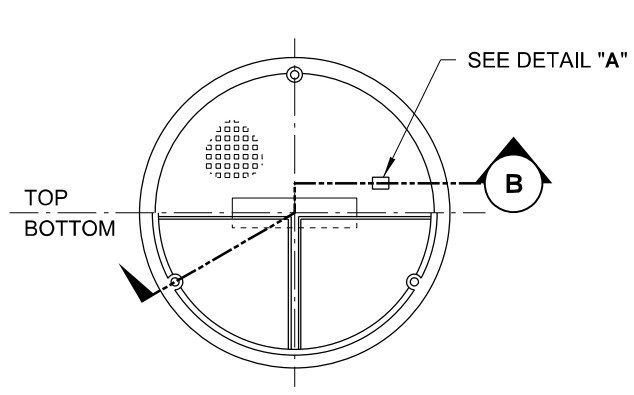


COVER PLAN

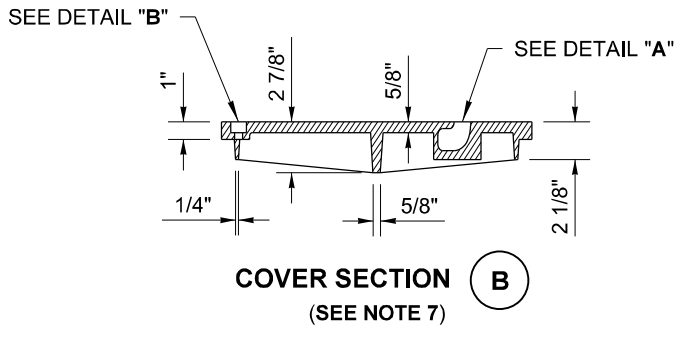


COVER SECTION (B)
(SEE NOTE 7)

STANDARD
TYPE 1



COVER PLAN

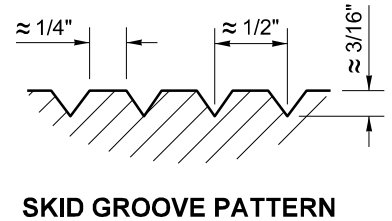


COVER SECTION (B)
(SEE NOTE 7)

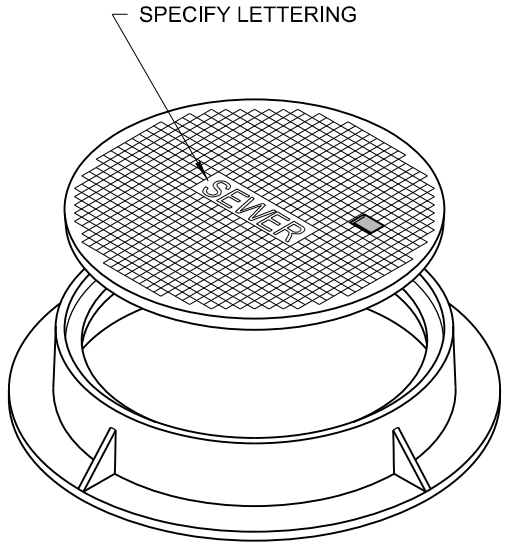
BOLT-DOWN / WATERTIGHT
TYPE 2

NOTES

1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S) 5/8" - 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.
3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.
4. Washer shall be neoprene (Detail "B").
5. In lieu of blind pick notch for manhole covers, a single 1" (in) pick hole is acceptable. Hole location and number of holes may vary by manufacturer.
6. Alternative reinforcing designs are acceptable in lieu of the rib design.
7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).



SKID GROOVE PATTERN
DETAIL



ISOMETRIC VIEW

JULIE HEILMAN
STATE OF WASHINGTON
41819
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PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:55 PM

CIRCULAR FRAME (RING) AND COVER

STANDARD PLAN B-30.70-04

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 27 2018 7:59 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

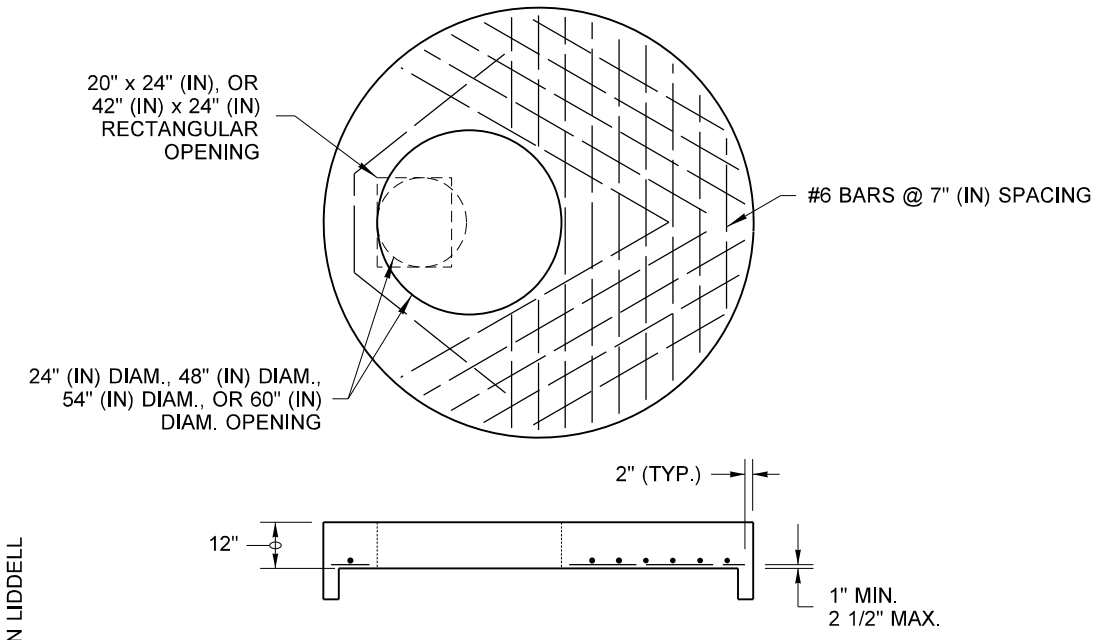
SUPPLEMENTAL TO STANDARD PLAN
B-30.70-04

Modify the Standard Plan as follows:

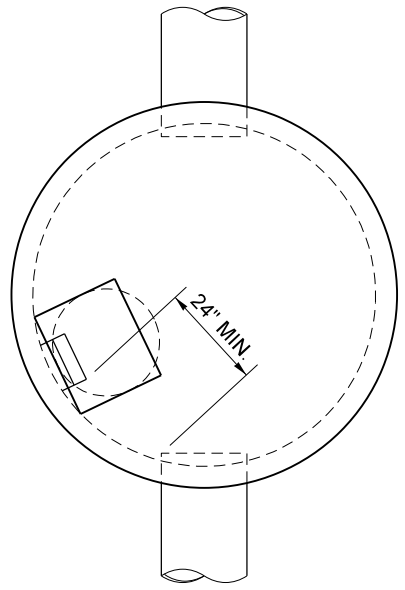
Notes:

1. Manhole covers shall have double 1" pick holes. The pick holes shall completely penetrate the cover.

2. Sanitary sewer covers shall be marked with the word "SANITARY".

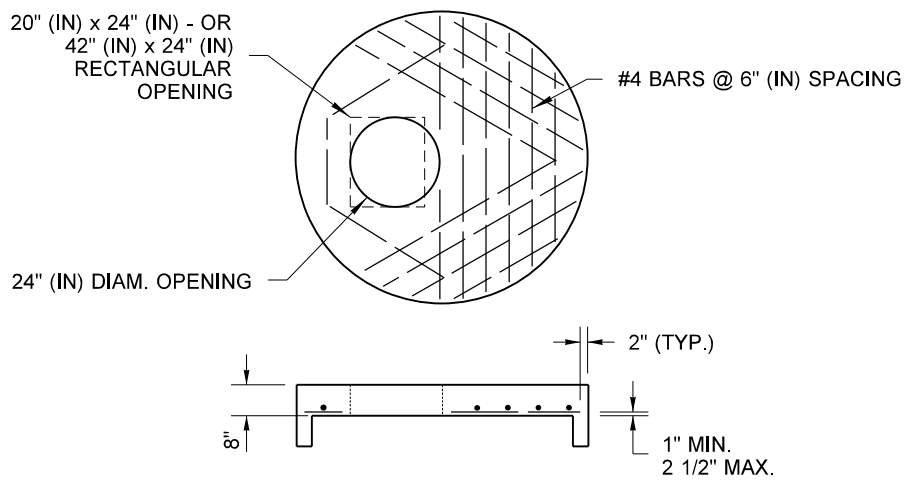


84" (IN) or 96" (IN) FLAT SLAB TOP

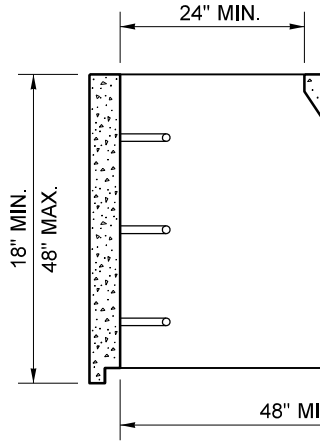


TYPICAL ORIENTATION FOR ACCESS AND STEPS

72" (IN) FLAT SLAB TOP



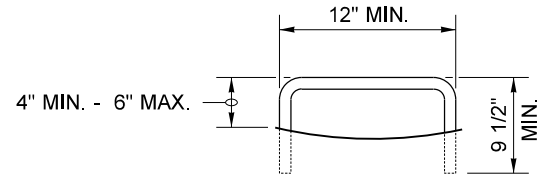
48" (IN), 54", or 60" (IN) FLAT SLAB TOP



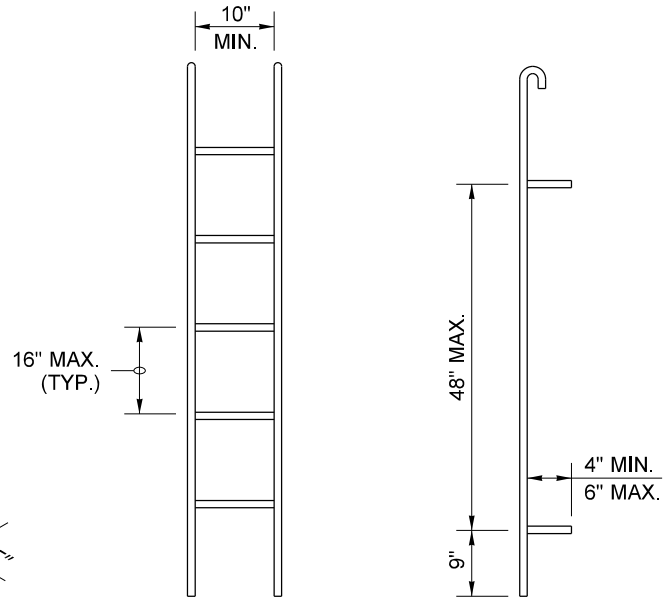
ECCENTRIC CONE SECTION

NOTE

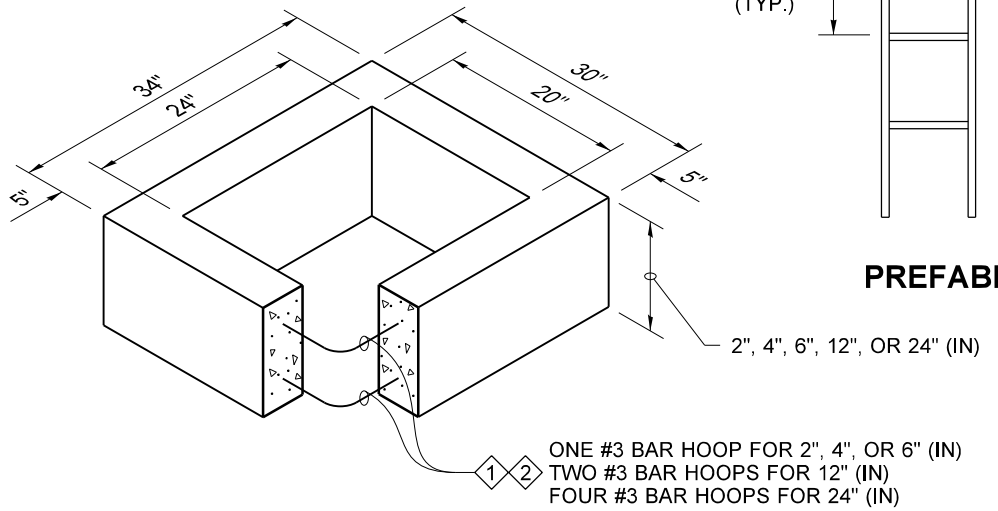
1. Ladder rungs for manholes and catch basins shall meet the requirements of **AASHTO M 199.**



STEP

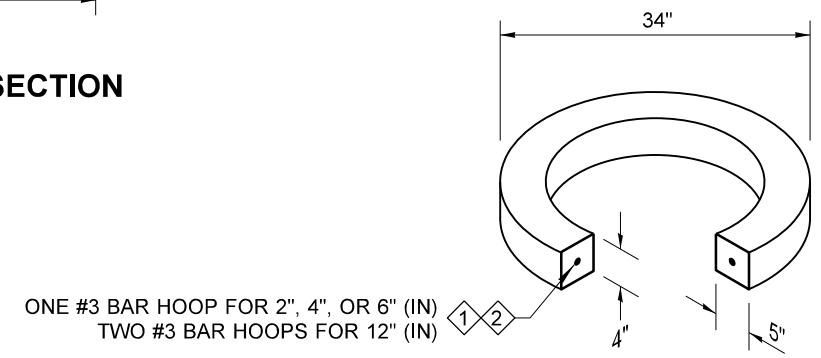


PREFABRICATED LADDER



RECTANGULAR ADJUSTMENT SECTION

1. As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.
2. As an acceptable alternative to conventional steel reinforcment, manufacturers shall use Synthetic Structural Fibers meeting the requirements of **Standard Specification Section 9-05.50(10)**.



CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs

DRAWN BY: FERN LIDDELL

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:01 PM

MISCELLANEOUS DETAILS FOR DRAINAGE STRUCTURES STANDARD PLAN B-30.90-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:52 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

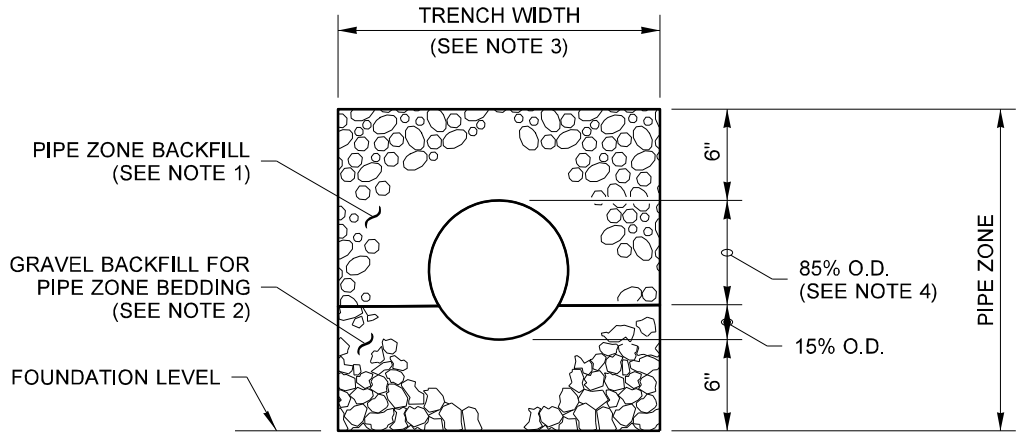
SUPPLEMENTAL TO STANDARD PLAN
B-30.90-02

Modify the Standard Plan as follows:

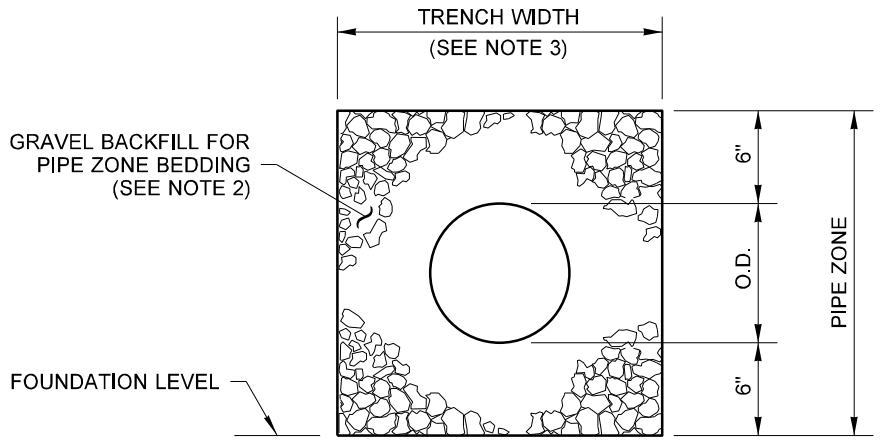
Notes:
1. No steps shall be installed within cone sections.

2. Where steps are installed, they shall be polypropylene.

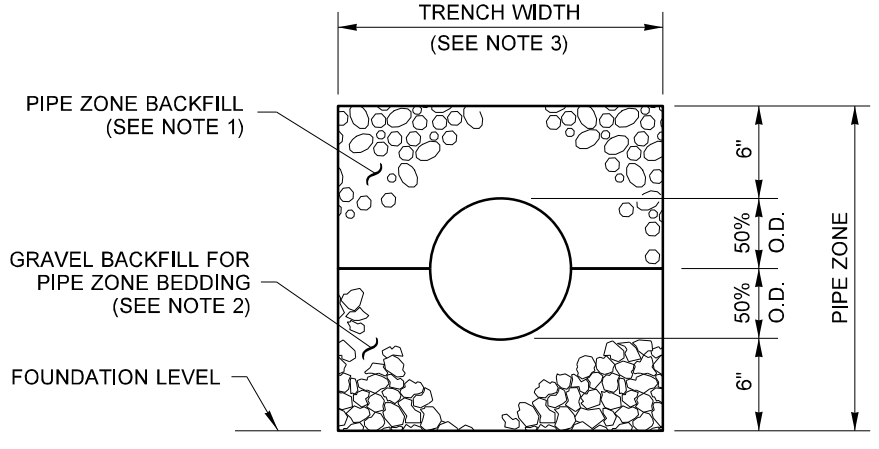
DRAWN BY: FERN LIDDELL



CONCRETE AND DUCTILE IRON PIPE



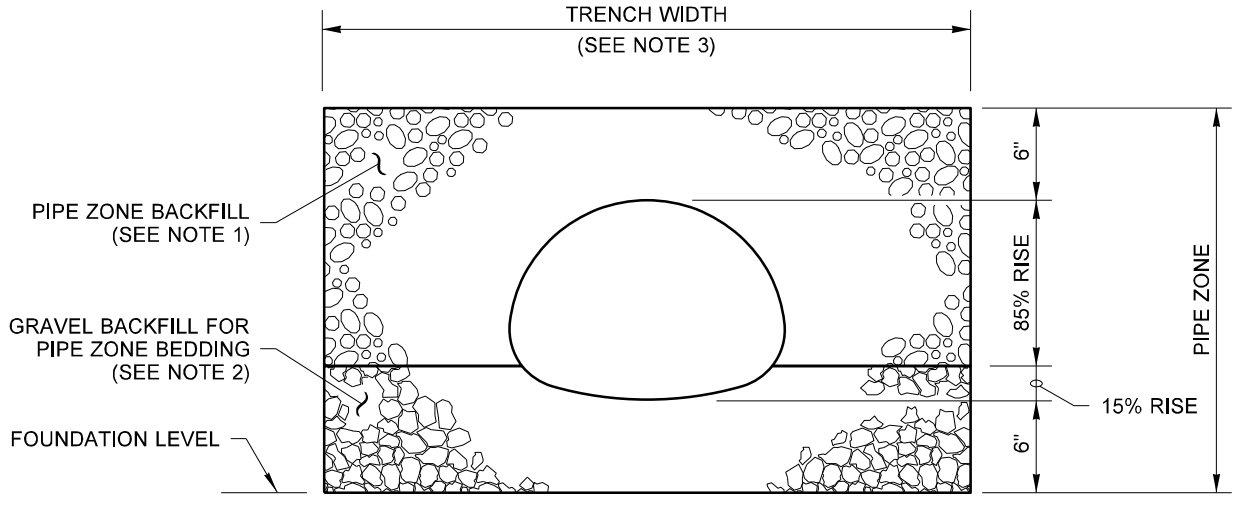
THERMOPLASTIC PIPE



METAL AND STEEL RIB REINFORCED POLYETHYLENE PIPE

NOTES

1. See **Standard Specifications Section 7-08.3(3)** for Pipe Zone Backfill.
2. See **Standard Specifications Section 9-03.12(3)** for Gravel Backfill for Pipe Zone Bedding.
3. See **Standard Specifications Section 2-09.4** for Measurement of Trench Width.
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.



PIPE ARCHES

CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS		
PIPE	**SIZE**	**MINIMUM DISTANCE BETWEEN BARRELS**
CIRCULAR PIPE (DIAMETER)	**UP TO 48"**	**24"**
METAL PIPE ARCH (SPAN)	**48" AND LARGER**	**DIAMETER/2 OR 36" WHICHEVER IS LESS**

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
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Heilman, Julie
Feb 20 2018 12:56 PM

PIPE ZONE BEDDING AND BACKFILL

STANDARD PLAN B-55.20-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 27 2018 8:01 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-55.20-02

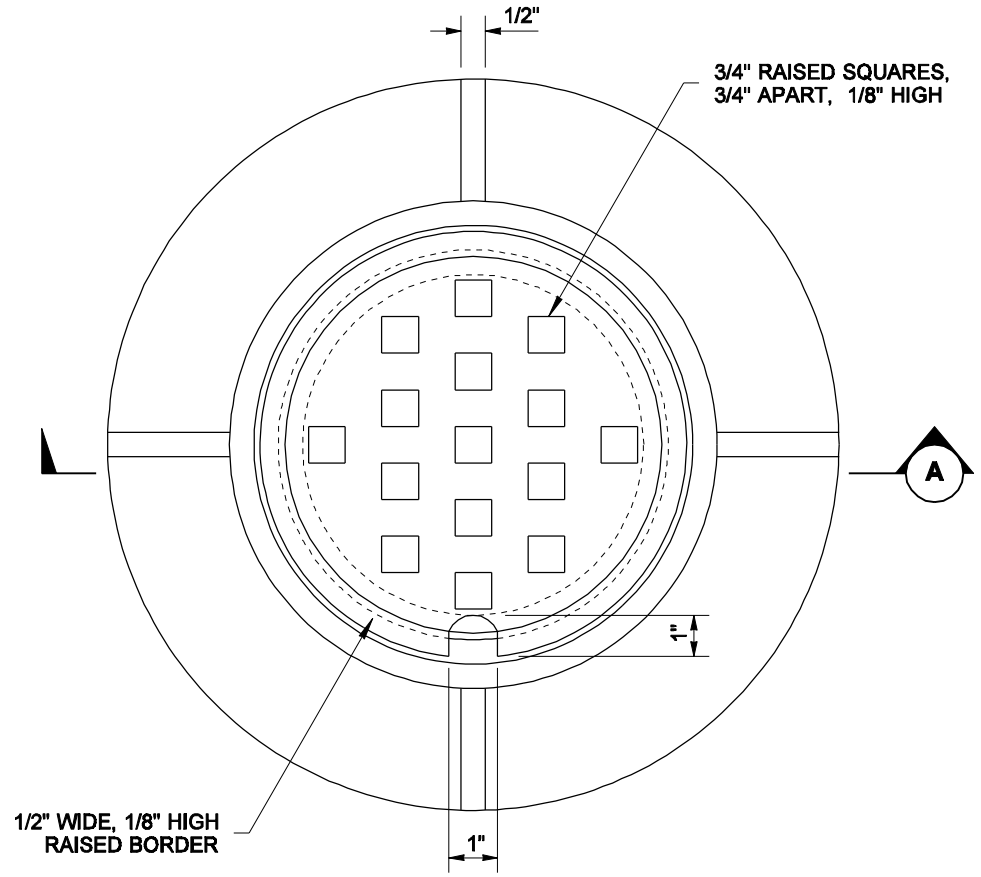
Modify the Standard Plan as follows:

Notes:

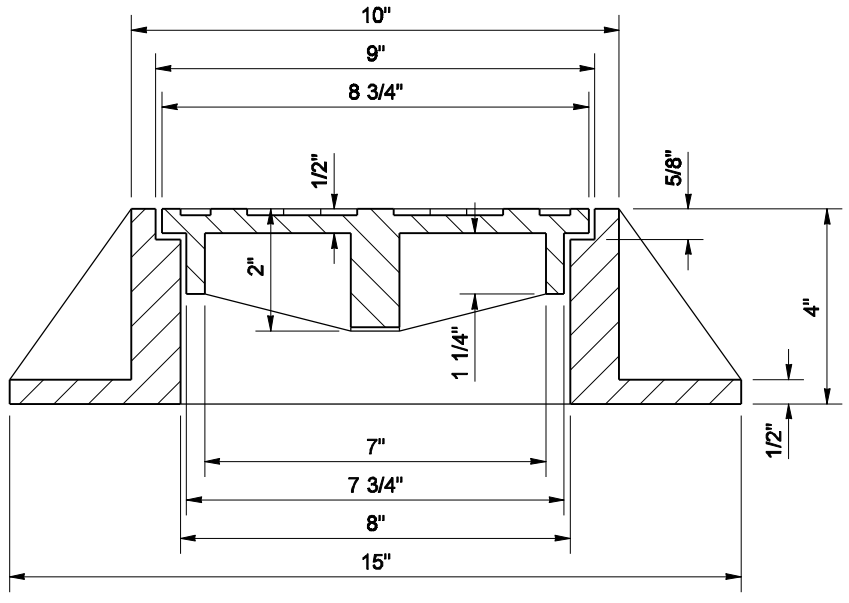
1. Delete Notes 1. and 2.

2. Pipe Zone Backfill and Pipe Zone Bedding shall be CSTC.

DRAWN BY: ADAM COCHRAN

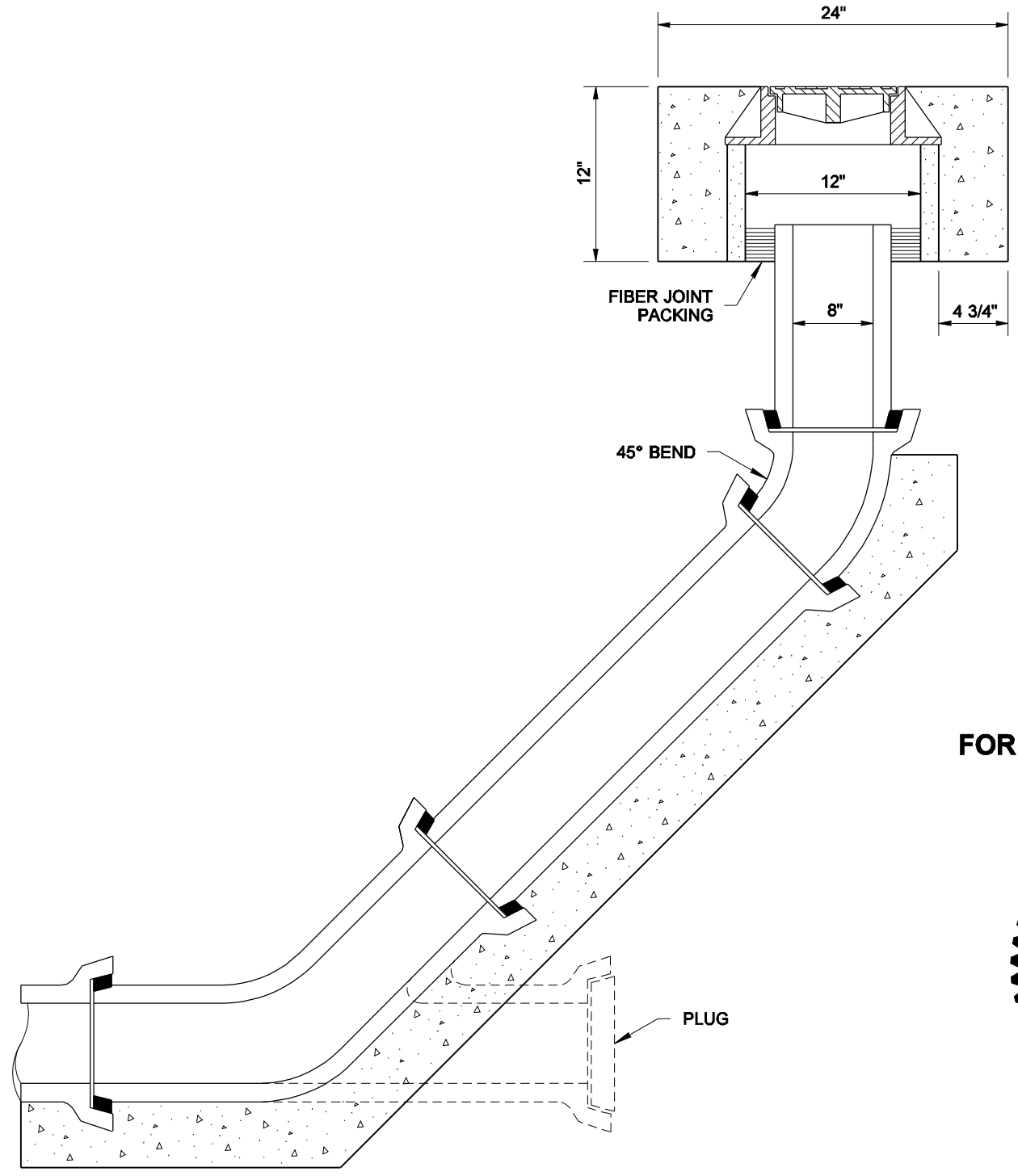


PLAN



SECTION (A)

CAST IRON RING AND COVER



FOR SANITARY SEWER USE

MATTHEW J. WITECKI
STATE OF WASHINGTON
15588
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES JULY 1, 2007

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

8 INCH SEWER CLEAN-OUT

STANDARD PLAN B-85.40-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterfeso — STATE DESIGN ENGINEER

06-08-06 — DATE

Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-85.40-00

Modify the Standard Plan as follows:

Notes:

1. The straight pipe section connected to the wye and the 45 deg bend may be interchanged in location as needed.

2. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.