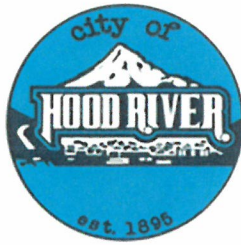


# *City of Hood River Engineering Standards*



*Adopted: July 8<sup>th</sup>, 2019*

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## **Acknowledgements**

Bell Design Company, working together with City staff members, prepared these Engineering Standards for the City of Hood River. In preparation of this document, Bell Design Company endeavored to be consistent with the following objectives:

- Provide for safe, adequate public facilities now and in the future,
- Provide for cost effective long-term operation and maintenance of public facilities,
- Minimize initial construction costs without compromising the preceding objectives,
- Encourage creative solutions designed to enhance and expand upon the natural environment.

The following individuals are acknowledged for their significant contributions:

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Devry Bell, PE, City Engineering Department/Bell Design Company  
Riston Andrews, EIT, City Engineering Department/Bell Design Company  
Cory Brown, EIT, City Engineering Department/Bell Design Company  
Gary Lindemyer, Former Project Manager





## Comment Form

Recognizing that by their very nature these Engineering Standards will continually evolve, we encourage users of these Standards to provide us with comments so that we can continue to improve the content and usefulness of this document.

Please use this form to email, mail, or fax your comments to:

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## ***1. Introduction***

### **1.1 Purpose**

The purpose of the City of Hood River Engineering Standards (Engineering Standards or Standards) is to provide a consistent process for the design and construction for both public and private improvements under the jurisdiction of the City of Hood River (City). These Engineering Standards apply to proposed work within the City and Urban Growth Boundary (UGB), and to extensions of City-owned utilities outside the City limits and UGB.

These Standards are intended to provide technical guidance to those responsible for designing and reviewing engineered sites and facilities for public and private improvements. These Standards do not cover all possible situations. The user is assumed to have the necessary training and practical experience in the application of civil engineering principles to implement the methodologies described herein. Any exception to these Standards will be made at the sole discretion of the City Engineer on a case-by-case basis and require sufficient justification prior to approval.

### **1.2 Conflict**

Except where these Engineering Standards provide otherwise, design, construction, materials, and testing shall conform to the appropriate standards of the most current edition of the following publications:

- Oregon Department of Transportation/APWA Oregon Standard Specifications for Construction
- American Water Works Association (AWWA) Standards
- Oregon Health Authority Regulations
- Department of Environmental Quality Sewer Design Criteria, Oregon Administrative Rules
- AASHTO Policy on Geometric Design of Highways and Streets (AASHTO)
- U.S. Department of Transportation Federal Highway Administration Manual of Uniform Traffic Control Devices (MUTCD)
- Oregon Temporary Traffic Control Handbook
- Oregon Structural Specialty Code (OSSC)
- Oregon Residential Specialty Code (ORSC)
- U.S. Department of Justice ADA Standards for Accessible Design (ADAAG)
- U.S. Access Board Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG)
- Department of Justice/Department of Transportation Joint Technical Assistance on the Title II of the Americans with Disabilities Act Requirements to Provide Curb Ramps when Streets, Roads, or Highways are Altered through Resurfacing



- Supplement to the 2013 DOJ/DOT Joint Technical Assistance on the Title II of the Americans with Disabilities Act Requirements To Provide Curb Ramps when Streets, Roads, or Highways are Altered through Resurfacing

In case of conflicts between the text of these Engineering Standards, Standard Drawings, City's Transportation System Plan (TSP), Capital Facilities Plan (CFP), Comprehensive Plan, or the Hood River Municipal Code (HRMC), the more stringent as determined by the City Engineer shall apply. Acceptable materials shall be as outlined in these Engineering Standards.

When conflicts between these Engineering Standards and Oregon State Building Codes occur within private properties the governing State Building Code shall apply.

### 1.3 Definitions and Abbreviations

Words not defined here shall have the meaning as defined in the Hood River Municipal Code.

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphaltic Concrete
ACI	American Concrete Institute.
ADA	Americans with Disabilities Act
ADDAG	U.S. Department of Justice ADA Standards for Accessible Design
ADT	Average Daily Traffic
ALTA	American Land Title Association
ANSI	American National Standards Institute
Applicant	The person applying for a permit from the City's Public Works Department for a public or private improvement to which these Standards apply.
APWA	American Public Works Association
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWWA	American Water Works Association
Bicycle Facilities	A general term denoting improvements and provisions that accommodate or encourage bicycling, including parking facilities, maps, signs, pathways, bike lanes, widened sidewalks, bikeways, and shared roadways designated for bicycle use.
Bicycle Lane	Also known as "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.
Bicycle Path	Also known as "Bike Path" or "Off-Street Pathway". A paved pathway physically separated from motorized vehicular traffic by an open space or barrier within independent Right Of Way (ROW).
Bicycle Route	Also known as "Bike Route". A segment of a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational markers, with or without a specific



	bicycle route number, or as designated on a bicycle map, brochure, or guidebook.
Bikeway	Any road, path or way specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.
BMP	Best Management Practice according to Oregon DEQ Construction Stormwater Best Management Practices Manual 1200-C NPDES General Permit
BOD	Biological Oxygen Demand
CAD	Computer Aided Design
CARV	Combination Air and Vacuum Release Valve
CBR	California Bearing Ratio
CFP	Capital Facilities Plan
City	City of Hood River including all staff and departments as applicable.
City Engineer	Oregon licensed Professional Engineer on city staff or under contract by the City to perform engineering design reviews or his/her designated representative.
Contractor	Person listed on the Construction Site/ROW Permit application as the party performing construction of the permitted work.
CTS	Copper Tube Size
DBA	Diameter at breast height
Design Engineer	Oregon licensed Professional Engineer responsible for preparation of the construction plans to be reviewed and approved by the City Engineer. The Design Engineer shall be competent and experienced to practice in the specific disciplines of engineering. The Design Engineer may be asked to provide references and a list of representative projects that he/she has completed.
Detention Facility	A stormwater facility that reduces the peak flow of stormwater runoff (but not the total volume) to the downstream system in a controlled manner.
Developer	The owner and/or their agents or Contractors responsible for a given project.
DEQ	Oregon Department of Environmental Quality.
DHS	Oregon Department of Human Services
Director	Director of Public Works or their designee
Driveway	A public or private way, located outside of ROW, which affords the principle means of providing access to a property.
DSL	Oregon Department of State Lands
DOGAMI	State of Oregon Department of Geology and Mineral Industries
DWG	Binary drawing file format used by CAD software design programs such as AutoCAD ®
DWS	Oregon Drinking Water Services
Engineer	Engineer doing the project design



Engineers Cost Estimate	A unit price estimate of probable construction costs prepared and stamped by an Oregon licensed Professional Engineer competent and experienced in preparing construction cost estimates.
Engineering Standard(s)	City of Hood River Engineering Standard(s) or Standard(s)
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
FEMA	Federal Emergency Management Agency
FHWA	U.S. Department of Transportation Federal Highway Administration
Final Acceptance	City Engineer's written acceptance of public facilities constructed by others.
Final Approved Plans	Complete set of construction plans approved and signed by the City Engineer.
FOG	Fats, oils, and grease
FSE	Food Service Enterprise
Gate	Movable barrier designed and constructed to prohibit or limit motor vehicle access from a public street to private property.
GPS	Global Positioning System
HCM	Highway Capacity Manual (by TRB)
HDPE	High-Density Polyethylene
HRES	City of Hood River Engineering Standards
HRMC	City of Hood River Municipal Code
IAMP	Interchange Area Management Plan (by ODOT)
IE	Invert Elevation
Intersection	Refers to the area joined by two (2) or more roads intersecting. For approaches of a continuous street at an acute curve or some other angle point with different street names.
IPS	Iron Pipe Size
LOS	Level of Service Classification as defined by TRB Highway Capacity Manual, AASHTO Geometric Design of Highways and Streets and the HRMC
LPSS	Low Pressure Sanitary Sewer Mains
LUCS	Land Use Compatibility Statement
Manager	City Manager
Multi-Use Trail	A pathway designated for pedestrian or bicycle use.
MUTCD	Manual on Uniform Traffic Control Devices.
NEC	National Electric Code with Oregon amendments
NEMA	National Electrical Manufacturers Association
NPDES	National Pollutant Discharge Elimination System
NRCS (SCS)	Natural Resources Conservation Service (Soil Conservation Service)
OAR	Oregon Administrative Rules
ODFW	Oregon Department of Fish and Wildlife



ODOT	Oregon Department of Transportation
OFC	Oregon Fire Code
OHA	Oregon Health Authority
O&M	Operations and Maintenance
OMC	Oregon Mechanical Code
OPSC	Oregon Plumbing Specialty Code
ORS	Oregon Revised Statutes
OS & Y	Outside Stem and Yoke
OSHA	Occupational Safety and Health Administration
OSSC	Oregon Structural Specialty Code
OSRC	Oregon Residential Specialty Code
Parking Lot	Paved surfaces on private property intended for the movement and storage of six (6) or more vehicles.
PE	Oregon Licensed Professional Engineer
P&ID	Piping and Instrumentation Diagram
Private Utilities	Any utilities not owned by the City of Hood River
PROWAG	U.S. Access Board Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way
PRV	Pressure Reducing Valve
PUE	Public Utility Easement
PVC	Polyvinyl Chloride
Record Drawings	Complete set of plans incorporating all changes made to the Final Approved Plans during construction.
Resident Engineer	Oregon Licensed Professional Engineer responsible for project oversight during construction.
Retention Facility	A stormwater facility that reduces the volume of stormwater runoff to the downstream system by means of evaporation, plant transpiration, or infiltration into the soil.
ROW	Right-Of-Way or Rights-Of-Way
Shy Distance	The distance from the edge of the traveled way beyond which a roadside object will not be perceived as an immediate hazard by the typical driver to the extent that the driver will change the vehicle's placement or speed.
Sidewalk	The portion of a street designed for preferential use by pedestrians.
Significant Tree	Tree with a DBH equal to or great than six inches (6").
Standard Drawings	The latest edition of the City of Hood River's Standard Drawings for Public Works Construction.
Street	A public or private way, which affords the principal means of access to abutting property.
Structure	That which is built or constructed. A structure may contain one or more buildings separated by fire rated construction elements in accordance with prevailing codes. Retaining walls, soundwalls, and fences including their footings are considered structures.
TCDH	Traffic Control Device Handbook



TAL	Traffic Assessment Letter
TIA	Traffic Impact Analysis
TIR	Technical Information Report
TPZ	Tree Protection Zone
TRB	Transportation Research Board
TSP	City of Hood River Transportation System Plan
TSS	Total Suspended Solids
UGB	Urban Growth Boundary
UIC	Underground Injection Control
UL	Underwriters Laboratory
USACE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Services
USPS	United States Postal Service
Wetlands	Those areas that are 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 typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Identification and delineation of jurisdictional wetlands and wetland boundaries shall be done by a qualified biologist using applicable State and Federal guidelines.

## 1.4 Clarification and Final Authority

Requests for clarification of these Standards shall be directed, in writing, to:

Mark Lago  
Director of Public Works  
211 2<sup>nd</sup> St.  
Hood River, OR 97031  
M.Lago@cityofhoodriver.com  
(541) 386-2383

The City Engineer shall have final authority on all questions that may arise regarding the interpretation of these Standards.

## 1.5 Engineering Standards Revisions

Questions or suggestions should be addressed to the Director of Public Works (see email address above). It is anticipated that these Standards will be updated from time to time. The City will provide updates to those who have requested they receive revisions. However, it shall be the applicant's responsibility to make sure they are using the most current version.



This document and revisions shall be available for download from the City's Public Works website <https://cityofhoodriver.gov/engineering/engineering-standards/>.

## **1.6 Non-enforcement**

Non-enforcement of any requirement in these Standards by the City shall not construe a waiver of that requirement, nor shall it affect the enforceability of that requirement or of the remainder of the Hood River Engineering Standards (HRES).





## **2. Development Process**

### **2.1 General Process**

#### **2.1 A. Planning Review**

Reviews by the City Planning Department, planning reviews, are generally required for all development projects under the jurisdiction of the City which involve the subdivision or partition of land, re-plats, plat vacations, lot line adjustments, construction or reconstruction of any building, change of use, or multi-family or group residential construction. Refer to the HRMC Title 16: Land Divisions and Title 17: Zoning Ordinances for a detailed description of the planning process. Most planning reviews include some level of engineering review.

#### **2.1 B. Engineering Review**

Engineering reviews by the City Engineer are generally required for all projects under the jurisdiction of the City that involve the

- 1) Construction of public facilities;
- 2) Work within the public ROW;
- 3) Construction of private facilities discharging to public facilities;
- 4) Construction of facilities, including grading, that may have an impact on stormwater runoff or downstream water quality;
- 5) Dedication of public ROW;
- 6) Construction and removal of retaining walls or structures located within or impacting the ROW;
- 7) Demolition of significant surfaces or structures located within or impacting the ROW;
- 8) Placement or removal of trees in ROW;
- 9) Repaving existing public and commercial parking lots.

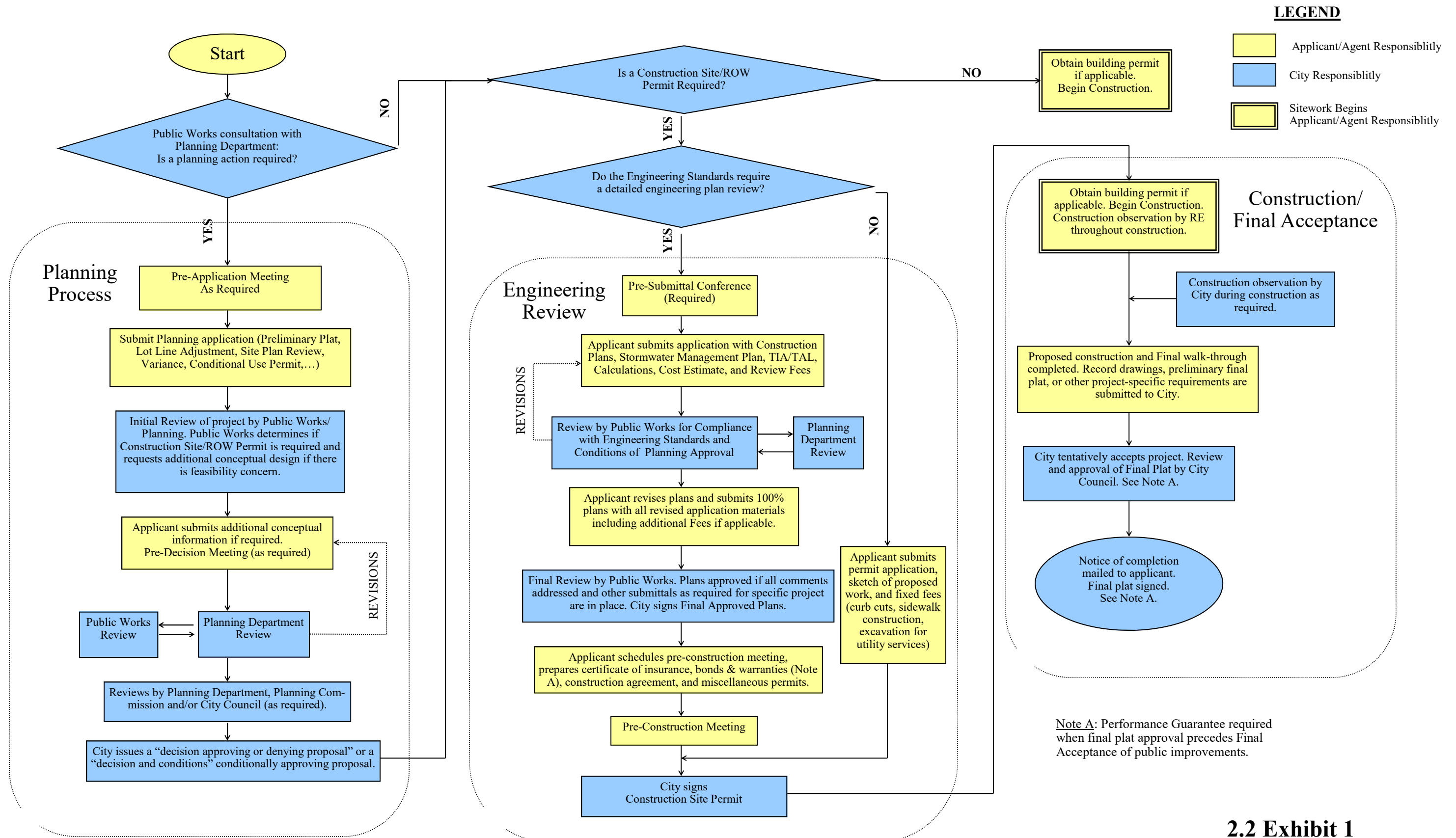
See Exhibit 1 for a summary of the planning and engineering review process.

#### **2.1 C. Design Exception Process**

These Standards are not intended to limit the creativeness and ingenuity, nor substitute for the competent work of the Design Engineer. However, these Standards are intended to provide uniformity in the design and construction of safe public facilities in a manner allowing economical future maintenance. Therefore, any proposed exception to these standards is expected to provide a better or at least comparable result, in every way consistent with sound engineering practices as determined by the City Engineer.



Any proposed Design Exception should be discussed with the City Engineer prior to the plan submittal, followed by a written request with sufficient justification why the exception should be approved at the time of plan submittal. All approved Design Exceptions will be clearly listed on the cover sheet of the Final Approved Plans. It will be the applicant's responsibility to build the project consistent with the HRES unless specifically noted as a Design Exception on the cover sheet of the Final Approved Plans.



**2.2 Exhibit 1**  
**Development Process**



### **3. Construction Site/ROW Permit**

#### **3.1 Construction Site/ROW Permit Application Process**

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

A Construction Site/ROW Permit is required when one or more of the following apply:

- 1) Any work in the public ROW.
- 2) Construction site preparation including, but not limited to, excavation, rock removal, rock crushing, earth moving, fill, or other similar activities.
- 3) Planting, pruning, and/or tree removal in the Public ROW.
- 4) Imported fill (borrow) or excavation will exceed 50 cubic yards, including asphalt or concrete surface removal (Note: A separate stormwater report/design is required when 250 cubic yards, or more, is excavated/filled).
- 5) Excavation or fill will result in elevation changes exceeding two feet (2') on any portion of the site excluding landscaping on developed property, for which a permit is not otherwise required under these Engineering Standards.
- 6) One acre (1 ac) or more of land will be disturbed or when a DEQ 1200-C Permit is required.
- 7) 3,000 square feet, or more, of new impervious surface will be added to the site (i.e. new parking lots, structures, or other impervious surfaces that individually or in combination replace 3,000 square feet, or more, of existing pervious surface).
- 8) A combination of 6,000 square feet, or more, of impervious area will be added and/or reconstructed (i.e. 4,000 square foot of existing building reconstructed with the addition of a new 2,000 square foot parking lot, structure, or other impervious surface OR reconstruction of 6,000 square feet, or more, of existing impervious surface).
- 9) Infrastructure will be constructed and dedicated to the City.
- 10) Site will be converted to a use that is a potentially significant source of water or air pollution (e.g. reconstruction of a neighborhood grocery into a gas station).
- 11) Construction and removal of retaining walls located within or impacting ROW.
- 12) Demolition of significant surfaces or structures located within or impacting ROW.

See Exhibit 2 for Construction Site/ROW Permit requirements.

##### **3.1 B. Sketch Plan Required**

The applicant shall submit a reproducible sketch (drawn to scale) to the City Engineer for approval of the following types of projects that require a Construction Site/ROW Permit:

- Curb Cuts – driveway approach.



- Sidewalk Construction.
- Excavation for purpose of installing utility service lines only.
- Landscaping within the public ROW.
- Grading for construction of one single family dwelling that does not result in elevation changes exceeding two feet (2') on any portion of the site.
- Tree planting, pruning, and/or removal in the public ROW.

The Sketch Plan shall include

- 1) Adequate detail to allow confirmation that calculations meet design criteria outlined in these Engineering Standards.
- 2) North arrow.
- 3) Scale.
- 4) Property Lines with dimensions.
- 5) Easement(s) of Record.
- 6) Dimensions that clearly define lengths of driveways, distances between buildings or structures, lengths of buried or overhead utilities, lengths of street cuts, distances between all utilities, sizes of utility lines or structures, widths and lengths of driveways and ramps.
- 7) Building Locations.
- 8) Existing and proposed structures, roads, curbs, gutters, sidewalks, and driveways within 50 feet of property lines.
- 9) Existing and proposed buried utility lines such as water, sewer, storm, power, phone, gas, cable, etc.
- 10) Existing and proposed clean outs, fire hydrants, service boxes, valves, tee's, hand boxes, utility poles, pole anchors, cross walks, mail boxes, signs, bike racks, utility splice boxes, transformers, or vaults.
- 11) Tax Lot Number and property description.
- 12) Depiction of proposed work.
- 13) Existing significant trees and/or vegetation.
- 14) Proposed contours when the cuts or fills have the potential to impact surrounding properties or when grading is an integral part of the stormwater drainage for the site. Use two foot (2'), maximum, contour intervals unless otherwise approved. Indicate direction of stormwater flows. Contours may be approximate as long as grading for construction of one single family dwelling that does not result in elevation changes exceeding two feet (2') on any portion of the site.
- 15) Estimated cost of the proposed work when cuts in existing city streets are required. Submitted separately from Sketch Plan.
- 16) Any other requirements necessary to show that the proposed work is consistent with the requirements of these Engineering Standards as determined by the City Engineer.



### 3.1 C. Detailed Engineering Plan Review

For all projects not listed in 3.1 B that require a Construction Site/ROW Permit, a Detailed Engineering Plan Review is required. The elements of a Detailed Engineering Plan Review are as follows:

- 1) Mandatory Pre-submittal Conference: To discuss conceptual designs for roads, utilities, stormwater, and ESC management so that the City can assist in confirmation of the adequacy of public facilities to meet proposed and future development. If conceptual designs have already been prepared as part of the planning process, this step provides the applicant an additional opportunity to get input from Public Works (i.e. proposed Design Exceptions) prior to the preparation of detailed plans. There is no fee assessed for the pre-submittal conference.
- 2) Plan Submittal & Engineering Review: It is anticipated that a typical project will involve 1-2 reviews before final review depending on the completeness of the plan submittal. Upon receipt of the plan submittal, the City will have five (5) business days to determine plan submittal completeness. Two (2) plan completeness reviews max before applicant is required to pay an hourly rate for each additional plan completeness review. After three (3) full plan completeness reviews a formal plan completeness review meeting is scheduled. After the plan submittal has been deemed complete, the City will have 20 business days to complete the engineering plan review and provide comments (if any) to the applicant. Two (2) full plan reviews max before applicant is required to pay an hourly rate for all further plan review. A maximum of three (3) plan reviews will be conducted before a formal plan review meeting is scheduled. See *Section 4* for submittal requirements. All Construction Site/ROW Permit fees described in *Section 3.1 D* must be received prior to the commencement of the Engineering Review.
- 3) Final Review: The City Engineer will issue final approval following receipt and review of the final (100%) plan submittal. The final plan submittal shall address all the City's review comments previously submitted.

### 3.1 D. Construction Site/ROW Permit & Associated Review Fees

See *Appendix A*—Schedule of Fees

### 3.1 E. Construction Site/ROW Permit Time Limits

Sketch Required (3.1 B): From permit issuance, construction shall start within 60 days and be completed within one (1) year from start date or the permit will be void and a new permit will be required.

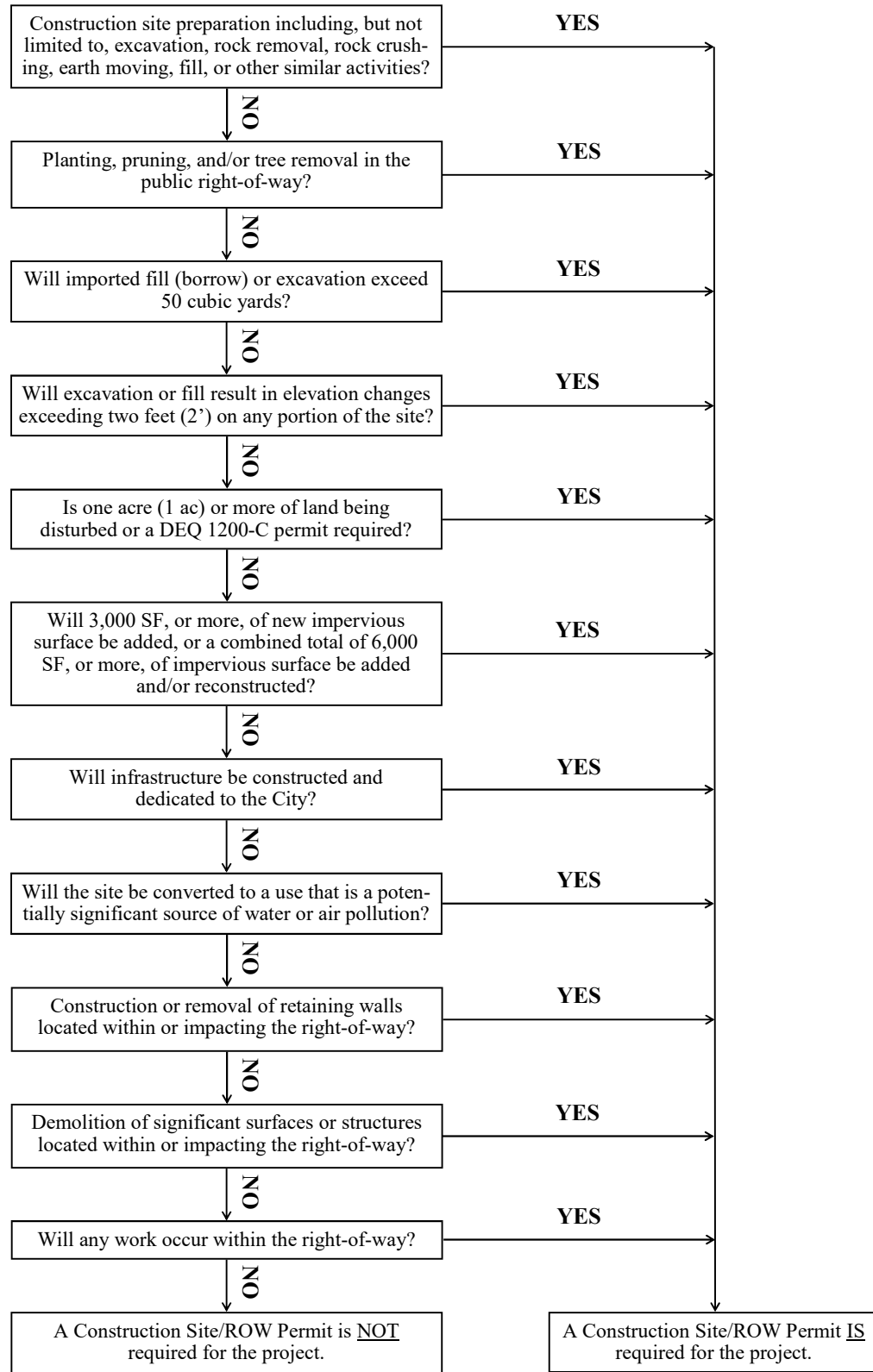


Detailed Engineering Plan Review Required (3.1 C): From permit issuance, construction shall start within one (1) year or the permit will be void and a new permit will be required.

Note: Each phase of construction will require a separate Construction Site/ROW Permit.

## 3.2 Exhibit 2

### Is a Construction Site/ROW Permit Required?







### 3.3 Construction Site/ROW Permit Issuance

Prior to issuance of a permit, the following conditions must be met:

#### 3.3 A. Pre-Construction Meeting

A pre-construction meeting is mandatory for every project that requires a Detailed Engineering Plan Review (*Section 3.1 C*). The applicant is responsible for scheduling the meeting with the City Engineer, Prime Contractor (including job Foreman), Resident Engineer, Design Engineer (if different from Resident Engineer), Owner, and private utility representatives. If all permit requirements are met, the City Engineer will approve the Construction Site/ROW Permit following the Pre-Construction Meeting.

#### 3.3 B. Contractor Pre-qualifications

All Contractors intending to provide construction services or connect to existing or future City-owned infrastructure within the public ROW must be pre-qualified with the City. See form in *Appendix B*.

- All Contractors must be able to provide proof of no less than five (5) years of responsible experience of work to be performed. Work within the public ROW is preferred.
- Contractors providing services for documented franchise utility providers are exempt from pre-qualification when the work to be completed has been permitted by the City according to specific franchise agreements.
- The City Engineer shall reserve the right to accept or reject documented work experience as being relevant for pre-qualification approval.

#### 3.3 C. Insurance Requirements

Refer to the HRMC Title 13.36: Management of City ROW for all work within public ROW.

Certificate of Insurance: The City of Hood River and its agents shall be named as additionally insured.

#### 3.3 D. Bonding & Warranty Requirements

Refer to the HRMC Title 13.36: Management of City ROW for all work within the public ROW and HRMC Title 16 for construction of all public facilities.

Construction Agreement: The applicant shall sign a Construction Agreement with the City that defines the terms and responsibilities of the Construction Site permit.



Surety Bond:

- 1) Performance Guarantee: The applicant shall provide the City with proof of the performance bond prior to commencement of any construction of public improvements. The City Engineer may, but is not obligated to, accept alternative security. The decision shall be in the City Engineer's sole discretion; except when HRMC Section 16.12.060 (H) applies, the applicant may file a personal bond or provide cash in lieu of a performance bond. The performance guarantee shall be for a sum determined by the City Engineer as required to cover 110 percent of the Engineers Cost Estimate (*Section 4.2 B*) including improvement fees and deposits, and related engineering and incidental expenses (HRMC Section 16.12.070 4 B).
- 2) Warranty Guarantee: If applicable, the City Engineer shall require a warranty bond to insure against defects in the improvement to cover a period of two (2) years from the date of acceptance of the public improvements by the City. The warranty guarantee shall be for ten percent (10%) of the actual construction cost, as determined by the final Engineers Cost Estimate, for the public improvements to which this provision applies (HRMC Section 16.12.080 B).

Street Tree Performance and Maintenance Bond: If applicable, the City Engineer shall require the applicant to provide a performance and maintenance bond in an amount determined by the City Engineer, to ensure the planting and maintenance of the tree(s) during the first two (2) years after planting. (HRMC Section 16.12.050 (5)).

Street Cut Bond: If applicable, the City Engineer shall require the applicant to provide a maintenance bond in an amount determined by the City Engineer, to ensure against defects in the improvement to cover a period of two (2) years from the date of acceptance of the public improvements by the City.

### **3.4 Permits and Reviews from Other Agencies**

#### **3.4 A. ROW Permits**

In addition to a City Construction Site/ROW Permit, work within County or State ROW requires a ROW Permit from the applicable jurisdiction. The applicant is responsible for obtaining the necessary permit(s) as required.

#### **3.4 B. Miscellaneous Permits**

The following other types of permits/approvals may be required depending on the type of work and site conditions:

- NPDES 1200-C Department of Environmental Quality (DEQ) Permit for earth disturbance of more than one (1) acre or as otherwise required for the type of earth disturbance to be made,



- U.S. Army Corps of Engineers (USACE) and/or Oregon Division of State Lands Permit for jurisdictional wetlands,
- DEQ registration for Underground Injection Systems,
- Railroad Permit for work that crosses or is adjacent to a railroad ROW,
- Oregon Plumbing Specialty Code (OPSC) Permit for work that involves private storm drains,
- City building permits for work that involves the placement, demolition or removal of retaining walls, other structures or fills on private property,
- County or State approval for development that adds unanticipated traffic to county or state roads.

The above list may not address all permits required for a specific project. The City is not responsible for notifying the applicant of permits that may be required. It is the applicant's sole responsibility to determine which permits are required and obtain those necessary for the work as a condition of the City issuing the Construction Site/ROW Permit. In cases where requirements conflict, the most stringent shall apply.

### **3.5 Final Acceptance and Record Drawings**

The following requirements and process shall apply to all projects requiring a Detailed Engineering Plan Review (*Section 3.1 C*).

#### **3.5 A. Final Acceptance Requirements**

- 1) Following completion of construction, the RE shall notify the City Engineer that the improvements are complete and ready for final inspection and acceptance.
- 2) Following notification, the RE shall schedule the final walk-through of the construction site with the Contractor, Design Engineer, and City Engineer. If the work is not acceptable to the City Engineer, the RE shall document the unacceptable items in writing and provide a copy to the Contractor, applicant, Design Engineer, and City Engineer.
- 3) When all final walk-through items have been addressed to the City Engineer's satisfaction, the RE shall prepare Record Drawings incorporating the changes made during construction, the final walk-through, if any, and submit these drawings to the City Engineer. The documents shall be provided in hard copy and electronic format, including the CAD files. Submit one hard copy of the record drawings printed on either 22"x34" or 24"x36" paper, an electronic version in PDF format and CAD drawings in DWG format conforming to the requirements of *Appendix E*. See *Section 4* for submittal requirements.
- 4) The City Engineer will not give Final Acceptance until all final walk-through items have been addressed to his/her satisfaction and the City Engineer has received the Record Drawings, certification letter, project log book, testing documentation, proof of all warranties, insurance and guarantee bonding as required by HRMC, and written proof of approval from all private utilities.



## **4. Detailed Engineering Plan Review Submittal Requirements**

### **4.1 Survey**

All designs shall be based on a complete topographic survey including surface and subsurface features, existing utilities, and all property line information on the City's coordinate system (*Appendix D*). Record information on existing utilities and street improvements may be available from the City. Although, when available, this information can be used to assist in determining capacity constraints during conceptual design, all record information must be field verified through design surveys. Surveys must extend beyond the site boundary an adequate distance to determine grading and any other potential impacts to surrounding properties with an absolute minimum of 50 feet.

### **4.2 Submittal and Format Requirements**

#### **4.2 A. Submittal Requirements**

All plan submittals subsequent to the mandatory pre-submittal conference shall be made directly to the City of Hood River Engineering Department, Attn: City Engineer.

Plan packages can be hand-delivered to:

1200 18<sup>th</sup> St. Hood River, OR 97031

Alternatively, plan packages can be mailed to:

211 2<sup>nd</sup> St. Hood River, OR 97031

All documents must be submitted in hard copy and electronic format via removable storage device (i.e. thumb-drive or current equivalent). The only acceptable file type for documents is PDF, except for as-built CAD files, which shall be submitted in DWG format or other pre-approved file format for the City GIS system (*Appendix E*). Email or file sharing submission of electronic files may be allowed, as approved by the City Engineer.

#### **4.2 B. Site Development Engineer's Cost Estimate**

Design Engineer's estimated project cost (in unit prices) for all proposed infrastructure (Note: This is not for final plat approval; please refer to HRMC Title 16 for final plat approval requirements).

- All estimates shall be based on public works costs including prevailing wage labor rates.



- Estimates shall fall within +15% to -10% of actual construction costs, otherwise reassessment charges shall apply for the difference between estimated and final constructions costs. See Class 1 Estimates as described by the Association for the Advancement of Cost Engineering International in Recommended Practice #18R-97, latest edition.

1) General Requirements:

- a) Two (2) copies of the Design Engineer's Site Development Cost Estimate (in unit prices) for all proposed infrastructure on 8.5"x11" paper or 11"x17" paper as appropriate. Shall be stamped by an Oregon licensed professional Engineer.
- b) Engineer's cost estimates shall conform to Oregon Department of Transportation (ODOT) Standard and Special Item unit price format. Whenever possible use ODOT standard bid items to describe the work to be performed.
- c) All cost estimate items shall be described with limits of work clearly described and defined on the plans or within the plan specifications.
- d) A contingency of no less than 10% shall be added to the cost estimate.
- e) Any changes in the project scope that are deemed significant by the RE or by the City Engineer shall be reflected in a revised and updated Site Development Engineer's Cost Estimates.

2) Minimum Requirements:

- a) All work in the ROW or other public easements.
- b) Stormwater, on-site water, drainage, and other related items on-site.
- c) Public portions of water systems (fire and potable) serving commercial units on-site.
- d) Irrigation connected to the public water system.
- e) Public portions of sanitary sewer system related items on-site.
- f) On-site grading.
- g) Retaining wall structures that support site work or the ROW (Exclude costs for walls that exclusively support new buildings).
- h) Joint utility trench sections.
- i) All roads, paths, and parking areas, including curbs and gutters.
- j) Reconstruction of structures, including parking areas over 3,000 square feet.
- k) Public lighting for parking and driving areas.
- l) Cross-access related services (i.e. roads or paths required by code or conditional use).
- m) Special items required by the Condition of Approval, Planning Commission decision, or at the discretion of the City Engineer.



#### 4.2 C. List of Changes

Provide two (2) copies of the List of Changes to the plans and responses to questions resulting from the previous review by the City Engineer on an 8.5"x11" paper.

#### 4.2 D. Stormwater Management Plan

A site-specific Stormwater Management Plan prepared by an Oregon Professional Engineer must be submitted for each development project requiring a Detailed Engineering Plan Review (*Section 3.1 C*). At a minimum, the plan must include

- 1) Two (2) bound copies of the Stormwater Management Plan on 8.5'x11" paper. Any required 11"x17" sheets shall be Z-folded into this bound document.
- 2) Stormwater management calculations (*Section 8.2*).
- 3) Drainage area maps (to scale) showing entire contributory area(s) and clearly delineating all calculated sub-areas and time of concentration routes.
- 4) Documentation of all assumptions.
- 5) Adequate detail to allow confirmation that calculations meet design criteria in these Engineering Standards.

#### 4.2 E. General Construction Drawing Requirements

- 1) Submit two (2) sets of construction drawings on 22"x34" sheets (24"x36" drawings are also acceptable with the appropriate border for half size reduction to 11"x17") and two (2) sets on 11"x17" sheets in bound sets.
- 2) Drawings shall be reproducible in black and white with shading and grays allowed provided that they are easily reproducible by black and white copy machines.
- 3) Each drawing shall have a title block aligned on the right hand side, or bottom, of the page and contain the seal of the responsible Design Engineer.
- 4) Horizontal scale for plan and profile sheets shall be at a scale of 1"= 20', unless otherwise approved via the Design Exception process.
- 5) Vertical scale on profiles shall be 1"= 2', unless otherwise approved via the Design Exception process.
- 6) Text on full size sheets shall not be less than 0.1" using all capital lettering. Fonts shall be clearly legible and easily reproducible at half size when reduced.
- 7) North arrow shall be shown on all plan views.
- 8) Area Hatches shall be reproducible in black and white and shall be clearly identified by Legend.
- 9) Linetypes shall be distinct and reproducible in black and white. When line types are not self-identified provide a clear Legend that describes each significant feature being represented by the line. They shall conform to the City of Hood River CAD Standards (*Appendix E*).



- 10) CAD Record Drawing files reflecting as-built conditions shall be submitted in DWG format prior to final acceptance and must comply with the City of Hood River CAD Standards (*Appendix E*).

#### 4.2 F. Minimum Sheet Requirements

The construction drawing submittal shall address all design criteria included or referenced in these Standards and shall include the following sheets as applicable:

##### 1) Cover Sheet:

- a) Project name, Owner, Developer, Surveyor, and Design Engineer with contact information for each, Vicinity Map, Legend, Standard Notes as listed below, Sheet Index, Signature Blocks for Utility Owners, and City Engineer.
- b) All potential conflicts with private utilities must be addressed prior to submission of the final (100%) plan submittal. The applicant must verify plan submission requirements for each private utility according to their specific franchise agreements with the City of Hood River. Final plan submittal shall include completed signature blocks for all private utilities. The Design Engineer or applicant shall be responsible to coordinate with all non-city-owned utilities to resolve conflicts and obtain signatures. Provide full name, position, and current contact information for each utility provider and the City Engineer including daytime phone number. Provide signature and date block for each signatory.
- c) The following “Standard Notes” shall be included on the Cover Sheet of all projects:
  - i. All materials and workmanship shall be in accordance with the HRES, the ODOT/APWA Oregon Standard Specifications for Construction, and the American Water Works Association (AWWA) Standard Specifications. In case of conflicts, the City’s Engineering Standards shall apply unless specifically listed as a Design Exception on this Drawing.
  - ii. All late-season AC paving (placed after October 15th and before April 1st), shall be held to the same performance criteria as all other paving. If for any reason there is aggregate separation, a rough finished surface, or other non-acceptable final product and the City Engineer determines that it is not in the best interest of the City to reject the work and have it removed and reconstructed, the City Engineer may require an asphalt seal coat or other remediation on the entire surface or portions thereof.
  - iii. Design Exceptions: all Design Exceptions shall be listed below this note.





2) Standard Roadway Section(s) and General Notes:

Project specific applicable standard roadway, sidewalk, and other significant surface sections and general notes. Drawings shall be at a scale appropriate to show the level of complexity. Sections shall be clearly defined according to their locations on the site plans.

3) Existing Conditions Plans:

Show all existing streets, utilities, appurtenances, streetscape elements, street markings, contours, control devices, signals, lighting, storm drainage, survey control, ROW and property lines, easements, jurisdictional overlays (i.e. zoning, city limits, UGB, and IAMP boundaries, etc.), curbs, walks, ramps, driveways, retaining wall, bridges, structures and natural features including wetlands, floodways, floodplains, all significant trees and their drip lines.

4) Phasing Plan (If Necessary):

Projects which include multiple phases shall provide a phasing plan, clearly indicating the areas and type of work to be performed in each phase

5) Demolition Plan (If Necessary):

Clearly indicate existing conditions to be removed or relocated.

6) Composite Site Plan:

Show all existing and proposed streets, utilities, appurtenances, streetscape elements, street markings, signals, lighting, storm drainage, survey control, ROW and property lines, easements, jurisdictional overlays (i.e. zoning, city limits, UGB, and IAMP boundaries, etc.), curbs, walks, ramps, driveways, retaining walls, bridges, structures and natural features including wetlands, floodways, floodplains, all proposed trees and existing significant trees, and their drip lines.

7) Grading, Erosion, and Sediment Control Plan:

A Grading, Erosion, and Sediment Control Plan (ESCP) drawing must be submitted for all developments requiring a Detailed Engineering Plan Review (*Section 3.1 C*). At a minimum, the drawing shall show

- a) The general notes required by *Section 6.3 B* Grading, Erosion, and Sediment Control Design Criteria.
- b) Existing contours at a maximum of two foot (2') intervals (1' for sites with an average land slope less than 5%) extending a minimum of 50 feet beyond the





boundaries of the site. Five foot (5') or ten foot (10') contours may be allowed for steeper sites via the Design Exception process.

- c) Proposed contours will be required, under normal conditions, when the cuts or fills have the potential to impact surrounding properties and/or the grading plan is an integral part of the stormwater drainage design for the site.
- d) Intersection grading plans that clearly show direction of flow and elevations at all curb lines including curb returns, ditch lines, crowns, flow lines, walks, paths, and ramps adjacent to the intersection. Clearly indicate Americans with Disabilities Act (ADA) compliant grading when services are required.
- e) Grading limits.
- f) Location of all existing and proposed structures including buildings and retaining walls.
- g) Finished floor elevations for buildings when appropriate.
- h) All natural features including wetlands, floodways, floodplains, significant trees and their drip lines, and dense vegetation. Clearly indicate all protective measures.
- i) All existing and proposed drainage systems and ESC measures including swales & channels (both permanent and temporary). Clearly define type and location of each ESC BMP utilized when appropriate. See Oregon DEQ Construction Stormwater Best Management Practices (BMPs) Manual for the 1200-C NPDES General Permit.
- j) At a minimum, drainage arrows depicting the proposed direction of flow for all individual lots including those lots not graded as part of the initial construction.
- k) Existing utility locations and estimate of depth. Pot holing may be required. Contact Public Works Department prior to pot holing.

8) Plan & Profile Sheets for Streets, Sidewalks, Curbs, Gutters, Ditches, Stormwater Systems, Sanitary Sewers, Private Utilities, Retaining Walls, Structures in the ROW, and Water Systems:

These sheets shall contain all information necessary for staking and construction of these items including

- a) General
  - i. ROW, property, tract, and easement lines (existing and proposed).
  - ii. Subdivision, Development or Project name, lot numbers, street names.
  - iii. Existing aboveground and underground utilities and significant trees and their drip lines. Show existing utility profiles with grades. Indicate invert elevations of all pipes and drainage structures.
  - iv. Location of existing and proposed buildings, walls, structures, wells, septic tanks, drain fields, fuel tanks, and any other buried structures.
  - v. Clearly designate existing conditions to be demolished or to remain.
  - vi. Match lines with sheet and station number references.



- vii. Location and description of existing survey monuments.
- viii. Pot holing may be required to establish elevations of the City's existing utilities. Contact Public Works Department prior to pot holing.

b) Streets, Retaining Walls, Stormwater Plan, and Profiles

- i. Horizontal alignment, vertical alignment, and curve data of street centerlines and face of curb flowlines or edge of pavement where curbs are not required. Stationing shall be given at a minimum of 50 foot intervals along tangents and 25 feet at face of curb returns.
- ii. All tie-ins to existing streets and stormwater facilities.
- iii. Super-elevations and cross-slope transitions; show all rate of change profiles.
- iv. Curb return profiles. Flowline of curb elevations shall be given at quarter-delta and 25 foot (max) stations in plan view.
- v. In profile view, show existing ground elevations along roadway centerline and, if necessary, along ROW or other applicable offsets.
- vi. Profiles of Cul-de-sacs shall show elevations along the flowline of all curbs or street edges, at a minimum of 25 foot intervals. Clearly indicate low or high spots within the cul-de-sac.
- vii. Intersection grading plans that indicate spot elevations at all crowns, low points, transitions, and radius points along face of curb radii.
- viii. For stub streets that may be extended in the future, the vertical alignment shall be designed for at least 300 feet beyond the present scope of construction.
- ix. Driveway locations and dimensions. Clearly identify all ramp and wing transitions.
- x. Retaining wall locations. Show wall types, heights, widths, lengths, offsets, and depths. Show all footings. Show beginning and ends of all walls. Show top and bottom of walls on profiles. Clearly indicate subdrainage systems including outlet locations. Indicate utility passage or minimum separations required between walls and utilities.
- xi. Retaining wall finishes, patterns, and joint locations.
- xii. Sidewalk (existing and proposed) locations including ramps, landings and transitions and their relationship to driveways, planter strips, and approaches.
- xiii. Limits of overlay work if any.
- xiv. Location of all low points of street grades and curb returns.
- xv. Grading limits.
- xvi. Plan and profile views showing location, stationing, size, and material of all existing and proposed mains and service lines for storm drainage.
- xvii. All existing and proposed stormwater structures including upstream and downstream systems as required to show conditions affecting the design. Include invert and top elevations, slopes, materials, and bedding.



- xviii. Numbering system for all proposed stormwater structures consistent with the Capitol Facilities Plan.
- xix. All existing and proposed utility crossings shall be shown in profile. Clearly label all utility conflicts (note: if a private utility has not been located vertically, the horizontal location of the crossing shall be shown on the profile at minimum).
- xx. All sanitary and water lines in “background” linestyle on plan and profiles so that conflicts can be clearly seen.
- xxi. FEMA designated 100-year floodplains and flood ways.
- xxii. Wetland areas and water quality buffer strips.
- xxiii. Guardrails, where required, including all end treatments.
- xxiv. Profiles for ditch and creek flowlines shall extend a minimum of 200 feet beyond the project and include cross sections at 50 foot intervals, unless otherwise directed by the City Engineer.

c) Sanitary Sewer & Water Plan and Profiles

- i. All existing and proposed sanitary sewer and water structures and appurtenances including upstream and downstream systems as required to show conditions affecting the design. Include invert and top elevations, slopes, and materials.
- ii. Plan and profile views showing location, stationing, size, and material of all existing and proposed mains and service lines for sanitary sewer, and water.
- iii. In profile view, show existing ground elevations along roadway centerline and, if necessary, along ROW or utility centerline when located outside of roadway.
- iv. Numbering system for all sanitary sewer structures consistent with the Capital Facilities Plan (CFP) and suitable for importation into the City GIS system.
- v. All tie-ins to existing sanitary and water systems.
- vi. All existing and proposed utility crossings shall be shown in profile. Clearly label all utility conflicts (note: if a private utility has not been located vertically, the horizontal location of the crossing shall be shown on the profile with a note indicating the elevation is unknown).
- vii. All stormwater lines in “background” line type on plan and profiles so that conflicts can be clearly seen.

d) Private Utility Plan

- i. Location of all proposed power, phone, gas, cable, etc. not owned by the City;
- ii. Cross section showing these facilities in relation to the street;



- iii. In general and for all new developments, private utilities shall be installed in public utility easements (PUE) when PUE's are required as part of the approved development.

e) Signing, Pavement Marking, and Lighting Plan

- i. Location of all proposed street signs, pavement marking, street lights, and traffic signals including conduit and other related items.
- ii. Street signs shall be tabulated with size, type, colors, and MUTCD sign codes clearly indicated on the plans.
- iii. Pavement markings shall be clearly described using MUTCD designations with color, widths, types, and sizes as pertinent.
- iv. Lighting shall be clearly identified.
- v. Roadway lighting shall conform to the requirements of *Section 12.3*.

9) Cross Sections:

- a) Cross sections shall be clearly defined according to their locations on the site plans.
- b) Cross sections shall be labeled sequentially by station, not to exceed 50 foot increments.
- c) Throughout intersections, or other specific locations, cross section station intervals shall be as necessary to show all details.

10) Details:

Include all project specific, special, and applicable details. Detail drawings shall be at a scale appropriate to show the level of complexity.



## **5. General Design Criteria**

### **5.1 General Design Guidelines**

All public improvements shall be designed as a logical part of the development of the surrounding area. Conveyance and distribution pipes (storm drains, sanitary sewers, and water mains) and street improvements shall be designed and constructed to provide adequate capacity of public facilities to, at a minimum, be able to accommodate the entire area the facilities will ultimately serve. The CFP shall be used as a guideline in determining the extent of the service areas. Additional studies may be required by the City Engineer. All utilities and street improvements shall be extended, at a minimum, along the entire frontage of the property or through the entire property to the far boundary of the site to provide for future extensions to the adjoining properties. All facility requirements shall be consistent with the most current edition of the City's Water Facilities Plan, Sanitary Sewer Facilities Plan, Wastewater Facilities Plan, Stormwater Facilities Plan, Transportation System Plan, I-84 Exit 62 Interchange Area Management Plan, and I-84 Exit 63/64 Interchange Area Management Plan.

The City has a number of tools that may be available to the owner/developer pursuant to which they may be able to obtain reimbursement or credit for public improvements that benefit others or that are constructed with excess capacity. These include system development charge credits, reimbursement districts, or developer agreements with the City.

### **5.2 City Utility Easements**

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

- In general, all city utilities shall be placed within public ROW. In the extreme condition where a utility cannot be placed in a public ROW, a Design Exception is required for all city utilities on private property.
- If, at the discretion of the City Engineer, a Design Exception is granted on private property, all city utilities on private property shall be located in easements. The easement shall be a minimum of 20 feet wide and there shall be a minimum of seven and a half feet (7.5') from center of utility to edge of easement. When minimum setbacks or separations cannot be achieved within 20 foot wide easements, wider easements may be required.
- In no circumstance may any structure (i.e. buildings, sheds, fences, patios, eaves, retaining walls) or natural feature be built or placed within an easement.
- Easements shall be recorded prior to Final Acceptance.

#### **5.2 B. Access Roads**

- An all-weather access road shall be constructed for all city utilities located outside of the ROW. The all-weather access road shall be a minimum of 15 feet wide with a minimum of six inches (6") of aggregate base or such depth as required to



support an AASHTO WB-40 truck. Larger design vehicles may be required. Provide sufficient width for vehicle turn radii at all turns. An AASHTO vehicle turning radius study may be required (Swept Path Analysis). The access road shall be shaped to promote drainage and shall not cause ponding of stormwater. Drainage ditches, catch basins, and cross culverts may be required; these may increase minimum required easement sizes.

- Access roads with grades over 12% shall require a Design Exception. Maximum grades shall be limited by the service vehicles utilizing them as approved by the City Engineer.
- Access roads that connect to paved streets with curbs shall be installed with ADA compliant concrete driveway approaches and be hard surfaced for a minimum of 20 feet behind the back edge of driveway approaches. Runoff water from access roads shall not be allowed to run onto the streets they connect to.
- Access roads serving stormwater ponds, pump stations, treatment structures, or other significant City operated facilities shall be hard surfaced with sufficient width to allow adequate access as determined by the City Engineer.



## **6. Grading, Erosion, and Sediment Control Design Criteria**

### **6.1 Establishing Site Grades and Elevations**

- Undisturbed existing condition elevations and grades shall be based on site conditions existing prior to any site work being done.
- Elevation Datum shall be tied to City Aerial Mapping Elevation Control. See *Appendix D: Survey Control*.
- In general, existing elevations and grades shall be established by a licensed Professional Land Surveyor (PLS). LiDAR may be available from Hood River County/State of Oregon and may be suitable for use by designers for preliminary design when allowed by the City Engineer.

### **6.2 Grading Requirements**

- 1) Finished cut and/or fill slopes shall not exceed a two foot (2') horizontal to one foot (1') vertical slope (2:1) without site specific geotechnical engineering or an engineering geology study (or both). The study, signed and sealed by the appropriate registered professional, must state that the site soils have been investigated and that a steeper slope will be stable. All recommendations of the report must be adhered to in the site design and construction in order for the City Engineer to consider allowing the Design Exception.
- 2) All fills shall be placed in 6-12 inch lifts and compacted to accepted Engineering Standards sufficient to support the structure(s) intended.
- 3) Any proposed fills on an existing slope shall be constructed by benching the existing slope and placing the fill from the bottom to the top of slope. Consult with a qualified Geotechnical Engineer to determine the specific details required for the site conditions.
- 4) The limits of construction shown shall allow for sufficient room for the Contractor to construct the cuts and fills along the perimeter of the site while not encroaching on adjacent properties or a temporary construction agreement shall be obtained from the adjacent property owner.
- 5) Temporary cuts and fills may need geotechnical engineering reports when directed by the City Engineer.
- 6) Shoring plans may be required when proposed grading appears to affect adjacent properties or structures, as directed by the City Engineer. Shoring plans shall be prepared by qualified Professional Civil or Geotechnical Engineers licensed in Oregon.

### **6.3 Erosion and Sediment Control Requirements**

Current ESC BMPs shall be utilized for all earth disturbing activities. Refer to the most current version of the Oregon DEQ Construction Stormwater Best Management Practices





Manual for the 1200-C NPDES General Permit for a detailed description of BMPs, selection, and implementation of the appropriate measures for ESC. All critical areas and waters of the State shall be protected according to agency requirements.

### 6.3 A. Minimum Requirements

At a minimum, all plans shall address the following items:

- 1) All clearing limits (limits of construction) shall be flagged prior to initial clearing.
- 2) Construction timing and phasing such that it minimizes the potential for erosion.
- 3) Stabilized construction entrance(s), which will be the sole means of ingress and egress from the site, will be constructed prior to initiating construction.
- 4) Wheel washing areas may be required at construction entrances as determined by the City Engineer.
- 5) All stockpiles and staging areas shall be stabilized such that no material erodes into the adjoining street or property.
- 6) Slope stabilization measures (for all slopes 3:1 and steeper) shall be initiated within seven (7) calendar days after earthmoving activities have temporarily or permanently ceased in that portion of the site.
- 7) Sediment Control measures (silt fence, wattles, ESC matting, inlet protection, sediment traps, and basins etc.) for both temporary and permanent conditions as required for the individual site are clearly shown and are consistent with the guidelines in the State of Oregon DEQ BMPs or Stormwater Discharges Associated with Construction Activities manual.
  - a) Inlet protection measures will be consistent with State of Oregon DEQ BMPs for Stormwater Discharges Associated with Construction Activities manual for the specific site conditions.
  - b) Calculations for sizing of structural controls such as sediment traps and basins will be required and included in the Drainage Report.
  - c) Verification that other measures such as ESC matting are being used appropriately may also be required.
- 8) Establishment of all permanent cover through hydro-seeding or other appropriate means shall be clearly shown. On steep slopes, natural fiber ESC mats will be required. Mats shall have a minimum life expectancy of two (2) years. See *Appendix F* for seed mix requirements.
- 9) It shall be the responsibility of the Contractor (and ultimately the applicant) to ensure that all sediment controls are being maintained throughout construction.

### 6.3 B. ESC General Notes

The following notes shall be printed on the plans. For projects requiring a 1200-C Permit, additional notes are required as specifically indicated on the permit.





- 1) The ESC measures shown on the plan should be used as a guideline only; ESC measures may need to be added or altered depending on construction methods, staging, site conditions, weather, and scheduling.
- 2) The Contractor is responsible for control of sediment transport within project limits during construction and until the site is permanently stabilized. If an installed ESC system does not adequately contain sediment on site, then the ESC measures must be field adjusted by the Contractor as necessary for expected storm events to ensure that sediment laden water does not leave the site.
- 3) The implementation of the ESCP and the construction, maintenance, replacement, and upgrading of these ESC facilities is the responsibility of the Contractor until all construction is complete and approved, and vegetation is established.
- 4) The ESC facilities shall be inspected by the Contractor and maintained as necessary to ensure their continued functioning.
- 5) The Contractor shall seed and mulch all cut and fill slopes, and all disturbed ground areas. The Contractor shall be responsible for the seeded areas until vegetation upon them is established. Any additional seeding necessary to establish vegetation shall be done by the Contractor. On steep slopes, natural fiber ESC mats are required. Mats shall have a minimum life expectancy of two (2) years.
- 6) The Contractor is solely responsible for protection of all adjacent properties and downstream facilities from erosion and siltation during the course of the work. Any damage resulting from such erosion and siltation shall be corrected at the sole expense of the Contractor.
- 7) Stabilized construction entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to insure that all paved areas are kept clean for the duration of the project.
- 8) In areas subject to surface and air movement of dust, one or more of the following preventative measures shall be taken for dust control:
  - a) Minimize the period of soil exposure through the use of temporary ground cover and other temporary stabilization practices (i.e. plastic, gravel, etc.);
  - b) Sprinkle the site with water until the surface is wet, repeat as needed;
  - c) Spray exposed soils with an approved dust palliative (note: used oil is prohibited as a palliative).
- 9) Prior to any site excavation, all existing and newly constructed storm drainage inlets shall be protected as shown in the details to prevent sediment from entering the storm drainage system prior to permanent stabilization of all disturbed areas. Clean the filter as necessary to maintain drainage. Provide approved traffic control devices as necessary to protect the erosion control methods. Remove filter and clean catch basins following completion of all sitework. See standard detail for Inlet Protection.
- 10) At no time shall more than 12 inches of sediment be allowed to accumulate within a sediment trap or protected catch basin. All catch basins and conveyance lines



shall be cleaned prior to paving. The cleaning operation shall not flush sediment laden water into the downstream system.

- 11) Install silt fences or approved wattle dams at the toe of all fill slopes before construction starts. Remove all silt when it becomes greater than 12 inches at the silt fence. Remove all silt and silt fences after completion of the project, and after vegetation has been permanently established.



## **7. Roadway Design Criteria**

### **7.1 General Requirements**

#### **7.1 A. References**

- 1) HRMC Title 16: Subdivisions, for the typical street sections by street classification. These are the minimum lane widths and ROW requirements, additional ROW and traffic lane width and number of lanes may be required to accommodate turning movements at intersections and as identified through traffic studies (TIA) for proposed projects. The street classifications are listed in the TSP.
- 2) HRMC Title 16.12.020 and 17.20.060 for Traffic Impact Analysis (Traffic Study) requirements.
- 3) HRMC Title 16.12.060 Public Facilities Standards proportionality to determine impact of development, except where proposed development does not have adequate public facilities as defined by a Level of Service (LOS) D or below.

#### **7.1 B. Structural Section**

The minimum street section (thickness of base and wearing surface) shall conform to the section as shown in the Standard Drawings (*Appendix H*). Site-specific pavement designs may be required by the City Engineer for proposed roadways under conditions such as the following:

- Unusually high traffic volumes or percentage of trucks are anticipated,
- Oversized or overloaded trucks are expected on a regular basis,
- Site soils are unusually poor for the area,
- Construction is staged such that the roadway will receive traffic prior to placing the final lift of asphalt pavement,
- Requirements imposed by other governing jurisdictions (i.e. Hood River County, ODOT, etc.).

#### **7.1 C. Public Street Improvements**

Depending on the level of development, half-street or full-street improvements along the property frontage or beyond may be required. In general, larger developments proposing new streets or the use of existing partially improved streets will require full street improvements, as determined by the City Engineer.

- Half-street improvements are defined as a complete new or replacement street section and improvements from the ROW line adjacent and fronting the proposed project area to the centerline of the road.



- Half-street plus ten improvements are defined as a complete new or replacement street section and improvements from the ROW line adjacent and fronting the proposed project area to the centerline of the road plus a minimum ten foot (10') travel lane beyond the centerline, as defined by the City Engineer.
- Required street improvements may be reduced or eliminated by Design Exception on existing improved roads when allowed by the City Engineer.
- Street Improvements shall be extended a minimum of 25 feet beyond the limits of the project when transitions to existing conditions are necessary, as directed by the City Engineer.
- When proposed developments will utilize public streets for ingress and egress (as defined in the HRMC) that have sections which are not fully developed, the applicant may be required to fully build out unimproved off-site sections of said streets, as directed by the City Engineer.
- When proposed developments will utilize public streets for ingress and egress which are dead end streets 400 feet (or longer) without an adequate public turnaround, an approved public turnaround shall be provided at the end of the road, or as approved by the City Engineer.

The City has a number of tools that may be available to the owner/developer pursuant to which they may be able to obtain reimbursement or credit for public improvements that benefit others or that are constructed with excess capacity. These include system development charge credits, reimbursement districts, or developer agreements with the City.

#### **7.1 D. ADA Curb Ramp Upgrade Requirements**

- 1) ADA upgrades are required for all public or public-serving projects located within a public ROW or public serving easement involving new construction, reconstruction or resurfacing of streets, curbs, sidewalks, and ramps for
  - a) Any project that extends from intersection to intersection. This includes normal four-way intersections, mid-block intersections, and T-intersections on the opposite side of the street.
  - b) Any project that spans from edge to edge of a street, (i.e. curb to curb, curb to edge of pavement, etc.) involves sidewalks, or pedestrian access routes, with an exception allowed for an exempted utility trench surface repair.
  - c) All public service alterations and any activity that is not considered maintenance, according to Title II of the American with Disabilities Act, or an exempted utility trench surface repair.
- 2) When construction, reconstruction, or resurfacing affects a crosswalk route (marked or not marked), even if it is not the full roadway width, curb ramps must be provided at both ends of the crosswalk route and be adequate to provide barrier free access along the pedestrian access route. The project scope of work shall not



be structured to avoid ADA obligations that require curb ramps when resurfacing a roadway (i.e. resurfacing only between crosswalks in an attempt to circumvent ADA obligations shall not be allowed).

- a) Typically, two curb ramps must be provided at each street corner. Curb ramps must be wholly contained within the pedestrian street crossings served and provide an unimpeded, straight, pedestrian access route. When installation of curb ramps are required, the construction of additional curb ramps on the opposite side of the street(s) may be required, as well to providing adequate pedestrian access routing.
- b) For alterations of existing non-compliant ramps, where existing physical constraints prevent two curb ramps from being installed at a street corner, a single diagonal curb ramp may be permitted at the corner, as directed by the City Engineer.
- c) All new or upgraded curb ramps shall be directionally oriented in the best manner possible to provide clear and straight pedestrian access routes to the curb ramp on the opposite side of the street. When no ramp is present on the opposite side of the street, the curb ramp shall be directed towards the best possible location of a future ramp.
- d) When no existing pedestrian services are present on the opposite side of a crosswalk route, (this may occur at intersections and mid-block crossing routes) curb ramps may, at the discretion of the City Engineer, be omitted. However, when existing services are present, upgraded ADA compliant curb ramps shall be required. All new or upgraded curb ramps shall be directionally oriented in the best manner possible to provide clear and straight pedestrian access routes to the curb ramp on the opposite side of the street. When no ramp is present on the opposite side of the street, the curb ramp shall be directed towards the best possible location of a future ramp.

3) Resurfacing activities that specifically require full ADA upgrade compliance:

Overlays	Thin lift overlays	Reconstruction
Cape Seals	Concrete Rehab	In place asphalt recycling
Widening	Open-graded surfacing	Micro-surfacing
Resurfacing at Crosswalks	Grind & Replacement of Asphalt	

4) Maintenance activities that specifically do not require ADA upgrade compliance:

Painting	Striping	Crack Filling/Sealing
Surface Sealing	Chip Seals	Slurry Sealing
Fog Seals	Scrub Sealing	Joint Repairs/Sealing
Dowel Bar Retrofit	Spot High Friction	Diamond Grinding (No Overlay)



- 5) Exempted utility trench surface repair: Single utility trench surface repair that does not meet the conditions of item one (1) does not require ADA upgrade compliance if the utility trench work is limited to a portion of the pavement, even including a portion of a crosswalk. Repaving necessary to cover the single utility trench is considered maintenance and will not require simultaneous installation or upgrading of curb ramps.
  - a) If the utility work impacts the curb at a pedestrian street crossing where no curb ramp exists, the work affecting the curb falls within the definition of “alteration”, a curb ramp must be constructed rather than simply replacing the curb.
  - b) Utility trenching that requires patch repairs six feet (6’) or greater, that disturb half (or more) of a vehicle travel lane, or that contain more than one (1) utility that disturbs crosswalk route areas are required to provide ADA upgrades to all curb ramps served by the crosswalk(s) that have been disturbed.

## 7.2 Horizontal and Vertical Geometrics

### 7.2 A. References

See HRMC Title 16.12.060 B: Transportation Standards for requirements for street alignment and connection, intersection layout, cul-de-sacs, driveways, and other relevant criteria not included here.

### 7.2 B. Horizontal Curves

Centerline radii shall not be less than the following

Arterials	700 feet
Collectors	500 feet
Local Roads	100 feet

There shall be a minimum 100 foot tangent section between reverse horizontal curves on arterial and collector streets.

### 7.2 C. Intersection Layout

- Street intersections shall be as near to right angles (90°) as possible except where site constraints require a lesser angle, but in no case shall the acute angle be less than 75°. The ROW line along the acute angle shall have a minimum corner radius of 20 feet.
- There shall be a minimum 50 feet of tangent from the centerline of the intersection to the beginning of a horizontal curve.



- A minimum landing length of 20 feet from the intersecting edge of pavement at a maximum grade of 5% shall be provided at all new intersection approaches.
- ROW lines at intersections with arterial streets shall have a minimum corner radius of 20 feet.
- The width of ROW beyond the curb line shall not be reduced by the turning radius of the roadway.
- Additional ROW may be required at intersections to facilitate the construction of ADA compliant curb ramps and sidewalks within the public ROW.
- Intersection spacing (offsets) shall be determined by HRMC Table 13.28-A: City of Hood River Access Management Spacing Standards (except for local street driveway spacing). These standards apply for offsets to intersections on the opposite side of the street as well as on the same side of the street, unless otherwise proven to be allowable by a TIA or as approved by the City Engineer.
- Local street driveway spacing shall be 34 feet between adjacent edge of driveway throats. Minimum distance for local street driveways from an intersection shall be 28 feet from the end of the curb return to the nearest edge of driveway throat(s).

#### 7.2 D. Grades

- All grades exceeding 8% shall require a Design Exception. In no case shall grades exceed the following

Arterials	10 %
All other roads	12%*

\*Local roads and residential access roads may have segments with grades up to 15% for distances of no more than 250 feet.

- Minimum slope for drainage control at the gutter line for all streets is 0.5%, with 1% preferred. In all cases where less than 1% is used, a Design Exception shall be required.

#### 7.2 E. Vertical Curves

The minimum vertical curve length for crest and sag curves shall be as determined by the AASHTO formulas in *The Policy on Geometric Design of Highways and Streets* for the design speed and condition.

The following table can be used to determine the minimum “K” value allowed for design of crest and sag vertical curves, as defined by AASHTO.

**Table 7.2 Allowable K values for Vertical Curves**

<b>“K” Values</b>				
<b>S (MPH)</b>	<b>SSD (FT)</b>	<b>CREST</b>	<b>SAG</b>	
			<b>Headlight Control</b>	<b>Street lights</b>
15	80	3	10	-
20	115	7	17	-
25	155	12	26	13
30	200	19	37	20
35	250	29	49	28
40	305	44	64	35
45	360	61	79	46
50	425	84	96	55
55	495	114	115	68
60	570	151	136	80
Ref. AASHTO A Policy on Geometric Design of Highways and Streets (latest edition)				

**Notes**

- S = Design Speed in MPH,
- SSD = Safe Stopping Distance in feet,
- Use 25 MPH speed unless otherwise directed,
- Use Headlight Control K values for sags not designed for street light,
- Use Street Light Control values when street lights have been designed to allow decreased K values. Submit street lighting profile showing locations of 25 foot tall lights and angle of lighting spread at street level (Assume 60 degree Zenith angle from lamp unless otherwise allowed). Profiles must indicate minimum SSD based on design speed for roadway classification and posted speeds.

**7.2 F. Tapers & Flared Roadways**

- For travel lane shifts, the taper lengths shall conform to the following per the MUTCD manual:

Speeds under 45 mph  
Speeds over 45 mph

$$L = WS^2/60$$

$$L = WS$$

Where

L = length of taper (feet)  
W = width of taper (feet)  
S = design speed (mph)

- For addition of a right turn lane and/or left turn lane, a 15:1 approach taper shall be used,  $L = 15W$ , unless a site specific constraint requires a shorter taper for storage reasons. Appropriate reverse curves per AASHTO recommendations may be allowed as an alternative.





- Turn lane minimum widths shall be 14 feet, which includes a two foot (2') minimum Shy Distance. Unless otherwise shown in the City's TSP.

## 7.2 G. Cross-slopes and Superelevation

- All new streets shall be crowned with 2% cross-slopes.
- Developments on existing shed street sections may be allowed, as directed by the City Engineer, and shall have a minimum slope of 2%.
- All cross-slope transitions (i.e. intersection approaches) shall be clearly shown on the roadway profile and shall be designed in accordance with AASHTO recommendations per the design speed. The plans shall specifically address any stormwater drainage issues created by the transitions.
- Intersection and cul-de-sac spot elevation plans will be required.

## 7.2 H. Curb Returns

- At the intersection of two (2) local streets, the minimum allowable curb radius shall be 20 feet, measured from the radius point to face of curb. For the intersection of a local street with any collector or arterial, the minimum radius shall be 25 feet. On all other intersections, the minimum allowable radius shall be 30 feet.
- Radii of 40 feet or more shall be provided where commercial trucks and buses turn frequently. Radii of 40 feet or more shall be designed to fit the paths of appropriate design vehicles.
- The City Engineer may require a Swept Path Analysis at intersections or driveway approaches that accommodate commercial trucks, buses, emergency vehicles, or delivery traffic.
- All curb return geometrics, both horizontal and vertical, shall be shown on the plans. Elevations given at quarter (1/4) points may be sufficient to show the grades. All high and low points shall be shown.
- Where pedestrian access ramps are required, show all grading, layout, orientation, warning devices, and transitions along the curb necessary to meet ADA requirements.

## 7.2 I. Sight Distance

In accordance with AASHTO *Policy on Geometric Design of Highways and Streets*

- 1) All streets shall meet adequate Stopping Sight Distance (SSD),
- 2) All collectors and arterials shall meet adequate Intersection Sight Distance (ISD),
- 3) Provide sight distance triangles for all intersection and driveway approaches (both approach and departure) unless otherwise waived by the City Engineer in writing.



## 7.2 J. Parking Lot Design

Parking lot design shall conform to the current version of *The Dimensions of Parking by the Urban Land Institute and the National Parking Association*, the HRMC, or other design criteria as approved by the City Engineer.

A Construction Site/ROW Permit is required prior to reconstructing existing parking lots in order to bring them up to current stormwater and landscaping standards.

## 7.2 K. Sidewalks

In order to comply with ADA regulations, the City has adopted a policy dictating that sidewalks, including intervening driveway approaches, be completed in full by the developer. Federal law prohibits partially completed sidewalks. Damage incurred during the course of construction must be repaired prior to final acceptance. The applicant shall be required to install ADA compliant access ramps and the sidewalk portion of the driveway approach as part of the infrastructure improvements. The applicant may be required to install off-site ADA compliant access ramps to accommodate ADA requirements (i.e. across the street, block to block, etc.).

## 7.2 L. Street Sections

For all proposed streets, the location of all utilities (both public and private) shall be shown in concept during the planning stages for conceptual agreement by the City Engineer prior to the development of construction drawings.

When PUE's are required, utilities must be shown.

## 7.2 M. Asphalt Concrete Pavement (AC Paving)

ACP shall meet the requirements of ODOT Standard Specifications Section 00744 – Asphalt Concrete and the following conditions:

- 1) All AC paving, regardless of the time of year the paving is placed, shall be held to the same performance criteria. If for any reason there is aggregate separation, a rough finished surface, or other non-acceptable final product, the City Engineer may determine that it is in the best interest of the City to reject the work and have it removed and reconstructed. Alternatively, the City Engineer may require an asphalt seal coat or other remediation on the entire surface or portions thereof.
- 2) In no case shall the ratio of asphalt lift thickness to maximum aggregate size be greater than five (5) or less than three (3).
- 3) Asphalt tack shall be required along edges, curbs, saw cuts, and between layers of ACP. Removal of all tack overspray and trackings shall be required. Failure to



remove unwanted tack properly may require removal and replacement of damaged surfaces at the applicant's expense.

- 4) The maximum aggregate size in the final lift of AC paving shall be less than three-quarter inch (3/4").
- 5) Asphalt concrete pavement and asphalt tack performance criteria shall be provided to the City Engineer prior to placement.
- 6) Compaction of both asphalt and base rock shall conform to the Standard Drawing, "Street Detail".
- 7) Manholes, valve boxes, monument boxes, etc. shall be recessed a quarter to half inch (1/4"-1/2") below the finished grade of pavement in all streets. Failure to adjust to the specified tolerances will be grounds for rejection of the asphalt paving at the sole discretion of the City Engineer.

## 7.2 N. Utility Trench Patching

- 1) Four inches (4") minimum compact ACP required over trench patch areas per City trench patch standards is required for all Utility Trench patching within existing paved area located within the ROW. However, match depths when existing asphalt is greater than four inches (4"). Lift thickness shall be not greater than two inches (2") unless allowed by the City Engineer.
- 2) Any damaged asphalt caused during construction will trigger two inch (2") deep minimum grind and replacement, no spot patching will be allowed. Areas of damaged surface to be determined by the City Engineer. If large portions of the street have been damaged (i.e. settlement or significant cracking), remove and replace all damaged areas marked by the City Engineer (replace full depth of asphalt and base materials as required).
- 3) For all utility trenches parallel to the street with final street cuts within two feet (2') of the gutter/road edge, replace asphalt to the edge of gutter/road per minimum City Standards.
- 4) Pavement Grind and Replacement (*Section 7.2 O*) and ADA Curb Ramp Upgrade Requirements (*Section 7.1 D*) apply for utility trenching activities when directed by the City Engineer.

## 7.2 O. Pavement Grind and Replacement

- 1) The applicant shall grind and replace pavement with a minimum of two inches (2") of asphalt overlay under the following circumstances:
  - a) If utility street cuts are ten feet (10') or less apart, grind and replace the entire extents between street cuts.
  - b) If, in the opinion of the City Engineer, a significant portion of the street along the frontage has been disturbed by utility street cuts, the applicant shall grind and replace



- i. The areas marked, or
  - ii. Half street along the frontage, or
  - iii. Half street plus ten feet (10') along the frontage, or
  - iv. The entire street along the frontage, as directed by the City Engineer.
- 2) If the total existing asphalt depth is three inches (3") or less, in areas requiring grind and replacement, an entire asphalt replacement of these areas will be required (minimum of four inches of depth plus base rock material if existing base is not adequate). Subgrade improvements may be required, as directed by the City Engineer.
- 3) For all utility trenches parallel to the street with final street cuts within three feet (3') of the gutter/road edge, replace asphalt to the edge of gutter/road.
- 4) When grind and replacement is required, complete ADA curb ramp reconstruction/replacement may be required per *Section 7.1 D*.

## **7.2 P. Permanent Traffic Safety Guards and Fencing**

Permanent traffic safety devices such as guardrails and pedestrian safety guards shall be required where conditions warrant such devices, as determined by the City Engineer.

- Vehicular Guardrails shall meet the conditions of the ODOT Standard Specifications, Part 00800 – Permanent Traffic Safety and Guidance Devices.
- Pedestrian guards and fencing shall be required along sidewalks, walls, ramps, or stairways in locations where there is more than 30 inches of vertical elevation drop adjacent to the traveled path and when directed by the City Engineer.
  - Fall guards shall be no less than 42 inches above walking surfaces. Fall guards shall be rust resistant steel structures capable of resisting a 200 lb horizontal point load at any location. Fall guards shall be constructed with at least one horizontal mid-bar.
  - Protective fencing shall be no less than 60 inches tall. Fencing shall be as specified by the City Engineer.

## **7.3 Retaining Wall and Structure Requirements**

### **7.3 A. References**

Walls, structures, and their foundations shall be designed according to the latest Oregon Structural Specialty Code (OSSC) Chapter 16 – Structural Design and Chapter 18 – Soils and Foundations.



### **7.3 B. General Design Conditions**

- 1) Walls and structures must be designed and stamped by the Design Engineer. A stamped report clearly indicating design considerations is required for submission to the City or its Agents by the applicant.
- 2) All portions of walls and structures, including their foundations and drainage systems, must be constructed within the ROW unless
  - a) A permanent wall easement is obtained with private properties,
  - b) The structure is part of an approved driveway or pedestrian access bridge (special conditions apply for this situation),
  - c) A written agreement is made between governmental agencies for shared structures.
- 3) All retaining walls supporting property outside of the ROW must be designed to support existing conditions, slopes, and soil types plus known anticipated conditions.
- 4) All walls supporting streets, bridges, abutments, sidewalks, or public improvements shall be design for anticipated live and dead loadings plus 250 per square feet surcharge loadings.
- 5) All Driveway Bridge structures must meet current seismic loading requirements as required by the OSSC.
- 6) When portions of walls or structures will be located below the 100-year flood elevation of a stream or within a flood-plain, design according to FHA HEC 18 Evaluating Scour at Bridges publication FHWA-HIF-12-003 or latest edition.



## **8. Stormwater Management Design Criteria**

### **8.1 General**

#### **8.1 A. Applicability**

A Stormwater Management Plan is required when one or more of the following criteria apply:

- 1) Excavation and/or imported fill (borrow) exceeds 250 cubic yards.
- 2) 3,000 square feet or more of new impervious surface will be added to the site (i.e. new parking lots, structures, or other impervious surfaces that individually or in combination replace 3,000 square feet, or more, of existing pervious surface).
- 3) A combination of 6,000 square feet, or more, of impervious area will be added and/or reconstructed (i.e. 4,000 square foot of existing building reconstructed with the addition of a new 2,000 square foot parking lot, structure, or other impervious surface OR reconstruction of 6,000 square feet, or more, of existing impervious surface). A parking lot is considered to be “reconstructed” only when the base material, or a portion of the base material, is removed, replaced, or added. The removal and replacement of asphalt or asphalt overlays is not considered reconstruction.
- 4) Stormwater infrastructure will be constructed and dedicated to the City.
- 5) Private stormwater infrastructure will be constructed.
- 6) The site will be converted to a facility that will potentially affect downstream water quality (i.e. fueling station).
- 7) Any activity increasing runoff, equal to or greater than 0.05 cfs, over pre-developed conditions (i.e. tree removal, vegetation removal, soil compaction, etc.)

This criteria does not apply to single family homes or duplexes within existing subdivisions that have approved stormwater plans which mitigate the stormwater runoff created from lot development, unless the approved subdivision stormwater plan included individual lot on-site stormwater management such as detention, retention, or other BMPs. This criteria is applicable for private stormwater infrastructure as it pertains to the quantity and quality of stormwater runoff leaving the site.

#### **8.1 B. Other Agency Reviews**

Other agencies may require drainage review. The policies in this manual shall not relieve the Owner from complying with the requirements of any federal, state, or local authority with jurisdiction over a development (e.g. ODOT, Oregon DEQ, Oregon DSL, USACE, ODFW, USFWS, and Hood River County).



### 8.1 C. Minimum Criteria

Recognizing that the field of stormwater management, both regulatory and design, is continually evolving in an effort to provide more effective long-term solutions to managing stormwater; the above stated standards are intended to set the minimum criteria which must be met, but are in no way intended to limit the ingenuity and creativity of either the applicant or Design Engineer for a specific site.

## 8.2 Stormwater Management Plan

### 8.2 A. General

- As part of the Planning Application submittal, a planning-level concept for the development's storm drainage system and BMPs is required.
- A preliminary Stormwater Management Plan is required as part of the Engineering pre-submittal process.
- A final Stormwater Management Plan is required at the time of Detailed Engineering Plan submittal.

### 8.2 B. Minimum Criteria

A Stormwater Management Plan is required to be prepared by the Design Engineer and shall include

- 1) Project Overview: Briefly describing the nature and goals of the project with a vicinity map showing the location of the project site.
- 2) Existing Conditions Summary: Including a topographic map and narrative describing existing drainage patterns of the site, surrounding areas, and upstream contributing areas. The map shall cover all areas presently draining to the site as well as adjoining and downstream areas that may be impacted by the development. The map shall indicate total site acreage, existing land use, drainage courses, flow direction, drainage basins, any existing development and/or drainage facilities, and information regarding areas such as wetlands that may require additional permits.
- 3) Proposed Improvements Summary: Shall include a map and narrative showing proposed improvements as relevant to the stormwater management plan. Include drawings as needed to show proposed topography (drainage arrows may be sufficient), structures and impervious areas, existing and proposed drainage infrastructure, and other BMP's. Include all required infiltration testing per *Appendix G*.
- 4) Operation and Maintenance Plan, O&M Plan: Shall describe the maintenance requirements and who will be responsible for operation and maintenance of all





proposed stormwater facilities. See *Section 8.9* for an exhaustive list of requirements.

- 5) Level of Detail: Detail included in the Stormwater Management Plan will vary greatly depending on the complexity of the site. The information shall be presented in a clear and concise format commensurate to the complexity of the site and sufficient to convey to the reviewer that the proposed design concept is feasible and will meet City standards if designed and constructed appropriately. It is in the discretion of the City Engineer, or his/her designee, to determine whether the proposed stormwater management design adequately addresses the following questions or if criteria additional to that in this section is required to provide safe and effective mitigation measures for the concentration of natural rainwater resulting from the proposed development. The following types of questions shall be addressed
- Are additional permits required?
  - Where will the flows discharge?
  - Are all off-site flows addressed?
  - Is detention required? If so, how will this be addressed?
  - How will the proposed plan protect water quality?
  - Is ESC a significant concern? If so, how will this be addressed?
  - Will any of the proposed facilities be maintenance intensive? If so, how will this be addressed?

## 8.3 Determination of Design Flows (Hydrologic Analysis Methods)

### 8.3 A. Acceptable Methods

- Rational Method for sizing of conveyance systems only where attenuation effects of existing storage are ignored.
- Hydrograph Technique such as the Soil Conservation Service Unit Hydrograph (SCS) or similar method for volume and/or time-dependent analysis such as detention and water quality flows and volumes.

### 8.3 B. Rainfall

Rational Method – use the ODOT Zone 5 IDF curves in the *ODOT Hydraulics Manual*.

SCS Method – The rainfall distribution over the 24-hour period is based on the SCS Type 1A rainfall distribution which is standard for developing synthetic storms in the Pacific Northwest region. The National Oceanic and Atmospheric Administration (NOAA) Atlas 2, Volume 10, for Oregon presents the return frequencies of the storm events which varies significantly between the west side and east side of Hood River. This NOAA Atlas was published in 1973 and used various rain gauges to develop





regression equations based upon latitude, longitude, elevations, and hydrological regions within Oregon. The isopluvial lines shown on the maps are based upon the regression equations derived. In addition, two separate frequency analyses were performed on hourly precipitation records from the Hood River Experiment Station (HOXO). One Analysis covered the period of record from 1900-1997. The other analysis covered the period of record from 1990-2012. Based on the two extreme event analyses of the HOXO gauge and the NOAA Atlas, the following precipitation rates were selected to be used City wide for statistical design storms. The following precipitation depths for the 2, 5, 10, 25, 50, and 100-year return frequencies for a 24-hour maximum rainfall event are shown in *Table 8.3 B*.

**Table 8.3 B**  
**24-hour Maximum Rainfall Events**

<b>Storm Return Period (year)</b>	<b>P (inches)</b>
2	2.0
5	2.6
10	3.3
25	3.9
50	4.2
100	4.8

Water quality design storm – One inch (1.0”) in 24 hours.

### 8.3 C. Soils Information

Hydrologic soil groups shall be determined from the SCS Soil Survey of Hood River County or as determined by a soils report prepared by a qualified Professional Engineer, geologist, or soils scientist.

### 8.3 D. Runoff Coefficients and Curve Numbers

Rational Method runoff coefficients shall be determined from the table in the *ODOT Hydraulics Manual*.

USDA NRCS *Urban Hydrology for Small Watersheds Technical Release 55 (TR55)* shall be used for developing Runoff Curve Numbers (CN), but CN values listed in TR55 for various residential lot sizes shall not be used. Designers must supply the anticipated maximum impervious areas that will be developed for each lot/parcel. Runoff from impervious areas such as streets, sidewalks, and roofs shall be calculated independently of pervious areas. The separate impervious and pervious hydrographs shall be combined to calculate the runoff at a particular location and to size stormwater management facilities. In no case shall curve numbers with a difference of more than ten (10) be area averaged together.



### 8.3 E. Time of Concentration

Time of concentration – the time it takes for runoff to travel from the hydraulically most distant point in the watershed to the point of reference downstream, shall be calculated according to the methods in the *ODOT Hydraulics Manual* or the *TR-55: Urban Hydrology for Small Watersheds* with a minimum time of five (5) minutes.

Travel times for sheet flow, shallow concentrated flow, open channel flow, and pipe flow shall be included as applicable.

## 8.4 Sizing of System Components (Hydraulic Analysis Methods)

### 8.4 A. General

- Where a site presently receives flow from upstream properties, the site shall be designed to provide for conveyance of these same flows through the site in a manner consistent with these Engineering Standards while preserving existing streams and channels in their existing condition wherever possible.
- The design shall minimize existing site disturbances, maintain areas of existing sheet flow discharge, minimize the creation of new impervious surfaces, and lengthen the post-development time of concentration wherever feasible.
- The applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge without causing erosion, sedimentation, flooding, or other harm. If conveyance facilities do not exist, existing sheet flow shall not be concentrated and discharged onto adjacent property. If flows are concentrated they must be redistributed over the downstream area to emulate the existing down gradient runoff hydrograph.
- Sizing of all conveyance systems within ODOT jurisdiction (i.e. City arterials and culverts under Interstate 84) shall conform to ODOT criteria.
- All portions of the stormwater system intended to meet quantity and quality controls shall be constructed separately from the City's conveyance system (i.e. utilizing the City's conveyance pipes for detention is not acceptable).

### 8.4 B. Outlets

Appropriate Discharge Location: All surface and stormwater runoff from a site must discharge directly into the City storm drainage system or other approved discharge location. The applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge without causing erosion, sedimentation, flooding, or other harm. If the downstream system does not have sufficient capacity to handle the flows or increased volume from the site, or is a documented problem area (see Capital Facilities Plan), the applicant will not be allowed to connect to the system without the necessary improvements to relieve the documented problems or prove that the proposed improvements will not worsen the existing conditions (note: increasing volume to downstream systems will likely result



in increased duration of flooding even if peak flows are not increased). In general, stormwater runoff shall not be diverted from one drainage basin to another. If this is proposed for any reason, the applicant must document the ability of the downstream system to safely convey the additional flows at basin build-out conditions without causing erosion, sedimentation, flooding, surcharging within two feet (2') of finished grade, or other public safety concerns within the system.

**Outlet Protection:** The receiving channel at the outlet shall be protected from erosion. A rock lining, as specified in *Table 8.4 B*, is generally acceptable.

**Table 8.4 B**  
**Required Outlet Protection for Receiving Channels**

Design Flow Discharge Velocity (fps)	Required Protection (Minimum Dimensions)			
	Type (ODOT/AWA Specs)	Thickness (feet)	Width (feet)	Length (feet)
0-5	Riprap Class 50	1	Diameter +6 ft.	8 ft. or 4x Diameter (whichever is greater)
>5-10	Riprap Class 100	2	Diameter +6 ft. or 3x Diameter (whichever is greater)	12 ft. or 3x Diameter (whichever is greater)
>10	Site specific design by Design Engineer and approved by the City Engineer			

Outlet protection shall also meet the following requirements:

- 1) The rock lining shall have a minimum height equal to the pipe crown + 1 foot.
- 2) Filter blanket or geotextile shall be placed under all riprap.
- 3) Engineered energy dissipaters including stilling basins, drop pools, etc. are required for design flow velocities exceeding 20 fps.
- 4) Design reference shall be included on the plan submittal for all design flow velocities exceeding ten feet per second (10 fps).

#### 8.4 C. Catchbasin & Inlet Sizing/Spacing

Inlets shall be designed for the 10-year storm and shall be spaced such that

- 1) The maximum encroachment of runoff on the roadway pavement shall not exceed one half of the traveled lane during the design storm.
- 2) Bypass flow shall be limited to a maximum of 30 percent.
- 3) Runoff greater than 0.5 cfs does not flow across intersections (i.e. catch basins placed just before the beginning of the curb radius).
- 4) Maximum inlet spacing is 300 feet.



- 5) In limited cases, inlets may be used as junction structures (pipes 18 inches in diameter and less) as approved by the City Engineer through Design Exception.
- 6) Inlets shall be connected to the stormwater system using a wye, tee, or manhole. In general, connections shall be perpendicular to the stormwater mainline.
- 7) Design is in accordance with methodology described in the *ODOT Hydraulics Manual*.

#### 8.4 D. Pipes

Local collector pipes shall be designed to convey the 10-year storm event by gravity flow. Additionally, pipes receiving flows from sumps (low points) on collectors shall be designed to convey the 25-year storm event by gravity flow. Arterial pipes shall be designed to convey the 25-year storm event by gravity flow. In addition, mainline stormwater sewers that receive runoff from ditches or streams should be designed for the 25-year storm event. More stringent criteria may be required by other agencies with jurisdiction on a given project.

A backwater and/or hydraulic grade line analysis may be required for a proposed or existing pipe system if tailwater conditions could potentially affect the ability of the system to carry the design flows. In the case of a system where private service lines are connected to the storm pipe network, calculations must show that the 100-year storm will not back up in the pipes to the point of connection at the building, otherwise, a backflow prevention or overflow device must be provided.

#### 8.4 E. Channels

- All channels shall be designed for the 25-year storm with 0.5 foot freeboard. These channels will also be required to contain the 100-year storm when overtopping of the channel could result in flooding of any structures or excessive damage to private property.
- Sizing of channels shall be in accordance with the design methodology described in the *ODOT Hydraulics Manual*.
- Channels shall be designed to provide required conveyance capacity while minimizing erosion and allowing for aesthetics and preservation of riparian habitat.
- All channels shall be designed to be stable with flexible linings such as vegetation, riprap, temporary matting, etc. Reference the Federal Highway Administration Design of Roadside channels with Flexible Linings for design methodology. *Table 8.4 E* summarizes acceptable channel types based on design flow velocities.



**Table 8.4 E**  
**Channel Lining Types Based On Design Flow Velocities**

Velocity at Design Flow (fps)	Channel Type	Min. Height above Design Water Surface	Maximum Side Slopes
0-5	Vegetative Lining	6 inches	3:1
>5 – 8	Riprap or Bioengineered Lining	1 foot	2:1
>8 – 12	Riprap	2 feet	2:1
>12 – 20	Site specific design by qualified Engineer and approved by the City Engineer.		

- If the design velocity of a channel to be vegetated by seeding exceeds two feet per second (2 fps), a temporary channel liner (ESC matting) is required before the channel can be used to convey stormwater.

#### 8.4 F. Culverts

- Roadway culverts shall be designed to carry the 25-year storm unless more stringent criteria is required by other governing jurisdictions.
- For new culverts up to 18 inches in diameter, the maximum allowable design storm headwater (measured from the inlet invert) shall not exceed two (2) times the pipe diameter and shall not overtop the road, driveway, or parking lot surface.
- For larger culverts, the maximum allowable design storm headwater shall be a minimum of one foot (1') below the road, driveway, or parking lot surface. Structural analysis of embankment may be required.
- Culvert design shall be in accordance with the design methodology described in the ODOT Hydraulics Manual. The Federal Highway Administration's Hydraulic Design of Highway Culverts is also a good reference.

#### 8.4 G. Overflow Route

Plans must show that an overflow route exists for the 100-year storm allowing for a one foot (1') freeboard below building finished floors.

### 8.5 Water Quantity Controls (Detention)

#### 8.5 A. General

- Water quantity control is required for all developments, new or existing, that add over 3,000 square feet of impervious surface area or for redevelopment projects with a combination of 6,000 square feet, or more, of new and/or redeveloped impervious area. Water quantity control is also required for all developments that ultimately flow through one of ODOT's system, unless it can be shown by the



applicant that ODOT's detention criteria can be met without providing water quantity controls. Developments requiring water quantity control will require construction of detention or retention to limit runoff at the downstream discharge of the site to a rate less than or equal to the peak flow for the 2, 10, and 25-year storms under pre-development conditions. Pre-development conditions for redevelopment is forest ground cover type. Assume the ground cover conditions are "fair", or provide justification for other ground cover conditions to the City Engineer for evaluation and approval.

- If an acceptable channel or stormwater facility downstream does not exist, the applicant shall be required, as a condition of approval, to build conveyance infrastructure to an approved stormwater conveyance facility. If the cost of building such infrastructure is considered disproportionate to the project cost and the Design Engineer can satisfactorily demonstrate to the City Engineer that the site layout, grades, and stormwater design will mitigate the potential for damage to properties immediately downstream of the development, the concentrated mitigated flows may be evenly re-dispersed over the original area where the existing runoff sheet flowed from the property. In addition to the 2, 10 and 25-year design storms, these systems shall be designed to mitigate the 100-year design storm. Furthermore, the 2-year design storm flows shall be limited to half of the pre-development 2-year flows.
- Detention/retention facilities shall adequately show all necessary elevations, including water surface level of the design storm events on the control structure.

Note: If the site discharges directly to an ODOT system, ODOT criteria shall apply.

### 8.5 B. Downstream Capacity

For sites not otherwise required to provide water quantity controls as outlined above, water quantity controls may be required if, in the opinion of the City Engineer, the downstream pipe or drainage course does not have sufficient capacity to convey the design storm. In lieu of providing water quantity controls, the applicant may elect to increase the downstream capacity.

### 8.5 C. Post-Development Runoff

For all sites regardless of size, limiting increases in post-development runoff is encouraged. Landscaping, landscape planters, vegetative filters, vegetated swales, porous pavement, and eco-roofs are examples of the types of systems that reduce runoff while also improving water quality. A good reference for the appropriate application of these types of systems is the *City of Portland Bureau of Environmental Services Stormwater Management Manual*.



#### 8.5 D. Roof Drains

Roof drains shall not be piped directly to the public or private stormwater conveyance systems unless site conditions warrant. Properly designed retention systems or splash blocks are preferred. It will be the applicant's responsibility to confirm that DEQ's Underground Injection Control (UIC) requirements are met.

#### 8.5 E. Additional Quantity Control Requirements

The City Engineer may impose additional requirements for sites where existing downstream erosion or flooding problems may be aggravated due to increased total runoff volume. The additional measures may include but are not limited to

- 1) Additional detention to further control peak flows (e.g. applicant may be required to over-detain to match the capacity available in the downstream system).
- 2) Retention of stormwater rather than detention or a combined detention/retention system to limit discharge to less than pre-development volumes.
- 3) Upsizing of downstream pipes to address the problem.
- 4) When there are small pre-development flows, increasing the time of concentration and use of surface infiltration facilities, where appropriate, are encouraged to decrease the post-development peak flow.

#### 8.5 F. Control Structures

- All control structures shall be designed to accommodate the 100-year design storm.
- All detention or retention systems shall have a separate emergency overflow structure designed to safely convey the 100-year design storm in case of clogging of the primary control structure. Appropriate screening devices shall be provided for all outlets with clogging potential.
- The minimum orifice size shall be two inches (2") for quantity control facilities serving open ponds. Buried detention facilities with filters protecting control structures shall have an orifice not smaller than one inch (1").
- All control structures shall be designed so that the orifices can be easily accessed and cleaned during storm events.

#### 8.5 G. Acceptable Systems

- 1) Ponds: Ponds are the most desirable alternative for detention facilities for water quality benefits, relative ease of inspection, and access for maintenance. All ponds shall
  - a) For ponds used to achieve both water quantity and quality standards, maximize the flow length from inlet to outlet with a minimum length to width





- ratio of 2:1. Should site conditions necessitate short circuiting, additional water quality features may be required.
- b) Have an emergency overflow capable of discharging the 100-year storm, assuming the primary discharge is clogged.
  - c) Provide a minimum of one foot (1') freeboard above the design storm to the emergency overflow and one foot (1') freeboard between the emergency overflow and the top of berm.
  - d) Have sufficient depth such that the maximum design water surface in the pond is below the invert of the pond inlet pipe. If this is not feasible, a backwater analysis will be required to show that the pond backwater does not adversely impact the operation of the upstream storm drain system.
  - e) Have maximum interior slopes of 3:1 and be seeded with mixes that are water tolerant and require minimal mowing, or do not need to be mowed. If the slopes are intended to be mowed, the interior slopes shall not exceed 4:1.
  - f) Have maximum exterior slopes of 2:1 unless they will be mowed, in which case they shall be 4:1 max.
  - g) Construction requirements for pond berm embankments addressing compaction, keys, lifts, etc. shall be clearly noted on the plans. The Owner will be responsible for addressing all slope stability issues and involving a qualified Geotechnical Engineer as necessary.
  - h) If the pond berm is to accommodate vehicular access, the top of the berm shall be designed to be 15 feet wide and designed for traffic loads. If the pond berm will not accommodate vehicular access, the minimum top width of the pond berm shall be three feet (3') in width.
  - i) Have an access road to the pond for maintenance. Access roads shall meet the conditions of *Section 5.2 B* unless otherwise allowed by the City Engineer. Additionally, an access road shall be constructed allowing maintenance equipment to access the bottom of the pond. In lieu of an access road to the bottom of the pond, the pond side slope adjacent to the access road may be designed at a 4:1 grade to allow maintenance equipment to access the bottom of the pond.
  - j) Provide a minimum of five feet (5') or half (1/2) the berm height, whichever is greater, between toe of berm and adjacent property lines.
  - k) Include fencing if required by the City Engineer (note: fencing is not desirable).
  - l) Be designed to avoid standing water unless designed as a constructed wetland or wet pond.
  - m) Be lined if necessary to protect downstream properties.
- 2) Underground Pipes and Vaults: Underground detention pipes and vaults, although a more efficient use of land, provide less water quality benefit. The Design Engineer shall include adequate provisions for cleaning, accessing, and maintaining the buried facility and its flow control mechanisms. The design shall include methods for preventing or minimizing sediment and debris from entering the buried facility such as pretreatment devices and filtering mechanisms.





- 3) Private Parking Lot Ponding: The following guidelines shall apply for parking lots used for detention volume:
  - a) The depth of the detained water cannot exceed half foot (1/2') at any location.
  - b) The minimum gradient of the parking lot area subject to ponding shall be 2%.
  - c) The emergency overflow path shall not create a hazard.
  - d) Fire lanes used for emergency equipment shall be free from standing water.
  - e) The parking lot shall remain functional during the design event (i.e. pedestrian pathways to parked vehicles).
  - f) ADA designated routes and parking stalls shall be free of standing water.
- 4) Retention Systems: Retention systems are an acceptable alternate to detention and can provide both water quantity and quality improvements when properly designed and constructed. These systems are only appropriate in specific conditions where the soils infiltrate well and the potential for groundwater contamination has been properly addressed. A report from a qualified geotechnical professional is required to confirm the site's suitability for the proposed systems. All retention facilities must comply with the Oregon DEQ UIC Rules and be approved by the City Engineer.
  - a) The minimum infiltration rate for concentrated flows is 0.5 inch/hour.
  - b) The minimum infiltration rate for rain on events is 0.3 inch/hour.
  - c) Retention/Detention ponds shall be designed to drain within 48 hours of the design storm event.

#### 8.5 H. Design Methodology

There are many references describing accepted practices for the design of detention and retention facilities including the *Federal Highway Administration Hydraulic Engineering Circular 22: Urban Drainage Design Manual*. The following minimum procedures shall be followed:

- 1) Stage-storage and stage-discharge calculations shall be used to model the proposed system. Typically, half foot (1/2') intervals provide a satisfactory model. Note that a prismoidal formula, or other accepted procedure, shall be required to determine the stage-storage curve for sloped pipes.
- 2) The inflow hydrograph shall be routed through the detention/retention system using the Storage Indication method:  $\text{Inflow} - \text{Outflow} = \text{Change in Storage}$

### 8.6 Water Quality Controls

Recognizing that the regulatory controls for non-point source pollution are steadily increasing, the following criteria are established as minimum measures and are expected to be updated on a regular basis. Water quality treatment is required for all sites that add or reconstruct over 3,000 square feet of impervious surface area. Water quality treatment is not required for infiltration



systems receiving roof runoff from one single family home. Water quality treatment shall be required, as determined by the City Engineer, for all existing commercial parking areas when the development applies for a Building Permit or Construction Site/ROW Permit, or repaves the parking lot.

#### 8.6 A. Design Criteria

- The water quality design storm = 1.0 inch in 24 hours.
- The water quality volume and runoff rates are calculated using all pollution generating surfaces, existing and new.
- All water quality facilities shall be designed to bypass or convey the larger storm events.
- Vegetation/plantings within the water quality facilities shall be appropriate for the intended use (i.e. water tolerant, dense stand of vegetation, etc.). The construction plans will specify all plants and seed mixes and all installation requirements. Several current seed mixes and appropriate uses are included in *Appendix F*. Consultation with a landscape designer or biologist is recommended and may be required by the City Engineer depending on the proposed facility.

#### 8.6 B. Acceptable Systems

The following systems are the most common acceptable facilities. Other types of facilities shall be approved on a case by case basis. Incorporation of BMPs in the site design and the use of 'natural' systems (i.e vegetated swales, vegetative filters, etc.) incorporating bio-filtration is preferred. Additional stormwater treatment measures (i.e. oil separation, etc.) shall be required for sites converted to a use that is a potentially significant source of pollution.

##### 1) Extended Dry Pond:

- a) The water quality storm shall be released over a minimum of 48-hours.
- b) The water quality storm shall be routed through the pond to size the pond and outflow controls or the following simplified approach may be used:
  - i. Use total effective runoff volume (V) of the water quality storm to determine the water quality storage requirements.
  - ii. The water surface at the top of the water quality storage volume is used to determine the effective head, "H", to be used in solving for the required orifice size or other outlet control. The water quality storage outflow rate in cfs is  $Q = V/(48)(60)(60)$ , where V is in cubic feet.
  - iii. If this simplified approach is used for combined facilities, water quality and quantity controls, the water quality volume shall be assumed full prior to routing of the water quantity storm.



- c) When the primary orifice is required to be less than two inches (2") to meet the water quality criteria of this section, the secondary outlet shall be a weir or other non-clogging outlet control.
- d) See additional criteria for Ponds in the Water Quantity Control section.

2) Vegetated Swale:

- a) Hydraulic residence time = 9 minutes (preferred), 5 minutes (minimum)
- b) Maximum Design Depth = 0.5 foot
- c) Manning's "n" value = 0.24 (appropriate vegetation must be used)
- d) Maximum velocity = 2 fps
- e) Minimum length = 100 feet
- f) Minimum slope = 0.5%
- g) Minimum bottom width = 4 feet
- h) Maximum side slope = 4:1 (within treatment depth)
- i) Include flow spreader where pipe enters swale and at 50-foot intervals

3) Vegetated Filter Strips:

- a) Maximum length of impervious area flowing towards the filter is 60 feet.
- b) Minimum length of filter in the direction of flow is 15 feet.
- c) Width of filter shall be the same as the tributary area.
- d) Maximum filter slope = 10%
- e) Filter slopes greater than 5% require check dams at five foot (5') intervals.
- f) Check dams, when required, shall be 3-5 inches high, constructed of durable, non-toxic material and run the full length of the vegetated filter.
- g) Flow spreaders may be required at the entrance to the vegetated filter, depending on site conditions.
- h) Filters shall be maintained with complete vegetative covering and shall be kept free of sediment build-up.
- i) All vegetated filter strips shall drain to an approved stormwater conveyance/disposal system.

**8.6 C. Alternative Water Quality Treatment Methods**

All alternative water quality treatment systems must be approved by the City Engineer. To be considered for approval, the proposed alternative treatment system must meet the following minimum requirements:

- 1) The basic treatment goal of the water quality treatment facilities is to remove 80% of total suspended solids for an influent concentration range of 100 mg/L to 200 mg/L. For influent concentration less than 100 mg/L, the effluent goal is 20 mg/L total suspended solids. For influent concentrations higher than 200 mg/L, enhanced treatment at a higher level than 80% removal may be required. Proprietary water quality treatment methods approved for basic treatment are those listed in



Washington State Department of Ecology's list of Stormwater Treatment Technologies Approved through the Treatment Assessment Protocol Program (TAPE) and Chemical Treatment Assessment Protocol Program (CTAPE) process.

- 2) Calculations showing the pollutant removal capability of the structure for the specific site shall be required.
- 3) An operation and maintenance manual shall be provided for all water quality structures.
- 4) In general, Water Quality Maintenance contracts with qualified providers will be required for the approval of priority systems.

## 8.7 Stormwater Piping

### 8.7 A. Minimum Pipe Sizes

Mains & Culverts:	12 inches
Laterals (catch basin to main):	10 inches

### 8.7 B. Pipe Materials

- Service laterals shall be white PVC, SDR 35 pipe meeting ASTM D3034.
- Mains shall be PVC, SDR 35 pipe meeting ASTM D3034 for pipes 10-15 inches and ASTM F679 for larger pipes with gasketed bell end, or other approved materials.
- Acceptable materials for culverts may include HDPE, ADS N-12 (or equal), concrete, or ductile iron pipe. Water-tight joints required.
- It shall be the responsibility of the Design Engineer to specify the appropriate pipe for the design conditions (soil, depth, buoyancy, and design loadings).

### 8.7 C. Pipe Identification

All stormwater mains shall be identifiable as follows

- 1) All pipes shall be installed with detectable, green, six inch (6") wide marking tape one foot (1') above the crown of the pipe along its entire length. The marking tape shall be marked with the phrase "Storm Sewer" every five feet (5'), or as approved by the City Engineer.
- 2) Stormwater pipes shall be installed with a toning wire along their entire length, terminated underneath the manhole frame, and accessible from ground level. The toning wire shall be size 12 AWG Solid Cooper with green insulation suitable for direct burial. Any splices in the toning wire shall be made using King Innovations DryConn DBSR direct bury gel caps with strain relief, or approved equal. See the Standard Drawings (*Appendix H*) for toning wire termination practices.



#### 8.7 D. Minimum Cover

Mains & Laterals: Three feet (3') except at catch basins, refer to standard detail  
Culverts: Two feet (2') preferred, depth of pavement section minimum\*

\*Note: All proposed culverts shall be designed to meet traffic loadings (HS-20) based on the cover provided and the material used.

#### 8.7 E. Minimum Slopes

Mains and Laterals: Minimum desirable slopes for mains and laterals are 1% with an absolute minimum of 0.5%. In all cases where less than 1% is used, a Design Exception is required.

Culverts: Minimum slope is 0.5%, 1% preferred.

HDPE & ADS N-12 Pipe: Absolute minimum slope is 1%. Use alternate pipe material if minimum slope cannot be achieved, as directed by the City Engineer.

#### 8.7 F. Steep Slopes

Pipes on slopes steeper than 20% must be properly anchored.

#### 8.7 G. Decreasing Pipe Size

Downstream decrease in pipe size is not a recommended practice and will only be allowed as a Design Exception.

#### 8.7 H. Trash Racks/Grates

Trash racks or grates are required for all inlet and outlet ends of pipes 18 inches and larger, accessible by the public. Trash racks and grates shall be designed to be accessible and easily cleared of debris.

### 8.8 Catch Basins and Manholes

In general, stormwater mains shall be constructed between stormwater manholes. Stormwater mains shall not be constructed running parallel underneath curb and gutter and shall be a minimum of three feet from outer diameter of the pipe to the edge of the gutter. Catch basins shall collect runoff from the gutter and discharge to the stormwater main via tees, wyes, or manholes. Configurations other than the aforementioned shall require a Design Exception.



#### **8.8 A. Junction Structures**

Manholes shall be required at all changes in horizontal or vertical alignment and at all pipe intersections. Wyes and tees are allowed where catch basin laterals connect to the storm main. If a Design Exception is granted for the use of catch basins as a junction, the following conditions must be met:

- 1) Pipe diameters are 18 inches and smaller,
- 2) Pipe cover is less than 48 inches in depth,
- 3) Pipe cover is greater than 36 inches in depth.

#### **8.8 B. Maximum Manhole Spacing**

Maximum spacing is 300 feet.

#### **8.8 C. Private Lateral Connections to Manholes**

Private lateral connections to manholes will not be allowed. Storm sewer services (laterals) shall be connected directly to the catch basins or the public main and not to publicly owned manholes.

#### **8.8 D. Manhole Floor Elevation**

The manhole floor elevation shall be no lower than 18 inches below the invert elevation of the outlet pipe. Sumps in manholes are generally not required. When hydraulic efficiency is required, manholes serving mains shall be channelized to reduce entrance and exit losses within the manhole.

#### **8.8 E. Catch Basin and Manhole Sizing**

Catch basin and manhole sizing shall be determined by pipe size and orientation at the junction structure. A plan view of the junction structure, drawn to scale, will be required when angles of approach and clearance between pipes is a concern. The integrity of the structure to support the design loadings shall not be compromised. The minimum manhole diameter shall be 48 inches. Minimum distance between hole penetrations into catch basins or manholes shall be per the manufactures minimum recommendations. Manhole sections shall not have hole penetrations within eight inches (8") of the edge of the top or bottom of the section.

#### **8.8 F. Maximum Catch Basin Depth**

Maximum depth of catch basins shall be five and a half feet (5'-6") to lowest invert unless otherwise approved by the City Engineer. The maximum cover over pipes entering and leaving catch basins shall be 48 inches. Use storm water manholes for pipes requiring more than 48 inches of cover.



### 8.8 G. Sumps

All newly installed catch basins shall have an 18 inch minimum depth sump below the invert out. If a sump is provided in a storm manhole, the manhole shall have an 18 inch maximum sump below the invert out. Sumps in manholes are generally not required.

### 8.8 H. Invert Elevations

The drop from the highest inlet invert to the outlet invert shall not exceed 24 inches in catch basins or manholes. If the drop between pipe invert elevations exceed 24 inches, an outside drop structure is required. The minimum drop from the lowest invert in to the invert out shall be 0.2 feet for manholes or catch basins used as junction structures.

### 8.8 I. Crown Elevations

Match crown elevations of different diameter pipes at catch basins and manhole penetrations unless otherwise allowed by City Engineer.

### 8.8 J. Field Verification

The Contractor shall be required to field verify all existing invert elevations prior to making connections to existing structures or constructing new manholes over existing pipes. Deviations in elevation or alignment from those shown on the Final Approved Plans shall be immediately reported to the City Engineer. Any required changes to the plan must be approved through the City Engineer.

### 8.8 K. Manhole Steps

Steps shall not be allowed in manholes.

## 8.9 Provisions for Maintenance and Operation

### 8.9 A. Public O&M Responsibility

The City will provide operation and maintenance on all publicly owned facilities.

### 8.9 A. Private O&M Responsibility

- 1) Storm drainage facilities to be managed by the person(s) responsible (i.e. the owner/developer/their successors or assigned) include but are not limited to:
  - a) A storm drainage facility not located on City owned property, City ROW, or City easement;
  - b) A private parking lot storm drain;





- c) Any roof, footing, or area drain;
  - d) A storm drainage facilities not designed and constructed for use by the general public;
  - e) An open drainage way;
  - f) Access drive culverts in the public ROW or on private property;
  - g) A detention, retention, or treatment system, in the construction of which the City did not financially participate;
  - h) All private LID facilities that are a part of the development approval.
- 2) Any person(s) responsible shall keep open drainage ways on property which they possess or control cleared of debris and vegetation as required.
  - 3) Any person(s) responsible for non-public stormwater facilities shall enter into a Private Stormwater Maintenance Agreement with the City, and maintain such facilities so as to prevent flooding or damage to other property not possessed or controlled by the person(s) responsible and to prevent injury to any person or property not owned or controlled by the person(s) responsible. The Private Stormwater Maintenance Agreement shall be recorded in the deed records of Hood River County, Oregon for each individual lot/unit. This agreement shall run with the title to the land. This agreement will be in place prior to final plat approval.
  - 4) Any person responsible shall not alter a detention, retention, or treatment system from its original properly functioning condition or intended design without prior written approval of the City Engineer.
  - 5) Private parking lots and private streets must be swept or cleaned at least semi-annually. Prior to the sweeping or cleaning, bio-filter bags must be installed to prevent pollution during the maintenance effort from entering the City's storm drainage system and impacting downstream water quality. The property owner or manager must certify every year through a cleaning contractor that the inspections and cleanings have been completed.
  - 6) The person(s) responsible shall provide the City up to date contact information within 10 days of any changes.
  - 7) The person(s) responsible shall bear all costs, expenses, and risks arising out of or in any way relating to the operation, maintenance, and repair of the private stormwater facility.

#### **8.9 B. Access (Public Facilities)**

Public ingress/egress easements shall be provided for all public stormwater facilities which require maintenance. Public ingress/egress easement shall be a minimum of 20 feet wide and shall have an all-weather access road as described in *Section 5.2 B*. Easements shall be recorded prior to Final Acceptance.

#### **8.9 C. Access (Private Facilities)**

A 20 foot wide exclusive, perpetual, access easement, benefiting the City of Hood River is required for all private stormwater facilities. Easements shall have an all-





weather access road as described in *Section 5.2 B*. Easements shall be recorded prior to Final Acceptance.

This easement gives the City and its authorized agents and employees the right, but not the obligation, of immediate entry to maintain access to the private stormwater facility to inspect, repair, or maintain the private stormwater facility in the event the person(s) responsible (i.e. owner/developer/their successors or assigned) fail to operate, maintain, and repair the private stormwater facility in a timely manner, as required. If upon inspection by the City, the private stormwater facility is not being properly operated, maintained, or repaired, the City shall make the necessary repairs and all expenses for those repairs or maintenance shall be paid by the person(s) responsible. The City is under no obligation to maintain or repair private stormwater facilities.

#### **8.9 D. Operations and Maintenance Manual**

As part of the Final Plan Submittal, the Design Engineer shall submit an O&M manual that includes

- 1) O&M Drawing/Map: Detailing which portions of the proposed storm sewer system will be dedicated to the City, which will remain in private ownership, and easements (if any) that will be provided (with map narrative if necessary).
- 2) O&M Narrative: Describing the required maintenance criteria (frequency of inspection, description of maintenance practices, etc.) for all water quality and quantity systems, and who will be responsible for maintenance of these facilities once the project is completed.
- 3) Proprietary Systems: Provide proof of maintenance agreements and provide yearly proof of inspections unless otherwise approved by the City Engineer.



## **9. Potable Water Systems Design Criteria**

### **9.1 Pipe Sizing and System Capacity**

Pipe sizing shall be as shown in the Water Master Plan or as required to provide peak domestic demand with fire flow for existing, planned, and future development. Capacity and flow calculations may be required which meet the Oregon Department of Human Services (DHS), Oregon Drinking Water Services (DWS), and Hood River Water Master Plan standards for specific sites. The applicant shall meet with the City Engineer early in the process to discuss connection to the City's existing water system and determine if there are any existing system problems that would need to be addressed in order to provide adequate capacity to the proposed development.

#### **9.1 A. Pressure**

All water mains shall be designed to maintain a minimum pressure of 20 psi at ground level for peak day system flows, plus fire demand. Higher residual pressures may be required in areas of multi-story buildings or hilly terrain. Normal working pressures in the system shall be approximately 60 psi and no less than 45 psi.

#### **9.1 B. Distribution Pipes**

Minimum distribution pipe size is eight inches (8").

#### **9.1 C. Fire Protection**

All distribution systems shall be designed to provide the minimum fire flow as defined by the Oregon Fire Code with modifications that may be required by the City Engineer and Fire Chief.

#### **9.1 D. Pipe Looping Requirements**

Distribution piping shall be looped. When looping is not feasible, a Design Exception is required. If allowed, dead end lines shall be extended to the property boundary for future extension/looping with adequate easement and access, as directed by the City Engineer. In most cases, a fire hydrant shall be placed at the end of dead end lines for flushing and maintenance. Fire hydrants placed at dead end lines shall meet requirements of *Section 9.1 C*. In rare cases, a blow off assembly may be approved through a Design Exception.



### 9.1 E. Design Velocity

Pipeline velocities shall not exceed eight feet per second (8 fps) under peak hourly demand flows. Pipes designed for higher velocities shall require special evaluation and/or materials, and shall only be approved through Design Exception.

### 9.1 F. Service Pipes

Single family residential service lines shall be three-quarter inch (3/4"). No splices shall be allowed in service lines. All other services shall be sized appropriately by the applicant for the intended use. See Standard Drawing (*Appendix H*). When this section and the Standard Drawing conflict, the Standard Drawing shall control.

### 9.1 G. Pipe Identification

All potable water mains shall be identifiable as follows

- 1) All pipes shall be installed with detectable, blue, six inch (6") wide marking tape one foot (1') above the crown of the pipe along its entire length. The marking tape shall be marked with the phrase "Potable Water" every five feet (5'), or as approved by the City Engineer.
- 2) Water pipes shall be installed with a toning wire along their entire length, terminated in the top of valve boxes, meter boxes, and fire hydrants, accessible from ground level. The toning wire shall be size 12 AWG Solid Cooper with blue insulation suitable for direct burial. Any splices in the toning wire shall be made using King Innovations DryConn DBSR direct bury gel caps with strain relief, or approved equal. See the Standard Drawings (*Appendix H*) for toning wire termination practices.
- 3) PVC potable water pipe shall be blue in color.

## 9.2 Pipe Materials

### 9.2 A. Distribution Pipes

All piping four inches (4") and larger shall be C-900/C-905 DR 14 PVC colored blue throughout the entire composition of the pipe. Pressure class of pipe shall exceed the anticipated operating pressures by a minimum of 50 psi. Pipe dimensions shall conform to Iron Pipe Sizing (IPS) standards. Consult with the City Engineer regarding operating pressures within the existing system. Under certain conditions, ductile iron pipe may be allowed with specific approval.



## 9.2 B. Service Pipes

Residential and commercial service pipes up to two inches (2") in diameter shall be CTS PEX-A meeting the requirements of NSF 61, ANSI 372 and ASTM F2023 or type "K" seamless, soft, annealed copper.

## 9.2 C. General

All material and products in contact with domestic water shall meet the requirements of NSF Standard 61 per Oregon Administrative Rules (OARs) Section 333-061 and all appropriate AWWA standards.

# 9.3 Connections and Fittings

## 9.3 A. Mains

All connections and fitting shall meet the requirements of NSF 61. Fittings shall be ductile iron pipe and shall meet the requirements of AWWA C110 or AWWA C153, and shall have a minimum working pressure rating of 350 psi. Joints shall meet the requirements of AWWA C111. Fittings shall be cement mortar lined and seal coated, meeting the requirements of AWWA C104. Gaskets for flat faced or raised faced flanges shall be an eighth inch (1/8") thick neoprene having a Durometer reading of 60,  $\pm 5$ . The type, material, and identification mark for bolts and nuts shall be provided.

- Compact ductile iron mechanical joint and flange fittings are required unless otherwise approved by the City Engineer. In general, mechanical joint fittings are preferred over flange fittings.
- Where two mechanical joint fittings are joined together, Foster adapters shall be used.
- All mechanical joint fittings shall be fitted with Megalug style, or equal, restraining glands.

## 9.3 B. Service Pipes

PEX-A pipe fittings shall be brass or stainless steel CTS Mueller 110 compression fitting on service pipes. Push type and press type fittings will not be allowed. All service pipe materials shall meet the requirements of ASTM B88 and NSF 61.



## 9.4 Valves

### 9.4 A. Valve Type

- All valves ten inches (10") or less in diameter shall be ductile iron, resilient wedge gate valves rated for a working pressure of 200 psi, bubble/seal tight at a differential pressure of 250 PSI and shall be counter-clockwise (left) opening. Provide a two inch (2") square nut to conform to AWWA C-504 on all buried valves.
- All valves 12 inches or larger in diameter shall be actuator equipped, counter-clockwise (left) opening, ductile iron, butterfly valves rated for a minimum working pressure of 250 psi and bubble/seal tight at a differential pressure of 250 psi, unless otherwise specified.
- All buried valves shall have non-rising stems.
- Valves located in vaults shall have rising stems or position indicators.
- Use a ductile iron swivel tee, or equivalent, to ensure the operational nut and valve box is perpendicular to the road surface.

### 9.4 B. Valve Locations

Valves shall be located as follows

- 1) Maximum 600 foot spacing along mains,
- 2) In fire hydrant line at hydrant locations (locate next to main),
- 3) At pipe intersections, one valve per branch.

## 9.5 Meters

Water meters, up to two inches (2"), are provided and installed by the City of Hood River. See the Standard Drawings (*Appendix H*) for the appropriate meter boxes to be installed by the applicant. Drop in reading cavities meeting the drawing specifications will be required.

Water meters larger than two inches (2") shall be a Hersey HbMAG meter assembly provided and installed by applicant. All water meters larger than two inches (2") shall be in a vault, with double-doors, located behind the sidewalk in an easement.

## 9.6 Fire Hydrants

### 9.6 A. Acceptable Fire Hydrants

Fire hydrants shall be Mueller Super Centurion 250 configured with the following ports:

- 1) One (1) five and a quarter inch (5 1/4") pumper with a four inch (4") Storz adapter.



- 2) Two (2) two and a half inch (2 1/2") hose nozzles.
- 3) All City owned fire hydrants shall be painted Hood River Yellow and all privately owned fire hydrants shall be painted Mueller Red, as specified by the City Fire Chief.

#### 9.6 B. Fire Hydrant Location

Install approved new fire hydrant(s) per the following

- 1) Within 250 feet of facilities to be served and along a route accessible by fire department vehicles.
- 2) One at or near every roadway intersection.
- 3) At a maximum spacing of 500 feet along mains.
- 4) Hydrants must have a five foot (5') clear space surrounding them on all sides. A minimum of 18 inches clearance from the back of a hydrant may be allowed, by Design Exception, when against a retaining wall.
- 5) The applicant shall be responsible for obtaining approval from the City Engineer and City Fire Chief for the location of all proposed fire hydrants.
- 6) For some developments, more than one (1) fire hydrant may be necessary to produce the required fire flow, as directed by the City Engineer and Fire Chief.

#### 9.6 C. Fire Hydrant Sizing

Line size from main to fire hydrant shall be six inches (6").

### 9.7 Combination Air and Vacuum Release Valves (CARV)

#### 9.7 A. Location

Mains shall be designed to eliminate high points. If high points are unavoidable, properly sized combination air and vacuum release valves (CARV) shall be installed in a vault at the apex. CARVs shall be Vent-O-Mat RBX, or approved equal.

#### 9.7 B. Venting

All CARVs shall vent to the outside of the vault. Vents shall be designed with a down turned elbow and a bug screen. Vents shall terminate a minimum of two feet (2') above finish grade or two feet (2') above the reasonable local flood surface elevation, whichever is greater. See City Standard Drawings (*Appendix H*).



## 9.8 Installation

### 9.8 A. Cover

Minimum cover is 36 inches from finished grade to top of pipe. Maximum Cover is 60 inches unless allowed by Design Exception. A minimum cover of 30 inches may be approved under certain localized situations, on a case-by-case basis, through the Design Exception process.

### 9.8 B. Separation

See *Section 10.2 G* for water and sanitary sewer line separation requirements.

### 9.8 C. Backfill and Compaction

- Pipe bedding, pipe zone material, and trench backfill shall be an approved granular material three-fourths inch (3/4") minus crushed rock. Sand backfill is not allowed.
- Trench compaction shall be per the HRES. Contractor to determine the type of equipment and method to achieve the required compaction. Each lift shall be compacted to a minimum of 95 percent of the maximum density as determined by the AASHTO T-180 test method.
- Settlement of the finished surface within the warranty period shall be considered to be a result of improper compaction and shall be promptly repaired by the Contractor at no expense to the owner.

### 9.8 D. Thrust Restraint

- Thrust restraints shall properly brace, and shall be required at all tees, flanges, caps, bends, offsets, plugs, dead-ends, hydrants, blow-off locations, as well as all other appurtenances which are subject to unbalanced thrust per OAR Section 333-061.
- Concrete thrust blocking shall be placed at bends, tees, dead ends, and crosses unless noted otherwise. Blocking shall be 3,000 psi concrete poured in place. Concrete blocking shall be against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to obstruct access to the joints of the pipe or fittings. The maximum design soil bearing strength is 1500 psf unless a letter is provided from a licensed Geotechnical Engineer that states higher bearing strengths may be used for the design of the thrust blocks. The allowable design soil bearing strength may be less if poor soil conditions are observed in the field. Check with Field Engineer on thrust block size before pouring thrust blocks.
- Pipe and fittings in contact with thrust or saddle blocks shall be wrapped in eight (8) mil polyethylene.



- For unbalanced forces in the vertical direction, which would force the pipe or fitting in the upward direction, use mechanical joint restraint and effective length design.
- Mechanical joint restraint use EBBA Iron series 2000pv mega lug mechanical joint thrust restraint or approved equal. Contractor to restrain the minimum required pipe length with EBBA Iron series 1500, 1600, or 2800 bell restraint harness or approved equal unless otherwise specified on plans.
- Submit pipe restraint info prior to purchase. For non-standard thrusting conditions or non-standard thrusts not shown on the plans, submit plans and calculations signed and stamped by a State of Oregon Licensed Professional Engineer.

## **9.9 Cross-Connection Prevention**

### **9.9 A. General**

Cross-connection prevention shall be required in accordance with the City's cross-connection ordinance and OAR 333-061 on backflow and cross-connection prevention. See Section 12.02.250 and Chapter 12.08 of the HRMC.

### **9.9 B. Location**

Backflow prevention assemblies shall be located outside of the ROW on private property.

### **9.9 C. Ownership**

Backflow prevention assemblies shall be provided, installed, owned, and maintained by the property owner.

## **9.10 Disinfection**

### **9.10 A. Protection of Pipes and Appurtenances**

All pipe, pipe fittings, valving, and associated appurtenances when delivered to the work site, shall be placed in a suitable storage area with the consideration to effect maximum protection from any sources of contamination. Pipe stored at the work site should never be stored in a manner that surface water pooling could occur allowing any portion of the piping, fittings, valving or other appurtenances to become partially or wholly flooded with extraneous water sources. Pipe, pipe fittings, valving and associated appurtenances to be stored at the job site for more than 24-hours shall be suitably protected from animals and/or rodents from entering the interior of same. If in the judgment of the Project Engineer any pipe, pipe fittings, valving, and associated appurtenances are found to be so contaminated, the contractor shall not use such





facilities until proper flushing and/or disinfection has been afforded same and approved by the engineer for use.

#### **9.10 B. Flushing**

Prior to disinfection, flush all foreign matter from the pipeline using only potable water. Provide hoses, temporary pipes, ditches, and other suitable conveyance as required to dispose of the flushing water without damage to adjacent properties, or the environment. Flushing velocities shall be at least two and a half feet per second (2 1/2 fps). For large diameter pipe where it is impractical or impossible to flush the pipe at two and a half feet per second (2 1/2 fps) velocity, clean the pipeline in place from the inside by brushing and sweeping, then flush the line at a lower velocity. Contaminated pipe fittings, valving, and other related facilities shall be properly cleaned and flushed prior to project use.

#### **9.10 C. Chlorination**

Following completion of new facilities and repairs to existing facilities, those portions of the facilities which will be in contact with the water delivered to users shall be disinfected with chlorine before they are placed into service. Disinfection shall use the continuous feed method and shall conform to AWWA C651-5 and OAR section 333-061-0050 as hereinafter modified or expanded, and the requirements of any governing agency having jurisdiction.

#### **9.10 D. Dechlorination**

Appropriate disposal and/or dechlorination of flushed water during blowoff is the responsibility of the Contractor. Under no circumstances shall water be discharged in such a manner as to cause erosion.

#### **9.10 E. Bacteria Test**

Testing for coliforms is required for all new water lines and any existing water lines that are in service, but lose of pressure for any reason (i.e. drained for connection or broken) per OAR 333-061-0050 and AWWA C651-5. This will require a minimum of two (2) testing periods, 24-hours apart.

### **9.11 Testing Requirements:**

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

All testing shall conform to the requirements of *Section 13.2*, the ODOT/APWA Oregon Standard Specifications for Construction, applicable AWWA Specifications, and OAR 333-061-0050. When conflict exists, the most stringent shall apply.



The City Engineer shall have the final authority for accepting or rejecting test results. Failure of an initial test is required to be brought to the attention of the City Engineer immediately and a re-test shall not occur without the City Engineer's presence, or his/her written approval to proceed in his/her absence.

## **9.12 Pressure Reducing (PRV) Station**

### **9.12 A. Supplier Qualifications**

PRV stations shall be packaged PRV stations as supplied by GC Systems, NW Hydrotech, or other qualifying companies meeting the following requirements:

- 1) Manufacture pre-engineered and shop assembled PRV stations meeting all the requirements of this Section for a complete and operable system.
- 2) Have the financial resources, technical qualifications, experience, organization, and adequate facilities to manufacture a PRV station of the type specified.
- 3) Minimum five (5) years of experience in manufacturing PRV stations.
- 4) Completed at least ten (10) prior successful installations with the type of PRV station similar in size and scope to the installation herein specified. The manufacturer shall supply proof of installations including facility locations, names, and phone numbers of operators or persons familiar with the system performance, dates of operation, and other pertinent information as requested by the City Engineer.
- 5) Provide onsite setup, testing, and training.
- 6) Provide continued on-call assistance and onsite service and maintenance for all components of the PRV station.

### **9.12 B. Minimum Requirements**

All control valves shall be Cla-Val, coordinate with the City Engineer for sizing and features. All packaged PRV stations shall include

- 1) Large meter vault;
- 2) Main control valves (PRV);
- 3) Bypass control valves (PRV);
- 4) Isolation valves on the inlet and outlet side of the main, bypass lines, and on the inlet side of relief line;
- 5) Inlet and outlet pressure gauges with isolation valves;
- 6) Line strainers on the main and bypass lines;
- 7) Air release valve (Vent-O-Mat RBX) with isolation valve;
- 8) Hose bib with ball valve and inline PRV;
- 9) Pressure relief valve;
- 10) Drip valve on relief discharge line;
- 11) Access ladder with extension;



- 12) Access hatch;
- 13) Couplings to allow easy valve removal;
- 14) Piping, fittings, and appurtenances;
- 15) A real time telemetry system to access upstream and downstream pressures;
- 16) Acceptable vault drain system;
- 17) Other components as required by the City Engineer.

Non-packaged PRV stations, assembled in field, may be allowed at the discretion of the City Engineer. Non-packaged PRV stations shall meet all of the above requirements for a packaged system, if allowed.

#### 9.12 C. Vault

- The PRV vault shall be a large meter vault with a minimum inside vault height of six feet six inches (6'-6").
- The vault shall be pre-cast reinforced concrete with an AASHTO H-20 load rating.
- All pipe penetrations shall be core drilled and the void between the pipe and vault must be sealed with Link-Seal modular seals.
- Mastic shall be provided between vault sections to provide a watertight seam.
- The chamber interior shall be painted with White CS55 sealant to improve lighting. The chamber exterior shall be sealed with Black CS55 sealant or insulated with polyurethane foam, as required, to provide a watertight enclosure.
- Vault shall have a full-length sump at the outlet end with a minimum depth of ten inches (10").
- A trench grate shall be provided over the entire length of the sump.
- The sump shall gravity drain with a minimum four inch (4") diameter watertight drain system or with an Automatic Ejector Assembly (Model #996633) to the nearest storm system facility.
- The drain system discharge shall be designed to prevent backflow into the vault. The drain discharge shall be screened to prevent blockage.
- Vault shall have adequate weight to resist buoyancy forces, or shall be provided with adequate counter-buoyancy measures.
- Buoyancy calculations stamped by the Design Engineer shall be supplied. Buoyancy calculations shall assume a groundwater level at the surface and a safety factor of at least 1.25.

#### 9.12 D. Piping and Fittings

- All vault piping and fittings shall be fabricated, schedule 40 stainless steel T-304 welded pipe.
- All pipe and fitting joints in the vault shall be either flanged or Victaulic.
- Plain end pipe with restrained adapter will not be allowed within the vault.
- Pipe shall extend three feet (3') outside of the vault and shall be anchored to the vault wall with anchor bolts and a mid-span pipe restraint.



- Adequate thrust restraint shall be provided for both the inlet and outlet side of the vault.
- Thrust calculations, stamped by the Design Engineer, shall be supplied. Calculations shall assume the pipe is a dead-end line, vault isolation valves closed and PRVs removed, and shall use the maximum estimated static pressure expected for the line as the design pressure.

#### 9.12 E. Access Hatch

Within Roadway: The access hatch shall be a 38 inch frame and cover with a 24 inch inner cover EJ model #1581Z (frame), #1581E (outer cover), and #1040A (inner cover), or as approved by the City Engineer. The access hatch shall have an AASHTO H-20 load rating and be stamped "WATER".

Outside of Roadway: The access hatch shall be latchable, reinforced, galvanized steel, double door meeting AASHTO H-20 load rating. Door sizes shall be suitable as determined by the City Engineer. The doors shall be provided with a spring assist lifting mechanism. An internal safety grate shall also be provided that complies with fall through protection per OSHA standard 1910.28 & 29, and controlled confined space entry per OSHA standard 1910.146.

#### 9.12 F. Ladder

The vault ladder shall be an aluminum or galvanized steel ladder with an aluminum extension. The ladder shall be sized appropriately for the vault height. The ladder shall be tall enough to be easily accessed from the ground level. The ladder shall be load rated for a minimum of 300 pounds.

#### 9.12 G. Pressure Reducing Valves

- Valves shall be a Cla-Val model # 90-01YVBCSKC or 690-1YVBCSKC.
- Valves may be full or reduced port pressure reducing and pressure sustaining globe valve with hydraulic check feature and position indicator.
- The valves shall have an epoxy coated ductile iron body with stainless steel trim.
- Valves shall be flanged with ANSI class 150 drilling.
- The main (larger) valve shall be equipped with a pressure sustaining feature.

#### 9.12 H. Pressure Relief Valves

- All PRV vaults shall be provided with a pressure relief valve on the outlet side and shall be a Cla-Val model # 50A-01BVKC.
- Valve shall be full port pressure relief angle valve with position indicator.
- The valves shall have an epoxy coated ductile iron body with stainless steel trim.
- Valves shall be flanged with ANSI class 150 drilling.



#### 9.12 I. Isolation Valve

All isolation valves shall meet the requirements of *Section 9.4*. Isolation valves one inch (1") and smaller shall be stainless steel ball valves.

#### 9.12 J. Combination Air Relief Valve

PRV vaults shall be provided with a combination air relief valve on the outlet side and shall meet the requirements of *Section 9.7*.

#### 9.12 K. Strainer

Inline strainers shall be provided on the inlet side of the PRVs and shall be Cla-Val X43H strainers.

#### 9.12 L. Pressure Gauges

- Pressure gauges shall be provided on the inlet and outlet sides of the PRV vault.
- Pressure gauges shall be liquid filled stainless steel with an accuracy of plus or minus 1%, or better, over full range meeting or exceeding ASME B40.1 Grade A.
- Pressure gauges shall be a minimum size of two and a half inch (2 1/2") and read to two (2) psi.
- PRV vault pressure gauges shall have a pressure range of 1-200 psi.
- Provide a half inch (1/2") isolation valve and half-quarter (1/2-1/4") reducer.

#### 9.12 M. Hose Bib

A hose bib shall be provided on the inlet side of the vault. All hose bibs shall be brass or schedule 40 304 stainless steel. In most cases, an inline PRV will be required on the inlet side of the hose bib to reduce pressure to 50 psi.

#### 9.12 N. Drip Valve

The drip valve shall be installed on the relief valve discharge line in a location and manner as to completely drain the discharge line of standing water. The drip valve shall be a Dixon straight ball drip valve model #SBDV50 or as approved by the City Engineer.

#### 9.12 O. Toning Wire

Toning wire shall be installed along the mains as per *Section 9.1 G* and shall extend into the vault. Toning wire shall also be installed along the blowoff and air relief valve lines.



### 9.12 P. Telemetry

All instrumentation, controls, and alarms shall be integrated with the City's existing SCADA system, unless otherwise approved by the City Engineer. The Design Engineer shall coordinate and comply with the City's requirements. Instrumentation control and alarm shall be achieved by one of two methods as outlined below.

#### 1) Stand Alone RTU and Pressure Transducers

Remote Telemetry Unit (RTU): A cellular RTU shall be provided to transfer upstream and downstream pressure data in real time to the City's existing SCADA system.

Pressure Transducers: Pressure transducers (Rosemount 3051T only) shall be provided to sense the system pressures on the inlet and outlet side of the PRV. The pressure transducers shall have the following minimum specifications:

- a) Pressures range from 0-200 psi.
- b) Dense pressure and provide a 4-20 mA signal output proportional to pressure.
- c) Supplied with a bleed valve and a wall mount, mountable on the concrete vault wall.
- d) Process connection shall be half inch (1/2") female NPT.
- e) Certified by CE approved.
- f) Wetted materials shall be 316 SS.
- g) System accuracy shall be 1% or better over full range.
- h) Response time to be 50 msec or better.
- i) Compensation temperature range shall be 0 to 175 degree Fahrenheit.
- j) The sensing element shall exhibit non-measurable hysteresis and withstand overpressures to 200% of rated range without damage.

#### 2) Combined RTU and Pressure Transducers

Combined RTU and Pressure Transducer shall be Cello 4S Remote Monitoring Solution, as manufactured by Technolog LTD.

### 9.12 Q. Start-Up and Testing

The Design Engineer shall be responsible for coordinating and ensuring the following items occur:

- 1) When the packaged PRV station is ready for operation, the PRV station manufacturer shall provide the services of a qualified technician who shall review the installation and conduct the initial startup and test of the complete package system. An operational test, simulating service conditions, shall be given to verify



proper operation and to check for leaks in all piping, valves, seals, and all auxiliary equipment. All irregularities shall be corrected immediately.

- 2) The PRV station manufacturer shall provide the services of a qualified technician to complete follow up testing as necessary up to two (2) years after initial startup to insure proper performance, as deemed necessary by the City Engineer.
- 3) Disinfection and pressure testing of the vault piping shall occur at the same time as the waterline. The vault shall be pressure tested at the same test pressure as the pipes adjacent to the vault.

#### **9.12 R. Operation and Maintenance Manual**

The Design Engineer shall provide the City Engineer with four (4) paper copies of the O&M manual, bound in a three ring binder and clearly labeled, and one (1) electronic version. Include all pertinent information necessary to operate and maintain all equipment. The O&M manual shall include

- 1) List of all equipment components and appurtenances included with the system.
- 2) Equipment manufacturer, model number, serial numbers, and date of installation.
- 3) Utilities requirements.
- 4) Equipment arrangement drawing(s), sectional assembly drawing(s) with parts list(s), and dimensioned drawing(s).
- 5) Recommended spare parts list with part and catalog number(s).
- 6) Lubrication recommendations and instructions.
- 7) Schematic wiring diagram.
- 8) Description of instrumentation.
- 9) Maintenance instructions including trouble-shooting guidelines, lubrication, and preventive maintenance instructions with task schedule.
- 10) Special tools and equipment required for operation and maintenance.
- 11) Assembly, installation, alignment, adjustment, checking, and operating instructions.
- 12) Suppliers name, address, and telephone number along with manufacturer's job number and/or purchase order number.
- 13) Equipment warranty certificates.

#### **9.12 S. Warranty**

- The PRV station chamber and cover shall be warranted for a period of two (2) years to be free from defects, resistant to rust, corrosion, or physical failures occurring in normal service, when installed in accordance with the manufacturer's recommendations.
- The interior equipment, valves, piping, and apparatus shall be warranted for a period of two (2) years, excluding only those items normally consumed in service, such as light bulbs, oil, grease, gaskets, or O-rings.



- Major components, which fail to perform or prove defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified without cost of parts or labor to the City. After start-up service has been performed, labor to replace accessory items, or other accessible and easily serviced parts, shall be the responsibility of the City. Such components, parts, or repairs determined to have failed because of defects in workmanship or materials will be replaced at no cost to the City. Parts shall be shipped from the factory to the site or other designated location at no cost to the City.





## 10. Sanitary Sewer System Design Criteria

### 10.1 General

#### 10.1 A. Pipe Sizing

- Pipe sizing shall be as shown in the Wastewater Facilities Plan (CFP) or as required to provide capacity for the ultimate flow (existing, planned, and future development) for the contributing basin.
- In areas where the Wastewater Facilities plan does not specify specific pipe alignment or size, capacity and flow calculations may be required meeting the Oregon State DEQ Guidelines, HRES, and accepted professional practice.
- Problem areas exist within the existing system; if there are documented existing problem areas within the existing system that impact a proposed development, the applicant shall meet with the City Engineer in the mandatory pre-submittal meeting to discuss any existing downstream system problems that would need to be addressed in order to provide adequate capacity to the proposed development.

#### 10.1 B. Flow Calculations

- Accepted flow design practice must be employed.
- The Manning's coefficient value ("n") to be used in calculating gravity sewage flows is 0.013.
- For force mains, analyze the hydraulics for pipe in both new and old condition. Hazen-Williams "C" values for pipe in old condition shall be 120 for plastic pipe, 100 for iron or steel pipe, and 110 for cement mortar lined ductile iron.

The following table lists design flows that are consistent with the most recent CFP:

**Table 10.1 B**  
**Flow Units for Future Service Areas**

Land Use	Average Flow <sup>1</sup>	Peak Hour Flow <sup>1</sup>	Units
Residential	95	400	gpcd
Commercial / Light Industrial	1,100	4,000	gpad

1 Includes normal Inflow/Infiltration

### 10.2 Gravity Conveyance Systems

#### 10.2 A. Minimum Pipe Size

Sewer Mains: 8 inches  
Sewer Laterals: 4 inches



## 10.2 B. Pipe Materials

All piping shall be green PVC, SDR 35 pipe meeting ASTM D3034 for pipes 4-15 inches, and ASTM F679 for pipes 18-24 inches with a gasketed bell end.

## 10.2 C. Pipe Identification

All sewer mains shall be identifiable as follows

- 1) All pipes shall be installed with detectible, green, six inch (6") wide marking tape one foot (1') above the crown of the pipe along its entire length. The marking tape shall be marked with the phrase "Sanitary Sewer" every five feet (5'), or as approved by the City Engineer.
- 2) Sewer pipes shall be installed with a toning wire along their entire length, terminated underneath the manhole frame, and accessible from ground level. The toning wire shall be size 12 AWG Solid Cooper with green insulation suitable for direct burial. Any splices in the toning wire shall be made using King Innovations DryConn DBSR direct bury gel caps with strain relief, or approved equal. See the Standard Drawings (*Appendix H*) for toning wire termination practices.

## 10.2 D. Cover

- Minimum cover for sewer mains is six feet (6'). Exceptions may be allowed by the Design Exception process.
- Minimum cover for service laterals is three feet (3') from finished grade to top of pipe at ROW.
- Grades and depths shall provide for future extensions of mains.

## 10.2 E. Slope

Minimum slope for mains is 1% but flatter slopes may be acceptable where topography constraints dictate and when approved in advance by the City Engineer. Any slopes less than 1% require a Design Exception. The absolute minimum slopes are determined by a minimum flushing velocity of two feet per second (2 fps) flowing full and are as follows:

**Table 10.2 E**

<b>Pipe Size</b>	<b>Absolute Minimum Slope in Feet per 100 Feet</b>
4''*	2.0
6''*	1.0
8''	0.40
10''	0.28
12''	0.22
15''	0.15
18''	0.12

\*Minimum slope for laterals require higher flushing velocities

#### **10.2 F. Steep slopes**

Pipes on slopes steeper than 20% shall be properly anchored.

#### **10.2 G. Separation of Sanitary Sewer and Potable Water**

- Sanitary sewers and potable waterlines shall not be laid in the same trench.
- Parallel water and sanitary sewer lines shall have a minimum ten feet (10') horizontal separation.
- When sanitary sewer and waterlines must cross, the crossing angle shall be as close to 90 degrees as practical with the waterline on top.
- A minimum vertical separation of 18 inches is required between pipes.
- A full stick of pipe shall be centered over the crossing.
- Construction shall conform to the requirements of the OAR Section 333-061.
- Alignments that do not conform to the standards above may be granted through the Design Exception process at the discretion of the City Engineer.

#### **10.2 H. Backwater Valves**

- Backwater valves are encouraged on all sanitary service laterals.
- Backwater valves shall be located outside of the public ROW.
- Depending on the relationship between the finished floor elevation and the nearest upstream manhole, buildings may be required to have an approved backwater valve on the sanitary drain line.
- Contact the Hood River County Building Department Plumbing Division (541-386-1306) for additional information on the backwater valve.



## 10.3 Manholes

### 10.3 A. Location

- Manholes shall be required at all changes in horizontal or vertical alignment and at all pipe intersections.
- In general, manhole lids shall be located between travel lanes, in the middle of travel lanes, or outside of travel lanes to minimize manhole lid noise and facilitate a smooth travel surface for vehicles.
- Manholes shall not be located in sidewalks or underneath gutters.
- A Design Exception will be required for locations that do not meet the above standards.

### 10.3 B. Spacing

Maximum manhole spacing is 300 feet.

### 10.3 C. Channel Slope

For pipes that do not change horizontal alignment through manholes, a minimum of 0.2 feet of fall through the manhole is required when the incoming pipe slope is 5% or less, otherwise the pipe grade shall be maintained across the manhole.

For pipes changing horizontal alignment through manholes, a minimum of 0.2 feet fall is required between inlet and outlet inverts.

### 10.3 D. Channel Finish

Manhole flow channels shall be smooth, trowel finished, and conform to the shape of the intersecting sewers.

### 10.3 E. Manhole Drops

- Outside drop manholes shall be used whenever the difference in flow line elevations between pipes exceeds 24 inches.
- Inside drop manholes are highly discouraged and will be evaluated on a case-by-case basis only. In general, no inside drops will be allowed in 48 inch manholes.
- When a smaller sewer joins a larger one, pipe crowns shall be matched.

### 10.3 F. Diameter

- Manhole diameter shall be determined by pipe size and orientation at the junction structure with a minimum diameter of 48 inches.



- A plan view of the junction structure, drawn to scale, will be required when angles of approach and clearance between pipes is a concern.
- Minimum clear space between core holes shall be per the manufacturer's recommendations, typically eight inches (8"). Core holes shall not be less than eight inches (8") from manhole section seams.
- The integrity of the structure to support the design loadings shall not be compromised.

### 10.3 G. **Shallow Manholes**

- All manholes under 6 feet (6') in depth are considered shallow manholes. Special provisions shall be required for shallow manholes.
- Short concentric cone or flat top manholes will be required when there is less than eight inches (8") between the bottom of the cone section and the top of the highest core hole. All shallow manholes will require a Design Exception.
- Special details shall be provided in the construction plans for all shallow manholes.

### 10.3 H. **Steps**

Steps shall not be allowed in manholes.

### 10.3 I. **Laterals**

- Service laterals shall not be connected directly to a manhole.
- Connections to the new mains shall be via manufactured wyes or sanitary tees.
- Connections to an existing main shall be cored through a tapping saddle.
- Insert-A-Tee type connections will not be allowed.

### 10.3 J. **Coating**

Manholes receiving the discharge of a pumped system shall be coated with Raven 404 epoxy coating. Coating thickness shall be 80 mils.

### 10.3 K. **Field Verification**

The Contractor shall be required to verify all invert elevations of existing pipes and structures prior to the start of construction of any proposed connections to City facilities. Any required changes to the plan during construction must be approved by the City Engineer. Any work performed prior to approval by the City Engineer shall be at the developers own risk.



## 10.4 Low Pressure Sanitary Sewer Systems

In situations where a pumping system is required that will only serve a few homes, and it is unreasonable to conclude that other properties will contribute flows to the area at a future date, the City may consider proposals to develop low pressure sanitary sewer systems (LPSS). LPSS shall be designed in accordance with accepted standards, such as the E/One Pressure Sewer System Design Manual or Water Environment Federation (WEF) Manual of Practice FD-12, Second Edition. LPSS shall either be septic tank effluent pump systems or progressive cavity style grinder pumps. Individual owners shall be responsible for the ownership and maintenance of all components of the LPSS outside of the public ROW. Individual services shall include corporation stops at the public force main connection, curb stop valves and check valves at the property line, and check valves and shut off valves near the pumps. Lateral service connections shall be owned and maintained by the individual owners to the LPSS force main within the ROW. The LPSS force mains shall have pressure cleanouts installed at all branches, and at intervals not to exceed 1,000 feet. The terminal ends of all branch lateral mains shall be equipped with a flushing style cleanout. The LPSS force main shall connect into the City's gravity system using a manhole or cleanout as determined by the City Engineer on a case by case basis. Sanitary sewer air release valves shall be installed at relative high points along the lines or at intervals not to exceed 2,500 feet. At the first location where a gravity sewer can be installed to flow to the existing City's collection system, the LPSS shall be terminated and a gravity system shall be constructed to the City's existing collection system. Currently LPSS systems are only allowed in portions of the Windmaster Sanitary Sewer District and portions of Westcliff Drive.

## 10.5 Prohibited Discharge Standards

### 10.5 A. Industrial Waste Discharge Permit

Sanitary users producing any of the following flows or loadings into the City's POTW shall apply for an Industrial Waste Dischargers permit per HRMC 12.06 and shall be regulated under the City's pretreatment program.

- Users with peak sanitary discharge flows equal to or greater than 25,000 gpd.
- Users with peak sanitary loading equal to or greater than 250 lbs per day five day biological oxygen demand (BOD<sub>5</sub>).
- Users with peak sanitary loading equal to or greater than 250 lbs per day total suspended solids (TSS).

These local limits shall be in addition to, or to modify, those limits specified in HRMC 12.04 and 12.06.



## 10.5 B. Fats, Oils, and Greases Management

All Food Service Enterprises (FSE) shall have an adequately sized grease interceptor(s). The interceptor(s) shall be connected to all plumbing fixtures in the food preparation area including floor drains, not just the prewash sink.

- The City recommends installation of grease interceptors that are large enough to hold the quantity of grease produced by the FSE over a 90 day period. This reduces the life cycle cost of cleaning and pumping of the grease interceptors, and in most cases, will pay for the larger size grease interceptor many times over. In general, grease interceptors sized per the OPSC will need to be pumped or cleaned every 30 to 45 days. The FSE is encouraged to talk to their Mechanical Contractor to determine what their estimated grease cleaning frequency shall be. A useful link to estimate the pumping frequency of the FSE for various grease interceptor sizes can be found at Shier's Grease Monkey Sizer <http://schierproducts.com/sizing>.
- All FSE's, industrial manufactures, light industrial manufacturers, and other businesses that use or produce BOD, TSS, Fats, Oils, and Grease (FOG), or other discharges that could potentially harm the City's sewer collection system or Publicly Owned Treatment Works (POTW), or could cause the City to experience a NPDES Permit violation shall install an external monitoring port for the use of the City to inspect and sample the business's effluent. If an FSE provides an external grease interceptor, it may be used as a monitoring port if the outlet of the grease interceptor is easily accessible and visible from the ground. If an external (outside) grease interceptor is not provided, or the outlet cannot be easily inspected, then an external monitoring port shall be provided. Monitoring port construction and dimensions shall meet the City's standards and shall be easily accessible and clear of obstructions. To the maximum extent possible, the design of the business's black water plumbing should be kept separate from its process water plumbing so that the process water or kitchen water goes through the monitoring port before it joins with the black water plumbing.
- FSE's and other businesses which discard food waste or other substances potentially harmful to the environment shall provide a covered, screened, trash enclosure which will contain leaks and spills.
- Trash compactors shall be designed so that spills and/or leaks are contained onsite and are not allowed to discharge to the environment or the City's stormwater system. Containment systems shall be approved on a case by case basis by the City Engineer.
- New construction and major remodels are required to have trash enclosures with a containment area which includes an inward sloping floor and an area drain to convey leaking fluids from the trash enclosure to a grease interceptor and into the sanitary sewer.
- Existing facilities performing minor tenant improvements shall also provide a containment area for their trash enclosure. However, if an area drain with a connection to a grease trap and the sanitary sewer is determined by the City



Engineer to not be feasible, one of the following containment configurations may be allowed:

- 1) The FSE will create a FOG containment area with an inward sloping floor without an area drain. The low point of the floor shall be a minimum of three inches (3") below the containment overflow.
  - 2) The FSE will create a FOG containment area with a gentle berm, a minimum of three inches (3") above the containment floor, at the front of the enclosure. The FSE shall work with the solid waste collection company to ensure that the trash receptacles can easily move across the berm for garbage pickup.
  - 3) Either configuration shall be designed so that a minimum of three inches (3") of FOG can be trapped in the containment area without any leaving the area. The containment area shall be frequently inspected and manually cleaned. In no case shall FOG be allowed to directly or indirectly enter the City's stormwater system.
- The FSE shall designate where their Yellow Grease shall be stored. If it is not to be stored inside the building or in the trash containment area then the FSE shall create an additional containment area for the Yellow Grease, conforming to the same requirements of the trash enclosures (covered, contained, and drained to grease interceptor). In no case shall FOG be allowed to directly or indirectly enter the City's stormwater system.





## ***11. Sanitary Sewer Pressure Systems***

All pumping systems shall be designed by a qualified Professional Engineer licensed by the State of Oregon, who is experienced and proficient in the design of pumping systems. Pumping systems shall mean any system delivering sewage to the City's collection system using means other than gravity. This may include but is not limited to pump stations, low pressure sewer system, effluent pump system, vacuum systems, and individual grinder pumps and discharge lines, etc.

In general, all developers and owners will be required to provide gravity solutions, which may include modified routes and deeper excavations to accommodate the installation of gravity sewers to serve developments. In cases where, in the opinion of the City Engineer, it is impossible or deemed unreasonable expensive to provide gravity sewer to an area under consideration for development, the City Engineer may allow installation of a sanitary pump station and associated force main to serve the development and its surrounding area. In general, if the area being served will be solely owned by a single entity, such as a hotel, trailer court, or governmental agency, the City will allow a private pump station to be developed and pump into the City's system. In the case where the pump station will serve several parcels owned by more than one entity, the pump station will be a public facility and be designed and built as such. In cases where the pump station will serve several legal lots all owned by a single entity, the type and ownership of pump station will be determined on a case by case basis.

### **11.1 Approving Jurisdictions**

In conjunction with report preparation, the Design Engineer shall identify and work with the City of Hood River and all other permitting agencies that have jurisdiction or authority over the work as required to gain the necessary reviews, approvals, and permits. Where requirements conflict the highest standard shall be held. Agencies which may have permitting authority for a particular project are

- 1) Department of Environmental Quality (predesign report and plan review, approval to construct, review of draft and final O&M manual, approval to operate, and NPDES 1200C Erosion Control Permit)
- 2) Municipal and county building and construction permits, roads and street permits, greenway permits, floodplain development permits, and conditional use/zone change
- 3) Division of State Lands (wetlands and creek or river crossing permits)
- 4) U. S. Army Corps of Engineers (wetlands and creek or river construction)
- 5) United States Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and National Marine Fisheries Service (wetlands, creek or river crossings, and other permits)
- 6) Oregon Department of Transportation Highway Division (permit to work within State highway ROW)
- 7) Federal Aviation Administration



- 8) Any affected railroads (crossings, access easements, and other permits of entry)

## 11.2 Submittal Requirements

The following documents shall be submitted in approved electronic format and in hardcopy as described below.

### 11.2 A. Pre-Design Report

The Design Engineer shall submit a pre-design report for all proposed pumping systems. At a minimum the report shall include

- 1) Location and description of the development.
- 2) Assumed ownership of the proposed pressure system.
- 3) Justification for the proposed pumping system (i.e. why a gravity system will not work for the development).
- 4) Estimated location of proposed pressure system facilities.
- 5) Extent of the service area.
- 6) Number of equivalent residential units to be served. If built in phases, provide the number of ERUs per phase.
- 7) Proposed pump configuration and controls operation.
- 8) Estimated flow rates and required FIRM pump capacity, per phase (if applicable).
- 9) Estimated total dynamic head pump requirements.
- 10) Proposed force main size and route.
- 11) Cost alternatives, plans and schematics.

For projects to expand or replace existing facilities:

- 1) An approach and plan to maintain pump station operations during construction.
- 2) The Design Engineer's field investigation data and professional evaluation of the force main discharge manhole and downstream sewer system, in accordance with DEQ guidelines, with respect to hydraulic capacity, corrosion, and serviceability.

### 11.2 B. Pumping System Design Package

The Design Engineer shall submit a design package for all proposed pumping systems and shall include

- 1) Drawings: Submit two (2) sets of drawings on 22"x34" or 24"x36" paper. At a minimum, the pump station drawings must include
  - a) Vicinity Map.
  - b) Proposed sequence of work.



- c) Existing conditions site plan showing property lines, easements, all public and private utilities, existing structures, and any other information pertinent to the construction and operation of the facility.
  - d) Demolition plan showing all proposed property lines, easements, all public and private utilities, existing structures, extent of pavement removal/replacement, and any other information pertinent to the construction and operation of the facility to be removed or modified.
  - e) Proposed conditions site plan showing property lines, existing and proposed easements, all proposed and remaining public and private utilities, existing structures to remain, proposed facilities, and any other information pertinent to the construction and operation of the facility. Plans shall demonstrate adequate spacing to show vehicular access and circulation, and pedestrian circulation. Plans shall demonstrate adequate clearance for access and maintenance for vault and cabinet doors.
  - f) Force main plans, profile, and elevations, which shall include above-ground and below-ground facilities, tie-ins, and surge protection.
  - g) Plan and section views of the pump station, valve vault, and all other major components of the pumping system, drawn to scale. These drawings should show the structural dimensions, mechanical layout, and instrument locations. Plan views shall show coordinate points for key features.
  - h) Detail sheets showing applicable details.
  - i) Fencing plan and detail sheets.
  - j) Electrical site plan, including electrical supply and entrance plan, lighting plan, yard conduit, communications, security, controls, instrumentation, SCADA, the generator location and setbacks, and backup power system.
  - k) Electrical wiring diagrams.
  - l) Mechanical systems including HVAC.
  - m) Plumbing system.
  - n) Stormwater Management Plan sheets.
  - o) Erosion and Sediment Control sheets.
  - p) The Design Drawings shall include a Calculations Sheet that presents all applicable design parameters, assumptions, and calculations. Information on the Calculations Sheet should include design flows, wet well and vault buoyancy calculations, wet well sizing, control and alarm levels, and pump curve and system curve calculations.
- 2) Specification Package: Submit two (2) sets of the specification package on 8.5"x11" paper. The specification package must include a table of contents. The specifications can take the form of product cut sheets.
- 3) Calculations Package: Update pre-design report to reflect final design and submit two (2) copies of the calculations package for the pump station on 8.5"x11" paper. Shall include flow projections, capacity requirements, and system-curve calculations. The calculations should support sizing of the wet well, pump and force



main selection based on system-head curve analysis, proposed pump curves and system-head curves, wet well and vault counter-buoyancy, pipe sizing, control and alarm levels, conduit and cable sizing, and any other design features that rely on site-specific study. When warranted or required by the City Engineer, a surge analysis to establish sizing and characteristics of surge-protection devices. Surge Protection shall be designed to prevent damage to the existing infrastructure, prevent column separation in the discharge piping, and excessive surge-related pressures at the pump station. When warranted or required by the City Engineer, an analysis of flowmeter selection and sizing alternatives shall be included. Force main detention calculations for the dry weather period, including an evaluation of sulfide control alternatives where average detention will exceed 35 minutes, with design calculations for the selected control system.

- 4) Control Narrative: Provide two (2) copies of a written control narrative, on 8.5"x11" paper, describing the automatic and manual operation modes of the pump station, input/output table, and alarms. The control narrative must include a Piping and Instrumentation Diagram (P&ID) on 11"x17" paper. The P&ID should show all equipment including pumps, motors, and sensors with its associated equipment number, pipe sizes, digital and analog I/O signals, control panels, switches, and alarm lights.

## 11.3 Pump Stations

### 11.3 A. Acceptable Pump Station Types

Pump Stations or Lift stations may be public or private. The City of Hood River will only accept and operate pump stations complying with the following set of standards and requirements.

Pump Stations, in general, should be designed as submersible pump stations with an external valving and metering vault. Need for accessing the wet well should be limited to servicing sensors, floats, and removing and installing pumps via a rail system.

### 11.3 B. Pump and Force main Sizing Standards

- The pump station shall be designed with a firm capacity to pump the peak hourly and peak instantaneous flows associated with the five (5) year, 24-hour storm intensity of its tributary area, without overflows from the station or its collection system.
- All public pumps stations shall be designed as a duplexing pump system where each pump can accommodate the peak demand based upon a 20-year forecast of flows that will be entering the pump station with the associated infiltration and inflow defined above. Each pump will alternate between starts. If one pump fails to start or if the wet well elevation continues to rise above the pump alarm level, the



non-operating pump will be activated and an alarm will be sent out to public works via a telemetry system. In cases where more than one pump is necessary to meet the FIRM capacity of the pump station, Pump redundancy is required. Should any one pump be out of service, there shall be adequate capacity for the remaining pumps(s) to handle the design peak hourly flow.

- Piping and valves shall be in accordance with AWWA standards. The minimum force main size shall be four inches (4") to handle solids. The combination of the pump and force main shall be sized so that the design fluid velocities are in the following ranges:
  - 1) Pump suction lines: 3 to 5 feet per second
  - 2) Pump vertical discharge lines: 6 to 10 feet per second
  - 3) Pump discharge lines including force mains: 3.5 to 8 feet per second
- Vertical discharge piping on pumps with variable-speed drives shall be sized to maintain minimum design velocities during the programmed initial flushing period. All valves shall be accessible to the operators for operation and maintenance without entering a wet well.

### 11.3 C. Pump Requirements

Pumps shall be Flygt N series (3085 or 3153) self-cleaning sewage pumps capable of handling a three inch (3") diameter solid. One pump shall be fitted with a flushing valve. The pumps shall be capable of sensing over current, excessive heat, and over speed conditions and shut the pump down, sending an error alarm to Public Works via a telemetry system. Motors shall be 460 Volt/3-Phase, designed with a 1.15 Service Factor and be non-overloading over the entire pump curve. Premium efficiency motors are required.

### 11.3 D. Odor and Corrosion Design Requirements

- 1) In general, pumps should be variable speed to accommodate a wider range of flows and to reduce the time that sewage sits in force mains. Pump around systems may also be considered to reduce resident time of sewage in force mains.
- 2) The pump starts should be designed so that the maximum retention time in the wet well is no more than 20 to 30 minutes to avoid sewage going septic; variable speed motors can reduce this time to 5 to 15 minutes. The wet well shall be designed to prevent septic action from taking place during periods of extreme low flow. The dissolved hydrogen sulfide content of the wet well shall be maintained below 0.1 mg/l. Wet wells and receiving manholes should have corrosion protection as part of their design (Xypex additive at the caster's facility is acceptable) or be treated with a corrosion proof sealer, or be provided with a corrosion resistant liner.



- 3) All wet wells shall have venting that directs air through activated carbon filters such as the Super Wolverine produced by Industrial Odor Controls or an equivalent brand approved by the City Engineer.
- 4) The discharge of sewage from a force main into a gravity sewer can potentially generate odor and the release of hydrogen sulfide at the transition manhole and in the downstream gravity sewer. Activated carbon filters shall be required at transition manholes to control odor. Turbulence in the transition manhole should be minimized. Consider the corrosive effects of hydrogen sulfide in the design and protection of transition manholes and in the design and selection of gravity sewer pipe material downstream of transition manholes.

## **11.4 Vaults and Manholes (wet well) Requirements**

Vaults, manholes, and drains shall be located inside the fenced pump station site. Vaults shall be designed for the expected vehicle loading with a minimum H-20 vehicle loading. Vaults shall be provided with standard lockable, spring-loaded, double-leaf access doors, and fitted with a safety grate system. Areas around any confined space entry shall be suitable for use of standard retrieval equipment. Vaults that are six feet (6'), or deeper, shall have stairways or installed ladders with extensions per OSHA standards.

### **11.4 A. Wet Well Requirements**

- 1) Wet wells shall be sized in accordance with the pump manufacturer's recommendations. Only one inlet pipe shall be allowed to enter the wet well. The inlet pipe orientation shall conform to the manufacturer's recommendations. Location of the inlet discharge shall provide for proper flow patterns to each pump suction. The wet well shall be designed to avoid vortexing, approach velocity imbalance, cavitation, and low local velocities.
- 2) Wet well inlets and the receiving manhole inlet should be designed so that quiescent, non-turbulent, and non-cascading conditions exist to reduce the release of gas, odors, and the potential for corrosion.
- 3) Link seals, or equivalent products, shall be used to seal conduits and force mains penetrating the wet well walls (inlet pipes may use rubber boots).
- 4) All equipment and fixtures in the wet well shall be explosion and corrosion proof. Corrodible metals including galvanized steel, brass, aluminum, and zinc-cadmium plated steel shall not be used in wet wells. Type 316 stainless steel hooks shall be mounted in appropriate locations around the inside of the hatch opening for cable support. All cables shall be provided with stainless steel Kellems Grips or equivalent.
- 5) Wet well lids will be equipped with pneumatically assisted, diamond plate double-leaf access hatch. The hatch doors, frame, hinges, and all other components shall be type 316 stainless steel. The hatch shall be mounted flush with the top of the wet well lid. An internal safety grate shall also be provided that complies with fall through protection per OSHA standard 1910.28 & 29 and controlled confined





space entry per OSHA standard 1910.146 to prevent personnel from accidentally falling into the wet well. The access hatch and safety grate shall be sized so that the pumps and flush valve easily fit through the opening. The concrete flat top lid will most likely have to be oversized to accommodate the vault doors and safety grate. The access hatch shall be positioned to accommodate easy access of the pumps with a truck-mounted crane for maintenance.

- 6) All wet wells shall be equipped with stainless steel rails and a cast iron discharge foot for each pump, installed per the pump manufacturer's recommendations. The rail spacing shall take into consideration the flush mount system. The rails shall be installed in such a manner as to allow unhindered access of the pumps through the access hatch opening.
- 7) Wet wells shall have a sloped bottom from the base of the pump foot to the edges of the wet well, with a minimum slope of 1:1, H:V, (preferably 1:2 H:V) to avoid solids accumulation at the bottom of the wet well along the edges.
- 8) Buoyancy Calculations: Wet well buoyancy shall be evaluated under two conditions:
  - a) The ground water at the ground surface.
  - b) The groundwater at the estimated 100-year ground water flood elevation.

Per ACI 350.4R-04, the buoyancy calculations shall demonstrate the wet well meets or exceeds a minimum safety factor of 1.1 under condition one and 1.25 under condition two. If the wet well fails to meet the minimum safety factor under one or both conditions, buoyance countermeasures shall be provided.

- 9) Wet Well Level Measurements: Pressure transducers shall be the primary liquid level measurement for pump operations. The pressure transducer shall be placed in a PVC stilling well, suspended approximately ten inches (10") from the wet well floor. The stilling well shall be anchored to the wet well wall and placed at a suitable location to avoid the sloped bottom tapering. A redundant float shall be provided to activate the standby pump and standby pump alarm in the event of a pressure transducer failure. A second float shall also be provided to activate the overflow alarm in the event of a pressure transducer failure.

#### 11.4 B. Valve Vault Requirements

No valves or other appurtenances shall be allowed to be located within the wet well. All valves required for proper pump functioning and maintenance shall be located in a detached valve vault. Each pump shall have an isolation valve and check valve mounted downstream of the pump in the detached valve vault. A flow meter, suitable for measuring raw sewage flows, shall also be provided in the valve vault or in a separate vault downstream of the check valves. The valve vault shall be supplied with a floor drain that is plumbed to drain back into the wet well. The drain shall be supplied with a self-priming P-trap. The drain shall discharge into the wet well above



the duty pump on level with a downturned elbow fitted and a duck bill style check valve such as a Tideflex series TF-2. Sufficient drop from the vault drain to the check valve shall be provided to allow the check valve to open without causing standing water in the vault.

Valve vaults shall be of sufficient depth for a person to stand underneath the lid, typically a minimum of six and a half feet (6'-6") of clear span. Vaults shall be wide enough to allow two feet (2') of clear space between the wall of the pipe and the wall of the vault. The bottom of the pipe shall be two feet (2') minimum above the floor of the vault. The vault shall be supplied with multiple locking, non-slip, galvanized steel doors that allow access to a majority of the vault space. The doors shall be spring assisted and rated for HS-20 loading. An internal safety grate shall also be provided that complies with fall through protection per OSHA standard 1910.28 & 29 and controlled confined space entry per OSHA standard 1910.146. All steel/metal components will either be galvanized or epoxy powder coated. Doors shall be mounted to accommodate unhindered access to all major vault components with a truck-mounted crane for maintenance.

- 1) Check Valves: All inline check valves shall be rubber flapper swing check valves capable of passing a minimum three inch (3") diameter solid such as a Dezerik model number 104P3 four inch (4") valve. All check valves shall also be equipped with a spring return.
- 2) Flow Meters: Flow monitoring shall be accomplished using a mag meter; Siemens Sitrans Magflo 5100 and matching transmitter, or equivalent. Meters shall be installed per the manufacturer's recommendations including upstream and downstream spacing requirements to insure accurate flow measurement.
- 3) Isolation/shut off valves: All non-buried isolation or shutoff valves shall be eccentric plug style valves. All non-buried plug style valves shall meet AWWA C517 standards. Valves larger than four inches (4") shall be supplied with a gear operator box with wheel operators. Plug valves shall be rated for the pressures that the pipe line will be tested at. Non-buried plug valves shall be installed in the direction and orientation as specified by the manufacturer.
  - a) Non-Buried plug valves shall be Val-Matic 100% port valves with manual gear and wheel operators. Plug valves shall be Val-Matic Cam-Centric plug valves series 5800 (flanged) or 5900 (mechanical joint), or equivalent.
- 4) Pressure Gauges: Pressure gauges shall be mounted on each pumps discharge piping upstream of the check valves near the vault wall. Pressure gauge assemblies shall include stainless steel pipes, fittings nipples, spring return ball valve to closed position, Swagelok, diaphragm, and snubber. The pressure gauge shall have a minimum four and a half inch (4 1/2") face and shall be scaled appropriately for





the discharge pressure that is anticipated from the pumps (maximum scale should be near the zero flow head of the pumps). Pressure gauges shall be liquid filled stainless steel with an accuracy of plus or minus 1%, or better, over full range meeting or exceeding ASME B40.1 Grade A with two (2) psi increments.

- 5) Buoyancy Calculations: Vault buoyancy shall be evaluated under the same conditions as the wet well. Refer to *Section 11.4 A* for buoyance evaluation requirements.

## 11.5 Yard Piping Requirements

All pressure piping between the pumps and the valve vault as well as the valve vault and the pig launching station shall be cement mortar lined ductile iron pipe or 316 stainless steel pipe. The ductile or stainless pipe shall extend one pipe length past the last buried structure before transitioning into the force main pipe line. All ductile iron pipe within the wet well, valve vault, and exposed above ground for the pig launching station shall be painted with epoxy enamel paint. Non potable piping within vaults shall be painted OSHA safety red. Non-potable piping above ground shall be painted a neutral color that blends in with the surroundings. Submit color to the City Engineer for approval.

### 11.5 A. Pump-around Tees

All pump stations, that do not have a receiving manhole close by shall have the force main fitted with an appropriately sized pump-around tee, valve, and cam lock fitting located downstream of the force main/pumps check valves. The purpose of the pump around fitting is to give Public Works the ability to put an external submersible trash pump in the wet well and pump into the force main should the installed pumps become inoperable.

## 11.6 Force Main Requirements

To the greatest extent possible, the force main shall be designed to avoid a reduction in gradient (or a change from a positive to a negative gradient), intermediate high points, and plateaus. The force main shall be designed to avoid bends greater than 45 degrees. Where 90 degree bends are unavoidable, two 45 degree elbows shall be used. Cutoff walls shall be used in the trench for slopes of 20 percent and over, per standard practice.

Pipe materials shall conform to the materials approved in *Section 9.2*. C900/C905 PVC shall be colored green.

### 11.6 A. Cleaning of Force Mains

Force mains less than 300 feet shall be cleaned by conventional methods provided there is access from both the discharge manhole and the station and discharge force



main. Pig launch and retrieval systems shall be provided at all other stations, unless waived by the City Engineer as not being required. The pig launch system shall be permanently piped to utilize the station's installed sewage pumps. Provide an acceptable pig retrieving facility in the design.

#### **11.6 B. Pipe Identification Requirements**

In addition to being green in color, all sewer force mains shall be installed with detectable, green, six inch (6") marking tape one foot (1') above the crown of the pipe along its entire length. The terra tape shall be marked with the phrase "Pressure Sewer" every five feet (5'). Force mains shall also be installed with a toning wire along their entire length. The toning wire shall be size 12 AWG with insulation suitable for direct burial. Any splices in the toning wire shall be made using King Innovations DryConn DBSR direct bury gel caps with strain relief, or approved equal. Test stations shall be provided at the beginning (at the valve vault), end (discharge manhole), and every 500 feet in between. Toning wires must be terminated in test stations and not inside vaults or manholes.

#### **11.6 C. Isolation/Shut-Off Valves**

All isolation or shutoff valves on buried pressure sewer lines shall be eccentric plug style valves. All buried plug style valves shall meet AWWA C517 standards, be supplied with a gear operator box with a two inch (2") nut, and be suitable for buried conditions. Buried plug valves shall be rated for the pressures that the pipe line will be tested at. Buried plug valves shall be installed in the direction and orientation as specified by the manufacturer.

Buried plug valves shall be Henry Pratt Ballcentric Full Port Plug Valves with manual gear actuators. Henry Pratt series 600FP/601FP Ductile Iron Plug Valve; or equivalent.

#### **11.6 D. Sewage Air Release Valves**

Air relief, air-vacuum release, or combination air release and vacuum valves shall be of a type and brand manufactured for the specific purpose in sewage service, and shall be provided at critical locations in the pump station and force main. The valves shall serve to prevent air being captured inside the piping system, or prevent collapse of the piping system because of vacuum conditions. Each valve shall be sized with the proper orifice size, suitable for the volume of air to be admitted or released, and each shall be provided with an isolation valve. For each air-valve assembly, the pipe-nipple connection to the manifold and all other piping in the assembly shall be copper. An insulated coupling, ball valve, and pipe union shall be provided on each assembly to allow for maintenance and removal of the air valve. The air-release valve discharge piping in pump stations shall be piped to the station wet well.



Sewage air release valves shall be A.R.I. D-025 SB underground air valve system with PVC shell, reinforced nylon body, and integral, flat, quarter (1/4) turn, knife shutoff valve operated from the surface; or equivalent.

## 11.7 Transition Manholes

Force mains shall enter the gravity sewer system at a point no higher than two feet (2') above the flow line of the receiving manhole. The end of the force main shall be deflected downward with a 90 degree bend, anchored to the inside manhole wall, and terminate no more than six inches (6") above the manhole floor. The interior of the receiving manhole shall be coated with Raven 404 epoxy coating. Coating thickness shall be 80 mils. Activated carbon filters shall be required in all transition manholes for odor control.

## 11.8 Dissolved Hydrogen Sulfide Controls

Dissolved H<sub>2</sub>S concentrations discharged from force mains into gravity sewers shall be consistent with a design life of 75 years for concrete manholes and concrete or ductile-iron sewers. To prevent premature collapse of pipelines and manholes, and to minimize odor problems and employee hazards, the H<sub>2</sub>S content of force mains shall be designed to remain below 0.1 mg/l at 20° C at the point of discharge into the gravity sewer system. H<sub>2</sub>S controls shall be provided to meet this standard where warranted, and shall either be designed for summer operation or year round, as necessary. H<sub>2</sub>S controls shall be provided for all stations where the anaerobic detention in a force main averages more than 35 minutes during low-flow periods in July, August, and September. Detention time shall be computed as the volume contained in the force main divided by the average daily flowrate that is tributary to the station during July, August, and September.

### 11.8 A. Back-drainage

- Where feasible, on ascending mains of moderate size and length, H<sub>2</sub>S controls should consist of a back-drainage system to drain the entire force main automatically on a daily basis.
- Wet wells must be designed oversized to accommodate the contents of the force main. Back-drainage systems shall employ a full-port pneumatic pinch valve or electrical plug valve wired to close during pumping, and to reopen when the pump stops.
- To minimize excessive re-pumping, an adjustable timer may be installed to prevent the valve from opening for a period of 60-120 minutes after pump operation.
- Solenoid valves may be installed on pneumatic lines, but shall not be used in place of pinch or plug valves on sewage lines.
- Back-drainage valves shall be installed in a shallow vault at an elevation which permits the entire force main to drain completely.
- A manual isolation valve shall be installed to permit maintenance of the valve without disrupting pumping operations.



- Electrical operators for plug valves shall be explosion-proof type, where required by code, for installation in a valve vault.

#### 11.8 B. Air Injection

- Alternatively, where back-drainage of a force main is not feasible, continuous air injection should be considered to prevent anaerobic conditions from developing. The design air delivery shall be at a rate of two standard cubic feet per minute (2 SCFM) per inch diameter of force main.
- Air injection systems shall be designed for continuous injection, and shall be installed without timers.
- Force mains utilizing air injection for hydrogen sulfide control shall be constructed of plastic, plastic-lined steel, or plastic-lined ductile iron, and shall not be fitted with air release valves.
- Temporary blow-offs may be installed at high points for acceptance testing and shall be capped or plugged prior to placing the main in service.
- Pumps shall be sized to pump against the head of the pressurized force main. Due to absence of air-release valves in a pressurized main, static head on the pumps shall be computed as the sum of all ascending segments in the main.
- Vertical undulations in pipe and bedding during the installation of a pressurized force main must be prohibited during construction, unless accounted for in the static head calculation and accommodated for in sizing the pump. Static head at the air injector shall be computed as the sum of all ascending segments, including pipe undulations caused during construction, that are downstream from the injection point.
- The ascending pipe segments between the pump and the air injector tap should be disregarded for the purpose of computing the actual air injection rate and sizing air injection controls.
- Design calculations for sizing the compressor, receiver, and controls shall address both standard airflows and actual airflows under static pressure. Design calculations shall include a schematic profile of the force main based on surveyed topography and the proposed installation.
- Air injection equipment must be fully gauged, metered, and adjustable.
- The pressure regulating valve between the compressor receiver and the airflow meter shall be adjustable between the working pressure of the receiver and the static head on the injector.
- All compressor receiver tanks shall be fitted with an automatic condensate purge. Airflow meters shall be rotameter type. Airflow shall be trimmed using a needle valve or equivalent control valve.
- Rotameters shall be sized for actual airflow, and not for the theoretical airflow at standard temperature and pressure. Range of the airflow pressure gauge shall be based on the static head of the pressurized main at the point of air injection, instead of the dynamic head that would be attained during pumping.



- Due to heat, no plastic components shall be employed in the air injection system. Rotameter tubes shall be Pyrex body. The bottom of the vertical riser in the air piping which houses the rotameter shall contain a drip leg with purge cock.
- Air injection piping will normally be one inch (1") annealed copper, unless otherwise approved by the City Engineer.
- Due to the slow growth of sulfide bacteria, the mechanical and electrical design of air injection and back-drainage systems will not require redundant or standby equipment.

#### 11.8 C. Chemical Controls

Where an economical air injection or back-drainage system is impractical or undesirable, chemical alternatives must be considered. However, the design of chemical addition systems which do not prevent the growth of sulfide forming bacteria must conform to EPA Class I reliability with respect to component redundancy, standby power, and failure alarms.

- Chemical systems, to be considered, must include solution feeders for calcium nitrate, hydrogen peroxide, hypochlorite, and potassium permanganate. The selection of chemical controls shall be based on the recommendation of the Design Engineer, subject to the City Engineers approval.
- Systems shall be designed for continuous feed to maintain the H<sub>2</sub>S concentration of the force-main discharge below 0.1 mg/l at all times.
- Systems shall be complete and operational, including all tankage and spill containment, pumps, piping, valves, gauges, meters, recorders, control panel, electrical systems, controls, and failure alarms.

#### 11.8 D. Sewer and Manhole Coatings

For extremely small discharges, or low-sulfide situations arising from detention times of less than one hour, the durability of the system may be sufficiently protected by installing a corrosion-proof armoring or durable acid-proof coating to the downstream gravity sewer system.

### 11.9 Surge Analysis and Protection

For pump stations with high heads or long force mains, pump and pipeline systems shall be protected against damage from transient pressures. A reduction in gradient or a change from a positive to a negative gradient in piping shall be avoided where possible. Protection against surges and water-column separation shall be provided by means of air-cushion check valves, surge anticipation and surge-relief valves, air-relief valves, and surge tanks. Discharge piping and the force main shall be analyzed by the Design Engineer, who is responsible for preparing a surge analysis which documents surge aspects of the installed system.



## 11.10 Site Requirements

### 11.10 A. Access Requirements

- In general, all pump stations shall be designed for unrestricted service vehicle access of the wet well and valve vault. Access shall be suitable for a City service vehicle (with truck-mounted crane or Vactor truck) to back up to the wet well for cleaning or to remove, service, and reinstall the pumps.
- In the case where accommodations for service rigs backing up to the wet well cannot be provided, the pump station design shall include a permanent crane system for the purpose of installing and pulling pumps from the wet well.
- Vehicular access to pump stations shall have a 24 foot wide easement and a minimum 16 foot wide paved road at a 15% maximum slope, unless otherwise approved by the City Engineer.
- Site layout of the pump station shall take into consideration vehicle access. Provisions shall be made for adequate turning radius and room for outriggers for the City's equipment, such as a dump truck, backhoe, and crane truck required for the removal of equipment. Access shall be provided around the entire perimeter of the pump station for required maintenance equipment.
- For completely buried stations, room shall be provided to access hatches and vents with equipment, including adequate clearance from overhead power lines to allow for safe operation of a crane.
- Parking space shall be provided for two (2) maintenance vehicles.
- Pump station access hatches, vaults, manholes, and equipment, including pad-mounted transformers, shall be located to minimize access problems.
- Access for maintenance trucks shall be provided at all manholes and vaults.
- Above-grade equipment and piping shall be protected by bollards. A concrete pad shall be placed around vaults which is suitable for confined space personnel-retrieval equipment.
- Vaults shall be designed for expected vehicle loading, with a minimum H-20 loading. Site layout must allow maintenance vehicles to access the site when the vaults are open.

### 11.10 B. Hoist-jib Crane Requirement

If the weight of the pump exceeds the City's truck-mounted crane capacity, or if site constraints restrict use of a truck-mounted crane, a hoist-jib crane shall be provided at the station. It shall be capable of removing the equipment from the below grade structure and loading the equipment onto the City's maintenance vehicle. Design shall ensure adequate horizontal and vertical clearance between the hoist and other equipment.





#### 11.10 C. Wash-down Water

- Potable water service for use at the station shall be provided from a metered one inch (1") copper service connection, or as approved by the City Engineer.
- A reduced pressure backflow prevention device shall be provided on the water service as required by OAR 333-61-070. A backflow preventer shall be provided for the hose bib used for wet-well wash-down, isolating it from all other water usage at the station. If the reduced-pressure device or backflow preventer is located outside of a structure, it shall be insulated and heat traced.
- Hose bibs shall be located a minimum of five feet (5') away from any electrical equipment. One hose bib shall be installed for wash down of the wet well. Each hose bib shall be provided with a hose rack with 75 feet of approved hose. Hose bibs installed outside of buildings shall have locking mechanisms and shall be a frost free hydrant with a draining barrel and a minimum bury of two feet (2').

#### 11.10 D. Security Fencing Requirements

- 1) All pump stations shall provide six foot (6') tall security fencing with slats designed to be long lasting in high UV conditions. The slat color shall be earth tone and neutral. The color shall be submitted to the City Engineer for review. Fencing fabric shall be polyvinyl chloride coated galvanized wire fabric with a minimum gauge of seven (7). The vinyl coating color shall be earth tone and neutral. The color of the vinyl fencing shall be submitted to the City Engineer for approval. All fencing shall be supplied with polyvinyl chloride slats matching the approved fence color.
- 2) Corner posts, line posts, gate posts, top rails, truss rods, brace rails, tension bars, and other supporting fence appurtenances shall be supplied with polyvinyl chloride coating or epoxy coated paint with the color matching the wire fabric. All fencing shall be supplied with top rails having a minimum outside diameter of one and two-thirds inch (1 2/3").
- 3) All posts shall be buried a minimum of 36 inches below ground. Corner posts shall be steel and have a minimum outside diameter of two and seven-eighths inch (2.875"). Corner fence sections shall be supplied with brace rails, tensions bars, and three-eighths inch (3/8") adjustable truss rods. Line posts shall be steel and have a minimum outside diameter of two and three-eighths inch (2 3/8"). Maximum spacing between posts shall be no more than ten feet (10').
- 4) Gate posts shall be steel and shall have a minimum outside diameter of four inches (4"). Angled guide wires shall be provided between panels next to corners and gates. In addition to top rails, all gates shall be provided with bottom rails having a minimum outside diameter of one and two-thirds inch (1 2/3"). Gates shall be a minimum of 16 feet wide and can be mounted on rail rollers or a swinging type. In general, swinging gates should be designed to swing inward to avoid conflicts with parked vehicles. Swinging gates accommodating vehicular traffic should be split and should have one and three-eighths inch (1 3/8") heavy duty galvanized steel



drop rods to secure the gates to the ground or pavement where the gates come together. An 18 inch long galvanized receiving pipe set flush with the ground and encased in concrete shall be installed to receive the drop rods. The receiving pipe shall have an outside diameter suitable to receive the drop rod. A locking mechanism shall be provided.

- 5) A separate man-gate shall be provided through the security fencing for non-vehicular access into the pump station. A locking mechanism shall be provided.
- 6) Grading of the site should be designed to accommodate fencing. In general, fencing should be even with the ground and be custom cut for uneven ground. At no point should the gap between the bottom of the fence and the finished grade be greater than four inches (4"). The top of the fencing should run in straight lines and should attempt to be level whenever possible.

#### 11.10 E. Stormwater Requirements

All stormwater runoff from the pump station and its associated access should be eliminated. Methods for controlling stormwater runoff may include porous asphalt or permeable pavers. All structures and associated equipment shall be protected from the 100-year flood. See *Section 8* for stormwater management requirements.

#### 11.10 F. Landscaping

Landscaping and irrigation systems shall meet City requirements. If an automatic irrigation system is required by the City, the controls shall be located inside the pump station in an aboveground structure. If no aboveground structure is provided, the controls shall be housed in a lockable enclosure.

#### 11.10 G. Lighting

All pump stations shall be equipped with a yard light connected to backup power. The yard light shall be optimally located to illuminate the control panels, valve vault, and controls of the backup power unit. The yard light shall be operated by a NEMA 4X rated switch mounted exteriorly on the control panel. Lights shall be shielded and shall comply with *Section 12.3*.

#### 11.10 H. Site Surfacing Requirements

The area within the pump station shall be paved with hard surfacing for the purpose of controlling weeds and reducing maintenance. Curbs shall be installed around the pump station for the purpose of paving.





## 11.11 Electrical, Controls, and Instrumentation

### 11.11 A. General Criteria

- 1) All instrumentation, controls, and alarms shall be integrated with the City's existing SCADA system, unless otherwise approved by the City Engineer. The Design Engineer shall coordinate and comply with the City's requirements.
- 2) All panels, equipment, and materials shall bear the Underwriter's Laboratories label or Factory Mutual rating, as applicable. All design, materials, and installation shall comply with the NEC, NFPA, UBC, and other applicable local codes.
- 3) The project Design Engineer shall verify during design that sufficient electrical service capacity for the planned build-out condition is available at the site, and that space for it is provided.
- 4) Control circuit design drawings shall be represented in a power-off position. In a control power-off position, the manual or automatic controls shall not allow the start of any pumps. The pump controller shall include a control power on/off switch so that in a control power-off condition the manual or automatic controls shall not allow the start of any pumps.
- 5) Pump control and alarm circuit diagrams shall be included in the design plans, unless waived through Design Exception by the City Engineer, and shall include the following identification to aid in reading the diagram:
  - a) Buss Number
  - b) Wire Number
  - c) Switches (pressure, temperature, H-O-A, etc.)
  - d) Relay Contacts
  - e) Relays (control, alarm, time delay, etc.)
  - f) Control Description Label
  - g) Number of Control Relay Contacts
  - h) In the design plans, provide a relay schedule adjacent to the diagram indicating the function of each relay.
- 6) The Design Engineer shall assign the Contractor responsibility for labeling all wires and control devices inside the control panel, or on the face of it. All labeling shall be as specified by the City Engineer.
- 7) A pump-control-sequence description shall be prepared by the Design Engineer. The sequence shall be included in the design specifications and the O&M manual.

### 11.11 B. Lockout Safety

Removable disconnects shall be provided in the main panel to ensure open circuits for safety while working on switch gear. Alternatively, provide circuit breakers with a lockout tag out safety switch handle to provide a switched disconnect of power for use during maintenance operations on machinery.



#### 11.11 C. **Pump Disconnect Panel**

All pump stations shall be equipped with quick disconnect configurations and equipment that will allow pumps and telemetry to be disconnected from the control panels by non-electrically certified personnel to pull pumps, floats, and telemetry from the wet well. See HRES Standard Drawing (*Appendix H*).

#### 11.11 D. **Circuit Breakers**

Specify magnetic motor protector application circuit breakers with adjustable trip setting and built-in ground fault protection in accordance with sizing deemed required by the site electrical provider.

#### 11.11 E. **Switch Gear Rating Coordination**

The circuit breakers shall be designed so that the main circuit breakers will not trip when a supplied breaker is overloaded. The current interrupting capacity rating of switch gear, including the main service breaker, circuit breakers, and the transfer switch, shall be coordinated per NEC requirements.

#### 11.11 F. **Power System Monitoring**

Power System Monitor shall be approved by the City Engineer.

#### 11.11 G. **Ground Fault Protection**

The specification shall require the Contractor's bid to include the services of a competent independent Contractor who will test and provide written certification of complete ground-fault testing and verification.

#### 11.11 H. **Junction Boxes**

Junction box connections for the pump power cable shall be located above flood elevation at stations with dry wells. Junction box connections for the pump power cable shall be located out of the wet well, sealed at both ends with duct seal, and accessible for maintenance at submersible pump stations. Conduits for power cables for submersible pumps installed in wet wells shall be oversized to facilitate maintenance.

#### 11.11 I. **Motor Starter Design**

- 1) All motor starters shall be equipped to provide under-voltage release and overload protection on all three (3) phases. Motor starter coil and contacts shall be easily replaceable without removing the motor starter from its mounted position or



without the removal of the phase conductors. Fuses shall be provided on the primary and secondary sides of the control power transformers with a separate power control transformer for each motor starter.

- 2) Motor starter circuits shall be designed to allow operation of the circuit in HAND mode, should failure of the programmable logic controller occur. The circuit interlocks, including the over-temperature and starter-overload contacts, shall be hard-wired in HAND mode outside of the programmable logic controller. The control circuit shall be designed so that an alarm does not result for an H-O-A switch selection of OFF or HAND mode, or upon lockout of the circuit breaker.
- 3) Soft-start reduced voltage type solid-state motor starters shall be required on all pump motors, unless otherwise approved by the City Engineer. On larger capacity stations, also provide manual contacts with soft-start allowing for manual operation of the starters should solid-state starter controls fail.

#### 11.11 J. Motor Control Center Switch-Gear Equipment

- Unless otherwise approved by the City Engineer, motor control center switch-gear equipment shall be factory-assembled sections. All motor control center circuit breakers and motor starters shall be NEMA-approved equipment consistent and compatible with their location and use.
- Each motor shall have an individual disconnect and shall have provisions for lock-out and tag-out.
- When motor control Center Switch-Gear is to be housed in an exterior cabinet, the unit shall be supplied in a stainless steel cabinet or housed in a stainless steel cabinet with a NEMA 4X rating. If the electrical cabinet is UL listed, then all other electrical items shall be housed in a separate stainless steel electrical cabinet so that the UL listing will not be voided. If the pump control panel is not supplied in a stainless steel cabinet, the control panel shall be mounted in a stainless steel control panel at the pump station facility.

#### 11.11 K. Wiring and Buss Bars

Stranded copper wire shall be used for all power and control wire sizes; solid copper wire is not acceptable. No aluminum wire shall be allowed for any station wiring. The motor control center and other control panels shall have buss bars and connectors constructed of tin-plated solid copper. Split buss shall be provided at very large stations, and stations where the approved standby power is not sufficient to supply the full load of the station. All wires shall be permanently labeled in a manner as approved by the City Engineer.



#### **11.11 L. Seismic Braces**

Seismic braces shall be installed on all electric service cabinets and other freestanding equipment per the latest edition of the NFPA NEC requirements. Details of the seismic braces shall be included in the design drawings.

#### **11.11 M. Service Panel**

The service breaker panel for lighting and auxiliary equipment shall have balanced loads within 15 percent for each phase. The panel shall have its own transformer and not rely on a transformer in the control panel for service voltage. All circuit breakers shall be labeled in accordance with the NEC. Panels shall have 25% spare circuits for future use.

#### **11.11 N. Electrical Cabinets**

- Electrical cabinets shall be stainless steel and NEMA 4X rated.
- Electrical cabinets shall have an inner wall which will allow non-electrically certified operators to open the panels and take readings or manually control the operation of the pumps and the pumping station. Otherwise, the controls and readouts shall be mounted through the electrical cabinet doors so that operators do not have to open the cabinets to operate the pumps or observe readings.
- If the electrical cabinets are supplied with an inner wall, then devices with readouts, input devices, and/or controls shall be mounted through the inner wall to allow operations without opening the inner wall. Heaters may be required in exterior electrical cabinets to control moisture and protect sensitive electrical equipment.

#### **11.11 O. Electrical Conduit**

Underground conduit shall be in accordance with the NEC. Indoor aboveground conduit shall be rigid, galvanized steel with sealed fittings. Liquid-tight, flexible conduit shall be used at motor terminations and all other locations where required by Code.

#### **11.11 P. Electrical Outlets**

For operation of miscellaneous station equipment or power tools, provide one duplex 20-amp, 120-volt electrical outlet with ground-fault protection for hand held power tools at the site. All outlets shall have wet location gasketed covers to protect against splashing and be housed in a NEMA 4X rating enclosures. In general, the outlets, including enclosure, should be mounted on the outside of the electrical cabinets.



#### **11.11 Q. Equipment Grounding Conductors**

Equipment grounding conductors shall be ran to each motor and properly bonded to the motor frame. Conductors shall be one continuous length, with no splices, and sized according to the latest NEC requirements. Conductors shall be grounded to the grounding buss at the motor control center. All other metallic devices shall also be properly grounded.

#### **11.11 R. Fail-Safe Design Alarm Relays**

Alarm relays shall be designed to be energized during normal pump station operation. Relay fail-safe design shall alert operators through the wastewater alarm system should an alarm condition occur that de-energizes the alarm relay as designed, or should an alarm relay fail and de-energize. Where electro-mechanical relays are installed, standard relays with bayonet base mounting shall be provided to simplify replacement of defective units.

#### **11.11 S. Pump Station Control Circuits**

The Design Engineer shall contact the City Engineer to review the applicable requirements, as established by the City:

- 1) Alarm relays shall be normally energized-type relays (i.e., fail-safe).
- 2) Control relays shall be normally de-energized (i.e., energize to initiate control functions).
- 3) Provide hard-wire motor starter circuit including interlock protection devices (i.e., hard-wire logic not part of programmable controller programming) to allow manual control of pumps when programmable logic controller failure occurs.
- 4) Check valve open signal from limit switch prevents pump start at call signal.
- 5) Pump fail alarm and pump shutdown if check-valve limit switch does not actuate within specified adjustable time delay at pump startup.

#### **11.11 T. Pump Status Indication**

- 1) For each pump include the following indicator lights: pump call (white); pump running (green); pump off (red); and pump failure (flashing red), unless otherwise approved by the City Engineer.
- 2) All indicating lights shall be connected to a push-to-test button to test for proper functioning of the bulbs. Indicator lamps shall be either transformer or diode-type device.
- 3) Provide an external, non-resettable elapsed time meter for each pump in service.



#### 11.11 U. Alarms, Telemetry, and SCADA

- Separate alarms, and discrete alarm points, shall be provided for sewage overflow level, high wet well level, and loss of standby reserve capacity, which occurs when the reserve pump or standby pump is called to RUN.
- The overflow alarm enables the City to meet DEQ requirements for immediate reporting of a sewage overflow. The loss of standby reserve capacity, defined as simultaneous operation of all installed pumps, shall also be alarmed. Each occurrence of this alarm condition indicates a potential sewage overflow. For that reason, they should be reported to DEQ on a monthly basis, indicating the status of system reliability.
- The loss of standby alarm shall be initiated with a call for the reserve pump or “last pump”, resulting in all pumps running. To avoid nuisance alarms, this function should be disabled whenever the station is attended. Kill switch for the alarm may be either manual or automatic, at the City Engineer’s discretion. A “high water” alarm level in the wet well will not be accepted as a substitute for alarm conditions involving simultaneous operation of all pumps or overflows.
- The City Engineer may require additional alarms to facilitate operation and maintenance. Consideration should be given to alarming the following:
  - 1) Pump vibration and temperature
  - 2) Low wet well level
  - 3) Dry well flooding
  - 4) Intrusion
  - 5) Check-valve failure to open
  - 6) Seal water pressure failure
  - 7) Loss of utility power
  - 8) Standby generator failure to start or energize
  - 9) Chemical feed failure
  - 10) Volatile gas detection
  - 11) Air or instrument compressor failure
- Station status and alarm conditions shall be displayed on the station panel view.
- Supplemental alarm lights may be installed at the station. Audible alarms shall not be installed in residential areas.
- All alarms shall be transmitted to the City's operations staff. The Design Engineer shall contact the Public Works Department to determine the methods, brands, and/or service provider currently being employed by the City to affect SCADA/telemetry. The Design Engineer shall contact said manufacturers and/or service provider(s) to determine the methods, means, and equipment necessary to provide SCADA/telemetry to the City’s system. Prior to substantial completion being granted, the Design Engineer shall work with Public Work’s designated staff to ensure that the City’s SCADA/telemetry system is showing the new pump



station site and receiving properly calibrated SCADA/telemetry data properly and in correct units.

#### 11.11 V. Alarm and Control Relay Resets

Provide an alarm push-button reset. Reset of alarm indication or conditions shall not occur automatically after an alarm condition clears unless otherwise programmed by the software.

#### 11.11 W. Uninterrupted Power Supply Requirements

Uninterrupted power supplies shall be provided for all devices that store data or settings to provide power between loss of public power and startup of generator power. Uninterrupted power supplies or power surge protectors shall be provided to protect all sensitive electrical equipment installed at the facility.

#### 11.11 X. Standby Generator

##### 1) General:

- a) A diesel-oil fueled, engine-driven electric generator unit shall be provided for all pump stations, unless otherwise approved by the City Engineer.
- b) Skid-mounted packaged generator units shall consist of an engine, alternator, controls, switchgear, and auxiliary systems suitable for installation inside a building, as applicable. The generator unit shall be installed on spring isolation supports to reduce vibration from the unit into the foundation and for seismic protection. The generator unit shall be fully shop assembled, wired, and tested from a single engine-generator manufacturer (i.e. Kohler).
- c) Sound attenuation shall be accomplished by either installing the unit inside a building or by providing an external sound attenuation housing with the generator. Maximum allowable sound pressure levels shall comply with state and local code requirements.
- d) The unit shall be appropriately sized by an Electrical Engineer to accommodate all demands of the pump station facility including lights, heaters, controllers, un-interrupted power supplies, pumps, blowers, meters, and anticipated hand-held power equipment plugged into external outlets provided at the pump station.
- e) The unit shall be a Kohler Power Systems brand to match the other units within the City for the purpose of reducing the City's cost of maintenance of the unit.

##### 2) Generator Unit: The electrical generator unit shall be designed with the following features, except as otherwise approved or required by the City Engineer:

- a) The frequency output of the generator shall be 60 Hertz +/- 1 Hertz.





- b) The voltage output shall be 480 volt, 3-phase, +/- 4.8 volts. The generator shall have a solid-state voltage regulator capable of maintaining voltage within 2% at any constant load from 0-100 percent of rating.
- c) The generator shall be the brushless alternator type. All generator windings are to be constructed of copper only.
- d) The generator unit shall have sufficient capacity to supply all starting current requirements of the firm station pumping capacity. Upon application of the rated load, the instantaneous voltage dip shall not exceed 20% of the load and shall recover to the rated voltage within one (1) second.
- e) The generator shall be provided with a unit-mounted circuit breaker.
- f) The generator unit shall be provided with a permanently installed load bank equal to 100 percent of the capacity of the generator. The load bank shall utilize the radiator discharge for cooling.
- g) In residential areas, provide a hospital-grade silencer and sound-dampened inlet air louvers to reduce engine noise at the property line. For pump stations in industrial and commercial areas, a critical-grade silencer may be allowed if approved by the City Engineer.
- h) All exhaust piping inside the building, as applicable, shall be insulated and lagged, and the cold face temperature shall be 150 degree Fahrenheit maximum. On the exhaust manifold, install a water drain trap and wrap the exhaust piping in non-asbestos insulation.
- i) Oil fill system, oil pan spill dike, and oil drain line including hose extension shall be provided as part of the skid-mounted unit.

3) Fuel:

- a) The fuel tank installation shall be a double walled steel sub-base fuel tank on the emergency generator unit for 24 hours of operation at fuel pumping capacity load. The tank size shall be within allowable Code requirements. When required by Code, the fuel tank shall be installed in a protective vault located adjacent to the generator structure.
- b) All diesel storage tanks shall have a desiccant dry air filter on vents to prevent the condensation of water within the tank.
- c) A large-capacity, 2-micron combination fuel filter and water separator shall be included on the fuel line between the fuel tank and the engine.
- d) The engine fuel injector control shall include an energize-to-run solenoid and an automatic throttle to close by spring tension upon stop signal, control system failure, or engine alarm.

4) Engine Unit: The engine unit shall be designed with the following features

- a) An air-cooled engine shall be provided where air cooled engines in the required horsepower are available and noise mitigation measures can be met. If a water-cooled engine is provided, it shall be furnished with anti-freeze.





- b) The engine shall not be equipped with a turbocharger unless one is required to provide an economically sized unit.
- c) The maximum engine speed shall be 1800 RPM.
- d) The engine shall be equipped with an oil-sump heater (for an air-cooled engine) or an engine-block coolant heater (for a water-cooled engine). The heater units shall be rated to ensure a preheating temperature of 100 degrees Fahrenheit. The heater shall automatically disconnect upon engine start and run.
- e) The battery shall be sized to provide sufficient charge for five (5) cranking cycles, each a minimum of ten second (10 sec) periods. The battery trickle charger shall be a float-equalize type. The charger output shall be sized to recharge the batteries to full charge within one (1) hour after five (5) automatic cranking cycles in a row. The charger shall be equipped with an ammeter and voltmeter to allow proper adjustment of the unit. The generator shall automatically supply power to the battery charger when it is operating and service power is not available.
- f) The engine shall have an electronic speed governor that shall hold the engine speed to within one half (1/2) cycle per second of rated value.

5) Controls:

- a) The engine shall include the following instruments with analog or digital readouts for monitoring performance: oil pressure gauge, engine temperature gauge, RPM tachometer, and a non-resettable hour-run meter.
- b) The panel shall be equipped with the following instruments to monitor the three (3) phase generator: voltmeter, ammeter, frequency meter, and panel illumination light.
- c) Light-emitting diode-type panel lights shall be provided to indicate run status (green lights), anticipatory warnings to the operator (yellow lights), and failure conditions (red lights) including the following conditions: emergency generator run status, engine failure due to overheat, low oil pressure, over RPM, low fuel, and low battery voltage.
- d) A remote indicator shall be provided and installed near or on the generator to indicate run status and whether connected to operating load, on the site.
- e) A push-to-test button shall be provided for testing all panel indicator lights.
- f) A test/auto/off engine-control switch shall be provided to allow exercising the engine under load.
- g) An automatic emergency shutdown shall be provided for the following conditions: over cranking, over speed, low oil pressure, and high coolant temperature. The controls shall be interlocked to drop the electrical load prior to the emergency shutdown. The engine starting controls and transfer switch shall include an unloaded generator cool-down delay.
- h) An exercising timer shall be provided with the generator, providing for automatically or manually exercising the generator. A three (3) position



MANUAL-OFF-AUTO selector switch shall be provided. The timer shall be a programmable timer designed to automatically exercise the engine-generator for a period of one to four (1-4) hours per one to seven (1-7) day interval.

- i) The load bank control shall accept a contact from the automatic transfer switch that is closed when the utility source is normally operative and open when the utility source is inoperative. The load bank shall also accept a contact that is closed when the generator is running, and open when the generator is off. These contacts shall be interlocked so the load bank will not energize when the generator is connected to the plant load. In addition, the load-bank control shall provide a set of auxiliary contacts which open to inhibit the transfer switch from transferring to the generator source while the load bank is energized.

6) Selector switch in AUTO — Normal Operation:

When the timer provides a signal to start the engine-generator, a maintained signal shall be provided to the engine-generator control panel. The load bank shall be energized if the generator is running, the voltage is within limits, the utility source is operative, and all other permissive conditions have been met. When the exercise is complete, the load bank shall de-energize. The engine-generator shall continue to run through the cooldown cycle. If the utility source is lost during the exercise period, the exercise circuit shall be disengaged, the engine-generator shall remain running, and the transfer switch shall connect the generator to the station load.

7) Selector switch in AUTO — Standby Operation:

The exercise timer shall be disengaged during this period.

8) Selector switch in MANUAL — Normal Operation:

The load bank shall be permitted to energize if the generator is running, the voltage is within the limits, the utility source is operative, and all other permissive conditions have been met.

9) Selector switch in MANUAL — Standby Operation:

The exercise timer shall be disengaged during this period.

10) Transfer Switch — Automatic:

- a) The station shall have an interlock-protected emergency power transfer switch to automatically start the generator in the event of loss of any phase of power, reverse power, or low voltage brownout.



- b) The transfer switch shall include time-delay controls for the following functions: prevent start-stop short cycling of the standby generator due to momentary dips in line voltage, transfer the load to the generator when it is at the rated voltage and frequency, return to line power with adjustable time delay when line power is restored, and initiate an engine shutdown. Note: provide programmed neutral time delay (i.e., adjustable 0-10 seconds to allow equipment to coast off before transfer) or in-phase monitor (i.e., large units to match generator-to-line phasing).
- c) The generator shall have a disconnect plug and interlock at the transfer switch for isolation of the unit to prevent automatic operation during maintenance. A load-sequencer control with four (4) normally closed and four (4) normally open auxiliary contacts for the control system shall be provided. These shall be capable of operating prior to transfer in either direction, so as to avoid control/alarm relay problems at transfer. If applicable, the City may require inputs to a wastewater SCADA system to indicate the normal condition (i.e., automatic transfer switch not switched to standby power source), transfer by the automatic transfer switch to standby power, generator run, and generator fail-to-run after an automatic switchover to standby power.
- d) The automatic transfer switch shall be mounted within sight of the generator control panel or generator remote-status annunciator panel for ease of operation.
- e) Transfer switch operation by a programmable controller is allowed.

#### 11) Maintenance Service Contract

A two (2) year service contract shall be required of the standby generator vendor, to be furnished by the Contractor as part of their requirements as listed in the Design Specifications. This service contract shall include all routine service checks recommended by the manufacturer during the first (1) year of operation. The Contractor shall coordinate this work with the operations staff of the City.

#### 11.11 Y. **Lighting**

- 1) When above grades structures exist within the pump station site, provide motion detector exterior lighting on all four sides of the above grade structure with exterior manual on/off switch. Low-level exterior evening lighting compatible with the surrounding area shall be provided mounted on a pole or above grade structure.
- 2) LED lighting shall be used. No permanent lighting shall be provided in the wet well.
- 3) If a building is provided at the pump station facility, an emergency battery-powered lighting system shall be provided in the station. Provide lighted exit signs at the station access doors that are interconnected with the emergency lighting system.



## 11.12 Construction Management

### 11.12 A. Design Engineer's Responsibilities

- 1) The Design Engineer shall submit to the City Engineer for approval specifications for testing, inspection, startup, documentation, and warranty work for the project. The Design Engineer shall have ultimate responsibility for inspection and certification of the quality and dependability of the facility, in accordance with ORS 468 and OAR 340-52 and the HRES.
- 2) The Design Engineer shall include in the project specifications suitable requirements for quality of construction, material testing, and inspection. Material testing shall be performed by a qualified testing service acceptable to the City.
- 3) Inspectors familiar with pump station construction, including electrical, mechanical, and structural construction, shall be provided during construction by the Design Engineer or his approved representative.
- 4) In all projects, the Design Engineer shall be assigned the task of writing the O&M manual for the pump station, or for updating an existing pump station manual, as applicable. Manuals shall meet DEQ guidelines. By the 50% and 90% construction points, the Design Engineer shall provide draft and final manuals for submittal to DEQ.
- 5) The Design Engineer shall also be responsible for obtaining manufacturer's manuals and operating instructions from the Contractor. The Design Engineer shall assemble them into an organized supplement or separate companion volume to the O&M manual, for the use of the City.
- 6) The Design Engineer shall be responsible for submitting one (1) copy of the final manual, in a form fully acceptable to the City, to DEQ for review. The manual shall be submitted without the supplemental manufacturer's materials or instructions. The Design Engineer shall be responsible for obtaining DEQ approval of the manual prior to the City authorizing startup of the pump station.

### 11.12 B. Coordination of New Construction at Existing Stations

During construction of an expanded or renovated pump station, the Contractor shall be required by the contract specifications to maintain wastewater system operations at existing facilities. If this necessitates a temporary pump system, then its firm capacity shall be no less than the instantaneous five (5) year peak flow tributary to the station. Temporary pump systems shall be furnished with standby power and alarms, and shall operate at EPA Class I Reliability.

Where temporary pumping at an existing station is required, the plans shall note the required construction sequence for pipe connections, pumps, and standby power requirements.



#### 11.12 C. **Pump Inspection**

The Design Engineer shall provide services to confirm proper pump installation, as applicable to the project:

- 1) Upon initial installation and prior to startup, conduct a “soft foot check” to verify proper installation of the equipment base plate to the concrete supporting structure.
- 2) Upon initial installation and startup, measure the level of vibration. Submersible pumps in a wet well shall be checked prior to submersion.

#### 11.12 D. **Operational Testing**

- The Design Engineer shall include, in the project specifications, an operational test procedure to demonstrate the proper operation of all equipment at the station. This shall include simulated failure conditions to demonstrate the warning displays.
- The contractor shall be responsible for performing all required operational tests under active inspection by the Design Engineer. The Contractor shall be required to test, and adjust as necessary, all equipment after all construction is completed to ensure proper operation. The Contractor shall field align and balance pumps and motors per manufacturer’s recommendations. The Design Engineer shall coordinate and assist in resolving deficiencies during operational tests including all pump station mechanical equipment, electrical controls, emergency power operations, and control warning displays.
- The Design Engineer shall ensure that all electrical equipment, telemetry, SCADA, indicators, measuring devices, and meters are certified and properly calibrated to register correct measurements and/or signals. All electrical units and devices shall properly communicate as necessary; and all devices shall be set to display or transmit units acceptable to the City, before acceptance of the facility, by the City.
- As applicable, the operational acceptance test shall include the following equipment run test demonstrations:
  - 1) Operate the pump station in hand or on automatic control for one (1) week without equipment or control failure.
  - 2) Operate the generator under full load conditions using a resistance load bank as required for eight (8) hours. If a building is part of the pump station design, the test shall be performed with the station access doors closed to test the ventilation system capacity.
  - 3) Provide certified performance testing of the ventilation system as applicable.
  - 4) Perform a load test of the hoist equipment and provide certification as applicable.



#### 11.12 E. Field Acceptance Tests

- During or immediately following operational testing by the Contractor, the Design Engineer shall conduct and record all field acceptance tests. The following tests shall be performed on clean water:
  - 1) Measure total head at shutoff for each centrifugal sewage pump. Note any discrepancy from the manufacturer's test curve. Show measured elevations and shutoff head calculations on a diagram for each pump, along with the manufacturer's pump curve.
  - 2) Measure total dynamic head, motor rpm, and power draw for each pump during operation.
  - 3) Measure flowrate of each pump using the station flowmeter.
- The Design Engineer shall conduct, review, and approve the inspection establishing substantial completion. Unless otherwise agreed upon by the City, the Design Engineer shall then provide the City with a copy of results of the inspection and obtain the City's consent to proceed with startup and final testing.
- The Design Engineer shall act as the start-up coordinator and ensure City staff and other professional staff are available as necessary to work with the Contractor and his/her suppliers in the successful start-up of the completed facilities, in accordance with the start-up checklist.

#### 11.12 F. Operator Training

Prior to startup, the Contractor shall provide training of City's personnel by factory-trained representatives of equipment, pumps, controls, and other devices in accordance with the approved specifications. This training shall emphasize theory of operation and maintenance of electrical controls, hydrogen sulfide control system, pumps, motors, generators, instruments, HVAC equipment and controls, alarm telemetry devices, and other major equipment. Training should be coordinated by the Contractor to minimize City staff time in multiple training sessions. Unless otherwise approved, eight (8) hours of training for City staff shall be standard. The training proposal shall be subject to acceptance by the City prior to conducting the training.

#### 11.12 G. Acceptance and Startup

- Pump station acceptance shall be subject to the City's approval and written notice of acceptance. The effective date for transfer of operational responsibility for the new pump station from the Contractor to the City shall be the date of acceptance.
- Equipment warranty dates shall commence on the effective date of the transfer, unless otherwise agreed upon by the City.



- At the City's discretion, the Contractor may be required to submit the electrical utility billing and other utility billings, paid up to the effective date of the transfer, to the City, and to transfer billings to the City.
- No startup shall be undertaken or approved without proper completion of operator training and DEQ approval of the O&M manual, in accordance with OAR 340-52. DEQ approval of the manual constitutes permission for startup.

#### **11.12 H. Project Close Out**

Unless otherwise approved by the City Engineer, the Design Engineer shall be responsible for closing out the project, including

- 1) Restore property-corner monuments when disturbed or destroyed during construction. Set new corners after construction is complete.
- 2) Provide full and complete survey and measurements for record drawings.
- 3) Complete all documentation for close-out of the project, including preparation of record drawings. The record electrical drawings shall show the actual wire number labels if different from the design drawings.
- 4) Provide services to perform and confirm equipment calibrations.
- 5) Provide services to perform point-to-point checkout of systems from field devices or contacts through control panels and remote terminal unit, if applicable.
- 6) These services may include programming and integration of the pump station remote programmable logic controller into a SCADA System, where applicable, along with control schematics.
- 7) Unless otherwise agreed upon by the City, the Design Engineer and the Contractor shall be responsible for all programming costs, including costs for programming and loading into the City's devices performed through a programming service selected by the City.
- 8) Send DEQ a certification of proper construction in accordance with the approved plans, per OAR 340-52-045, or as required in DEQ's plan approval.

#### **11.12 I. Warranty**

All equipment at the station shall include at least two (2) years full parts and service warranty from the date of acceptance by the City. Generally, the manufacturer's warranty documentation shall name both the Contractor and the City as holders of the warranty.

Unless otherwise agreed upon by the City, the manufacturer, or equipment supplier fulfilling the manufacturer's warranty, shall commence all required warranty repairs within 24-hours of notification by the City of the requirement for warranty service.





#### 11.12 J. **Warranty Tests**

Warranty tests shall be approved and required by the City. The Design Engineer may be required to conduct or witness additional vibration checks and measurements at intervals of three (3) months, six (6) months, and ten (10) months warranty inspection.

#### 11.12 K. **Operations and Maintenance Manual**

For all pump stations, an O&M manual shall be compiled and written by the Design Engineer, and shall be approved by DEQ prior to startup.

##### 1) Format and Content:

- a) The format and contents of the manual shall meet the requirements of DEQ's guidelines for pump station O&M manuals.
- b) The manual shall be 8.5"x11" paper with 11"x17" exhibits, z-folded. Minimum font size on all exhibits is 0.05". The name of the pump station shall be noted on the spine of the manual. Binding shall be three-ring binder, preferably locking type to prevent accidental opening. Binding shall be sized to prevent a "bulged" condition. Tabbed dividers and a table of contents shall be included.
- c) Manuals for the operation of pump stations that are equipped with pressure gauges shall include DEQ standard instructions for the use and maintenance of gauges.
- d) Equipment literature, including supplier's and manufacturer's manuals, shall be separately bound, and shall not be submitted to DEQ for review.
- e) One (1) copy of the final manual, accepted by the City, shall be submitted to DEQ for approval prior to startup.
- f) Upon DEQ approval, the Design Engineer shall submit three (3) copies of the final manual to the City, prior to startup. Include one (1) PDF copy.

##### 2) O&M Manual Information: The Contractor shall be required, by the project specifications, to furnish the following information for inclusion in the Design Engineer's Operations and Maintenance section:

- a) Sequence of operations, including description of the operation and interaction of systems and subsystems during startup, operation in automatic mode, operation in manual mode, and operation with backup power. This includes, but is not limited to, equipment, pumps, piping, valves, HVAC, electrical, controls, and instrumentation. An appropriate schematic of the system should be supplied to reference the components list in the sequence of operations description.
- b) Station operation including updated information on the actual pumps installed.
- c) Utilities.





- d) A consolidated summary of the required routine scheduled maintenance and scheduled preventative and predictive maintenance for all station equipment, along with references to the location within the manual where detailed information may be found.
  - e) Safety.
  - f) Spare parts list including name, address, and telephone number of supplier and manufacturer.
  - g) Emergency plans and procedures.
- 3) Equipment Literature Supplement: The Contractor shall be required by the project specifications to furnish the following information for the equipment literature supplement:
- a) Disassembly and reassembly instructions.
  - b) Parts lists, by generic title and identification number.
  - c) Name, location, and telephone number of nearest supplier and spare parts warehouse.
  - d) Manufacturer's certifications, including calibration data sheets and specified calibration procedures and/or methods, for installed equipment.
  - e) Warranty forms and information for all installed equipment as provided by the Contractor.
- 4) Maintenance Programs: The Design Engineer's O&M manual shall include a planned maintenance program of preventive and predictive maintenance activities. Maintenance shall be triggered by frequencies (elapsed calendar days, run time, etc.) or on demand. Maintenance shall include lubrication, cleaning, inspection, oiling, adjusting, equipment condition monitoring, and rebuilding to factory specifications.
- a) Preventive Maintenance: Unless waived or otherwise approved by the City, the Design Engineer's O&M manual shall include a table of planned maintenance activities and actions for each piece of equipment and other components of the facilities. The table shall include the recommended schedule for periodic opening and inspection of equipment, and other standard maintenance procedures including lubrication.
  - b) Predictive Maintenance: Unless waived or otherwise approved by the City, the Design Engineer's O&M manual shall include a table of periodic performance testing of equipment. The table shall include recommendations for using and interpreting various investigative techniques such as thermography, vibration analysis, precision measurements, lube oil analysis, nondestructive testing, electrical resistance tests, corrosion tests and declining shutoff head.



## ***12. Signing, Pavement Marking, and Roadway Lighting***

### **12.1 Street Signs**

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

All street signs shall be provided by the applicant's Contractor and installed by the City. All costs for this work shall be reimbursed by the applicant.

- 1) All signs shall meet the standards of the current version of the MUTCD and applicable state or local laws.
- 2) All sign bases shall meet the requirements of the ODOT standard specification and the City.
- 3) The applicant must coordinate all sign installations with the City Public Works Department. Provide five (5) business days notice.

#### **12.1 B. Signage Plan**

- 1) A temporary Traffic Control Plan shall be submitted to the City prior to any work. Plans must be approved by the City Engineer.
- 2) Permanent Signage Plans shall be submitted to the City for review and acceptance.

### **12.2 Pavement Marking**

#### **12.2 A. Locations**

Longitudinal pavement marking shall be required on arterial and collector streets only, shall be in accordance with the latest MUTCD Manual, and approved by the City Engineer.

Exceptions: Parking stalls, stop bars, cross walks, sharrows, bike lanes, or other pavement markings as directed by the City Engineer will be required as appropriate on local streets.

#### **12.2 B. Materials**

- 1) White longitudinal paint shall be Ennis ORW-21-M-4.
- 2) Yellow longitudinal paint shall be Ennis ORY-21-M-1.
- 3) Paint shall include reflectivity per AASHTO M247-Type 1, one and a half (1 1/2) lbs. of beads per gallon of paint.
- 4) Transverse pavement markings, legends, and bars shall be PREMARK thermoplastic; heavy duty intersection grade by Ennis-Flint, Type B-HS.



## 12.2 C. ADA Markings

Barrier free ADA curb ramps are to be provided with yellow composite cast in place truncated dome panels meeting current ADA requirements. Panels using adhesive or caulking to adhere to the surface of the concrete are not acceptable. See the Standard Drawings (*Appendix H*) for ADA curb ramp details.

## 12.3 Roadway Lighting

Street lighting is an important element in street design. Lighting adds a visual connection to streets and provides for the safe movement of pedestrians, bicycles, and vehicles.

### 12.3 A. Classic Lights

The downtown/urban renewal lighting fixtures/standards shall be required along the Historic Columbia Highway 30, downtown business district, the port area, and as direct by the City Engineer. Classic lights shall be supplied by Spring City Electrical Manufacturing Company per standard drawing.

Spacing: Classic light poles shall be provided at intersections, midblock, a minimum of 40 feet and a maximum of 100 feet, measured center-to-center.

Base: Shall be constructed per City Standard Drawing (*Appendix H*).

#### Luminaire Specifications:

- Style: Villa LED Luminaire
- Height: 34 3/4"
- Width: 15 7/8" diameter
- Material: Cast aluminum alloy ANSI 356 per ASTM B26-95
- Finish: Prime paint then finish paint, Sherwin Williams Acrolon – to match Hood River Blue (M22-4B)
- Lamping: 70 watt LED
- Voltage: Electronic wired at 120-277 volts
- Color Temp: 3000K (warm white)
- Distribution: Type III (asymmetric) – refractive optics
- Globe: 118 Style – Stippled Acrylic Globe
- Modifiers: Up light shielding and button type photocontrol

#### Lamp Post Specifications:

- Style: Edgewater with Twin Banner Arms-M2
- Height: 12'-0"
- Photometric Center: 13'-3"



- Base: 20 1/8" octagonal
- Material: One (1) piece, heavy wall cast ductile iron per A536-84 grade 65-45-12
- Finish: Prime paint then finish paint, Sherwin Williams Acrolon – to match Hood River Blue (M22-4B)
- Access Door: Located in base, secured with tamper proof hex socket security machine screws
- Electronics: 15 amp, tamper, and weather resistant GFCI receptacle (Cooper Industries #: TWRVGF15) supplied with weather proof (weather proof while in use) lockable aluminum cover (TAYMAC #: MX4280S)
- Ground Stud Provisions: Drill and tap inside wall of base opposite access door to accommodate a 1/4"-20 ground stud (stud supplied by others)
- Anchor Bolts: Four (4) one inch (1") diameter X 30" long + four inch (4") hook (fully galvanized with one (1) gal. nut and one (1) gal. washer per bolt)
- Bolt Projection: Three inch (3") required
- Tenon: Seven inch (7") diameter x three fourths inch (3/4") high (to accept luminaire)

Electrical Disconnect: Provide separate electrical disconnects at a location approved by the City Engineer.

### 12.3 B. Standard Street Lights

- 1) Standard street lights shall be provided at all intersections, mid-block, and at a maximum spacing of 300 foot.
- 2) In residential areas, "flat glass", or an approved alternate, shall be used so that the light is directed downward resulting in a dark sky effect.
- 3) Heads shall be cobra LED cobra style.
- 4) Bulbs shall be LED 50-75 Watt with color temperature of 3000 Kelvin.
- 5) Lights shall be shielded to minimize skyglow.
- 6) Light poles shall be anchor base, 25 feet tall galvanized metal poles, as recommended by the local power company.
- 7) Base shall be recommended by the pole manufacture.

### 12.3 C. Coordination

The applicant shall coordinate with the local utility owner for installation requirements and utility connections.

### 12.3 D. Responsibility

The applicant shall be responsible for all costs associated with this work. Classic lights include monthly electrical charges for the operation of the lights.



## **13. Construction Standards**

### **13.1 Construction Responsibilities**

The following construction requirements apply to all projects that require a Detailed Engineering Plan Review (*Section 3.1 C*).

#### **13.1 A. Resident Engineer's Responsibilities**

All public improvements shall be inspected by the Resident Engineer (RE), or a qualified individual under the supervision of the RE. The RE shall not have any pecuniary interest in the project or development, other than that as a professional service provider. The applicant shall have the RE designated prior to the pre-construction meeting where the RE's attendance is mandatory. All costs associated with the RE's work and testing shall be paid by the applicant. The RE's minimum responsibilities include

- 1) The RE shall maintain a project log book which contains at least the following information:
  - a) Job number and name of Engineer and designers;
  - b) Date and time of site visits;
  - c) Weather conditions, including temperature;
  - d) Description of construction activities with dated and documented photographs of work in progress;
  - e) Statements of directions to change plans, specifications, stop work, reject materials, or other work quality actions;
  - f) Public Agency contacts which result in plan changes or other significant actions;
  - g) Perceived problems and actions taken;
  - h) General remarks;
  - i) Final inspections;
  - j) Record of all testing.
  - k) Compliance of supplied materials with specified materials.
- 2) The RE shall have a copy of the Final Approved Plans and Specifications on-site at all times.
- 3) The RE shall obtain written approval from the City Engineer for all proposed changes to the Construction Site/ROW Permit, plans, or specifications prior to implementing any change. All changes shall be documented on the Records Drawings. The RE shall provide copies of all changes to the City, Contractor, and applicant.
- 4) The RE shall review all materials prior to installation for conformance with the Standards or specific Design Exceptions as shown in the Final Approved Plans.



- 5) The RE shall observe construction activities for compliance with the Final Approved Plans and Specifications. Prior to Final Acceptance, the RE shall provide the City Engineer a certification letter stating that the project was constructed in conformance with the Final Approved Plans and Specifications, based on what he/she has observed.
- 6) The RE shall observe all required testing and shall provide copies of all results to the City Engineer in a format readily useable by the City. See *Appendix C*.
- 7) The RE shall confirm pre-paving approval is issued prior to paving operations.
- 8) The RE shall have the project log book available for review by the City Engineer upon request at all times throughout construction.
- 9) Prior to Final Acceptance, the RE shall stamp the project log book, or an exact copy, and file with the City Engineer.
- 10) The RE shall provide Record Drawings to the City.

### 13.1 B. City's Responsibilities

The City's activities and responsibilities are limited to the following

- 1) General monitoring of work progress.
- 2) Observation of performance testing as determined at the pre-construction meeting.
- 3) Issuance of pre-paving approval.
- 4) Pre-paving approval will not be issued until underground utilities, retaining walls, or structures located within or impacting ROW have been observed and tested to the City Engineer's satisfaction.
- 5) Continuity testing of tracer wires and confirmation of proper attachment to structures and boxes.
- 6) Approval of any plan changes during construction.
- 7) Issuance of stop work orders. The City will promptly notify the RE of any stop work order.
- 8) Operation of City owned valves (water or pressure sewer), or new valves directly connected to the City system for the purpose of filling, disinfection (for water only), and pressure testing newly constructed lines.
- 9) Representatives of both the City and the Contractor shall be present when collecting water samples for bacteria testing of potable water systems. The Contractor shall have the option of collecting potable water samples or requesting the City to collect the samples. The City will deliver the potable water samples to a certified laboratory for bacteria testing. Samples will be taken Monday through Thursday, excluding holidays, between the hours of seven (7) AM and noon. 48-hour notice is required to schedule City personnel for any on-site work.
- 10) Any work requiring a temporary water outage to any customer will require public notification. The Contractor shall provide the City with a minimum of four (4) business days advance notice for such operations, so that the City can provide 48-hours' notice to the affected customer(s).
- 11) Participation in final inspection for acceptance of improvements.



The City's construction observation is not an inspection or validation of the contractual obligations between the Contractor and the applicant, nor does it constitute Final Acceptance of any work.

### **13.1 C. Contractor's Responsibilities**

The Contractor's minimum responsibilities include

- 1) The Contractor listed on the Construction Site/ROW Permit shall perform or oversee all permitted work. Substitutions of Contractors following issuance of the permit will not be allowed without prior pre-qualification and written approval by the City Engineer.
- 2) The Contractor shall have a copy of the Final Approved Plans, specifications, and Construction Site/ROW Permit on the job site at all times.
- 3) The Contractor is responsible for observing the safety of the work and all persons and property coming into contact with the work. The Contractor shall conduct his/her work in such a manner as to comply with all the requirements prescribed by OSHA. The City Inspector's role is not one of supervision or safety management, but is one of observation only. Nothing contained in this section or elsewhere in these standards shall be interpreted to obligate the City to act in any situation, nor shift the Owner's responsibility for safety compliance to the City. No responsibility for the safety of the work or for construction means, methods, techniques, sequences, or procedures shall be attached to the City by virtue of its action or inaction under this section.

## **13.2 Construction Testing Requirements**

### **13.2 A. General**

For all projects requiring a Detailed Engineering Plan Review (*Section 3.1 C*), the applicant shall be responsible for meeting, providing, and passing to the City Engineer's satisfaction the following standards, notifications, documentation, and tests. (See *Section 13.2 E* through *Section 13.2 J* for specific tests required for type of work to be performed).

### **13.2 B. Testing Standards**

Test according to City of Hood River Testing Standards. See *Appendix H* Standard Drawings for Testing Standard Table.

### **13.2 C. Testing Notification**

The City Engineer will provide a list of the tests, which the City will observe, to the Contractor at the pre-construction meeting. The Contractor shall notify the City





Engineer a minimum of two (2) business days, prior to these tests. See Standard Drawings (*Appendix H*) for Testing Standards.

### **13.2 D. Testing Documentation**

Testing documentation shall be prepared and retained by the RE for all tests. Copies of the testing documentation will be required to be submitted to the City Engineer as part of the construction log book, prior to Final Acceptance.

### **13.2 E. Required Testing for Streets**

- 1) Street, retaining walls, and sidewalk grading. Clearly mark elevations and alignments of all crowns, transitions, turnpikes, valleys, hips, quarter-crowns, and footings prior to placement of walls, bases, and pavements.
- 2) Curb and gutter staking and/or string line inspection. String lines shall be clearly laid out to allow RE to verify flowline alignment and elevations without horizontal offset.
- 3) Subgrade compaction testing or proof rolls.
- 4) Base rock compaction testing and depths.
- 5) AC Pavement placement observation and density testing.
- 6) ADA compliance for curb ramps, crosswalks, sidewalks, landings, tactile, visual, or auditory warning elements of required services. Use ODOT curb ramp inspection forms. Inspectors shall be ODOT certified curb ramp inspectors. Smart tool levels shall be per ODOT regulations for curb ramp inspection use. The 24 inch smart tool level shall be Model #92379. The six inch (6") smart tool level shall be Model #92346.
- 7) Proper spacing and performance of all required street lighting and streetscape appurtenances or features.

### **13.2 F. Required Testing for Storm Sewers**

- 1) Backfill compaction testing,
- 2) Mandrel testing of mainlines,
- 3) Video inspection of mainlines (or services when specified during the pre-construction meeting),
- 4) City observation and tracer wire testing prior to paving.

### **13.2 G. Required Testing for Water Distribution System**

- 1) Backfill compaction testing.
- 2) Pressure Test. All potable water mains shall be tested at 150% of static pressure or 150 psi, whichever is greater, in accordance with AWWA and APWA Standard Specifications. Most stringent to apply. The City shall be notified two (2) business days in advance for filling and flushing.





- 3) Disinfection.
- 4) Observe proper operation of all appurtenances and valves.
- 5) City observation and tracer wire testing prior to paving.

#### **13.2 H. Required Testing for Sanitary Sewer Mains (Gravity)**

- 1) Backfill compaction testing.
- 2) Mandrel testing of mainlines.
- 3) Air testing of all pipes.
- 4) Video inspection of mainlines (or services when specified during the pre-construction meeting).
- 5) Hydrostatic or vacuum testing of manholes following paving.
- 6) City observation and tracer wire testing prior to paving.

#### **13.2 I. Required Testing for Sanitary Sewer Force Mains (4-inch or Larger)**

- 1) Backfill compaction testing.
- 2) Pressure Test.
- 3) Observe proper operation of all appurtenances and valves.
- 4) City observation and tracer wire testing prior to paving.
- 5) Pressure laterals tested to OPSC Standards.

#### **13.2 J. Required Testing for Low Pressure Sanitary Sewer Mains (LPSS)**

- 1) Backfill compaction testing.
- 2) Pressure Test.
- 3) Observe proper operation of all appurtenances and valves.
- 4) City observation and tracer wire testing prior to paving.
- 5) Pressure laterals tested to OPSC Standards.

### **13.3 Work within City ROW**

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

- All work within ROW shall conform to the requirements of *Section 6*.
- All existing survey monuments within the limits of work shall be protected during construction. If monuments must be relocated and/or replaced to complete the work, the monument(s) shall be relocated and/or replaced by an Oregon licensed Professional Land Surveyor.
- All existing utilities shall be located using the Oregon Utility Notification Center (OUNC). Call 811 or (1-800-332-2344) prior to the commencement of any work.
- Care shall be taken during construction to protect all existing utilities from damage. If relocation of utilities is required, the applicant shall be responsible for all coordination with the Utility Owner and any costs not borne by the Utility



Owner. The plans shall clearly show protection and/or relocation of any facilities within or adjacent to the public ROW.

- Upon completion of all work within ROW, all areas affected by construction shall be restored to the same or better condition as they were prior to the start of work.
- No surplus or excavated materials will be stored or allowed to remain within ROW at the end of each work day, unless specifically approved by the City Engineer in writing.

### **13.3 B. Maintenance of Traffic during Construction**

- Access to private driveways shall be maintained during construction. Any temporary closures required for phasing of construction shall be coordinated directly with the affected property owners.
- Access to fire hydrants shall be provided at all times.
- Temporary traffic control measures and devices (i.e. barricades, lights, warning signs, flaggers, etc.) shall be in accordance with the Oregon Department of Transportation's Temporary Traffic Control Handbook and the MUTCD.
- A Traffic Control Plan is required for all work in or on all public ROW. A copy of the Traffic Control Plan to be implemented during construction shall be submitted to the City Engineer for approval no less than ten (10) business days prior to start of work. Work shall not commence prior to the approval of the Traffic Control Plan.

### **13.3 C. Street Openings and Excavations**

- All excavation will be open cuts from the surface. Directional drilling, boring, or other means, will be permitted by Design Exception only.
- All excavations shall conform to Occupational Safety and Health Association, OSHA, regulations.
- No excavation shall be left open and unattended at any time, including the end of a work day. Traffic Rated steel plates may be allowed with prior approval by the City Engineer, or within the approved TCP, and shall be prevented from sliding or otherwise moving under traffic loadings. Use asphalt transitions at all steel plate edges where traffic is present to prevent abrupt edging. "Steel Plate Ahead" signs are required.
- No opening or excavation in any street shall extend beyond the centerline before being backfilled and the surface restored or temporarily surfaced. One lane of traffic to remain open at all times, unless approved in advance by the City Engineer or specifically approved in the TCP.
- No more than 150 feet of trench, measured longitudinally, shall be opened at any one time, except by written approval of the City Engineer.
- Rock excavation, where drilling and blasting is required, shall comply with the current version of Chapter 56 of the Oregon Fire Code (OFC). The applicant will be required to obtain blasting permits from the Fire Chief.



- All pavement cuts, backfilling, and resurfacing shall be in conformance with the City's most recent Standard Drawings (*Appendix H*).

### 13.3 D. Required Notices & City Observation

- 1) The Contractor shall provide a minimum two (2) business days advance notice to the City Engineer prior to the start of any work, excavation, backfilling, and surface restoration work. Notice may be by phone or email. The applicant's RE will observe each of these operations where applicable. When a Sketch Plan is required, the City Engineer shall observe these operations. The City Engineer will not accept any work that is not observed and verified by the RE when a RE is required by these Standards.
- 2) If the work will affect the use of properties abutting or adjoining the project, the applicant shall notify the affected property owners and/or tenants upon issuance of the Construction Site/ROW Permit. The Contractor shall notify these same owners and provide written proof of notification to the City Engineer a minimum of 48-hours in advance of the work.
- 3) Owners/residents shall be given a minimum of two (2) business days notice of any scheduled interruptions to their utility services. The Contractor shall notify the City Engineer a minimum of four (4) business days prior to any scheduled service interruption. The Contractor shall not give such notice to the City Engineer until all acceptance testing required for the service interruption has passed successfully.
- 4) If the work to be done will affect other subsurface utilities, the applicant shall notify the utility owners and provide written proof of notification to the City Engineer a minimum of 48-hours prior to start of work.
- 5) The applicant shall notify all public transportation and service facilities (including Fire, Police, Ambulance, Dispatch, Public Transportation Service, USPS, and School District) of all work which might affect, interrupt, or restrict traffic flow within the public ROW, and provide written proof of notification to the City Engineer a minimum of two (2) business days prior to start of work.

### 13.3 E. Additional Requirements

The City Engineer may have additional requirements depending on the size, nature, and location of the work. Such requirements may include but shall not be limited to

- 1) Limitations on the time of the year in which the work may be performed.
- 2) Designation of routes upon which the materials may be transported.
- 3) More extensive public notice requirements are required when construction may impact the traveling public. Anticipate seven (7) to ten (10) day notification period following approval of the TCP.
- 4) Regulations as to the use of streets in the course of the work.
- 5) Restrictions as to the size and type of equipment used.
- 6) Noise restrictions.



- 7) Blasting Restrictions.
- 8) Boring, Tunneling, or Micro Tunneling of utilities (examples: pavement moratoriums and or prohibitions of interference with traffic).
- 9) Pre-construction video of the project site.

## **13.4 Limitations and Conditions on Use of the City ROW**

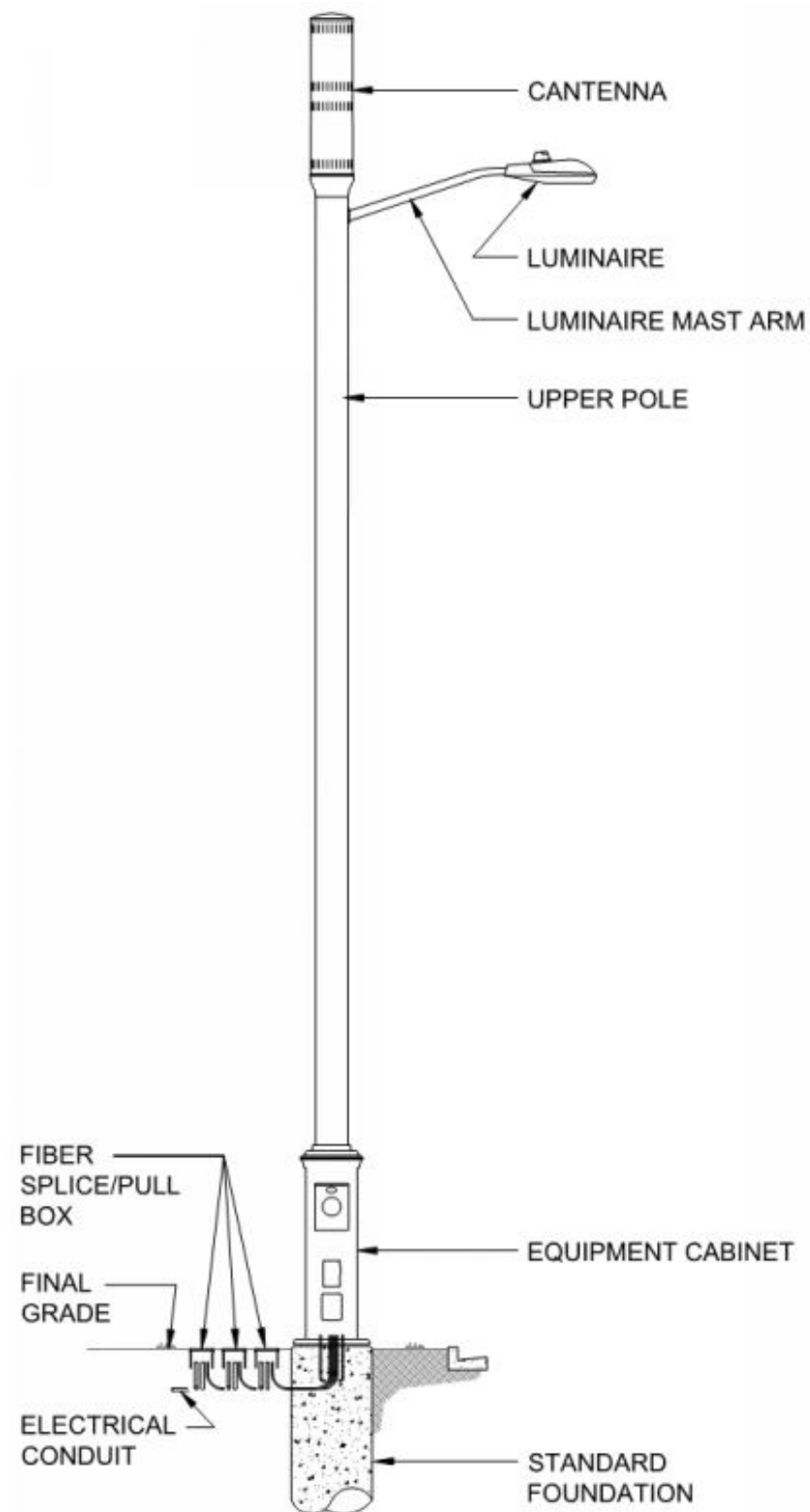
### **13.4 A. Use of the Public ROW**

Notwithstanding franchise agreements, private structures and facilities located in the public ROW will only be allowed through the City's temporary use permit process. An annual fee, set by the City Council, shall be assessed to these facilities. Any use of the public ROW, including the placement of temporary or permanent facilities, utilities, poles, equipment, or other fixtures, shall be subject to the following requirements and limitations:

- 1) All equipment located within the public ROW shall be located such that it meets ADA requirements and does not obstruct, impede, or hinder usual pedestrian or vehicular travel.
- 2) No temporary or permanent fixtures shall be placed in the public ROW that obstruct vehicle traffic lanes or reduce the usable width of the sidewalk to less than four feet (4').
- 3) Temporary or permanent fixtures that obstruct or eliminate one (1) or more on-street parking spaces may be allowed under special circumstances where there is a net benefit to the public, such as dedication of on-street parking spaces to permanent, protected bicycle parking, public outdoor seating, etc.
- 4) The City's goal is to reduce the number of poles in its ROW over time. Therefore, to the maximum extent possible, new facilities shall be co-located with other utilities at existing pole locations. This may take the form of mounting facilities on existing poles or replacing existing poles with new poles capable of supporting multiple facilities.
- 5) The City's goal is for all utilities with overhead wires to be placed underground. In light of that goal, to the maximum possible, all new and replacement poles and facilities shall be designed to receive power for underground facilities.
- 6) All carrier equipment shall be removed and relocated at no cost to the City if the City decides to underground the utility in the future. Equipment must be removed in a period of time that does not delay the removal of the utility pole or lines.
- 7) In general, poles shall be neutral dark colors designed to blend in with the surroundings. If an existing pole is being replaced that is of a style, material, and color of other poles in the immediate vicinity, such as lights at an intersection, the proposed replacement pole shall match the other remaining poles. If the proposed facility is to be mounted on an existing pole, to the maximum extent possible, the proposed facility shall blend in and/or match the style, color, and material of the



- existing pole. Proposed pole colors, materials, and coatings shall be reviewed and approved by the City Engineer.
- 8) Junction boxes, transformers, auxiliary, or ancillary equipment in support of the function the facility shall not be mounted on the sides of existing poles, new, or replacement poles. These items shall be mounted internally in the pole or in a buried vault next to the pole. Conduits shall not be mounted on the exterior sides of the pole but should be run internally. Not with standing franchise agreements, exterior conduits will only be allowed through a Design Exception granted by the City Engineer. See example shown in Figure 13.4 A.
  - 9) No new temporary or permanent fixtures or facilities shall be allowed in the public ROW without an Engineer's certification that the fixture or facility does not pose an unsafe obstruction in the traffic clear area or safety hazard to vehicles that might leave the travel lane.
  - 10) New street lights and fixtures proposed for replacement poles or new poles shall conform the City's applicable lighting codes and standards.
  - 11) No temporary or permanent fixtures, or other facilities in the public ROW, shall be taller than 35 feet, including new structures or extensions to existing utility or light poles. The City Engineer may grant taller fixtures as a Design Exception if in the Engineer's opinion the proposal is warranted, benefits the public, and does not create undue safety issues, or is aesthetically detrimental to the surrounding area.
  - 12) Proposed new and replacement poles shall be designed to minimize their diameter and foot print to the maximum extent feasible.
  - 13) Prior to application submittal, the pole owner shall ensure the supporting pole/street light are appropriately sized and has sufficient strength to accommodate the additional small cell equipment loads.
  - 14) All installations shall meet or exceed all applicable structural standards, clearance standards, and provisions of the latest National Electrical Safety Code (NESC), or applicable City standards/codes; in case of conflict, the most stringent requirements shall prevail.



**Figure 13.4 A: Combination Small Cell and Streetlight**



#### 13.4 B. Additional Conditions for Use of the Public ROW

Use of the public ROW may include reasonable conditions designed to protect the long-term function, safety and structural integrity of the ROW, aesthetic quality of the ROW (especially Main Street), protection of existing utilities within the ROW, and near-by affected private property including, but not limited to the following:

- 1) Traffic safety measures, flaggers, warning signs, lights, and any other measures deemed necessary to protect public safety, including limits to time of day or season to limit impacts on pedestrians, vehicular access in the school zone, time-sensitive commerce during harvest, etc.
- 2) Reconstruction, rehabilitation, reinforcement, and/or repair of any physical element or support structure of, in or near the public ROW that may be affected or need to be altered to accommodate the use.
- 3) Measures necessary to maintain proper operation and integrity of utilities within the ROW before, during, and after the applicant's use of the ROW.
- 4) The posting of a financial guarantee, in a form approved by the City Attorney in an amount approved by the City Engineer, sufficient to reconstruct, rehabilitate, or repair any physical element or support structure in or near the public ROW following the use.
- 5) Indemnification of the City of Hood River for any claim arising from property damage, injury, or death resulting from any activity by the permittee or placement of any fixtures or facilities in the public ROW.
- 6) The temporary movement, or permanent removal or relocation, of poles, utility lines, or other existing structures or facilities within or near the public ROW that may be affected by the proposed use.
- 7) A reduction in the size, profile, or other visible aspect of any facility or fixture in the public ROW to preserve the aesthetic views or design standards of City streets.
- 8) Any other condition or requirement deemed reasonably necessary to protect the long-term function, safety, structural integrity or aesthetic quality of the ROW, utilities within the ROW, or the traveling public.

#### 13.5 Grading Policies

No cut or fill work may be undertaken on a site without first obtaining a Construction Site/ROW Permit as required by these Standards (See *Section 3.2*). A person who undertakes cut or fill work without a permit will be required to restore the site to the condition, including elevations and grade, existing prior to the unauthorized work. =





## 13.6 Temporary Rock and Concrete Crushing

### 13.6 A. Rock and Concrete Crushing Application

An application for temporary on-site rock or concrete crushing activities shall contain the following information:

- 1) A detailed explanation of the proposed construction and rock or concrete crushing activities including
  - a) An approved grading/clearing plan.
  - b) An estimate of the amount of material to be processed.
  - c) The amount of material to be used on site and the amount to be removed, if any.
  - d) The duration and operating characteristics of the rock or concrete crushing activity.
  - e) An explanation for how the proposal will reduce truck trips or otherwise benefit the community.
  - f) A list containing the names, phone numbers, and addresses of all property owners adjacent to the site property.
- 2) A map drawn to scale showing
  - g) The location of the property boundaries.
  - h) The location and ownership of adjacent properties.
  - i) The truck travel routes for vehicles accessing the site and rock or concrete material being removed from the site.
  - j) The destination site for material being removed.
  - k) Setbacks to the rock or concrete crushing activity.
  - l) Any topographic features in the immediate vicinity of the crusher.
  - m) Stock pile locations with dimension and proximity to significant features (i.e. water, property lines, structures, etc.).
- 3) Any additional information which will assist in the evaluation of the proposed temporary rock or concrete crushing.
- 4) A Temporary Rock Crushing Permit is required.

### 13.6 B. Rock and Concrete Crushing Requirements

Temporary rock and concrete crushing for on-site construction is permitted with an approved Temporary Rock Crushing Permit. The following standards must be met:

- 1) The subject property must have received site plans, tentative plat, or final plat approval for the construction activity, or is an approved public facility project.





- 2) An approved Oregon DEQ Land Use Compatibility Statement (LUCS) for the activity when required.
- 3) The subject property must have a valid NPDES 1200-C Permit on file with the Oregon DEQ when required.
- 4) The rock or concrete crushing equipment must have a valid Oregon DEQ Air Containment Discharge Permit.
- 5) An Operating Permit issued by the State of Oregon Department of Geology and Mineral Industries (DOGAMI) is required for mining operations that have an activity level that exceeds one (1) acre and/or 5,000 cubic yards of new disturbance in any consecutive 12-month period.
- 6) The crushing equipment must be capable of processing material meeting Oregon Department of Transportation “three-quarter (3/4) minus” specifications.
- 7) No off-site material shall be brought on-site for crushing.
- 8) The rock or concrete crushing equipment must be removed from the site within 15 days of completing the crushing activity.
- 9) The rock or concrete crushing equipment must be set up as far as practicable from any property line or existing residence, but in no case shall the setback be less than 150 feet.
- 10) The duration of the temporary rock or concrete crushing activity shall be for no more than 60 consecutive days from the issuance of the permit, unless the applicant obtains an extension of time from the City Engineer.
- 11) Rock and concrete crushing shall occur Monday through Friday between 8:00 AM and 5:00 PM, and not on legal holidays.
- 12) Water or other approved method must be provided for dust control.

## **13.7 Restoration and Cleanup**

### **13.7 A. Site Restoration and Cleanup**

- The Contractor shall keep the premises clean and orderly at all times during the work, and leave the project free of rubbish or excess materials of any kind upon completion of the work. During construction, the Contractor shall stockpile excavated materials so as not to damage the adjacent lawns, grassed areas, gardens, shrubbery, trees, or fences, regardless of the ownership of these areas. All excavated materials shall be removed from these areas, and these surfaces shall be left in a condition equivalent to their original condition and free from all rocks, gravel, boulders, or other foreign material. Stockpiling of construction materials shall not be allowed on existing public ROW without prior written consent from the agency owning the ROW.
- All existing storm systems adjacent to the project area shall be cleaned and flushed with a vacuum truck and/or sewer jetter, and original drainage restored. Sediment, rock, and other debris shall be collected and disposed of in a proper manner. In no case shall debris be flushed down a storm or sanitary sewer for disposal. All



damaged/impaired storm facilities, irrigation, house drainage pipes, drain tiles, sewer laterals, and culverts shall be repaired expeditiously.

- All areas disturbed by the Contractor's operations inside dedicated ROW or easements shall be restored to original or better condition. Areas outside of the easements or ROW, which are disturbed by the Contractor's operations, shall be restored to their original or better condition in a method acceptable to the property owner. The Contractor shall obtain a written release from such property owners for any claims of injury or property damage prior to final acceptance of the work by the City.
- All site cleanup efforts shall be conducted during normal working hours. Adjust work schedule to allow for adequate clean up. Cleanup materials must be removed from the work site to an approved location unless otherwise allowed by the City Engineer, in writing.

#### **13.7 B. Street Cleanup**

- The Contractor shall clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation, unless it poses an ESC threat. If any spilled material poses an ESC threat, it shall be cleaned immediately. The Contractor shall follow the City's ESC procedures. Cleanup materials must be removed from the street to an approved location unless otherwise allowed by the City Engineer, in writing.
- As soon as practical after completion of all paving and gravel shoulder resurfacing, the Contractor shall remove all dirt, mud, rock, gravel, and other foreign material from the paved surface and storm drainage system.
- All street cleanup efforts shall be conducted during normal working hours. Adjust work schedule to allow for adequate clean up.

#### **13.7 C. Stream and Creek Crossings**

- The Contractor shall comply with all provisions of the permits required by the Oregon Department of Fish and Wildlife (ODFW), National Marine Fisheries Service (NMFS), the USACE, Oregon DSL, Oregon Department of Environmental Quality (DEQ), and the HRMC.
- Before any work may be performed in any body of water, the method of operation and the schedule of such work shall be approved in writing by all Agencies with authority over the water body being crossed or otherwise disturbed.
- Structures located within the 100-year flood elevation shall be designed according to State and Federal guidelines, when approved.

#### **13.7 D. Use of Explosives**

- All use, storage, and transportation of explosives shall follow federal and State of Oregon Law.



- Follow Oregon OSHA's Construction Rules in order to set minimum safety and health requirements for employees who use explosives.
- Use of Explosives, when allowed by the City Engineer, shall comply with the current version of Chapter 56 of the OFC. The applicant will be required to obtain Blasting Permits from the State Fire Marshall.
- A copy of the approved Use of Explosives plan shall be submitted to the City Engineer prior to any work where explosives will be used. The Engineer shall reserve the right to allow or disallow the use of explosives within City Limits or within areas served by City services susceptible to damage caused by explosives.
- Surrounding property owners affected by blasting are to be notified at least ten (10) business days in advance of the use of explosives according to the Blasting Plan approved by the State Fire Marshall's Office.
- Use of explosives shall not cause detrimental effects on surrounding neighbors and City services.







## ***Appendix A: Construction Site/ROW Permit Fees***





## **Schedule of Fees Construction Site/Right-of-Way Permits**

The following fees shall apply for projects defined within the Engineering Standards. Fee amounts for these projects are as determined within the Consolidated Fee Schedule by City Council Resolution.

See updated Consolidated Fee Schedule at the following web location or contact the City Engineer for a copy. Look for: CONSTRUCTION SITE / WORK IN THE ROW PERMIT

<http://ci.hood-river.or.us/FinancialReports>

The Permit Fee will cover the cost of the City Engineer's time to perform the following tasks:

- 1) One (1) review of the plan submittal for completeness.
- 2) One (1) full plan review.
- 3) One (1) full plan review of revised set of plans (100% Plans).
- 4) Construction Observation (includes time for 1 re-inspection of each item).

### **Re-Inspection Fees and Additional Reviews**

The Applicant shall reimburse the City for actual costs, charged at an hourly rate, for all additional completeness reviews, full plan reviews, and/or re-inspections required. After three (3) full plan reviews, a formal plan review meeting is scheduled.

### **Sketch Plans** (*Section 3.1 B* of the Engineering Standards)

Permit Fee:	Projects involving cuts in public streets:	*\$170 + Degradation Fee (if applicable)
	All other Projects:	*\$94

Street Cut Bond Amount:	SY of Removed Asphalt x *\$50
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### **Detailed Engineering Plan Review** (*Section 3.1. C* of the Engineering Standards)

Permit Fee:	*2% of Engineers Cost Estimate (\$500 minimum) + Degradation Fee (if applicable)
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Surety Bond Amount:	110% of the Engineers Cost Estimate
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The Engineers Cost Estimate is the construction cost for all infrastructure work to be reviewed by the City Engineer. The Design Engineer shall submit the Engineers Cost Estimate, in unit prices, with the application for the construction site permit to be approved





by the City Engineer. If plan changes during the approval process increase the estimated project cost more than \$10,000, the Engineers Cost Estimate shall be resubmitted with the 100% plans along with the additional fee percentage.

### Degradation Fee

For projects involving cuts in a public street when the pavement surface is less than 10 (ten) years old. The degradation fee shall be deposited in the City's Street Fund for ongoing maintenance of city streets. In cases of financial hardship and when the permit is for one single family dwelling, the City Manager may allow the degradation fee to be paid over a period of time not to exceed ten (10) years. The City Manager shall have discretion to determine when to allow installment payments and appropriate security for payment.

$$\text{Formula} \quad F = p(x + (s)(I))$$

F = Degradation fee

p = multiplier based on age of street (see below). Contact the Public Works Department for current street age. (541) 386-2383

Age of Street (Yrs)	Less than 2 (Emergency Only)	2-3	3-5	5-10
p =	3	2.5	1.5	.5

x = Base fee set by City Council (\*\$500)

s = square yards (sy) of street surface disturbed + final restoration

I = Cost per square yard (sy) based on Industry Average

Current cost = \*\$50/sy (Price may change annually)

Example: A utility opens a street that was paved 27 months ago. The trench is 9 square yards.

$$F = p(x + (s)(I))$$

$$F = 2.5(\$500 + (9 \text{ s.y.})(\$50/\text{s.y.}))$$

$$F = 2.5(\$500 + \$450)$$

$$F = 2.5(\$950)$$

$$F = \underline{\$2,375} \text{ (Degradation fee)}$$

### Surety Bond

As required by the Hood River Municipal Code Title 13 Section 13.36.130 - Financial Assurance for work within the ROW.

\*Fees provided in this document are current as of the date of this publication. The current fees shall apply. See Consolidated Fee Schedule on the City website for up to date fees.



***Appendix B: Contractor Pre-qualification Form***





## Contractor Pre-Qualification Form

Submit application to:

Engineering Department  
City of Hood River  
211 2<sup>nd</sup> St  
Hood River, OR 97031

FAILURE TO ADDRESS ALL ITEMS MAY RESULT IN REJECTION OF APPLICATION  
CITY ENGINEER SHALL HAVE FINAL AUTHORITY TO REJECT ANY OR ALL APPLICATIONS

Date \_\_\_\_\_

Contractor's Business Name \_\_\_\_\_

CCB Number \_\_\_\_\_

Business Address \_\_\_\_\_ Phone Number \_\_\_\_\_

\_\_\_\_\_ Fax Number \_\_\_\_\_

\_\_\_\_\_ Primary Contact Name \_\_\_\_\_

\_\_\_\_\_ Secondary Contact Name \_\_\_\_\_

Purpose of Application: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### FOR CITY USE ONLY

Application Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_

Application is ☐ Approved ☐ Denied

Expiration Date \_\_\_\_\_ (2 –Years from date of approval)



If business is a partnership, list names of all persons who have a financial interest in the business.

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_

**BOND INFORMATION:**

Total amount of work the applicant can be bonded for at one time: \$ \_\_\_\_\_

Bonding Agency: \_\_\_\_\_

Agent's Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Agents Address: \_\_\_\_\_ Fax Number: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Has the applicant ever been denied prequalification by any agency in Oregon, or any other state?

☐ Yes

☐ No

If yes, please attach explanation

Has the applicant ever failed to complete a contract?

☐ Yes

☐ No

If yes, please attach explanation

Has the applicant ever had a bond relinquished?

☐ Yes

☐ No

If yes, please attach explanation

**INSURANCE INFORMATION:**

Total amount of liability insurance carried: \$ \_\_\_\_\_

Insurance Agency: \_\_\_\_\_

Agent's Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Agents Address: \_\_\_\_\_ Fax Number: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**EQUIPMENT:**

List all equipment owned by applicant. List only major relevant items. Lump together small equipment and tools. Attach additional pages if necessary.

Quantity, Description and Capacity of Items	Age in Years	Condition of Equipment

Total market value of equipment: \$ \_\_\_\_\_

Does applicant intend to rent any equipment? ☐ Yes ☐ No If yes, please provide a general description:

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**EXPERIENCE:**

List major projects applicant has undertaken in the last 5 years beginning with the most recent. Attach additional pages if necessary. Contractor must show a minimum of 5 years of relevant responsible experience.

Name, Address and Contact Information of Agency	Name of Project	Type & Quantity of Work – i.e. 200 LF 8” Water, 300 LF 15” Storm, 375 8” Sanitary, Etc.	Contract Amount
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
20			
21			
22			



**EXPERIENCE:**

List following additional information using same numbers as previous page. Attach additional pages if necessary.

Date of Completion (If Completed)	Location and of Work	Surety Company if Project Bonded	Engineering Firm & Phone Number
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
20			
21			
22			





EXPERIENCE:

- A. How many years has applicant been in business under present name? \_\_\_\_\_
- B. How many years experience in construction work has applicant had? \_\_\_\_\_
- C. What is the experience of all owners, officers, partners, and principal individuals in applicant's organization? Also, list any other individuals or organizations that control or influence bidding in any way and to any extent. Attach additional sheets if necessary.

Individuals Name	Present Position or Office	Years of Construction Experience	Magnitude and Type of Work
1			
2			
3			
4			
5			

The following space may be used for general remarks, comments, and explanations to the foregoing prequalification statements.

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\_\_\_\_\_  
Signature

STATE OF OREGON  
County of Hood River

This instrument was acknowledged before me on \_\_\_\_\_ by: \_\_\_\_\_

\_\_\_\_\_  
Notary Public – State of Oregon  
My commission expires: \_\_\_\_\_



## ***Appendix C: Construction Testing Checklist***





## City Checklist – Testing & Inspection Documentation

Project: \_\_\_\_\_

Contractor: \_\_\_\_\_

Resident Engineer: \_\_\_\_\_

This checklist and accompanying documentation shall be stamped by the Resident Engineer and shall be submitted to the City Engineer prior to Final Acceptance.

### Is the following documentation included?

	YES	NO	NA
<u>Streets</u>			
1) Compaction testing/proof rolls for subgrade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Compaction testing for base rock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Curb string line inspection documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) City staff clearance to Pave	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) Compaction testing for AC Paving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Sidewalk ADA compliance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) ADA Curb Ramp Inspection Forms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>Sanitary Sewers</u>			
1) Compaction testing for backfill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Mandrel tests of mainlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Air testing of mainlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) Video inspection of mainlines (inc. video)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) Hydrostatic or vacuum testing of manholes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Tracer wire testing approval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



(Continued)	YES	NO	NA
<u>Storm Sewers</u>			
1) Compaction testing for backfill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Mandrel testing of mainlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Video inspection of mainlines (inc. video)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) Tracer wire testing approval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>Water Distribution System</u>			
1) Compaction testing for backfill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Pressure Test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Disinfection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) Copy of transmittal to DHS with final plan review form	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) Tracer wire testing approval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## ***Appendix D: Survey Control***





## **Survey Control**

All projects under the jurisdiction of the City of Hood River shall be prepared in the State Plane Coordinate System, North Zone, for the State of Oregon, NAD83 Datum (using international feet). The HARN Station, “Ponder 2”, shall be used as the primary control monument, using an elevation of 336.74 for this point (published North American Vertical Datum 88, NAVD 88 (2011)).

Note: The 1986 city aerial mapping is not NAVD 88. Approximate correction is: NAVD 88 (2011) – 3.9’ = City Aerial Mapping.







## ***Appendix E: Electronic Drawing Submittal Requirements***





## Electronic Drawing Submittal Requirements

The following information will be supplied in Autocad drawing format to the City along with the Record Drawing submittal:

Layer Name	Information	Layer Color	Linestyle
Bldg	Existing buildings within project mapping	Magenta	Continuous
Curb	New Back of Curb lines	White	Continuous
Easement_city	Easements for City owned utilities	White	Dashed
Easement_private	All other Easements	44	Dashed
EOP	Edge of Pavement	Red	Continuous
Property	Property Lines & Right-of-way lines	White	Centerx2
Sanitary	Sanitary Sewer Lines & Manholes, including pipe size and material (i.e. 8" PVC 3034)	Magenta	Continuous
Sidewalk	New Sidewalks, all handicap ramps shall have concrete hatch, include and label sidewalks to be "Installed with Home Construction"	White	Continuous
St_Names	Street Names	White	Continuous
Storm	Storm Sewer Lines, Catch Basins & Manholes, including pipe size and material (ie. 18" PVC 3034)	Green	Continuous
Topo_label	Contour labels	White	Continuous
Topo_Mjr	Index contours, either 5' or 10' intervals (proposed grading only)	Red	Continuous
Topo_Mnr	Interim contours, either 1' or 2' contours (proposed grading only)	Yellow	Continuous
Util_gas	Gas lines	Yellow	Continuous
Util_irrig	Irrigation lines	152	Dashdot2
Util_power	Power lines, delineate all above and below ground lines	Red	Continuous
Util_tvphone	TV and Phone lines. delineate all above and below ground lines	40	Continuous
Water	City water lines & appurtenances, including pipe size & material	Blue	Continuous



## Notes

- 1) All drawings shall be submitted in Autocad model space on the City's coordinate system and vertical datum. For all model space drawings, 1 drawing unit = 1 foot. Limit submittal to the layers listed above.
- 2) All colors and linestyles will be set "By Layer". The colors and linestyles noted shall be assigned to each individual layer.
- 3) All linework shall be assigned an LTScale = 1.
- 4) All line thicknesses will be accomplished by colors through plotting. All polyline, pline, widths shall be "0" (zero).
- 5) Appropriate text heights will be assigned to the model space layers such that the text height measures 0.1" on the final plotted paperspace sheets.

E.g.    Text height = 2        (20 Scale Plots)  
                                 5        (50 Scale Plots)

- 6) All Autocad drawings shall be clearly marked as Record Drawing with the appropriate date and name of design engineer.
- 7) Signed Record Drawings must be converted to PDF file format, acceptable to the City Engineer in full size.
- 8) Drawings shall be submitted on a USB drive (thumb/flash drive) or other approved electronic data transmittal format as allowed by the City Engineer.



## ***Appendix F: Seed Mixes***





## Seed Mixes

### Hydroseeding, Fertilizing, Hydromulching and Tacking

#### General Requirements

In general, when ground surfaces have been disturbed, the applicant will be required to apply Hydroseeding, Fertilizing, Hydromulching and Tackifiers according to the requirements of the ODOT Standard Specification Section 01030.43 for Permanent (East of Cascades) and Temporary Seeding and according to Section 01030.48. Follow One-Step Operation unless otherwise directed by the City Engineer.

For all Hydroseeding operations the following apply:

- 1) Apply a green dye tracer as a visual application aid.
- 2) On slopes steeper than 2H:1V double the rate of tackifier to be applied.
- 3) Apply hydroseeding only during the approved seeding dates.

#### Hydroseed Mixture Schedule

Apply according to the requirements of ODOT Standard Specification Section 01030.13 for areas of sun and partial shade. Provide Oregon Certified Weed Free grass-seed blends or mixes, proportioned by weight, as follows:

Proportion %	Name Common (Latin)	Min. % Germ	Min. % Pure Seed	Max. % Weed Seed
50	Kentucky Bluegrass (Poa Pratensis)	80	85	0.00
30	Chewings Red Fescue (Festuca Rubra Variety)	85	98	0.00
10	Perennial Rye Grass (Lolium Perenne)	90	98	0.00
10	Redtop (Agrostis Alba)	85	92	0.00

See Alternate Approved Seed Mixes below for other approved seed mixes.

#### Hydroseed Application Rates

Permanent Seeding	Pure Live Seed Rate: 4 #/1000 sf
Temporary Seeding	Pure Live Seed Rate: 1 #/1000 sf





## **Fertilizer**

Use standard commercial grade fertilizer according to ODOT Standard Specification Section 01030.14 for East of the Cascades applications. Adhere to Statewide Near Water Application requirements when applying within 50 feet of open water.

## **Mulch**

Apply Hydromulch materials made of cellulose, wood, or straw fiber according to ODOT Standard Specification Section 01030.15 and ODOT Section 01030.48 according to the following rates:

On slopes flatter than 2H:1V	50 #/1000 sf
On slopes 2H:1V or steeper	100 #/1000 sf

## **Asphaltic Emulsion Tackifier**

Use liquid stabilizer asphalt emulsion, ASTM 977, Grade SS-1, nontoxic and free from plant growth or germination-inhibitors, unless otherwise approved by the City Engineer. Apply according to ODOT Standard Specification Section 01030.16 and ODOT Section 01030.48. Dilute emulsion with water at a rate of 1 part emulsion to 30 parts water unless manufacturer recommends a greater rate of application for the conditions of use.

## **Alternate Approved Seed Mixes**

The following are low maintenance seed mixes. These mixes are generally suited for the Hood River climate and the suggested uses. At a minimum, the Design Engineer shall contact the supplier to confirm that the seed mix is appropriate for the intended use. When appropriate and when allowed by the City Engineer, alternate seed mixes may be used. Mulch, Fertilizers, and Tackifiers shall be used with these seed mixes applied according ODOT Standard Specification Section 01030 and 01040.

### **Eco Seed Mixture**

Recommended for very low maintenance natural grassed areas. No mowing required, although 1-2 times per year optimal. No irrigation required.

45% Hard Fescue  
44% Chewings Fescue  
5% Crimson Clover  
3% Yarrow  
2% English Daisy  
1% Alyssum  
Pure Live Seed Rate: 3-5 #/1000 sf



### **Traditional Fine Fescue Mixture**

Optimal as low maintenance natural cover or managed lawn. Mow 2 times per year minimum for natural setting, or mow regularly and irrigate for optimal performance.

40% Hard Fescue  
40% Chewings Fescue  
10% Blue Fescue  
10% Strong Creeping Red Fescue  
Pure Live Seed Rate: 4-6 #/1000 sf High Maintenance Turf  
1-3#/1000 sf Native/Naturalized Grass Areas

### **PTC Bio Swale Mixture**

Recommended for bio swales and riparian zones (transition between continuously wet and drier upland areas). No mowing required, although 2 times per year optimal.

30% SR 1019 Creeping Bentgrass  
30% Poa trivialis  
10% Fawn Tail Fescue  
10% White Clover  
10% SR 2100 Kentucky Bluegrass  
5% Highland Bentgrass  
5% SR 3200 Dwarf Blue Fescue  
Pure Live Seed Rate: 2.1 #/1000 sf

### **Wet Soil Mixture**

For continuously wet areas.

30% Poa trivialis  
20% Creeping Bentgrass  
20% Perennial Rye  
20% Colonial Bentgrass  
10% Timothy  
Pure Live Seed Rate: 1.5 #/1000 sf

### **Seed Mixes not applied using Hydroseeding or Hydromulching**

Hand Spread or Mechanically Spread dry seed, fertilizer, dry mulch, and tacking applications shall comply with ODOT Standard Specifications 01030.48 (b) and related requirements.





## ***Appendix G: Infiltration Testing***





## ***G. Infiltration Testing***

To properly size and locate stormwater management facilities, it is necessary to characterize soil infiltration conditions at the location of the proposed facility. Projects following the Simple Method utilize assumed soil infiltration rates based on soil type. Projects following the Simple Method that will be adding >6,000 sf of impervious area shall perform an infiltration test to ensure that the assumptions used in developing the sizing factors on the Simple Sizing Form are appropriate for site conditions (e.g. soil infiltration rates, in inches per hour, assumed for soil types are A=4 in/hr, B=2 in/hr, C=0.5 in/hr, d=0.1 in/hr).

All projects following the Engineered Method must evaluate existing site conditions and determine the infiltration rate prior to facility design. An infiltration test is also required for sites trying to demonstrate that on-site infiltration is infeasible.

### **G.1 Infiltration Test Requirements**

- Testing must be conducted or overseen by a qualified Professional Engineer, Registered Geologist, or Certified Engineering Geologist licensed in the State of Oregon.
- The depth of the test must correspond to the facility depth. If a confining layer, or soil with a greater percentage of fines, is observed during the subsurface investigation to be within four feet (4') of the bottom of the planned infiltration system, the testing should be conducted within that confining layer. Based on DEQ requirements, the boring log must be contained to a depth adequate to show separation between the bottom of the infiltration facility and the seasonal high groundwater level. (The boring depth will vary, based on facility depth).
- Tests must be performed in the immediate vicinity of the proposed facility. Exceptions can be made to the test location provided the qualified professional can support that the strata are consistent from the proposed facility to the test location, and approved through the Design Exception process by the City Engineer. The test must be conducted in the 24 months prior to the date the plans were submitted for review.

There are three infiltration testing methods that can be used to determine design infiltration rate:

- 1) Open pit falling head
- 2) Encased falling head
- 3) Double-ring infiltrometer

The qualified professional who will be performing the infiltration test must exercise judgement in the selection of the infiltration test method.



Where satisfactory data from adjacent areas using an approved infiltration testing methods is available that demonstrates infiltration testing is not necessary, the infiltration testing requirement may be waived by the City Engineer. A recommendation for forgoing infiltration testing must be submitted in a report which includes supporting data and is stamped and signed by the project geotechnical engineer or project geologist.

## **G.2 Minimum Number of Required Tests**

- At least one (1) infiltration test is required for any potential location where a stormwater facility will be sited.
- Additional tests shall be required for every 3,000 sf of project area.
- Additional tests shall be required for every 100 lf of infiltration facility.
- No more than five test are required per development (at the discretion of the qualified professional assessing the site, as well as the City Engineer).

Tests performed for a proposed land division can be used at the building permit state as long as the results of the test are submitted with the separate applications and were conducted within 24 months prior to the date the plans were submitted for review.

Where multiple types of facilities are used, it is likely that multiple tests will be necessary, since an infiltration test can test only a single location. It is required to conduct an infiltration test t each stratum used. The City Engineer may require additional testing. If additional testing is required during plan review, the applicant must provide 24-hours notice to the City and specify the time and location that the test will take place.

## **G.3 Factor of Safety**

For all of the testing methods described in this section, a minimum allowable factor of safety of 2 shall be applied to field obtained infiltration rates for use in stormwater design. To obtain the infiltration rate used in design, divide the infiltration rate measured in the field by the factor of safety. The factor of safety used in design should be chosen by collaboration between the geotechnical engineer or geologist overseeing the infiltration testing and the civil engineer designing the stormwater management system. Determination of the factor of safety should include consideration of project specific conditions such as soil variability, testing methods, consequences of system failure, complexity of proposed construction, etc.



## G.4 Open Pit Falling Head Procedure Instructions

The open pit falling head procedure is performed in an open excavation and therefore is a test of the combination of vertical and lateral infiltration.

- 1) Excavate a hole with bottom dimensions of approximately 2 feet wide by 2 feet deep into the native soil to the elevation of the proposed facility bottom. The test can be conducted in a machine-excavated pit or a hand-dug pit. If smooth auguring tools or a smooth excavation bucket are used, scratch the sides and bottom of the hole with a sharp pointed instrument, and remove the loose material from the bottom of the test hole.
- 2) Fill the hole with clean water a minimum of 12 inches and maintain this depth of water for at least 4 hours (or overnight if clay soils are present) to pre-saturate the native material.
- 3) Determine how the water level will be accurately measured. The measurement should be made with reference to a fixed point. A lath placed in the test pit prior to filling or a sturdy beam across the top of the pit are convenient reference points. The tester and excavator should conduct all testing in accordance with OSHA regulations.
- 4) After the pre-saturation period required in step 2, refill the hole with water to 12 inches and record the draw-down time. Alternative water head heights may be used for testing provided the pre-saturation height is adjusted accordingly and the water head height used in infiltration testing is no more than 50 percent of water head height in the proposed stormwater system during the design storm event. Measure the water level to the nearest 0.01 foot (1/8 inch) at 10-minute intervals for a total period of 1 hour (or 20 minute intervals for 2 hours in slower draining soils) or until all the water is drained. In faster draining soils (sands and gravels), it may be necessary to shorten the measurement interval to obtain a well-defined infiltration rate curve. Constant head test may be substituted for falling head tests at the discretion of the professional overseeing the infiltration testing.
- 5) Repeat the infiltration test until the change in measured infiltration rate between two successive trials is no more than 10 percent. The trial should be discontinued if the infiltration rate between successive trials increases. At least three trials must be conducted. After each trial, the water level must be readjusted to the 12 inch level. Enter results into the data table (7-G).
- 6) The average infiltration rate over the last trial should be used to calculate the design infiltration rate without a factor of safety applied. Alternatively, the infiltration rate measured over the range of water head applicable to the project stormwater system design may be used at the discretion of the professional overseeing the testing. The final rate must be reported in inches per hour.
- 7) Upon completion of the testing, the excavation must be backfilled.





- 8) For very rapidly-draining soils, it may not be possible to maintain a water head above the bottom of the test pit. If the infiltration rate meets or exceeds the flow of water into the test pit, conduct a test in the following manner:
  - a) Approximate the area over which the water is infiltrating.
  - b) Using a water meter, bucket, or other device, measure the rate of water discharging into the test pit.
  - c) Calculate the infiltration rate by dividing the rate of discharge (cubic inches per hour) by the area over which it is infiltrating (square inches).
  - d) Note that a maximum infiltration rate of 20 inches per hour can be used in stormwater system design.

### **G.5 Encased Falling Head Procedure Instructions**

The encased falling head procedure is performed with a six inch (6") casing that is embedded approximately six inches (6") into the native soil. The goal of this field test is to evaluate the vertical infiltration rate through a six inch (6") plug of soil, without allowing any lateral infiltration. The test is not appropriate in gravelly soils or in other soils where a good seal with the casing cannot be established.

- 1) Embed a solid six inch (6") diameter casing into the native soil at the elevation of the proposed facility bottom. Ensure the embedment provides a good seal around the pipe casing so that percolation will be limited to the six inch (6") plug of material within the casing. This method can also be used when testing within hollow stem augers, provided the driller and tester are reasonably certain that a good seal has been achieved between the soil and auger.
- 2) Fill the pipe with clean water a minimum of 12 inches above the soil to be tested and maintain this depth for at least 4 hours (or overnight if clay soils are present) to pre-saturate the native material. Any soil that sloughed into the hole during the soaking period must be removed. In sandy soils with little or no clay or silt, soaking is not necessary. If after filling the hole twice with 12 inches of water, the water seeps completely away in less than 10 minutes, the test can proceed immediately.
- 3) To conduct the first trial of the test, fill the pipe to approximately 12 inches above the soil and measure the water level to the nearest 0.01 foot (1/8 in). Alternative water head heights may be used for testing provided the pre-saturation height is adjusted accordingly and the water head height used in infiltration testing is 50 percent or less than the water head height in the proposed stormwater system during the design storm event. The level should be measured with a tape or other device with reference to a fixed point. The top of the pipe is often a convenient reference point. Record the exact time.
- 4) Measure the water level to the nearest 0.01 foot (1/8 in) at 10 minute intervals for a total period of 1 hour (or 20 minute intervals for 2 hours in slower soils) or until all the water has drained. In faster draining soils (sands and gravels), it may be necessary to shorten the measurement interval in order to obtain a well-



defined infiltration rate curve. Constant head test may be substituted for falling head tests at the discretion of the professional overseeing the infiltration testing, and approved by the City Engineer. Successive trials should be run until the percent change in measured infiltration rate between two successive trials is minimal. The trial should be discontinued if the infiltration rate between successive trials increases. At least three (3) trials must be conducted. After each trial, the water level is readjusted to the 12 inch level. Enter results into the data table (7-G).

- 5) The average infiltration rate over the last trial should be used to calculate the un-factored infiltration rate. Alternatively, the infiltration rate measured over the range of water head applicable to the project stormwater system design may be used at the discretion of the professional overseeing the testing, as approved by the City Engineer. The final rate must be reported in inches per hour.
- 6) Upon completion of testing, the casing must be pulled and the test pit backfilled.

## **G.6 Double Ring Infiltrometer Test**

The double-ring infiltrometer test procedure shall be performed in accordance with ASTM-3385-94. The test is performed within two concentric casings embedded and sealed to the native soils. The outer ring maintains a volume of water to diminish the potential of lateral infiltration through the center casing. The volume of water added to the center ring to maintain a static water level is used to calculate the infiltration rate. The double-ring infiltrometer is appropriate only in soils where an adequate seal can be established.

## **G.7 Double Ring Infiltrometer Test**

The Infiltration Test Report must be attached to the project's Stormwater Management Report. The following information must be included in the Infiltration Testing Report:

- 1) Statement of project understanding (proposed stormwater system).
- 2) Name, contact information, professional license information and qualifications of the person conducting the infiltration test.
- 3) Summary of subsurface conditions encountered, including soil textures and the depth that they were found.
- 4) Summary of pre-saturation timing.
- 5) Summary of infiltration testing including location and number of tests and testing method used. Discussion of how the tests were performed (i.e. pipe type or diameter or test pit dimensions).
- 6) Infiltration testing results in inches per hour for each interval as well as the average of the entire testing period.
- 7) Recommended design infiltration rate.



- 8) Groundwater observations within exploration and an estimate of the depth to seasonal high groundwater.
- 9) Site plan showing location of infiltration tests.
- 10) Boring or test pit logs, Boring or test pit logs will be required when an applicant's proposal relies on the presence of specific subsurface strata that allows infiltration. The logs must include an associated soil classification consistent with ASTM D2488-00, Standard Practice for Classification for Description and Identification of Soils (Visual-Manual Procedure). The logs must also include any additional pertinent subsurface information, such as soil moisture conditions, depth and description of undocumented or engineered fill, soil color and mottling conditions, soil stiffness or density, and approximate depth of contact between soil types.
- 11) A summary of the entire Infiltration Test.



## G.8 Infiltration Test Data Form

<b>City of Hood River - Infiltration Test Data Form</b>					
Location:		Date:		Test Hole Number:	
Depth to Bottom of Hole:		Dimension of Hole:		Test Method:	
Tester's Name:					
Tester's Company:					
Tester's Contact Number:					
Depth (feet)			Soil Texture		
Pre-saturation Start Time:					
Pre-saturation End Time:					
Time	Time Interval (minutes)	Measurement (feet)	Drop in Water Level (feet)	Infiltration Rate (inches/hour)	Remarks
Average Infiltration Rate =					
Factor of Safety =					(Minimum of 2)
Design Infiltration Rate =					





## ***Appendix H: Standard Drawings***





## ***Standard Drawings – General (G)***





## CITY OF HOOD RIVER TESTING STANDARDS - 2019

TEST	STANDARD	FREQUENCY	TESTING AGENCY	TIMING	TEST REQUIREMENTS	CITY SIGNOFF & DATE
SUBGRADE CUT SECTION COMPACTION	AGENCY/ENGINEER	ALL	AGENCY <sup>4</sup> *5	PRIOR TO BASE ROCK	LOADED 10 CY TRUCK—PROOFROLL	
SUBGRADE FILL COMPACTION	AASHTO T-180	EVERY 2500 CY, MIN. 2 & 1 PER 3' OF DEPTH	CERTIFIED LAB	FIELD REPORTS REQUIRED PRIOR TO BASE ROCK	95% MIN. COMPACTION	
	AGENCY/ENGINEER	ALL	AGENCY <sup>4</sup> *5	PRIOR TO BASE ROCK	LOADED 10 CY TRUCK—PROOFROLL	
UTILITY BACKFILL COMPACTION <sup>*2</sup> (IN RIGHT OF WAY)	AASHTO T-180	EVERY 200', MIN 1/LINE; 2 @ 100' FOR FAILED TESTS <sup>*1</sup>	CERTIFIED LAB	REPORTS PRIOR TO BASE ROCK	95% MIN. COMPACTION	
UTILITY BACKFILL COMPACTION <sup>*2</sup> (OUT OF RIGHT OF WAY)	AASHTO T-99 or AASHTO T-180	EVERY 200', MIN 1/LINE; 2 @ 100' FOR FAILED TESTS <sup>*1</sup>	CERTIFIED LAB	PRIOR TO FINAL ACCEPTANCE	MINIMUM COMPACTION REQUIRED: 95% W/ T-99 OR 90% WITH T-180	
UTILITY BACKFILL COMPACTION <sup>*2</sup> (OVER 3 FT. IN DEPTH)	SAME AS ABOVE REQUIREMENTS	EVERY 5' OF DEPTH & SAME AS ABOVE REQUIREMENTS	SAME AS ABOVE REQUIREMENTS	SAME AS ABOVE REQUIREMENTS	SAME AS ABOVE REQUIREMENTS	
LOT AREA COMPACTION (NON-TRAFFIC AREAS)	AASHTO T-99 or AASHTO T-180	MIN. 1 PER EVERY 3' DEPTH, EACH LOT	CERTIFIED LAB	PRIOR TO FINAL ACCEPTANCE	MINIMUM COMPACTION REQUIRED: 95% W/ T-99 OR 90% WITH T-180	
WATER MAINS DISINFECTION	AWWA C651	ALL	CONTRACTOR <sup>5</sup>	PRIOR TO BACTERIA SAMPLE	AWWA C651 5.2.3.3 METHOD	
BACTERIA WATER SAMPLE	AWWA C651	2 CONSECUTIVE TEST 24 HR APART PER REQ. LOCATION MIN. 2 LOCATIONS PER MAIN. 1 ADDITIONAL PER BRANCH AND 1 ADDITIONAL PER 1,000 FT.	ADDY LAB OR APPROVED LAB	PRIOR TO CONNECTION TO MAIN & BASE ROCK	E. COLI & COLIFORM ABSENT	
WATER LINE LEAK TEST	AWWA C605 AWWA C600 ASTM F2164	MAIN, SERVICE, F.H., AIR/VAC	CONTRACTOR <sup>5</sup>	PRIOR TO BASE ROCK	C605 7.3 SIMULTANEOUS PRESSURE AND LEAK- AGE TEST OR C600 5.2. 2HR @ MAX OF 150% OF STATIC OR 150 PSI, WHICHEVER IS GREATER.	
SEWER PRESSURE MAIN LEAK TEST	AWWA C605 AWWA C600 ASTM F2164	MAIN, SERVICE, AIR/VAC	CONTRACTOR <sup>5</sup>	PRIOR TO BASE ROCK	C605 7.3 SIMULTANEOUS PRESSURE AND LEAK- AGE TEST OR C600 5.2. 2HR @ MAX OF 150% OF STATIC OR 150 PSI, WHICHEVER IS GREATER.	
LOW PRESSURE SEWER PRESSURE TEST	AGENCY/ENGINEER	MAIN, AIR/VAC	CONTRACTOR <sup>5</sup>	PRIOR TO BASE ROCK	15 MIN. @ 150 PSI (MIN) OR WORK PRESSURE (HIGHER OF 2). NOT TO EXCEED 200 PSI.	
STEP SEWER SERVICE	AGENCY/ENGINEER	ALL SERVICES	CONTRACTOR	PRIOR TO BASE ROCK	100 PSI FOR 30 SECONDS	
STEP / STEF SEWER TONE TEST	AGENCY/ENGINEER	MAIN, SERVICES	AGENCY <sup>4</sup> *5	PRIOR TO BASE ROCK	CONTINUOUS TONE	
GRAVITY SEWER – AIR TEST	ASTM F 1417	MAIN, SERVICES	CONTRACTOR <sup>5</sup>	PRIOR TO BASE ROCK	PER ASTM F 1417-92	
STEF MH COATING	AGENCY/ENGINEER	ALL	-----	AFTER VACUUM TEST	H <sub>2</sub> S RESISTANT – CERTIFIED APPLICATOR – SUBMITTAL REQ'D	
VACUUM TEST – MH	ASTM C1244	ALL	CONTRACTOR <sup>5</sup>	AFTER PAVEMENT INSTALLED	PER ASTM C1244-05A	
HYDROSTATIC TEST – MH	ASTM C969	ALL	CONTRACTOR <sup>5</sup>	AFTER PAVEMENT INSTALLED	0.019 GPH/FT DIAM/FT OF DEPTH OF MH	
STEF/CONVENTIONAL SEWER – MANDREL TEST	ODOT 00445	AT AGENCY REQUEST	CONTRACTOR <sup>5</sup>	PRIOR TO BASE ROCK	EFF LENGTH > D, MANDREL DIA > 0.95D	
STEF/CONVENTIONAL SEWER – TV TEST	ODOT 00445	MAIN REQUIRED	CONTRACTOR	PRIOR TO BASE ROCK	INSPECTION REPORT & VIDEO	
STORM SEWER MANDREL TEST	ODOT 00445	AT AGENCY REQUEST	CONTRACTOR <sup>5</sup>	PRIOR TO BASE ROCK	EFF LENGTH > D, MANDREL DIA > 0.95D	
STORM SEWER TV TEST	ODOT 00445	AT AGENCY REQUEST	CONTRACTOR	PRIOR TO BASE ROCK	INSPECTION REPORT & VIDEO	
BASE ROCK GRADATION	ODOT 00610	ONE PER SOURCE	CERTIFIED LAB	PRIOR TO PLACEMENT	COPY TO INSPECTOR	
BASE ROCK COMPACTION	AASHTO T-180	EVERY 250'	CERTIFIED LAB	PRIOR TO TOP ROCK, CURBS, DRIVEWAYS, APPROACHES, AND SIDEWALKS	95% MIN. COMPACTION	
TOP ROCK GRADATION	ODOT 00610	ONE PER SOURCE	CERTIFIED LAB	PRIOR TO PLACEMENT	COPY TO INSPECTOR	
TOP ROCK COMPACTION	AGENCY/ENGINEER	ALL	AGENCY <sup>4</sup> *5	PRIOR TO PLACEMENT	LOADED 10 CY TRUCK—PROOFROLL	
AC GRADE & OIL CONTENT	ODOT 00744	ONE PER SOURCE	CERTIFIED LAB	PRIOR TO PLACEMENT	COPY TO INSPECTOR	
AC COMPACTION	AASHTO T-209	ONE EVERY 1000 TONS *(3)	CERTIFIED LAB	DURING PLACEMENT	1ST LIFT 91% MIN. COMPACTION. SUBSEQUENT LIFTS 92% MIN. COMPACTION	
SUBGRADE GRADE CHECK ELEV	AGENCY/ENGINEER	PER STATION (0+25)	AGENCY <sup>4</sup> *5	PRIOR TO BASE ROCK	+0.04' TOLERANCE	
BASE ROCK GRADE CHECK ELEV	AGENCY/ENGINEER	PER STATION (0+25)	AGENCY <sup>4</sup> *5	PRIOR TO TOP ROCK	MINIMUM SECTION REQUIRED	
TOP ROCK GRADE CHECK ELEV	AGENCY/ENGINEER	PER STATION (0+25)	AGENCY <sup>4</sup> *5	PRIOR TO PAVEMENT	+ 0.02' TOLERANCE	
CONCRETE CURB	ACI	PER 100', 1 TEST MIN.	CERTIFIED LAB	PRIOR TO TRAFFIC USE	28 DAY STRENGTH	
CONCRETE WALLS, STRUCTURAL ITEMS	ACI	PER ITEM AND EVERY 16 CYS	CERTIFIED LAB	PRIOR TO LOADING	28 DAY STRENGTH	
CONCRETE DRIVEWAYS, APRONS, APPROACHES	ACI	PER EACH AND EVERY 60 SY	CERTIFIED LAB	PRIOR TO TRAFFIC USE	28 DAY STRENGTH	

NOTE: CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH TESTING. ALL TESTING COST SHALL BE CONSIDERED INCIDENTAL AND INCLUDED IN THE APPROPRIATE UNIT BID ITEM.

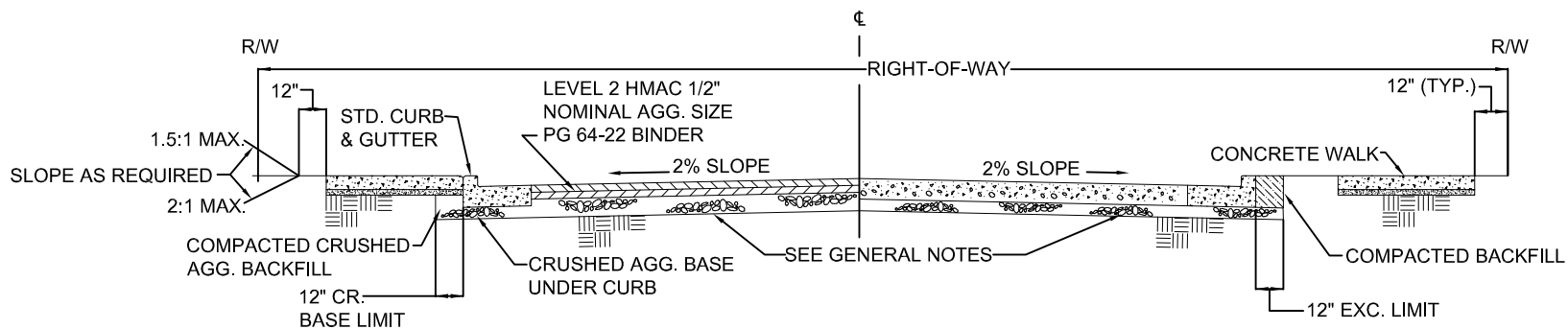
- \* 1) NOT LESS THAN ONE TEST BETWEEN UTILITY STRUCTURES(MHs, CLEANOUTS, VAULTS, ETC.)
- 2) ALL BACKFILL AROUND UTILITY STRUCTURES SHALL BE COMPACTED AND TESTED, ONE TEST PER STRUCTURE.
- 3) ONE TEST SHALL BE CONDUCTED EVERY BLOCK OR 500 LF OF WORK AS DETERMINED BY THE ENGINEER.
- 4) AGENCY SHALL BE OWNER APPROVED, INDEPENDENT, 3RD PARTY LAB OR TESTING AGENCY.
- 5) ENGINEER OR CITY REPRESENTATIVE SHALL BE PRESENT TO OBSERVE FIELD TESTS OR COLLECTION OF SAMPLES.





## ***Standard Drawings – Roadway (RD)***

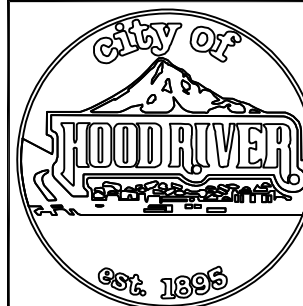




**GENERAL NOTES FOR ALL DETAILS:**

1. BASE ROCK SHALL BE 1 1/2"-0" CRUSHED AGGREGATE 8" COMPACTED DEPTH @ A MINIMUM OF 95% AASHTO T-180
2. FINISH COURSE SHALL BE 3/4"-0" CRUSHED AGGREGATE 2" COMPACTED DEPTH @ A MINIMUM OF 95% AASHTO T-180
3. ASPHALT PAVEMENT SHALL BE 4" MINIMUM COMPACTED DEPTH PLACED IN TWO (2) 2" LIFTS, FIRST LIFT @ A MINIMUM OF 91% OF RICE DENSITY AND SECOND LIFT @ A MINIMUM OF 92% OF RICE DENSITY.

**CITY OF HOOD RIVER STANDARD DRAWINGS RD-01**



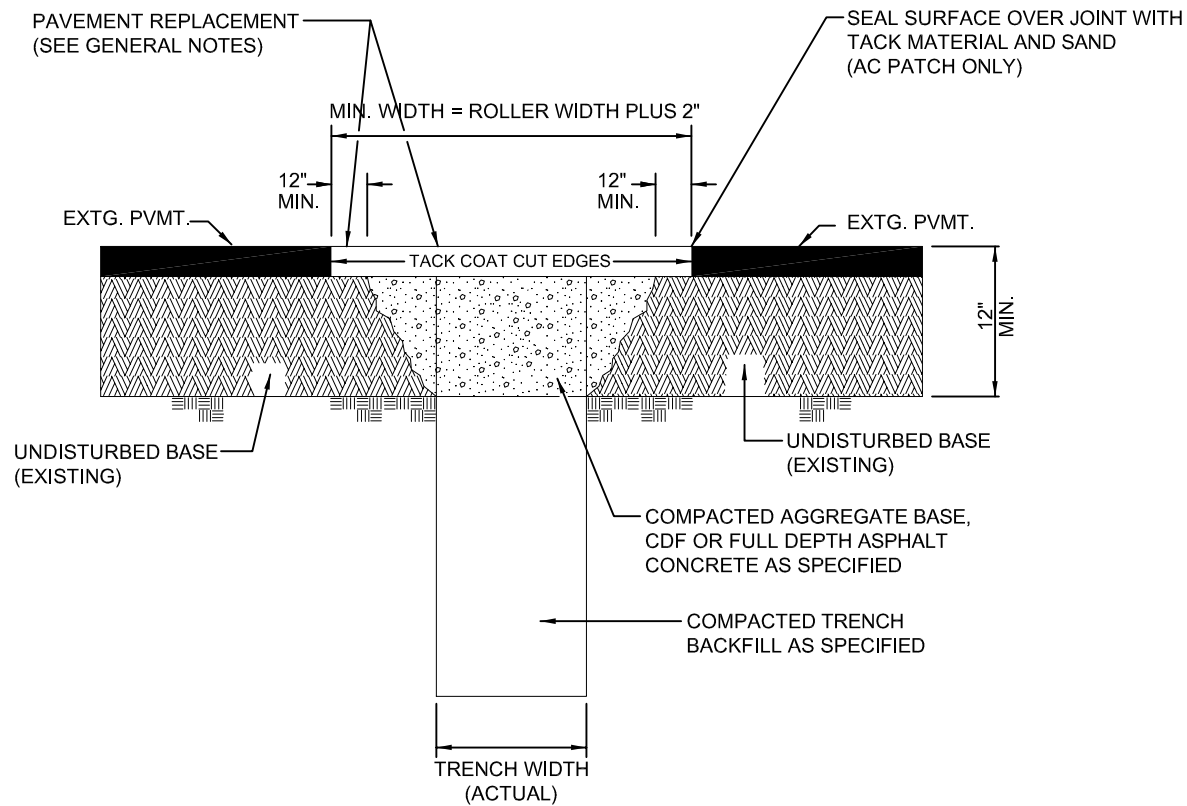
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

**STREET DETAIL**

**2019**

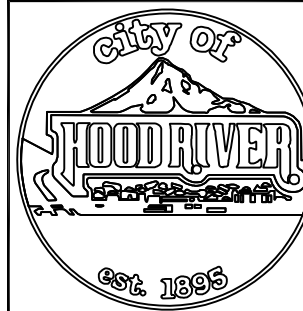
DATE	REVISIONS



**GENERAL NOTES FOR ALL DETAILS:**

1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT PRIOR TO REPAVING.
2. CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6" OR TO THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER.
3. PLACE AC MIX MINIMUM THICKNESS OF 4" OR THE THICKNESS OF THE REMOVED PAVEMENT, WHICHEVER IS GREATER. COMPACT AS SPECIFIED.

**CITY OF HOOD RIVER STANDARD DRAWINGS RD-02**



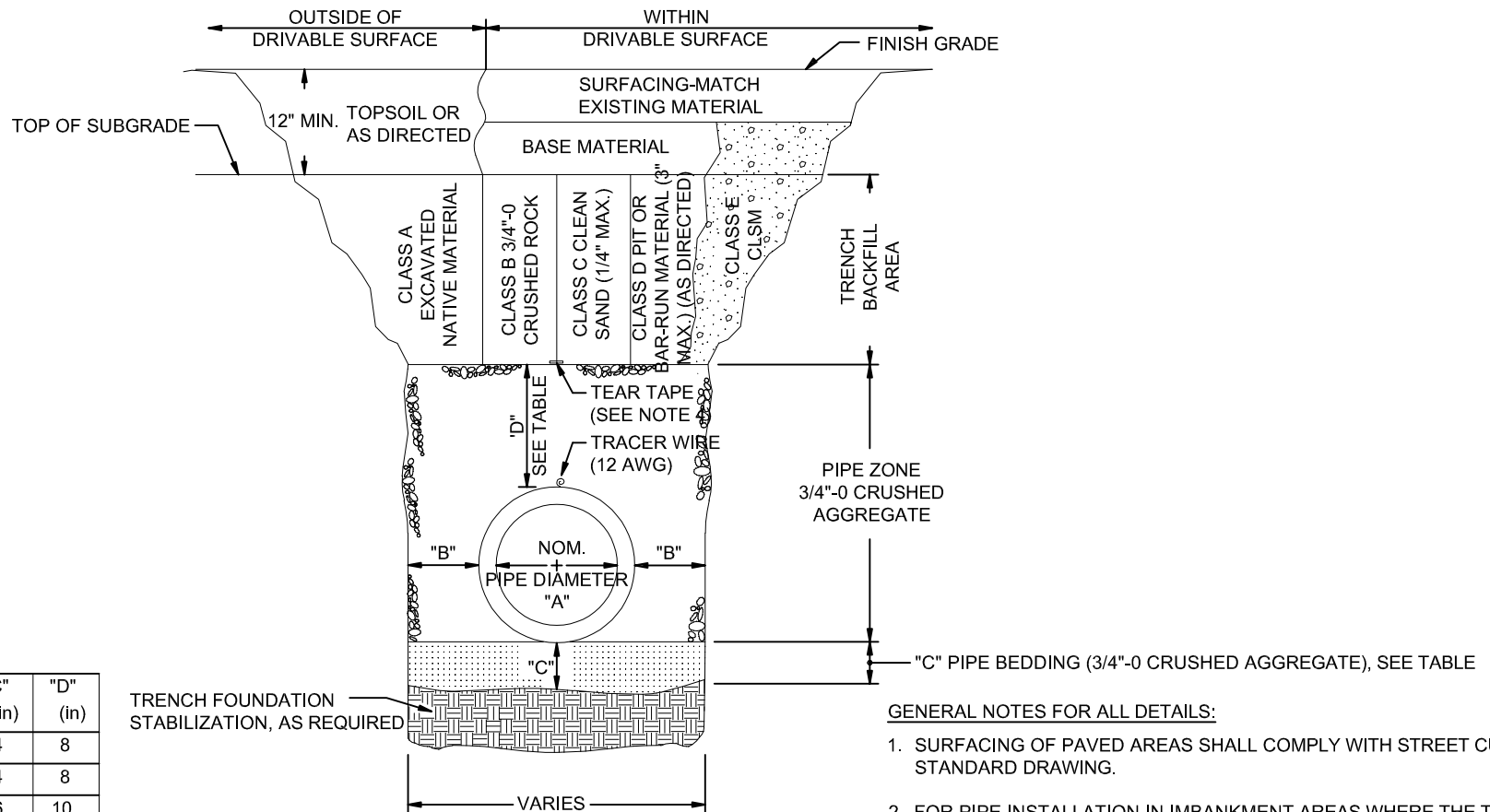
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

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**STREET CUT DETAIL**

2019

DATE	REVISIONS



TABLE

"A" (in)	"B" (in)	"C" (in)	"D" (in)
4	10	4	8
6	10	4	8
8	10	6	10
10	10	6	10
12	12	6	10
15	12	6	10
18	16	6	12
21	16	6	12
24	18	6	12
30	18	6	12
36	24	6	14
42	24	6	14
48	24	6	14
54	24	6	14
60	24	6	14
66	24	6	14
72	24	6	14

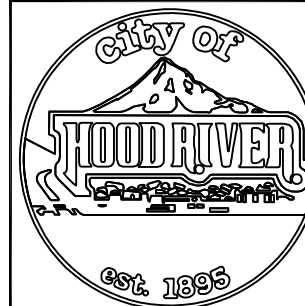
TRENCH FOUNDATION STABILIZATION, AS REQUIRED

**GENERAL NOTES FOR ALL DETAILS:**

1. SURFACING OF PAVED AREAS SHALL COMPLY WITH STREET CUT STANDARD DRAWING.
2. FOR PIPE INSTALLATION IN IMBANKMENT AREAS WHERE THE TRENCH METHOD WILL NOT BE USED AND THE PIPE IS  $\geq 36"$  IN DIAMETER, INCREASE DIMENSION "B" TO NOMINAL PIPE DIAMETER.
3. PIPES OVER 72" DIAMETER ARE STRUCTURES, AND ARE NOT APPLICABLE TO THIS DRAWING.
4. DETECTABLE, COLOR CODED, 6" WIDE MARKING TAPE.

MULTIPLE INSTALLATIONS	
DIAMETER	MIN. SPACE BETWEEN PIPES
UP TO 48"	24"
48" TO 72"	ONE HALF (1/2) DIA. OF PIPE

**CITY OF HOOD RIVER STANDARD DRAWINGS RD-03**



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

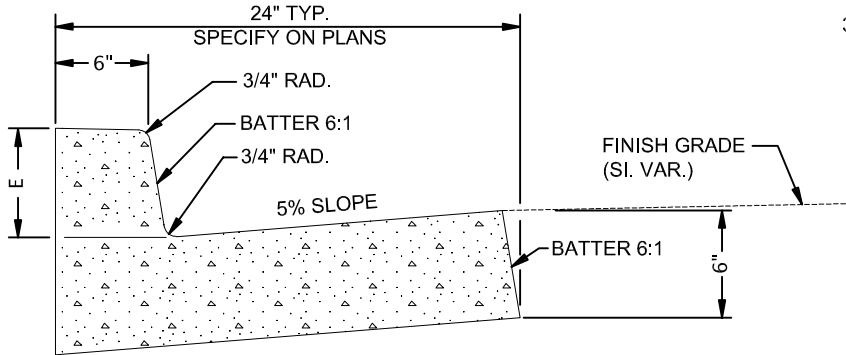
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

**TRENCH BACKFILL, BEDDING, PIPE ZONE & MULTIPLE INSTALLATIONS**  
2019

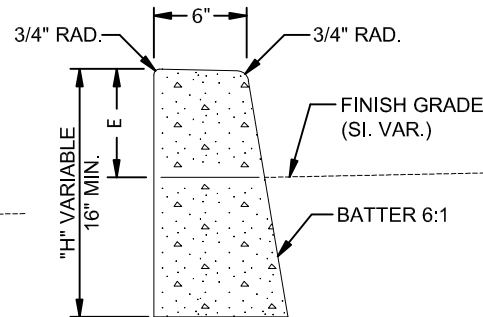
DATE	REVISIONS



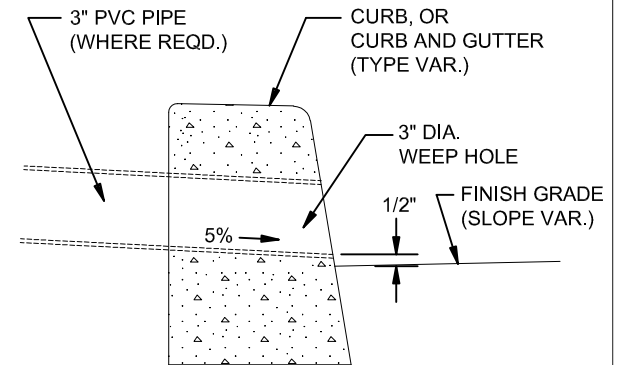
## STANDARD CURB AND GUTTER



## STANDARD CURB



## WEEP HOLE DETAIL



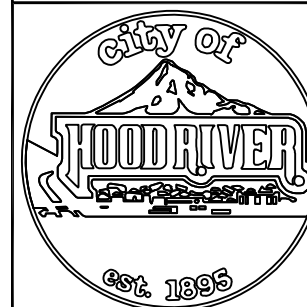
### NOTES FOR ALL DETAILS:

1. CURB EXPOSURE "E" 6" TO 9", AS MEASURED VERTICALLY FROM FLOWLINE TO HIGHEST POINT ON CURB. VARY AS SHOWN ON PLANS OR AS DIRECTED. CITY STANDARD "E" = 6".
2. CONSTRUCTION EXPANSION JOINTS AT 200' MAXIMUM SPACING, AND AT POINTS OF TANGENCY, AND AT ENDS OF EACH DRIVEWAY.
3. CONSTRUCTION CONTRACTION JOINTS AT 15' MAXIMUM SPACING, AND AT ENDS OF EACH INLET AND CURB RAMP.
4. TRANSITIONS SHALL BE USED TO CONNECT CURBS OF DIFFERENT EXPOSURES "E". ("E" IS THE TOTAL VERTICAL DIMENSIONS OF THOSE CURB SURFACES HAVING A SLOPE OF 1:1 OR STEEPER). MINIMUM DESIRABLE TRANSITION LENGTH SHALL BE 20' FOR EACH 1" DIFFERENCE IN "E".
5. TOP OF ALL CURBS SHALL SLOPE TOWARD THE ROADWAY AT 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE), UNLESS OTHERWISE SHOWN, OR AS DIRECTED.
6. DIMENSIONS ARE NOMINAL, VARY TO CONFORM WITH CURB MACHINE APPROVE BY THE ENGINEER
7. DIMENSIONS ADJACENT TO RADII ARE MEASURED TO THE POINT OF INTERSECTION OF CURB SURFACES.
8. CURB AND GUTTER IS REQUIRED AT CURB RAMPS.
9. WEEP HOLES ARE ALLOWED BY DESIGN EXCEPTION ONLY.
10. A CONTRACTION JOINT SHALL BE PLACED ALONG AND OVER WEEP HOLE THROUGH THE CURB AND THROUGH THE SIDEWALK WHEN APPROVED.
11. WHEN SIDEWALKS ARE CONSTRUCTED, EXTEND 3" PIPE TO BACK OF SIDEWALK AND INSTALL COUPLING AT ALL WEEP HOLES.
12. BASE COURSE UNDER CURB AND GUTTER SHALL BE 8-INCH MIN. COMPACTED DEPTH OF 1-1/2" MINUS CRUSHED ROCK AND SHALL EXTEND AT LEAST 1'-0" BEYOND THE FRONT AND BACK OF THE CURB AND GUTTER. COMPACT TO 95% AASHTO T-180.

### GUTTER PAN NOTES:

1. SLOPE 4.0% MAX. AT CURB RAMPS. (MAX. 5.0% FINISHED SURFACE SLOPE).
2. VARY SLOPE AS REQUIRED FOR DRAINAGE.
3. VARY WHERE SHOWN ON PLANS, AND ALLOWED BY CITY.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-04



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

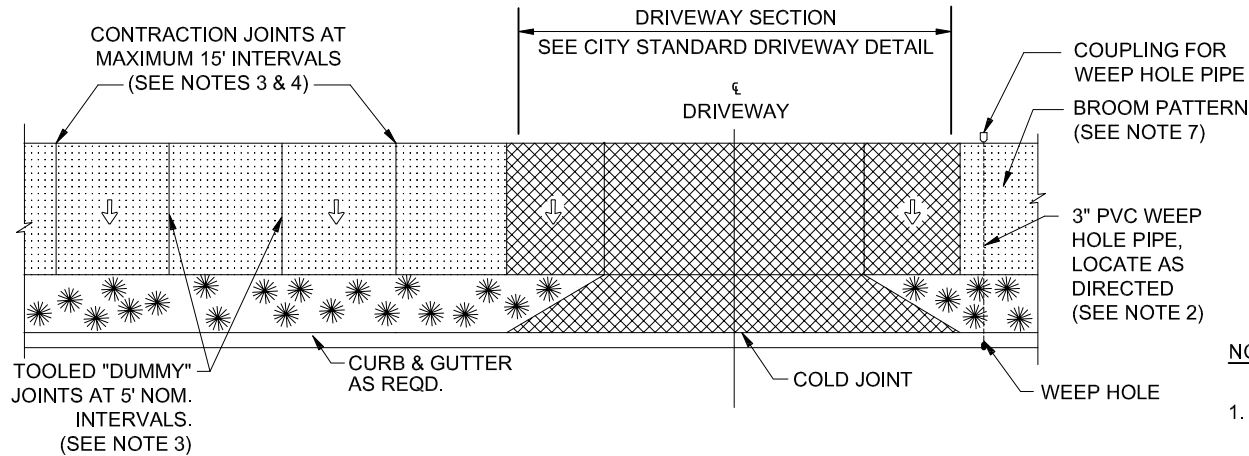
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## STANDARD CURB DETAIL

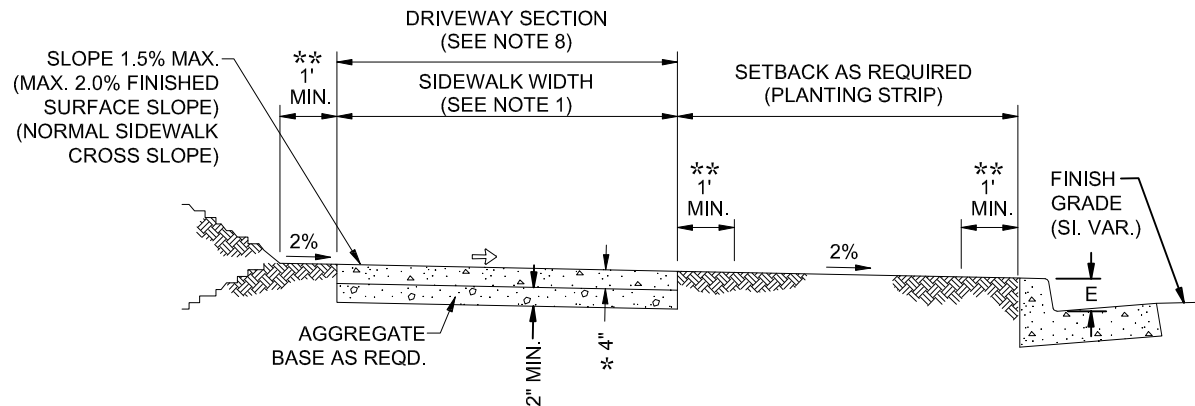
2019

DATE	REVISIONS

## TYPICAL PLAN VIEW - SEPARATED SIDEWALK



## TYPICAL SEPARATED SIDEWALK CROSS SECTION



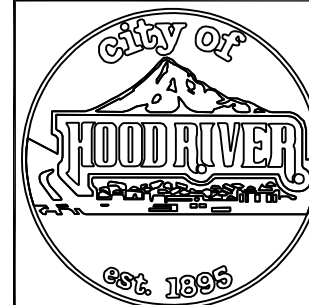
- \* MIN. 4" OR AS SPECIFIED IN PLANS. A THICKNESS 6" OR GREATER IF SIDEWALK IS INTENDED AS PORTION OF A DRIVEWAY OR MOUNTABLE CURB IS USED.
- \*\* PROVIDE COMPACTED BACKFILL ADJACENT TO CURB AND SIDEWALK (1.5' ON DOWN SLOPES 4:1 AND GREATER
- E = CURB EXPOSURE (SEE NOTE 5)

↓  
SLOPE 1.5% MAX. (MAX. 2.0%  
FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

### NOTES FOR ALL DETAILS:

1. CURB TYPE AND SIDEWALK WIDTH AS SHOWN ON PLANS OR AS DIRECTED. ON SIDEWALKS 8' AND WIDER, PROVIDE A LONGITUDINAL JOINT AT THE MIDPOINT.
2. INSTALL 3" PVC WEEP HOLE PIPES IN SIDEWALKS WHERE SHOWN ON PLANS, IF ALLOWED THROUGH DESIGN EXCEPTION. PLACE CONTRACTION JOINT OVER TOP OF PIPE. SEE CITY STANDARD FOR WEEP HOLE DETAIL.
3. CONST. EXPANSION JOINTS 200' MAXIMUM SPACING, AND AT POINTS OF TANGENCY
4. CONST. CONTRACTION JOINTS AT 15' MAXIMUM SPACING, AND AT ENDS OF EACH DRIVEWAY AND CURB RAMP.
5. FOR CURB DETAILS, SEE CITY STANDARD CURB DETAIL.
6. FOR DRIVEWAY DETAILS NOT SHOWN, SEE CITY STANDARD DRIVEWAY DETAIL.
7. FINISH SHALL BE MEDIUM BROOM WITH NO SHINE MARKS.
8. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-05



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

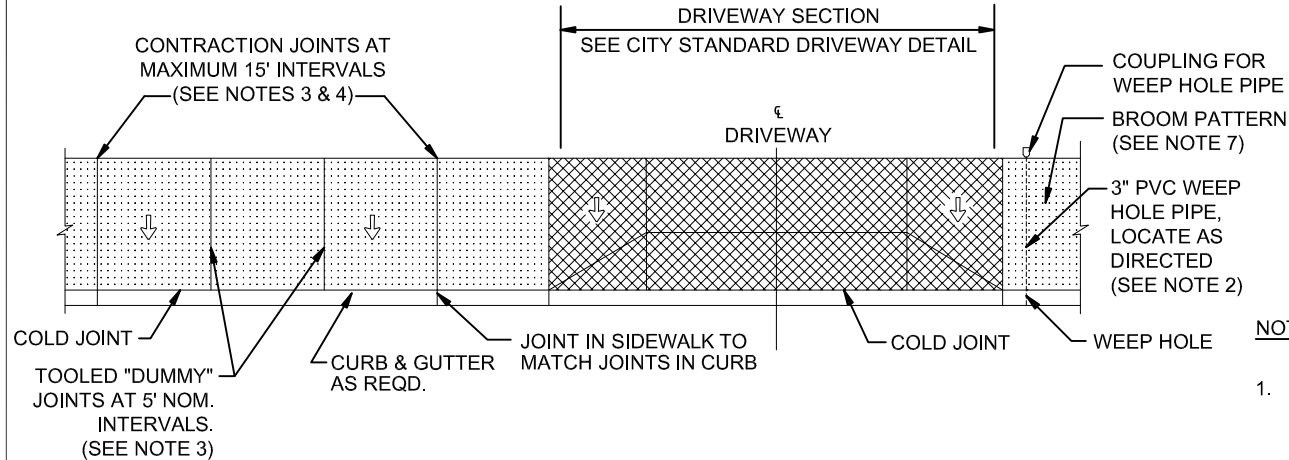
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## SEPARATED SIDEWALK

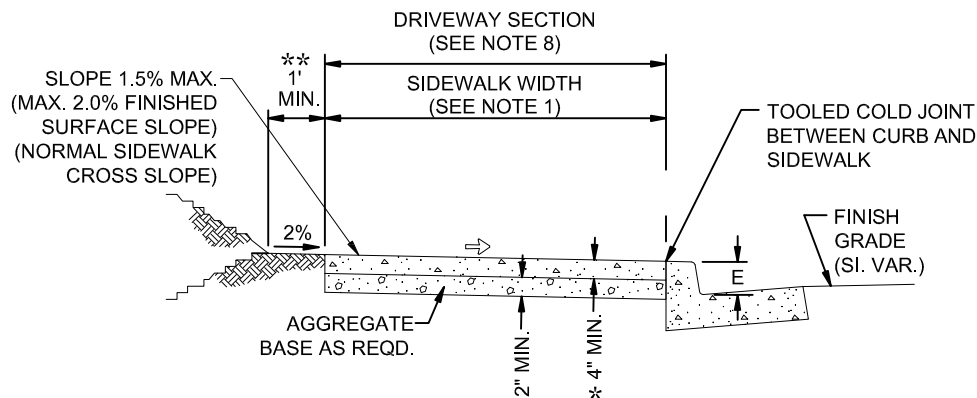
2019

DATE	REVISIONS

## TYPICAL PLAN VIEW - CURBSIDE SIDEWALK



## TYPICAL CURB SIDEWALK CROSS SECTION



\* MIN. 4" OR AS SPECIFIED IN PLANS. A THICKNESS 6" OR GREATER IF SIDEWALK IS INTENDED AS PORTION OF A DRIVEWAY OR MOUNTABLE CURB IS USED.

\*\* PROVIDE COMPACTED BACKFILL ADJACENT TO CURB AND SIDEWALK (1.5' ON DOWN SLOPES 4:1 AND GREATER

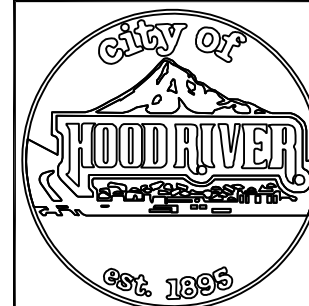
E = CURB EXPOSURE (SEE NOTE 5)

↓ SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)

### NOTES FOR ALL DETAILS:

1. CURB TYPE AND SIDEWALK WIDTH (5' MINIMUM) AS SHOWN ON PLANS OR AS DIRECTED. ON SIDEWALKS 8' AND WIDER, PROVIDE A LONGITUDINAL JOINT AT THE MIDPOINT.
2. INSTALL 3" PVC WEEP HOLE PIPES IN SIDEWALKS WHERE SHOWN ON PLANS, IF ALLOWED THROUGH DESIGN EXCEPTION. PLACE CONTRACTION JOINT OVER TOP OF PIPE. SEE CITY STANDARD FOR WEEP HOLE DETAIL.
3. CONST. EXPANSION JOINTS 200' MAXIMUM SPACING, AND AT POINTS OF TANGENCY.
4. CONST. CONTRACTION JOINTS AT 15' MAXIMUM SPACING, AND AT ENDS OF EACH DRIVEWAY AND CURB RAMP.
5. FOR CURB DETAILS, SEE CITY STANDARD CURB DETAIL.
6. FOR DRIVEWAY DETAILS NOT SHOWN, SEE CITY STANDARD DRIVEWAY DETAIL.
7. FINISH SHALL BE MEDIUM BROOM WITH NO SHINE MARKS.
8. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-06



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

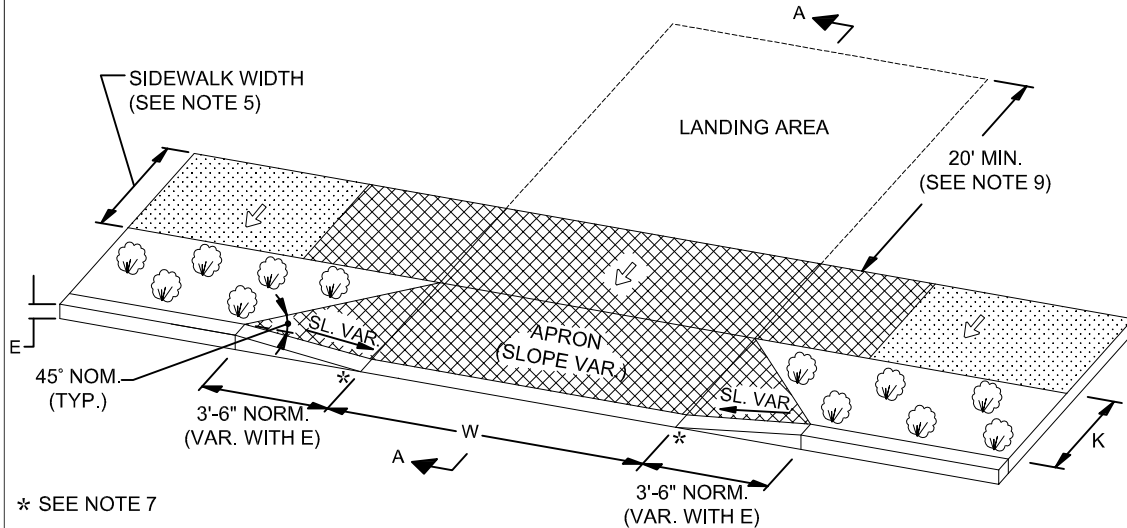
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## CURBSIDE SIDEWALK

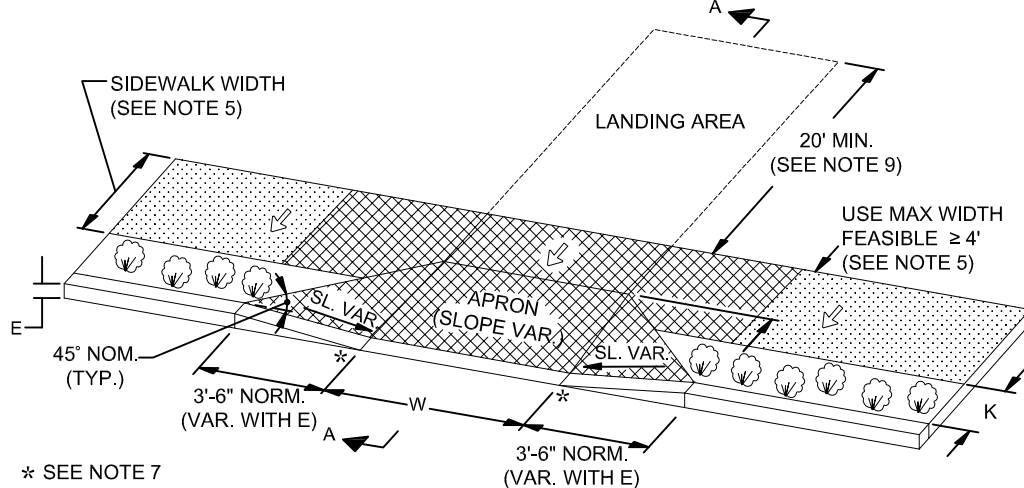
2019

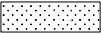


DATE	REVISIONS

## OPTION A TYPICAL SEPARATED SIDEWALK DRIVEWAY



## OPTION B DRIVEWAY ENCROACHES INTO SIDEWALK

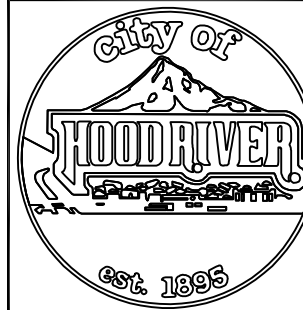


- \* SEE NOTE 7
-  SIDEWALK
-  DRIVEWAY PAY LIMIT (SEE PROJECT PLAN FOR DETAILS NOT SHOWN)
-  SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
- W WIDTH OF DRIVEWAY (VARIES)
- K BUFFER STRIP WIDTH (5' MIN.)
- E CURB EXPOSURE

### NOTES FOR ALL DETAILS:

- DETAILS ARE BASED ON ODOT STANDARDS.
- THE FOLLOWING DIMENSIONS ARE AS SHOWN ON PLANS, OR AS DIRECTED:  
DRIVEWAY WIDTH, DRIVEWAY SLOPE, SIDEWALK WIDTH, BUFFER STRIP WIDTH, CURB EXPOSURE, DRIVEWAY LIP EXPOSURE, LANDING AREA LENGTH AND WIDTH. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.
- CURB, GUTTER, AND SIDEWALK TYPES VARY, SEE PLANS. SEE CITY STANDARD DRAWINGS FOR CURB & SIDEWALK DETAILS.
- A GREATER THAN OR EQUAL TO 4' UNOBSTRUCTED CLEAR PASSAGE WITH SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) IS REQUIRED BEHIND DRIVEWAY APRON.
- WHERE EXISTING DRIVEWAY IS IN GOOD CONDITION, AND MEETS SLOPE REQUIREMENTS, CONSTRUCT ONLY AS MUCH AS REQUIRED FOR SATISFACTORY CONNECTION WITH NEW WORK.
- CHECK THE GUTTER FLOW DEPTH AT DRIVEWAY LOCATION TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK AT DRIVEWAY. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OF DRIVEWAY OR PERFORM OTHER APPROVED DESIGN MITIGATION.
- TOOLED JOINTS ARE REQUIRED AT ALL DRIVEWAY SLOPE BREAK LINES.
- 20' MIN. OF THE DRIVEWAY BEHIND THE SIDEWALK SHOULD BE SURFACED TO PREVENT TRACKING OF GRAVEL ONTO THE SIDEWALK. DESIGN EXCEPTION REQUIRED FOR LESS.
- FINISH SHALL BE MEDIUM BROOM, WITH NO SHINE MARKS.
- MAXIMUM 6" SQUARE WIRE PLACED ON 3" DOBE BLOCKS IS REQUIRED IN COMMERCIAL DRIVEWAYS.
- AGGREGATE BASES UNDER PRIVATE AND PUBLIC DRIVEWAYS (INCLUDING WINGS AND TRANSITIONS SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:
  - BASE COURSE SHALL BE 8-INCH MIN COMPACTED DEPTH OF 1½" MINUS CRUSHED ROCK COMPACTED TO 95% AASHTO T-180.
  - FINISH COURSE SHALL BE 2-INCH MIN COMPACTED DEPTH OF ¾" MINUS CRUSHED ROCK COMPACTED TO 95% AASHTO T-180.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-07



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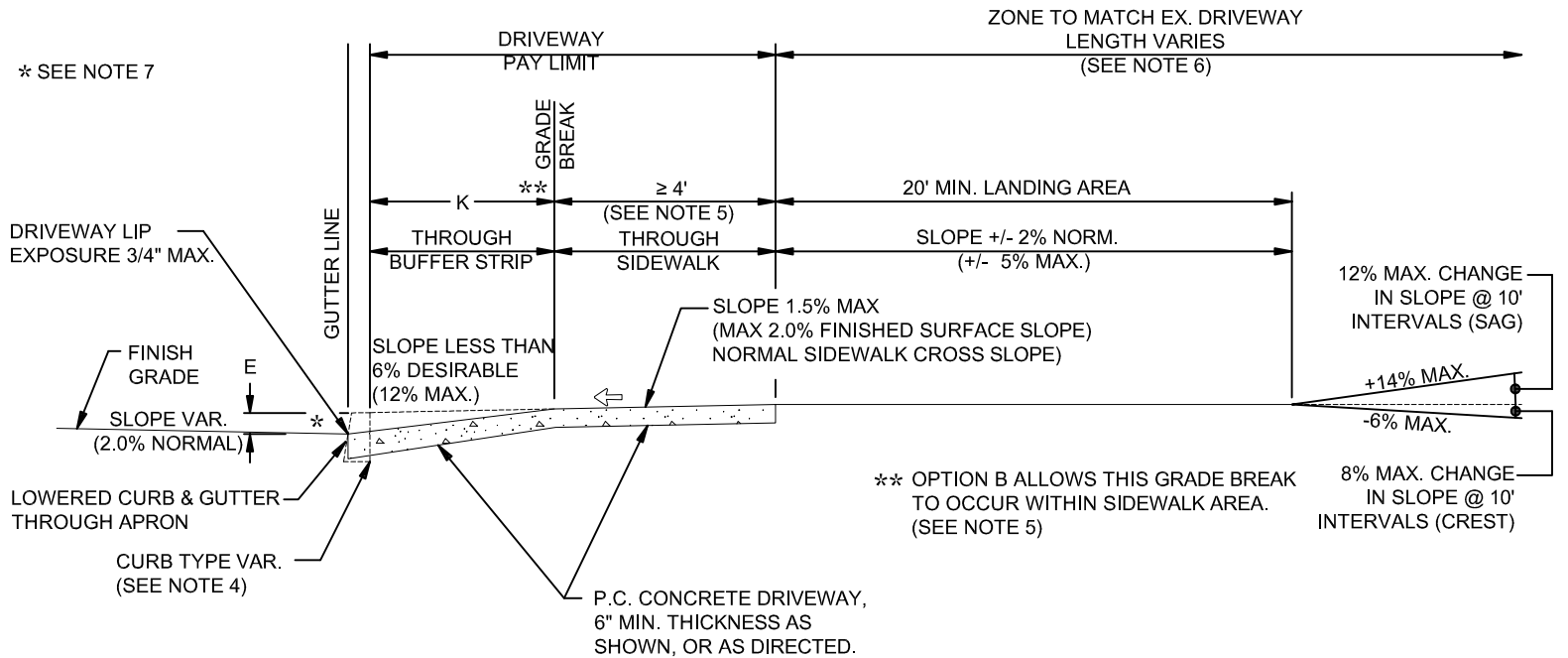
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### DRIVEWAY DETAIL (OPTIONS A & B)

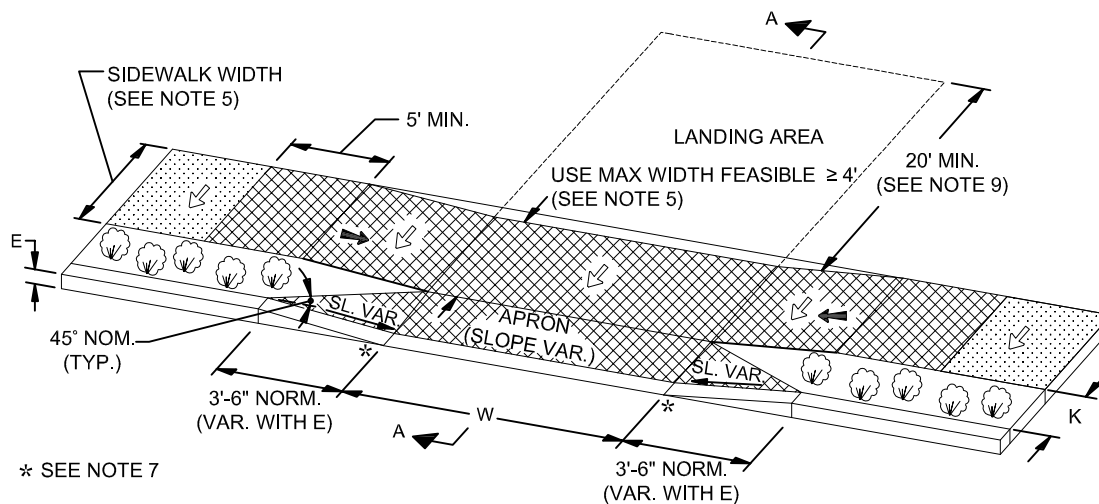
1 OF 5  
2019

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## SECTION A-A



## OPTION C LOWERED SIDEWALK



SIDEWALK

W WIDTH OF DRIVEWAY (VARIES)

DRIVEWAY PAY LIMIT (SEE PROJECT PLAN FOR DETAILS NOT SHOWN)

K BUFFER STRIP WIDTH (5' MIN.)

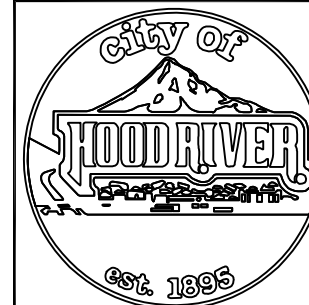
SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)

SLOPE 7.5% MAX. (MAX. 8.3% FINISHED SURFACE SLOPE)

### GENERAL NOTES:

1. NOTES FOR ALL DETAILS FOUND ON SHEET 1.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-07



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

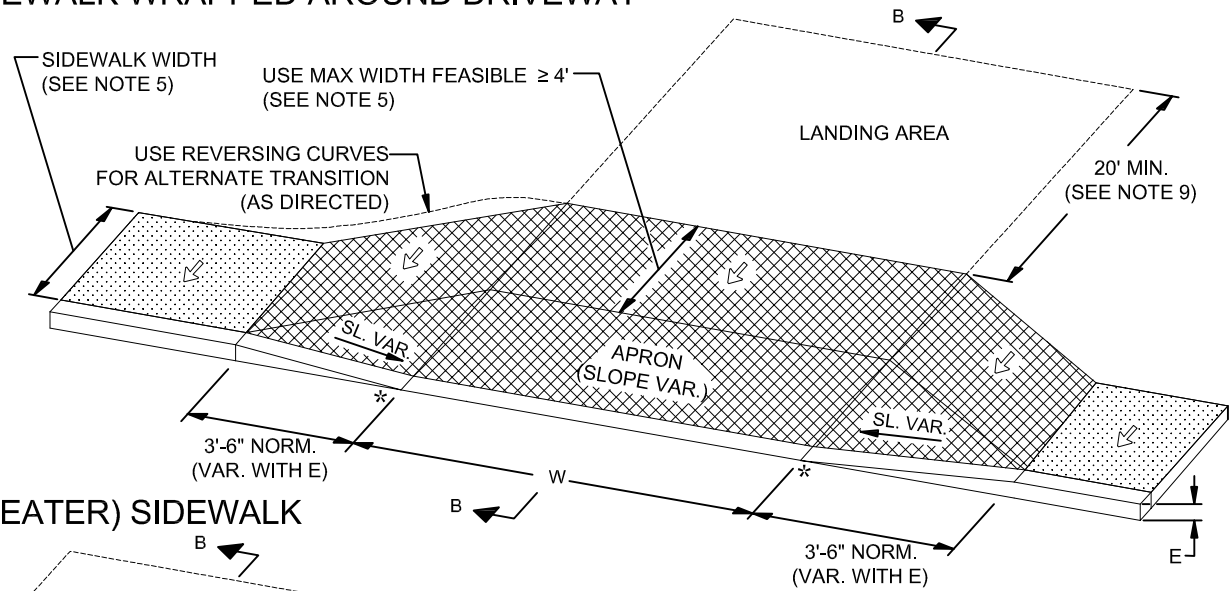
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## DRIVEWAY DETAIL (OPTION C)

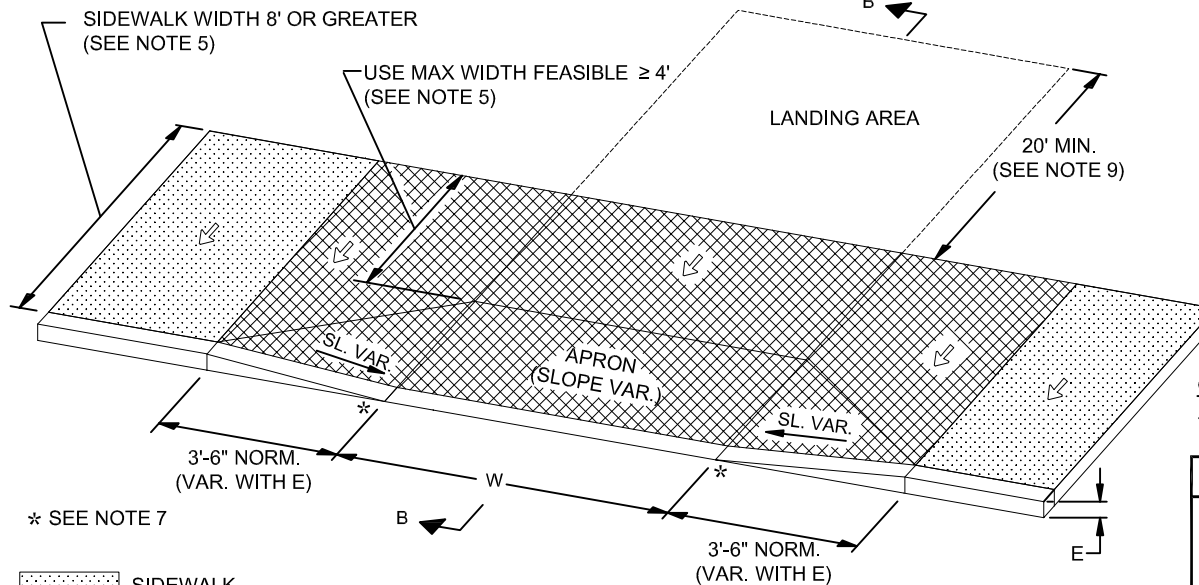
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2019

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## OPTION D SIDEWALK WRAPPED AROUND DRIVEWAY



## OPTION E DRIVEWAY IN WIDE (8' OR GREATER) SIDEWALK



\* SEE NOTE 7



SIDEWALK



DRIVEWAY PAY LIMIT (SEE PROJECT PLAN FOR DETAILS NOT SHOWN)



SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

W

WIDTH OF DRIVEWAY (VARIES)

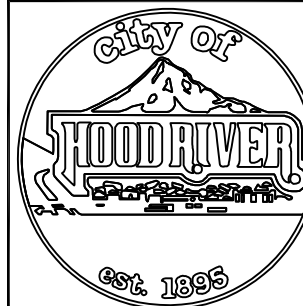
E

CURB EXPOSURE

### GENERAL NOTES:

1. NOTES FOR ALL DETAILS FOUND ON SHEET 1.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-07



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

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### DRIVEWAY DETAIL (OPTIONS D & E)

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2019

DATE	REVISIONS

Diagram illustrating the components and dimensions of a wheelchair ramp assembly:

- SIDEWALK WIDTH (SEE NOTE 5)**: Dimension for the sidewalk area.
- 5' MIN.**: Minimum dimension for the apron area.
- LANDING AREA**: The flat area at the top of the ramp.
- 20' MIN. (SEE NOTE 9)**: Minimum dimension for the landing area.
- USE MAX. WIDTH FEASIBLE  $\geq 4'$  (SEE NOTE 5)**: Requirement for the maximum width of the ramp.
- APRON (SLOPE VAR.)**: The sloped section of the ramp.
- SL. VAR.**: Slope variable, indicated by arrows on the apron.
- 45° NOM. (TYP.)**: Typical angle for the ramp.
- 3'-6" NORM. (VAR. WITH E)**: Normal dimension for the ramp, variable with the elevation (E).
- W**: Width of the ramp.
- B**: Depth of the ramp.
- 3'-6" NORM. (VAR. WITH E)**: Normal dimension for the ramp, variable with the elevation (E).
- ZONE TO MATCH EX. DRIVEWAY**: The area at the bottom of the ramp.
- E**: Elevation, indicated by an arrow.
- \* SEE NOTE 7**: Reference to Note 7 for additional information.

12% MAX. CHANGE  
IN SLOPE @ 10'  
INTERVALS (SAG)

+14% MAX.

-6% MAX.

8% MAX. CHANGE  
IN SLOPE @ 10'  
INTERVALS (CREST)

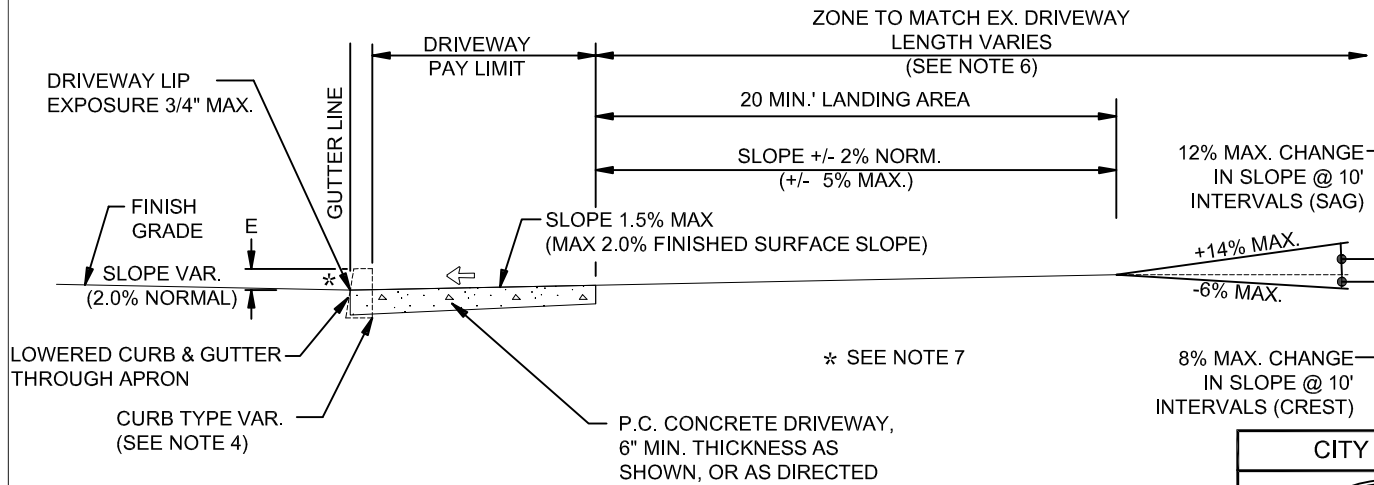
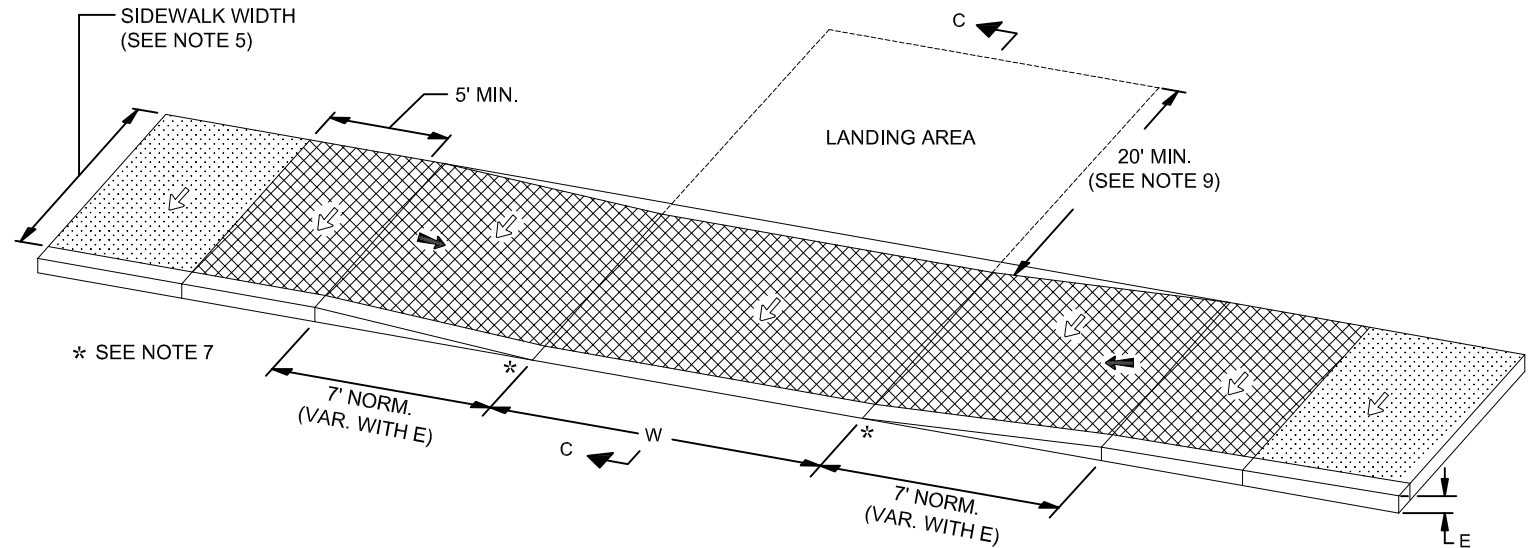
1. NOTES FOR ALL DETAILS  
FOUND ON SHEET 1.

← SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

DATE	REVISIONS

# OPTION G FULLY LOWERED SIDEWALK

## SECTION C-C



### GENERAL NOTES:

- NOTES FOR ALL DETAILS FOUND ON SHEET 1.

SIDEWALK

DRIVEWAY PAY LIMIT (SEE PROJECT PLAN FOR DETAILS NOT SHOWN)

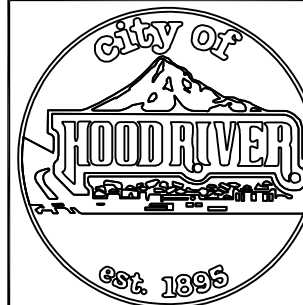
SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

W WIDTH OF DRIVEWAY

E CURB EXPOSURE

SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-07



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

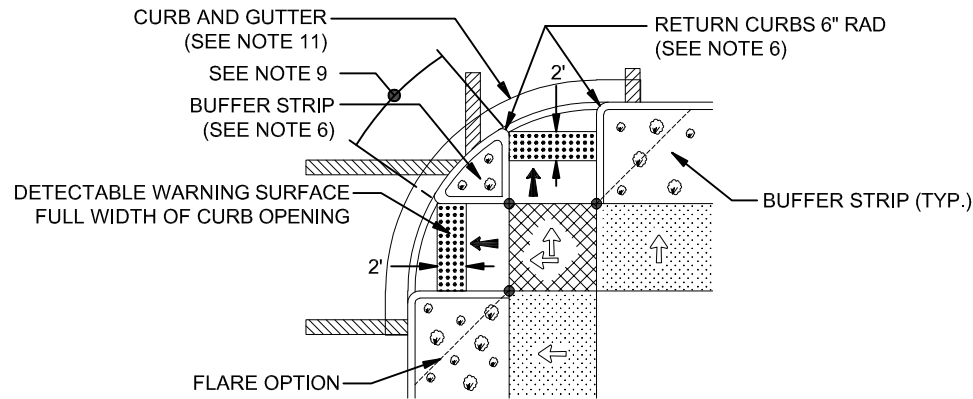
### DRIVEWAY DETAIL (OPTION G)

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2019

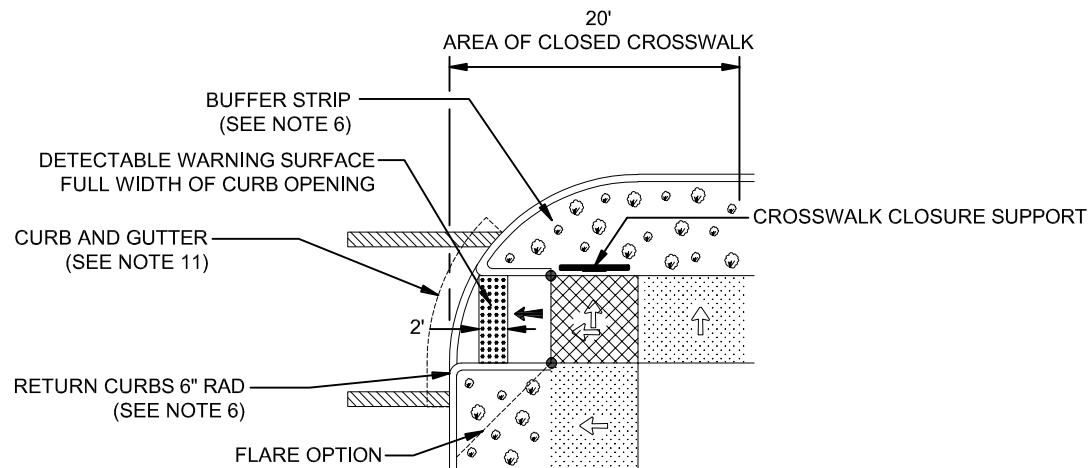
DATE	REVISIONS




## OPTION A CURB RAMPS WITH LANDSCAPED BUFFER STRIP




## OPTION A (WITH CROSSWALK CLOSURE) CURB RAMPS WITH LANDSCAPED BUFFER STRIP




 MARKED OR INTENDED CROSSING LOCATION

 SIDEWALK

 TURNING SPACE. MIN. LEVEL AREA 4.5' X 4.5' (4' X 4' MIN. FINISHED SURFACE). WHEN CONSTRAINED 4.5' X 5.5' (4' X 5' MIN. FINISHED SURFACE WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSE OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.

 DETECTABLE WARNING SURFACE

 SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

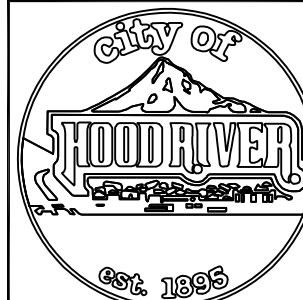
 SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

 ZERO CURB EXPOSURE

### NOTES FOR ALL DETAILS:

- CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
- TOOLED JOINTS ARE REQUIRED AT ALL CURB RAMP SLOPE BREAK LINES.
- CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
- PLACE DETECTABLE WARNING SURFACE AT THE BACK OF CURB FOR A MINIMUM OF 2' AT CURB RAMP THAT IS ADJACENT TO TRAFFIC. FOR DETAILS NOT SHOWN, SEE STD. DWG. DETECTABLE WARNING SURFACE.
- CHECK THE GUTTER FLOW DEPTH TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OR PERFORM OTHER APPROVED DESIGN MITIGATION.
- RETURN CURB MAY BE PROVIDED IN LIEU OF FLARED SLOPE IF PROTECTED FROM TRAVERSE BY LANDSCAPING OR FIXED BARRIER. RETURN CURB SHALL NOT REDUCE WIDTH OF APPROACHING SIDEWALK.
- FOR THE PURPOSE OF THIS DRAWING, A CURB RAMP IS CONSIDERED "PERPENDICULAR" IF THE ANGLE BETWEEN THE LONGITUDINAL AXIS OF THE CURB RAMP AND A LINE TANGENT TO THE CURB AT THE CURB RAMP CENTER IS 75° TO 90°.
- CURB RAMPS FOR PATHS INTERSECTING A ROADWAY SHOULD BE FULL WIDTH OF PATH, EXCLUDING FLARES. WHEN A CURB RAMP IS USED TO PROVIDE BICYCLE ACCESS FROM A ROADWAY TO A SIDEWALK, THE CURB RAMP SHOULD BE 8' WIDE.
- WHEN 2 CURB RAMPS ARE IMMEDIATELY ADJACENT. THE CURB EXPOSURE (E) BETWEEN THE ADJACENT SIDE FLARES MAY RANGE BETWEEN 3" AND FULL DESIGN EXPOSURE.
- GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES.
- CURB AND GUTTER IS REQUIRED AT CURB RAMPS.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-08



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

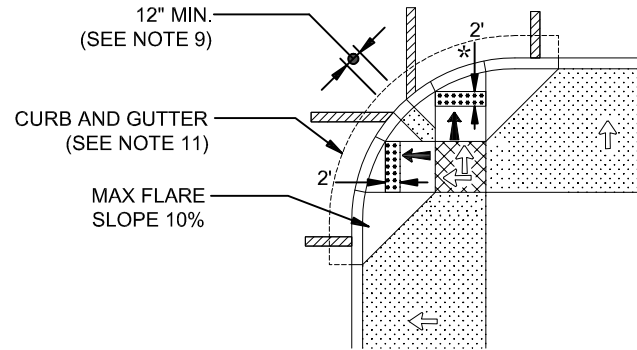
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### CURB RAMP PLACEMENT OPTION A, SMALL RADII

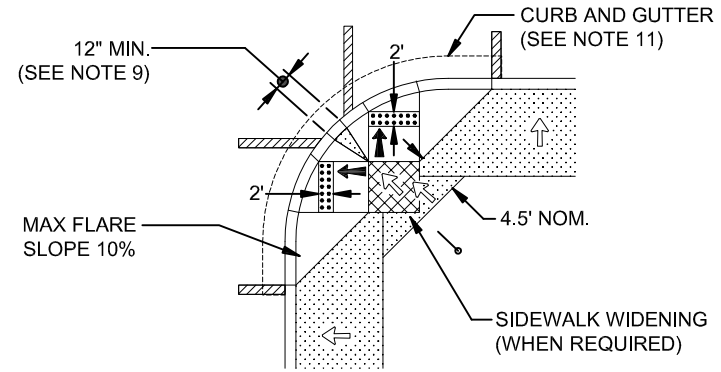
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2019

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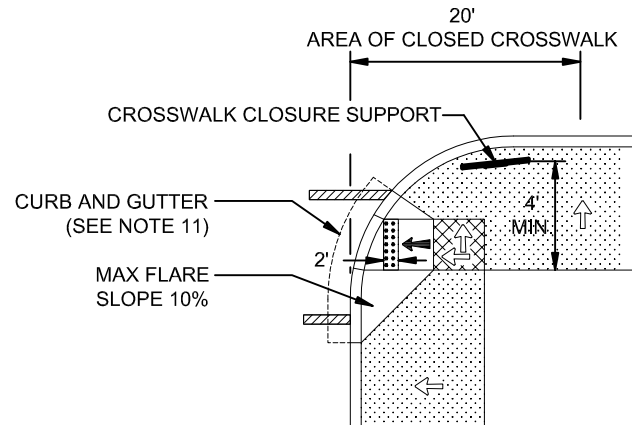
## OPTION B CURB RAMPS FOR WIDE SIDEWALKS



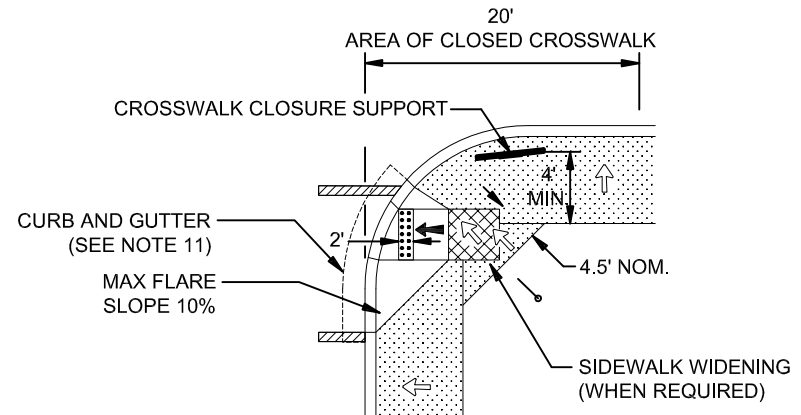
## OPTION C CURB RAMPS FOR NARROW SIDEWALKS




## OPTION B (WITH CROSSWALK CLOSURE) CURB RAMP FOR WIDE SIDEWALKS




## OPTION C (WITH CROSSWALK CLOSURE) CURB RAMPS FOR NARROW SIDEWALKS




 MARKED OR INTENDED CROSSING LOCATION

 SIDEWALK

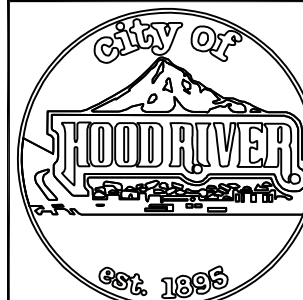
 TURNING SPACE. MIN. LEVEL AREA 4.5' X 4.5' (4' X 4' MIN. FINISHED SURFACE). WHEN CONSTRAINED 4.5' X 5.5' (4' X 5' MIN. FINISHED SURFACE WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSE OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.

 DETECTABLE WARNING SURFACE

 SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

 SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-08



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

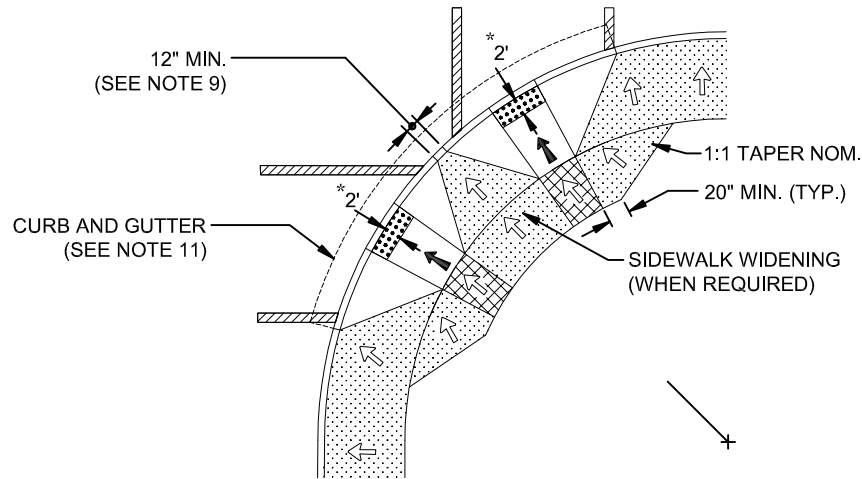
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## CURB RAMP PLACEMENT OPTION B&C, SMALL RADII

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2019

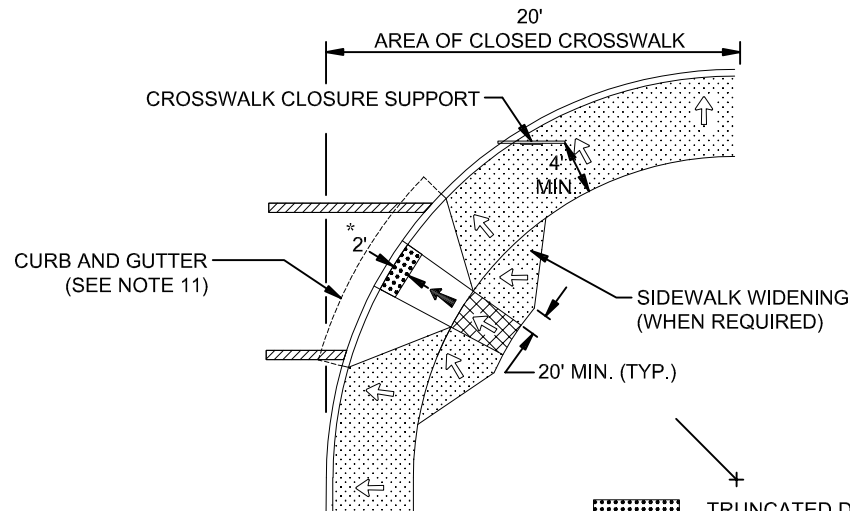
DATE	REVISIONS

## OPTION G CURB RAMPS FOR NARROW SIDEWALKS



## OPTION G (WITH CROSSWALK CLOSURE) CURB RAMPS FOR NARROW SIDEWALKS

(CURB RAMP WIDTH 4' MIN.)



MARKED OR INTENDED CROSSING LOCATION

SIDEWALK

TURNING SPACE. MIN. LEVEL AREA 4' X 4'. 4' X 5' WHEN CONSTRAINED (WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSE OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.



TRUNCATED DOME DETECTABLE WARNING SURFACE



SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)



SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

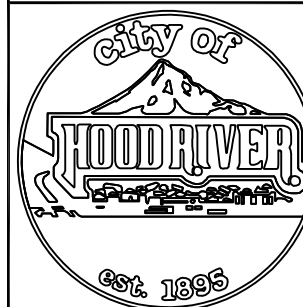


SEE NOTE 4

### NOTES FOR ALL DETAILS:

- CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
- TOOLED JOINTS ARE REQUIRED AT ALL CURB RAMP SLOPE BREAK LINES.
- CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
- PLACE DETECTABLE WARNING SURFACE AT THE BACK OF CURB FOR A MINIMUM OF 2' AT CURB RAMP THAT IS ADJACENT TO TRAFFIC. FOR DETAILS NOT SHOWN, SEE STD. DWG. DETECTABLE WARNING SURFACE.
- CHECK THE GUTTER FLOW DEPTH TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OR PERFORM OTHER APPROVED DESIGN MITIGATION.
- RETURN CURB MAY BE PROVIDED IN LIEU OF FLARED SLOPE IF PROTECTED FROM TRAVERSE BY LANDSCAPING OR FIXED BARRIER. RETURN CURB SHALL NOT REDUCE WIDTH OF APPROACHING SIDEWALK.
- FOR THE PURPOSE OF THIS DRAWING, A CURB RAMP IS CONSIDERED "PERPENDICULAR" IF THE ANGLE BETWEEN THE LONGITUDINAL AXIS OF THE CURB RAMP AND A LINE TANGENT TO THE CURB AT THE CURB RAMP CENTER IS 75° TO 90°.
- CURB RAMPS FOR PATHS INTERSECTING A ROADWAY SHOULD BE FULL WIDTH OF PATH, EXCLUDING FLARES. WHEN A CURB RAMP IS USED TO PROVIDE BICYCLE ACCESS FROM A ROADWAY TO A SIDEWALK, THE CURB RAMP SHOULD BE 8' WIDE.
- WHEN 2 CURB RAMPS ARE IMMEDIATELY ADJACENT. THE CURB EXPOSURE (E) BETWEEN THE ADJACENT SIDE FLARES MAY RANGE BETWEEN 3" AND FULL DESIGN EXPOSURE.
- GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES.
- CURB AND GUTTER IS REQUIRED AT CURB RAMPS.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-09



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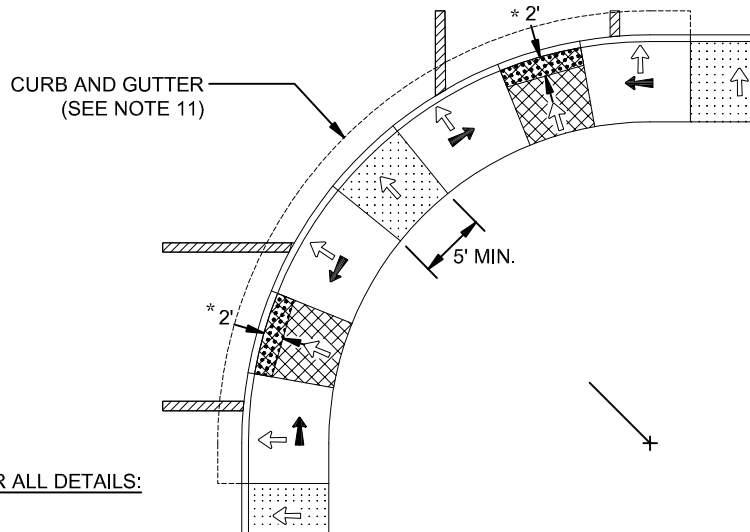
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### CURB RAMP PLACEMENT OPTION G, LARGE RADII

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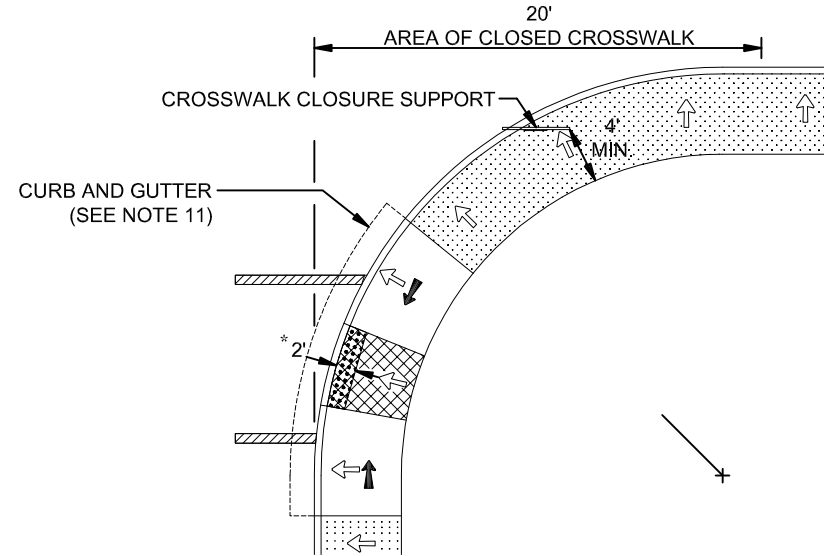
## OPTION H CURB RAMPS FOR NARROW SIDEWALKS



### NOTES FOR ALL DETAILS:

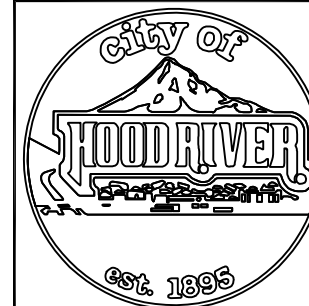
1. CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
2. TOOLED JOINTS ARE REQUIRED AT ALL CURB RAMP SLOPE BREAK LINES.
3. CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
4. PLACE DETECTABLE WARNING SURFACE AT THE BACK OF CURB FOR A MINIMUM OF 2' AT CURB RAMP THAT IS ADJACENT TO TRAFFIC. FOR DETAILS NOT SHOWN, SEE STD. DWG. DETECTABLE WARNING SURFACE.
5. CHECK THE GUTTER FLOW DEPTH TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OR PERFORM OTHER APPROVED DESIGN MITIGATION.
6. RETURN CURB MAY BE PROVIDED IN LIEU OF FLARED SLOPE IF PROTECTED FROM TRAVERSE BY LANDSCAPING OR FIXED BARRIER. RETURN CURB SHALL NOT REDUCE WIDTH OF APPROACHING SIDEWALK.
7. FOR THE PURPOSE OF THIS DRAWING, A CURB RAMP IS CONSIDERED "PERPENDICULAR" IF THE ANGLE BETWEEN THE LONGITUDINAL AXIS OF THE CURB RAMP AND A LINE TANGENT TO THE CURB AT THE CURB RAMP CENTER IS 75° TO 90°.
8. CURB RAMPS FOR PATHS INTERSECTING A ROADWAY SHOULD BE FULL WIDTH OF PATH, EXCLUDING FLARES. WHEN A CURB RAMP IS USED TO PROVIDE BICYCLE ACCESS FROM A ROADWAY TO A SIDEWALK, THE CURB RAMP SHOULD BE 8' WIDE.
9. WHEN 2 CURB RAMPS ARE IMMEDIATELY ADJACENT. THE CURB EXPOSURE (E) BETWEEN THE ADJACENT SIDE FLARES MAY RANGE BETWEEN 3" AND FULL DESIGN EXPOSURE.
10. GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES.
11. CURB AND GUTTER IS REQUIRED AT CURB RAMPS.

## OPTION H (WITH CROSSWALK CLOSURE) CURB RAMPS FOR NARROW SIDEWALKS



- MARKED OR INTENDED CROSSING LOCATION
- SIDEWALK
- TURNING SPACE. MIN. LEVEL AREA 4' X 4'. 4' X 5' WHEN CONSTRAINED (WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSE OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.
- TRUNCATED DOME DETECTABLE WARNING SURFACE
- SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
- SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE) \* SEE NOTE 4

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-09



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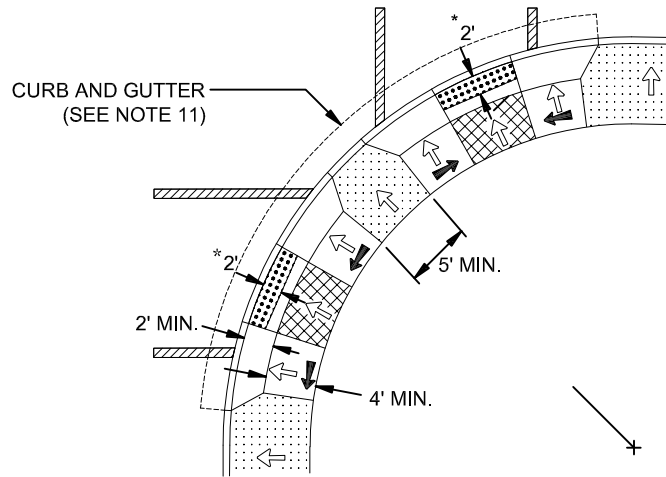
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### CURB RAMP PLACEMENT OPTION H, LARGE RADII

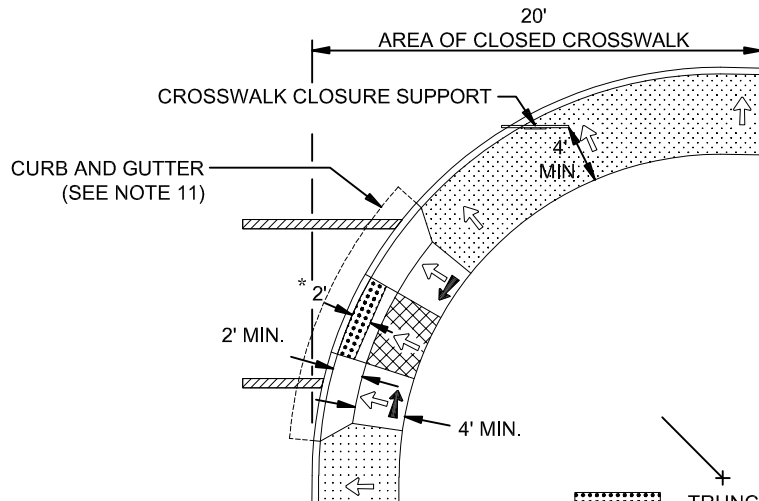
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

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


## OPTION I CURB RAMPS FOR WIDE SIDEWALKS



## OPTION I (WITH CROSSWALK CLOSURE) CURB RAMPS FOR WIDE SIDEWALKS



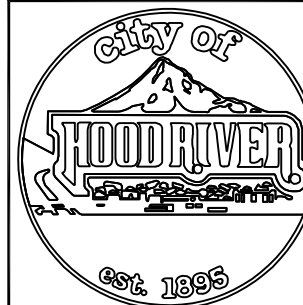
-  MARKED OR INTENDED CROSSING LOCATION
-  SIDEWALK
-  TURNING SPACE. MIN. LEVEL AREA 4' X 4'. 4' X 5' WHEN CONSTRAINED (WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSE OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.

-  TRUNCATED DOME DETECTABLE WARNING SURFACE
-  SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)
-  SLOPE 7.5% MAX. (MAX. 8.3% FINISHED SURFACE SLOPE)
-  SEE NOTE 4

### NOTES FOR ALL DETAILS:

1. CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
2. TOOLED JOINTS ARE REQUIRED AT ALL CURB RAMP SLOPE BREAK LINES.
3. CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
4. PLACE DETECTABLE WARNING SURFACE AT THE BACK OF CURB FOR A MINIMUM OF 2' AT CURB RAMP THAT IS ADJACENT TO TRAFFIC. FOR DETAILS NOT SHOWN, SEE STD. DWG. DETECTABLE WARNING SURFACE.
5. CHECK THE GUTTER FLOW DEPTH TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OR PERFORM OTHER APPROVED DESIGN MITIGATION.
6. RETURN CURB MAY BE PROVIDED IN LIEU OF FLARED SLOPE IF PROTECTED FROM TRAVERSE BY LANDSCAPING OR FIXED BARRIER. RETURN CURB SHALL NOT REDUCE WIDTH OF APPROACHING SIDEWALK.
7. FOR THE PURPOSE OF THIS DRAWING, A CURB RAMP IS CONSIDERED "PERPENDICULAR" IF THE ANGLE BETWEEN THE LONGITUDINAL AXIS OF THE CURB RAMP AND A LINE TANGENT TO THE CURB AT THE CURB RAMP CENTER IS 75° TO 90°.
8. CURB RAMPS FOR PATHS INTERSECTING A ROADWAY SHOULD BE FULL WIDTH OF PATH, EXCLUDING FLARES. WHEN A CURB RAMP IS USED TO PROVIDE BICYCLE ACCESS FROM A ROADWAY TO A SIDEWALK, THE CURB RAMP SHOULD BE 8' WIDE.
9. WHEN 2 CURB RAMPS ARE IMMEDIATELY ADJACENT. THE CURB EXPOSURE (E) BETWEEN THE ADJACENT SIDE FLARES MAY RANGE BETWEEN 3" AND FULL DESIGN EXPOSURE.
10. GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES.
11. CURB AND GUTTER IS REQUIRED AT CURB RAMPS.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-09



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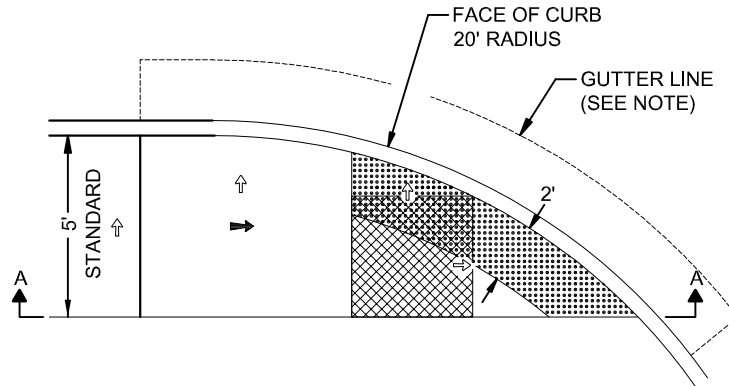
### CURB RAMP PLACEMENT OPTION I, LARGE RADII

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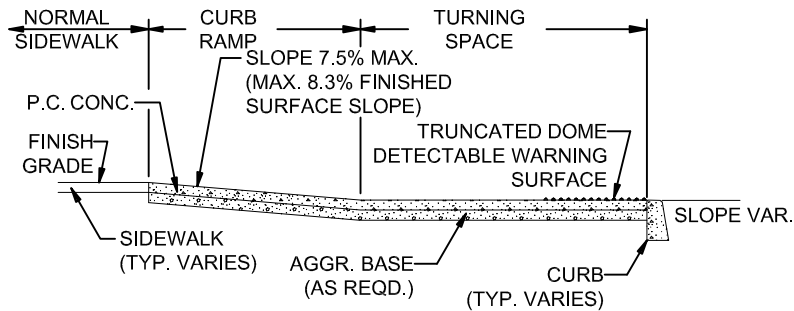
DATE	REVISIONS

## 20' CURB RADIUS

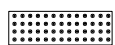
### PLAN



### SECTION A-A



TURNING SPACE. MIN. LEVEL AREA 4'X4'. 4'X5' WHEN CONSTRAINED (WITH LONGER DIMENSION IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSES OF THIS APPLICATION, A MAX. 2.05 FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.



DETECTABLE WARNING SURFACE

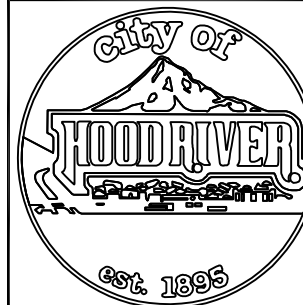
← SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)

← SLOPE 7.5% MAX. (MAX. 8.3% FINISHED SURFACE SLOPE)

#### NOTES FOR ALL DETAILS:

1. CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
2. SITE CONDITIONS NORMALLY REQUIRE A PROJECT SPECIFIC DESIGN WHICH CONSIDERS DESIGN VEHICLE TURNING MOVEMENTS, BICYCLE AND PEDESTRIAN CROSSING NEEDS, CURB ALIGNMENT, CURB EXPOSURE, GRADES, DRAINAGE, RIGHT-OF-WAY, STREET FURNITURE, ETC.
3. CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
4. P.C. CONCRETE SIDEWALK, CURB RAMP, AND TURNING SPACE MINIMUM THICKNESS IS 4".
5. ABOVE GRAPHICS ARE BASED ON SIDEWALK WITH STANDARD CURB (6" TOP, 6" EXPOSURE). CURB RADIUS IS MEASURED AT TOP FACE OF CURB.
6. CURB AND GUTTER IS REQUIRED AT CURB RAMPS.

#### CITY OF HOOD RIVER STANDARD DRAWINGS RD-10



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

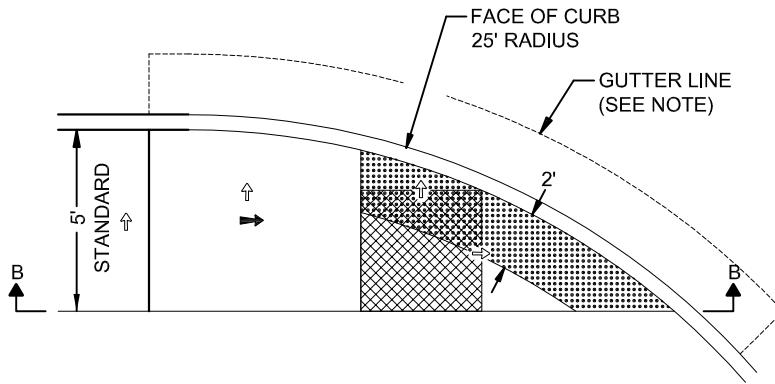
### CURB RAMP CROSSING 1 OF 2

2019

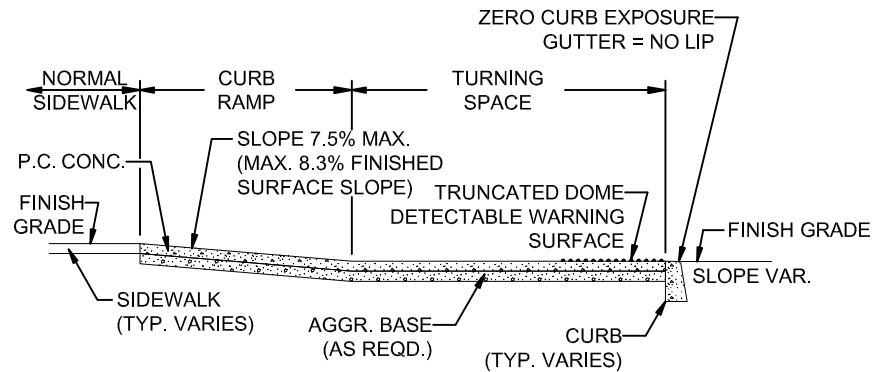
DATE	REVISIONS

## 25' CURB RADIUS

### PLAN

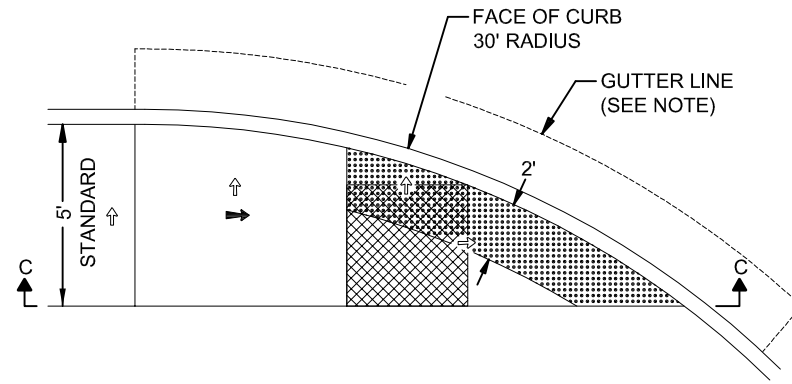


### SECTION B-B

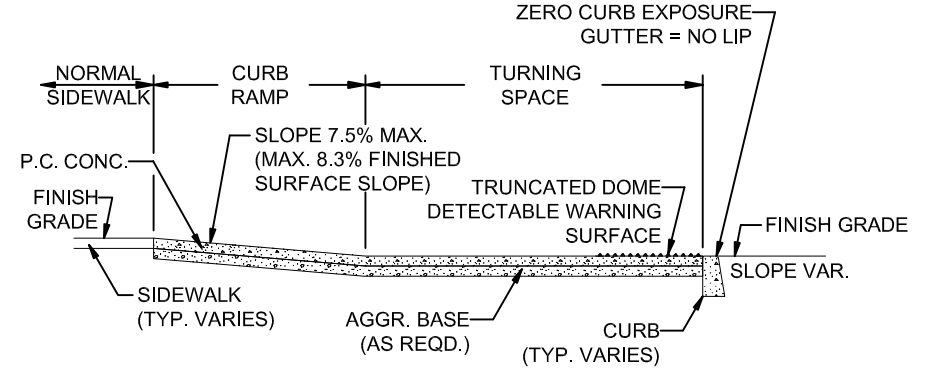


## 30' CURB RADIUS

### PLAN




### SECTION C-C





#### GENERAL NOTES:

#### 1. NOTES FOR ALL DETAILS FOUND ON SHEET 1.

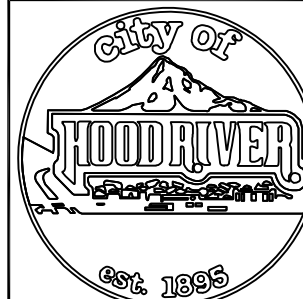
 TURNING SPACE. MIN. LEVEL AREA 4'X4'. 4'X5' WHEN CONSTRAINED (WITH LONGER DIMENSION IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSES OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.

 DETECTABLE WARNING SURFACE

 SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)

 SLOPE 7.5% MAX. (MAX. 8.3% FINISHED SURFACE SLOPE)

#### CITY OF HOOD RIVER STANDARD DRAWINGS RD-10



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NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

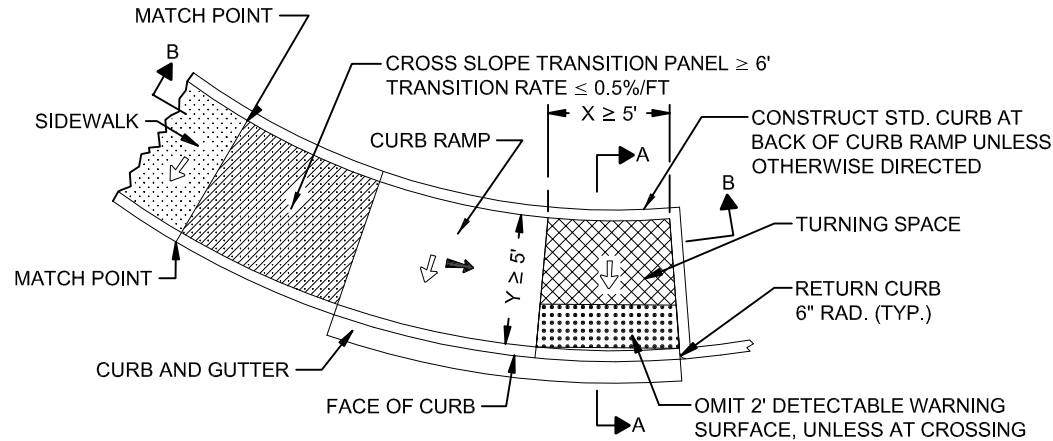
## CURB RAMP CROSSING 2 OF 2

2019

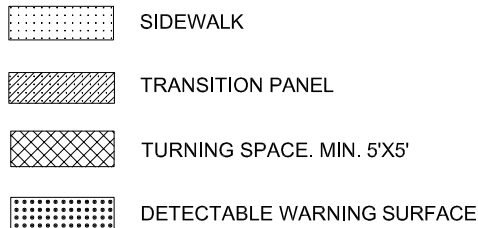
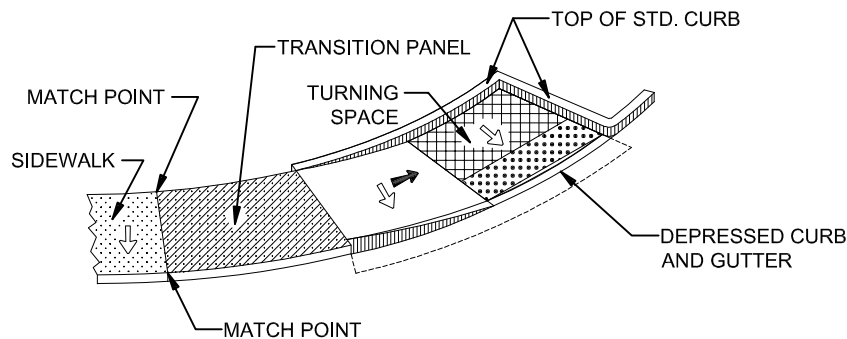
DATE	REVISIONS

# CURBED OPTION (END OF SIDEWALK)

## PLAN



## ISOMETRIC VIEW

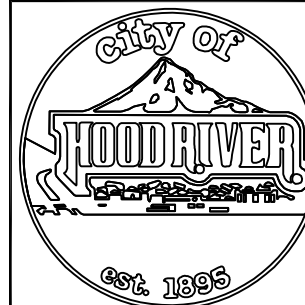


- ↖ SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
- ↙ SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)
- ↔ COUNTER SLOPE  
5% MAX. ASCENDING OR DESCENDING,  
SLOPE AS REQUIRED FOR DRAINAGE

### NOTES FOR ALL DETAILS:

1. CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
2. TOOLED JOINTS ARE REQUIRED AT ALL CURB RAMP SLOPE BREAK LINES.
3. CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
4. CHECK THE GUTTER FLOW DEPTH TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OR PERFORM OTHER APPROVED DESIGN MITIGATION.
5. WHEN A SHARED USE PATH TERMINATES, THE CURB RAMP SHALL BE THE FULL WIDTH OF THE PATH AND GENERALLY USE TAPER OR SHOULDER OPTION. IF CURBED OPTION IS USED, THE TURNING SPACE X-DIMENSION SHOULD BE MIN. 8' WIDE TO ENABLE BICYCLES TO RIDE FROM RAMP TO SHOULDER.
6. GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES. SURFACE SLOPES THAT MEET AT GRADE BREAKS SHALL BE FLUSH.
7. ALL END OF SIDEWALK OPTIONS CAN BE USED FOR CURVED OR TANGENT ROADWAY SECTIONS.
8. WHEN THE SLOPE OF THE TRANSITION AREA IS GREATER THAN 5.0%, A 4'X5' LANDING SPACE WITH MAX. 1.5% SLOPE IS REQUIRED AT THE TOP OF THE RAMP. SEE SECTION C-C.
9. CURB AND GUTTER IS REQUIRED AT CURB RAMPS.
10. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-11



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### CURB RAMP & TURNING SPACE END OF SIDEWALK 1 OF 3

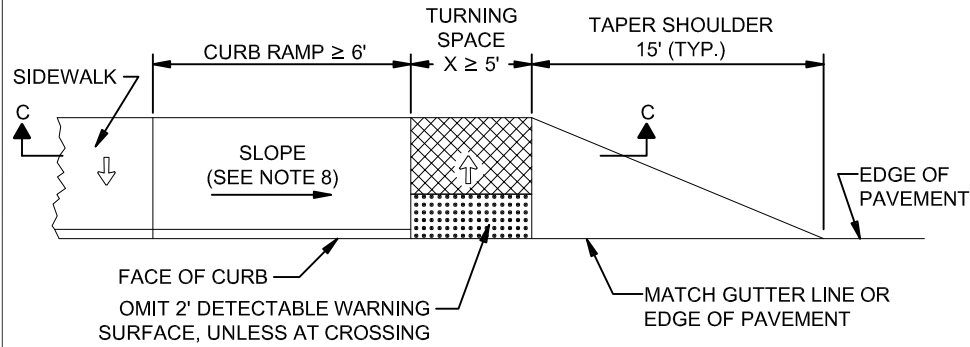
2019

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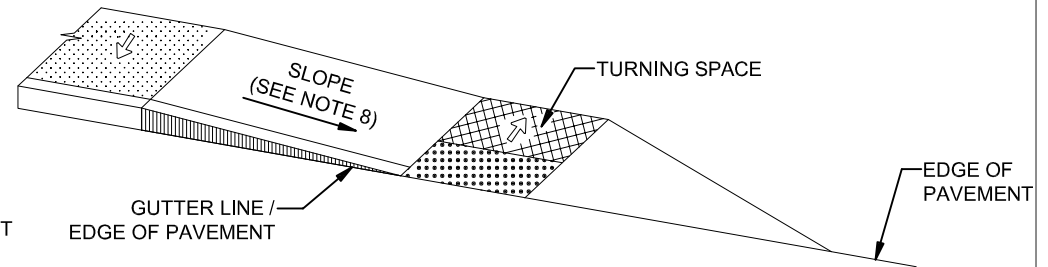


## TAPER OPTION (END OF SIDEWALK)

PLAN

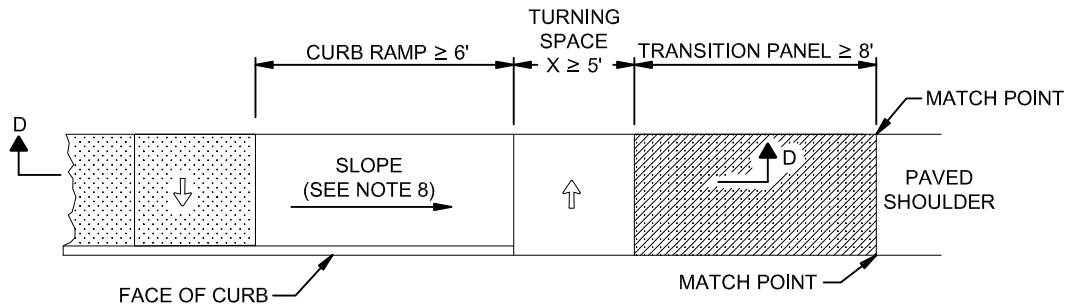


ISOMETRIC VIEW

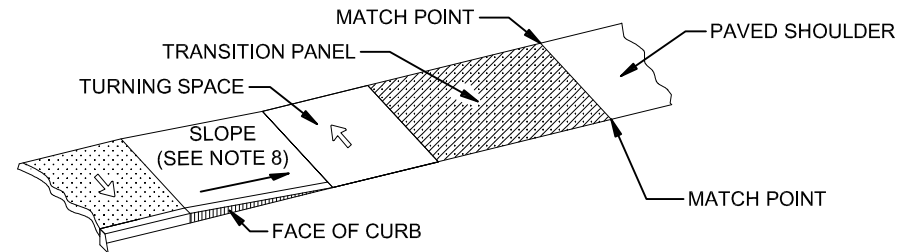



## SHOULDER OPTION (END OF SIDEWALK)




PLAN



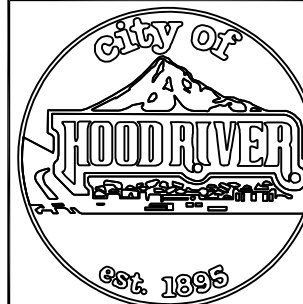
ISOMETRIC VIEW



-  SIDEWALK
-  TRANSITION PANEL
-  TURNING SPACE. MIN. 5'X5'
-  DETECTABLE WARNING SURFACE

-  SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
-  SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)
-  COUNTER SLOPE  
5% MAX. ASCENDING OR DESCENDING,  
SLOPE AS REQUIRED FOR DRAINAGE

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-11



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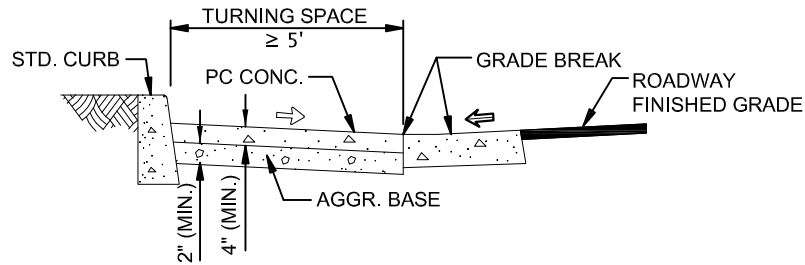
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### CURB RAMP & TURNING SPACE END OF SIDEWALK 2 OF 3

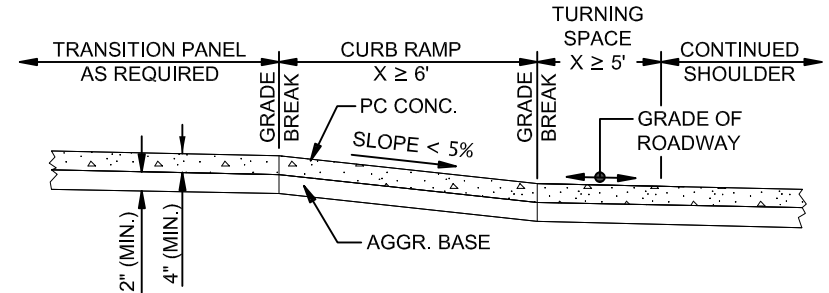
2019

DATE	REVISIONS

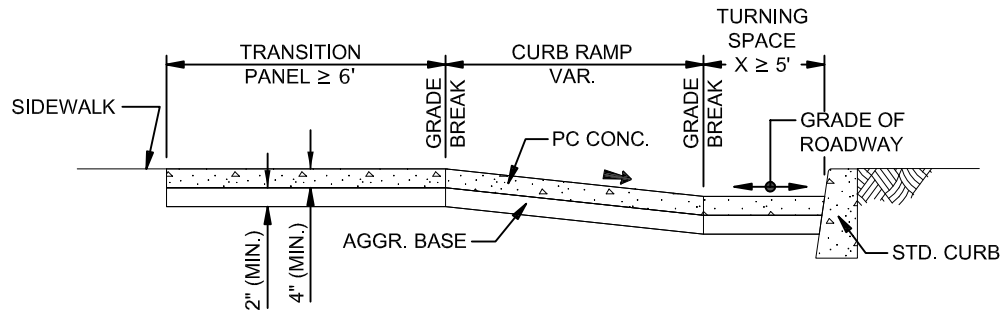
## SECTION A-A



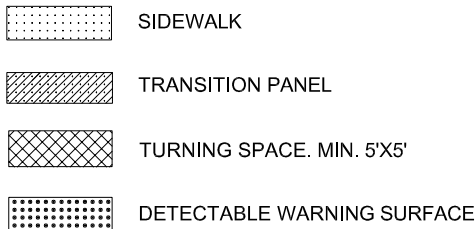
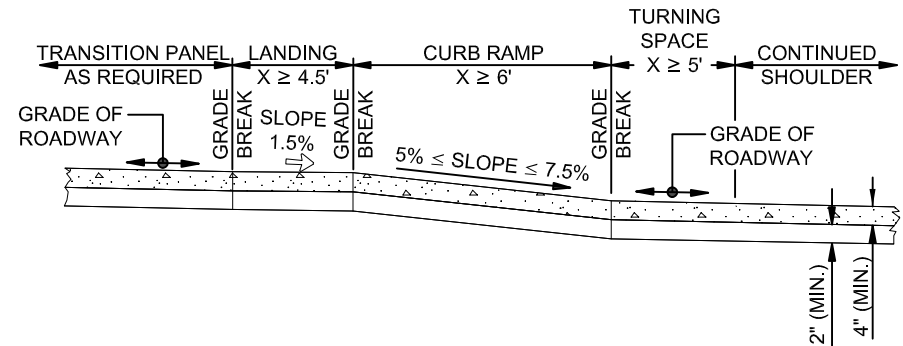
## SECTION C-C



## SECTION B-B

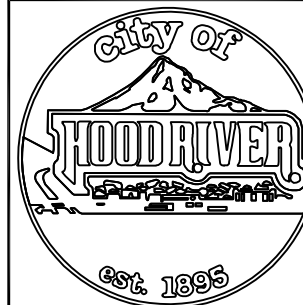


## SECTION C-C



- SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
- SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)
- COUNTER SLOPE  
5% MAX. ASCENDING OR DESCENDING,  
SLOPE AS REQUIRED FOR DRAINAGE

## CITY OF HOOD RIVER STANDARD DRAWINGS RD-11



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

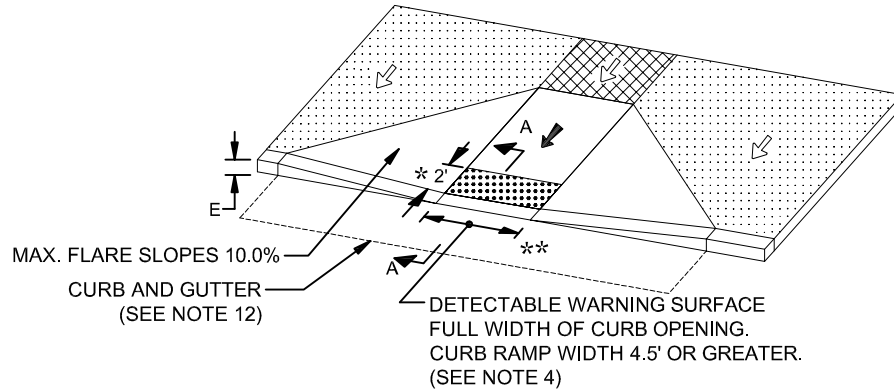
## CURB RAMP & TURNING SPACE END OF SIDEWALK 3 OF 3

2019

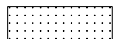
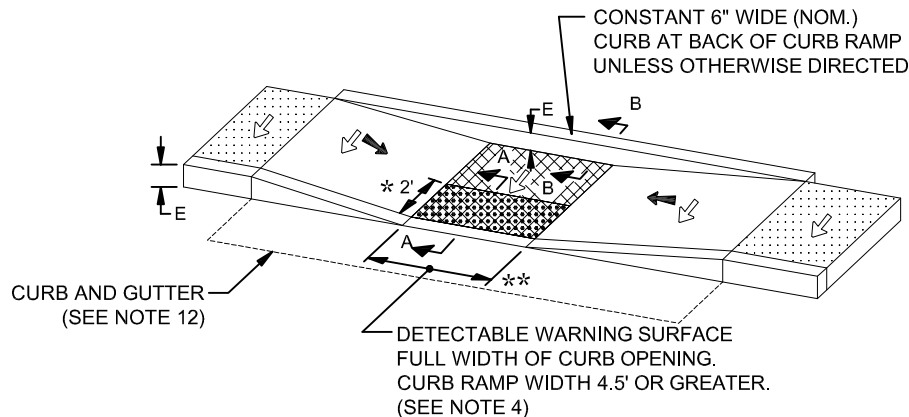
DATE	REVISIONS

## PERPENDICULAR CURB RAMP DETAIL

USE "PARALLEL CURB RAMP DETAIL" OR "COMBINATION CURB RAMP DETAIL" WHEN REQD. TURNING SPACE CANNOT BE OBTAINED)



## PARALLEL CURB RAMP DETAIL



SIDEWALK



TURNING SPACE. MIN. LEVEL AREA 4'X4'  
4'X5' WHEN CONSTRAINED (WITH LONGER DIMENSIONS IN  
DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE  
PURPOSES OF THIS APPLICATION, A MAX. 2.0% FINISHED  
SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.



TRUNCATED DOME DETECTABLE  
WARNING SURFACE



SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)



SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

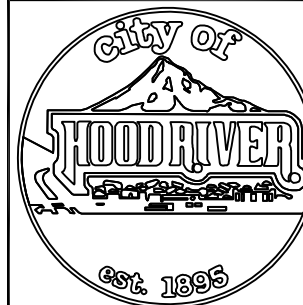
\* SEE NOTE 4

\*\* SEE NOTE 9

### NOTES FOR ALL DETAILS:

- CURB RAMP DETAILS ARE BASED ON ODOT STANDARDS.
- TOOLED JOINTS ARE REQUIRED AT ALL CURB RAMP SLOPE BREAK LINES.
- CURB RAMP SLOPES SHOWN ARE RELATIVE TO THE TRUE LEVEL HORIZON (ZERO BUBBLE).
- PLACE DETECTABLE WARNING SURFACE AT THE BACK OF CURB FOR A DEPTH OF 2' AT CURB RAMP THAT IS ADJACENT TO TRAFFIC. FOR DETAILS NOT SHOWN, SEE DETECTABLE WARNING SURFACE STD. DWG.
- GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES. SURFACE SLOPES THAT MEET AT GRADE BREAKS SHALL BE FLUSH.
- RETURN CURB MAY BE PROVIDED IN LIEU OF FLARED SLOPE ONLY IF PROTECTED FROM TRAVERSE BY LANDSCAPING OR FIXED BARRIER. RETURN CURB SHALL NOT REDUCE WIDTH OF APPROACHING SIDEWALK.
- FOR THE PURPOSE OF THIS DRAWING, A CURB RAMP IS CONSIDERED "PERPENDICULAR" IF THE ANGLE BETWEEN THE LONGITUDINAL AXIS OF THE CURB RAMP AND A LINE TANGENT TO THE CURB AT THE CURB RAMP CENTER IS 75° TO 90°.
- CURB RAMP FOR PATHS INTERSECTING A ROADWAY SHOULD BE FULL WIDTH OF PATH, EXCLUDING FLARES. WHEN A CURB RAMP IS USED TO PROVIDE BICYCLE ACCESS FROM A ROADWAY TO A SIDEWALK, THE CURB RAMP SHOULD BE 8' WIDE.
- CHECK THE GUTTER FLOW DEPTH AT CURB RAMP LOCATIONS TO ASSURE THAT THE DESIGN FLOOD DOES NOT OVERTOP THE BACK OF SIDEWALK AT CURB RAMP. IF OVERTOPPING OCCURS PLACE AN INLET AT UPSTREAM SIDE OF CURB RAMP OR PERFORM OTHER APPROVED DESIGN MITIGATION.
- SITE CONDITIONS NORMALLY REQUIRE A PROJECT SPECIFIC DESIGN. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.
- CURB AND GUTTER IS REQUIRED AT CURB RAMP.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-12



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

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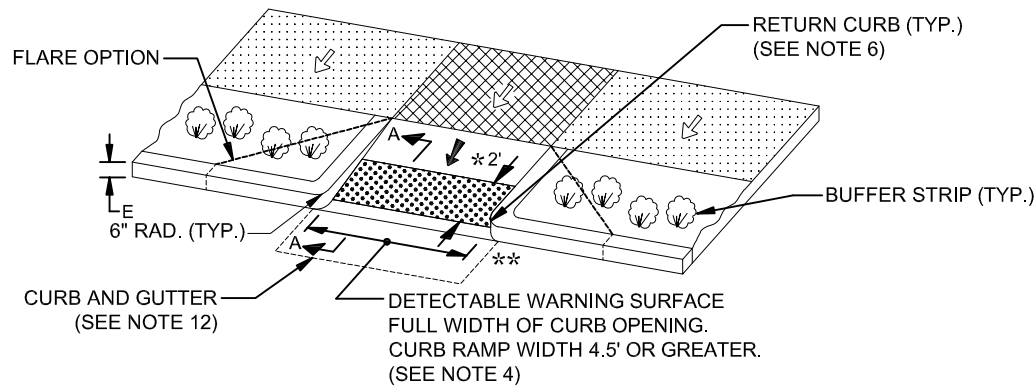
## CURB RAMP DETAILS

1 OF 2

2019

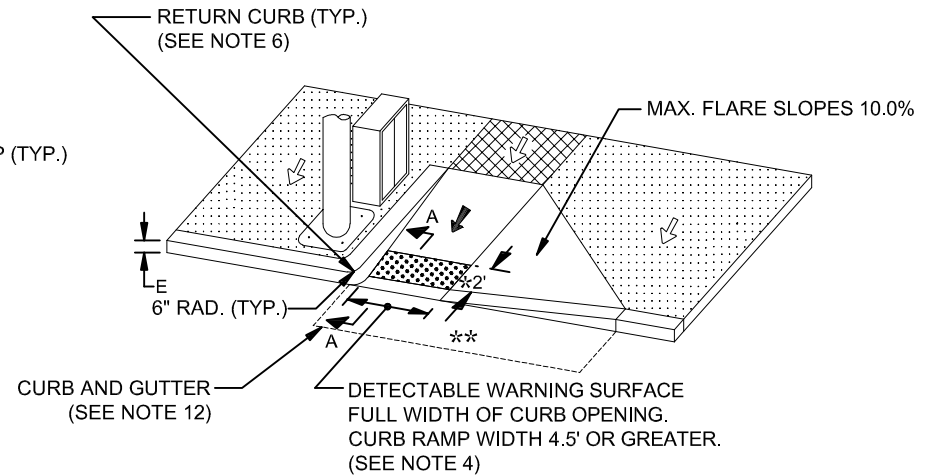
DATE	REVISIONS

## PERPENDICULAR CURB RAMP DETAIL (THROUGH BUFFER STRIP)

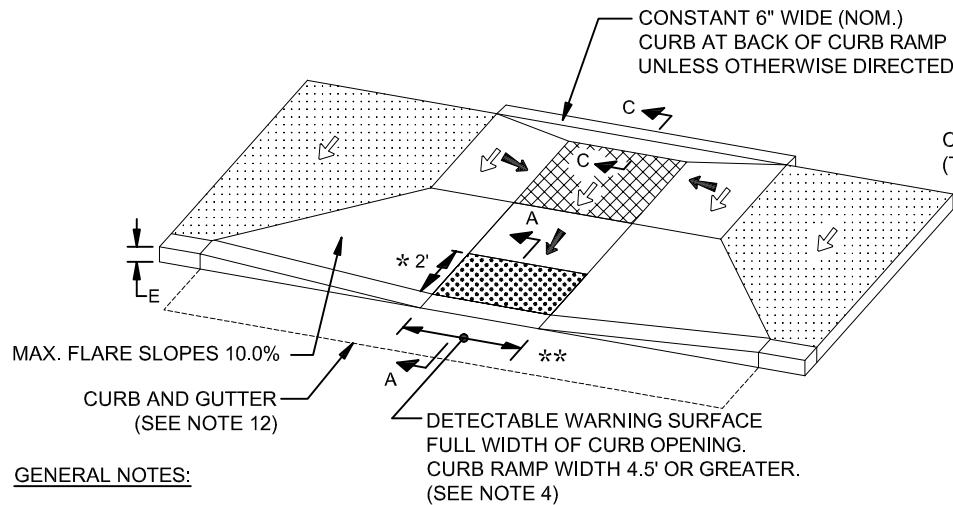


## PERPENDICULAR CURB RAMP DETAIL (WITH SINGLE FLARE)

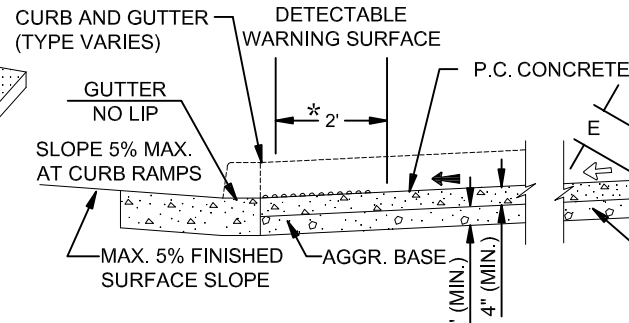
USE "PARALLEL CURB RAMP DETAIL" OR "COMBINATION CURB RAMP DETAIL" WHEN REQD. TURNING SPACE CANNOT BE OBTAINED)



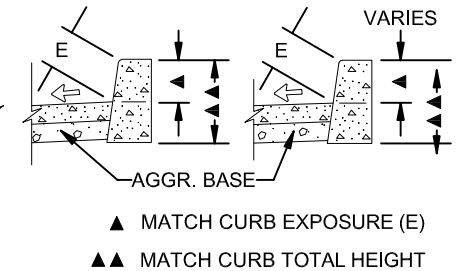
## COMBINATION CURB RAMP DETAIL



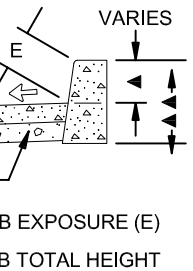
### SECTION A-A



### SECTION B-B

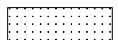


### SECTION C-C



### GENERAL NOTES:

#### 1. NOTES FOR ALL DETAILS FOUND ON SHEET 1.



SIDEWALK



TURNING SPACE. MIN. LEVEL AREA 4'X4' 4'X5' WHEN CONSTRAINED (WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSES OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.



TRUNCATED DOME DETECTABLE WARNING SURFACE



SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

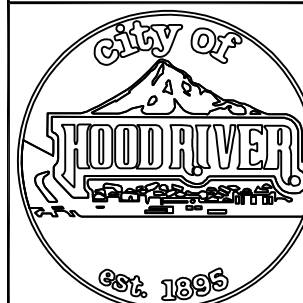


SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

\* SEE NOTE 4

\*\* SEE NOTE 9

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-12



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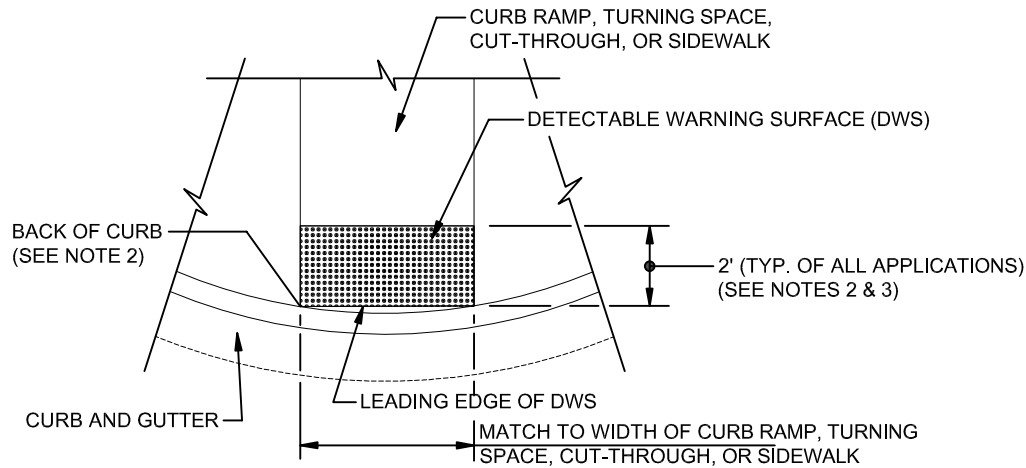
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## CURB RAMP DETAILS 2 OF 2

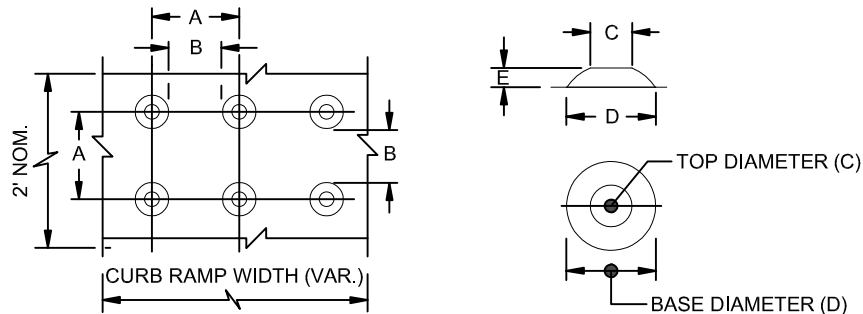
2019

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## DETECTABLE WARNING SURFACE DETAIL



## TRUNCATED DOME DETAILS



	A	B	C	D	E
MIN.	1.60"	0.65"	0.45"	0.90"	0.20"
MAX.	2.40"	0.65"	0.91"	1.40"	0.20"

 SIDEWALK

 DETECTABLE WARNING SURFACE

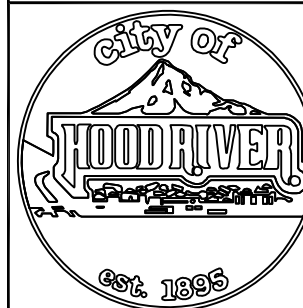
↖ SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

← SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

### NOTES FOR ALL DETAILS:

- DETECTABLE WARNING SURFACE DETAILS & LOCATIONS ARE BASED ON ODOT STANDARDS.
- THE DETECTABLE WARNING SURFACE SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP, OR OTHER ROADWAY ENTRANCE AS APPLICABLE. A GAP OF UP TO 2" ON EACH SIDE OF THE DETECTABLE WARNING SURFACE IS PERMITTED (MEASURED AT THE LEADING CORNERS OF THE DETECTABLE WARNING SURFACE PANEL).
- DETECTABLE WARNING SURFACE SHALL BE PLACED AT THE BACK OF CURB A MIN. DEPTH OF 2' AT CURB RAMPS THAT ARE ADJACENT TO TRAFFIC. DETECTABLE WARNING SURFACE MAY BE RADIAL OR RECTANGULAR, BUT MUST COMPLY WITH THE TRUNCATED DOME SIZE AND SPACING STANDARDS. DETECTABLE WARNING SURFACE MAY BE CUT TO MEET NECESSARY SHAPE AS SHOWN IN PLANS. COLOR TO BE SAFETY YELLOW IF NO COLOR IS SPECIFIED IN CONSTRUCTION NOTE.
- DETECTABLE WARNING SURFACE SHALL BE USED IN THE FOLLOWING LOCATIONS:  
A) CURB RAMPS      B) CROSSING ISLANDS      C) RAIL CROSSINGS
- DETECTABLE WARNING SURFACE SHALL NOT BE USED IN THE FOLLOWING LOCATIONS:  
A) END OF SIDEWALK TRANSITIONS THAT ARE NOT A CROSSWALK  
B) DRIVEWAYS, UNLESS CONSTRUCTED WITH CURB RETURN  
C) PARKING LOTS
- GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF RAMP RUNS AND TURNING SPACES. SURFACE SLOPES THAT MEET AT GRADE BREAKS SHALL BE FLUSH.
- DETECTABLE WARNING SURFACES SHALL BE SEPARATED BY A 2 FT. MIN. LENGTH OF WALKWAY WITHOUT DETECTABLE WARNINGS. WHERE NO CURB IS PRESENT, THE DETECTABLE WARNING SURFACE SHALL BE PLACED AT THE EDGE OF ROADWAY.
- DETECTABLE WARNING SURFACE PLACEMENT FOR PERPENDICULAR RAMPS VARY AS SHOWN.
- CURB AND GUTTER IS REQUIRED AT CURB RAMPS.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-13



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

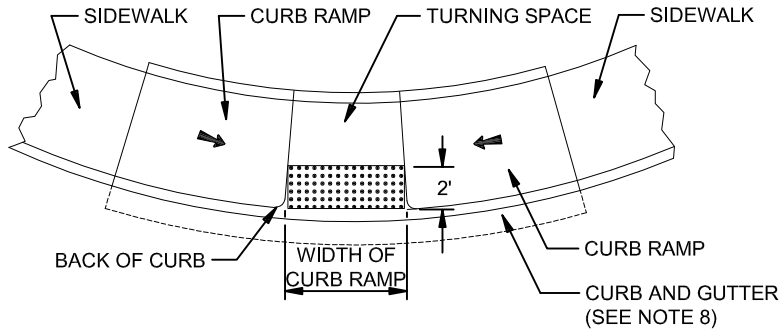
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## DETECTABLE WARNING SURFACE DETAILS

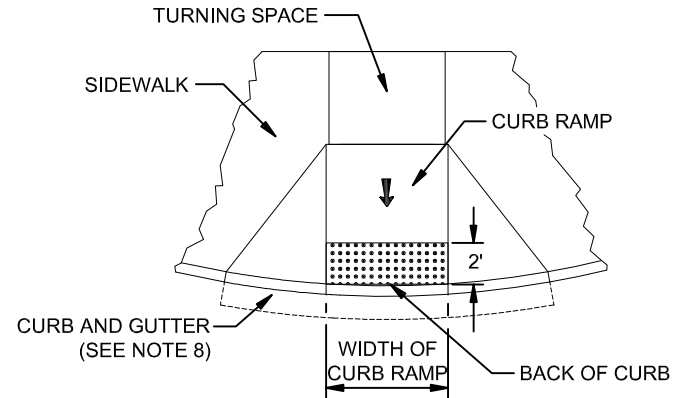
1 OF 3  
2019

DATE	REVISIONS

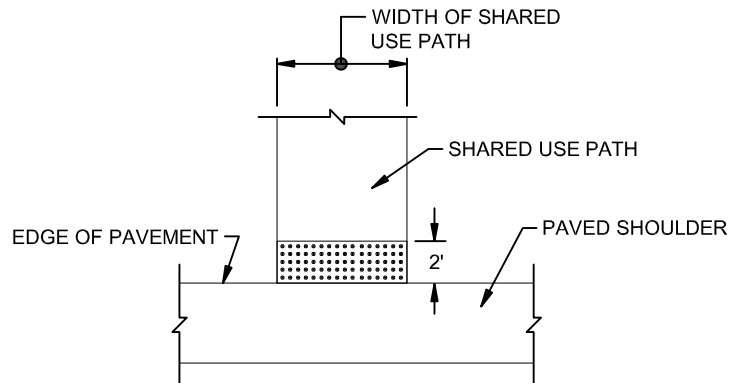
## PARALLEL CURB RAMP



## PERPENDICULAR CURB RAMP



## SHARED-USE PATH CONNECTION



 SIDEWALK

 DETECTABLE WARNING SURFACE

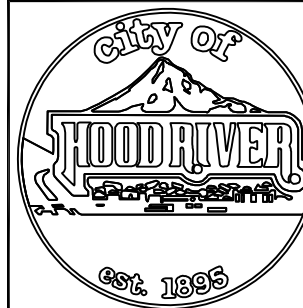
← SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)

← SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

### GENERAL NOTES:

1. NOTES FOR ALL DETAILS FOUND ON SHEET 1.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-13



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

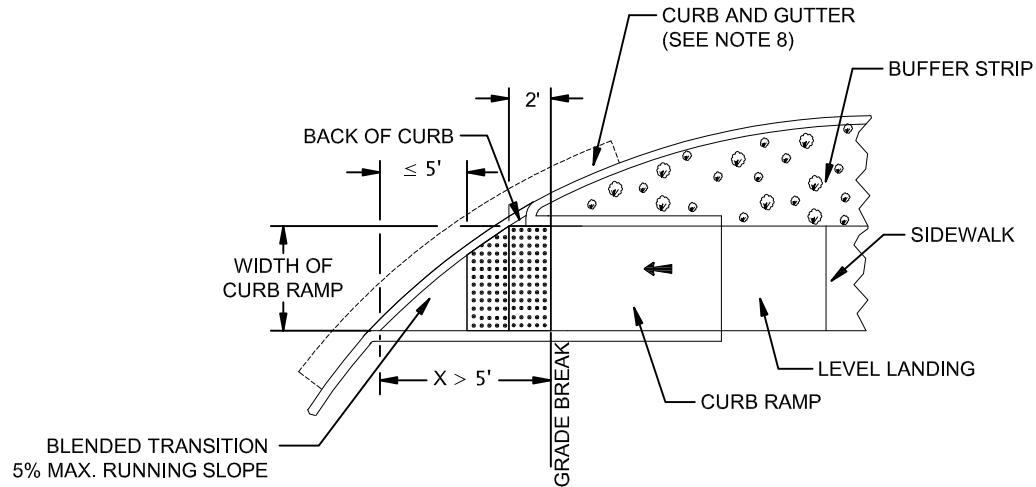
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## DETECTABLE WARNING SURFACE DETAILS

2 OF 3  
2019

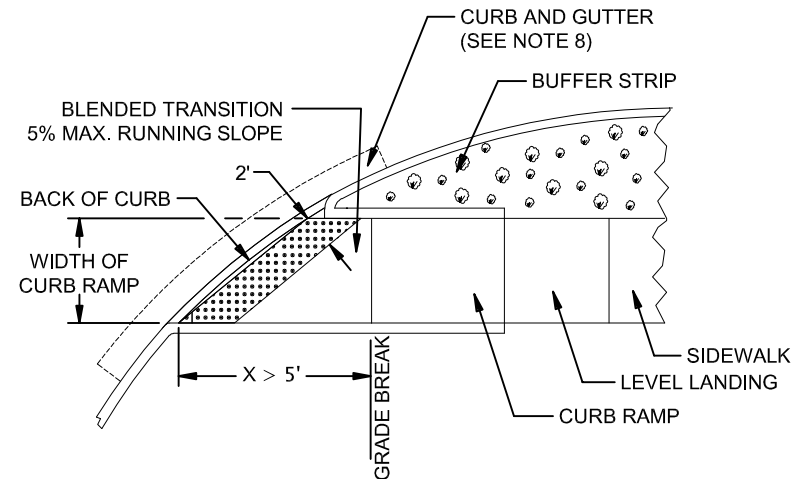
DATE	REVISIONS

## CURB RAMP CROSSING GRADE BREAK > 5 FT. FROM BACK OF CURB (OPTION 1)



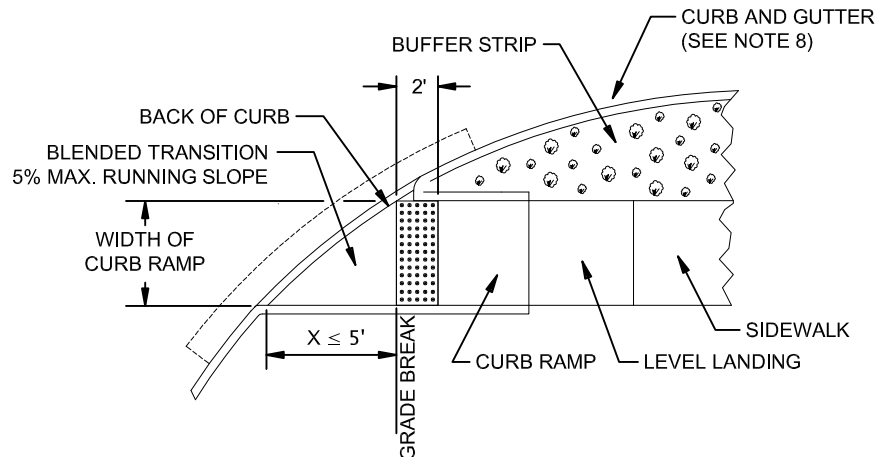
NOTE: DETECTABLE WARNING SURFACE SHALL BE PLACED IN AREA FROM CURB RAMP GRADE BREAK TO WITHIN 5' OF CURB

## CURB RAMP CROSSING GRADE BREAK > 5 FT. FROM BACK OF CURB

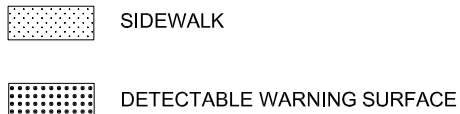


NOTE: DETECTABLE WARNING SURFACE SHALL BE PLACED IN THE LOWER 2' OF THE BLENDED TRANSITION THAT IS ADJACENT TO TRAFFIC.

## CURB RAMP CROSSING GRADE BREAK ≤ 5 FT. FROM BACK OF CURB



NOTE: DETECTABLE WARNING SURFACE SHALL BE PLACED ON THE BOTTOM OF THE CURB RAMP DIRECTLY ABOVE THE GRADE BREAK

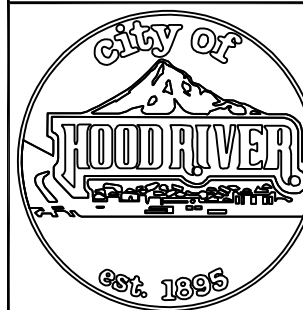


- ← SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
- SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)

### GENERAL NOTES:

1. NOTES FOR ALL DETAILS FOUND ON SHEET 1.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-13



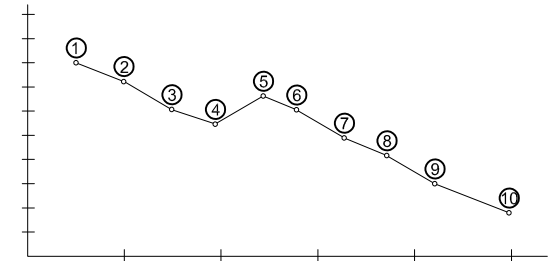
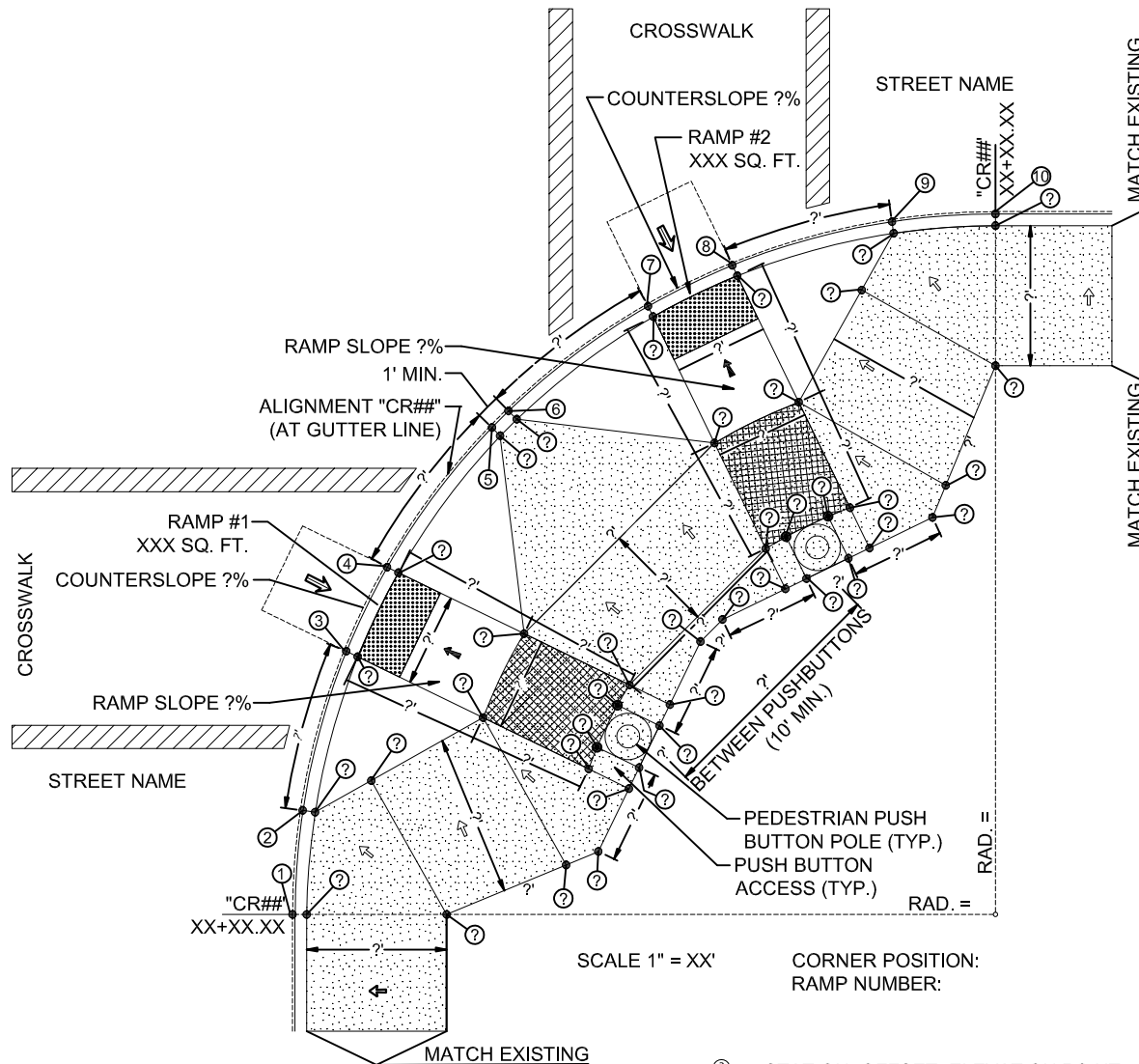
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

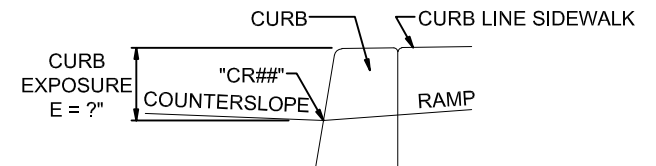
### DETECTABLE WARNING SURFACE DETAILS

3 OF 3  
2019

DATE	REVISIONS



PROFILE (OPTIONAL)



CURB DETAIL

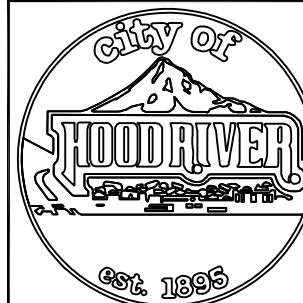
NOTES FOR ALL DETAILS:

1. THIS DRAWING IS INTENDED AS A GUIDE. MODIFY FOR PROJECT REQUIREMENTS.
2. SLOPES HOLD OVER ELEVATIONS.
3. MAX. CROSS SLOPE CHANGE ON RAMP 0.5% PER FOOT.
4. SEE STANDARD DRAWINGS FOR DETAILS NOT SHOWN.
5. SEE SHEETxxx FOR CURB DETAIL (USE OTHER DETAIL SHEETS WHEN CURB DETAIL IS SAME.

- MARKED OR INTENDED CROSSING LOCATION
- SIDEWALK
- TURNING SPACE. MIN. LEVEL AREA 4'X4'. 4'X5' WHEN CONSTRAINED (WITH LONGER DIMENSION IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSES OF THIS APPLICATION, A MAX. 2.05 FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.
- DETECTABLE WARNING SURFACE

- STATION, OFFSET, ELEVATION POINT
- STATION, OFFSET, ELEVATION POINT (FOR POLE FOUNDATION)
- SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)
- SLOPE 7.5% MAX. (MAX. 8.3% FINISHED SURFACE SLOPE) (RAMP LENGTH 15' MAX., MEASURED ALONG FINISHED SURFACE SLOPE)
- COUNTER SLOPE

CITY OF HOOD RIVER STANDARD DRAWINGS RD-14



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

MIN. CURB  
RAMP DETAILS

1 OF 2  
2019

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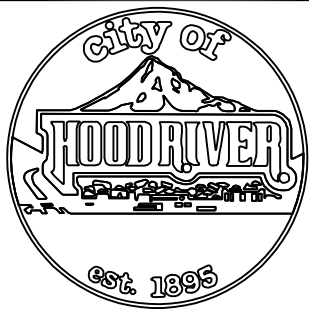
RAMP	ITEM	VALUES	
		RAMP 1	RAMP 2
RAMP RUN 1	RUNNING SLOPE		
	CROSS SLOPE		
	GUTTER FLOW SLOPE		
	COUNTER SLOPE		
	RAMP LENGTH		
RAMP RUN 2	RUNNING SLOPE		
	CROSS SLOPE		
	RAMP LENGTH		
RAMP RUN 3	RUNNING SLOPE		
	CROSS SLOPE		
	RAMP LENGTH		
TURNING SPACE	WIDTH X		
	LENGTH Y		
	SLOPE X		
	SLOPE Y		

LOCATION	"CR##" STATION	GUTTER ELEV
①	?	?
②	?	?
③	?	?
④	?	?
⑤	?	?
⑥	?	?
⑦	?	?
⑧	?	?
⑨	?	?
⑩	?	?

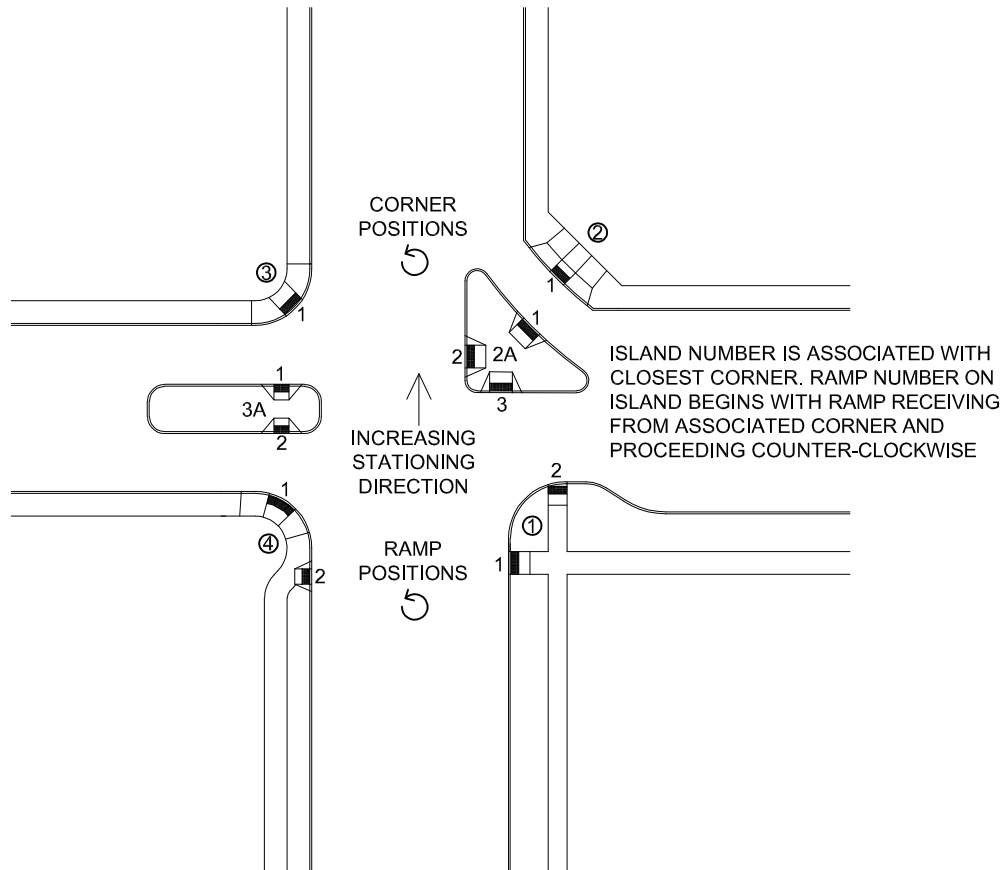
LOCATION	STATION	OFFSET	ELEVATION
②			
②			
②			
②			
②			
②			
②			
②			
②			
②			

GENERAL NOTES:

- NOTES FOR ALL DETAILS FOUND ON SHEET 1.

CITY OF HOOD RIVER STANDARD DRAWINGS RD-14	
	<small>THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER</small>
	<small>NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.</small>
<h2 style="text-align: center;">MIN. CURB RAMP DETAILS</h2> <h3 style="text-align: center;">2 OF 2 2019</h3>	
DATE	REVISIONS

# CORNER POSITION AND RAMP POSITION DIAGRAM (RAMP WIDTH 4' MIN.)



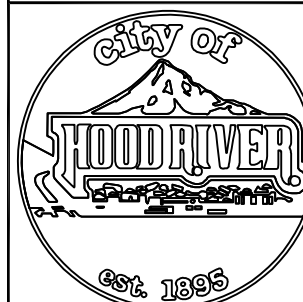
## NOTES FOR ALL DETAILS:

1. THESE ITEMS REPRESENT THE MINIMUM INFORMATION REQUIRED ON CURB RAMP DETAILS.
2. CORNER POSITION IS BASED ON TRAVELING IN THE INCREASING STATIONING DIRECTION, BEGINNING WITH THE FIRST CORNER ON THE RIGHT AND PROCEEDING COUNTER-CLOCKWISE AROUND THE INTERSECTION, NUMBERING CONSECUTIVE 1 THROUGH THE END OF CORNERS. AN "A" IS ADDED TO THE NUMBER FOR AN ISLAND. FOR EXAMPLE AN ISLAND BETWEEN CORNER POSITIONS 1 AND 2 AND IS CLOSER TO CORNER 2 HAS A CORNER POSITION NUMBER 2A (SEE CORNER POSITION AND RAMP POSITION DIAGRAM).
3. RAMP POSITION IS A NUMBER GIVEN TO EACH RAMP BEGINNING WITH CORNER POSITION 1 AND THE FIRST RAMP ENCOUNTERED IN THE INCREASING STATIONING DIRECTION AND PROCEEDS COUNTER-CLOCKWISE AROUND THE CORNER. PROCEED FOLLOWING THE PEDESTRIAN ROUTE AND IN CORNER POSITION NUMBER ORDER (SEE CORNER POSITION AND RAMP POSITION DIAGRAM). WHEN MORE THAN ONE RAMP IS SHOWN, LABEL THE RAMPS.
4. ALIGNMENT LOCATED AT GUTTER.
5. NAME ALIGNMENT "CR##". NUMBER CONSECUTIVE THROUGH THE PROJECT LENGTH, ONE ALIGNMENT PER CORNER.
6. IF EXISTING RAMPS AND SIDEWALK ELEVATIONS ARE RAISED OR LOWERED, ELECTRICAL JUNCTION BOXES AND CONDUIT SYSTEMS WILL REQUIRE ADJUSTMENT WHICH MAY REQUIRE ADDITIONAL CONCRETE WORK. SHOW ALL EXISTING JUNCTION BOX LOCATIONS WITH ELEVATIONS. ADJUSTMENT OF THE JUNCTION BOXES CONDUIT SYSTEM IS GENERALLY EASIER WHEN THE EXISTING ELEVATIONS ARE RAISED.
7. LOCATION OF SIGNAL POLE, PEDESTRIAN POLE, AND PUSHBUTTON NEED TO BE SHOWN. A 10" MAX. REACH IS REQUIRED TO THE PEDESTRIAN PUSHBUTTON. ADDITIONAL CONCRETE MAY NEED TO BE ADDED TO PROVIDE ACCESS TO THE PEDESTRIAN PUSH BUTTON. USE THE WHEELCHAIR DESIGN VEHICLE TO VERIFY ACCESS TO THE PEDESTRIAN PUSH BUTTON AS SHOWN IN THE SIGNAL DESIGN MANUAL.
8. SUGGEST USE OF EXCEL AND AXIOM TO CREATE THE POINT TABLE.
9. ADD CORNER POSITION DATA.
10. SCALES ARE 1"=5' FOR SIGNALIZED INTERSECTIONS (1 CORNER PER SHEET), AND 1"=10' FOR NON-SIGNALIZED INTERSECTIONS (2 CORNERS PER SHEET). (NOTE: LARGE RADIUS CORNERS MAY REQUIRE DIFFERENT SCALE TO FIT ON SHEET).
11. ADDITIONAL TABLES MAY BE ADDED FOR CLARITY, IF REQUIRED. DATA FLAGS SHOWING STATION OFFSET, ELEVATION MAY BE USED INSTEAD OF A TABLE.
12. ADDITIONAL DATA FLAGS MAY BE ADDED FOR CLARITY, IF REQUIRED.
13. ELEVATIONS SHOWN AT A MINIMUM AT FRONT AND BACK OF RAMP, FRONT AND BACK OF WINGS, HORIZONTAL BREAKS ALONG BACK OF SIDEWALK.
14. LABEL SIDEWALK WIDTH.
15. WHEN SIGNALS ARE PRESENT ON CORNERS WITH SIDEWALK RAMPS, COORDINATION BETWEEN THE SIGNAL DESIGNER AND THE ROADWAY DESIGNER IS REQUIRED.
16. SHOW UTILITIES AND CONFLICTS.
17. SHOW SCALE OF DETAIL.

- MARKED OR INTENDED CROSSING LOCATION
- SIDEWALK
- TURNING SPACE. MIN. LEVEL AREA 4.5' X 4.5' (4' X 4' MIN. FINISHED SURFACE). WHEN CONSTRAINED 4.5' X 5.5' (4' X 5' MIN. FINISHED SURFACE WITH LONGER DIMENSIONS IN DIRECTION OF PEDESTRIAN STREET CROSSING). FOR THE PURPOSE OF THIS APPLICATION, A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL.

- DETECTABLE WARNING SURFACE
- SLOPE 1.5% MAX.  
(MAX. 2.0% FINISHED SURFACE SLOPE)  
(NORMAL SIDEWALK CROSS SLOPE)
- SLOPE 7.5% MAX.  
(MAX. 8.3% FINISHED SURFACE SLOPE)
- ZERO CURB EXPOSURE

## CITY OF HOOD RIVER STANDARD DRAWINGS RD-15



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

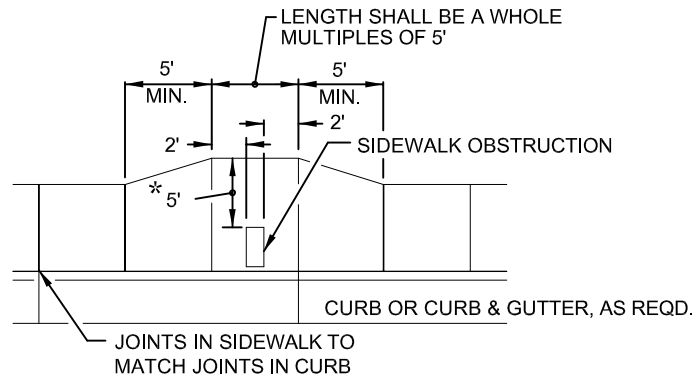
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## MIN. CURB RAMP DETAILS INSTRUCTIONS

2019

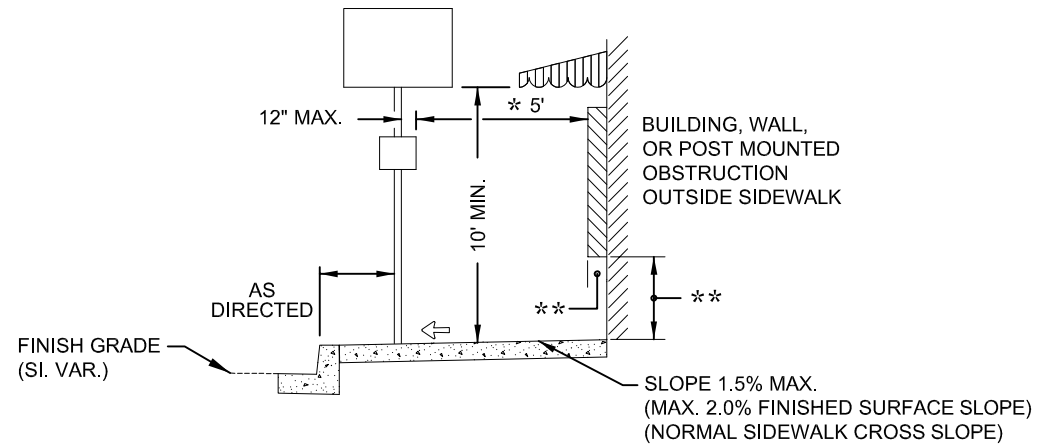
DATE	REVISIONS

## REQUIRED SIDEWALK WIDENING AROUND OBSTRUCTIONS



\* WHEN SITE CONSTRAINTS PROHIBIT A 5' PASSAGE, THE ENGINEER MAY DIRECT THIS TO BE REDUCED, BUT NO LESS THAN 4'.

## CLEAR CIRCULATION PATH



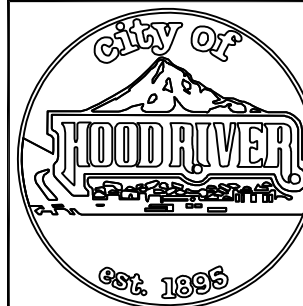
\*\* OBJECTS WITH BASE BELOW 2' - 4" MAY PROTRUDE ANY DISTANCE AS LONG AS THE 5' CIRCULATION PATH IS MAINTAINED. WHEN AN OBJECT WITH A BASE HIGHER THAN 2' - 4" PROTRUDES FURTHER THAN 4" PROVIDE A CURB BELOW PROTRUSION TO DELINEATE EDGE.

### GENERAL NOTES FOR ALL DETAILS:

1. INCLUDE ADDITIONAL PAVED 2' CLEARANCE TO VERTICAL FACES HIGHER THAN 5' SUCH AS RETAINING WALLS, SOUND WALLS, FENCES, AND BUILDINGS.
2. CURB TYPE AND SIDEWALK WIDTH AS SHOWN OR AS DIRECTED. ON SIDEWALKS 8' AND WIDER, PROVIDE A LONGITUDINAL JOINT AT THE MIDPOINT.
3. INSTALL 3" PVC WEEP HOLE PIPES IN SIDEWALKS WHERE SHOWN ON PLANS, AND WHEN ALLOWED BY DESIGN EXCEPTION. PLACE CONTRACTION JOINT OVER THE TOP OF THE PIPE. SEE CITY STANDARD FOR WEEP HOLE DETAIL.
4. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

↓ SLOPE 1.5% MAX. (MAX. 2.0% FINISHED SURFACE SLOPE) (NORMAL SIDEWALK CROSS SLOPE)

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-16



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

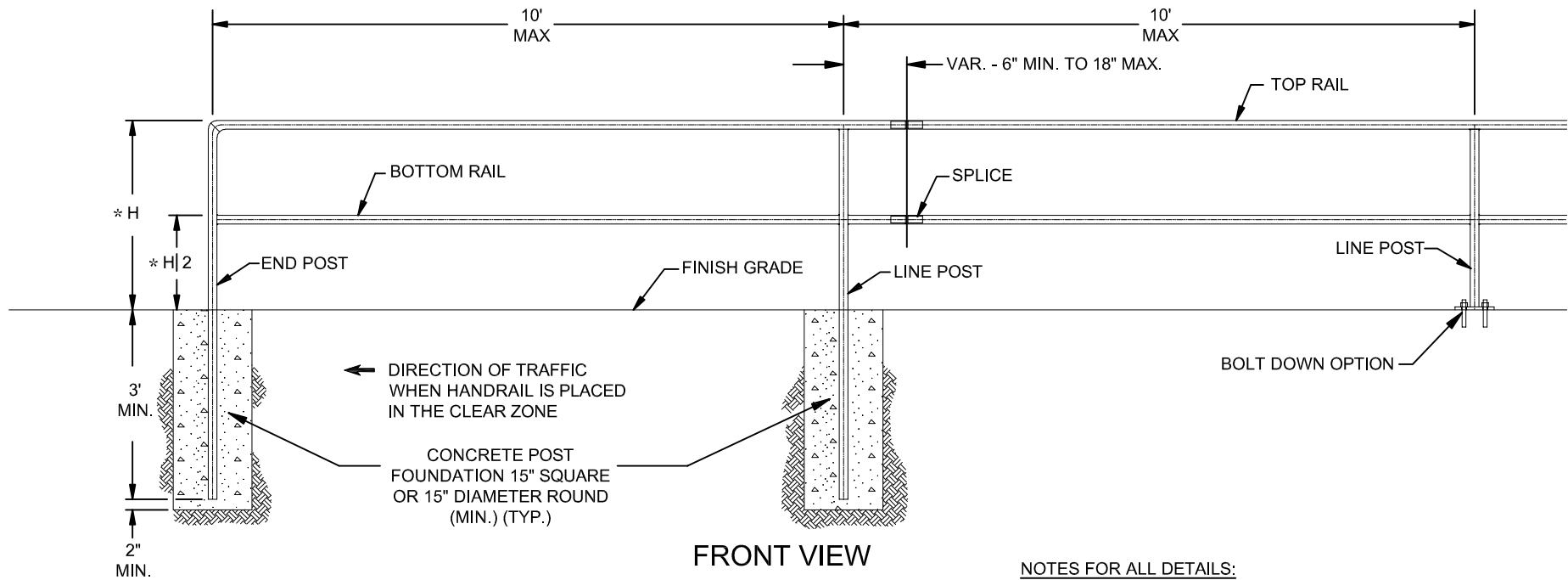
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## SIDEWALK OBSTRUCTIONS

2019

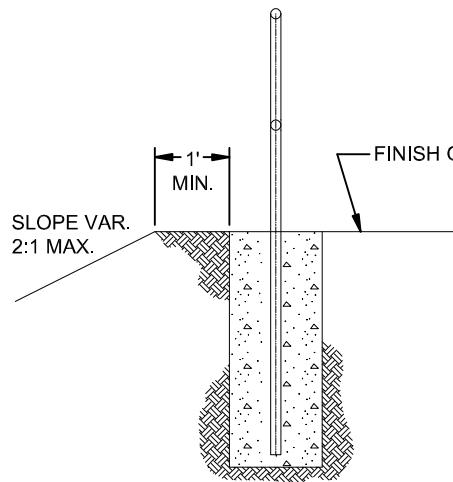
DATE	REVISIONS

## TWO RAIL HANDRAIL

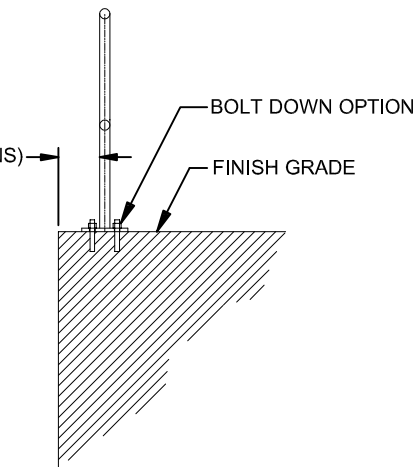


\* H VARIES  
34" MIN.  
38" MAX. } ALONG STAIRS

42" MIN.  
54" MAX. } ALONG WALKS  
WITHOUT STAIRS



VAR. (SEE PLANS)

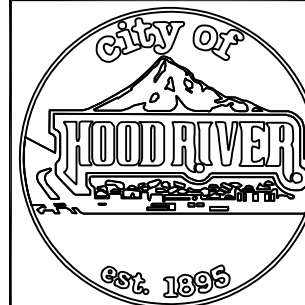


(SEE NOTE 3)

### NOTES FOR ALL DETAILS:

- HANDRAIL DETAILS ARE BASED ON ODOT APPLICABLE STANDARDS.
- HOT-DIP GALVANIZE ALL METAL PARTS AFTER FABRICATION.
- STRUCTURE VARIES, SEE PROJECT PLANS.
- HANDRAIL HEIGHT (H) SHALL BE CONSTANT WITHIN A RUN.
- ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-17



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

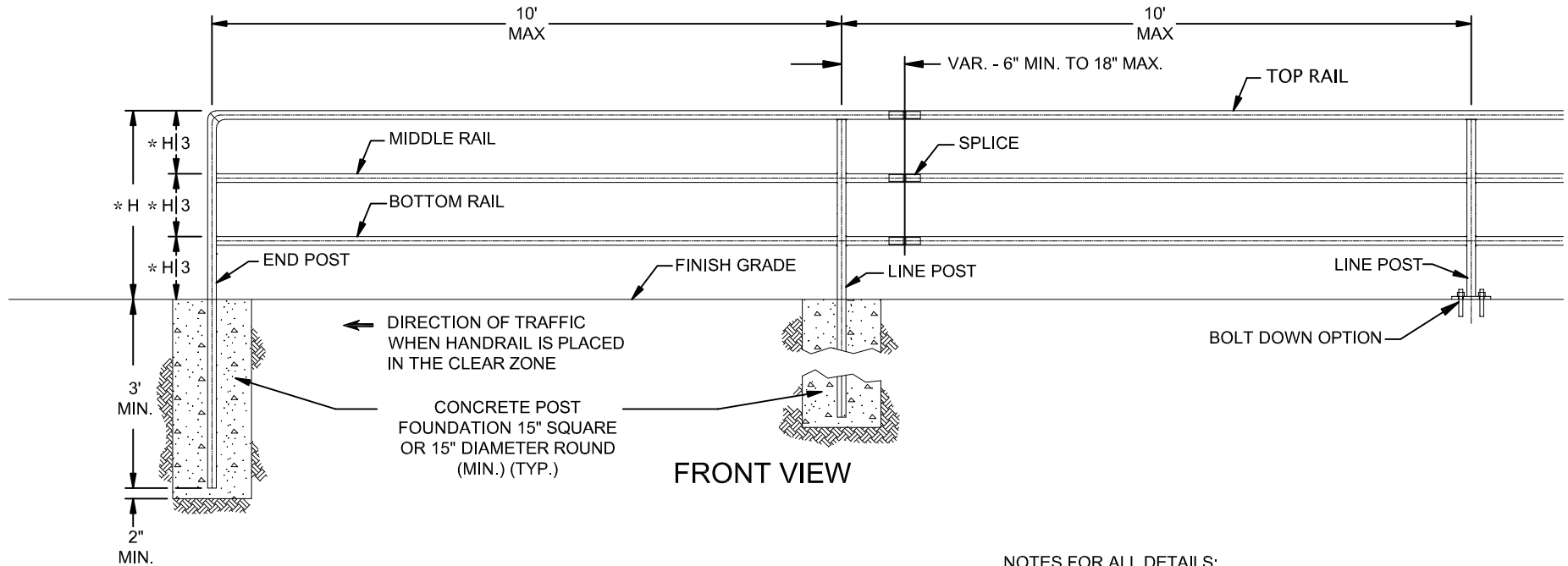
### PEDESTRIAN HANDRAIL

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2019

DATE	REVISIONS

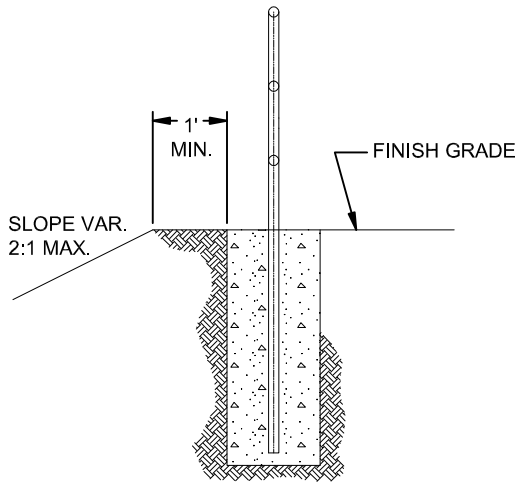
# THREE RAIL HANDRAIL



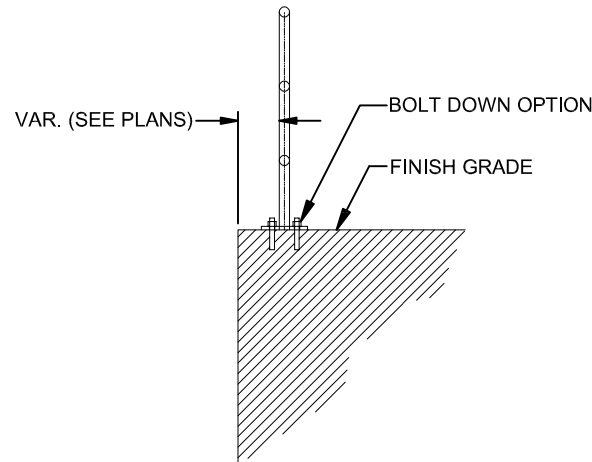
FRONT VIEW

\* H VARIES  
34" MIN. } ALONG STAIRS  
38" MAX. }

42" MIN. } ALONG WALKS  
54" MAX. } WITHOUT STAIRS



SIDE VIEW  
(ON GRADE)

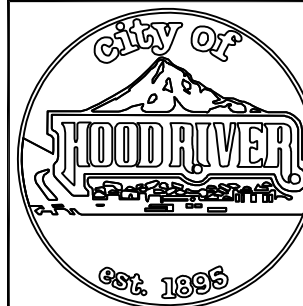


SIDE VIEW  
(ON STRUCTURE)  
(SEE NOTE 3)

## NOTES FOR ALL DETAILS:

- HANDRAIL DETAILS ARE BASED ON ODOT APPLICABLE STANDARDS.
- HOT-DIP GALVANIZE ALL METAL PARTS AFTER FABRICATION.
- STRUCTURE VARIES, SEE PROJECT PLANS.
- HANDRAIL HEIGHT (H) SHALL BE CONSTANT WITHIN A RUN.
- ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

## CITY OF HOOD RIVER STANDARD DRAWINGS RD-17



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

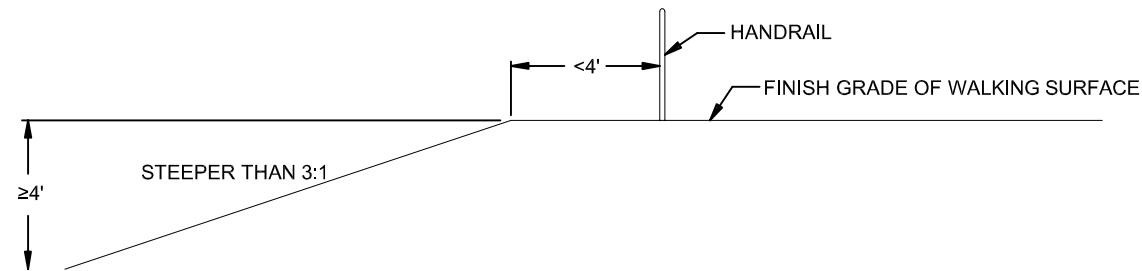
## PEDESTRIAN HANDRAIL

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# WHEN HANDRAIL IS REQUIRED FOR WALKING SURFACES



## NOTES FOR ALL DETAILS:

- HANDRAIL DETAILS ARE BASED ON ODOT APPLICABLE STANDARDS.
- HOT-DIP GALVANIZE ALL METAL PARTS AFTER FABRICATION.
- STRUCTURE VARIES, SEE PROJECT PLANS.
- HANDRAIL HEIGHT (H) SHALL BE CONSTANT WITHIN A RUN.
- ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

## CITY OF HOOD RIVER STANDARD DRAWINGS RD-17



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

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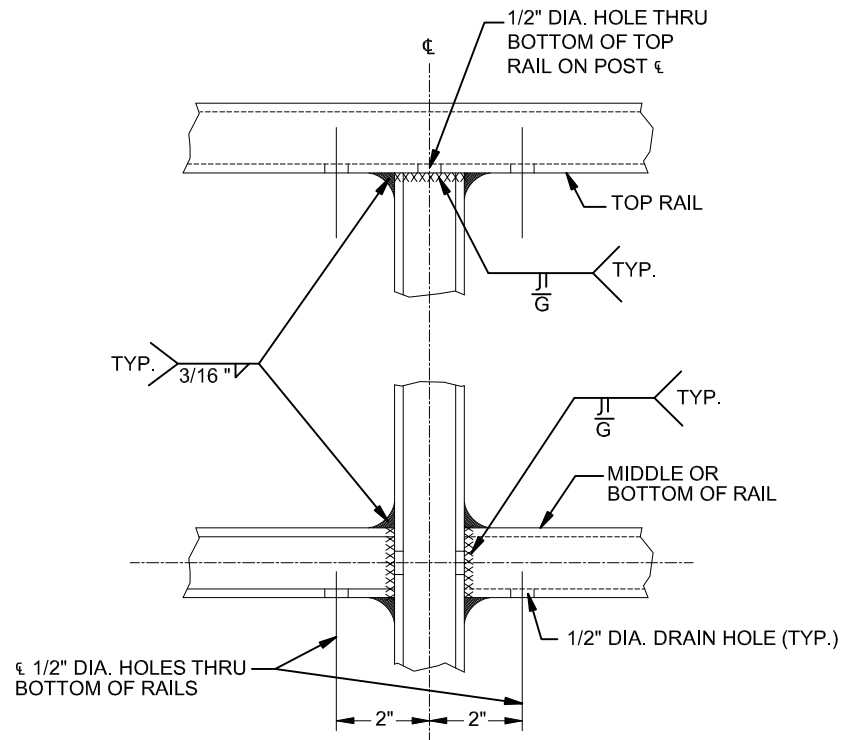
## PEDESTRIAN HANDRAIL

3 of 3

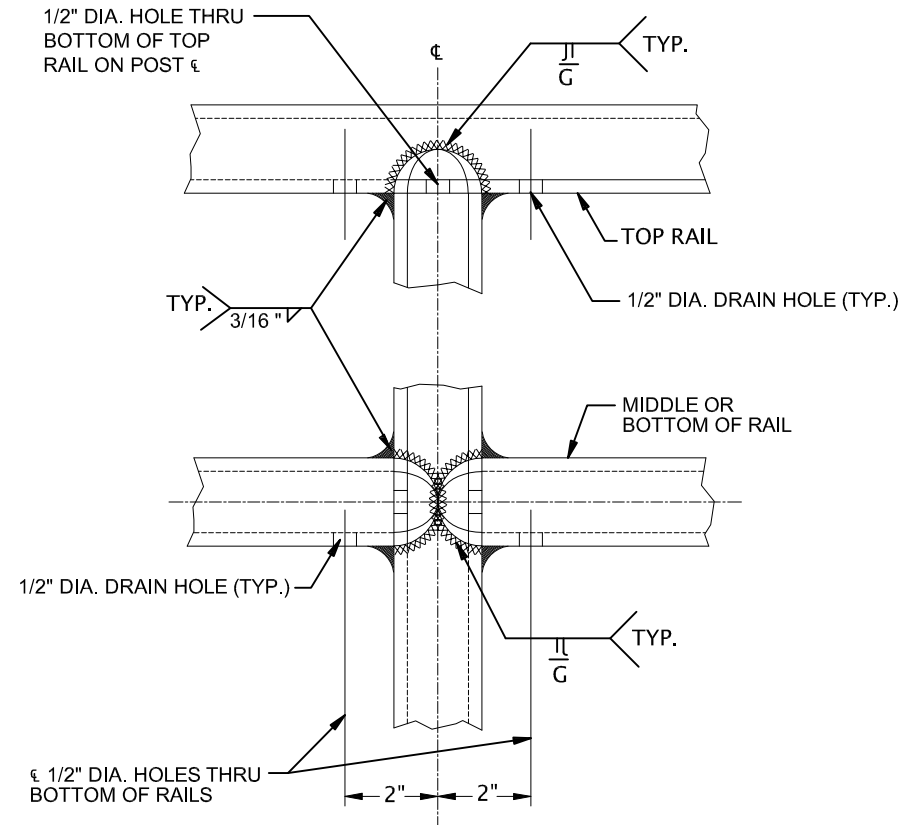
2019

DATE	REVISIONS

## WELD DETAILS FOR STEEL TUBING



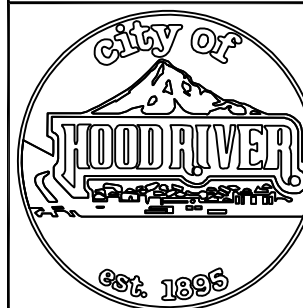
## WELD DETAILS FOR STEEL PIPE



### GENERAL NOTES FOR ALL DETAILS:

- HANDRAIL DETAILS ARE BASED ON ODOT APPLICABLE STANDARDS.
- SELECT MATERIALS FROM TABLES. POSTS AND RAILS SHALL BE IDENTICAL MATERIAL. STRUCTURAL STEEL TUBING SHALL CONFORM TO ASTM SPECIFICATION A500, GRADE B.
- POSTS SHALL BE VERTICAL. THE TOP RAIL SHALL BE CONTINUOUS OVER A MINIMUM OF TWO POSTS.
- ON STRUCTURE, THE RAILING SHALL CONFORM TO THE VERTICAL ALIGNMENT OF THE STRUCTURE. RAILS SHALL HAVE A SPLICE IN THE POST SPACE OCCURRING AT EXPANSION JOINTS.
- ON GRADE, RAILS SHALL HAVE SPLICES AT INTERVALS NOT TO EXCEED 100'.
- HOT-DIP GALVANIZE ALL METAL PARTS AFTER FABRICATION.
- SEE STANDARD DRAWING PEDESTRIAN HANDRAIL FOR DETAILS NOT SHOWN.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-18



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

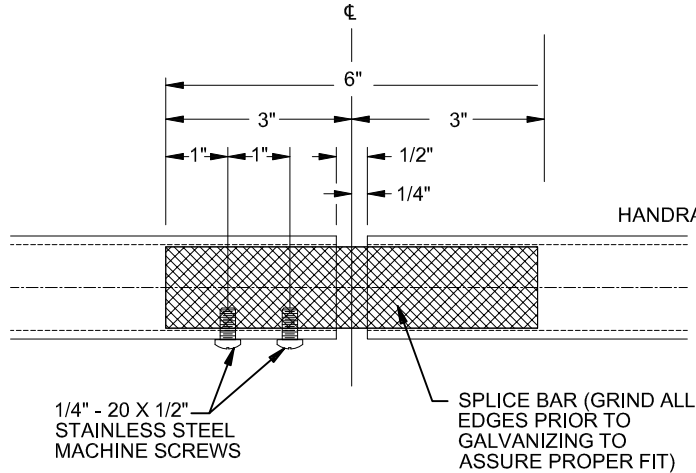
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### PEDESTRIAN HANDRAIL DETAILS

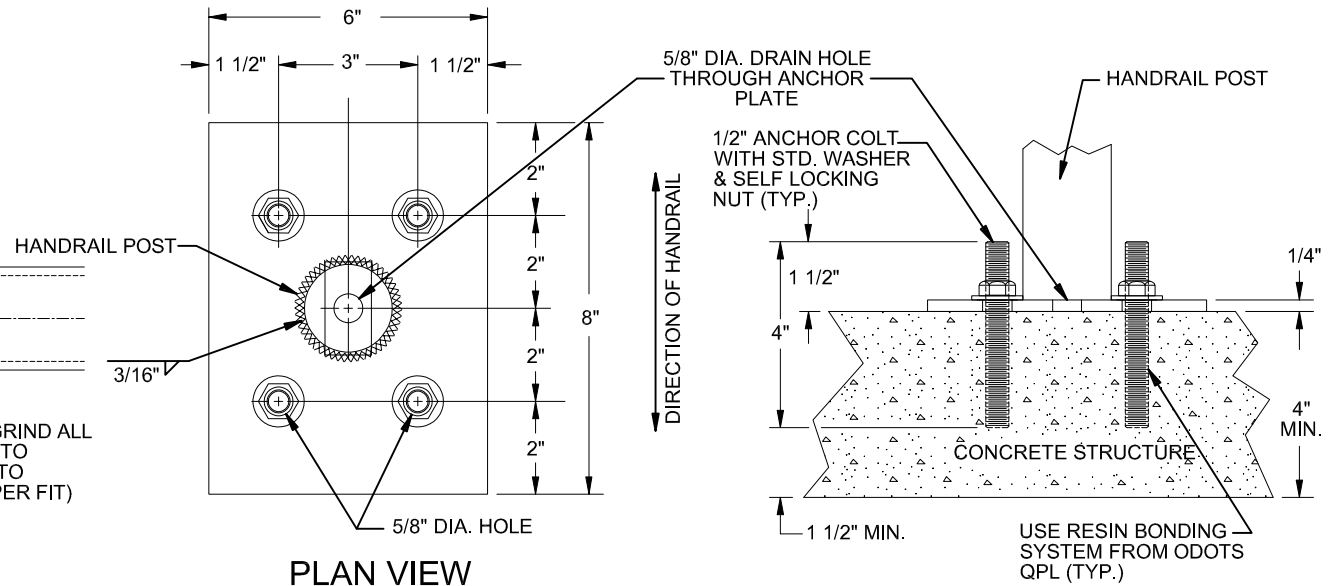
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2019

DATE	REVISIONS

## SPLICE DETAIL



## ANCHOR PLATE FOR BOLT DOWN OPTION



## PLAN VIEW MATERIAL TABLES

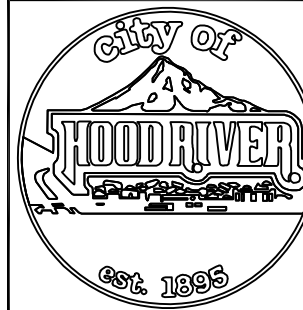
STEEL PIPE POST & RAIL MEMBERS				ROUND SPLICE BAR
NOM. DIA.	SCH.	O.D.	I.D.	O.D.
1 1/4"	40	1.660"	1.380"	1 1/4"
1 1/2"	10	1.900"	1.682"	1 1/2"
	40	1.900"	1.610"	

SQUARE STRUCTURAL STEEL TUBING POST & RAIL MEMBERS		SQUARE SPLICE BAR
OUTSIDE DIMENSIONS	WALL THICKNESS	OUTSIDE DIMENSIONS
1 1/2" X 1 1/2"	1/8"	1" X 1"
	3/16"	3/4" X 3/4"

### GENERAL NOTES FOR ALL DETAILS:

- HANDRAIL DETAILS ARE BASED ON ODOT APPLICABLE STANDARDS.
- SELECT MATERIALS FROM TABLES. POSTS AND RAILS SHALL BE IDENTICAL MATERIAL. STRUCTURAL STEEL TUBING SHALL CONFORM TO ASTM SPECIFICATION A500, GRADE B.
- POSTS SHALL BE VERTICAL. THE TOP RAIL SHALL BE CONTINUOUS OVER A MINIMUM OF TWO POSTS.
- ON STRUCTURE, THE RAILING SHALL CONFORM TO THE VERTICAL ALIGNMENT OF THE STRUCTURE. RAILS SHALL HAVE A SPLICE IN THE POST SPACE OCCURRING AT EXPANSION JOINTS.
- ON GRADE, RAILS SHALL HAVE SPLICES AT INTERVALS NOT TO EXCEED 100'.
- HOT-DIP GALVANIZE ALL METAL PARTS AFTER FABRICATION.
- SEE STANDARD DRAWING PEDESTRIAN HANDRAIL FOR DETAILS NOT SHOWN.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-18



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

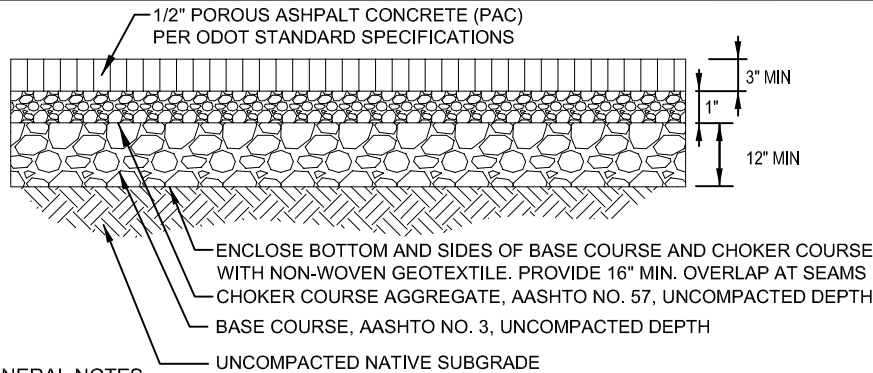
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## PEDESTRIAN HANDRAIL DETAILS

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DATE	REVISIONS





## MATERIALS SPECIFICATIONS

### AGGREGATE SPECIFICATIONS

- ALL AGGREGATES BENEATH THE PAVEMENT SURFACE SHALL MEET THE FOLLOWING:
  - MAXIMUM WASH LOSS OF 0.5%
  - MINIMUM DURABILITY INDEX OF 35
  - MAXIMUM ABRASION OF 10% FOR 100 REVOLUTIONS AND MAXIMUM OF 50% FOR 500 REVOLUTIONS.
- UNLESS OTHERWISE APPROVED BY THE ENGINEER, BASE ROCK SHALL BE UNIFORMLY GRADED WITH THE FOLLOWING GRADATION (AASHTO NUMBER 3):

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
2 1/2" (63 MM)	100
2" (50 MM)	90-100
1 1/2" (37.5 MM)	35-70
1" (25 MM)	0-15
1/2" (12.5 MM)	0-5

IF THE ABOVE GRADATION CANNOT BE MET, THE FOLLOWING GRADATION (AASHTO SIZE NUMBER 5) IS ACCEPTABLE WITH THE APPROVAL OF THE ENGINEER AND MINIMUM VOID SPACE OF 40%:

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
1 1/2" (37.5 MM)	100
1" (25 MM)	90-100
3/4" (19 MM)	20-55
1/2" (12.5 MM)	0-10
3/8" (9.5 MM)	0-5

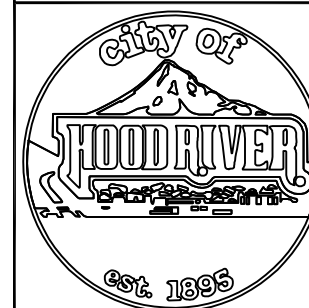
- CHOKER COURSE AGGREGATE SHALL HAVE THE FOLLOWING GRADATION (AASHTO NUMBER 57)

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
1 1/2" (37.5 MM)	100
1" (25 MM)	95-100
1/2" (12.5 MM)	25-60
4 (4.75 MM)	0-10
8 (2.36 MM)	0-5

### GENERAL NOTES

- FOR RESIDENTIAL DRIVEWAYS ONLY.
- TO PREVENT LONG-TERM CLOGGING, GRADING PLAN SHALL REFLECT THAT LANDSCAPE AREAS DO NOT DRAIN TOWARDS PVIOUS PAVEMENT AREA.
- A FIELD TEST SHOWING THAT NATIVE SOILS WILL HAVE MINIMUM DESIGN INFILTRATION RATE OF 0.1 INCHES/HOUR SHALL BE SUBMITTED.
- WHEN IT IS DETERMINED BY THE CITY ENGINEER THAT SOIL CONDITIONS ARE NOT SUITABLE FOR PLACEMENT OF PAC, THE DEVELOPER SHALL CONSULT A GEOTECHNICAL ENGINEER TO RECOMMEND THICKNESS OF AGGREGATE BASE COURSE THAT WILL BE SUITABLE FOR ANTICIPATED TRAFFIC LOADING AND VOLUMES.
- DESIGN AND INSTALLATION OF POROUS ASPHALT CONCRETE SHALL BE PER ODOT STANDARD SPECIFICATIONS SECTION 00743.
- THE GENERAL CONTRACTOR SHALL SUBMIT A NARRATIVE IDENTIFYING ANY ADDITIONAL SITE-SPECIFIC METHODS FOR PROTECTING POROUS PAVEMENT SURFACES FROM RECEIVING SEDIMENT DURING THE ENTIRE CONSTRUCTION PROJECT.
- THE FULL EXTENT OF THE POROUS PAVEMENT SHALL BE FENCED OFF PRIOR TO BEGINNING EARTH MOVING THROUGH PROJECT COMPLETION TO PREVENT COMPACTION OF THE SUBGRADE, TRACKING OF DIRTY ONTO ANY LAYER OF THE FACILITY, AND STOCKPILING OF CONSTRUCTION MATERIALS THAT MAY CLOG THE SURFACE.
- IF THE NATIVE SOIL HAS BEEN EXPOSED TO RAINFALL, HAND RAKE THE SURFACE TO A DEPTH OF 3" TO RESTORE INFILTRATION CAPACITY AND CONTACT THE CITY ENGINEER. IF IN THE OPINION OF THE CITY ENGINEER, THE SOILS HAVE BEEN COMPROMISED, A QUALIFIED GEOTECHNICAL ENGINEER SHALL BE REQUIRED TO INSPECT SOILS FOR PERMEABILITY AND PROVIDE RECOMMENDATIONS FOR RESTORATION.
- CONTACT THE CITY A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTING FOR INSPECTION.
- AGGREGATE BASE COURSE SHALL BE DELIVERED CLEAN (2% WASH LOSS) AND WASHED ON-SITE TO REDUCE WASH LOSS TO 0.5%. THIS MAY BE DONE BY HOSING THE ROCK OFF WHILE STILL IN THE DELIVERY TRUCK OR AFTER STOCKPILING. SCOOP FROM THE TOP AND PLACE ROCK. HOSE OFF AS NEEDED AS THE PILE DIMINISHES SINCE FINES WILL MIGRATE TO LOWER LEVELS OF THE PILE.
- DEPTH OF ROCK SHOWN ON THIS DETAIL IS FOR UNSATURATED SOILS WITH A MIN. BEARING STRENGTH OF 1500 PSF. AND NON COMMERCIAL VEHICLE LOADING. HIGHER LOADS AND WEAKER SOILS WILL REQUIRE DEEPER BASE COURSE. CONSULT AN ENGINEER FOR DIFFERING SOIL AND LOADING CONDITIONS.

## CITY OF HOOD RIVER STANDARD DRAWINGS RD-19



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### POROUS ASPHALT PAVEMENT FOR RESIDENTIAL DRIVEWAYS

1 OF 2

2019

DATE	REVISIONS

## MATERIALS SPECIFICATIONS (CONT.)

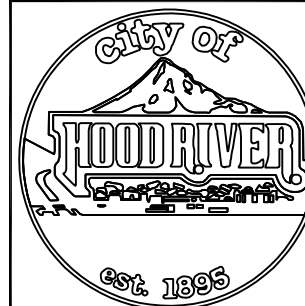
### POROUS ASPHALT CONCRETE (PAC)

1. IN ACCORDANCE WITH ODOT SECTION 00743, ½" PAC MIX EXCEPT AS MODIFIED BY THE FOLLOWING:
2. POROUS BASE ROCK SHALL CONFORM TO AASHTO NUMBER 3 GRADATION WITH UNCOMPACTED DEPTH OF 12". IF AASHTO NUMBER 3 GRADATION CANNOT BE MET, AASHTO GRADATION NUMBER 5 IS ACCEPTABLE WITH THE APPROVAL OF THE ENGINEER AND MINIMUM VOID SPACE OF 40%.
3. CHOKER COURSE SHALL CONFORM TO AASHTO NUMBER 57 GRADATION WITH UNCOMPACTED DEPTH OF 1".
4. POROUS ASPHALT PAVEMENT SHALL BE ½" POROUS ASPHALT CONCRETE (PAC). AFTER THE PAC HAS BEEN SPREAD, STRUCK OFF, AND SURFACE IRREGULARITIES AND OTHER DEFECTS REMEDIED, ROLL IT UNIFORMLY UNTIL COMPACTED.
5. COMPACTION OF PAC TO A SPECIFIED DENSITY WILL NOT BE REQUIRED.
6. CONTINUE THE BREAKDOWN AND INTERMEDIATE ROLLING UNTIL THE ENTIRE SURFACE HAS BEEN COMPACTED WITH AT LEAST FOUR COVERAGES BY THE ROLLERS. PERFORM ADDITIONAL COVERAGES TO COMPLETE FINISH ROLLING OF THE PAC.
7. PAVEMENT LIFTS CANNOT EXCEED 2" OF COMPACTED DEPTH.

### GEOTEXTILE SPECIFICATIONS

1. MATERIAL SPECIFICATIONS. NON-WOVEN GEOTEXTILE (DRAINAGE FILTER FABRIC) SHOULD CONFORM TO THE FOLLOWING CRITERIA:
  - a. MINIMUM FLOW RATE OF 95 GAL/MIN/FT<sup>2</sup> ASTM D-4491-85
  - b. GRAB TENSILE STRENGTH MIN 115 LB. ASTM D-4632-86
  - c. BURST STRENGTH MIN 150 PSI ASTM D-3786-80A
  - d. PUNCTURE RESISTANCE MIN 45 LB. ASTM D-4833-88
  - e. APPARENT OPENING SIZE 60-90 U.S. STANDARD SIEVE
2. INSTALLATION. GEOTEXTILE FABRIC SHOULD BE INSTALLED PER THE FOLLOWING GUIDANCE:
  - a. PLACE GEOTEXTILE IN ACCORDANCE WITH MANUFACTURER'S STANDARDS AND RECOMMENDATIONS.
  - b. ADJACENT STRIPS OF GEOTEXTILE SHOULD OVERLAP A MINIMUM OF SIXTEEN (16) INCHES.
  - c. SECURE GEOTEXTILE AT LEAST FOUR (4) FEET OUTSIDE OF EXCAVATED AREA OVER EXPOSED SOIL AND TAKE ANY STEPS NECESSARY TO PREVENT ANY RUNOFF OR SEDIMENT FROM ENTERING THE PAVEMENT ROCK BASE.
  - d. AFTER POROUS PAVEMENT SURFACE IS INSTALLED, CUT EXCESS GEOTEXTILE FABRIC AT THE INTERFACE BETWEEN THE GROUND AND THE PAVEMENT, SO THAT IT CANNOT BE SEEN ANY LONGER.

## CITY OF HOOD RIVER STANDARD DRAWINGS RD-19



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

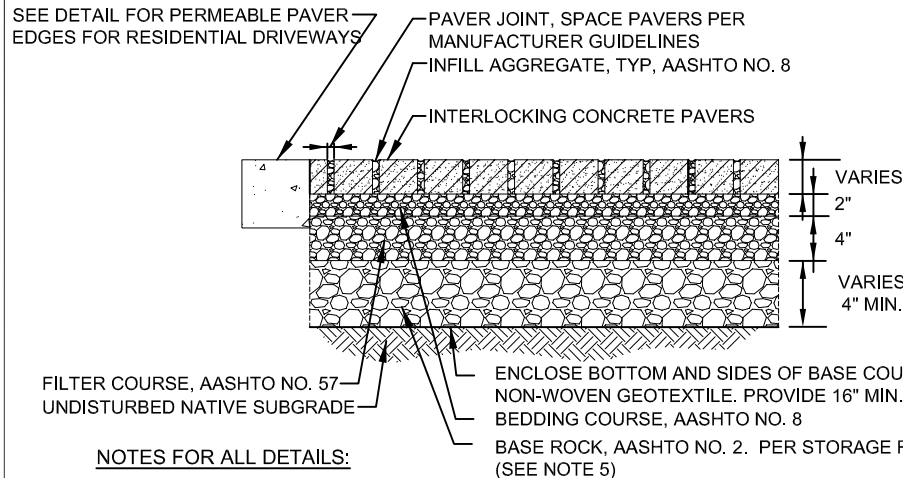
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### POROUS ASPHALT PAVEMENT FOR RESIDENTIAL DRIVEWAYS

2 OF 2

2019

DATE	REVISIONS



#### NOTES FOR ALL DETAILS:

- FOR RESIDENTIAL DRIVEWAYS ONLY.
- A FIELD TEST SHOWING THAT NATIVE SOILS WILL HAVE MINIMUM DESIGN INFILTRATION RATE OF 0.1 INCHES/HOUR SHALL BE SUBMITTED.
- THE GENERAL CONTRACTOR SHALL SUBMIT A NARRATIVE IDENTIFYING ANY ADDITIONAL SITE-SPECIFIC METHODS FOR PROTECTING PVIOUS PAVEMENT SURFACES FROM RECEIVING SEDIMENT DURING THE ENTIRE CONSTRUCTION PROJECT.
- THE FULL EXTENT OF THE POROUS PAVEMENT SHALL BE FENCED OFF PRIOR TO BEGINNING EARTH MOVING THROUGH PROJECT COMPLETION TO PREVENT COMPACTION OF THE SUBGRADE, TRACKING OF DIRT ONTO ANY LAYER OF THE FACILITY, AND STOCKPILING OF CONSTRUCTION MATERIALS THAT MAY CLOG THE SURFACE.
- IF THE NATIVE SOIL HAS BEEN EXPOSED TO RAINFALL, HAND RAKE THE SURFACE TO A DEPTH OF 3" TO RESTORE INFILTRATION CAPACITY AND CONTACT THE CITY ENGINEER. IF IN THE OPINION OF THE CITY ENGINEER, THE SOILS HAVE BEEN COMPROMISED, A QUALIFIED ENGINEER SHALL BE REQUIRED TO INSPECT SOILS FOR PERMEABILITY AND PROVIDE RECOMMENDATIONS FOR RESTORATION.
- IF POROUS PAVERS ARE TO BE USED TO INFILTRATE AREAS OTHER THAN THE DIRECT POROUS PAVEMENT AREA ITSELF, A QUALIFIED OREGON LICENSED DESIGN ENGINEER SHALL DESIGN THE RETENTION VOLUME AND BASE AGGREGATE DEPTH. THE DESIGN ENGINEER SHALL BE CONTACTED 72 HOURS IN ADVANCE OF CONSTRUCTING THIS FACILITY SO CONSTRUCTION OBSERVATION MAY BE PERFORMED TO IDENTIFY VARIATIONS IN THE FIELD THAT MAY AFFECT DESIGN AND VERIFY PROPER CONSTRUCTION.
- BASE AND FILTER ROCK SHALL BE DELIVERED CLEAN (2% WASH LOSS) AND WASHED ON-SITE TO REDUCE WASH LOSS TO 0.5%. THIS MAY BE DONE BY HOSING THE ROCK OFF WHILE STILL IN THE DELIVERY TRUCK OR AFTER STOCKPILING. SCOOP FROM THE TOP AND PLACE ROCK. HOSE OFF AS NEEDED AS THE PILE DIMINISHES SINCE FINES WILL MIGRATE TO LOWER LEVELS OF THE PILE.
- DEPTH OF ROCK SHOWN ON THIS DETAIL IS FOR UNSATURATED SOILS WITH A MIN. BEARING STRENGTH OF 1500 PSF. AND NON COMMERCIAL VEHICLE LOADING. HIGHER LOADS AND WEAKER SOILS WILL REQUIRE DEEPER BASE COURSE. CONSULT AN ENGINEER FOR DIFFERING SOIL AND LOADING CONDITIONS.

#### MATERIALS SPECIFICATIONS

##### AGGREGATE SPECIFICATIONS

- ALL AGGREGATES BENEATH THE PAVEMENT SURFACE SHALL MEET THE FOLLOWING:
  - MAXIMUM WASH LOSS OF 0.5%
  - MINIMUM DURABILITY INDEX OF 35
  - MAXIMUM ABRASION OF 10% FOR 100 REVOLUTIONS AND MAXIMUM OF 50% FOR 500 REVOLUTIONS
- UNLESS OTHERWISE APPROVED BY THE ENGINEER, BASE ROCK SHALL BE UNIFORMLY GRADED WITH THE FOLLOWING GRADATION (AASHTO NUMBER 2):

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
3" (75 MM)	100
2 ½" (63 MM)	90-100
2" (50 MM)	35-70
1 ½" (37.5 MM)	0-15
¾" (19.0 MM)	0-5

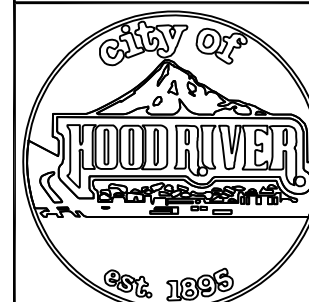
- UNLESS OTHERWISE APPROVED BY THE ENGINEER, FILTER ROCK SHALL BE UNIFORMLY GRADED WITH THE FOLLOWING GRADATION (AASHTO NO. 57)

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
1 ½" (37.5 MM)	100
1" (25 MM)	95-100
¾" (12.5 MM)	25- 60
4 (4.75 MM)	0-10
8 (2.36 MM)	0-5

- UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE BEDDING COURSE SHALL BE UNIFORMLY GRADED WITH THE FOLLOWING GRADATION (AASHTO NO. 8):

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
½" (12.5 MM)	100
3/8" (9.5 MM)	85-100
4 (4.75 MM)	10-30
8 (2.36 MM)	0-10
16 (1.18 MM)	0-5

#### CITY OF HOOD RIVER STANDARD DRAWINGS RD-20



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

#### INTERLOCKING CONCRETE PERMEABLE PAVERS FOR RESIDENTIAL DRIVEWAYS

1 OF 2  
2019

DATE	REVISIONS
10/10/19	CLARIFICATION OF APPROVED MATERIALS

## MATERIALS SPECIFICATIONS (CONT.)

### GEOTEXTILE SPECIFICATIONS

1. MATERIAL SPECIFICATIONS. NON-WOVEN GEOTEXTILE (DRAINAGE FILTER FABRIC) SHOULD CONFORM TO THE FOLLOWING CRITERIA:
  - a. MINIMUM FLOW RATE OF 95 GAL/MIN/FT<sup>2</sup> ASTM D-4491-85
  - b. GRAB TENSILE STRENGTH MIN 115 LB. ASTM D-4632-86
  - c. BURST STRENGTH MIN 150 PSI ASTM D-3786-80A
  - d. PUNCTURE RESISTANCE MIN 45 LB. ASTM D-4833-88
  - e. APPARENT OPENING SIZE 60-90 U.S. STANDARD SIEVE
2. INSTALLATION. GEOTEXTILE FABRIC SHOULD BE INSTALLED PER THE FOLLOWING GUIDANCE:
  - a. PLACE GEOTEXTILE IN ACCORDANCE WITH MANUFACTURER'S STANDARDS AND RECOMMENDATIONS.
  - b. ADJACENT STRIPS OF GEOTEXTILE SHOULD OVERLAP A MINIMUM OF SIXTEEN (16) INCHES.
  - c. SECURE GEOTEXTILE AT LEAST FOUR (4) FEET OUTSIDE OF EXCAVATED AREA OVER EXPOSED SOIL AND TAKE ANY STEPS NECESSARY TO PREVENT ANY RUNOFF OR SEDIMENT FROM ENTERING THE PAVEMENT ROCK BASE.
  - d. AFTER POROUS PAVEMENT SURFACE IS INSTALLED, CUT EXCESS GEOTEXTILE FABRIC AT THE INTERFACE BETWEEN THE GROUND AND THE PAVEMENT, SO THAT IT CANNOT BE SEEN ANY LONGER.

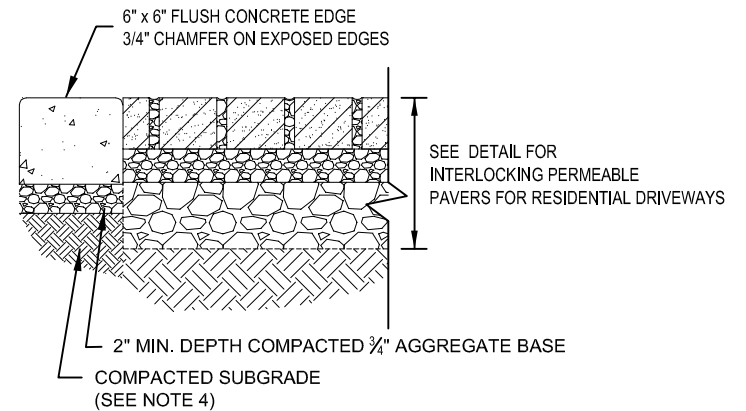
### GENERAL NOTES FOR ALL DETAILS:

1. FOR RESIDENTIAL DRIVEWAYS ONLY.
2. DURING INSTALLATION OF CURB, PROTECT PERMEABLE PAVER AREA FROM COMPACTION.
3. USE COMMERCIAL GRADE CONCRETE ACCORDING TO ODOT 00440 AND 00759.
4. COMPACTED SUBGRADE MATERIAL BENEATH CONCRETE EDGES SHALL BE AS DETERMINED BY THE CITY ENGINEER UNLESS OTHERWISE APPROVED.

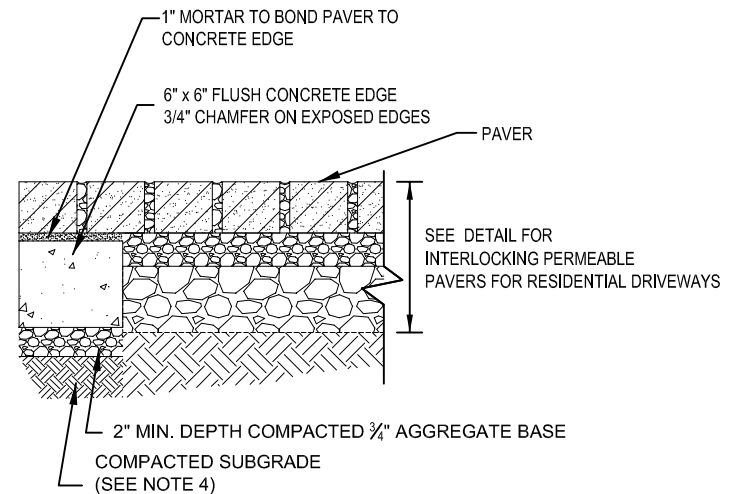
### CAUTION:

GRASSCRETE PERMEABLE PAVER SYSTEMS (A TRADEMARKED PROPRIETARY SYSTEM) ARE ALLOWED PER THE HRMC. HOWEVER, OPEN CELLED PERMEABLE PAVERS WITH OR WITHOUT GRASS ARE NOT APPROVED. FOR ALL PROPOSED PERMEABLE PAVER DRIVEWAYS, SUBMIT MATERIALS AND METHOD OF CONSTRUCTION TO THE PUBLIC WORKS & ENGINEERING DEPARTMENT FOR APPROVAL PRIOR TO PURCHASE AND CONSTRUCTION.

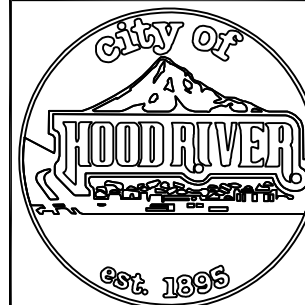
### FLUSH CURB



### HIDDEN CURB



## CITY OF HOOD RIVER STANDARD DRAWINGS RD-20



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

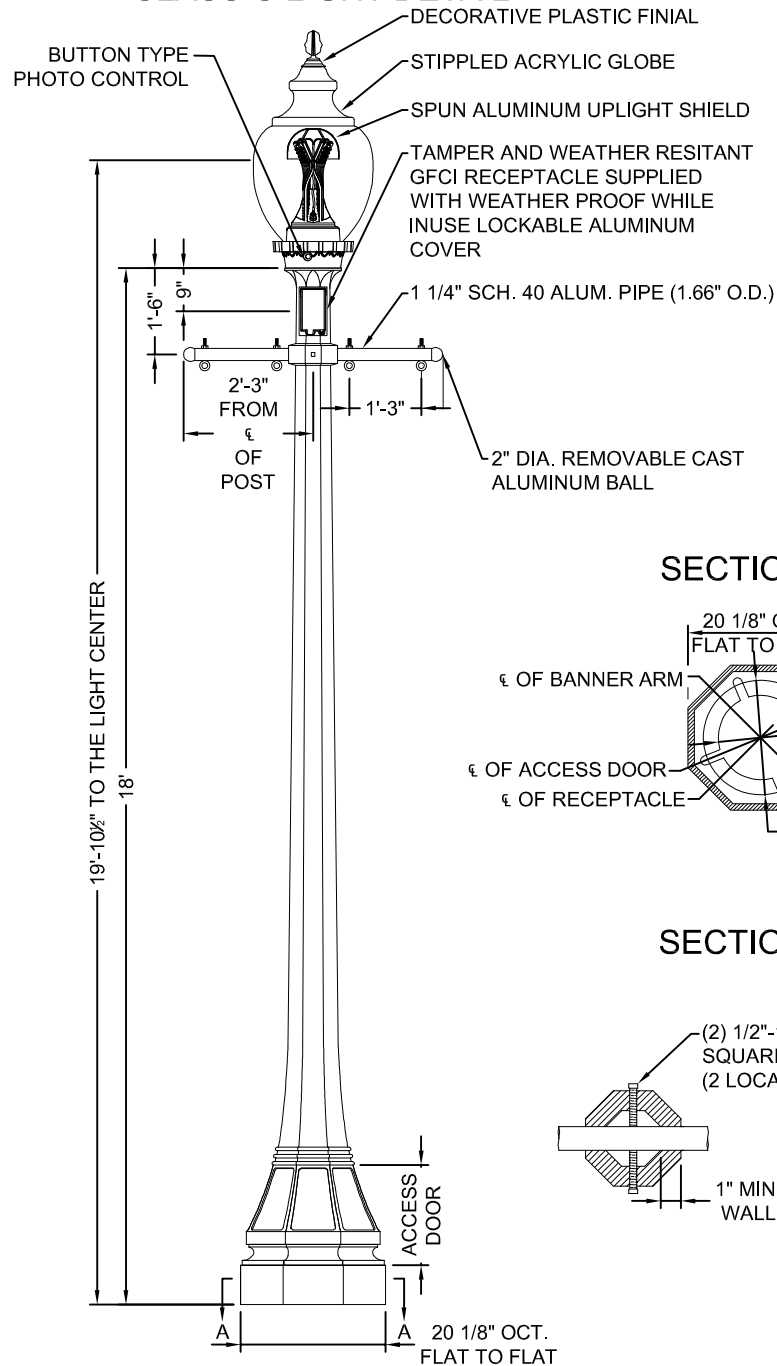
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### INTERLOCKING CONCRETE PERMEABLE PAVERS FOR RESIDENTIAL DRIVEWAYS

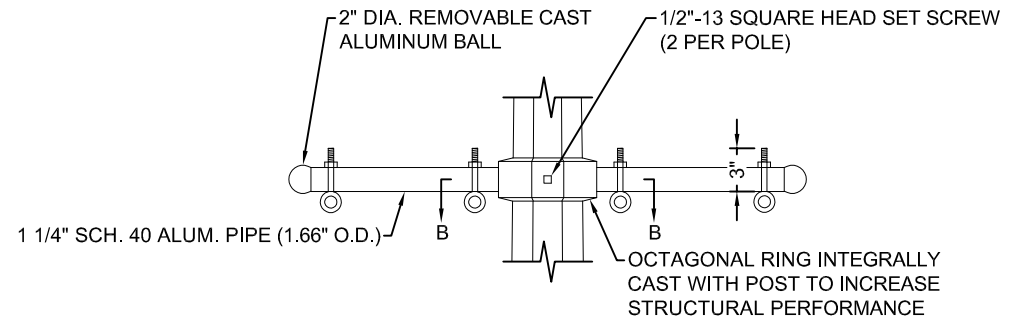
2 OF 2  
2019

DATE	REVISIONS
10/10/19	CLARIFICATION OF APPROVED MATERIALS

## CLASSIC LIGHT DETAIL

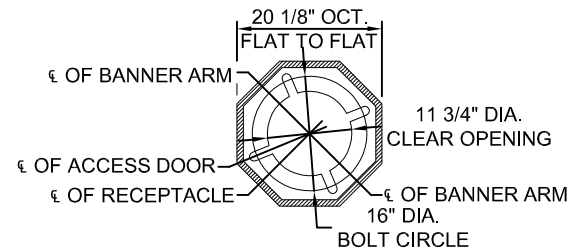


## BANNER ARM DETAIL

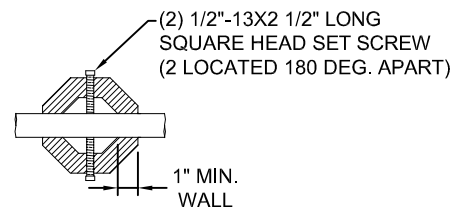


NOTE: SEE SECTION A-A FOR ORIENTATION OF BANNER ARMS

## SECTION A-A



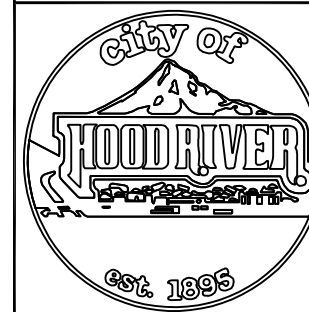
## SECTION B-B



### NOTES FOR ALL DETAILS:

1. DETAILS AND DRAWINGS PER SPRING CITY ELECTRICAL MANUFACTURING COMPANY.
2. LUMINAIRE STYLE: VILLA LED LUMINAIRE
3. LAMP POST STYLE: EDGEWATER WITH TWIN BANNER ARMS-M2
4. SEE HOOD RIVER ENGINEERING STANDARDS FOR DETAILS NOT SHOWN OR SPECIFIED.

### CITY OF HOOD RIVER STANDARD DRAWINGS RD-21



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

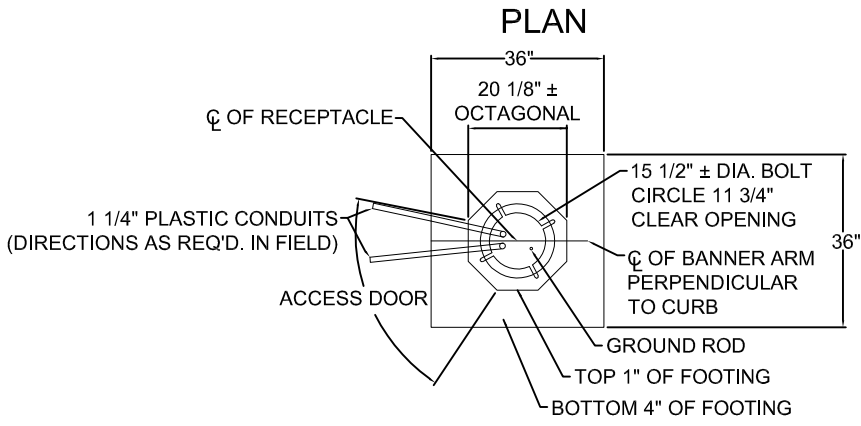
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## CLASSIC LIGHT 1 OF 2

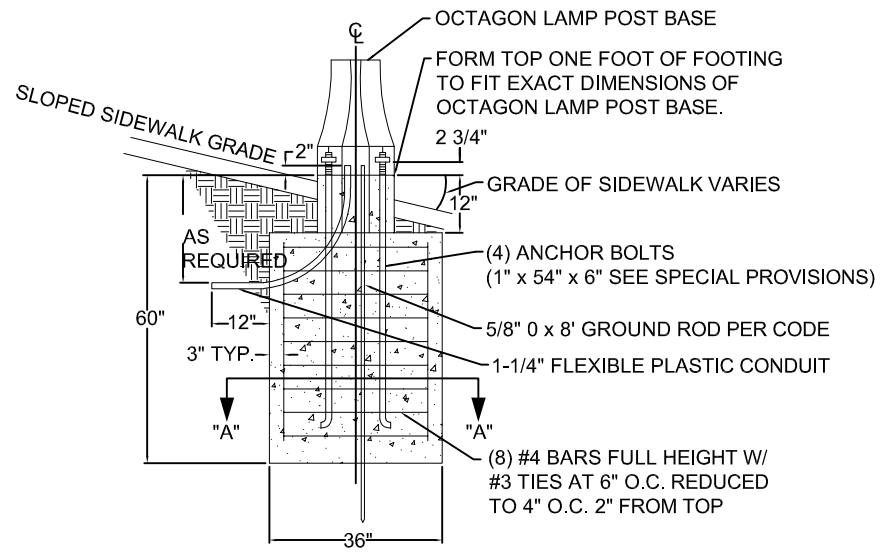
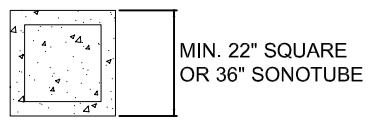
2019

DATE	REVISIONS

CLASSIC STREET LIGHT BASE



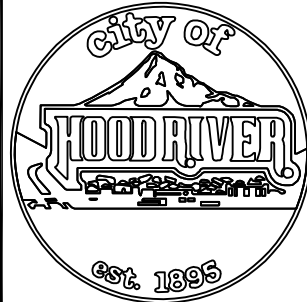
SECTION A-A



NOTES FOR ALL DETAILS:

1. FURNISH FOUR ANCHOR BOLTS AND ONE GROUND ROD FOR EACH FOOTING.
2. PLASTIC CONDUITS AND GROUND RODS MUST BE LOCATED WITHIN A 3" RADIUS FROM CENTER OF THE BOLT CIRCLE.

CITY OF HOOD RIVER STANDARD DRAWINGS RD-21



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

CLASSIC LIGHT  
2 OF 2

2019

DATE	REVISIONS

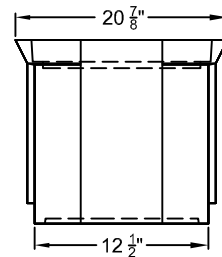
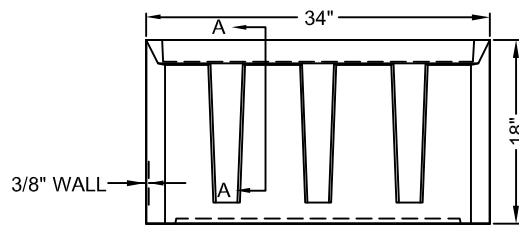
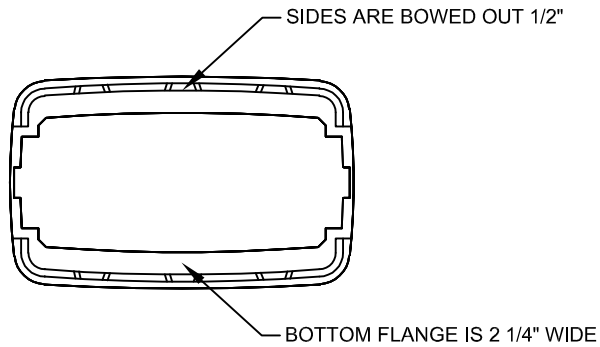


## ***Standard Drawings – Water (W)***

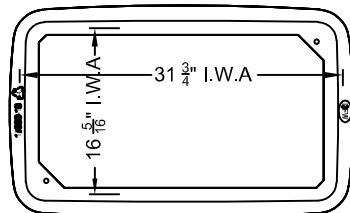




# 18" METER BOX - BODY



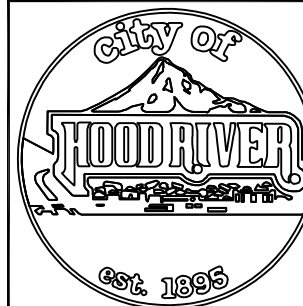
LIFT STRUCTURE  
SECTION A-A



## NOTES FOR ALL DETAILS:

- 18" METER BOX FOR 1 1/2" AND 2" SERVICES
- DFW PLASTICS, INC. PRODUCT ID: DFW1730CNP4-18-BODY  
DFW1730c-4MPT<-LID
- DIMENSIONS +/- 1/8" U.N.O.
- BODY MATERIAL: LLDPE
- LID MATERIAL: HDPE
- WALL THICKNESS: 3/8" MIN.
- I.W.A. = INSIDE WORK AREA

## CITY OF HOOD RIVER STANDARD DRAWINGS W-01



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

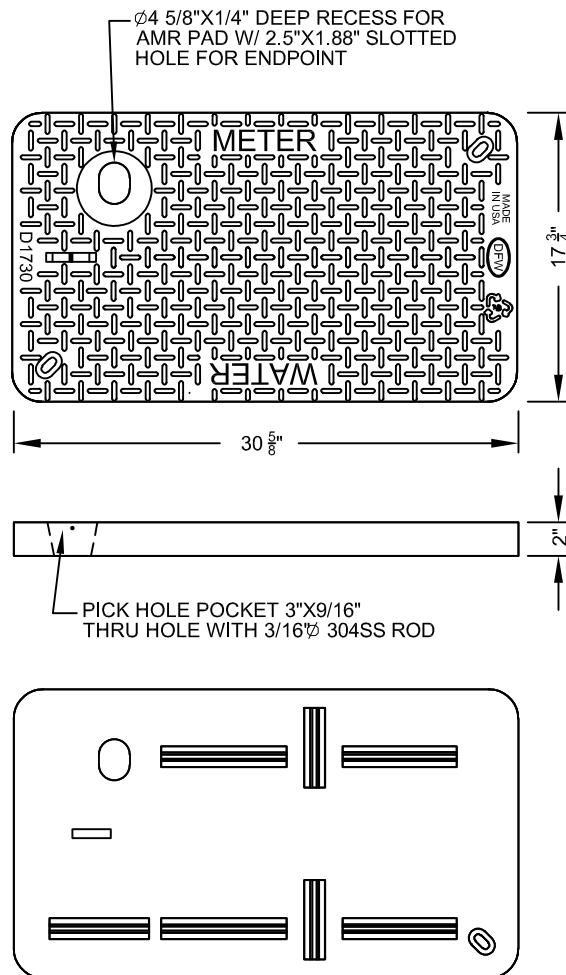
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## 18" METER BOX 1 OF 2

2019

DATE	REVISIONS

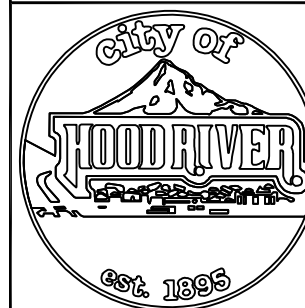
# 18" METER BOX - LID



## NOTES FOR ALL DETAILS:

1. 18" METER BOX FOR 1 1/2" AND 2" SERVICES
2. DFW PLASTICS, INC. PRODUCT ID: DFW1730CNP4-18-BODY  
DFW1730c-4MPT<->-LID
3. DIMENSIONS +/- 1/8" U.N.O.
4. BODY MATERIAL: LLDPE
5. LID MATERIAL: HDPE
6. WALL THICKNESS: 3/8" MIN.
7. I.W.A. = INSIDE WORK AREA

## CITY OF HOOD RIVER STANDARD DRAWINGS W-01



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

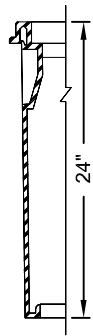
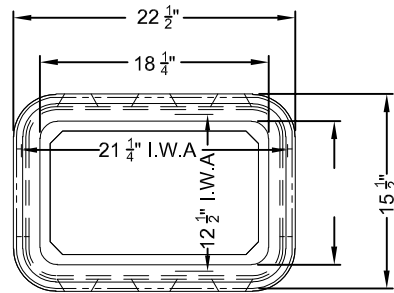
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## 18" METER BOX 2 OF 2

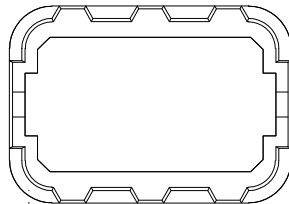
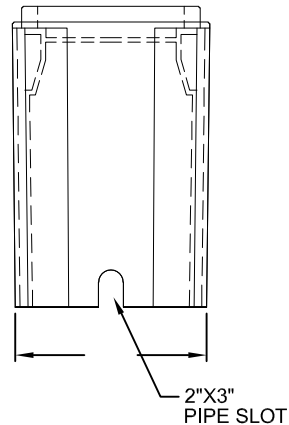
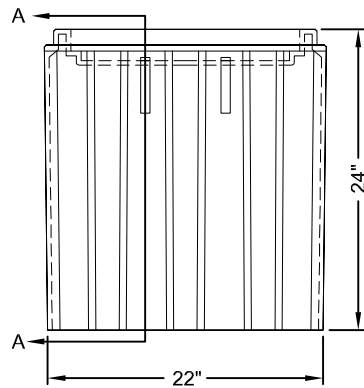
2019

DATE	REVISIONS

## 24" METER BOX - BODY



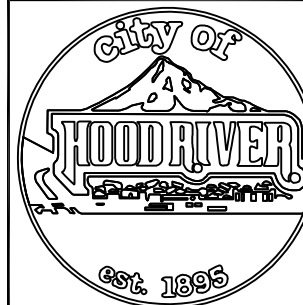
KISS OFF DETAIL  
SECTION A-A



### NOTES FOR ALL DETAILS:

1. 24" METER BOX FOR 3/4" AND 1" SERVICES
2. DFW PLASTICS, INC. PRODUCT ID: DFW486WBC4-24-BODY  
DFW486C-4MPT<-LID
3. DIMENSIONS +/- 1/8" U.N.O.
4. BODY MATERIAL: LLDPE
5. LID MATERIAL: HDPE
6. WALL THICKNESS: 3/8" MIN.
7. I.W.A. = INSIDE WORK AREA

### CITY OF HOOD RIVER STANDARD DRAWINGS W-02



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

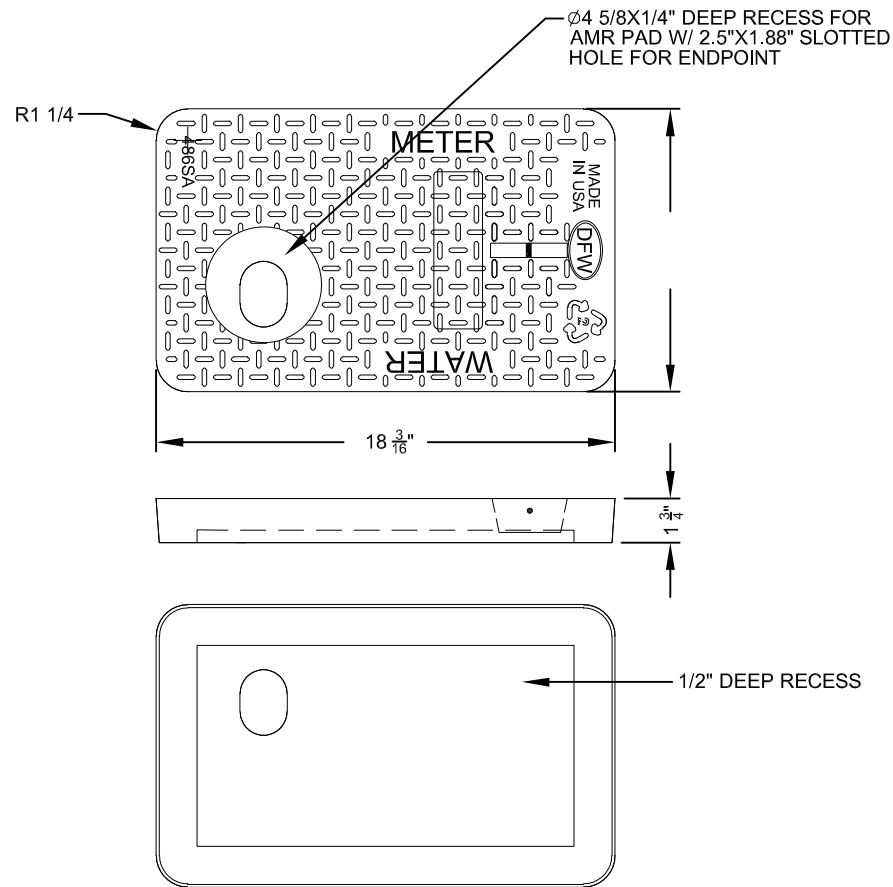
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## 24" METER BOX 1 OF 2

2019

DATE	REVISIONS

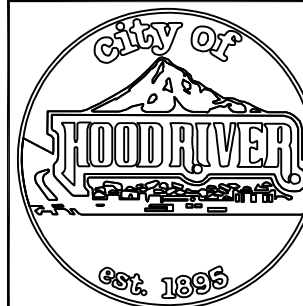
## 24" METER BOX - LID



### NOTES FOR ALL DETAILS:

1. 24" METER BOX FOR 3/4" AND 1" SERVICES
2. DFW PLASTICS, INC. PRODUCT ID: DFW486WBC4-24-BODY  
DFW486C-4MPT<-LID
3. DIMENSIONS +/- 1/8" U.N.O.
4. BODY MATERIAL: LLDPE
5. LID MATERIAL: HDPE
6. WALL THICKNESS: 3/8" MIN.
7. I.W.A. = INSIDE WORK AREA

### CITY OF HOOD RIVER STANDARD DRAWINGS W-02



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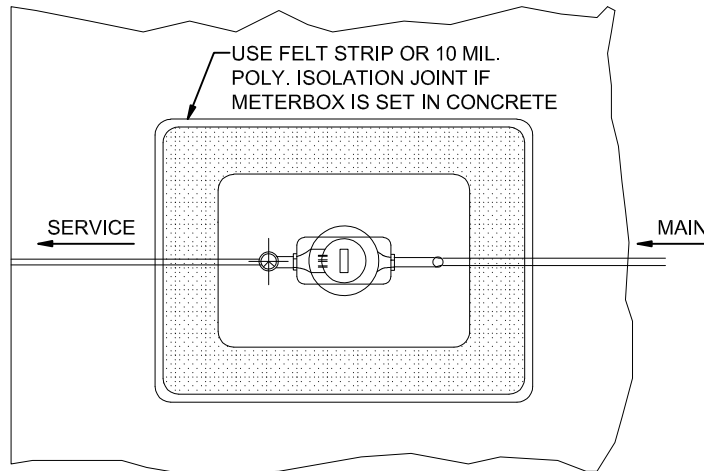
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## 24" METER BOX 2 OF 2

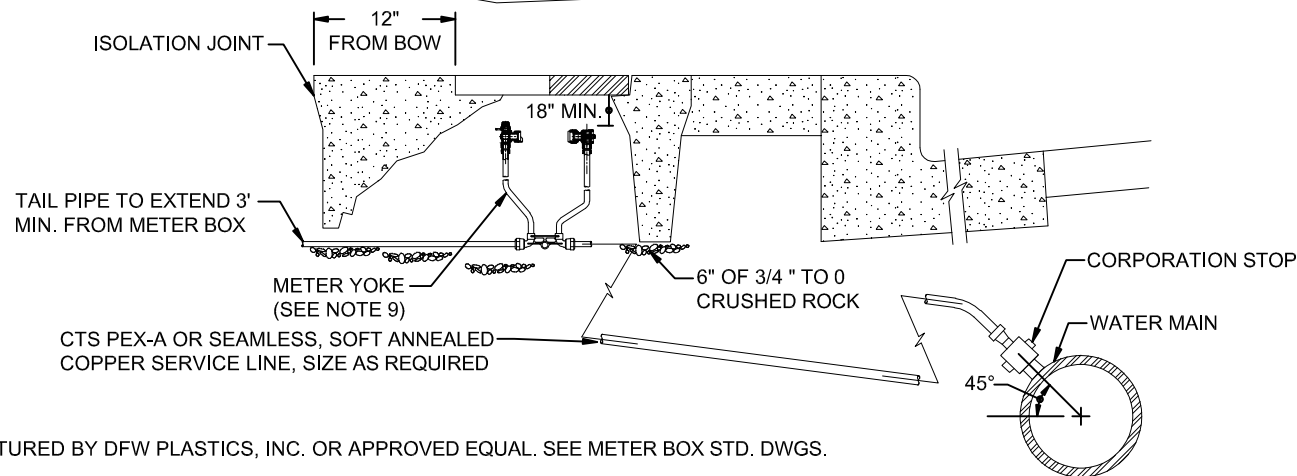
2019

DATE	REVISIONS

# PLAN



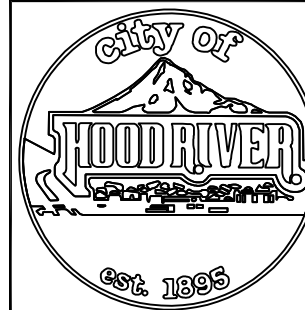
# SECTION



## NOTES FOR ALL DETAILS:

1. METER BOX TO BE MANUFACTURED BY DFW PLASTICS, INC. OR APPROVED EQUAL. SEE METER BOX STD. DWGS.
2. METER BOX LID AND COVER MUST PROVIDE FOR DROP IN READ CAVITY.
3. METER BOXES SET IN DRIVEWAYS SHALL HAVE TRAFFIC RATED LIDS & COVERS (H-20 MIN.).
4. ALL FITTINGS TO BE COPPER TUBE SIZE COMPRESSION MUELLER 110 OR APPROVED EQUAL.
5. WHEN METER BOXES ARE SET SIDE BY SIDE, A HOLE MUST BE DRILLED INTO EACH SIDE AND 1/2" PVC CONDUIT RAN TO CONNECT ALL BOXES. METER BOXES SHALL BE A MIN. OF 6" APART.
6. IF NOT PROVIDED, A 3" X 2" SLOT MUST BE CUT INTO EACH END OF THE METER BOX TO BOX SETTLING ONTO THE SERVICE PIPE.
7. ALL SERVICE LINES ARE TO HAVE 12 GA COLOR CODED LOCATE WIRES EXTENDED TO EACH METER BOX AND CONNECTED TO THE WATER MAIN LOCATE WIRE (BLUE).
8. ALL CUSTOMER CONNECTIONS TO BE MADE BEHIND THE METER BOX.
9. COPPER METER YOKE WITH HORIZONTAL INLET AND OUTLET (MUELLER 110 CONDUCTIVE COMPRESSION ENDS B-2470-2AN - METER SIZE 5/8"X3/4").

## CITY OF HOOD RIVER STANDARD DRAWINGS W-03



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

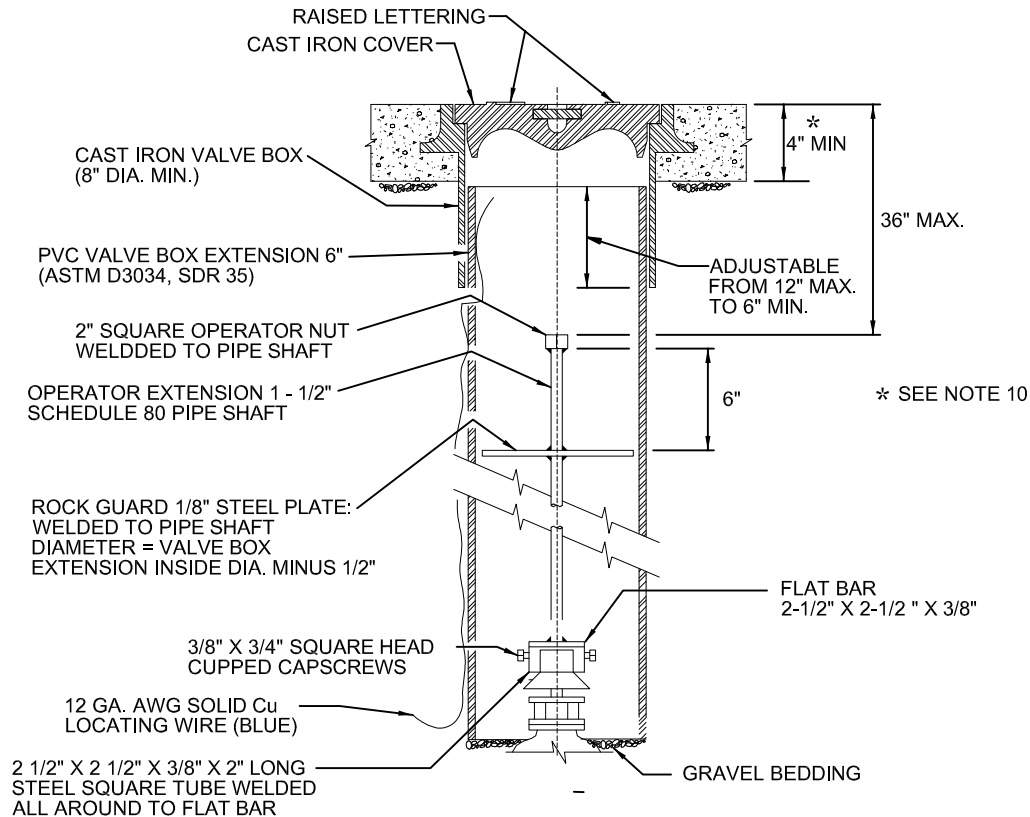
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## WATER SERVICE CONNECTION

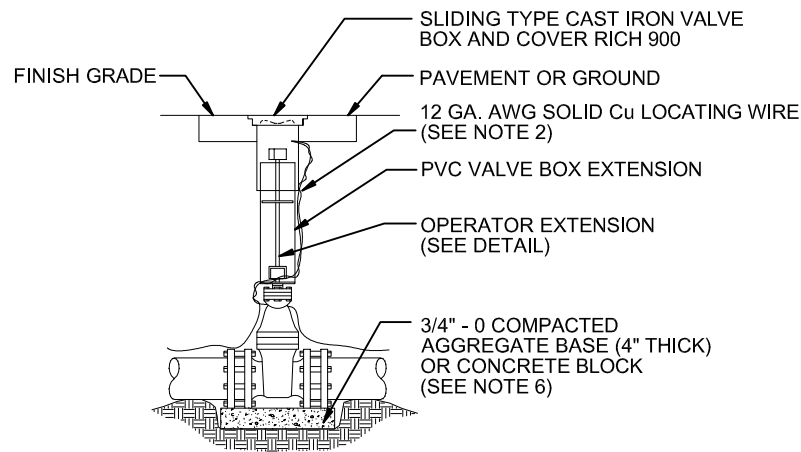
2019

DATE	REVISIONS

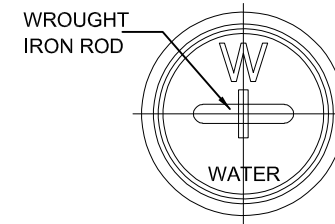
## VALVE BOX EXTENSION SECTION



## VALVE BOX ASSEMBLY DETAIL



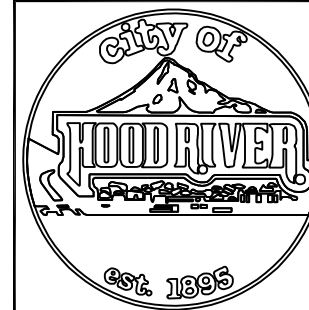
## COVER PLAN



### NOTES FOR ALL DETAILS:

1. VALVE BOX NOT TO REST ON OPERATING ASSEMBLY.
2. VALVE BOX TO BE RICH 910, 18" IN LENGTH.
3. A 1/2" HOLE MUST BE DRILLED THROUGH THE VALVE BOX 20" BELOW FINISH GRADE TO ALLOW LOCATING WIRE TO BE PLACED THROUGH THE SIDE OF THE BOX.
4. OPERATOR EXTENSION REQUIRED WHEN VALVE NUT IS DEEPER THAN 3' FROM FINISH GRADE.
5. CENTER VALVE BOX ON AXIS OF OPERATOR NUT.
6. VALVES 12" AND SMALLER SHALL BE PROVIDE WITH COMPACT AGGR. BASE ON UNDISTURBED GROUND. VALVES GREATER THAN 12" SHALL BE INSTALLED ON PRECAST CONCRETE BLOCK.
7. WELDS SHALL BE MINIMUM 1/4" ALL AROUND.
8. HOT DIP GALVANIZE OPERATOR EXTENSION AFTER FABRICATION.
9. CASTING SHALL MEET H20 LOAD REQUIREMENT.
10. PROVIDE CONCRETE OR ASPHALT PAD (24" SQUARE, 4" THICK), WHEN REQUIRED.
11. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS W-04



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

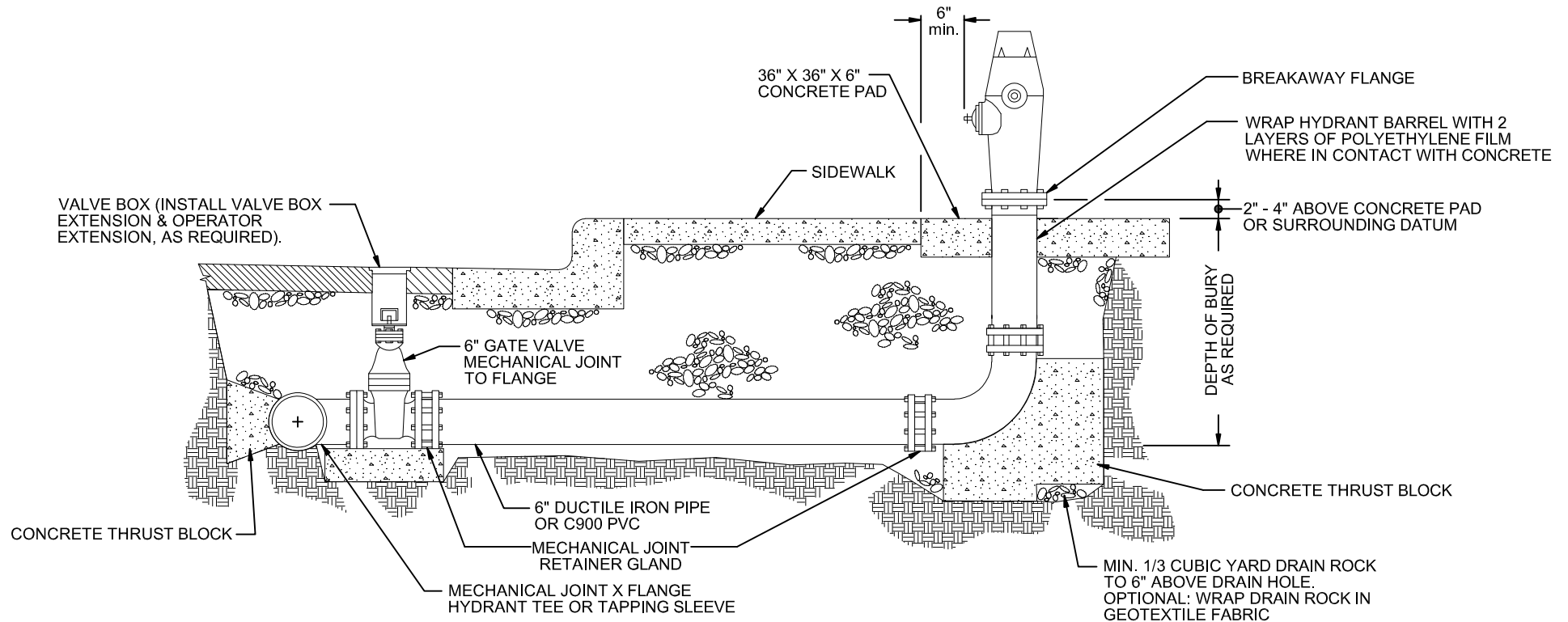
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## VALVE BOX & OPERATOR EXTENSION ASSEMBLY

2019

DATE	REVISIONS

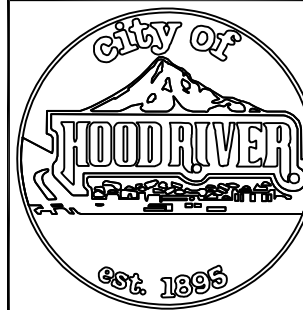
## HYDRANT ASSEMBLY



### GENERAL NOTES:

- HYDRANTS ARE TO BE MUELLER SUPER CENTURION 250.
- ONE 5 1/4" PUMPER WITH A 4" STORZ ADAPTER. HYDRANT PUMPER PORT SHALL FACE DIRECTION OF ACCESS.
- TWO 2 1/2" HOSE NOZZLES.
- WHEN PIPE IS SHORTER THAN 18', NO JOINTS ALLOWED. USE MECHANICAL JOINT RETAINER GLANDS.
- WHEN PIPE IS LONGER THAN 18' RETAINER GLANDS NOT REQUIRED.
- THERE SHALL BE A MINIMUM OF 18" HORIZONTAL CLEARANCE AROUND HYDRANT.
- WHEN PLACED ADJACENT TO CURB, HYDRANT PORT SHALL BE 24" FROM FACE OF CURB.
- CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED AS PER THRUST BLOCK STANDARD DRAWING. DO NOT BLOCK DRAIN HOLES.
- EXTENSIONS REQUIRED FOR HYDRANT SYSTEMS SHALL BE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS.
- HYDRANTS SHALL BE PLACED TO PROVIDE A MINIMUM OF 5' CLEARANCE FROM DRIVEWAYS, POLES, AND OTHER OBSTRUCTIONS.
- SET HYDRANT PLUMB IN ALL DIRECTIONS.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS W-05



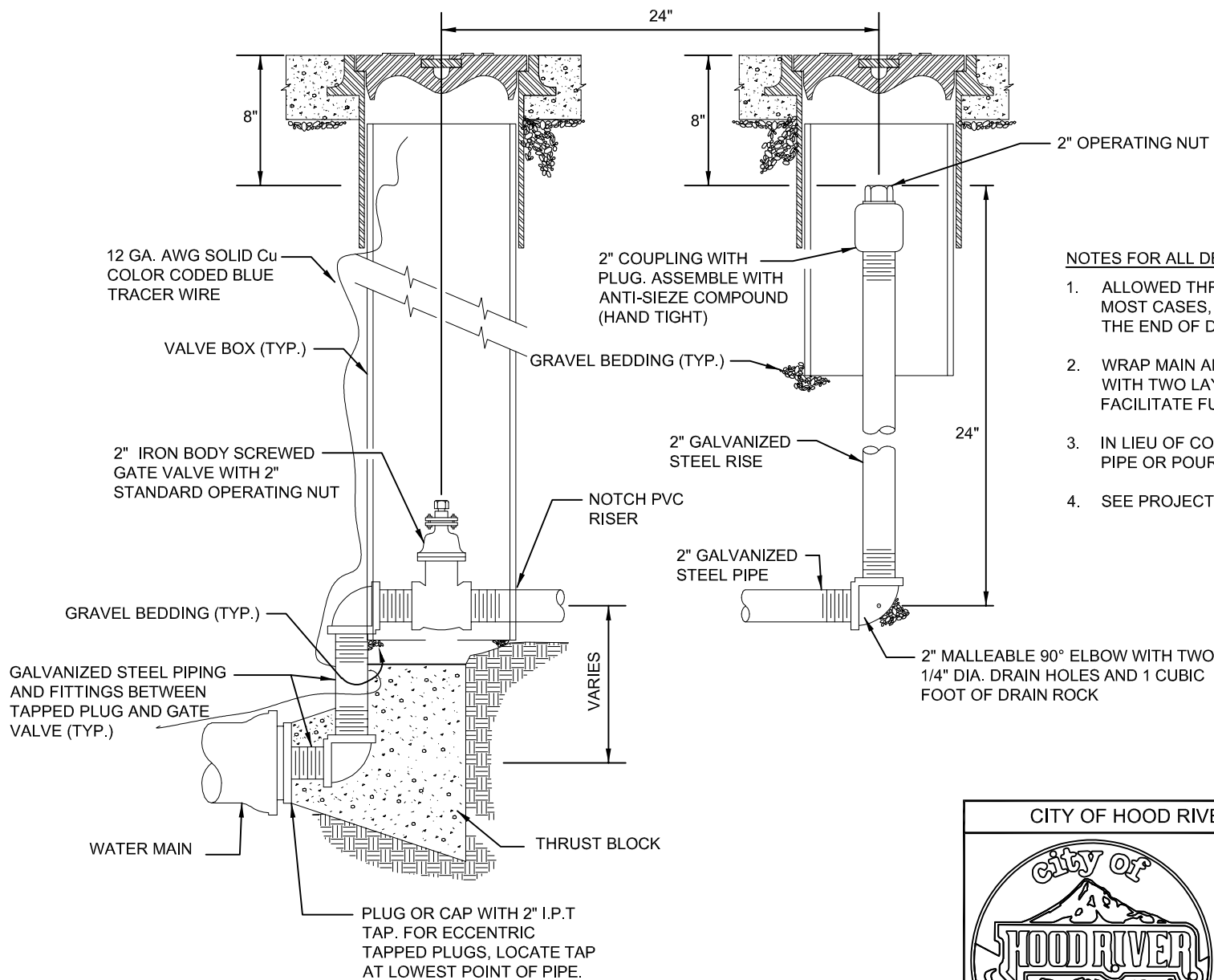
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

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## HYDRANT ASSEMBLY

2019

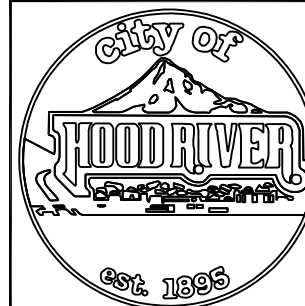
DATE	REVISIONS



#### NOTES FOR ALL DETAILS:

1. ALLOWED THROUGH DESIGN EXCEPTION ONLY. IN MOST CASES, FIRE HYDRANTS SHALL BE PLACED AT THE END OF DEAD END LINES.
2. WRAP MAIN AND FITTINGS IN THRUST BLOCK ZONE WITH TWO LAYERS OF POLYETHYLENE FILM TO FACILITATE FUTURE REMOVAL.
3. IN LIEU OF CONCRETE THRUST BLOCK, RESTRAIN PIPE OR POUR CONCRETE STRADDLE BLOCK.
4. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

#### CITY OF HOOD RIVER STANDARD DRAWINGS W-06



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

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## WATER MAIN DEAD-END BLOWOFF ASSEMBLY

2019

DATE	REVISIONS



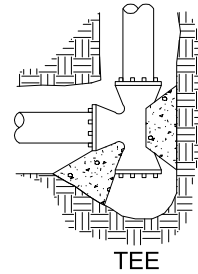
## CONCRETE THRUST BLOCKING (HORIZONTAL)

		THRUST (T) AT FITTINGS IN LBS				
PIPE DIA.	TABLE PRESSURE PSI	TEE & DEAD ENDS	90 DEG BEND	45 DEG BEND	22.5 DEG BEND	11.25 DEG BEND
4"	250	3140	4440	2405	1225	615
6"	250	7070	9995	5410	2760	1385
8"	250	12565	17770	9620	4905	2465
10"	250	19635	27770	15030	7660	3850
12"	250	28275	39985	21640	11030	5545
14"	250	38485	54425	29455	15015	7545
16"	250	50265	71085	38470	19615	9855

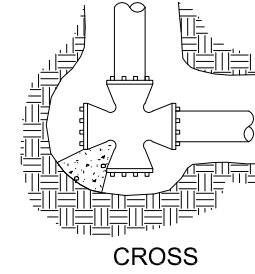
SOIL TYPE	SOIL BEARING CAPACITY (B) IN PSF
MUCK, PEAT, ECT.	0
SOFT CLAY	1000
SAND	2000
SAND AND GRAVEL	3000
SAND AND GRAVEL CEMENTED WITH CLAY	4000
HARD SHALE	10,000

## CONCRETE BLOCKING FOR CONVEX VERTICAL BENDS

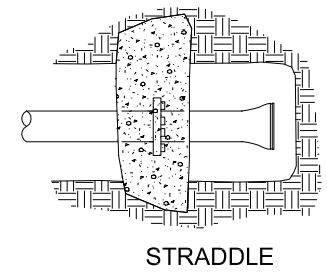
DIMENSION TABLE						
PIPE DIA. in.	TABLE PRESSURE PSI	BEND ANGLE (DEG)	CONCRETE VOLUME (cy)	CUBE SIZE (ft)	STIRRUP DIA. (in)	STIRRUP EMBMT. (in)
4"	250	11.25	0.21	1.8	5/8	17
		22.5	0.43	2.3		
		45	0.77	2.8		
6"	250	11.25	0.48	2.4	5/8	17
		22.5	0.95	3.0		
		45	1.79	3.6		
8"	250	11.25	0.86	2.9	5/8	17
		22.5	1.65	3.5		
		45	3.22	4.4		
10"	250	11.25	1.39	3.3	5/8	17
		22.5	2.62	4.1		
		45	4.97	4.1		
12"	250	11.25	1.94	3.7	5/8	17
		22.5	3.91	4.7		
		45	6.89	5.7		
14"	250	11.25	2.62	4.1	5/8	17
		22.5	5.26	5.2	3/4	20
		45	9.70	6.4	1	27
16"	250	11.25	3.44	4.5	5/8	17
		22.5	6.89	5.7	7/8	24
		45	12.63	7.0	1-1/8	30



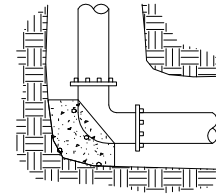
TEE



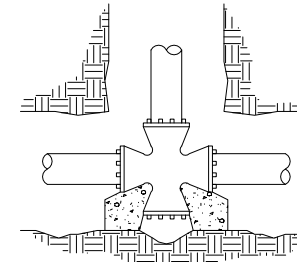
CROSS



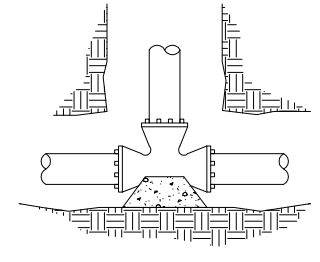
STRADDLE



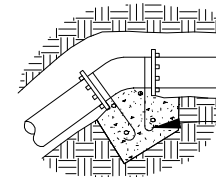
BEND



CROSS

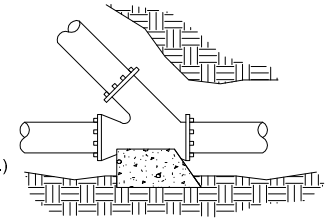


TEE



CONVEX  
VERTICAL BEND

STIRRUP (TYP.)



WYE

### DETERMINATION OF THRUST BLOCK BEARING AREA:

WHEN THRUST BLOCK BEARING AREA IS NOT SPECIFIED ON THE PLANS OR DETERMINED BY THE ENGINEER, USE THE FOLLOWING PROCEDURE TO DETERMINE REQUIRED BEARING AREA.

1. DETERMINE THRUST (T) FOR TYPE OF FITTING OR JOINT AND SIZE OF PIPE FROM TABLE.
2. DETERMINE DESIGN (TEST) PRESSURE FROM STANDARD SPECIFICATIONS OF SPECIAL PROVISIONS.
3. DETERMINE TABLE PRESSURE FROM TABLE.
4. DETERMINE SOIL BEARING CAPACITY (B) OF SOIL FROM TABLE.
5. DETERMINE REQUIRED BEARING AREA (A) IN SQ. FT. AS FOLLOWS:

$$A = \left( \frac{T}{B} \right) \left( \frac{\text{DESIGN (TEST) PRESSURE}}{\text{TABLE PRESSURE}} \right)$$

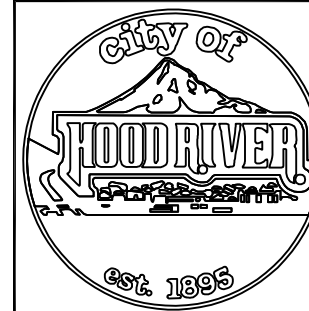
EXAMPLE: DESIGN (TEST) PRESSURE = 150 PSI  
PIPE = 14"  
FITTING = TEE  
SOIL = SAND

FROM TABLE, T = 38485 LBS  
FROM TABLE, B = 2000 PSF  
 $A = \left( \frac{38485}{2000} \right) \left( \frac{150}{250} \right) = 11.55 \text{ sq ft}$

### GENERAL NOTES:

1. CONTRACTOR TO PROVIDE BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE.
2. DRIVE THRUST BY SAFE BEARING LOAD TO DETERMINE REQUIRED BEARING AREA (A IN SQ.FT.) OF CONCRETE TO DISTRIBUTE LOAD.
3. ADJUST BEARING AREAS (A) FOR OTHER PRESSURE CONDITIONS. (SEE "DETERMINATION OF THRUST BLOCK BEARING AREA" EQUATION).
4. POUR CONCRETE BLOCKING AGAINST UNDISTURBED EARTH.
5. ALL CONCRETE TO BE 2900 PSI MINIMUM.
6. WRAP PIPE AND/OR FITTINGS WITH 2 LAYERS OF POLYETHYLENE FILM WHERE IN CONTACT WITH CONCRETE.
7. KEEP CONCRETE CLEAR OF ALL JOINTS AND ACCESSORIES.
8. STIRRUPS SHALL BE DEFORMED GALVANIZED COLD ROLLED STEEL AASHTO M31 (ASTM A615), GRADE 420. COAT WITH COAL TAR EPOXY AFTER INSTALLATION.

### CITY OF HOOD RIVER STANDARD DRAWINGS W-07



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## THRUST BLOCKING

2019

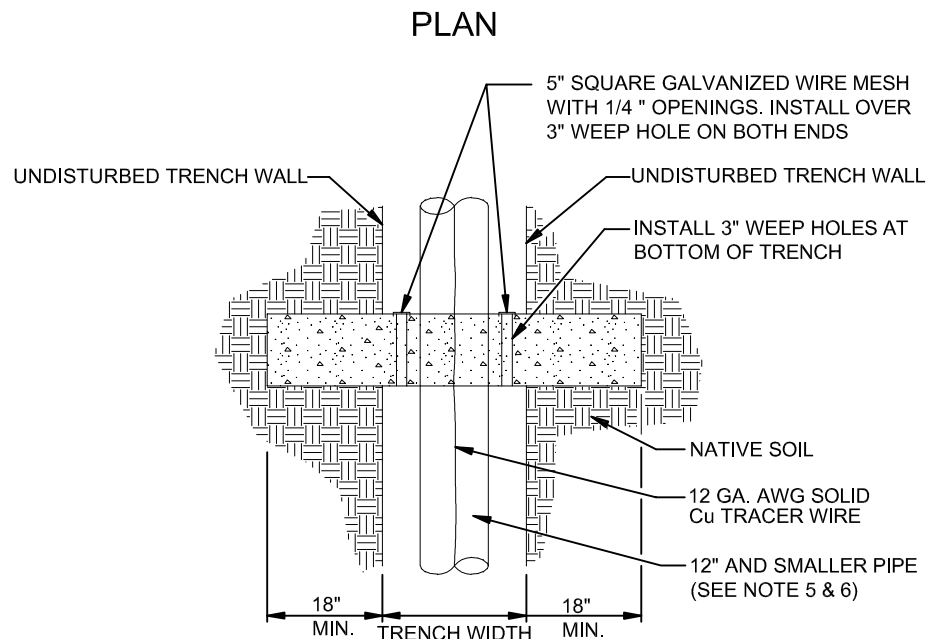
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## ***Standard Drawings – Drainage (D)***



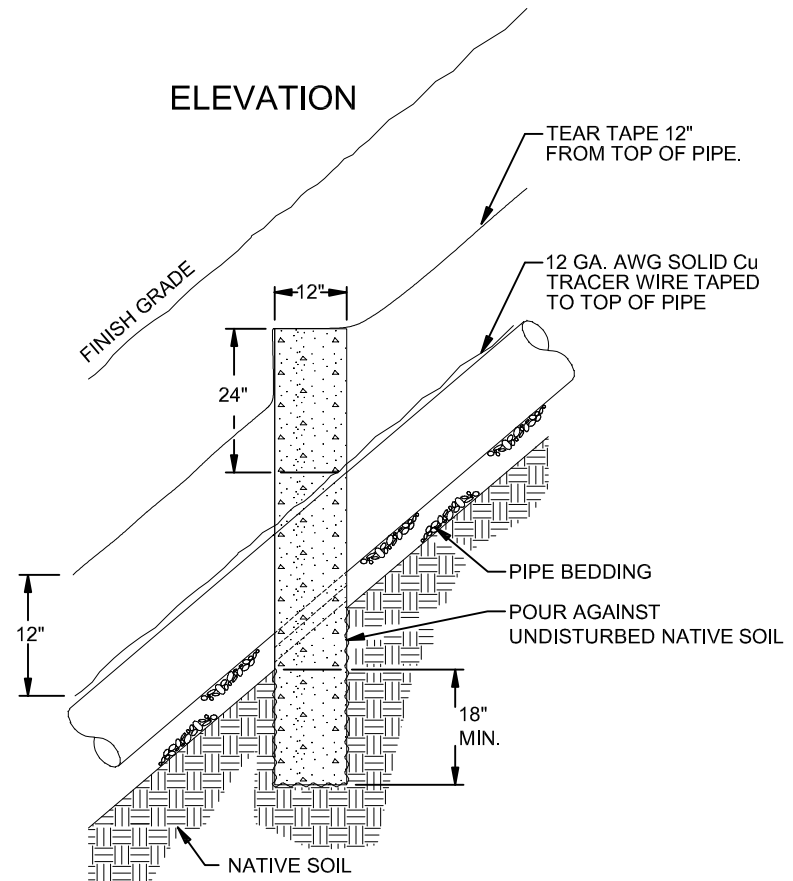


**NOTES FOR ALL DETAILS:**

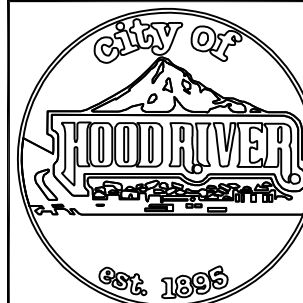
1. METAL PIPE REQUIRES POLYMERIC COATING WHEN USING SLOPE ANCHORS MADE WITH CONCRETE.
2. CONCRETE PIPE ANCHORS SHALL BE CONSTRUCTED USING FORMS WHEN SEWERS, STORM DRAINS, AND OTHER PIPELINES ARE CONSTRUCTED WITH SLOPES 20% OR GREATER. REMOVE FORMS PRIOR TO BACKFILLING TRENCH.
3. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
4. INSTALL CONCRETE PIPE ANCHOR AROUND OR DIRECTLY DOWNHILL OF PIPE BELL OR MECHANICALLY CONNECT TO PIPE.
5. CENTER TO CENTER MAX. SPACING OF CONCRETE PIPE ANCHORS SHALL BE:

SLOPE	SPACING
20-34%	35'
35-50%	25'
50+%	15'

6. DIMENSIONS FOR EMBEDMENT FOR PIPES LARGER THAN 12" SHALL BE APPROVED BY THE ENGINEER.



**CITY OF HOOD RIVER STANDARD DRAWINGS D-01**



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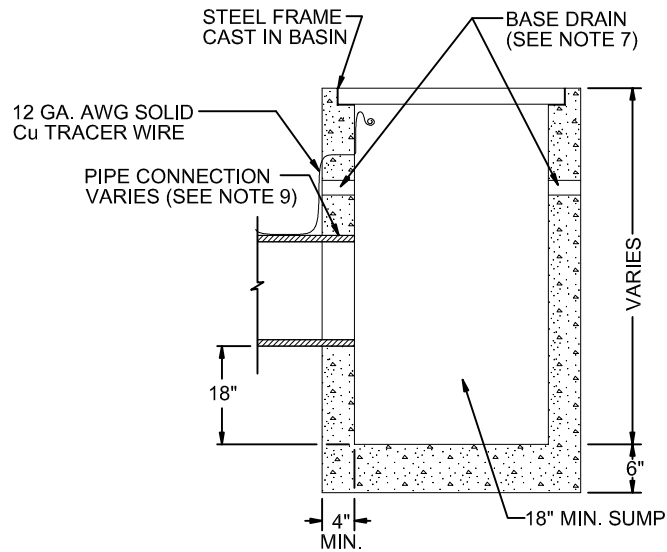
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

**PIPE SLOPE ANCHORS  
CONCRETE**

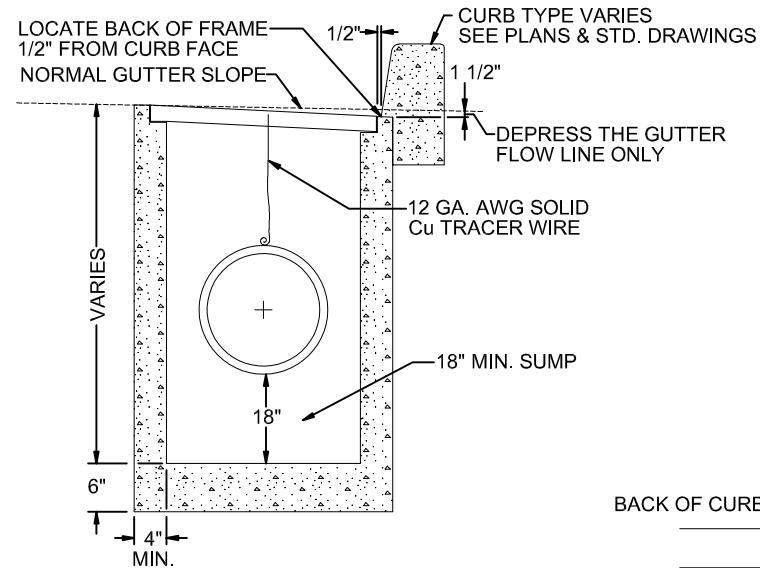
**2019**

DATE	REVISIONS

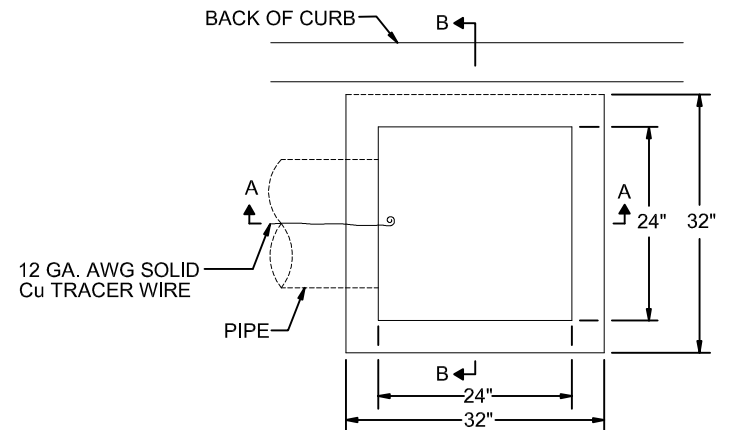
## SECTION A-A



## SECTION B-B



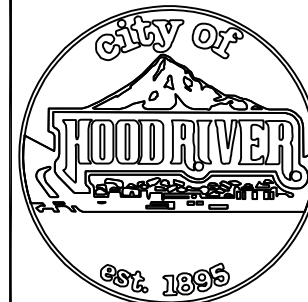
## PLAN



### NOTES FOR ALL DETAILS:

1. CATCH BASIN & GRATE SHALL MEET H20 LOADING.
2. ALL PRECAST CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
3. PRECAST WALLS SHALL BE A MINIMUM OF 4" THICK.
4. DEPRESS GUTTER FLOWLINE SEE DWG. CONCRETE INLET.
5. KNOCKOUTS ALLOWED FOR PRECAST OPTION.
6. IF DIRECTED, INSTALL 3" DIA. BASE DRAIN WITH FIELD INSTALLED MESH SCREEN FOR SUBGRADE DRAINAGE.
7. MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL.
8. ALL PRECAST INLETS SHALL CONFORM TO REQUIREMENTS OF ASTM C913.
9. SEE STD. DWG. FOR PIPE TO STRUCTURE CONNECTIONS.
10. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-02



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### STANDARD CATCH BASIN, FRAME, AND GRATE

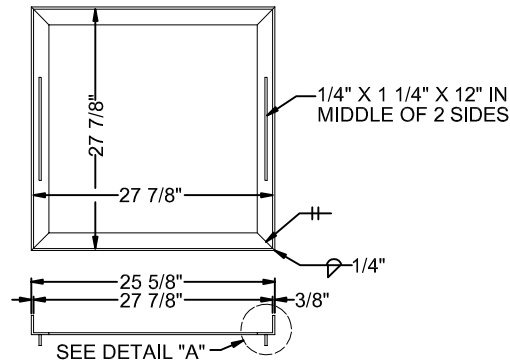
1 OF 2

2019

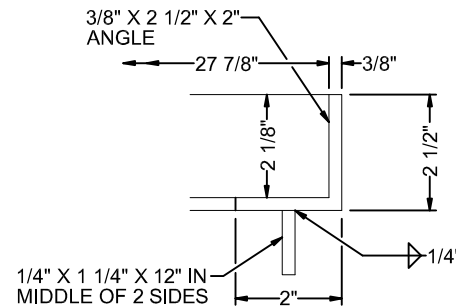
DATE	REVISIONS

## TYPE 3 FRAME - STEEL

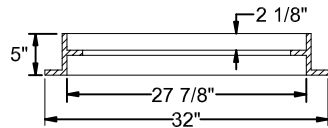
(HOT DIP GALVANIZE AFTER FABRICATION)



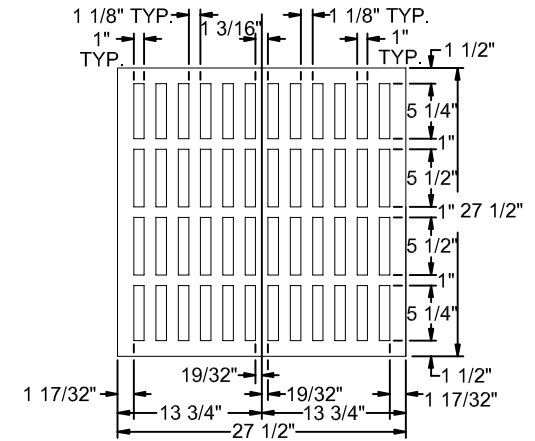
### DETAIL "A"



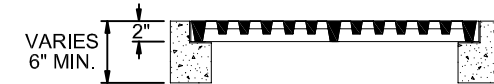
## OPTIONAL CAST IRON FRAME FOR A MORTAR-ON TYPE 2 CATCH BASIN



## TYPE 3 CATCH BASIN GRATE



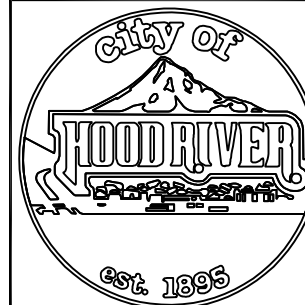
### PRECAST RISER



### NOTES FOR ALL DETAILS:

- CATCH BASIN & GRATE SHALL MEET H20 LOADING.
- ALL PRECAST CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
- PRECAST WALLS SHALL BE A MINIMUM OF 4" THICK.
- DEPRESS GUTTER FLOWLINE SEE DWG. CONCRETE INLET.
- KNOCKOUTS ALLOWED FOR PRECAST OPTION.
- IF DIRECTED, INSTALL 3" DIA. BASE DRAIN WITH FIELD INSTALLED MESH SCREEN FOR SUBGRADE DRAINAGE.
- MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL.
- ALL PRECAST INLETS SHALL CONFORM TO REQUIREMENTS OF ASTM C913.
- SEE STD. DWG. FOR PIPE TO STRUCTURE CONNECTIONS.
- SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-02



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

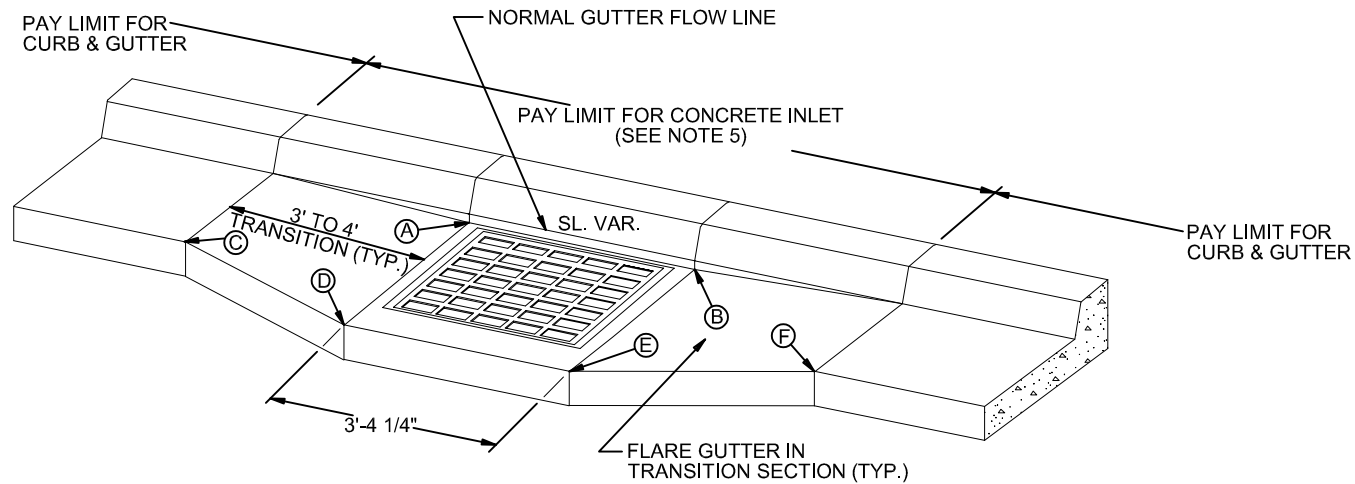
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## STANDARD CATCH BASIN, FRAME, AND GRATE

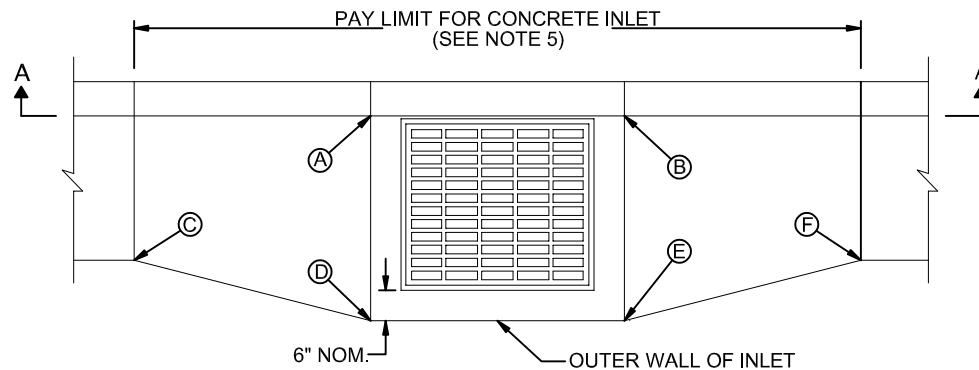
2 OF 2

2019

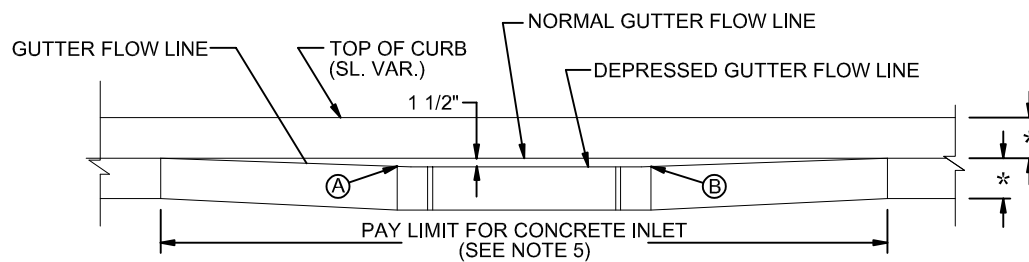
DATE	REVISIONS



### PLAN VIEW



### SECTION A-A

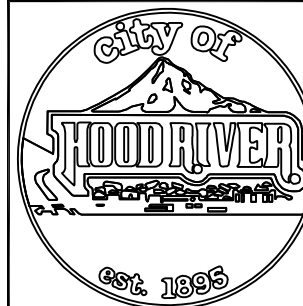


\* VARIES, SEE NOTE 3

#### NOTES FOR ALL DETAILS:

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STD. DWGS.
2. FOR FRAME AND GRATE DETAILS, SEE STD. DWG.
3. FOR CURB DETAILS, SEE STD. DWG.
4. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
5. PAY LIMIT FOR INLET WHEN CURB AND GUTTER ARE MONOLITHIC.
6. PROVIDE 1 1/2 " LOCAL DEPRESSION AT POINTS A & B.
7. MATCH NORMAL PAVEMENT GRADE AT POINTS C, D, E, & F.
8. VARY TRANSITION SECTION SLOPES TO MATCH ABOVE POINTS.

#### CITY OF HOOD RIVER STANDARD DRAWINGS D-03



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### GUTTER TRANSITION AT INLET

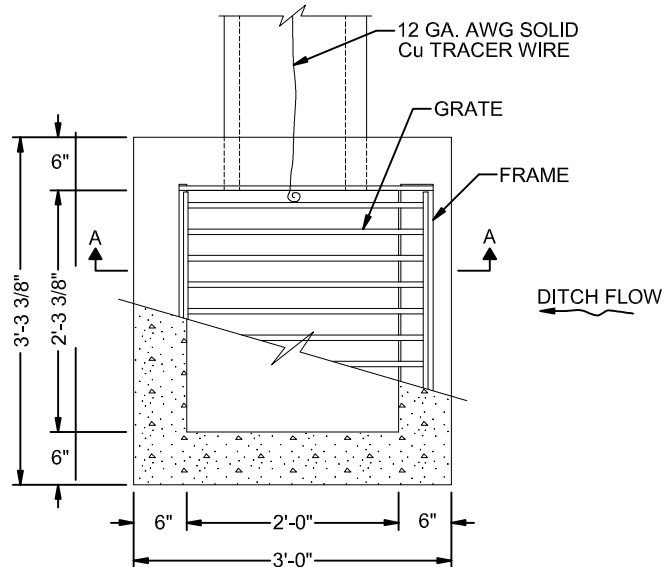
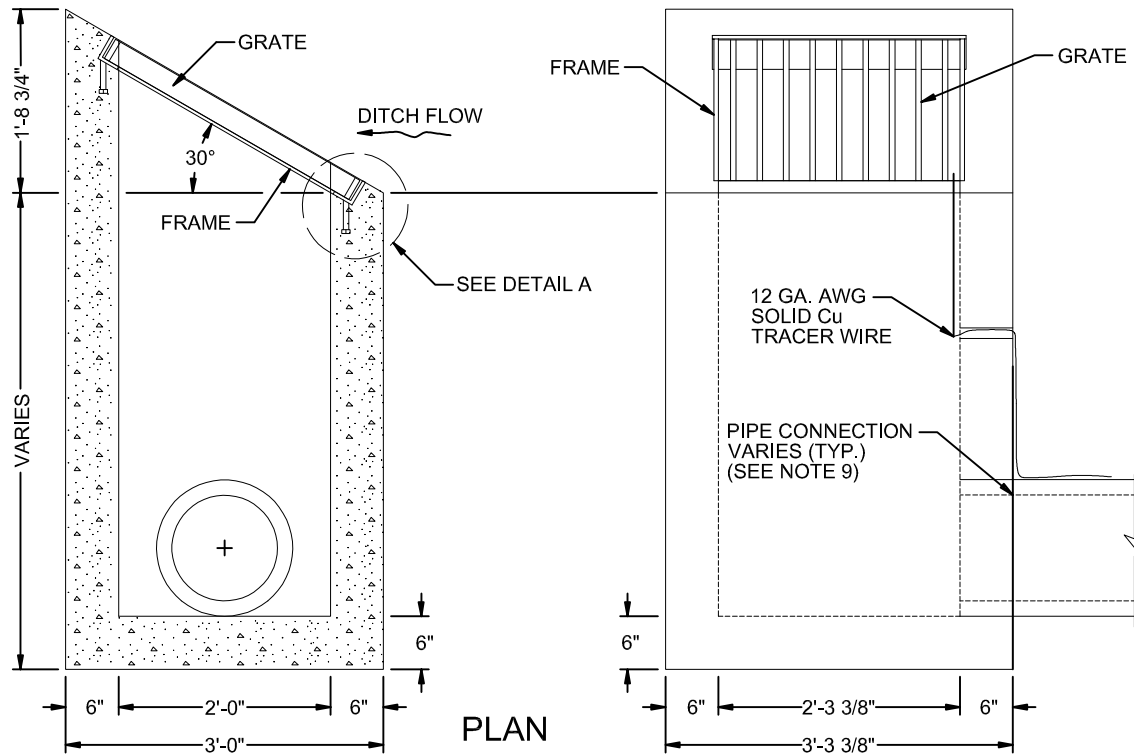
2019

DATE	REVISIONS



## SECTION A-A

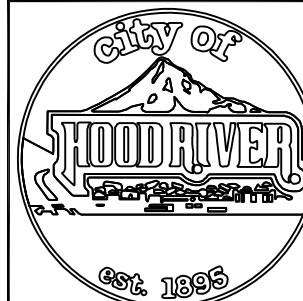
## ELEVATION



### NOTES FOR ALL DETAILS:

1. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
2. FOR FRAME & GRATE DETAILS NOT SHOWN SEE STD. DWG. MODIFY ANCHOR BOLT ATTACHMENT TO FRAME AS SHOWN IN DETAIL A.
3. CATCH BASIN, FRAME, AND GRATES SHALL MEET H20 LOADING.
4. PROVIDE 18" SUMP, AS DIRECTED BY THE CITY ENGINEER.
5. 5/8" CROSS BARS SHALL BE FLUSH WITH THE GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
6. MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL (2" MIN. CLEARANCE TO WALLS).
7. DO NOT USE IN LOCATIONS WHERE INLET CAN BE STRUCK BY AN ERRANT VEHICLE, OR PROVIDE SHIELDING OF INLET.
8. INLET BASE MAY BE CAST-IN-PLACE OR PRECAST. WHERE PRECAST INLET BASE IS USED AS AN ALTERNATE, A 4" COMPACTED LEVELING BED OF 3/4 "0 CRUSHED AGGREGATE SHALL BE PROVIDED. ALL PRECAST INLETS SHALL CONFORM TO REQUIREMENTS OF ASTM C913.
9. SEE STD. DWG. FOR PIPE TO STRUCTURE CONNECTIONS.
10. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-04



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

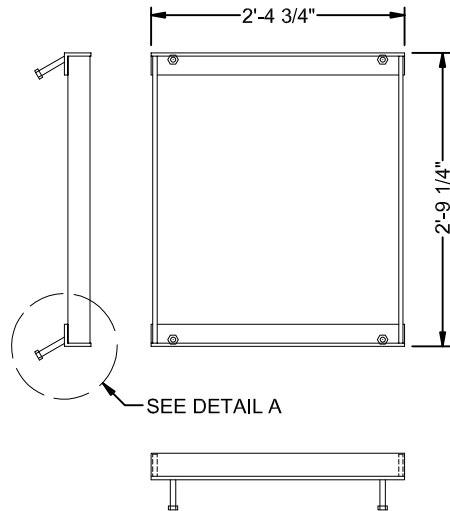
## DITCH INLET-TYPE D

1 OF 2

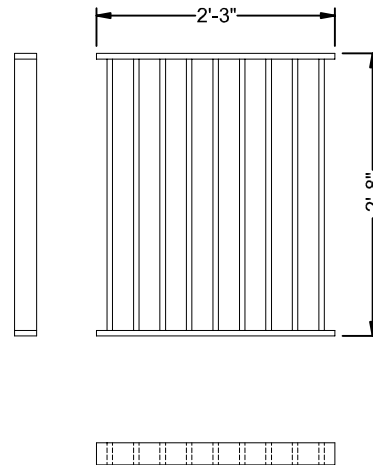
2019

DATE	REVISIONS

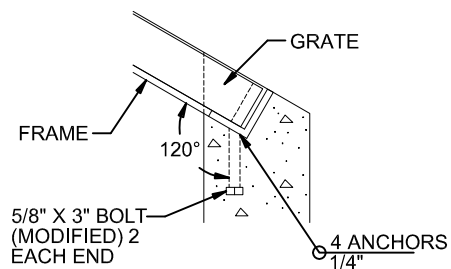
## G-2 FRAME (SEE NOTE 2)



## G-2 GRATE (TYPE 1) (SEE NOTE 2)



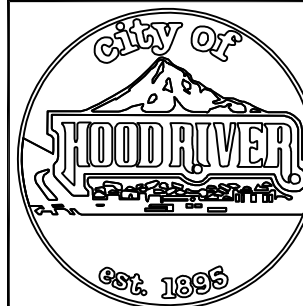
## DETAIL A (ANCHOR BOLT DETAIL, SEE NOTE 2)



### NOTES FOR ALL DETAILS:

1. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
2. FOR FRAME & GRATE DETAILS NOT SHOWN SEE STD. DWG. MODIFY ANCHOR BOLT ATTACHMENT TO FRAME AS SHOWN IN DETAIL A.
3. CATCH BASIN, FRAME, AND GRATES SHALL MEET H2O LOADING.
4. PROVIDE 18" SUMP, AS DIRECTED BY THE CITY ENGINEER.
5. 5/8" CROSS BARS SHALL BE FLUSH WITH THE GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
6. MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL (2" MIN. CLEARANCE TO WALLS).
7. DO NOT USE IN LOCATIONS WHERE INLET CAN BE STRUCK BY AN ERRANT VEHICLE, OR PROVIDE SHIELDING OF INLET.
8. INLET BASE MAY BE CAST-IN-PLACE OR PRECAST. WHERE PRECAST INLET BASE IS USED AS AN ALTERNATE, A 4" COMPACTED LEVELING BED OF 3/4" -0 CRUSHED AGGREGATE SHALL BE PROVIDED. ALL PRECAST INLETS SHALL CONFORM TO REQUIREMENTS OF ASTM C913.
9. SEE STD. DWG. FOR PIPE TO STRUCTURE CONNECTIONS.
10. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-04



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

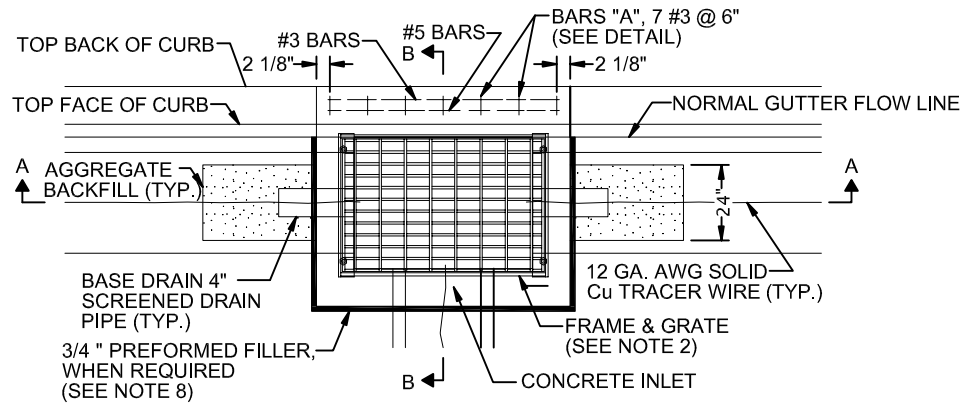
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## DITCH INLET-TYPE D 2 OF 2

2019

DATE	REVISIONS

## PLAN



## SECTION A-A

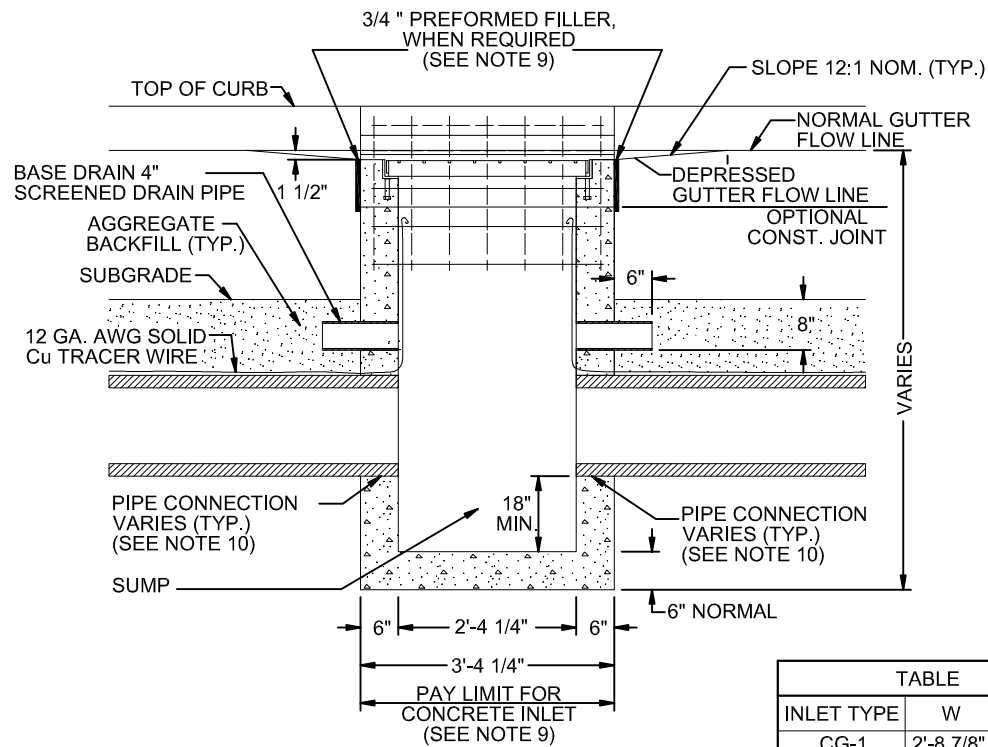
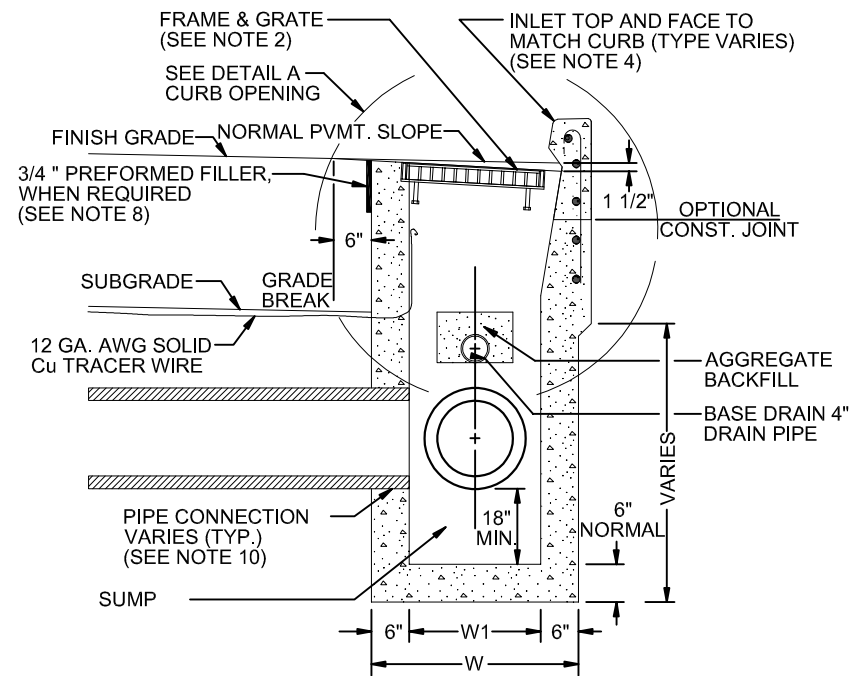
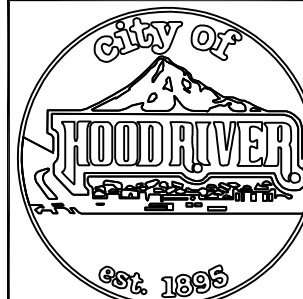


TABLE		
INLET TYPE	W	W1
CG-1	2'-8 7/8"	1'-8 7/8"
CG-2	3'-3 3/8"	2'-3 3/8"

## SECTION B-B



## CITY OF HOOD RIVER STANDARD DRAWINGS D-05



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

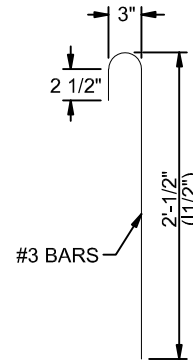
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## CONCRETE INLETS TYPE CG-1, CG-2

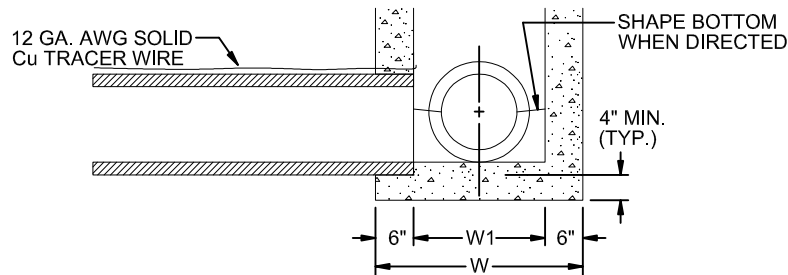
1 OF 2  
2019

DATE	REVISIONS

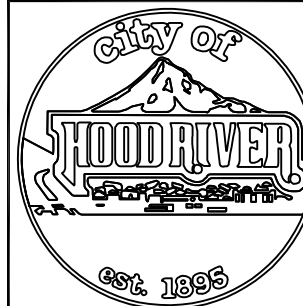
## BAR "A" DETAILS



### DETAIL B WITHOUT SUMP



1. WHERE PRECAST INLETS ARE USED AS AN ALTERNATE TO CAST-IN-PLACE INLETS, A 4" COMPACTED LEVELING BED OF 3/4"-0 CRUSHED AGGREGATE SHALL BE PROVIDED.
2. GRAPHICS SHOW CG-1 INLET WITH TYPE 2 GRATE. SEE TABLE FOR INLET DIMENSIONS. TYPE 1 GRATE ALLOWED ONLY IN LOCATIONS NOT SUBJECT TO BICYCLE OR PEDESTRIAN USE. FOR FRAME AND GRATE DETAILS, SEE STD. DWG. FRAMES & GRATES FOR CONCRETE INLETS.
3. PROVIDE SUMP UNLESS OTHERWISE SHOWN ON PLANS. SEE DETAIL B FOR INLET WITHOUT SUMP.
4. FOR CURB DETAILS, SEE STD. DWG. CURB DETAIL.
5. MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL AND INLET TYPE (18" MAX).
6. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
7. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
8. 3/4 " PREFORMED FILLER (IN CONCRETE PAVEMENT OR GUTTER ONLY) TO EXTEND THROUGH THICKNESS OF CONCRETE.
9. #3 "A" BARS TO BE PLACED DURING CURB CONSTRUCTION.
10. ALL BARS TO BE PLACED 1 1/2" CLEAR OF NEAREST FACE OF CONCRETE UNLESS SHOWN OR NOTED OTHERWISE.
11. ALL BARS SHALL BE FULL LENGTH (NO SPLICES).

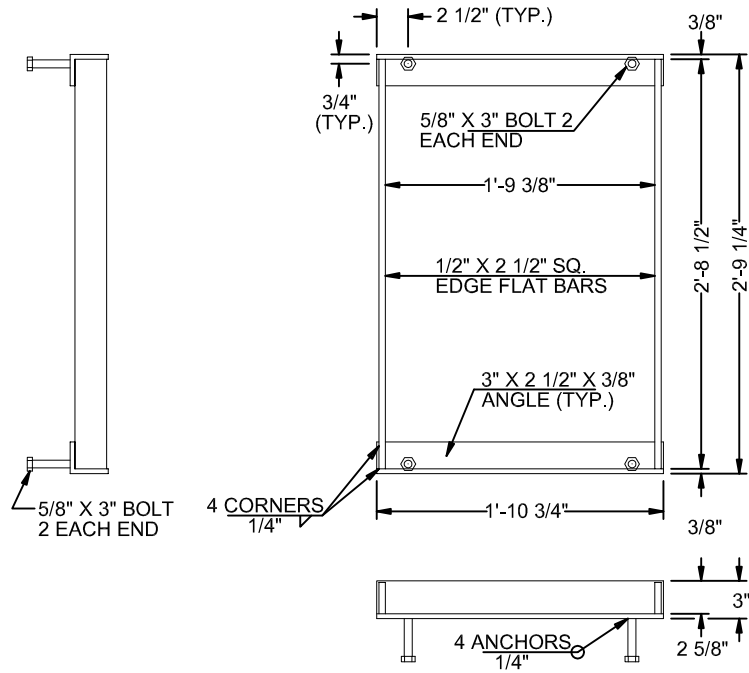


**NOTE:** ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

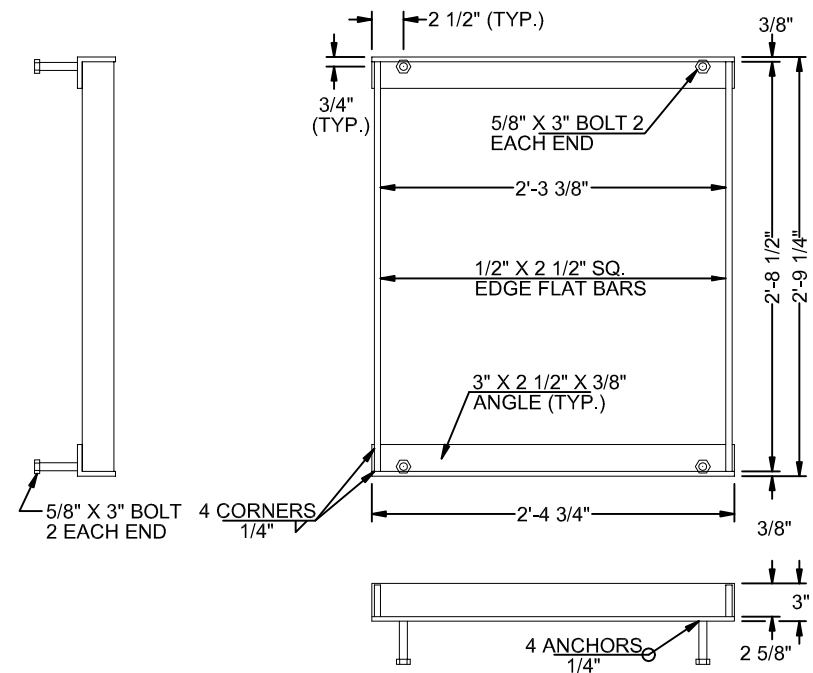
2 OF 2  
2019

DATE	REVISIONS

## G-1, CG-1 FRAME



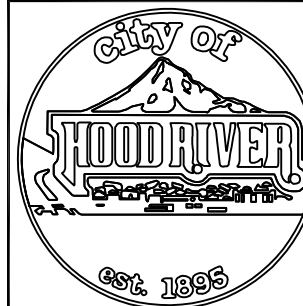
## G-2, G-2M, G-2MA, CG-2 FRAME



### GENERAL NOTES:

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STD. DWGS.
2. HOT DIP GALVANIZE AFTER FABRICATION.
3. CAST IRON GRATE AND FRAME ARE ACCEPTABLE ALTERNATES.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-06



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

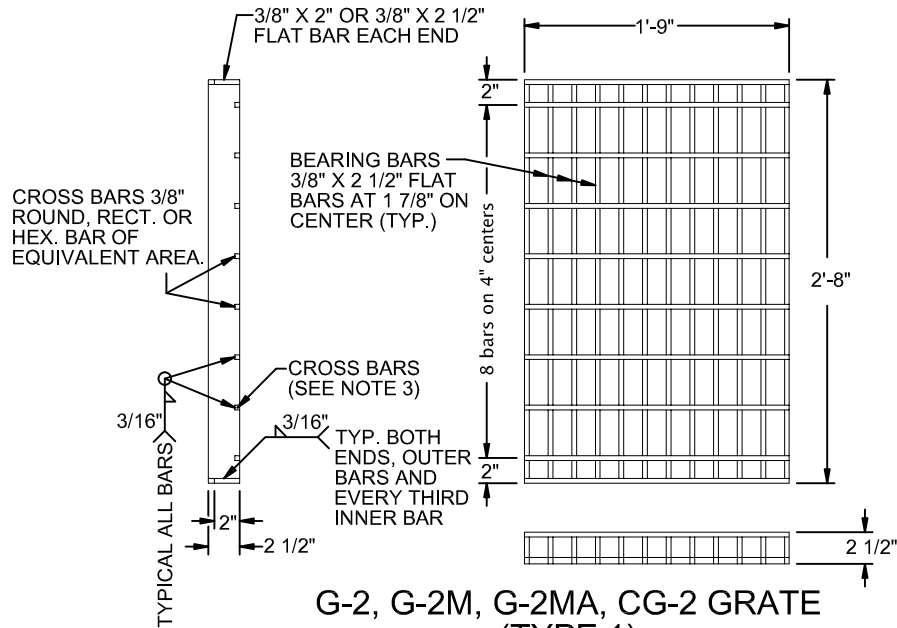
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## FRAMES & GRATES FOR CONCRETE INLETS

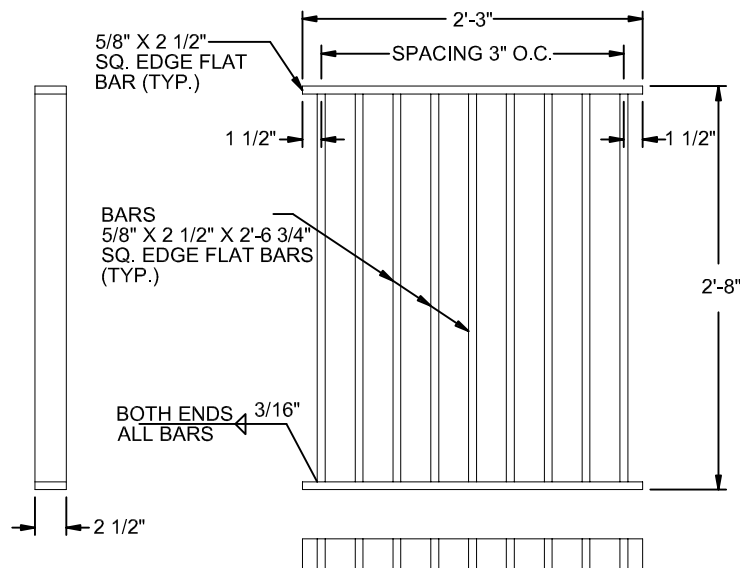
1 OF 2  
2019

DATE	REVISIONS

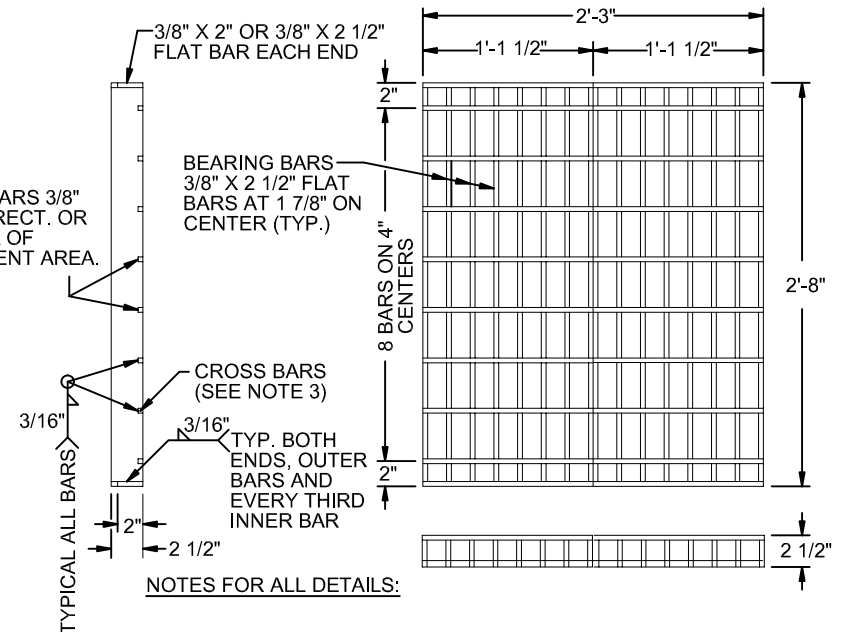
**G-1, CG-1 GRATE  
(TYPE 2)**  
(BICYCLE SAFE)



**G-2, G-2M, G-2MA, CG-2 GRATE  
(TYPE 1)**  
(SEE NOTE 2)



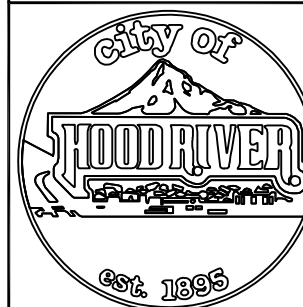
**G-2, G-2M, G-2MA, CG-2 GRATE  
(TYPE 2)**  
(BICYCLE SAFE)  
(2 GRATES REQUIRED PER INLET, AS SHOWN)



**NOTES FOR ALL DETAILS:**

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STD. DWGS.
2. TYPE 1 GRATE ALLOWED ONLY IN LOCATIONS NOT SUBJECT TO BICYCLE OR PEDESTRIAN USE.
3. 3/8" CROSS BARS SHALL BE FLUSH WITH THE TOP OF GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
4. HOT DIP GALVANIZE AFTER FABRICATION.
5. CAST IRON GRATE AND FRAME ARE ACCEPTABLE ALTERNATES.

**CITY OF HOOD RIVER STANDARD DRAWINGS D-06**



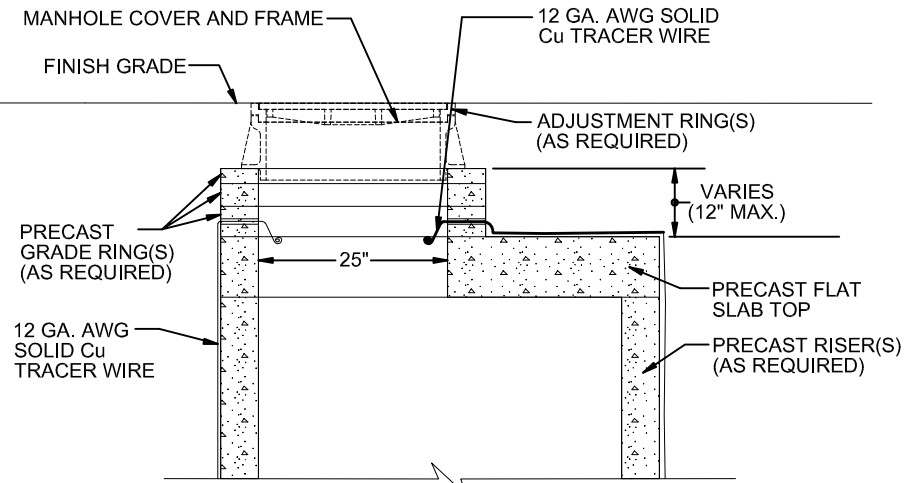
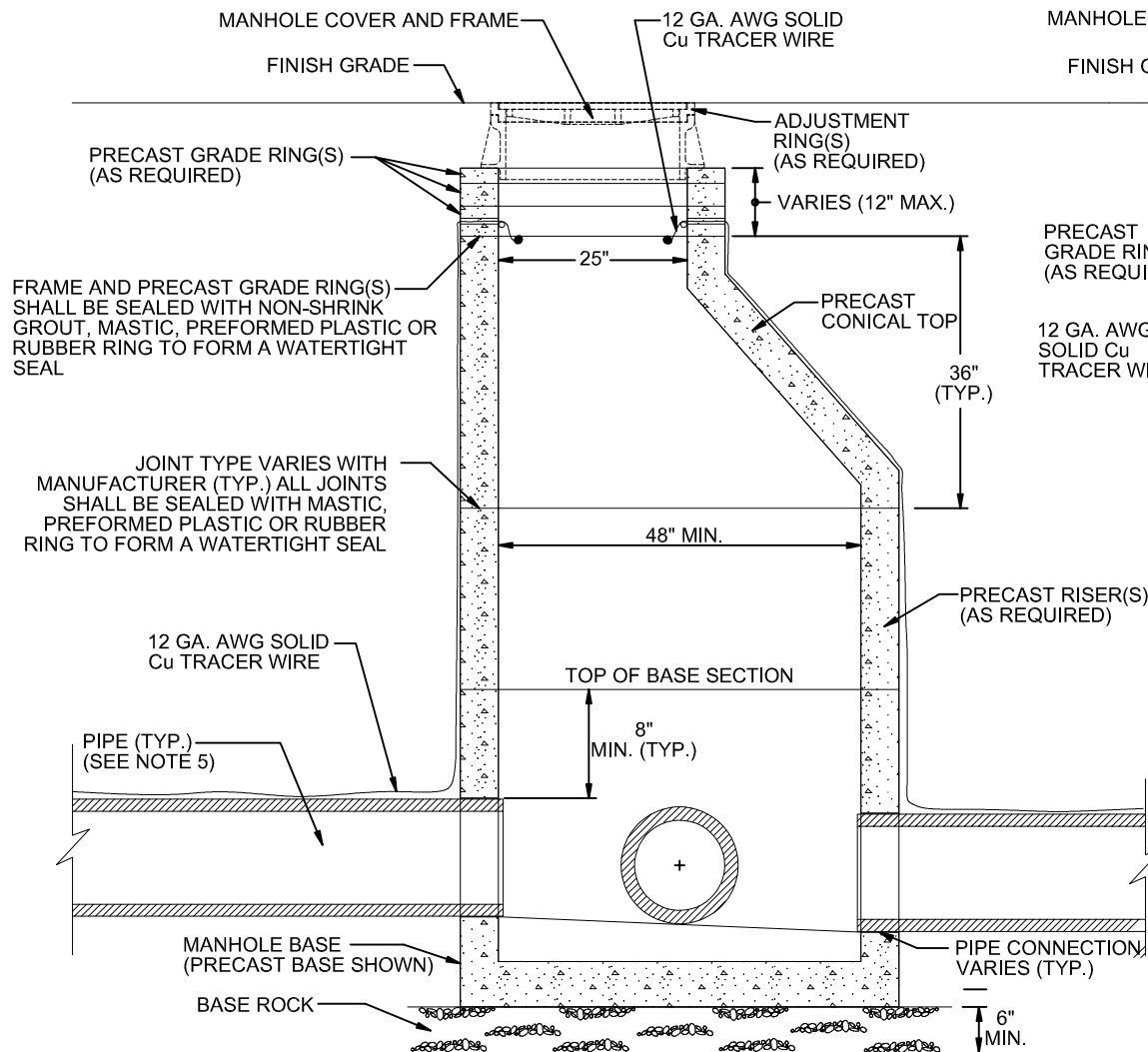
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

**FRAMES & GRATES FOR  
CONCRETE INLETS**

**2 OF 2  
2019**

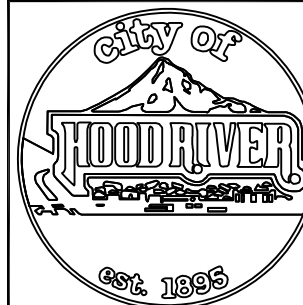
DATE	REVISIONS



**NOTES FOR ALL DETAILS:**

1. ALL PRECAST PRODUCTS SHALL CONFORM TO REQUIREMENTS OF ASTM C478.
2. STANDARD PRECAST MANHOLE SECTION DIAMETER SHALL BE 48".
3. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
4. SEE STD. DWGS. FOR PIPE TO MANHOLE CONNECTIONS AND STANDARD MANHOLE DETAILS.
5. MAX. PIPE DIAMETER VARIES.
6. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
7. PAVED INVERT OR 24" MIN. SUMP MAY BE ALLOWED AT THE DISCRETION OF THE CITY ENGINEER.
8. STEPS WILL NOT BE ALLOWED IN MANHOLES.

**CITY OF HOOD RIVER STANDARD DRAWINGS D-07**



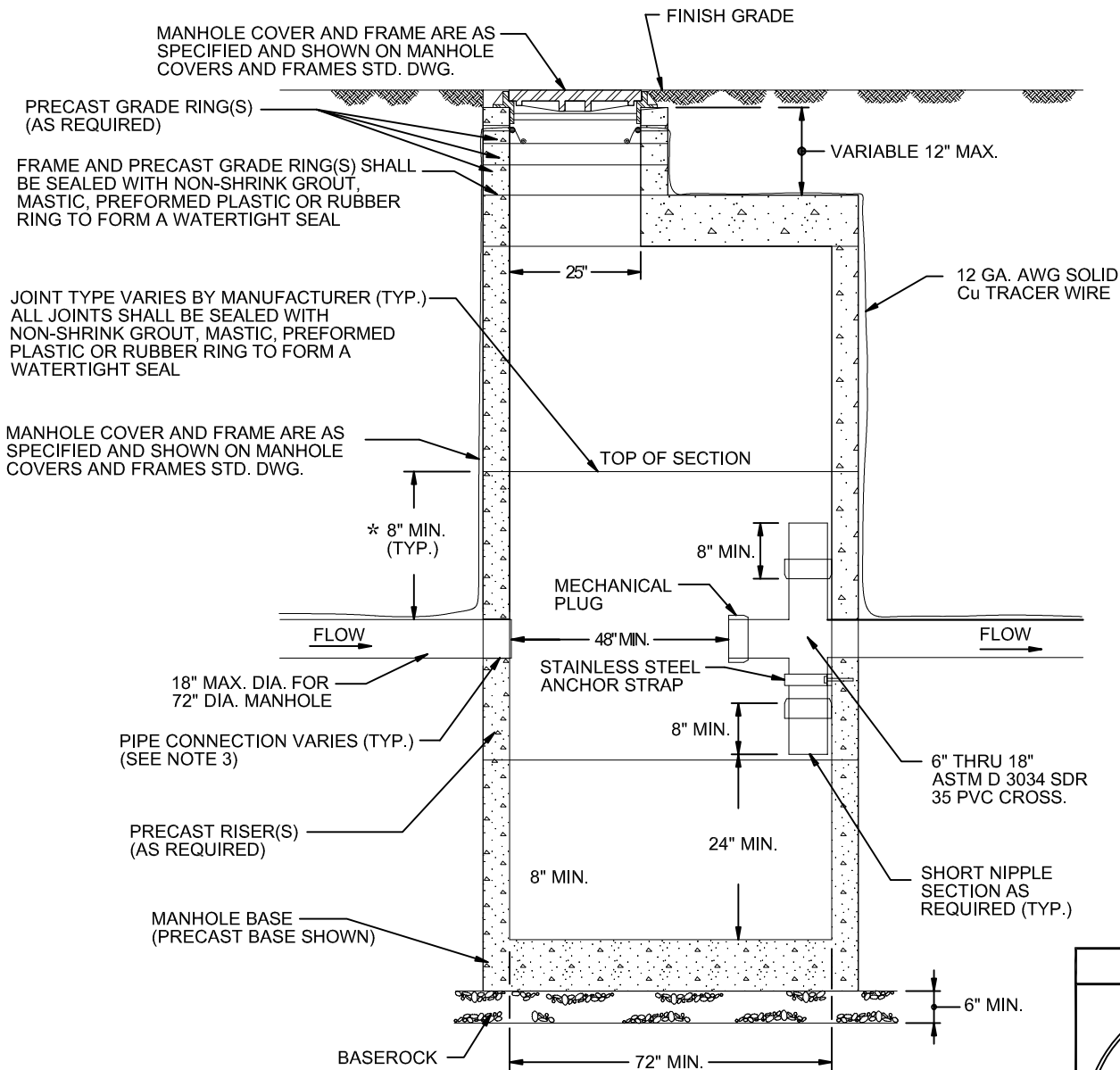
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

**STANDARD STORM  
SEWER MANHOLE**

2019

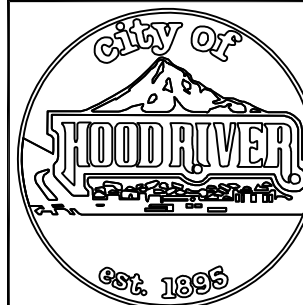
DATE	REVISIONS



#### NOTES FOR ALL DETAILS:

1. ALL PRECAST PRODUCTS SHALL CONFORM TO REQUIREMENTS OF ASTM C478.
2. STANDARD PRECAST MANHOLE SECTION DIAMETER SHALL BE 72" MIN., MAX. PIPE DIAMETER 18".
3. MAX. PIPE DIAMETER VARIES WITH MANHOLE DIAMETER.
4. SEE STD. DWG. FOR PIPE TO MANHOLE CONNECTION.
5. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
6. STEPS WILL NOT BE ALLOWED IN MANHOLES.

#### CITY OF HOOD RIVER STANDARD DRAWINGS D-08



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

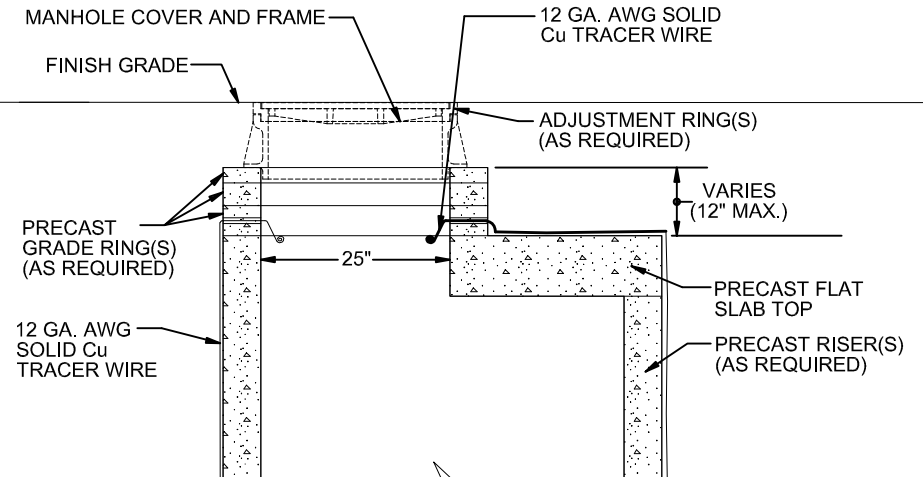
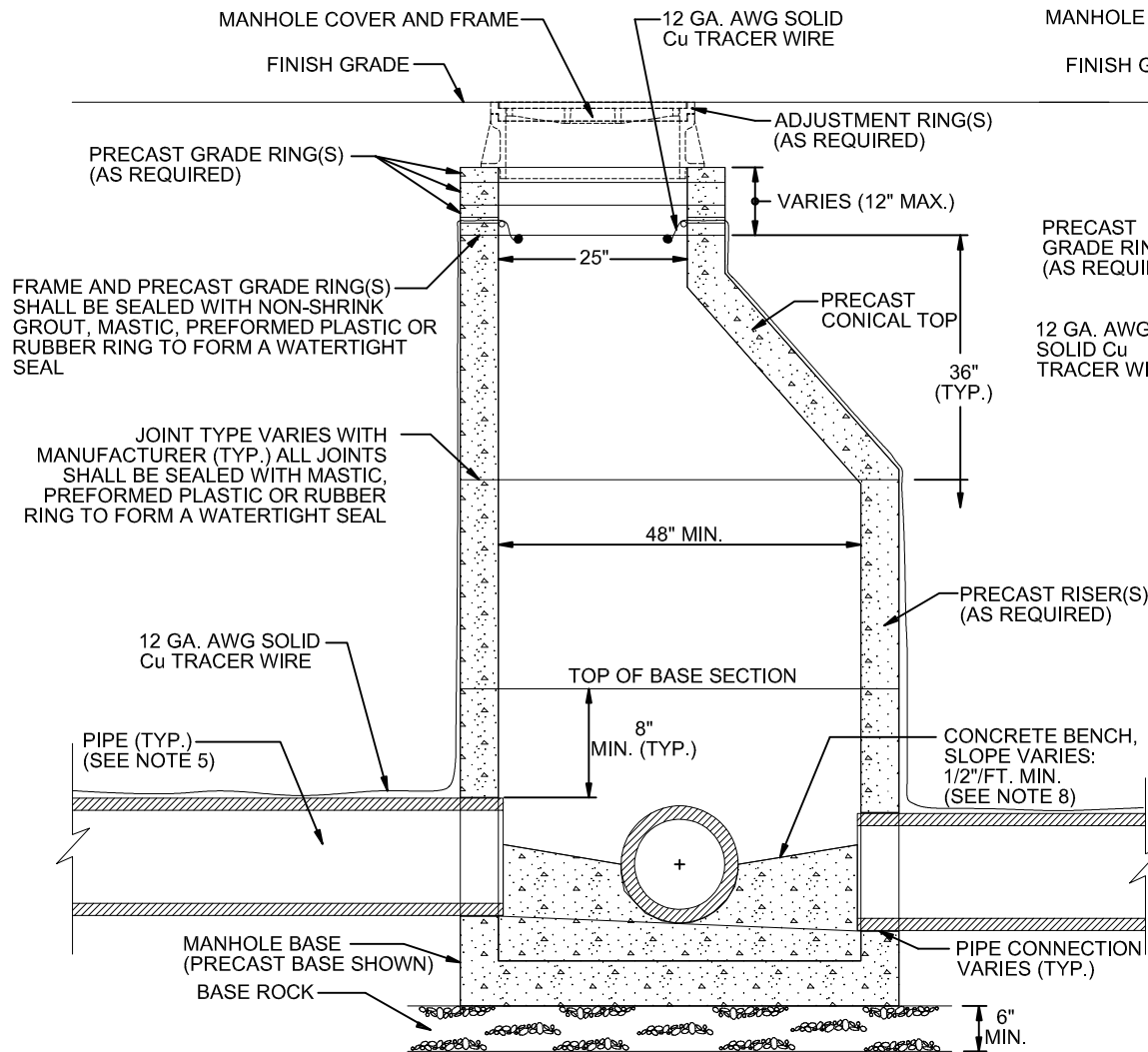
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### STORM SEWER PRE-TREATMENT MANHOLE 2019

DATE	REVISIONS

\* APPLIES TO ALL PENETRATIONS/HOLES UNLESS OTHERWISE APPROVED BY THE ENGINEER.

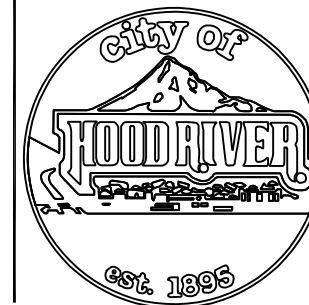




**NOTES FOR ALL DETAILS:**

1. ALL PRECAST PRODUCTS SHALL CONFORM TO REQUIREMENTS OF ASTM C478.
2. STANDARD PRECAST MANHOLE SECTION DIAMETER SHALL BE 48".
3. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
4. SEE STD. DWGS. FOR PIPE TO MANHOLE CONNECTIONS AND STANDARD MANHOLE DETAILS.
5. MAX. PIPE DIAMETER VARIES.
6. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
7. THIS DETAIL LIMITED TO INTERIOR DROP OF 24".
8. CONCRETE INVERT AND BENCH SHALL HAVE A SMOOTH TROWEL FINISH.
9. STEPS WILL NOT BE ALLOWED IN MANHOLES.

**CITY OF HOOD RIVER STANDARD DRAWINGS D-09**



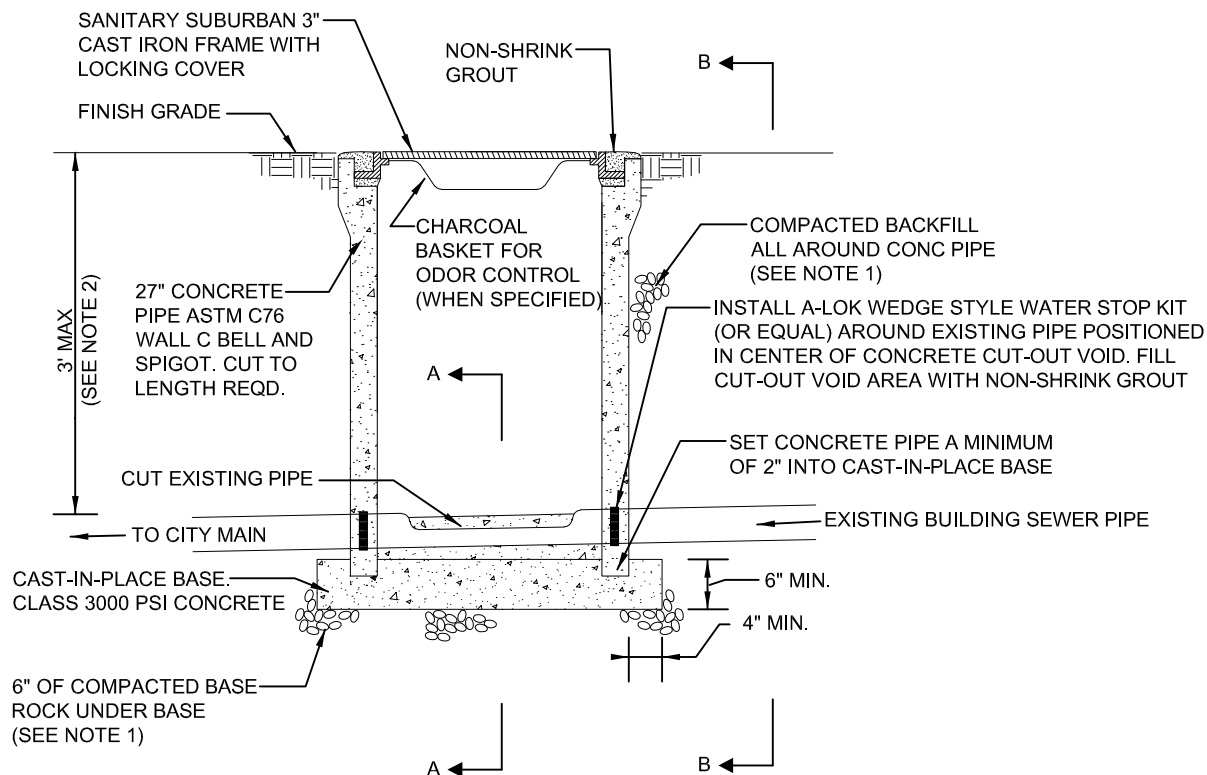
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

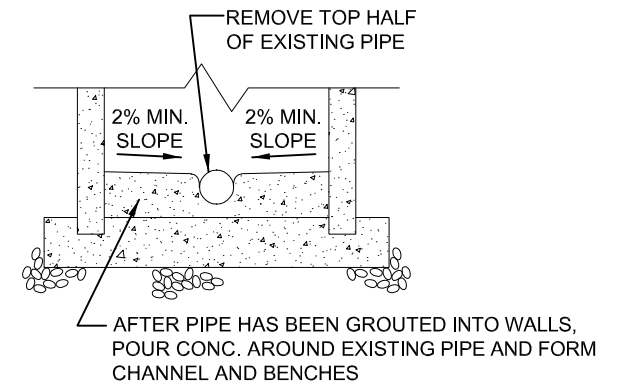
**STANDARD SANITARY SEWER MANHOLE**

2019

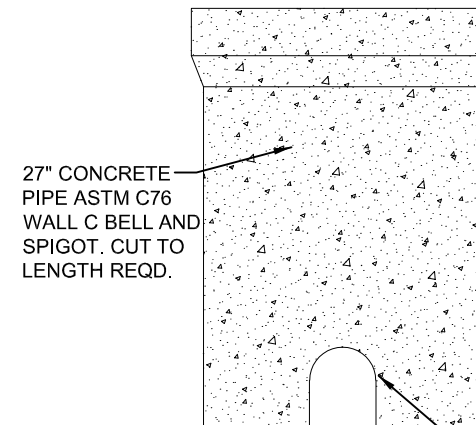
DATE	REVISIONS



## SECTION A-A



## SECTION B-B

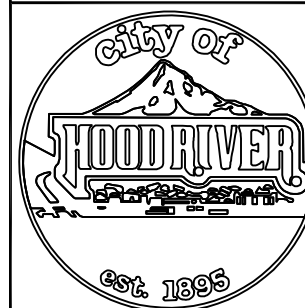


CUT NOTCH IN CONC. PIPE AND INSTALL OVER EXISTING SEWER LATERAL. PROVIDE MINIMUM CLEARANCE OF 2" AROUND PIPE. FILL VOID WITH NON-SHRINK GROUT AFTER INSTALLATION

### NOTES FOR ALL DETAILS:

1. COMPACT TO 95% OF MAX. DRY DENSITY AS PER AASHTO T-99 OR 90% T-180.
2. DEEPER LATERALS WILL REQUIRE LARGER ACCESS STRUCTURES.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-10



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

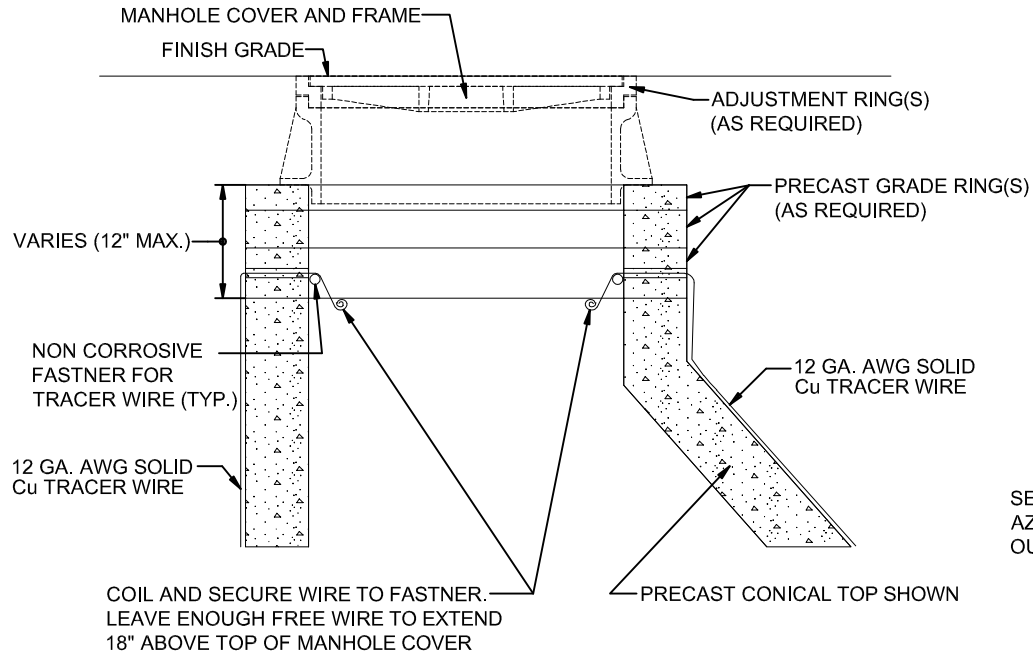
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## SAMPLING MANHOLE

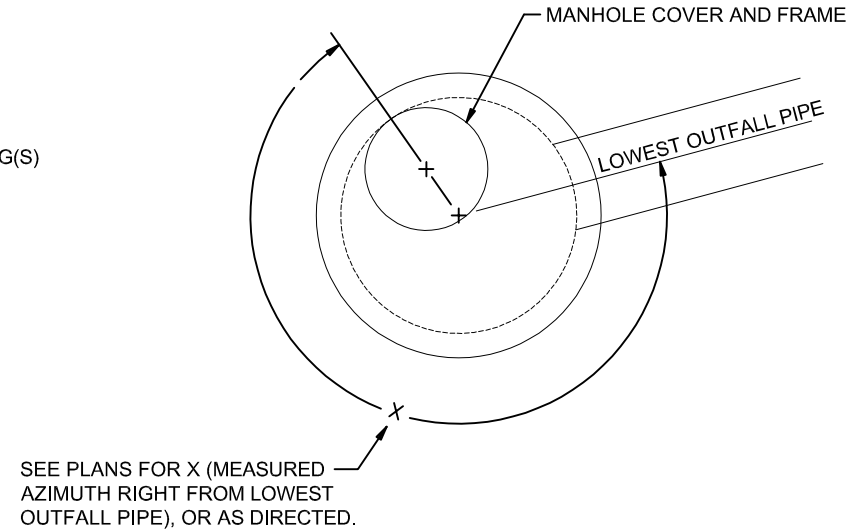
2019

DATE	REVISIONS

## DETAIL "A" TRACER WIRE



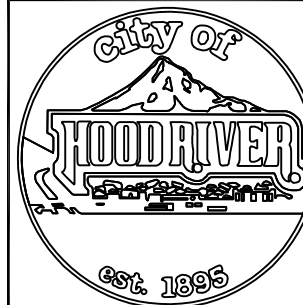
## DETAIL "C" PRECAST CONICAL TOP OR PRECAST FLAT SLAB TOP ORIENTATION



### NOTES FOR ALL DETAILS:

1. ALL PRECAST PRODUCTS SHALL CONFORM TO REQUIREMENTS OF ASTM C478.
2. STANDARD PRECAST MANHOLE SECTION DIAMETER SHALL BE 48".
3. SEE STD. DWG. FOR PIPE TO MANHOLE CONNECTION AND MANHOLE COVERS AND FRAMES.
4. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE. PLACE TRACER WIRE DIRECTLY OVER PIPE CENTERLINE AND ON TOP OF THE PIPE.
5. SEE PROJECT PLANS FOR DETAILS NOT SHOWN.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-11



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## MANHOLE DETAILS

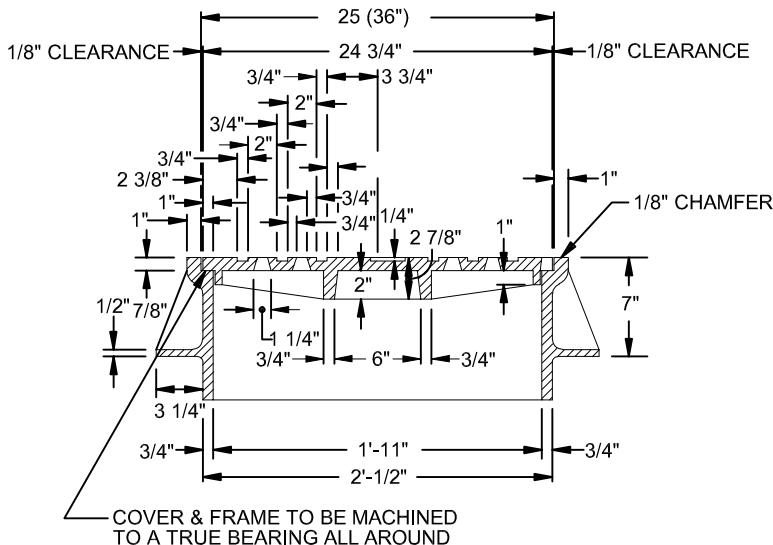
2019

DATE	REVISIONS

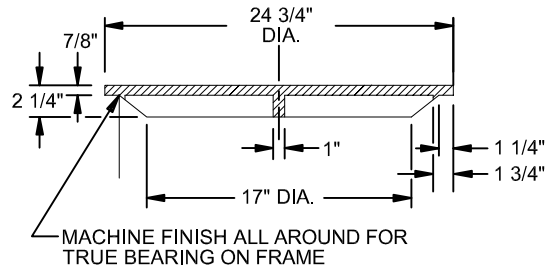
## STANDARD MANHOLE COVER, FRAME, & GRATE

## SECTION A-A

36" MIN. DIAMETER COVER IS REQUIRED FOR  
MANHOLES WITH DEPTHS OF 20' OR GREATER.

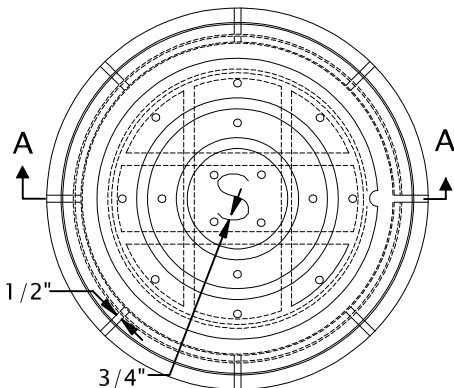


## SECTION B-B

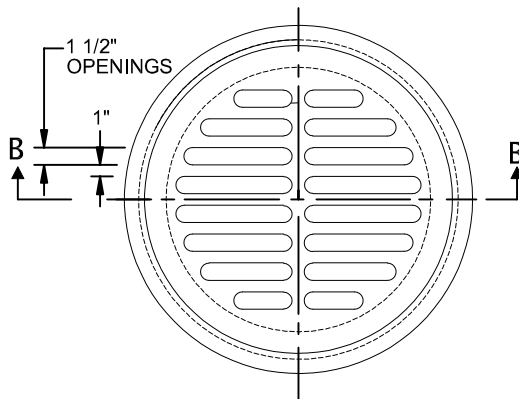


# PLAN

## MANHOLE COVER & FRAME



# PLAN MANHOLE GRATE



FOR USE WITH STANDARD MANHOLE FRAME  
(SEE NOTE 5)

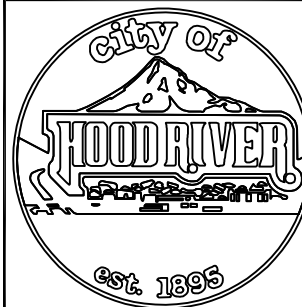
NOTES FOR ALL DETAILS:

1. COVERS FOR SANITARY MANHOLES SHALL HAVE 2 HOLES MAXIMUM.
2. WATERTIGHT COVERS REQUIRED IF LOCATED WHERE COVER MAY BE SUBMERGED. (NO HOLES).
3. COVERS AND FRAMES SHALL BE STAMPED WITH MANUFACTURER'S INITIALS, HEAT NUMBER, AND POINT OF ORIGIN.
4. SEE STD. DWG. FOR MANHOLE DETAILS.
5. MANHOLE GRATE ALLOWED ONLY IN LOCATIONS NOT SUBJECT TO BICYCLE OR PEDESTRIAN USE.

NOTE:

COAT OUTSIDE OF FRAME WITH ASPHALT WHERE FRAME IS TO BE PLACED IN CONCRETE PAVEMENT, CONCRETE GUTTER, OR WALK.

CITY OF HOOD RIVER STANDARD DRAWINGS D-12



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

**NOTE:** ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

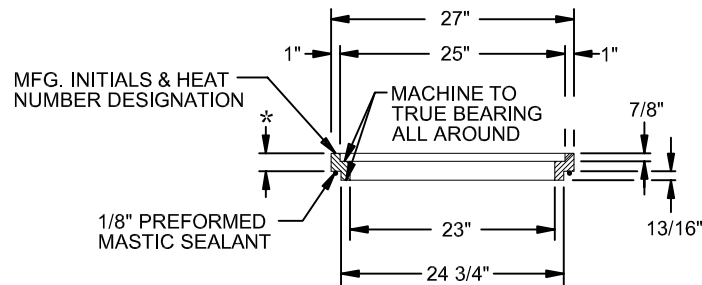
## MANHOLE COVERS & FRAMES

1 OF 3  
2019

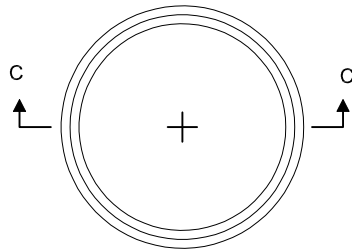
DATE	REVISIONS

## MANHOLE ADJUSTMENT RING FOR USE WITH STANDARD MANHOLE FRAME

\* STD. DEPTHS 1 1/2", 2", 2 1/2", & 3". MATL. TO BE GREY  
CAST IRON ASTM A48, CLASS 35B. TOLERANCE ON  
NON-MACHINED SURFACES TO BE 0.06".



### SECTION C-C

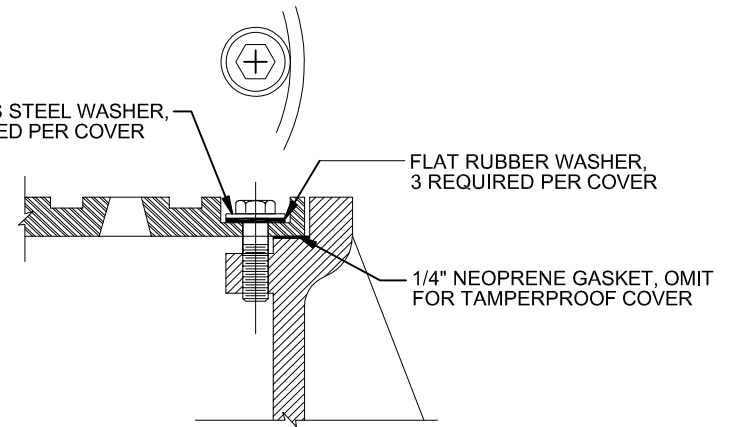


#### GENERAL NOTES:

- COVERS FOR SANITARY MANHOLES SHALL HAVE 2 HOLES MAXIMUM.
- WATERTIGHT COVERS REQUIRED IF LOCATED WHERE COVER MAY BE SUBMERGED. (NO HOLES).
- COVERS AND FRAMES SHALL BE STAMPED WITH MANUFACTURER'S INITIALS, HEAT NUMBER, AND POINT OF ORIGIN.
- MANHOLE GRATE ALLOWED ONLY IN LOCATIONS NOT SUBJECT TO BICYCLE OR PEDESTRIAN USE.

## BOLT-DOWN DETAIL (FOR TAMPERPROOF AND WATERTIGHT)

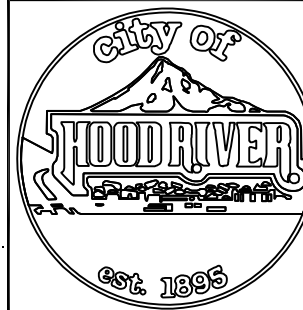
1 1/4" O.D. STAINLESS STEEL WASHER,  
1/8" THICK, 3 REQUIRED PER COVER



#### NOTE:

3 REQUIRED, EQUALLY SPACED, 1/2" X 1/2" PENTAGONAL OR HEXAGONAL  
HEAD, BRONZE OR STAINLESS STEEL.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-12



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN  
ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES,  
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CONSULTING A REGISTERED PROFESSIONAL ENGINEER

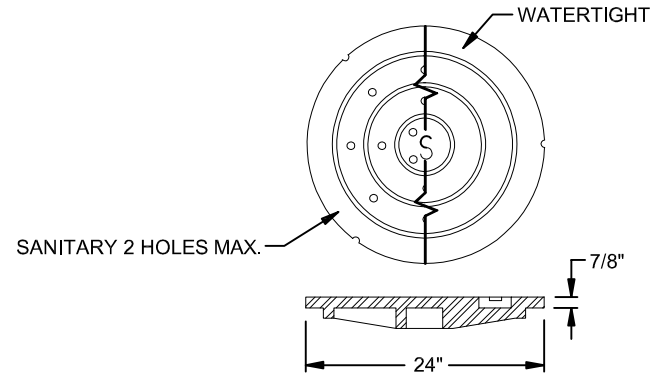
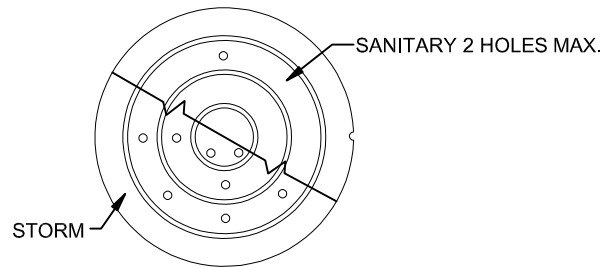
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE  
WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON  
STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## MANHOLE COVERS & FRAMES

2 OF 3  
2019

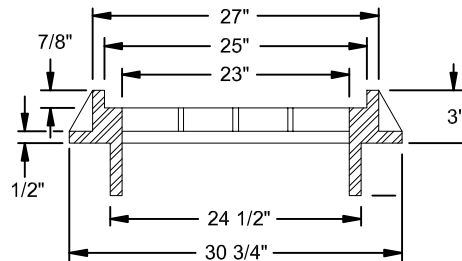
DATE	REVISIONS

# SUBURBAN MANHOLE COVER & FRAME



CAST IRON TAMPERPROOF & WATERTIGHT  
(FRAMES AVAILABLE IN STANDARD OR SUBURBAN PATTERN)

TO A TRUE BEARING

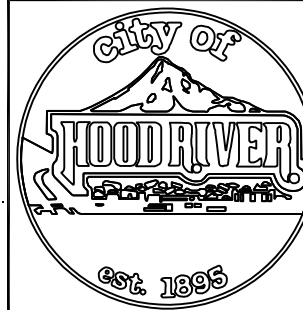


CAST IRON SUBURBAN FRAME  
FOR USE ON LOCAL STREETS ONLY (SEE NOTE 5)

## GENERAL NOTES:

- COVERS FOR SANITARY MANHOLES SHALL HAVE 2 HOLES MAXIMUM.
- WATERTIGHT COVERS REQUIRED IF LOCATED WHERE COVER MAY BE SUBMERGED. (NO HOLES).
- COVERS AND FRAMES SHALL BE STAMPED WITH MANUFACTURER'S INITIALS, HEAT NUMBER, AND POINT OF ORIGIN.
- MANHOLE GRATE ALLOWED ONLY IN LOCATIONS NOT SUBJECT TO BICYCLE OR PEDESTRIAN USE.
- FOR USE ON LOCAL STREETS ONLY, WHEN ALLOWED THROUGH DESIGN EXCEPTION.

## CITY OF HOOD RIVER STANDARD DRAWINGS D-12



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

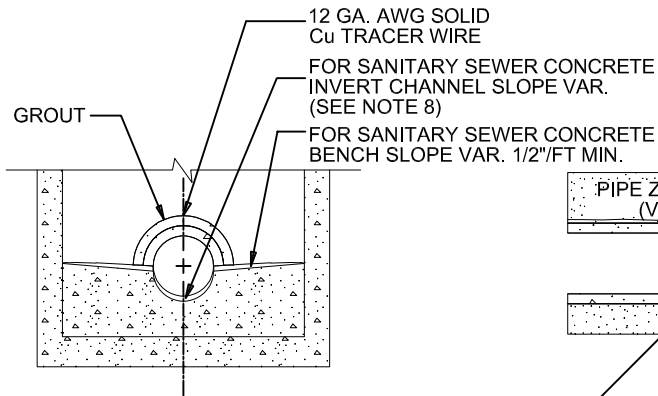
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## MANHOLE COVERS & FRAMES

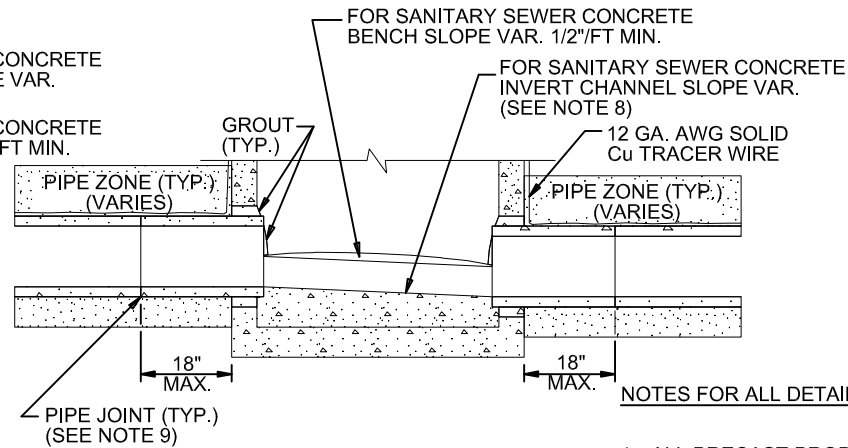
3 OF 3  
2019

DATE	REVISIONS

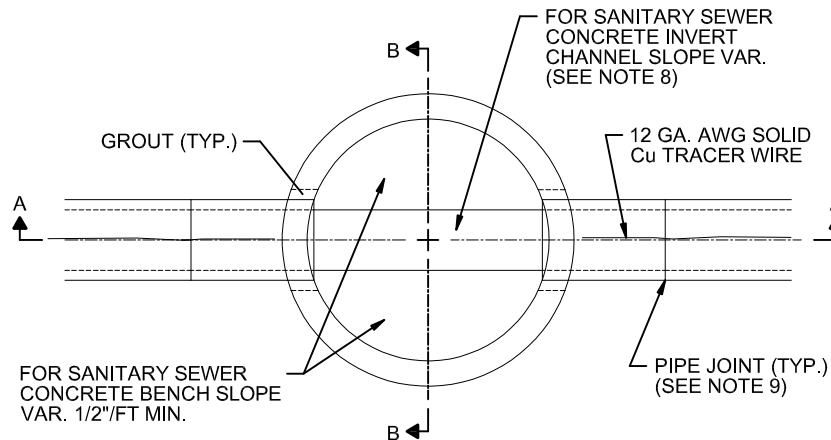
## CONNECTION OF RIGID PIPE TO MANHOLE



SECTION B-B



SECTION A-A

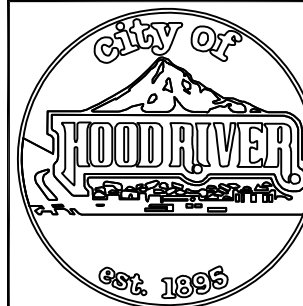


PLAN

### NOTES FOR ALL DETAILS:

1. ALL PRECAST PRODUCTS SHALL CONFORM TO REQUIREMENTS OF ASTM C478.
2. MANHOLE BASE SECTIONS MAY BE PRECAST OR CAST-IN-PLACE.
3. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
4. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
5. MAX. PIPE DIAMETER VARIES.
6. MINIMUM DISTANCE BETWEEN HOLE PENETRATIONS INTO MANHOLES SHALL BE PER THE MANUFACTURERS MINIMUM RECOMMENDATIONS.
7. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
8. INVERT CHANNELS SHALL BE CONSTRUCTED TO PROVIDE SMOOTH SLOPES AND RADII TO OUTLET PIPE. FOR ALL SANITARY MANHOLES.
9. WHEN RIGID PIPE IS USED, THE CONNECTING PIPE SHALL HAVE A FLEXIBLE, GASKETED AND UNRESTRAINED JOINT WITHIN 18" OF MANHOLE WALL. JOINT TYPE VARIES WITH MANUFACTURER.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-13



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

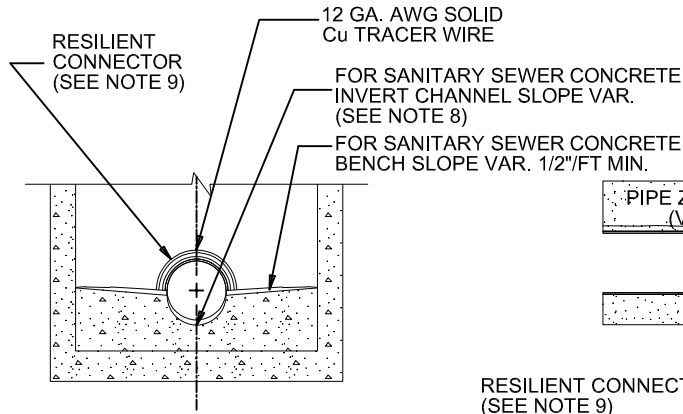
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### PIPE TO MANHOLE CONNECTION

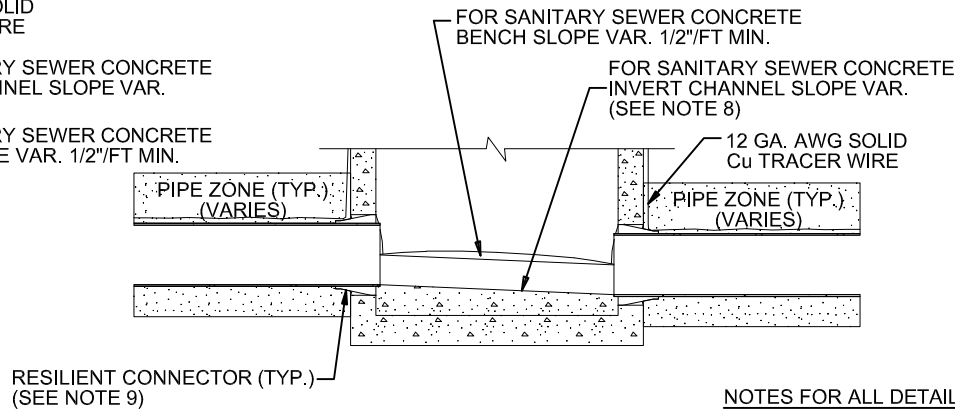
1 OF 2  
2019

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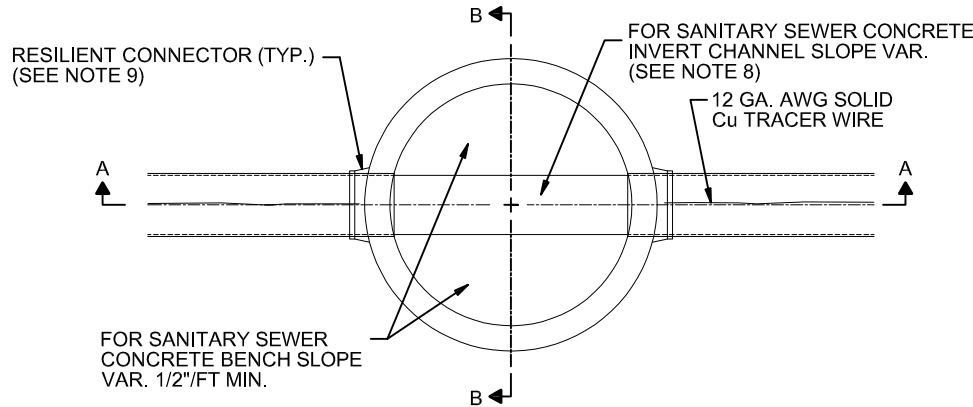
# CONNECTION OF FLEXIBLE PIPE TO MANHOLE



SECTION B-B



SECTION A-A

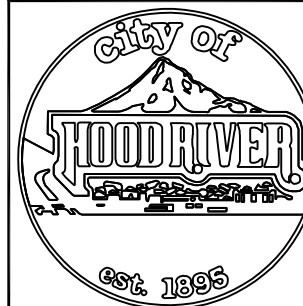


PLAN

## NOTES FOR ALL DETAILS:

1. ALL PRECAST PRODUCTS SHALL CONFORM TO REQUIREMENTS OF ASTM C478.
2. MANHOLE BASE SECTIONS MAY BE PRECAST OR CAST-IN-PLACE.
3. ALL CONCRETE SHALL BE COMMERCIAL GRADE CONCRETE.
4. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
5. MAX. PIPE DIAMETER VARIES.
6. MINIMUM DISTANCE BETWEEN HOLE PENETRATIONS INTO MANHOLES SHALL BE PER THE MANUFACTURERS MINIMUM RECOMMENDATIONS.
7. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
8. INVERT CHANNELS SHALL BE CONSTRUCTED TO PROVIDE SMOOTH SLOPES AND RADII TO OUTLET PIPE FOR ALL SANITARY MANHOLES.
9. WHEN FLEXIBLE PIPE IS USED, INSTALL RESILIENT CONNECTORS CONFORMING TO REQUIREMENTS OF ASTM C923 (I.E. KOR=N-SEAL BOOT).

## CITY OF HOOD RIVER STANDARD DRAWINGS D-13



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

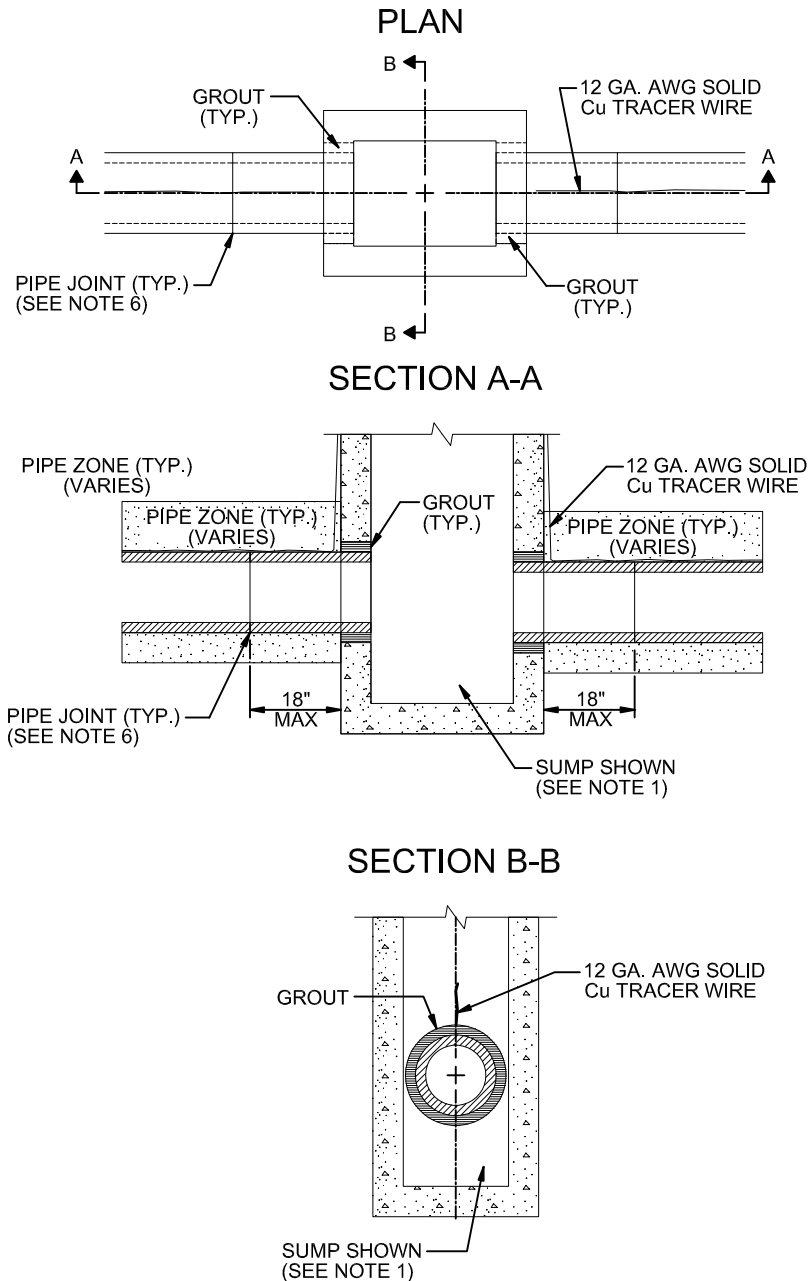
## PIPE TO MANHOLE CONNECTION

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2019

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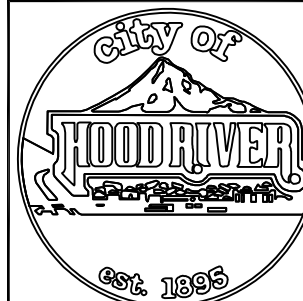
# CONNECTION OF RIGID PIPE TO STRUCTURE



## NOTES FOR ALL DETAILS:

1. SEE STD. DWG. FOR INLET DETAILS NOT SHOWN.
2. SEE APPROPRIATE STD. DWGS. OR SPECIAL PROJECT DETAILS FOR OTHER SIMILAR STRUCTURES.
3. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
4. MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL.
5. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
6. WHEN RIGID PIPE IS USED, THE CONNECTING PIPE SHALL HAVE A FLEXIBLE, GASKET, AND UNRESTRAINED JOINT WITHIN 18" OF MANHOLE WALL. JOINT TYPE VARIES WITH MANUFACTURER.
7. WHEN FLEXIBLE PIPE IS USED, INSTALL RESILIENT CONNECTORS CONFORMING TO REQUIREMENTS OF ASTM C923 (I.E. KOR-N-SEAL BOOT).

## CITY OF HOOD RIVER STANDARD DRAWINGS D-14



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

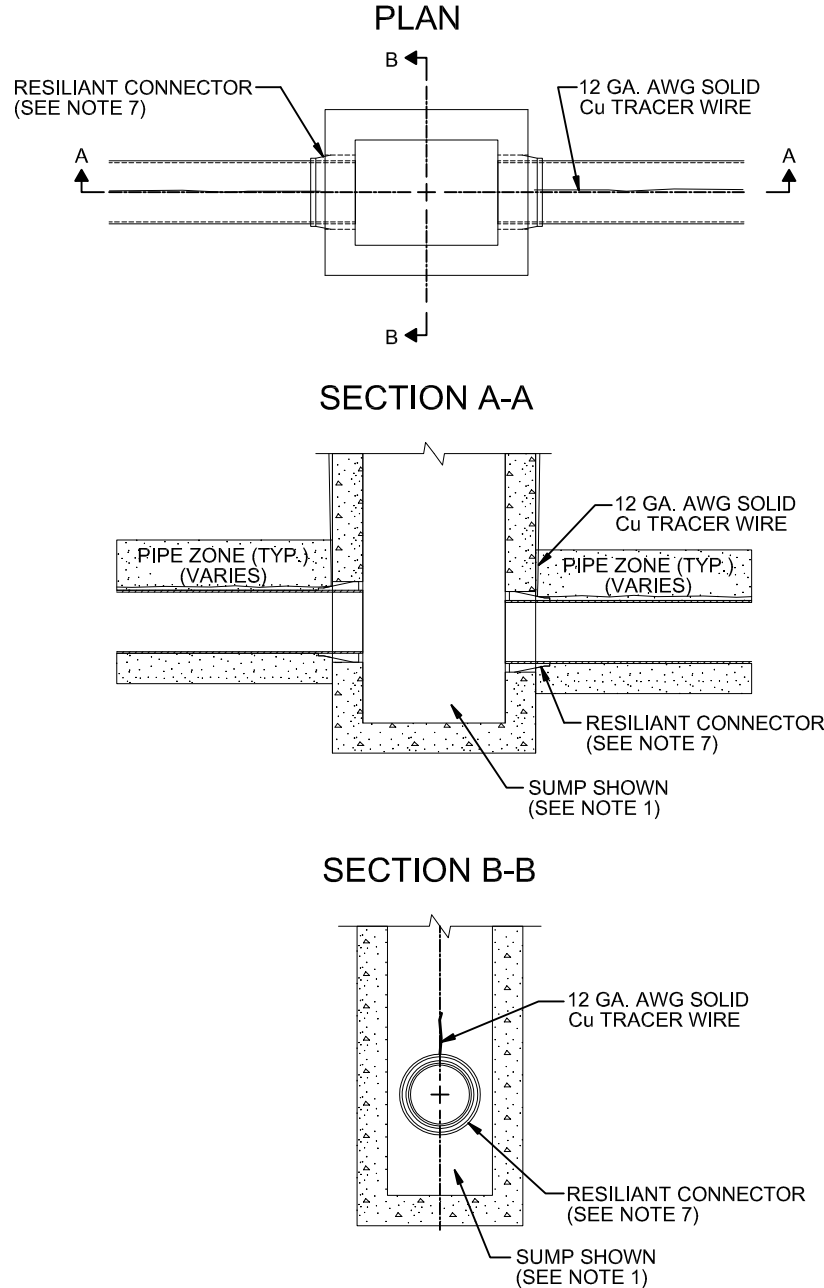
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## PIPE TO STRUCTURE CONNECTIONS

1 OF 2  
2019

DATE	REVISIONS

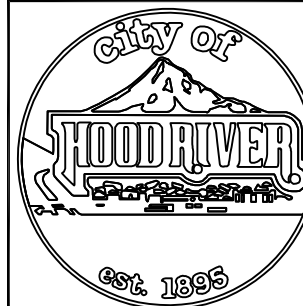
# CONNECTION OF FLEXIBLE PIPE TO STRUCTURE



## NOTES FOR ALL DETAILS:

1. SEE STD. DWG. FOR INLET DETAILS NOT SHOWN.
2. SEE APPROPRIATE STD. DWGS. OR SPECIAL PROJECT DETAILS FOR OTHER SIMILAR STRUCTURES.
3. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS.
4. MAX. PIPE DIAMETER VARIES WITH PIPE MATERIAL.
5. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
6. WHEN RIGID PIPE IS USED, THE CONNECTING PIPE SHALL HAVE A FLEXIBLE, GASKET, AND UNRESTRAINED JOINT WITHIN 18" OF MANHOLE WALL. JOINT TYPE VARIES WITH MANUFACTURER.
7. WHEN FLEXIBLE PIPE IS USED, INSTALL RESILIENT CONNECTORS CONFORMING TO REQUIREMENTS OF ASTM C923 (I.E. KOR-N-SEAL BOOT).

## CITY OF HOOD RIVER STANDARD DRAWINGS D-14



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

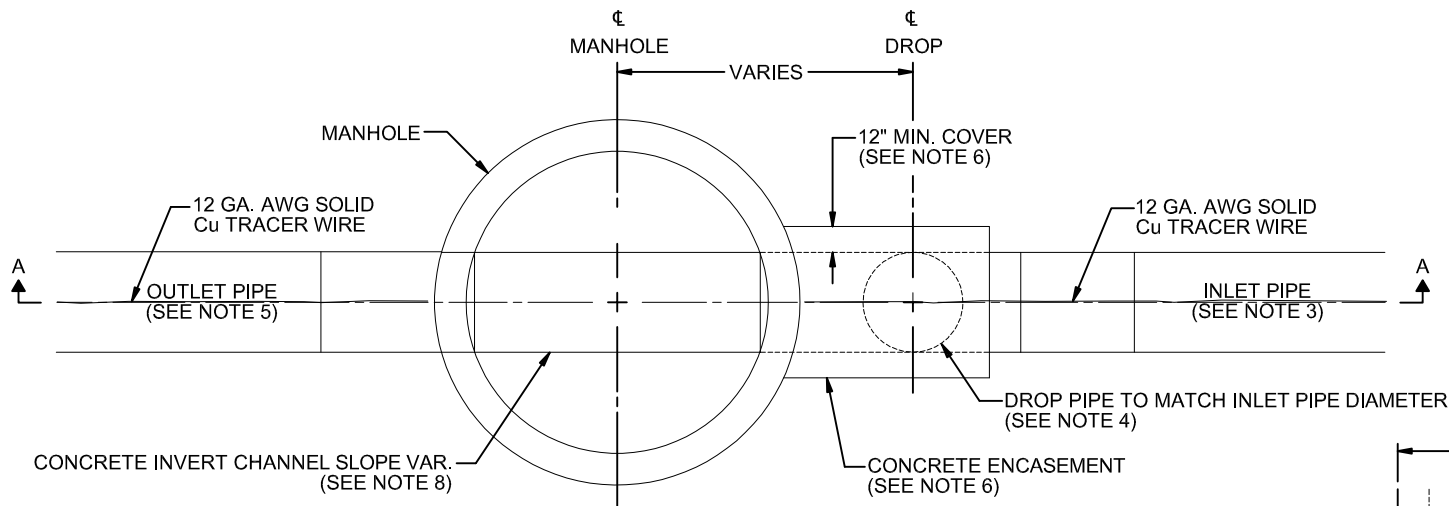
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## PIPE TO STRUCTURE CONNECTIONS

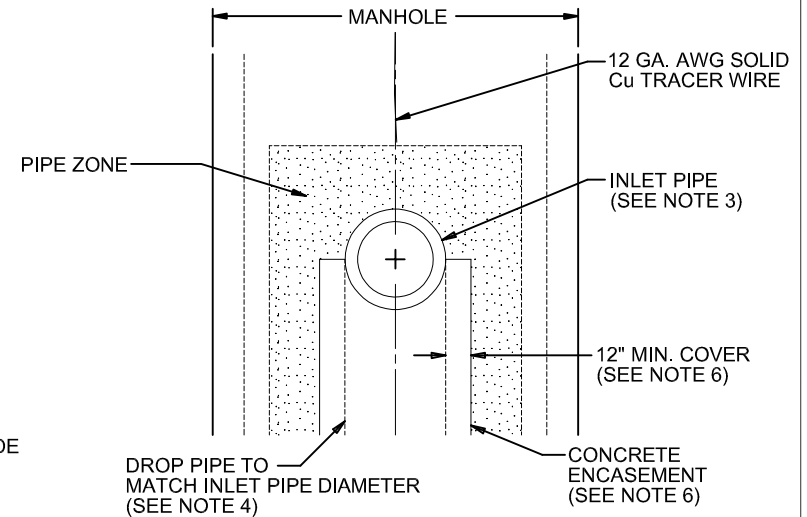
2 OF 2  
2019

DATE	REVISIONS

# PLAN



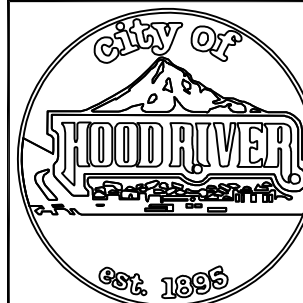
# END VIEW



## NOTES FOR ALL DETAILS:

1. SEE APPROPRIATE MANHOLE STD. DWGS. FOR DETAILS NOT SHOWN.
2. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS. ONLY 1 OUTSIDE DROP PIPE ALLOWED PER MANHOLE. SEE PROJECT PLANS FOR PIPE MATERIAL.
3. INLET PIPE MAY BE RIGID OR FLEXIBLE. THE CONNECTING PIPE SHALL HAVE A FLEXIBLE, GASKETED, AND UNRESTRAINED JOINT WITHIN 18" OF PIPE TEE, AS SHOWN. JOINT TYPE VARIES WITH MANUFACTURER.
4. DROP PIPE, TEE, AND ELBOW TO MATCH INLET PIPE DIAMETER.
5. RIGID PIPE CONNECTION SHOWN. OUTLET PIPE(S) MAY BE RIGID OR FLEXIBLE, SEE PROJECT PLANS. MAXIMUM OUTLET PIPE DIAMETER VARIES. SEE STD. DWG. FOR PIPE TO MANHOLE CONNECTIONS.
6. CONCRETE ENCASEMENT SHALL BE COMMERCIAL GRADE CONCRETE OR CDF. PROVIDE 12" MINIMUM COVER OVER OUTER MOST PARTS OF PIPE AND FITTINGS. EXTEND UP TO MID-POINT OF INLET PIPE.
7. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
8. FOR SANITARY SEWER ONLY; INVERT CHANNELS SHALL BE CONSTRUCTED TO PROVIDE SMOOTH SLOPES AND RADII TO OUTLET PIPE.

## CITY OF HOOD RIVER STANDARD DRAWINGS D-15



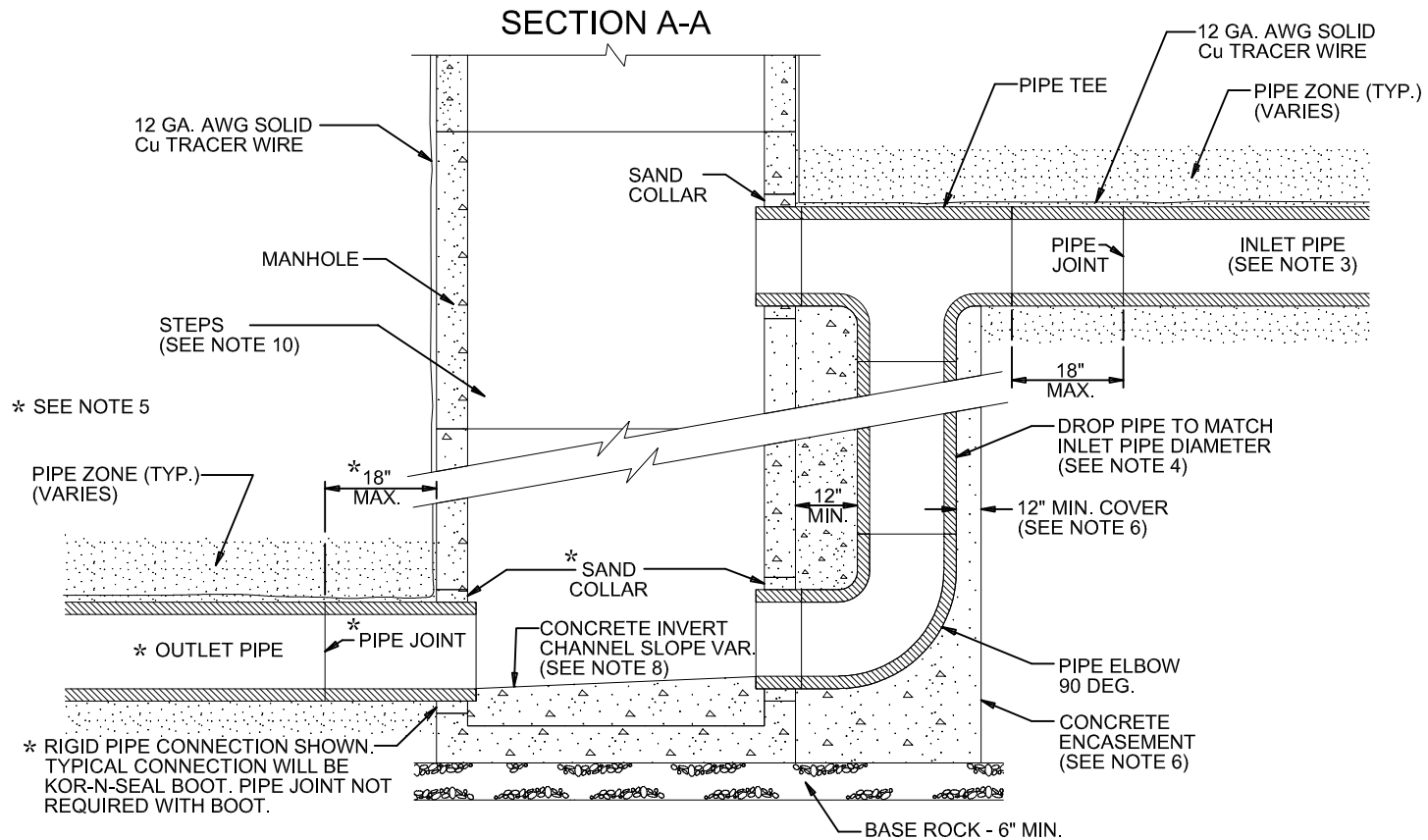
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NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## OUTSIDE DROP MANHOLE

1 OF 2  
2019

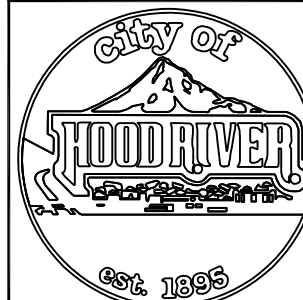
DATE	REVISIONS



**NOTES FOR ALL DETAILS:**

1. SEE APPROPRIATE MANHOLE STD. DWGS. FOR DETAILS NOT SHOWN.
2. LOCATION, ELEVATION, DIAMETER, SLOPE, AND NUMBER OF PIPE(S) VARIES, SEE PROJECT PLANS. ONLY 1 OUTSIDE DROP PIPE ALLOWED PER MANHOLE. SEE PROJECT PLANS FOR PIPE MATERIAL.
3. INLET PIPE MAY BE RIGID OR FLEXIBLE. THE CONNECTING PIPE SHALL HAVE A FLEXIBLE, GASKETED, AND UNRESTRAINED JOINT WITHIN 18" OF PIPE TEE, AS SHOWN. JOINT TYPE VARIES WITH MANUFACTURER.
4. DROP PIPE, TEE, AND ELBOW TO MATCH INLET PIPE DIAMETER.
5. RIGID PIPE CONNECTION SHOWN. OUTLET PIPE(S) MAY BE RIGID OR FLEXIBLE, SEE PROJECT PLANS. MAXIMUM OUTLET PIPE DIAMETER VARIES. SEE STD. DWG. FOR PIPE TO MANHOLE CONNECTIONS.
6. CONCRETE ENCASEMENT SHALL BE COMMERCIAL GRADE CONCRETE OR CDF. PROVIDE 12" MINIMUM COVER OVER OUTER MOST PARTS OF PIPE AND FITTINGS. EXTEND UP TO MID-POINT OF INLET PIPE.
7. ALL CONNECTING PIPES SHALL HAVE A TRACER WIRE, OR APPROVED ALTERNATE.
8. FOR SANITARY SEWER ONLY; INVERT CHANNELS SHALL BE CONSTRUCTED TO PROVIDE SMOOTH SLOPES AND RADII TO OUTLET PIPE.

**CITY OF HOOD RIVER STANDARD DRAWINGS D-15**



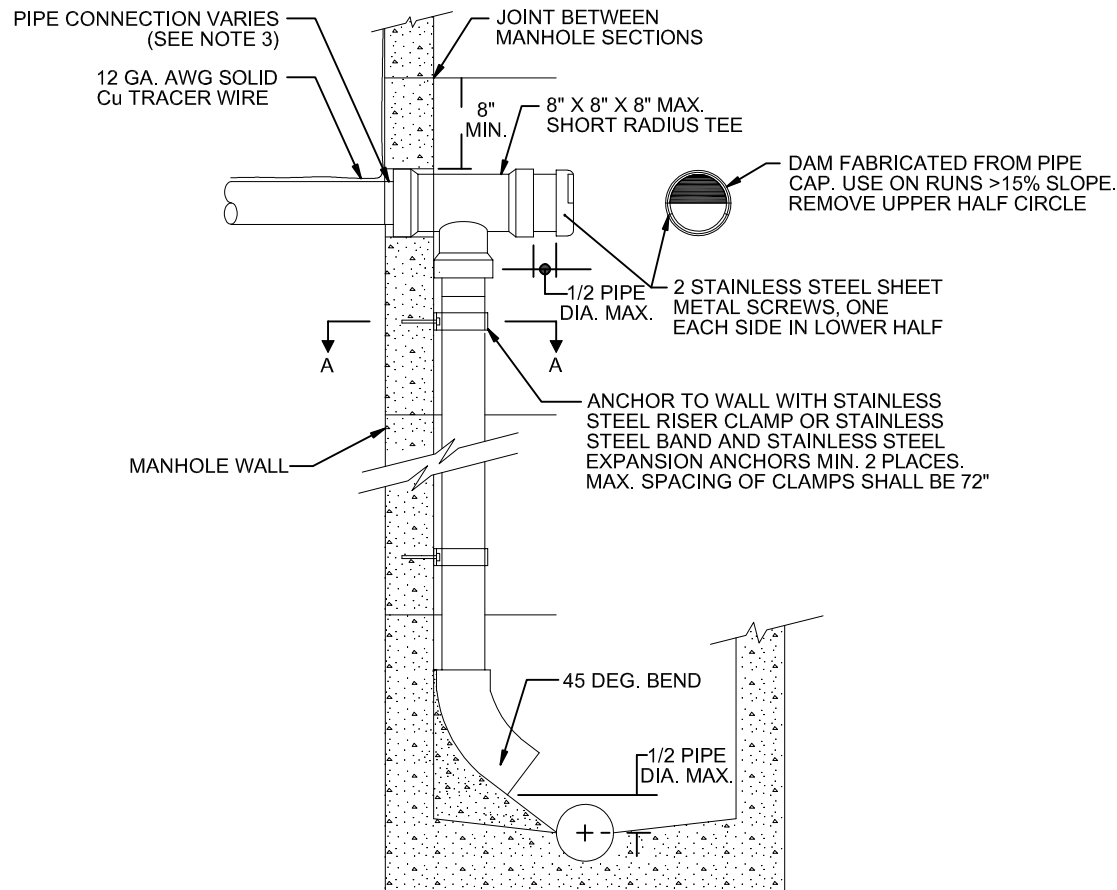
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NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

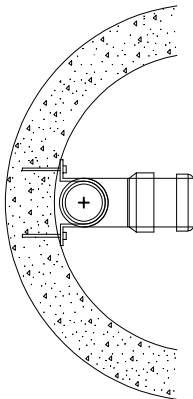
**OUTSIDE DROP  
MANHOLE**

**2 OF 2  
2019**

DATE	REVISIONS



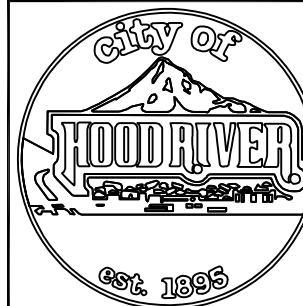
SECTION A-A  
CLAMP DETAIL



**NOTES FOR ALL DETAILS:**

1. A DESIGN EXCEPTION WILL BE REQUIRED.
2. ONE INSIDE DROP PER MANHOLE.
3. PVC SHALL BE ASTM D3034 SDR35.
4. SEE STD. DWG. FOR PIPE TO MANHOLE CONNECTIONS.
5. SEE APPROPRIATE MANHOLE STD. DWGS. FOR DETAILS NOT SHOWN.
6. INCOMING PIPE DIAMETER 8" MAX. DROP PIPE AND FITTINGS SHALL MATCH INCOMING PIPE.
7. LOCATION, ELEVATION, DIAMETER, AND SLOPE OF INCOMING PIPE VARIES, SEE PROJECT PLANS.

**CITY OF HOOD RIVER STANDARD DRAWINGS D-16**



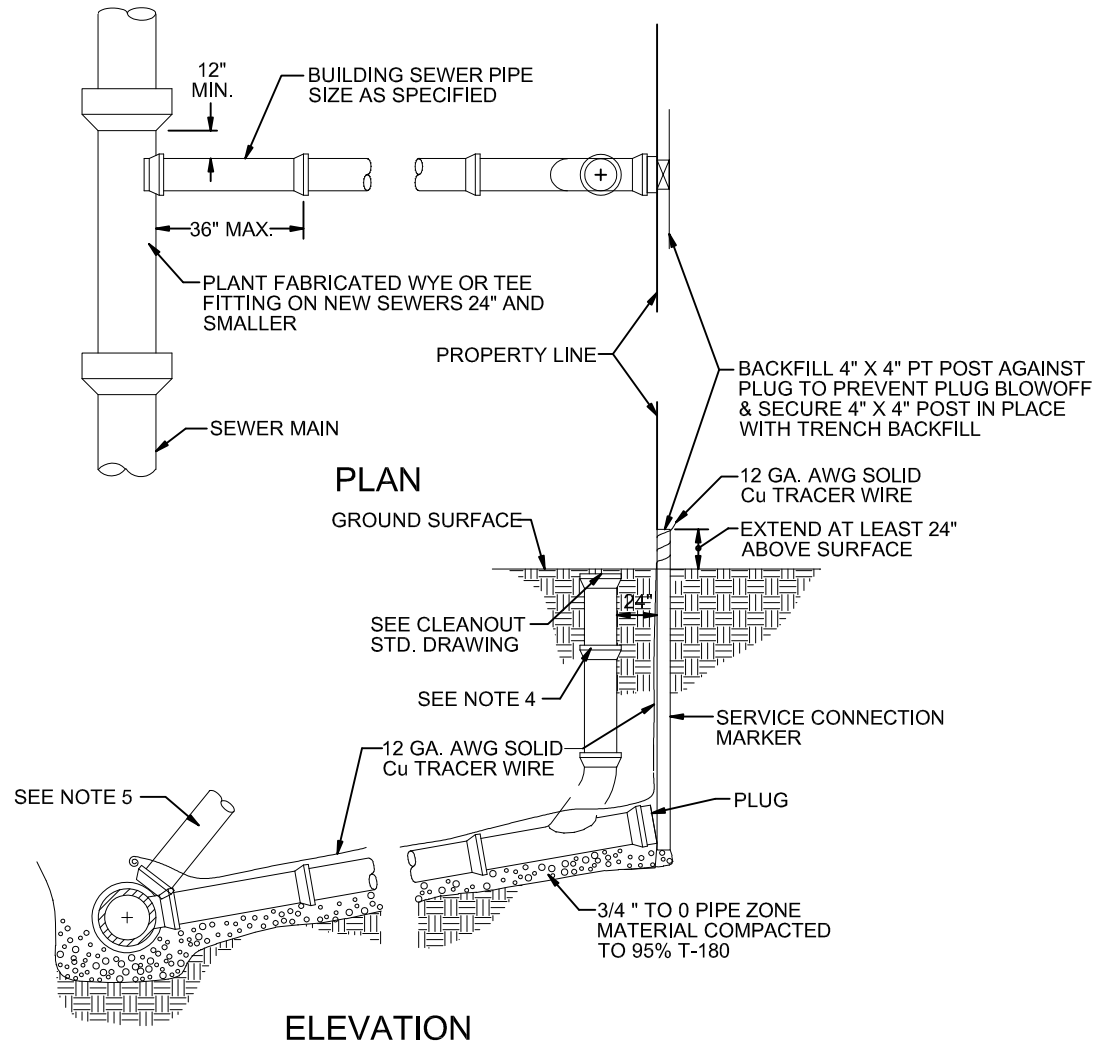
THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

**SANITARY SEWER  
PIPED INSIDE DROP  
CONNECTION MANHOLES  
2019**

DATE	REVISIONS

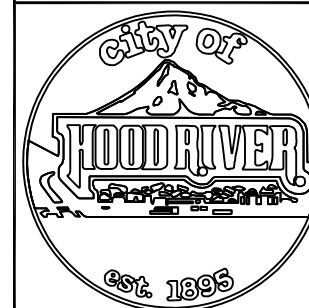
## SHALLOW TRENCH SERVICE



### NOTES FOR ALL DETAILS:

- PIPE AND FITTINGS SHALL BE COMPATIBLE. ONLY MANUFACTURED FITTINGS SHALL BE USED.
- MINIMUM DEPTH AT RIGHT-OF-WAY OR EASEMENT LINE SHALL BE 3'.
- MARKER POSTS AND BLOCKING SHALL BE PRESSURE TREATED WOOD. POST SHALL BE 4"X4" FIR. POST TO EXTEND 24" MIN. ABOVE FINISH GRADE AND EXPOSED AREA SHALL BE PAINTED WHITE.
- WHEN REQUIRED, A CLEANOUT SHALL BE INSTALLED 24" FROM PROPERTY LINE (ROW) OR 12" FROM BACK OF SIDEWALK WHERE APPLICABLE.
- LAY BUILDING SEWER AT MAX. 45° FROM HORIZONTAL TO ACHIEVE REQUIRED DEPTH AT PROPERTY LINE WHEN MIN. SLOPE RESULTS IN EXCESSIVE DEPTH.
- EXTEND SERVICE PIPE TO WITHIN 3' OF FINISH GRADE.
- FOR BEDDING AND BACKFILL SEE TRENCH DETAIL.
- LOCATE WIRE TO BE 12 GA. AWG, SOLID STRAND, COLOR CODED GREEN.
- EXISTING SEWER MAINS: SADDLE AND TAP. INSERTA TEES WILL NOT BE ALLOWED.
- NEW SEWER MAINS: MANUFACTURED WYES AND TEES ARE REQUIRED.
- MINIMUM SLOPE : 4" PIPE = 2%      6" PIPE = 1%

### CITY OF HOOD RIVER STANDARD DRAWINGS D-17



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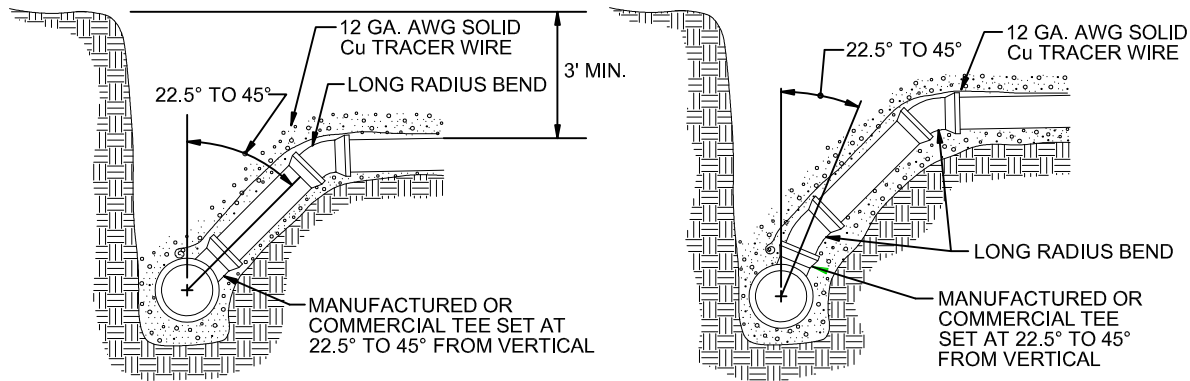
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### SANITARY SEWER CONNECTION

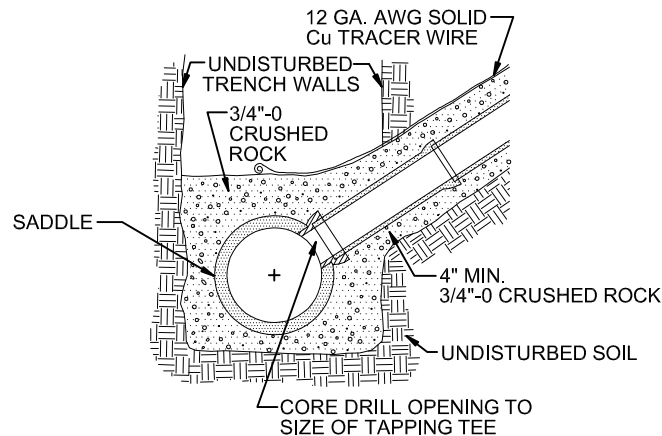
1 OF 2  
2019

DATE	REVISIONS

## DEEP TRENCH SERVICE



## WASTEWATER SERVICE TAP



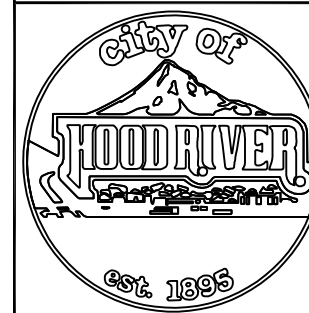
### GENERAL NOTES:

1. TAPPING SADDLE SHALL BE WATERTIGHT AND CONFORM TO STANDARD SPECIFICATION REQUIREMENTS.
2. TAP SHALL NOT PROTRUDE INTO PIPE.
3. FOR BEDDING AND BACKFILL SEE TRENCH DETAIL.

### NOTES FOR ALL DETAILS:

1. PIPE AND FITTINGS SHALL BE COMPATIBLE. ONLY MANUFACTURED FITTINGS SHALL BE USED.
2. FOR DETAILS NOT SHOWN SEE SHALLOW TRENCH SERVICE CONNECTION DRAWING.
3. VERTICAL TRENCH WALLS ARE REQUIRED. IF IT IS NOT POSSIBLE TO MAINTAIN VERTICAL TRENCH WALLS, USE ALTERNATE CONNECTION METHOD TO MAINTAIN 6" MIN. DISTANCE BETWEEN RISER PIPE AND TRENCH WALLS. REPLACE ALL EXCAVATED OR DISTURBED MATERIAL WITH FULL DEPTH GRANULAR BACKFILL COMPACTED TO 95% RELATIVE DENSITY PER T-180.
4. WHERE DEEP CONNECTION IS AT AN ANGLE LESS THAN 45° FROM VERTICAL, DUCTILE IRON PIPE AND FITTINGS SHOULD BE USED.
5. FOR BEDDING AND BACKFILL SEE TRENCH DETAIL.
6. EXISTING SEWER MAINS: SADDLE AND TAP. INSERTA TEES WILL NOT BE ALLOWED.
7. NEW SEWER MAINS: MANUFACTURED WYES AND TEES ARE REQUIRED.
8. MINIMUM SLOPE : 4" PIPE = 2%                      6" PIPE = 1%

### CITY OF HOOD RIVER STANDARD DRAWINGS D-17



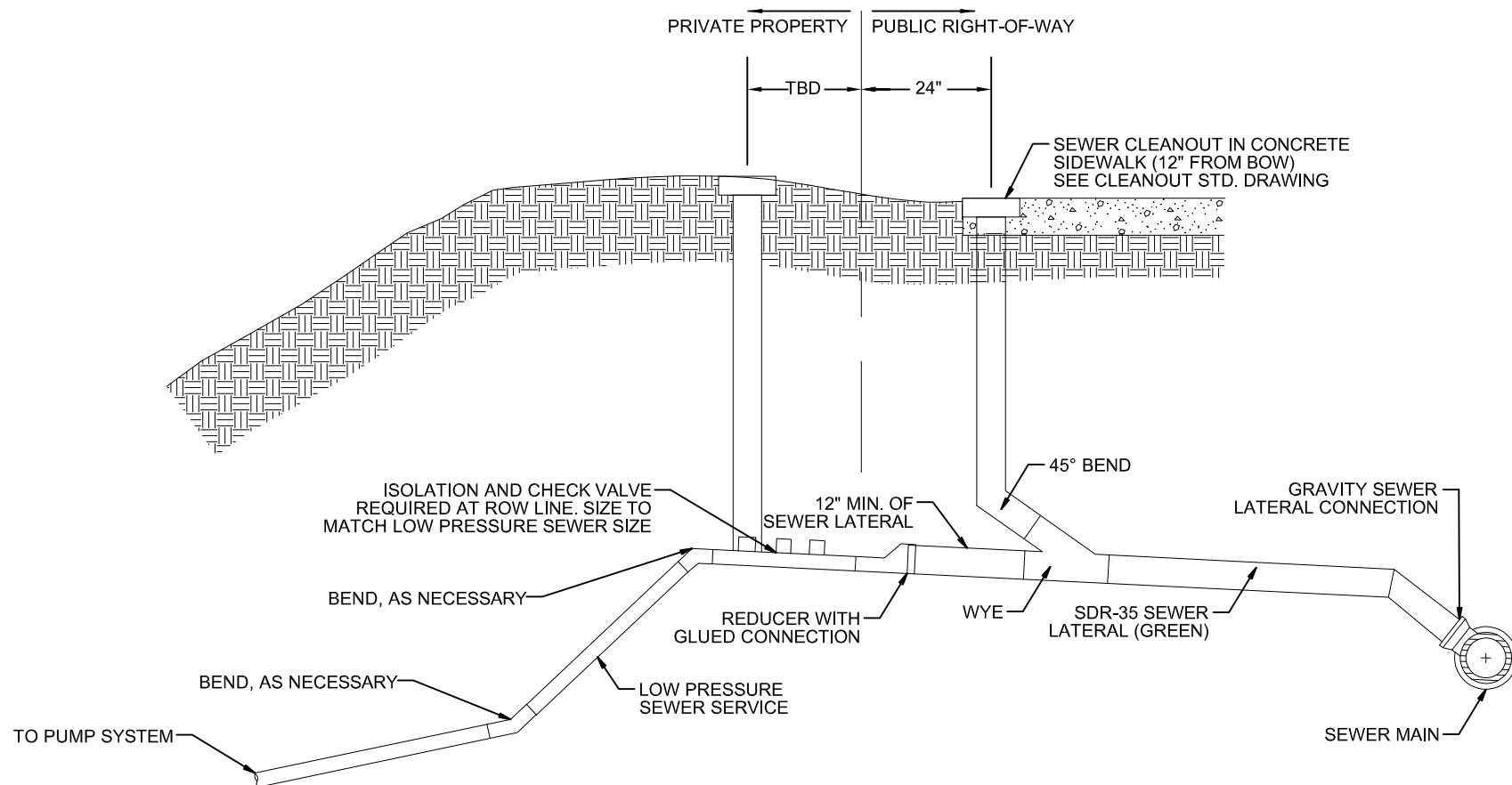
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## SANITARY SEWER CONNECTION

2 OF 2  
2019

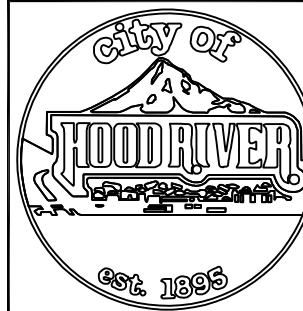
DATE	REVISIONS



**NOTES FOR ALL DETAILS:**

1. PIPE AND FITTINGS SHALL BE COMPATIBLE. ONLY MANUFACTURED FITTINGS SHALL BE USED.
2. MINIMUM DEPTH AT RIGHT-OF-WAY OR EASEMENT LINE SHALL BE 3'.
3. WHEN REQUIRED, A CLEANOUT SHALL BE INSTALLED 24" FROM PROPERTY LINE (ROW) OR 12" FROM BACK OF SIDEWALK WHERE APPLICABLE.
4. LAY BUILDING SEWER AT MAX. 45° FROM HORIZONTAL TO ACHIEVE REQUIRED DEPTH AT PROPERTY LINE WHEN MIN. SLOPE RESULTS IN EXCESSIVE DEPTH.
5. EXTEND SERVICE PIPE TO WITHIN 3' OF FINISH GRADE.
7. LOCATE WIRE TO BE 12 GA. AWG, SOLID STRAND, COLOR CODED GREEN.
8. FOR BEDDING AND BACKFILL SEE TRENCH DETAIL.
9. SEE SANITARY SEWER CONNECTION & CLEANOUT STANDARD DRAWINGS FOR DETAILS NOT SHOWN.
10. ALL CONSTRUCTION OUTSIDE THE PUBLIC RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH THE OREGON PLUMBING SPECIALITY CODE AND HOOD RIVER COUNTY BUILDING DEPARTMENT.

**CITY OF HOOD RIVER STANDARD DRAWINGS D-18**



NOTE: THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

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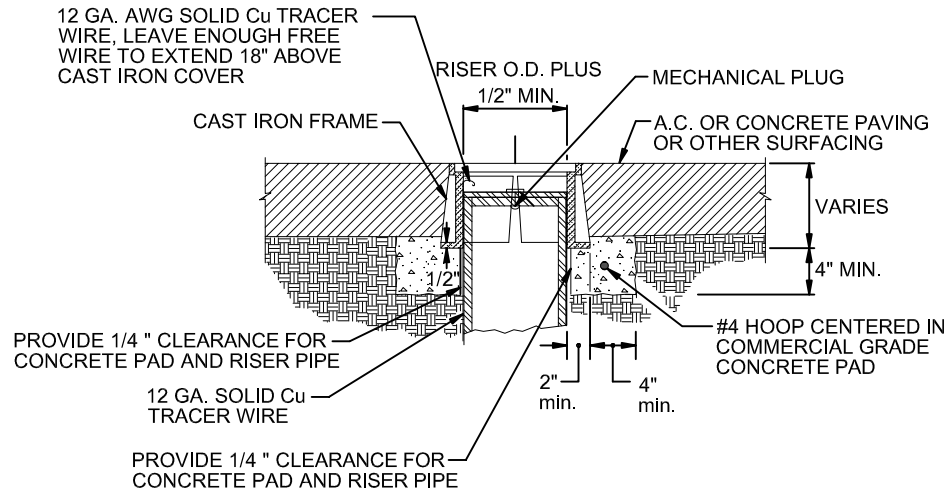
**PRESSURE SEWER TO GRAVITY CONNECTION**

**2019**

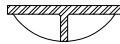
DATE	REVISIONS



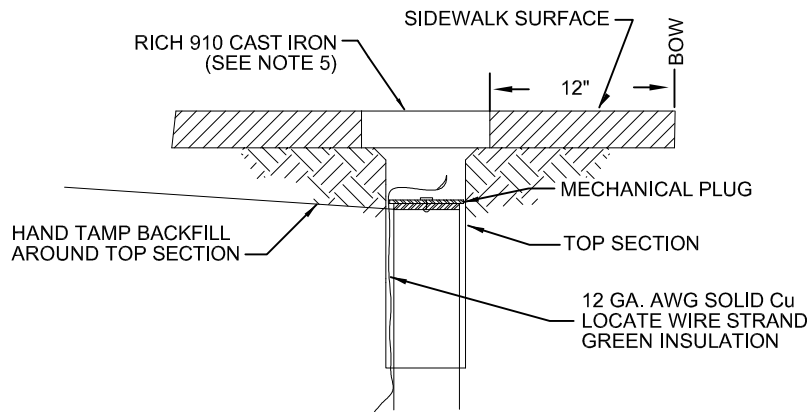
## MAIN LINE CLEANOUT



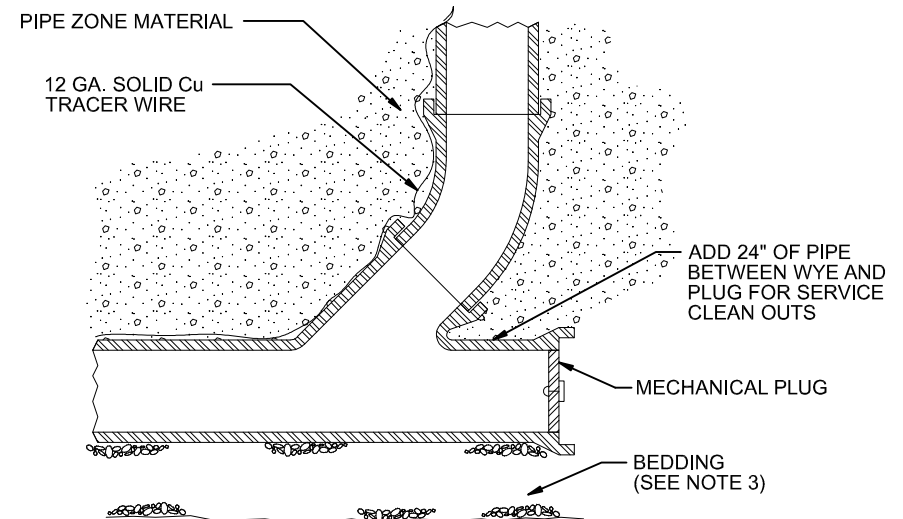
## CAST IRON COVER



## SERVICE LINE CLEANOUT



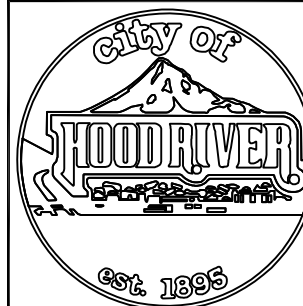
## CLEANOUT



### NOTES FOR ALL DETAILS:

1. ALL CLEANOUT MATERIAL AND DIAMETER TO BE SAME AS CARRIER PIPE.
2. SERVICE CLEANOUT TO BE PLACED 12" CLEAR FROM BACK OF SIDEWALK.
3. BEDDING MATERIAL TO BE COMPACTED 3/4"-0 CRUSHED ROCK (95% T-180).
4. FRAME AND COVER SHALL MEET H20 LOADING.
5. TOP SECTION WITH THE WORD "SEWER" OR "STORM" CAST IN TOP OF SURFACE, AS APPROPRIATE.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-19



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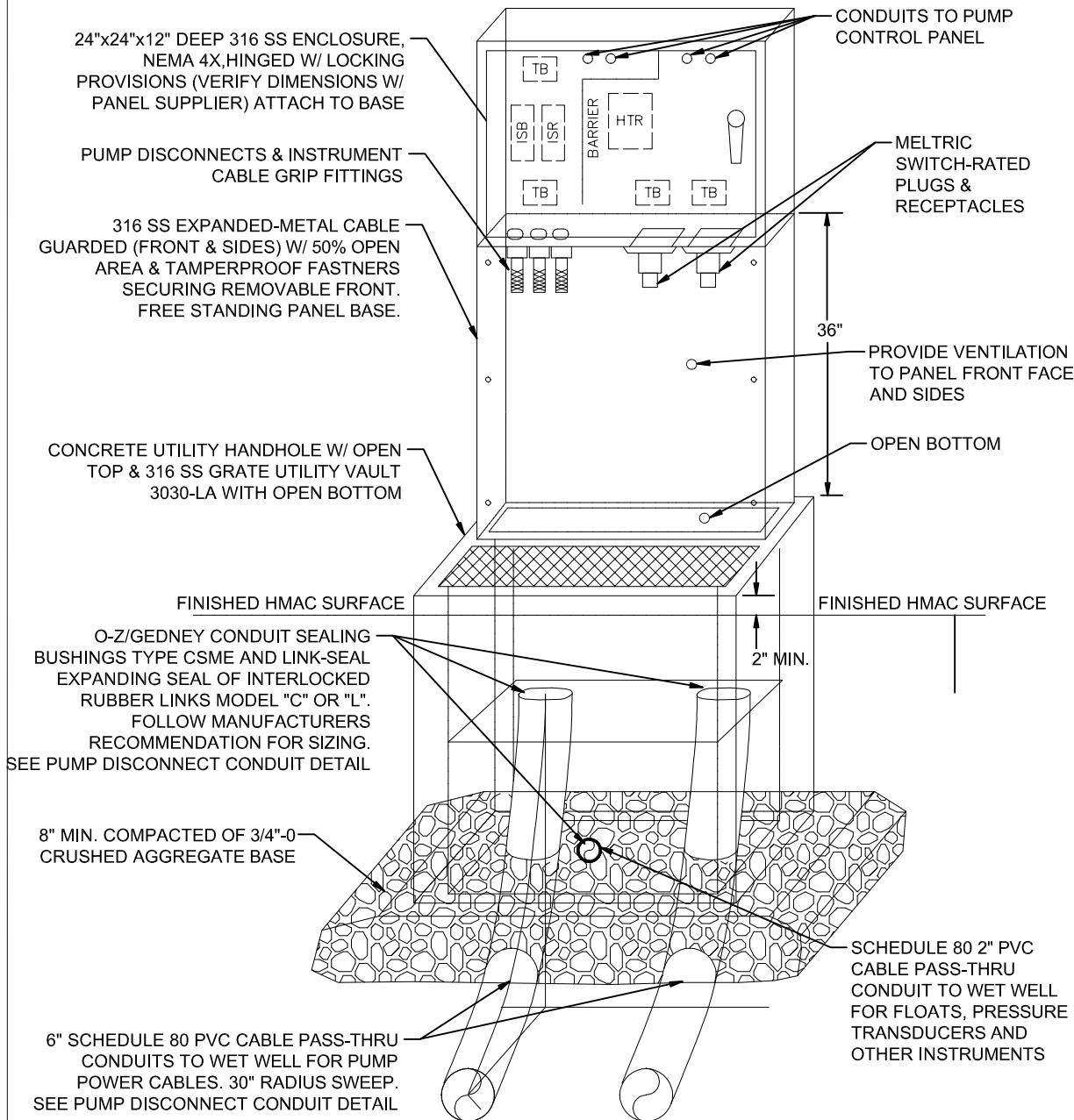
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## SEWER CLEANOUT

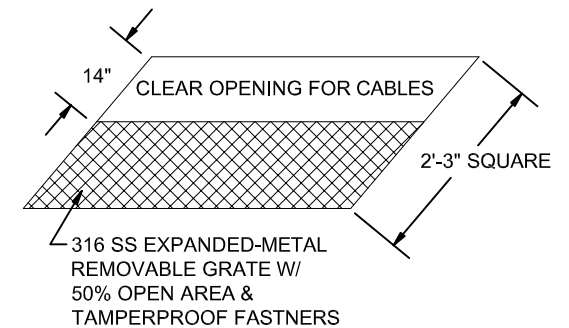
2019

DATE	REVISIONS

## PUMP DISCONNECT PANEL DETAIL



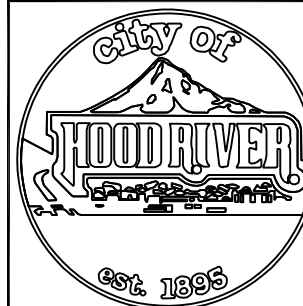
## HANDHOLE GRATE DETAIL



### GENERAL NOTES:

1. PUMP DISCONNECT SHALL BE PROVIDED BY PUMP MANUFACTURER. FIELD TERMINAL BLOCKS FOR PUMP T-LEADS, I/O CGB CABLE TERMINATORS AND ALL OTHER NECESSARY REQUIREMENTS TO BE DETAILED BY CONTRACTOR.
2. AUX CONTACTS ARE REQUIRED FOR PUMP MOTORS THERMAL & LEAK SENSOR UTILIZATION. SENSORS ARE IN SERIES, I.E. 2 WIRES REQUIRED. PUMP CABLE FROM PANEL TO PUMP.

### CITY OF HOOD RIVER STANDARD DRAWINGS D-20



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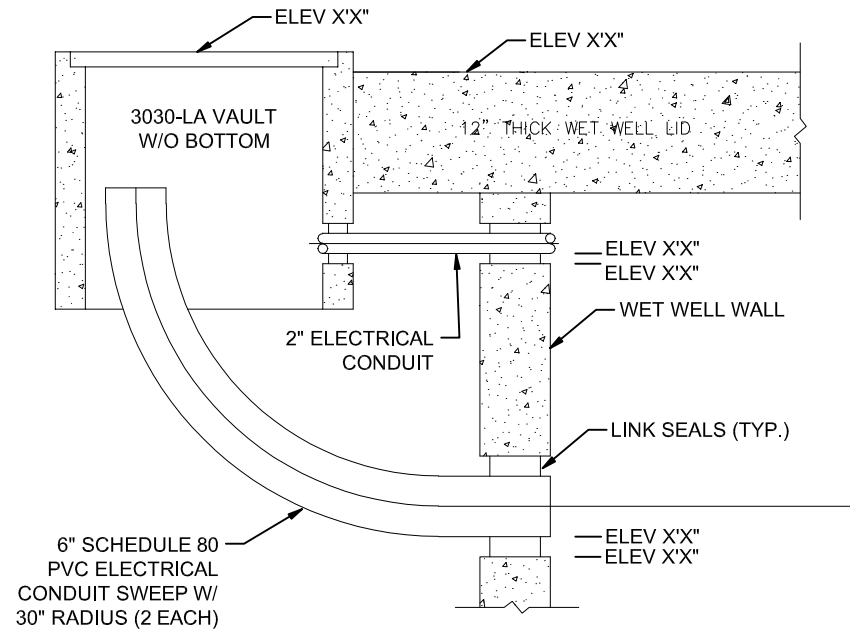
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### PUMP DISCONNECT 1 OF 2

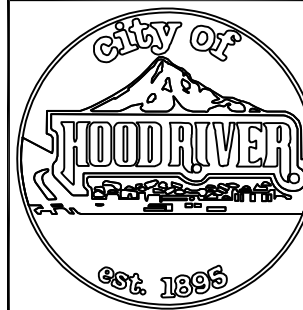
2019

DATE	REVISIONS

## PUMP DISCONNECT CONDUIT DETAIL



### CITY OF HOOD RIVER STANDARD DRAWINGS D-20



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## PUMP DISCONNECT 2 OF 2

2019

DATE	REVISIONS

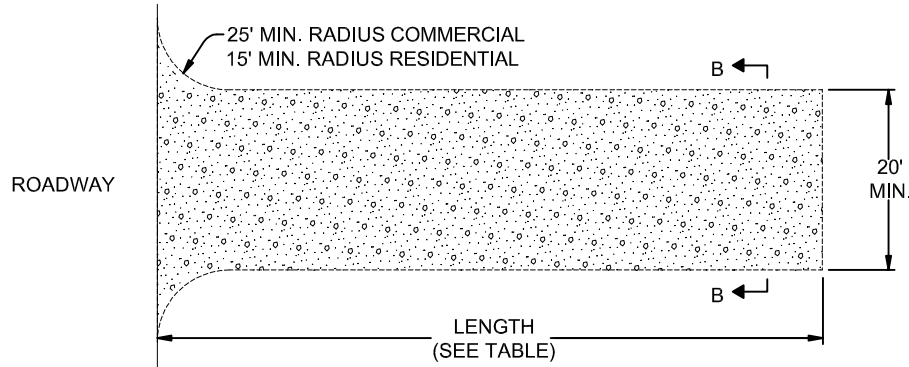




## ***Standard Drawings – Erosion & Sediment Control (ESC)***

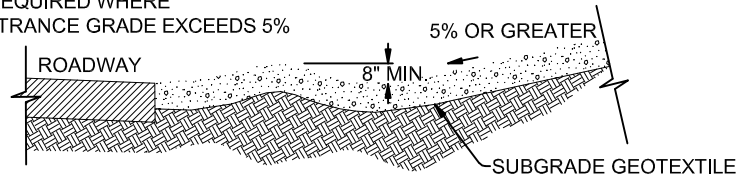


## CONSTRUCTION ENTRANCE - TYPE 1



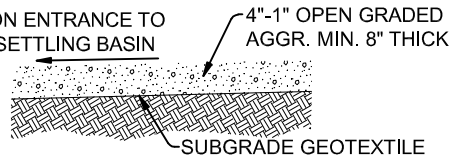
### SECTION A-A

DIVERSION RIDGE REQUIRED WHERE CONSTRUCTION ENTRANCE GRADE EXCEEDS 5%



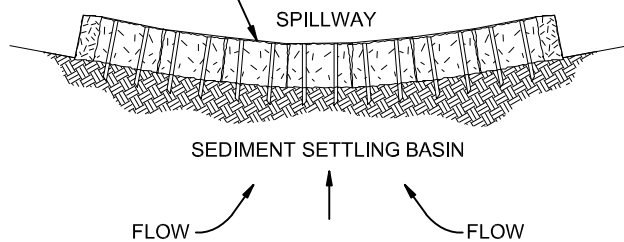
### SECTION B-B

SLOPE CONSTRUCTION ENTRANCE TO DRAIN TO SEDIMENT SETTLING BASIN

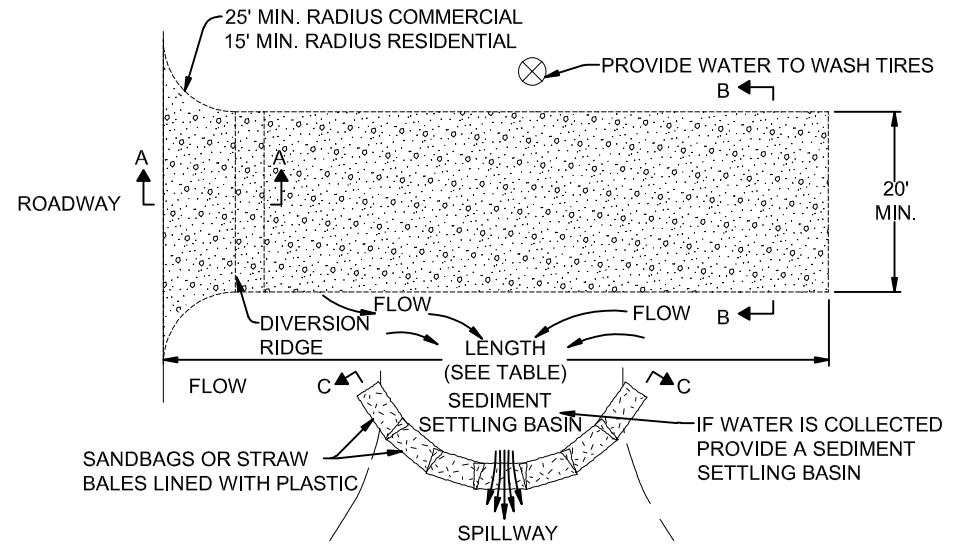


### SECTION C-C

SANDBAGS OR STRAW BALES LINED WITH PLASTIC



## CONSTRUCTION ENTRANCE - TYPE 2

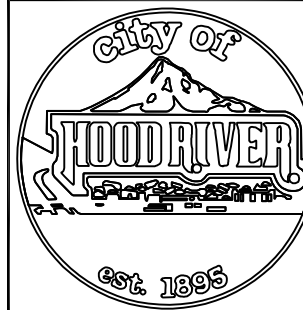


### NOTES FOR ALL DETAILS:

1. THE TYPE 1 ENTRANCE IS A SIMPLE ENTRANCE WITHOUT A DIVERSION RIDGE OR SETTLING BASIN.
2. THE WOODEN RAMP MAY BE USED ON EITHER TYPE 1 OR TYPE 2 ENTRANCES IN SITUATIONS WHERE THERE IS CURB AND THE CURB IS NOT REMOVED FOR THE CONSTRUCTION ENTRANCE.

CONSTRUCTION ENTRANCE TABLE MINIMUM LENGTH	
LENGTH (FT)	AREA OF EXPOSED SOIL (ACRE)
20	0.25
50	0.25 < A < 1.0
100	A > 1.0

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-01



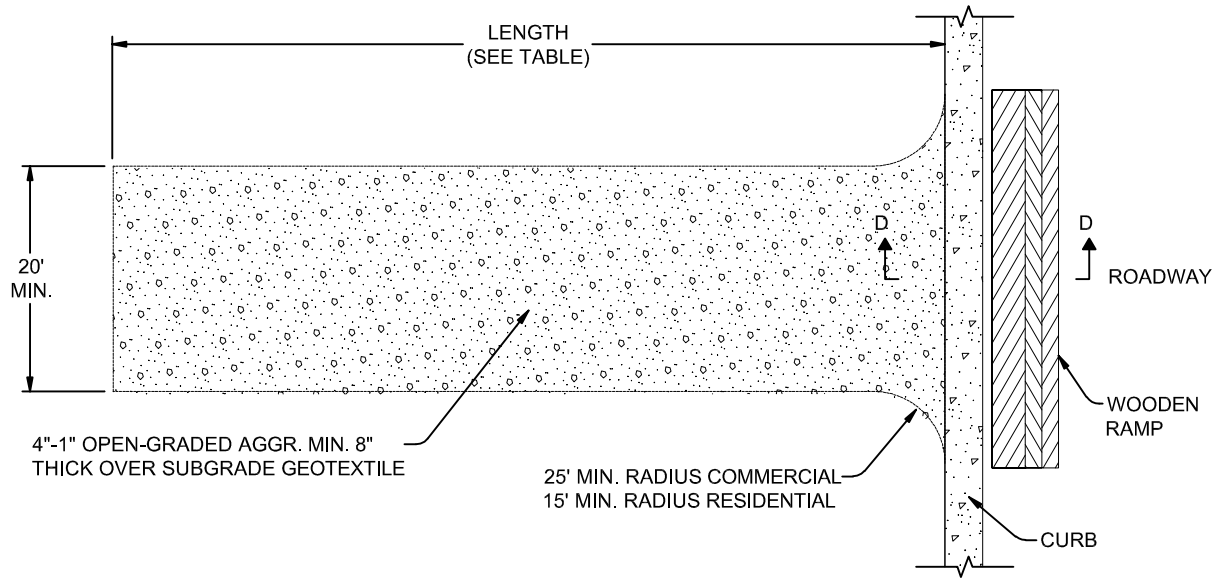
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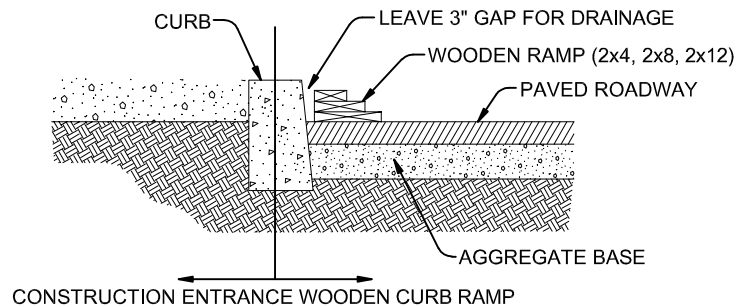
### CONSTRUCTION ENTRANCE 1 OF 2 2019

DATE	REVISIONS

## CONSTRUCTION ENTRANCE - TYPE 3 (TYPE 1 OR 2 WITH EXISTING CURB)

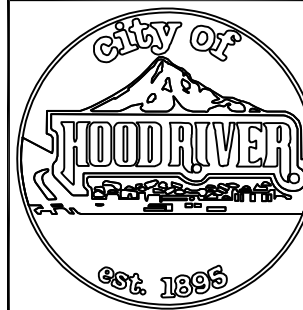


## WOODEN CURB RAMP SECTION D-D



CONSTRUCTION ENTRANCE TABLE MINIMUM LENGTH	
LENGTH (FT)	AREA OF EXPOSED SOIL (ACRE)
20	0.25
50	$0.25 < A < 1.0$
100	$A > 1.0$

## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-01



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

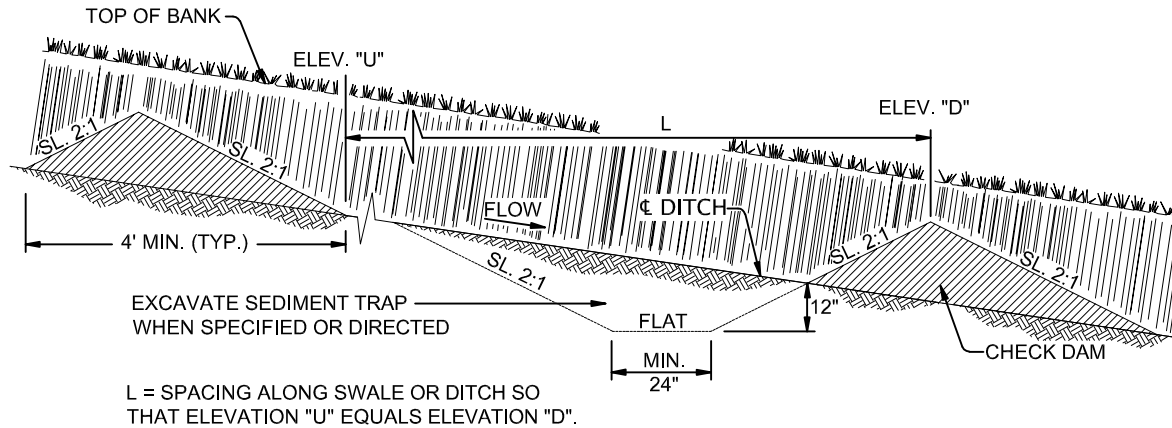
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## CONSTRUCTION ENTRANCE 2 OF 2 2019

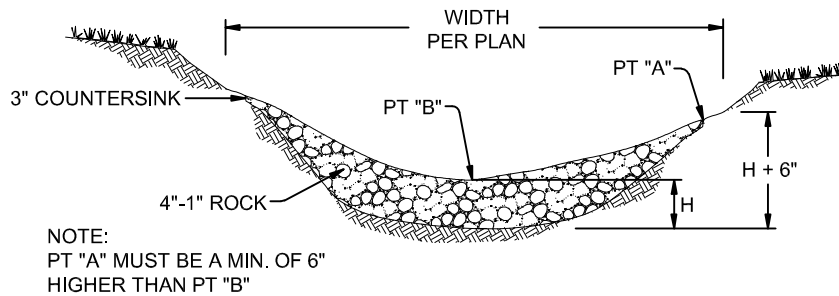
DATE	REVISIONS



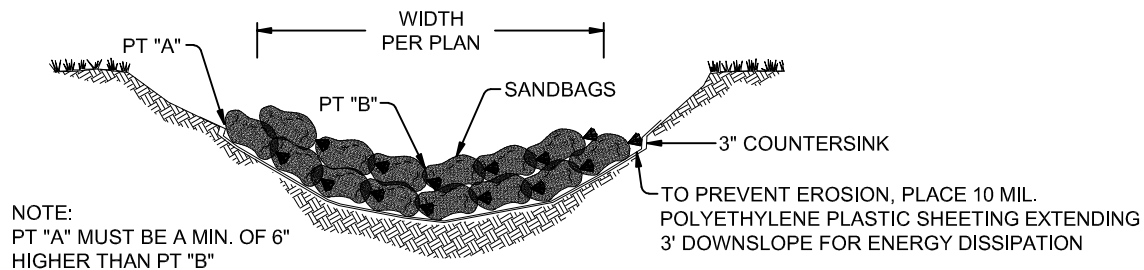
## TYPICAL PROFILE SECTION CHECK DAMS (SHOWN WITH AGGREGATE)



### AGGREGATE CHECK DAM - TYPE 1



### SANDBAG CHECK DAM - TYPE 4 (TEMP.)



MAXIMUM CHECK DAM SPACING "L"				
DITCH GRADE	H=8"	H=12"	H=18"	H=24"
10%	**	**	15'	20'
9%	**	**	16'	22'
8%	**	**	18'	25'
7%	**	**	21'	28'
6%	**	16'	25'	33'
5%	**	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

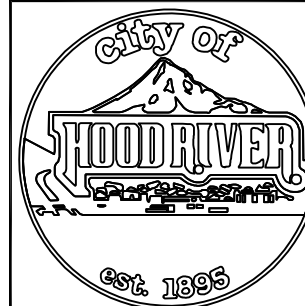
\*\* NOT ALLOWED

H = MIN. DAM HEIGHT

#### NOTES FOR ALL DETAILS:

1. TYPE 3 - STAKE BIOFILTER BAGS WITH TWO 2"x2"x18" (MIN.) WOOD STAKES PER BAG. DRIVE STAKES A MIN. OF 6" INTO THE GROUND AND FLUSH WITH THE TOP OF THE BAGS. OMIT STAKES IF PLACED OVER PAVED SURFACES. OVERLAP BAGS 6" MIN. AT EACH JOINT.
2. TYPE 4 - FOR TEMPORARY USE ONLY. TIGHTLY ABUT OR OVERLAP ENDS OF SANDBAGS AT EACH JOINT.
3. SPACING BETWEEN CHECK DAMS FOR ALL CHECK DAM TYPES SHALL COMPLY WITH THE TYPICAL PROFILE SECTION SHOWN ABOVE.

#### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-02



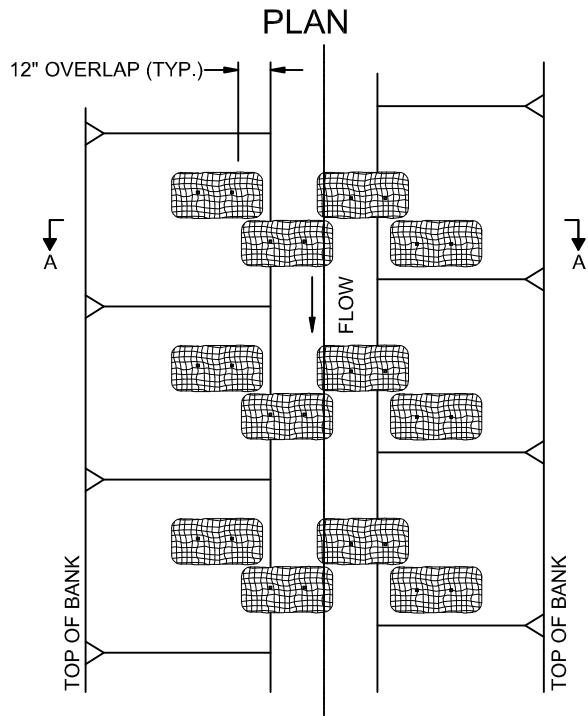
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### CHECK DAMS SHEET 1 OF 4

2019

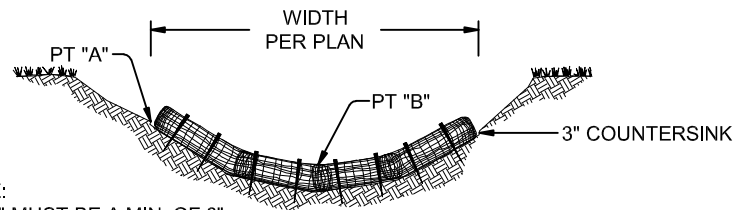
DATE	REVISIONS



MAXIMUM CHECK DAM SPACING "L"				
DITCH GRADE	H=8"	H=12"	H=18"	H=24"
10%	**	**	15'	20'
9%	**	**	16'	22'
8%	**	**	18'	25'
7%	**	**	21'	28'
6%	**	16'	25'	33'
5%	**	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

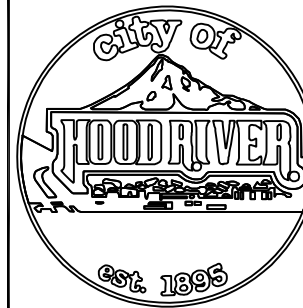
\*\* NOT ALLOWED  
H = MIN. DAM HEIGHT

### SECTION A-A BIOFILTER BAG CHECK DAM - TYPE 3



NOTE:  
PT "A" MUST BE A MIN. OF 6"  
HIGHER THAN PT "B"

#### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-02



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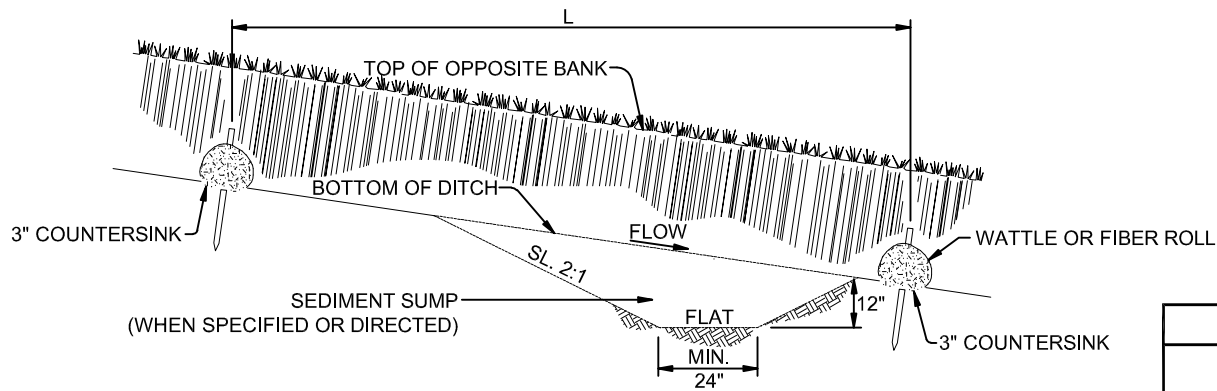
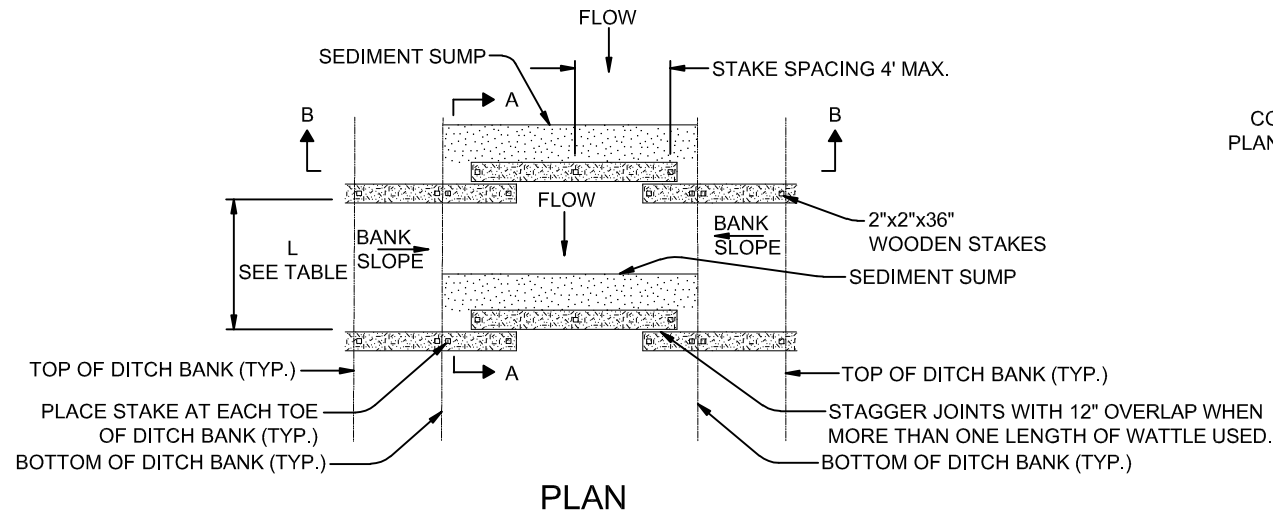
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### CHECK DAMS SHEET 2 OF 4

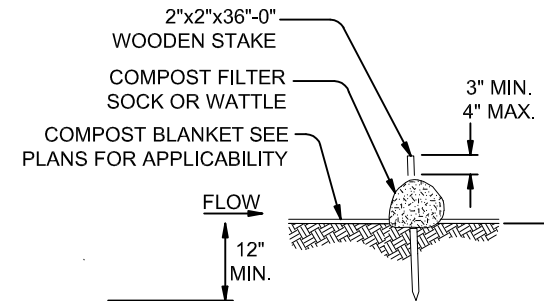
2019

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## WATTLE/FIBER ROLL CHECK DAM - TYPE 2



## FIBER ROLL STAKING

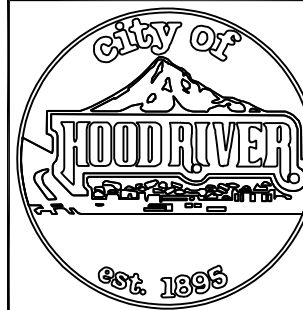


MAXIMUM CHECK DAM SPACING "L"				
DITCH GRADE	H=8"	H=12"	H=18"	H=24"
10%	**	**	15'	20'
9%	**	**	16'	22'
8%	**	**	18'	25'
7%	**	**	21'	28'
6%	**	16'	25'	33'
5%	**	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

\*\* NOT ALLOWED

H = MIN. DAM HEIGHT

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-02



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

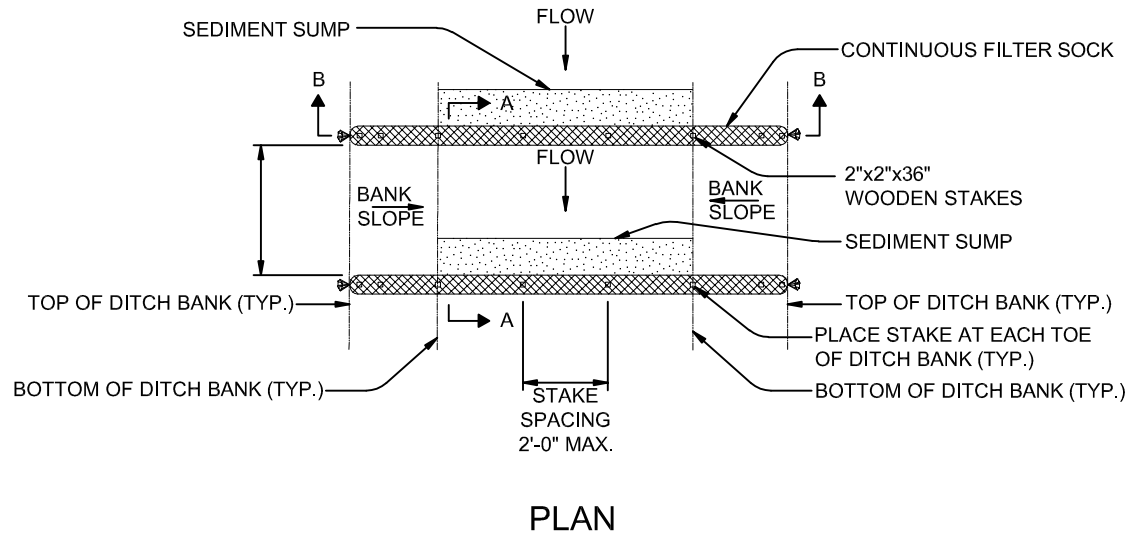
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## CHECK DAMS SHEET 3 OF 4

2019

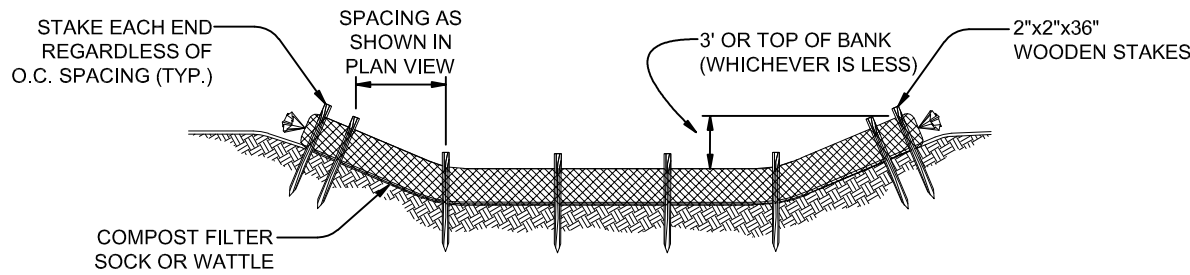
DATE	REVISIONS

# COMPOST FILTER SOCK CHECK DAM - TYPE 6



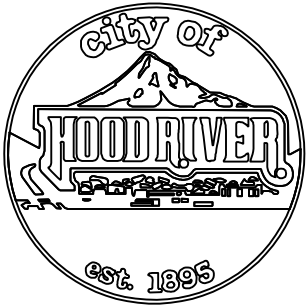
MAXIMUM CHECK DAM SPACING "L"				
DITCH GRADE	H=8"	H=12"	H=18"	H=24"
10%	**	**	15'	20'
9%	**	**	16'	22'
8%	**	**	18'	25'
7%	**	**	21'	28'
6%	**	16'	25'	33'
5%	**	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

\*\* NOT ALLOWED  
H = MIN. DAM HEIGHT



NOTE:  
FOR STACKING OPTIONS REFER TO ESC-04

## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-02



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

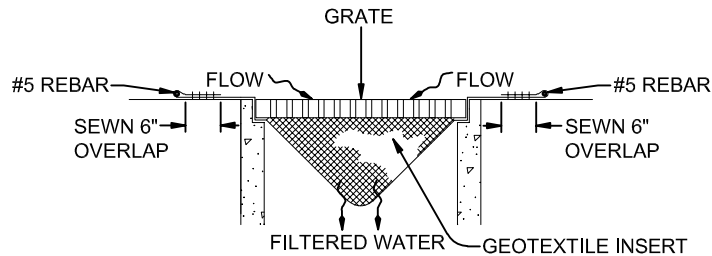
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## CHECK DAMS SHEET 4 OF 4

2019

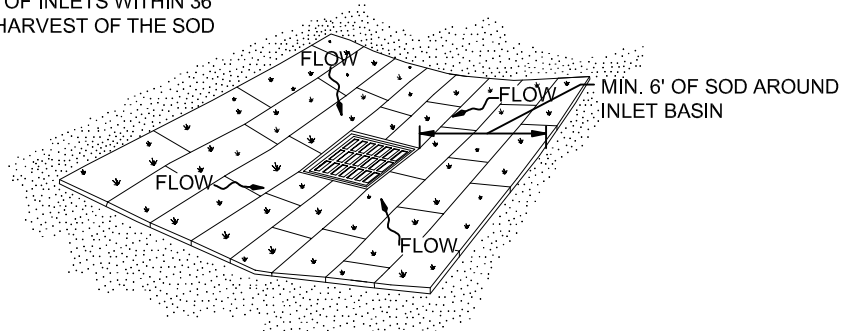
DATE	REVISIONS

## PREFABRICATED FILTER INSERT - TYPE 3



## SOD PROTECTON - TYPE 6

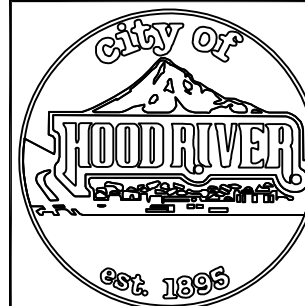
NOTE:  
INSTALL SOD AROUND THE  
PERIMETER OF INLETS WITHIN 36  
HOURS OF HARVEST OF THE SOD



### NOTES FOR ALL DETAILS:

1. TYPE 3 - PREFABRICATED FILTER INSERTS. INSTALL ACCORDING TO THE PLANS, SPECIAL PROVISIONS, AND MANUFACTURER RECOMMENDATIONS. FIELD FABRICATED INSERTS ARE NOT ALLOWED.
2. TYPE 7 - COMPOST FILTER SOCK. DRIVE 2"x2" WOOD STAKES A MIN. OF 6" INTO GROUND AND FLUSH WITH THE TOP OF THE SOCK. OVERLAP ENDS OF SOCK PER MANUFACTURERS RECOMMENDATIONS (1' MIN., 3' MAX.) USE 8" TO 12" DIA. SOCK IN TRAFFIC AREAS. USE 12" TO 18" DIA. SOCK IN NON-TRAFFIC AREAS OR AREAS WHERE THE LARGER SOCKS CAN BE USED SAFELY.
3. TYPE 10 - CURB INLET SEDIMENT DAM. FIT CURB INLET SEDIMENT DAM SNUGLY INTO INLET MOUTH. CURB INLET SEDIMENT DAM IS REQUIRED FOR USE WITH INLET FILTER INSERT WHERE AT-GRADE INLET GRATE AND CURB INLET ARE COMBINED AT A CATCH BASIN.
4. TYPE 11 - WATTLE BARRIER WITH FILTER INSERT. INSTALL PREFABRICATED FILTER INSERT PER TYPE 3 DETAIL. INSTALL WATTLES OVER OPENING AND 3' TO EACH SIDE OF OPENING TIGHT AGAINST CURB. ADJUST WATTLE TO FORCE STORM WATER TO FLOW THROUGH FILTER INSERT OR WATTLE PRIOR TO LEAVING THE SITE. ADJUST, REPLACE, OR MODIFY THE INLET PROTECTION AS NEEDED TO PREVENT SEDIMENT LADEN WATER FROM ENTERING CATCH BASIN.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-03



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

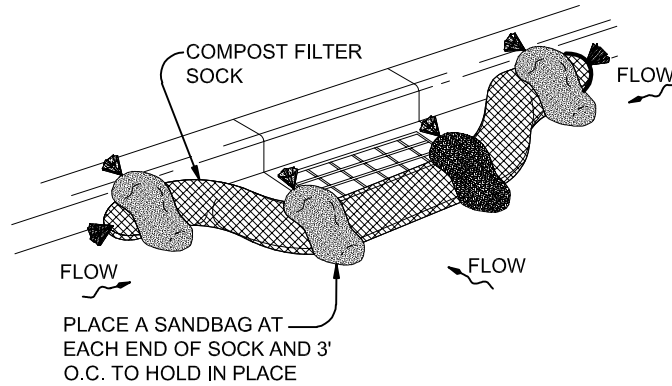
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## INLET PROTECTION 1 OF 4

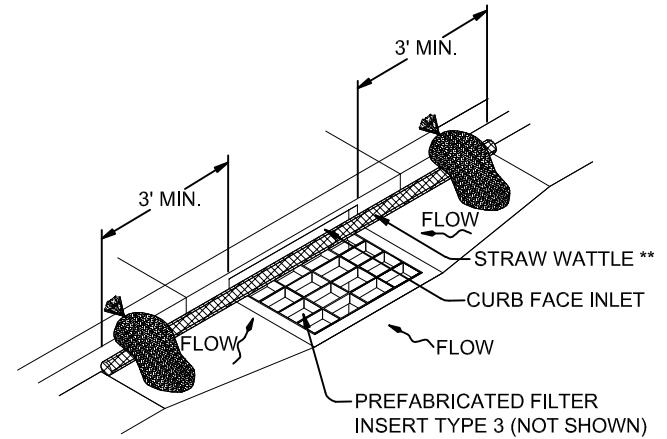
2019

DATE	REVISIONS

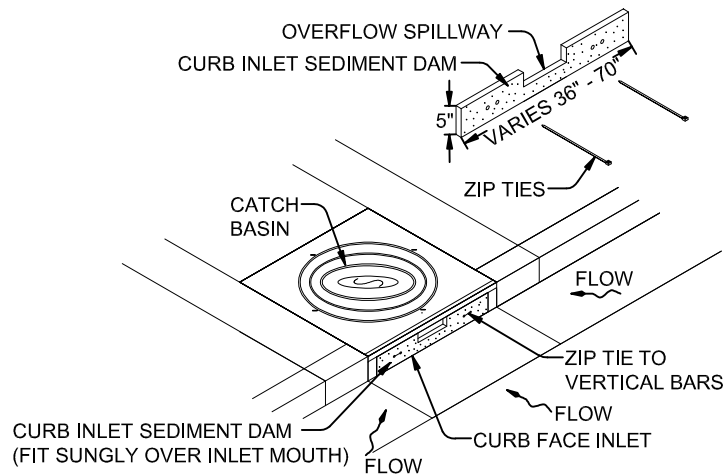
## CURB INLET PERSPECTIVE VIEW COMPOST FILTER SOCK OR WATTLE - TYPE 7



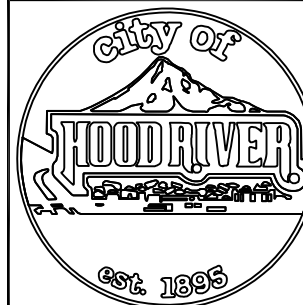
## WATTLE BARRIER WITH FILTER INSERT - TYPE 11



## CURB INLET SEDIMENT DAM - TYPE 10



### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-03



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

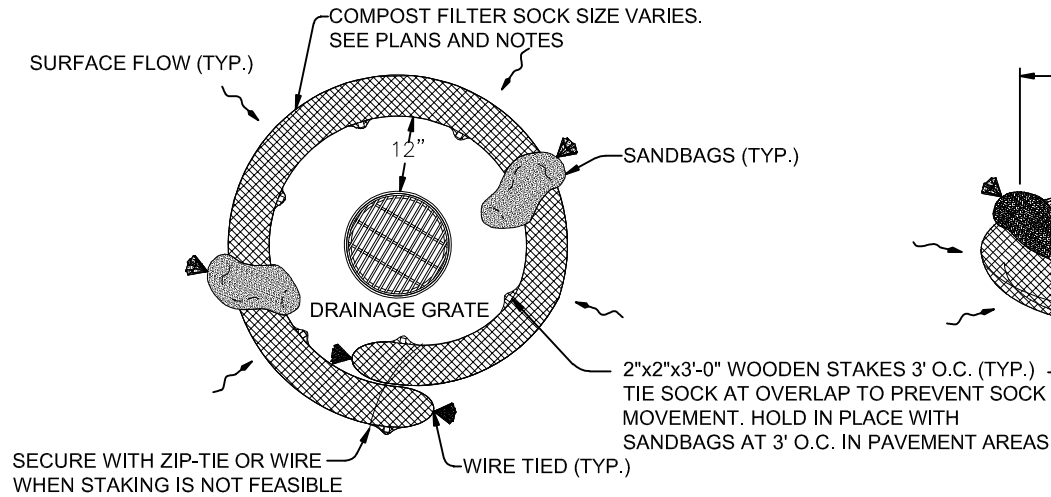
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## INLET PROTECTION 2 OF 4

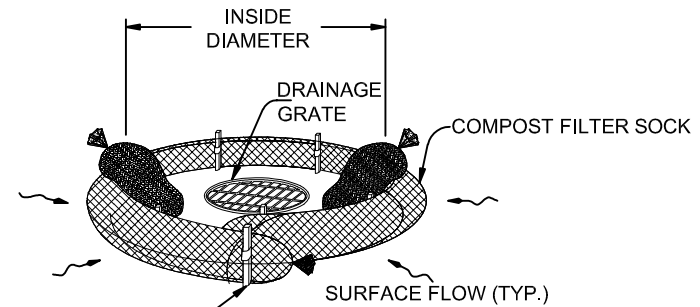
2019

DATE	REVISIONS

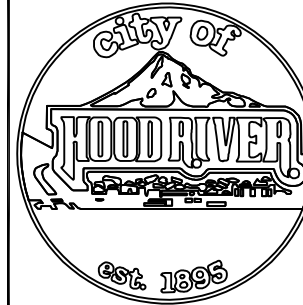
## AREA DRAIN PLAN



## AREA DRAIN PERSPECTIVE VIEW



### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-03



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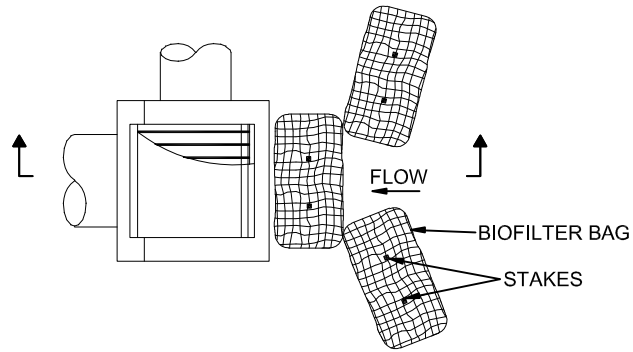
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## INLET PROTECTION 3 OF 4

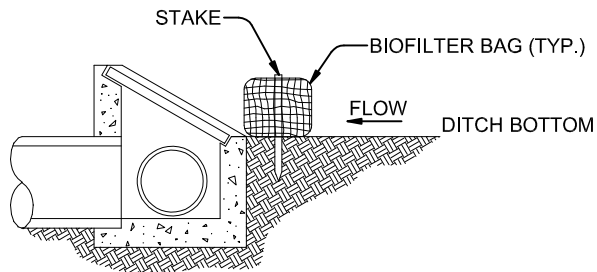
2019

DATE	REVISIONS

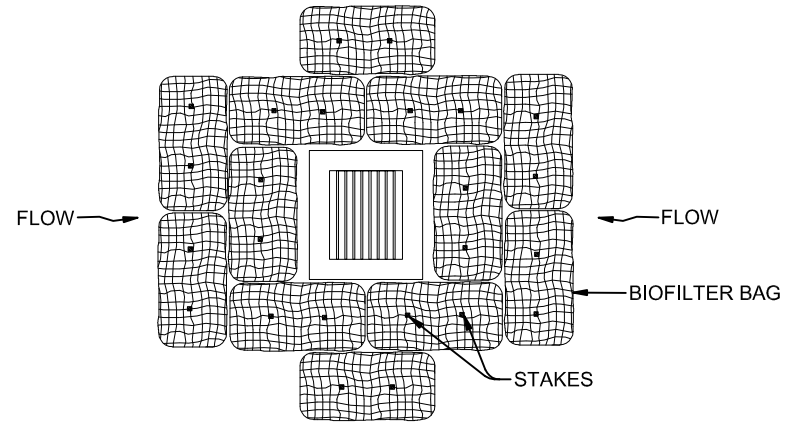
## BIOFILTER BAGS - TYPE 4



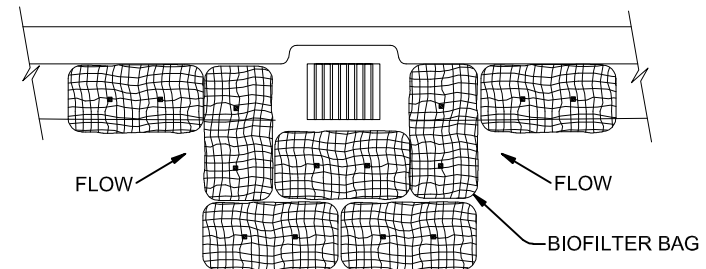
PLAN  
DITCH INLET



SECTION A-A  
DITCH INLET



PLAN  
AREA DRAIN

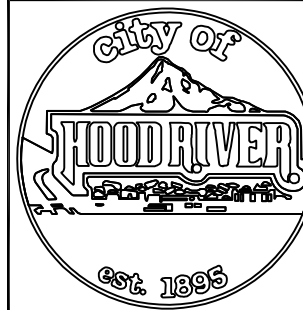


PLAN  
CATCH BASIN

### NOTES FOR ALL DETAILS:

1. STAKE BIOFILTER BAGS 2'x2' WOOD STAKES, AND USE A MIN. 2 STAKES PER BAG. DRIVE STAKES A MIN. OF 6" INTO THE GROUND AND FLUSH WITH THE TOP OF THE BAGS.
2. OMIT STAKES WHEN BAGS ARE PLACED ON PAVEMENT SURFACE.
3. OVERLAP ALL BAG JOINTS 6".

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-03



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NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

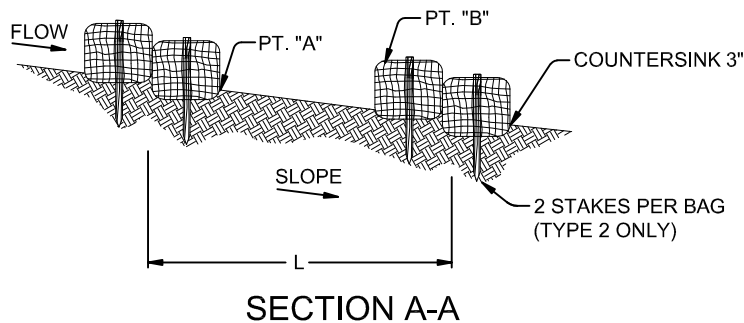
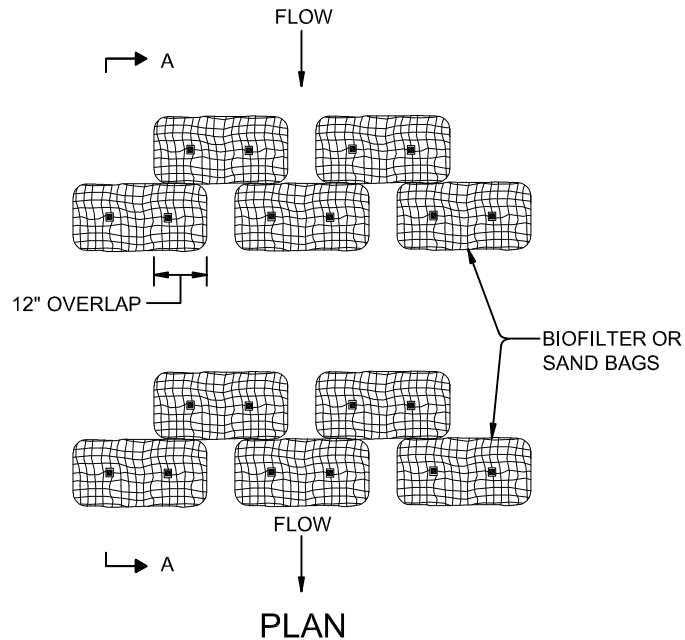
### INLET PROTECTION 4 OF 4

2019

DATE	REVISIONS



## BIOFILTER BAG/SAND BAG BARRIER - TYPE 2 & 4



### BARRIER SPACING

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS		
% SLOPE	H:V SLOPE	MAX. SPACING ON SLOPE
< 10 %	< 10:1	300'
10 > % > 15	10 > X > 7.5	150'
15 > % > 20	7.5 > X > 5	100'
20 > % > 30	5 > X > 3	50'
> 30 %	> 3:1	25'

#### NOTES FOR ALL DETAILS:

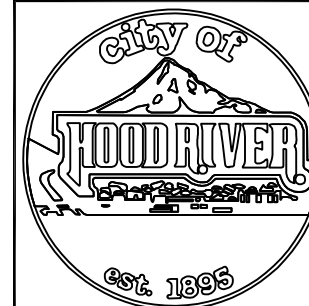
- FOR TYPE 2 AND 3 BARRIER, DRIVE STAKES FLUSH WITH TOP OF BAG AND INTO UNDISTURBED GROUND A MIN. OF 12". OMIT STAKES IF BAGS ARE PLACED ON PAVED SURFACE.
- FOR TYPE 2, 3, AND 4 BARRIERS, SPACE BAGS (L) SO THAT THE ELEVATION OF POINT "A" IS LESS THAN OR EQUAL TO THE ELEVATION OF POINT "B".

TYPE 2 - BIOFILTER BAGS

TYPE 3 - WATTLES

TYPE 4 - SAND BAGS

#### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-04



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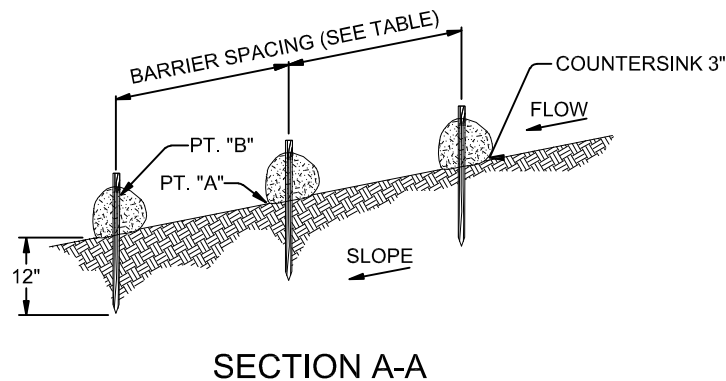
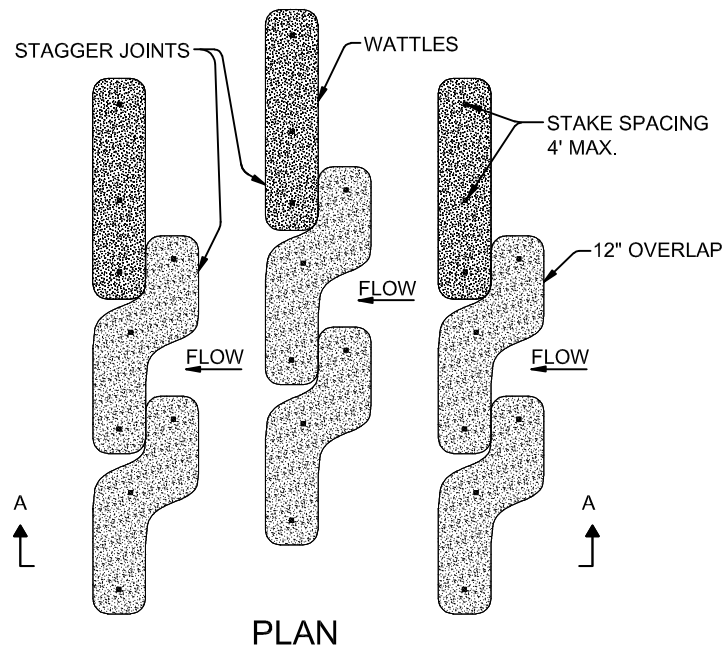
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### SEDIMENT BARRIER 1 OF 6

2019

DATE	REVISIONS

## FIBER ROLL BARRIER - TYPE 3



## BARRIER SPACING

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS		
% SLOPE	H:V SLOPE	MAX. SPACING ON SLOPE
< 10 %	< 10:1	300'
10 > % > 15	10 > X > 7.5	150'
15 > % > 20	7.5 > X > 5	100'
20 > % > 30	5 > X > 3	50'
> 30 %	> 3:1	25'

### NOTES FOR ALL DETAILS:

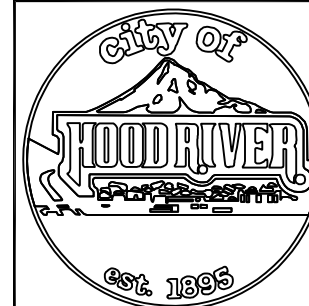
- FOR TYPE 2 AND 3 BARRIER, DRIVE STAKES FLUSH WITH TOP OF BAG AND INTO UNDISTURBED GROUND A MIN. OF 12". OMIT STAKES IF BAGS ARE PLACED ON PAVED SURFACE.
- FOR TYPE 2, 3, AND 4 BARRIERS, SPACE BAGS (L) SO THAT THE ELEVATION OF POINT "A" IS LESS THAN OR EQUAL TO THE ELEVATION OF POINT "B".

TYPE 2 - BIOFILTER BAGS

TYPE 3 - WATTLES

TYPE 4 - SAND BAGS

## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-04



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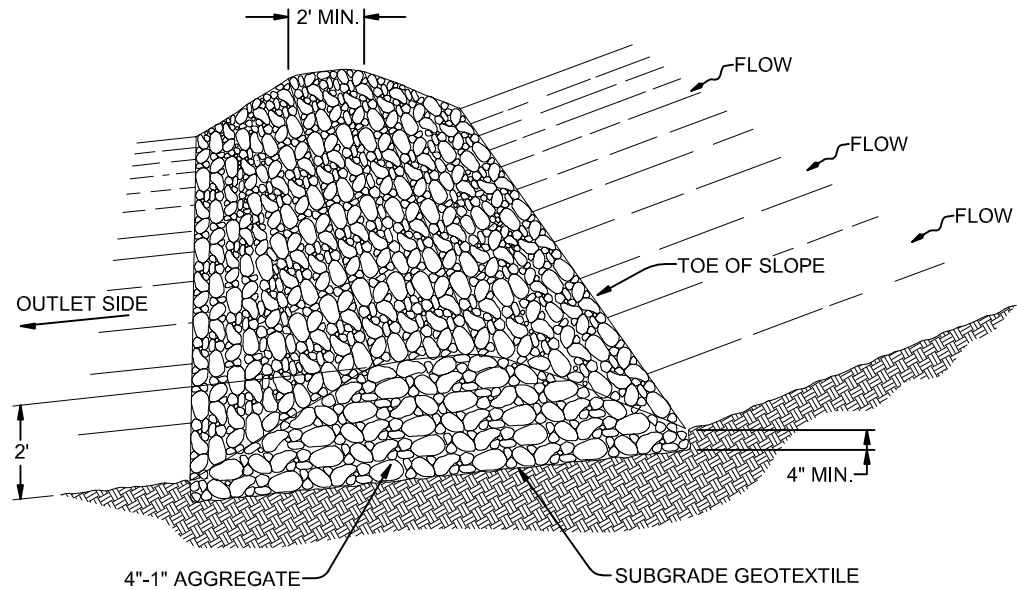
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## SEDIMENT BARRIER 2 OF 6

2019

DATE	REVISIONS

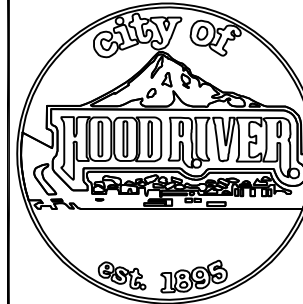
## AGGREGATE BARRIER - TYPE 6



### NOTES:

1. DIRECT DIVERTED FLOWS FROM THE OUTLET SIDE OF THE ROCK FILTER BERM/DAMS ONTO A STABILIZED AREA, SUCH AS VEGETATION AND OR ROCK, OR INTO A SEDIMENT TRAPPING FACILITY.
2. EMBED BARRIER A MIN. OF 4" INTO THE EXISTING GROUND/EMBANKMENTS.
3. USE 3:1 OR FLATTER SIDE SLOPE. WITHIN THE SAFETY CLEAR ZONE, USE 6:1 OR FLATTER SIDE SLOPES.
4. USE 4"-1" CLEAN AGGREGATE.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-04



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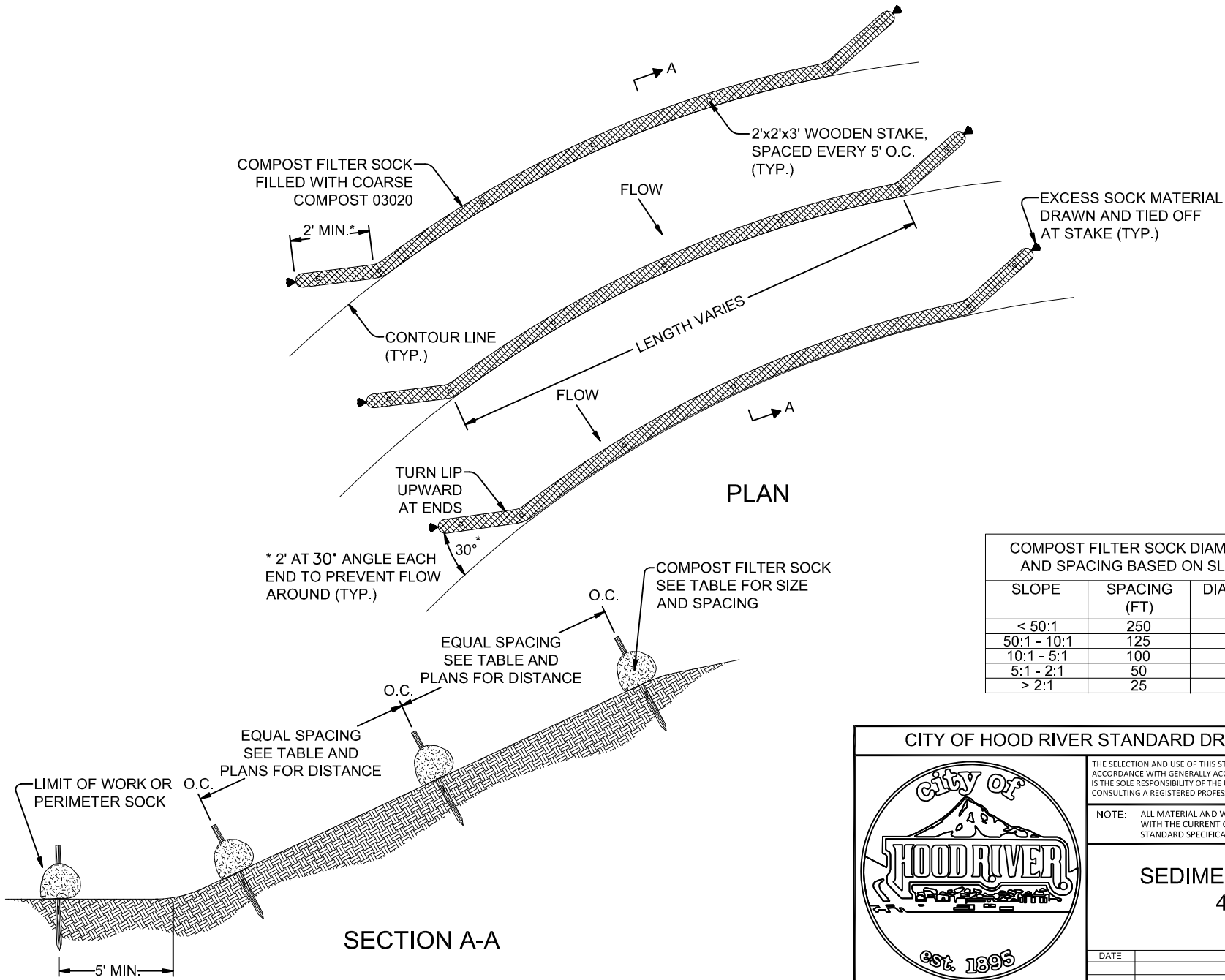
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### SEDIMENT BARRIER 3 OF 6

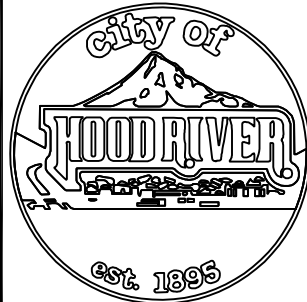
2019

DATE	REVISIONS

# COMPOST FILTER SOCK



## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-04



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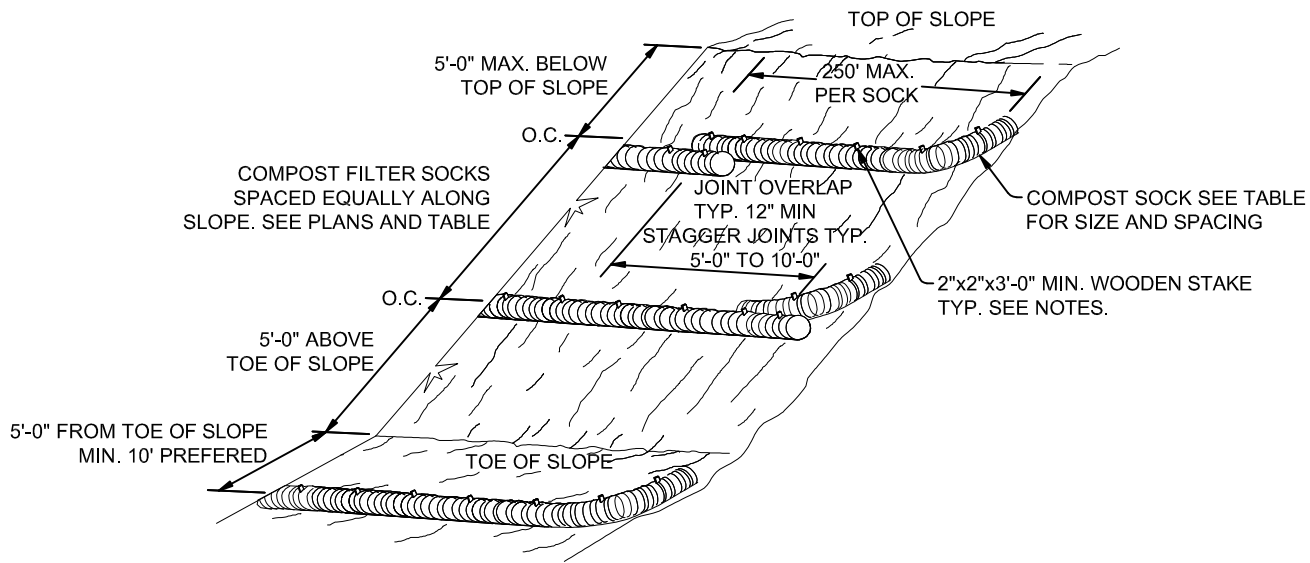
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## SEDIMENT BARRIER 4 OF 6

2019

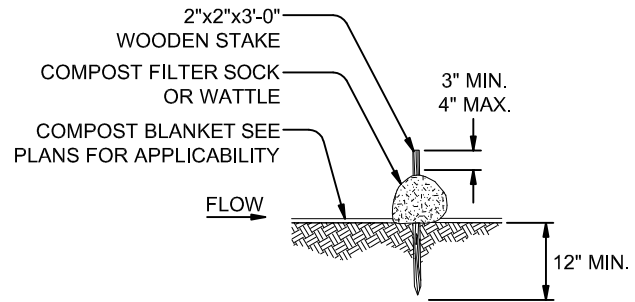
DATE	REVISIONS

# COMPOST FILTER SOCK



SLOPE APPLICATION - PERSPECTIVE VIEW

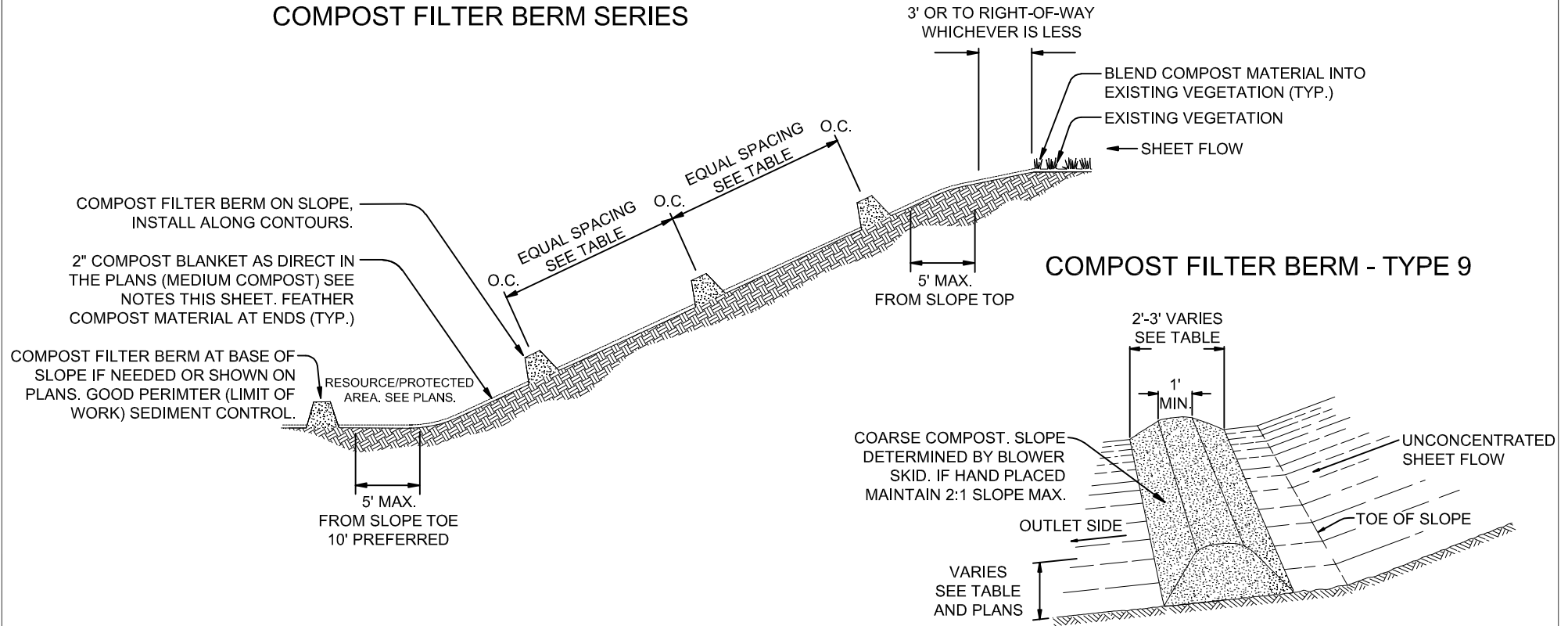
## STAKING



COMPOST FILTER SOCK DIAMETER AND SPACING BASED ON SLOPE		
SLOPE	SPACING (FT)	DIAMETER (IN)
< 50:1	250	8
50:1 - 10:1	125	12
10:1 - 5:1	100	12
5:1 - 2:1	50	18
> 2:1	25	18

CITY OF HOOD RIVER STANDARD DRAWINGS ESC-04							
	<p>THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER</p>						
	<p>NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.</p>						
	<p><b>SEDIMENT BARRIER</b> <b>5 OF 6</b> <b>2019</b></p>						
<table border="1"> <tr> <th>DATE</th> <th>REVISIONS</th> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	DATE	REVISIONS					
DATE	REVISIONS						

## COMPOST FILTER BERM SERIES



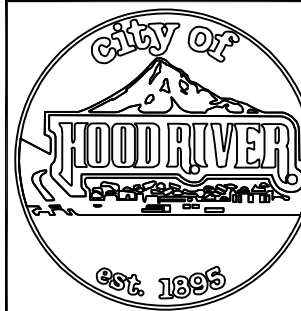
### COMPOST FILTER BERM GENERAL NOTES:

1. COMPOST FILTER BERMS ARE SEDIMENT CONTROL DEVICES FOR AREAS WHERE RUNOFF OCCURS AS SHEET FLOW.
2. THE MAX. DRAINAGE AREA FOR A CONTINUOUS BERM SHALL BE 1/4 ACRE PER 100 LINEAR FEET OF FILTER BERM.
3. WHERE POSSIBLE, BERMS SHOULD BE PLACED AWAY FROM THE TOE OF SLOPES A MIN. OF 5 FEET (10 FEET PREFERRED) TO ALLOW FOR ENERGY DISSIPATION AND SEDIMENT STORAGE.
4. DIRECT THE OUTLET SIDE OF THE BERM, LOCATED AT BASE SLOPE, ONTO A STABILIZED AREA, SUCH AS VEGETATION AND/OR AGGREGATE.
5. PLACE FILTER BERMS ALONG OR ON THE GROUND CONTOUR WITH THE ENDS OF THE FILTER BERM TURNED UP SLOPE PER DETAILS. ADEQUATE AREA SHALL BE PROVIDED BEHIND BERM FOR PONDING.
6. COMPOST FILTER BERMS MAY BE VEGETATED WITH TEMPORARY OR PERMANENT SEEDING AFTER PLACEMENT.
7. IF PLACED IN AREA WITH EXISTING GROUND VEGETATION, CUT VEGETATION TO 2-4 INCHES ABOVE GRADE AT BERM FOOTPRINT. DO NOT REMOVE EXISTING VEGETATION OR CUT BACK OUTSIDE BERM FOOTPRINT UNLESS DIRECT BY AGENCY.
8. IF SOILS ARE EXPOSED APPLY COMPOST BLANKET PER DETAILS AND SPECIFICATIONS.

### COMPOST FILTER BERM DIMENSIONS AND SPACING BASED ON SLOPE

SLOPE	BERM SPACING	BERM DIMENSIONS		
		HEIGHT	BOTTOM WIDTH	TOP WIDTH
< 50:1	250 FT	1 FT	2 FT (MIN.)	1 FT
50:1 - 10:1	125 FT	1 FT	2 FT (MIN.)	1 FT
10:1 - 5:1	100 FT	1 FT	2 FT (MIN.)	1 FT
3:1 - 2:1	50 FT	1.3 FT	2.6 FT (MIN.)	1 FT
> 2:1		1.5 FT	3 FT (MIN.)	1 FT

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-04



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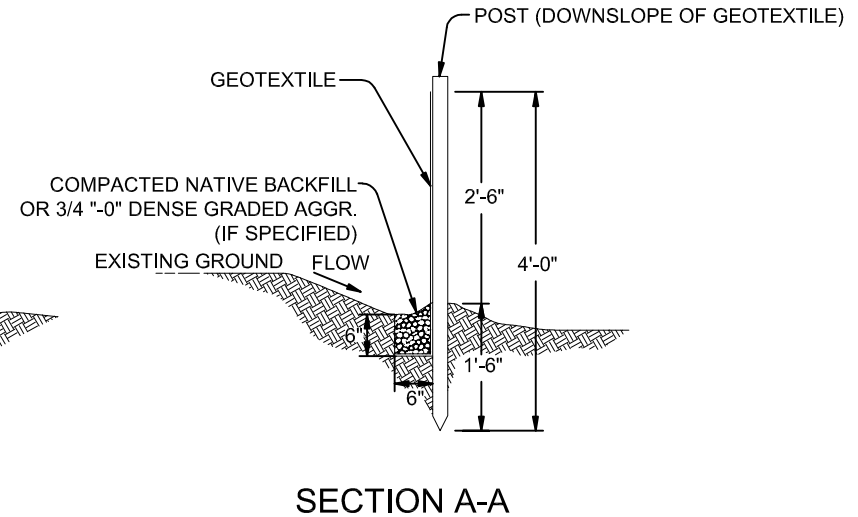
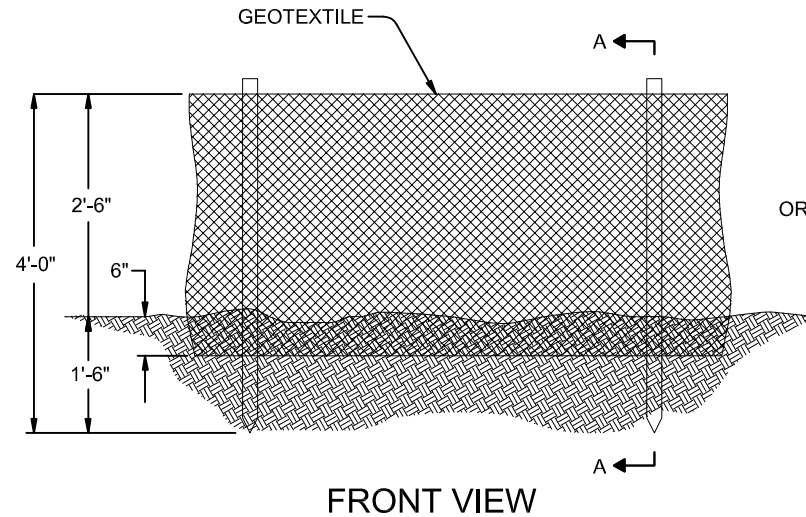
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### SEDIMENT BARRIER 6 OF 6

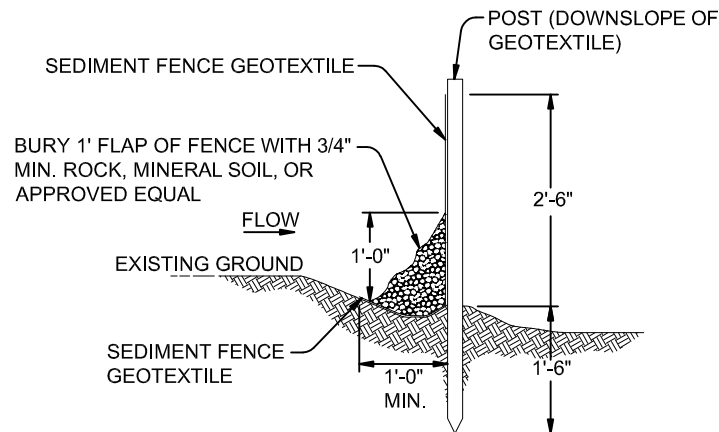
2019

DATE	REVISIONS

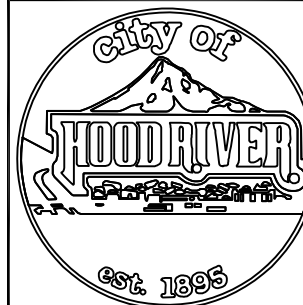
## SEDIMENT FENCE AND GEOTEXTILE BURY DETAIL - TYPE 1



## ALTERNATE SEDIMENT FENCE W/O TRENCHING - TYPE 2



### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-05



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

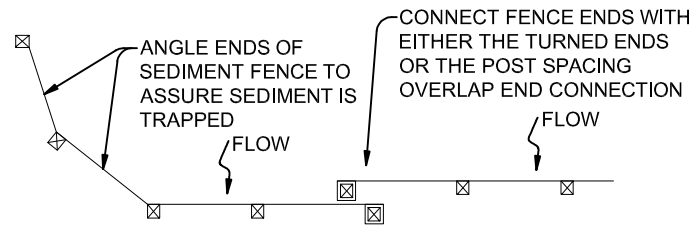
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### SEDIMENT FENCE 1 OF 2

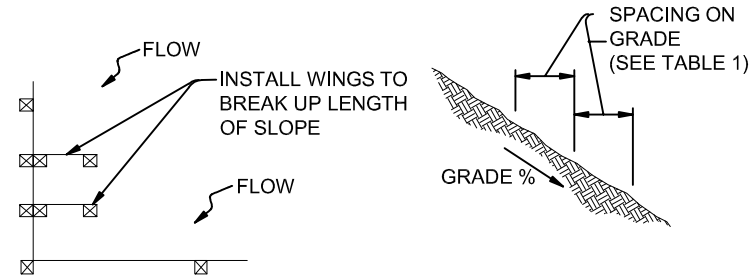
2019

DATE	REVISIONS

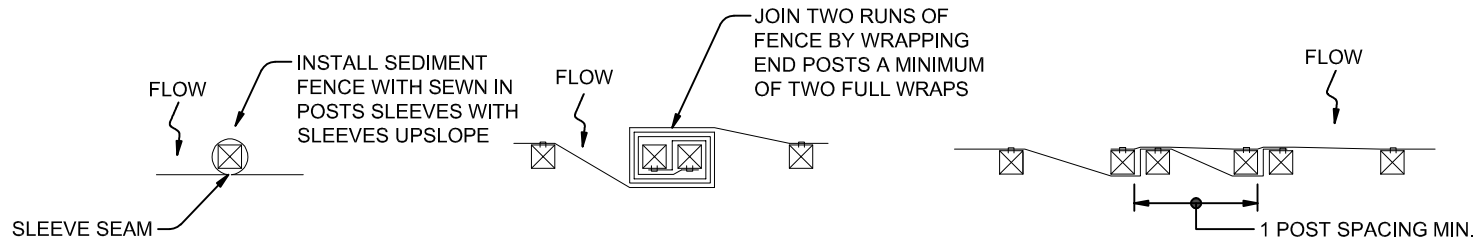
## PLAN VIEW



## TERMINATION AT CORNER OR PROPERTY LINE



## GEOTEXTILE END CONNECTIONS



## GEOTEXTILE WITH POST SLEEVES

## POST SPACING OVERLAP CONNECTION

**TABLE 1  
FENCE SPACING  
FOR GENERAL APPLICATION**

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS	
GRADE	MAX. SPACING ON GRADE
GRADE < 10%	300'
10% ≤ GRADE < 15%	150'
15% ≤ GRADE < 20%	100'
20% ≤ GRADE < 30%	50'
30% ≤ GRADE	25'

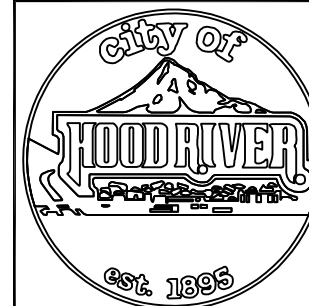
**TABLE 2**

POST SPACING	
6'	SEDIMENT FENCE WITH GEOTEXTILE ELONGATION LESS THAN 50%
4'	SEDIMENT FENCE WITH GEOTEXTILE ELONGATION 50% OR MORE

### NOTES FOR ALL DETAILS:

- USE 2"x2" WOOD FENCE POSTS OR TEE POSTS.
- POSTS TO BE INSTALLED ON DOWNHILL SIDE OF SEDIMENT FENCE GEOTEXTILE. POSITION POSTS TO PREVENT SEPARATION FROM GEOTEXTILE.
- COMPACT FILTER FABRIC TRENCH BACKFILL AND SOIL UPHILL SIDE OF FENCE.
- LOCATE FENCE NO CLOSER THAN THREE FEET TO THE TOE OF A SLOPE.
- WING SPACING SHALL COMPLY WITH TABLE 1.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-05



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER.

NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

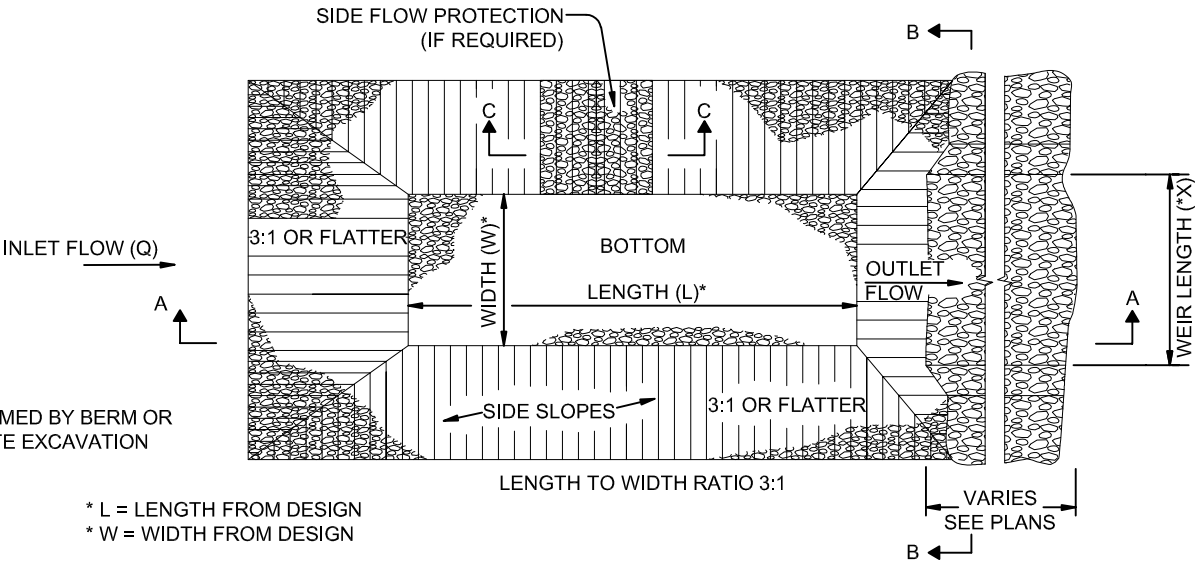
## SEDIMENT FENCE 2 OF 2

2019

DATE	REVISIONS



# SEDIMENT TRAP

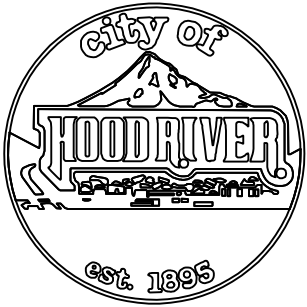


NOTE: TRAP MAY BE FORMED BY BERM OR BY PARTIAL OR COMPLETE EXCAVATION

\* L = LENGTH FROM DESIGN  
\* W = WIDTH FROM DESIGN

PLAN

## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-06



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

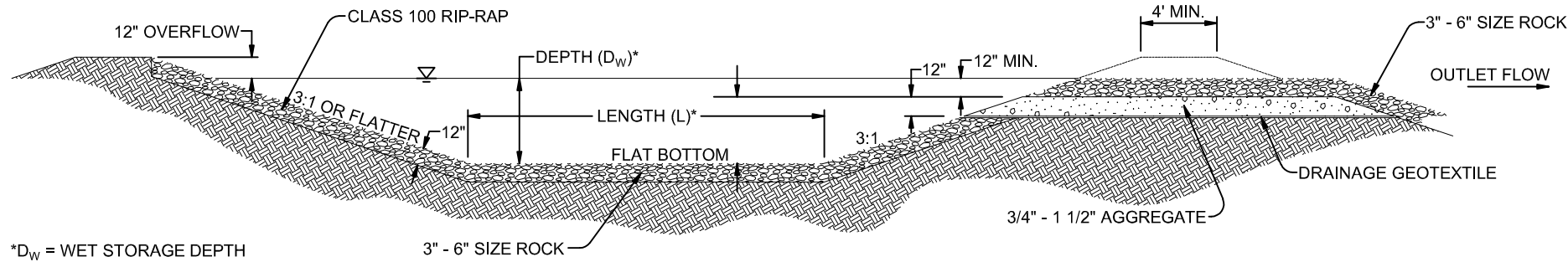
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## SEDIMENT TRAP 1 OF 2

2019

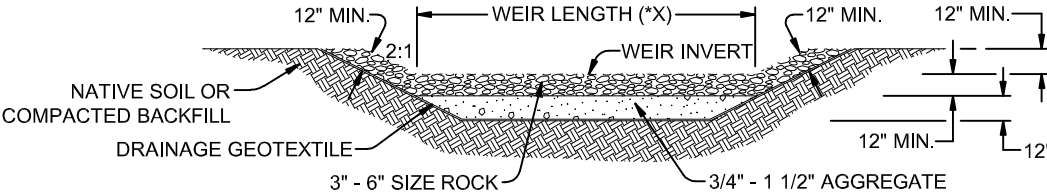
DATE	REVISIONS

# SEDIMENT TRAP



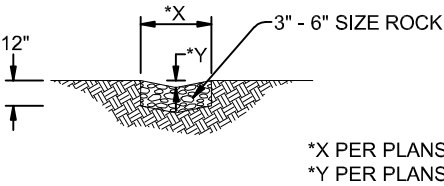
\* $D_w$  = WET STORAGE DEPTH

SECTION A-A



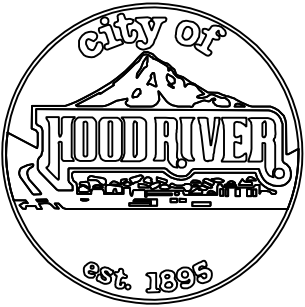
\*X PER PLANS

SECTION B-B



SECTION C-C

## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-06



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

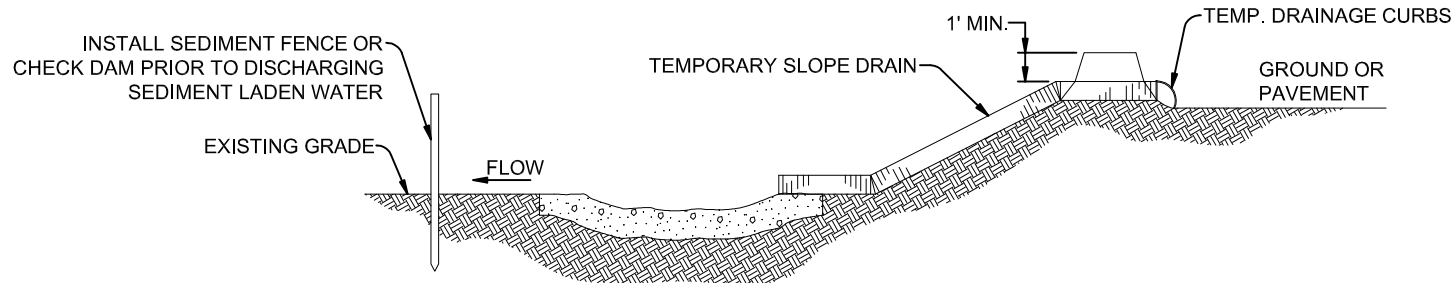
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## SEDIMENT TRAP 2 OF 2

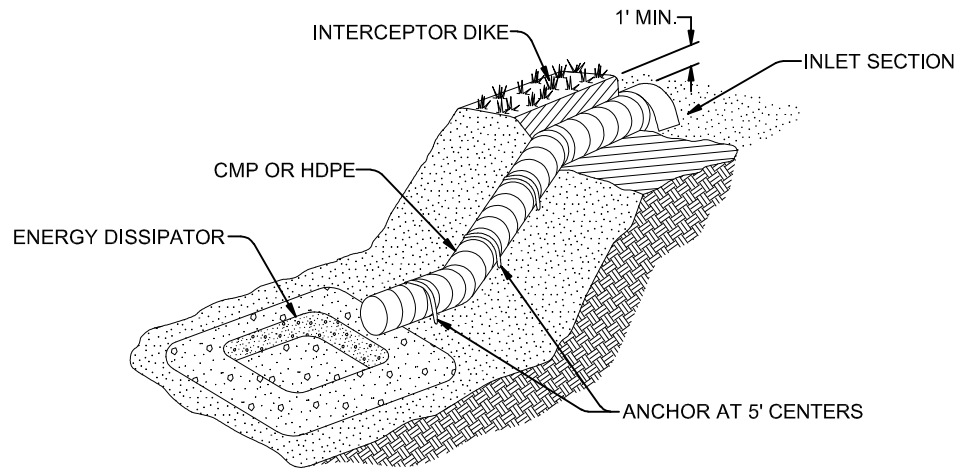
2019

DATE	REVISIONS

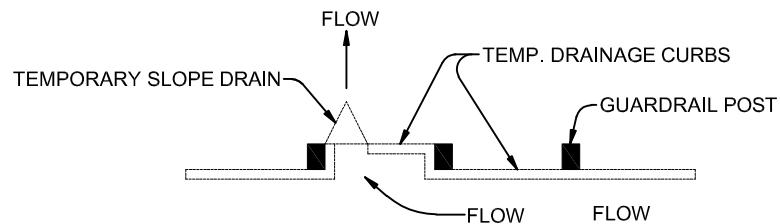
## PERSPECTIVE



## PROFILE



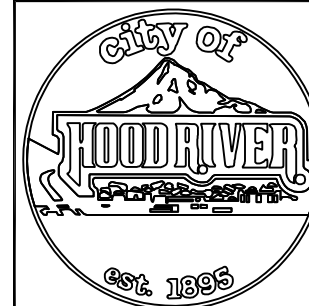
## PLAN TEMPORARY DRAIN AT GUARDRAIL



### NOTES:

1. TEMPORARY SLOPE DRAINS SHALL BE USED AT THE TOP OF FILL SLOPES AS THE EMBANKMENT IS CONSTRUCTED TO PREVENT EROSION.
2. TEMPORARY DRAINAGE CURBS SHALL BE USED IN CONJUNCTION WITH TEMPORARY SLOPE DRAINS TO PREVENT EROSION ON COMPLETED SLOPES AND TO DIRECT FLOW INTO END SECTION.
3. ALL DIMENSIONS NOT INDICATED WILL BE AS DIRECTED.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-07



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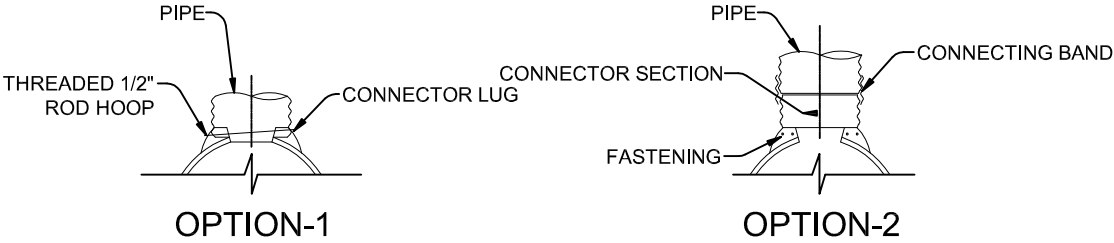
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### TEMP SLOPE DRAIN W/ ENERGY DISSIPATOR

1 OF 2  
2019

DATE	REVISIONS

CONNECTION DETAILS



INLET SECTION DETAILS

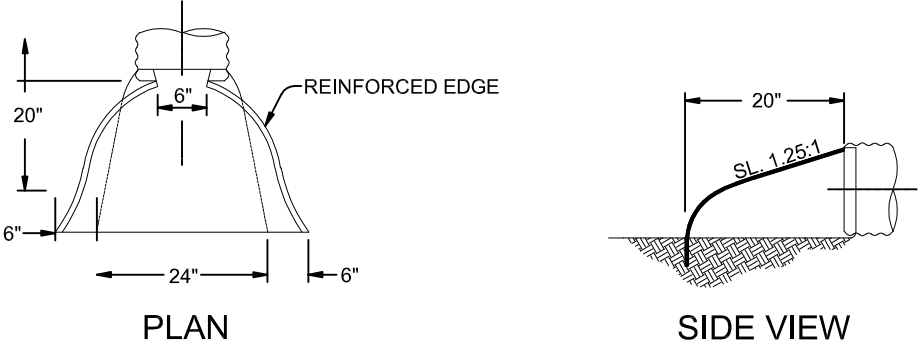
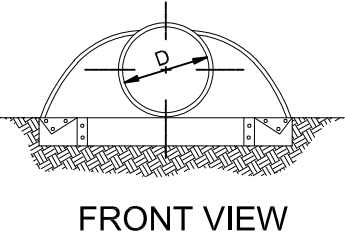
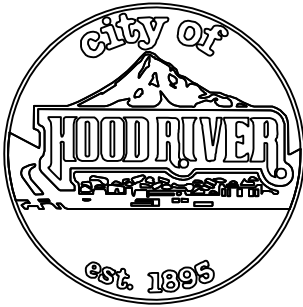


TABLE FOR PIPE SIZE		
PIPE		CONTRIBUTING AREA TO SLOPE DRAIN (SQ FT)
SLOPE (MIN.)	D IN. (MIN.)	
3.8%	6	$A < 200$
2.5%	8	$200 \leq A < 500$
1.9%	10	$500 \leq A < 850$
1.5%	12	$850 \leq A < 1400$
-	SPECIAL DESIGN REQD.	$1400 \leq A$



CITY OF HOOD RIVER STANDARD DRAWINGS ESC-07



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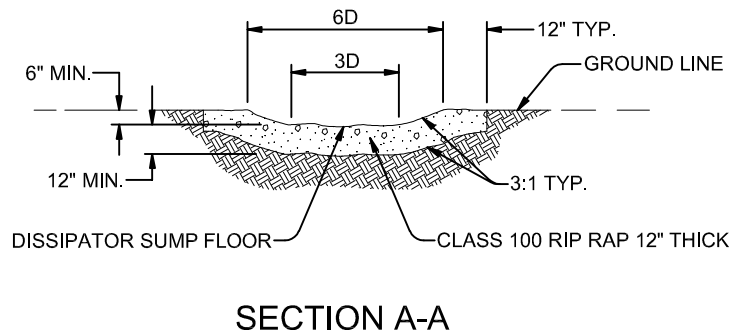
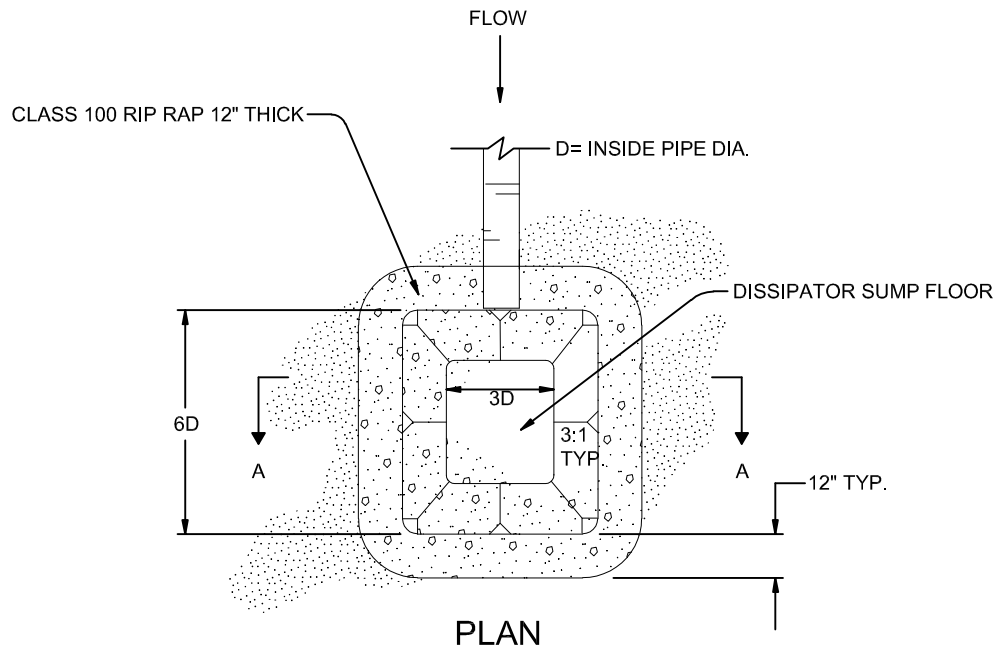
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

TEMP SLOPE DRAIN W/  
ENERGY DISSIPATOR

2 OF 2  
2019

DATE	REVISIONS

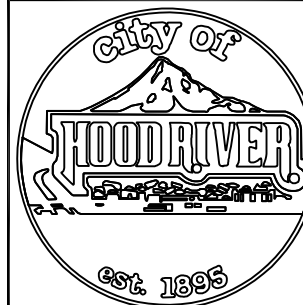
## TEMPORARY SCOUR BASIN / ENERGY DISSIPATOR



### GENERAL NOTE:

- ALL DIMENSIONS NOT INDICATED WILL BE AS DIRECTED BY ENGINEER.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-08



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

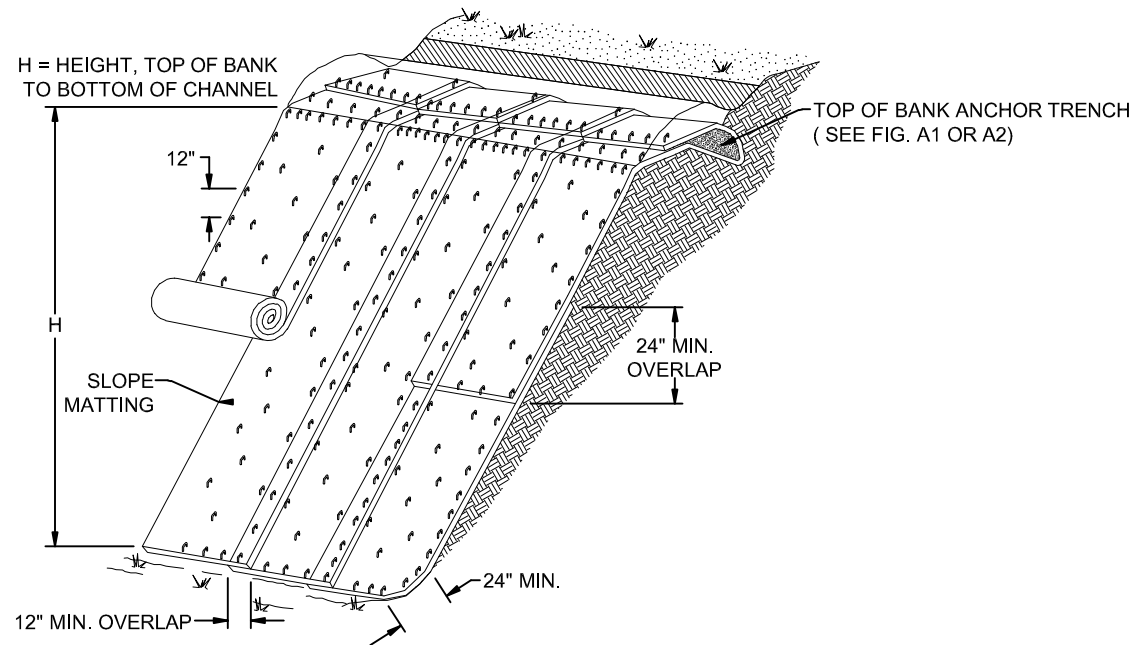
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### TEMP SCOUR BASIN/ ENERGY DISSIPATOR

2019

DATE	REVISIONS

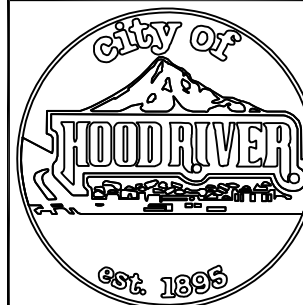
## SLOPE ISOMETRIC VIEW



### GENERAL NOTES:

1. INSTALL MATTING VERTICALLY DOWN SLOPE.
2. INSTALL MATTING SO EDGE OVERLAPS ARE SHINGLED AWAY FROM PREVAILING WINDS.
3. PLACE FASTENER AT 12" O.C. ON ALL MATTING EDGES (I.E. TOP, BOTTOM, SIDES).
4. OVERLAP UPPER MAT OVER LOWER MAT, AND FASTEN.
5. STAGGER ALTERNATE ROWS OF FASTENERS PLACED AT 24" O.C., EACH WAY.
6. EXTEND MAT 24" BEYOND TOE OF SLOPE; FOLD MAT BACK UNDER 4" AND FASTEN.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-09



THE SELECTION AND USE OF THIS STANDARD DRAWING, WHILE DESIGNED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES, IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER

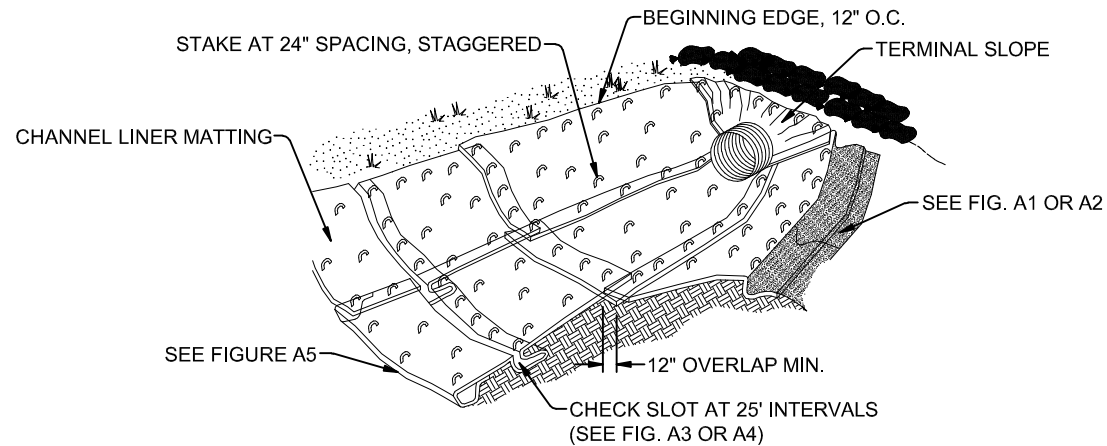
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### SLOPE AND CHANNEL MATTING

1 OF 3  
2019

DATE	REVISIONS

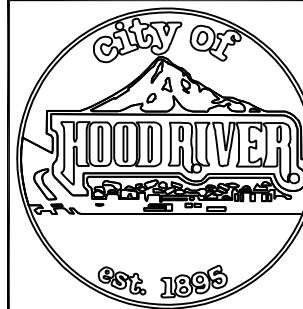
## CHANNEL ISOMETRIC VIEW



### GENERAL NOTES:

1. INSTALL CHANNEL LINER MATTING, IN THE DIRECTION OF WATER FLOW. ANCHOR UPSTREAM END OF MAT WITH CHECK SLOT FOR CULVERT OUTFALLS, PLACE MAT UNDER PIPE 12" MIN. UPSTREAM FROM PIPE OUTLET.
2. CONSTRUCT CHECK SLOTS ACROSS CHANNEL BOTTOM AT 25' SPACING AND AT THE END OF EACH MAT (FIG. A3 OR A4).
3. OVERLAP SIDE CHANNEL LINER MATTING EDGES 12" OVER THE CENTER CHANNEL LINER MATTING AND FASTEN EDGES 12" O.C. CONTINUE OVERLAP AND STAPLING PATTERN FOR EACH ADDITIONAL SIDE CHANNEL LINER MAT.
4. LAP UPSTREAM MATTING END 12" OVER BEGINNING EDGE OF DOWNSTREAM MATTING. FASTEN 12" O.C.
5. ANCHOR TOP EDGE OF SIDE CHANNEL MATTING IN TRENCH AND FASTEN 12" O.C. (FIG. A1 OR A2).
6. FASTEN MATTING INTERIOR AT 24" O.C. WITH STAGGERED SPACING.
7. CONSTRUCT INITIAL ANCHOR TRENCH AT DOWNSTREAM END OF MATTING AND TERMINAL SLOPE ANCHOR AT UPSTREAM END.

### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-09



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### SLOPE AND CHANNEL MATTING

2 OF 3  
2019

DATE	REVISIONS

TOP OF BANK ANCHOR TRENCH  
H>3' AND TERMINAL SLOPE

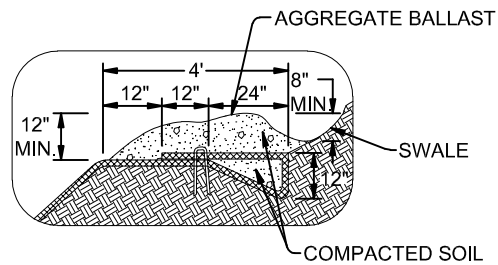


FIGURE A1

TOP OF BANK ANCHOR  
TRENCH, H<3'

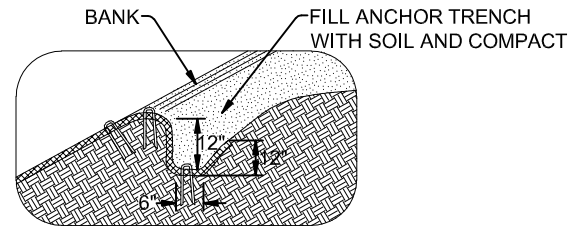


FIGURE A2

CHANNEL CHECK SLOT

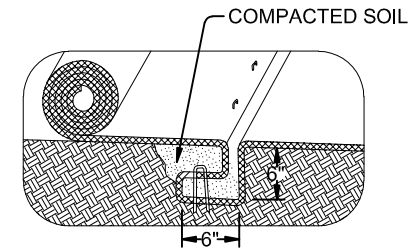


FIGURE A3

CHANNEL CHECK SLOT WITH  
ROCK BACKFILL

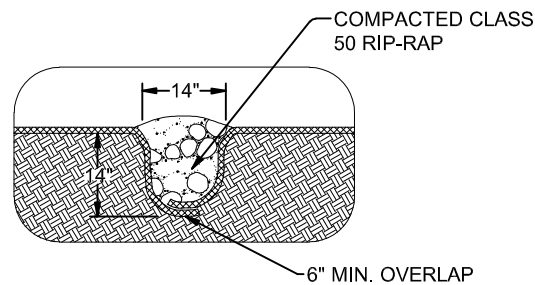


FIGURE A4

INITIAL CHANNEL  
ANCHOR TRENCH

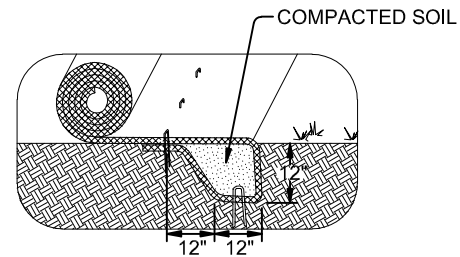
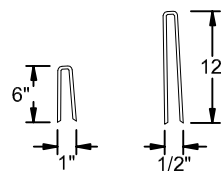
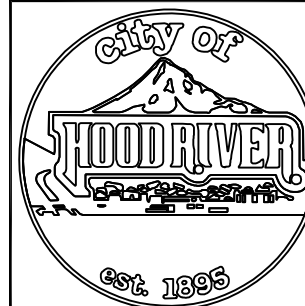


FIGURE A5



STAPLES

CITY OF HOOD RIVER STANDARD DRAWINGS ESC-09



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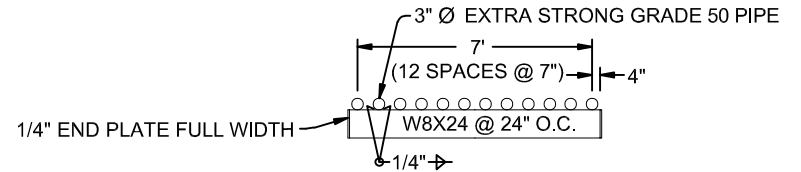
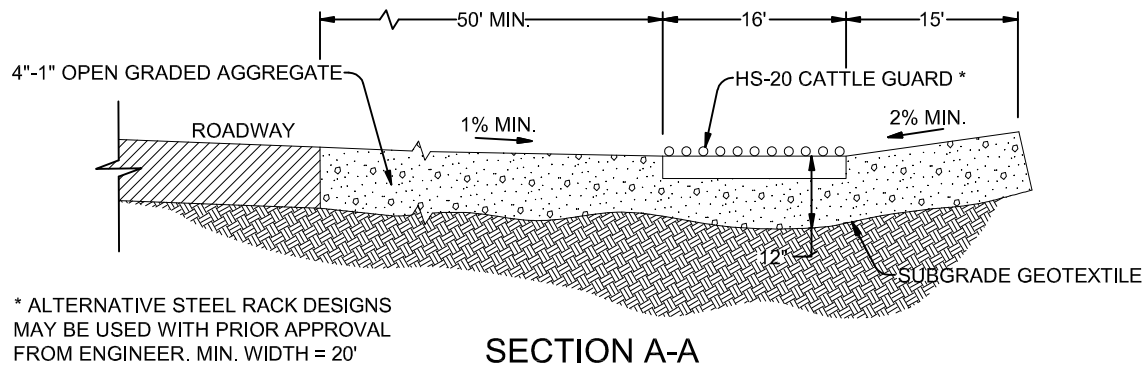
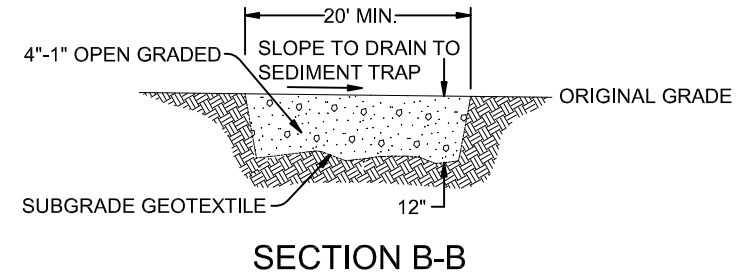
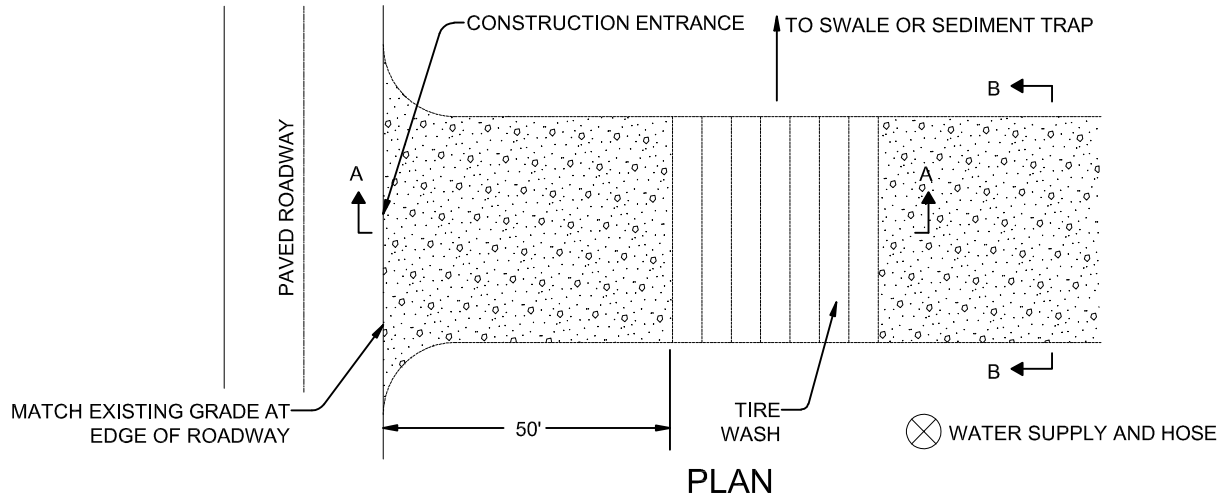
SLOPE AND CHANNEL  
MATTING

3 OF 3  
2019

DATE	REVISIONS

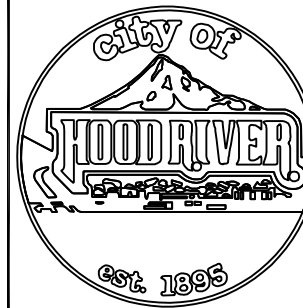


# TIRE WASH - TYPE 1 (MANUAL HOSE WASH)



HS-20 CATTLE GUARD

## CITY OF HOOD RIVER STANDARD DRAWINGS ESC-10



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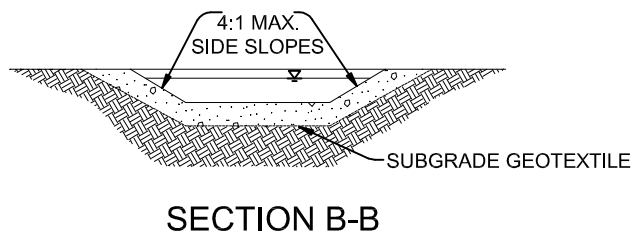
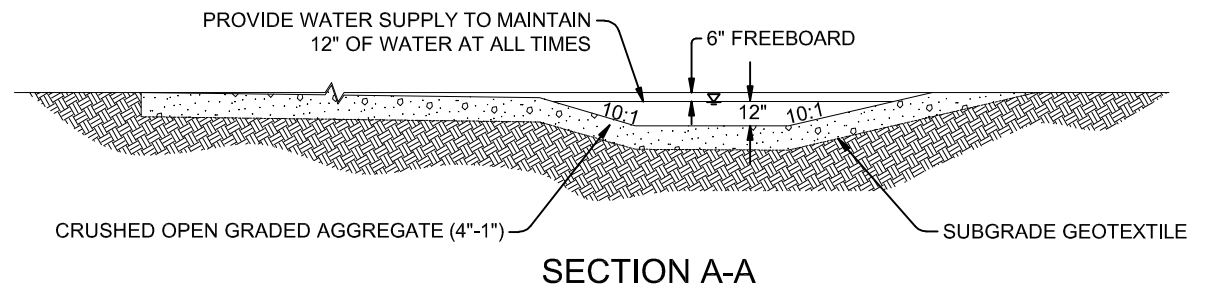
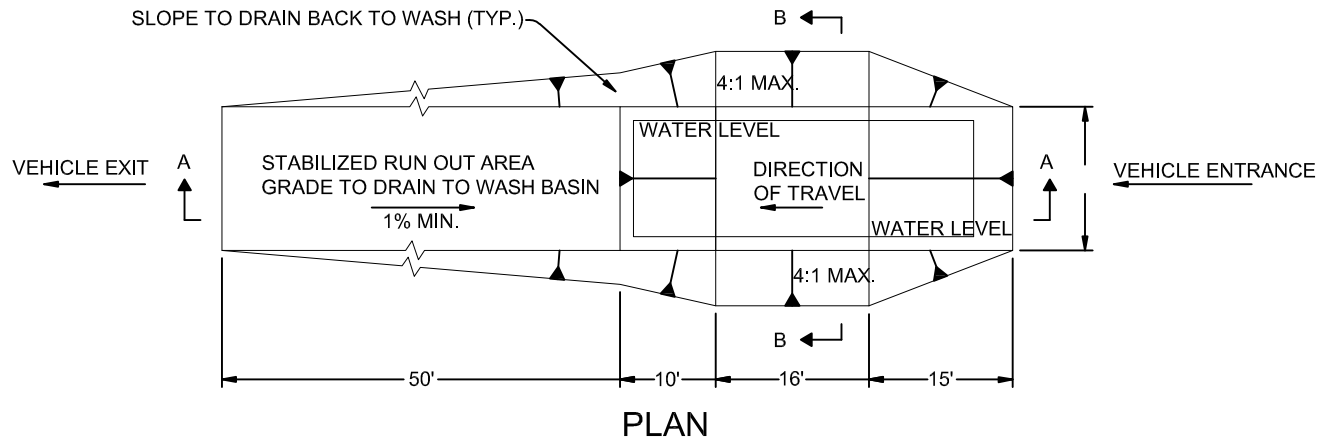
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

## TIRE WASH FACILITY 1 OF 2

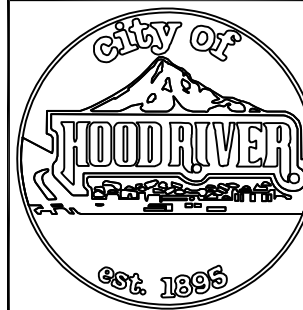
2019

DATE	REVISIONS

## TIRE WASH - TYPE 2



### CITY OF HOOD RIVER STANDARD DRAWINGS ESC-10



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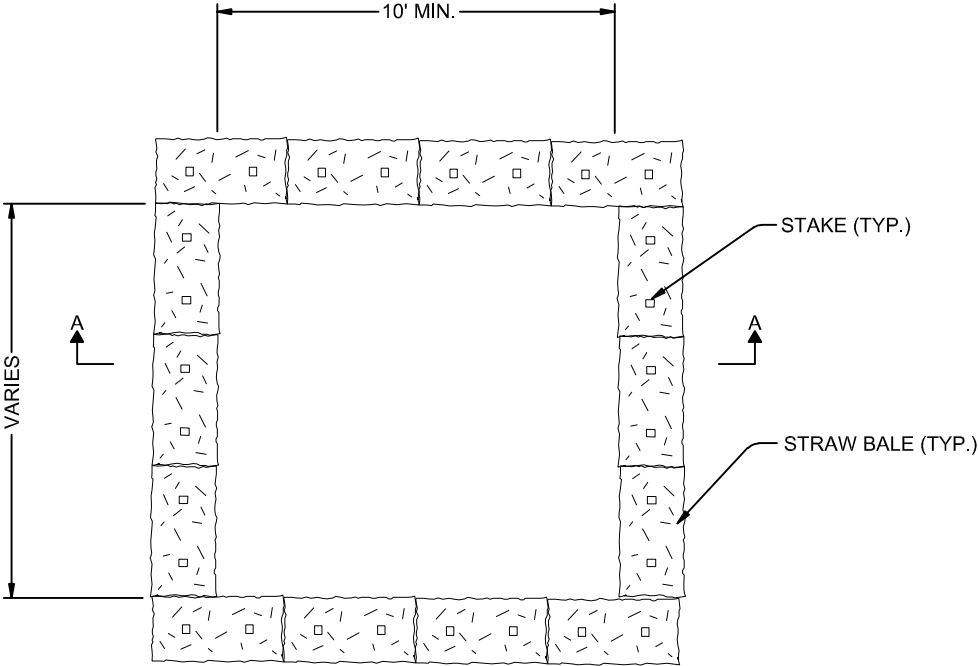
NOTE: ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CITY OF HOOD RIVER AND STATE OF OREGON STANDARD SPECIFICATIONS. THE MOST STRINGENT SHALL APPLY.

### TIRE WASH FACILITY 2 OF 2

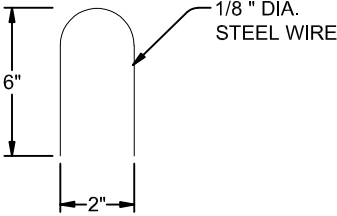
2019

DATE	REVISIONS

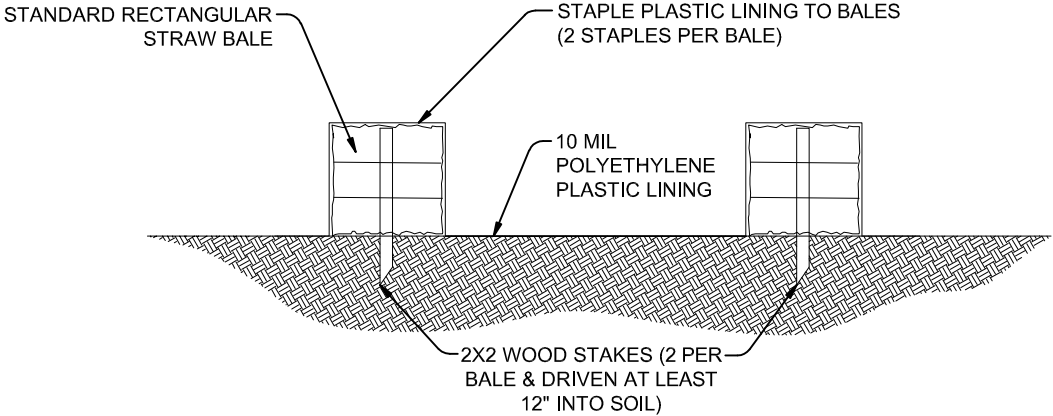
CONCRETE TRUCK WASH OUT FACILITY



PLAN

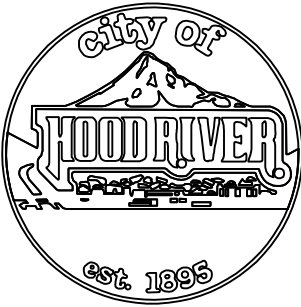


STAPLE DETAIL



SECTION A-A

CITY OF HOOD RIVER STANDARD DRAWINGS ESC-11



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CONCRETE TRUCK  
WASH OUT

2019

DATE	REVISIONS

