

Water Distribution Design and Construction Standards

EUGENE WATER & ELECTRIC BOARD



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Preface

This document outlines how to plan, design and construct improvements to EWEB's water distribution system. These standards and procedures have been developed to provide consistency in the design and construction of new distribution system improvements as well as provide a clear outline of the expectations and responsibilities of development driven work. This manual does not cover work to EWEB's transmission, storage, or pumping systems but is intended to cover the majority of distribution system improvements that arise from multi-lot subdivisions and other development proposals requiring improvements to EWEB's water distributions system.

For more information, forms, and current fees please visit <http://www.eweb.org> . To request more information or to schedule a pre-design consultation meeting please contact EWEB Water Engineering at the contact below. Staff will generally respond to requests within 3 business days. Please provide as much detail as possible about the location and scope of the proposed development

Email: waterengineeringtechnicians@eweb.org

Phone: 541-685-7377

Water service installation or modification requests may be placed directly through EWEB's Building and Renovation Services:

Phone 541-685-7000

E-mail: building-renovationservices@eweb.org

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Definitions

Board	<i>The body of elected officials of the Eugene Water & Electric Board</i>
City	<i>The city of Eugene</i>
Contractor	<i>A person or legal entity that has entered in an agreement with an owner or developer to construct water system improvements.</i>
County	<i>Lane County</i>
Design Engineer	<i>The engineer in responsible charge of designing the water system improvements, who must be registered in the State of Oregon.</i>
Designer	<i>Registered Professional Engineer responsible for the design of water infrastructure</i>
Developer	<i>The person or entity legally responsible for the development of land.</i>
Domestic service:	<i>A service that supplies water to be used by residents of a house or building for domestic needs.</i>
EWEB	<i>Eugene Water & Electric Board</i>
EWEB Project Engineer	<i>EWEB's Water Engineering Supervisor, or his/her authorized representative.</i>
Financial Guarantee	<i>A bond or irrevocable letter of credit guaranteeing work will be properly constructed, inspected, and accepted by EWEB pursuant to ORS 92.090</i>
Fire service:	<i>A service used exclusively for supplying a residential fire sprinkler.</i>
Inspector	<i>The person employed by EWEB to observe construction and enforce EWEB's Water System Standards and proper construction of water system improvements.</i>
Irrigation service	<i>A service used exclusively for irrigation or landscaping.</i>
Jurisdictional Authority	<i>The agency with jurisdiction over the right of way where work will occur (City of Eugene, Lane County, or the Oregon Department of Transportation)</i>
Long service:	<i>A service installed on the opposite side of the street as the water main line.</i>
Long Side	<i>The side of a street opposite of the side a water main is installed.</i>
Owner	<i>The person or entity who possesses legal ownership of the land affected by the improvements.</i>

Plans	<i>Construction drawings that show the location, type, dimensions and details of the work to be performed</i>
Point of connection	<i>The point at which EWEB's distribution system ends and the customer owned piping begins. It is dependent on the location of the water main, whether a meter is part of the service, the layout of the service, type of service, and valving. If a valve is included:</i>
Short service	<i>A service installed on the same side of the street as the water main Line.</i>
Short Side	<i>The side of the street that a water main is installed in.</i>
Standard Details	<i>Detail drawings showing specific installation details for water system components.</i>
Standards	<i>The Eugene Water & Electric Board's Water Distribution System Design and Construction Standards</i>
Subdivision	<i>An area or a tract of land to be subdivided for development</i>
System Connection	<i>The physical connection of new distribution piping to EWEB's live distribution system performed by EWEB crews.</i>
Temporary service	<i>A service that is installed to supply water for a period not to exceed one year. The water service is intended to supply water for construction, irrigation to establish landscaping, or transitory events that require water service or other similar needs. Backflow prevention is required on all temporary services.</i>

Acronyms and Abbreviations

Note: When references to the following capitalized abbreviations are made, they refer to the most current versions of Specifications, Standards or Methods of the respective association or agency.

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BFV	Butterfly Valve
BO	Blowoff
CAD	Computer Aided Drafting
CARV	Combination Air/Vacuum Release Valve
DI	Ductile Iron
EWEB	Eugene Water & Electric Board
FLG	Flange
FPS	Feet Per Second
GPM	Gallons per Minute
GV	Gate Valve
ISO	Insurance Services Office
LCOG	Lane Council of Governments
MJ	Mechanical Joint (fitting)
NSF	NSF International (formerly National Sanitation Foundation)
OAR	Oregon Administrative Rules
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statutes
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
NFPA	National Fire Protection Association
PE	Plain End (pipe), Polyethylene
PPM	Parts Per Million
PRV	Pressure Reducing Valve
PSI	Pounds per Square Inch
PUE	Public Utility Easement
RPBPD	Reduced Pressure Backflow Prevention Device
UL	Underwriter's Laboratories, Inc.

SECTION 1. PROJECT DELIVERY REQUIREMENTS

SECTION 1.1 GENERAL REQUIREMENTS

1.1.1 PURPOSE

These Water Distribution Design and Construction Standards include the procedures, requirements, and technical specifications for the design and construction of improvements within EWEB's water distribution system. Unless otherwise specified or approved, these standards shall govern the design and construction of all EWEB water distribution design projects.

While the goal of these standards is to provide a minimum level of quality and standardization, they are not intended to limit creative or innovative designs which could result in better quality and/or cost savings. Deviations from these standards must be approved in writing by EWEB's Water Engineering Supervisor.

1.1.2 REVISIONS

This document is intended to be a working document that will be updated regularly as methods, materials, and standards evolve. EWEB may revise these Standards at any time without prior notification. Each revision will be dated with the effective date. It is the responsibility of each holder of these standards to verify that they have the latest revised copy.

1.1.3 ENGINEERING POLICY

All plans for water system improvements must be prepared, stamped, and signed by a registered professional Civil Engineer licensed in the State of Oregon. It is the policy of EWEB that development driven projects be privately engineered in accordance with the standards herein and submitted for approval. EWEB will be responsible for the design and construction of transmission, storage, and pumping systems.

1.1.4 JOINT TRENCH

If required, the design shall incorporate joint trench construction options with underground utilities that includes electric, fiber optic, telephone, and cable television.

1.1.5 WATER SERVICE OUTSIDE OF EWEB'S SERVICE AREA

EWEB provides Water Service to customers within the city limits of Eugene, Mahlon Sweet Airport, Lane Community College, and within dissolved water districts. Extensions of Water Service to potential Customers outside the city limits of Eugene may be subject to city council approval of extension of Water Service.

1.1.6 EWEB RESPONSIBILITY

EWEB will provide the following information if available:

- Location and size of existing mains
- Location of existing valves and fire hydrants
- Location of existing services
- Approximate water pressure range in the connecting system
- Planning information for future sizing of water mains

- EWEB Drafting Requirements
- Joint Trenching Requirements, if applicable

1.1.7 WORK ON EWEB'S LIVE SYSTEM

Contractors shall maintain a 5 foot minimum distance from EWEB's water system during construction whenever practicable. Only EWEB personnel may operate valves, tap, or otherwise work on the existing water distribution system.

1.1.8 ERRORS AND OMISSIONS

If errors or omissions are discovered on the approved plans, EWEB reserves the right to immediately revoke the plan approval and stop permitted work. It will be up to the Project Engineer to demonstrate how issues have been resolved and submit revised drawings for approval as directed by EWEB.

1.1.9 CONSTRUCTION STANDARDS

Construction standards are outlined in Section 2, Technical Requirements, and Section 3, Standard Details, of this manual.

SECTION 1.2 DESIGN AND CONSTRUCTION PROCESS

1.2.1 INTRODUCTION

Developers of new commercial and residential subdivisions are expected to design and construct the public water mains and appurtenances within the limits of the subdivision. The worksheets and forms necessary to determine the appropriate fees and financial guarantee amount are included on EWEB's developer webpage <http://www.eweb.org>. This section outlines the procedures and requirements for privately designing and constructing water system improvements within EWEB's service area boundary and water districts managed by EWEB.

The following sections outline:

- Typical Process to Design and Construct Water Improvements
- Submittals
- Preconstruction Conference
- Substantial Completion and Warranty Period
- Final Acceptance
- Closeout

1.2.2 TYPICAL PROCESS TO DESIGN AND CONSTRUCT WATER IMPROVEMENTS

Table 1: Design and Construction Process Outline

REVIEW PROCESS	TYPICAL TIMEFRAME
<i>Pre-design Consultation:</i> After developer submits a Pre-Design Consultation Meeting Request Form, EWEB will meet with the Design Engineer/Developer to discuss water availability, minimum water system improvements, and other planning level details as necessary. An attempt will be made to identify special circumstances and necessary offsite improvements that could affect the timeframe or overall cost of the project.	Meeting will generally be scheduled within 15 business days after submittal of Pre-design Consultation Request Form.
<i>Plan Review Fee, 50% and 90% Plan Reviews:</i> After submittal of the Plans Review Request Form and applicable plan review fee, EWEB will perform two reviews of the plans at approximately 50% and 90% completion. One pdf copy shall be submitted clearly indicating what submittal they are (i.e. 50%, 90%). Plans will be returned as incomplete if they are not drawn in compliance with the EWEB drafting and design standards	Completeness review will be done within 10 business days. If plans are not complete they will not be reviewed and will be returned. If plans are complete they will be redlined and available within 15 business days.

<p><u>Final Plan Approval, Inspection/ System Connection Fee, and Financial Guarantee:</u> Developer submits a .pdf copy of the plans for approval along with the inspection/connection fee and financial guarantee. EWEB will return a .pdf of approved plans electronically.</p>	<p>10 business days after receipt of all materials, approved plans and water availability letter will be provided to the City.</p>
<p><u>Submittals:</u> Submit to EWEB for review and approval prior to beginning work. No materials shall be installed without an approved submittal</p>	<p>10 business days</p>
<p><u>Preconstruction Conference:</u> Design Engineer shall schedule a preconstruction conference with EWEB prior to beginning work.</p>	<p>Provide 5 business days minimum notice</p>
<p><u>Substantial Completion and Warranty Period:</u> After completion of distribution system improvements and successful pressure testing, Developer requests Substantial Completion from EWEB. EWEB will issue a substantial completion letter establishing the beginning of the 1 year warranty period. EWEB will inspect the work and issue contractor a punch list of remaining work to be completed.</p>	<p>Substantial Completion letter and punchlist issued within 10 business days of notice.</p>
<p><u>Final Acceptance:</u> The project will be accepted by EWEB after all punch list items are completed, as-constructed plans are submitted and approved, all easements are recorded, and a breakdown of project costs is submitted. NO SERVICES WILL BE SOLD UNTIL FINAL ACCEPTANCE IS ISSUED.</p>	<p>EWEB will issue a final acceptance letter within 10 business days of all required materials being submitted.</p>
<p><u>Closeout:</u> Financial guarantee can be released after the 1 year warranty period has been successfully completed. Developer must issue a written request for release after the warranty period is completed.</p>	<p>Financial Guarantee will be released within 10 business days after developer requests release.</p>

(A) Pre-Design Consultation

To determine if there are any potential issues or any offsite improvements needed, applicants are encouraged to request a pre-design consultation. To request the meeting, applicants must complete and submit a Pre-Design Consultation Request Form that contains basic information about the project and the development. EWEB will not respond to any questions about the project prior to this meeting. There is no fee for the initial meeting, but larger and/or more complicated projects will require an “Engineering Agreement” for EWEB to recoup costs in excess of three hours (most projects will require no more than 2 hours of staff research time plus 1 hour of staff time for the meeting). The meetings will generally be held at an EWEB facility.

(B) 50% and 90% Plan Review

When the design engineer has prepared subdivision water plans that meet minimum drafting and engineering standards, the design engineer may submit the plans to EWEB for review along with the Plans Review Request Form and applicable plan review fee. The preferred method of payment is a check mailed to:

Eugene Water & Electric Board
Water Engineering, Attn Plan Review Fee
PO box 10148,
Eugene OR 97440.

However, with prior arrangements the fee can be paid via EWEB's customer service department using alternate payment methods. Plans will not be reviewed and EWEB staff will not respond to questions until the plan review fee is received.

The design engineer shall submit plans in pdf format meeting EWEB's minimum electronic submission standards outlined in section 3.2. Review comments will generally be provided as an electronic markup and e-mailed to the Design Engineer. Hydraulic calculations, geotechnical reports, Fire Marshal review, and other pertinent information shall be submitted with the drawings.

At each stage in the review process, final comments will be made available within 15 business days. For more complicated projects, the design engineer will be notified if the review timeframe will exceed the standard 15 business day turnaround after EWEB completes a completeness review of the submittal.

Reviews will generally be organized as follows:

- Completeness/ Minimum standards check
- Drafting Standards (section 1.3.1)
- Electronic Submission Standards (section 1.3.2)
- Design Completeness (Section 2.1)

If EWEB determines that the plans do not conform to EWEB's minimum drafting and design standards or are illegible, they will not be distributed for review. The design engineer will be notified of the deficiencies within 10 business days of receipt of the plans. A transmittal form will be included with the returned plans indicating the deficiencies with the plans.

(C) Final Plan Submittal, Inspection/System Connection Fee, Financial Guarantee, and Agreement.

When the 90% review comments have been incorporated, the Design Engineer may submit final plans for approval. Submit final drawings in AutoCAD .dwg or .dwt format accompanied with a signed .pdf file. See Section 1.3.2 for electronic submission requirements. Final sealed hydraulic calculations, geotechnical reports, and other pertinent information shall be submitted at this time.

Prior to final plan approval the developer must pay the Inspection/System Connection Fee and provide a Financial Guarantee for the work to be performed. Any required easements shall be shown on the recorded plat before final plans are approved. Approved plans will be made available within 10 business days of receiving all materials and a Water Availability Letter will be sent to the City of Eugene. Plan approvals are valid for 1 year from the date of receipt of the inspection/connection fee. Plans must be resubmitted for approval after one year or more has elapsed without beginning construction on the water system.

1.2.3 SUBMITTALS

Prior to beginning work, the design engineer shall submit all of the required submittals. All products used in EWEB’s distribution system shall meet the specifications outlined in this manual. Provide EWEB with the following items for approval.

Table 2: Table of Required Submittals

Item	Required Submittal
Ductile Iron Pipe	Manufacturer, Pressure Class, and Certificate of Standards Compliance
Fittings	Manufacturer, Model, and Certificate of Standards Compliance
Joint Restraint	Manufacturer, Model, and Certificate of Standards Compliance
Gate Valves	Manufacturer, Model, and Certificate of Standards Compliance
Butterfly Valves	Manufacturer, Model, and Certificate of Standards Compliance
Fire Hydrants	Manufacturer, Model, and Certificate of Standards Compliance
Service Pipe/Fittings	Manufacturer, Model
Meter Boxes	Manufacturer, Model
Backfill Material	Source, Material Size, Gradation, and Moisture Density Curves
Fire Marshal Plan Review	Documentation from Fire Marshal was provided Fire Hydrant Locations for review.
Permits	Copies of all applicable city and county permits applicable to the work.
Schedule	Submit a copy of the proposed work schedule. Provide regular updates so EWEB can plan required inspections.
Traffic Control Permit	Submit a copy of the approved traffic control permit. Ensure permit covers any necessary EWEB work.

EWEB may also require additional submittals that may be relevant to a particular project. Review of submittals does not relieve the contractor from having to follow EWEB's design standards and specifications. EWEB is not liable for any errors or omissions in the submittals. No fabrication, ordering of materials, or other work shall commence until submittals are reviewed and approved by EWEB. EWEB will inspect all materials in the field to ensure they are consistent with the approved submittals.

1.2.4 PRECONSTRUCTION CONFERENCE

The design engineer shall schedule a preconstruction conference with EWEB prior to beginning any work. EWEB shall be provided a minimum of 5 business days of notice.

1.2.5 INSPECTION

Contractor shall schedule regular EWEB inspections in accordance with Section 1.3 of this manual.

1.2.6 SUBSTANTIAL COMPLETION AND WARRANTY PERIOD

When the work is sufficiently complete to place the improvements into service, EWEB will certify a project as Substantially Complete. Substantial Completion will not be issued until a successful pressure test has been performed on the system. Upon Substantial Completion, EWEB will schedule the work to disinfect and tie the new system into the distribution system. The project will be inspected again approximately 1 year after substantial completion. Should any deficiencies and/ or failures arise during the warranty period, the developer will be given the opportunity to correct them. If deficiencies are not corrected in a timely matter they will be corrected by EWEB at developer's expense.

EWEB will prepare and provide the contractor with a punch list. The failure to include any items on the punch list does not alter the responsibility of the contractor to complete all Work in accordance with the design plans and EWEB standards. The Contractor shall complete all punch list items within 30 days unless the contractor makes alternate arrangements with EWEB.

1.2.7 FINAL ACCEPTANCE

EWEB will issue the Final Acceptance letter and accept ownership of the water system after all work has been completed that was called for in the plans and specifications including a successful pressure test. Upon Final Acceptance, the total financial guarantee can be reduced to 20% of the value of the improvements or \$10,000 whichever is greater.

Before EWEB issues a final acceptance letter the following must be provided:

- Copies of recorded easements (as applicable)
- Record drawings. Must be in accordance with the EWEB Vendor CAD standards Manual.

1.2.8 CLOSEOUT

Once the one-year warranty has expired, and any warranty work has been completed, EWEB will notify the Developer of final acceptance and will authorize release of the financial guarantee.

SECTION 1.3 INSPECTION REQUIREMENTS

1.3.1 GENERAL

Inspection by EWEB or Authorized Representative does not relieve the Contractor of obligations to complete the work in accordance with these design and construction standards. Contractor or Developer shall provide special inspections where required below. Contractor shall coordinate the special inspections.

1.3.2 INSPECTION

The Contractor shall provide 48 hours' notice before a required inspection. See the table below outlining required inspections:

Table 3: Design and Construction Process Outline

Item	EWEB	Special Inspector	City of Eugene
Prepared subgrade prior to placing any bedding material below the pipe (every 500 ft) or vaults	X		
Compacted bedding material below pipe, valves, and vaults.	X		
Compacted pipe zone every 500 ft	X	X	
Compacted trench zone every 500 ft	X	X	
Pipe, valve, and vault installation prior to backfilling	X		
Existing sewer pipe where the water line crosses below	X		
Prepared road subgrade	X	X	X
Temporary Patching	X		X
Permanent Paving	X	X	X

Materials and workmanship not conforming to EWEB's requirements shall be considered defective and will be rejected. Defective work or material, whether in place or not, shall be removed immediately from the site and replaced with materials or workmanship that conforms to EWEB's requirements at the expense of the contractor.

EWEB will inspect joint trench utilities to ensure proper placement. Final acceptance of the installation must be coordinated with each individual utility.

1.3.3 SAMPLES AND TESTS

The source of supply of materials for the Work will be subject to tests and inspection before installation when requested by EWEB. EWEB shall have full authority to require continuing tests and inspection of any source of supply or supplier's source plants where there is evidence of irregularities in the materials presented or that the materials do not fully comply with the specifications. All tests of materials furnished by the Contractor shall be made in accordance with the specified standards.

1.3.4 FIELD CHANGES

No changes shall be made that deviate from the approved plans without written approval from EWEB.

SECTION 1.4 DRAWING REQUIREMENTS AND DRAFTING STANDARDS

1.4.1 DRAFTING STANDARDS

All plans submitted to EWEB shall comply with EWEB's CAD Standards Manual. Drawings shall be prepared using Computer Aided Drafting (CAD) and submitted in either .dxf or .dwg file format. At the start of the project, EWEB will provide an AutoCAD template file that contains EWEB's standard levels, styles, layers, line types, general notes, symbols, and sample sheet layouts. All electronic submissions of electronic drawings shall be accompanied by a matching .pdf drawing file.

(A) General Requirements

1) Drawing size

Title block shall be either 22 inches by 34 inches or 11 inches by 17 inches. If half size drawings are submitted they shall be plotted at exactly 50% scale and legible.

2) Title block

Consultants shall use their own title blocks that include, at a minimum, the following information:

a) Project Name

- i) Subdivisions: Subdivision name followed by types of improvements shown. (i.e. water improvements)*
- ii) Other work: Use street name or nearest parallel street and define limits of work by intersecting cross streets. (i.e. West 12th Ave from Monroe St to Polk Street: Water Main Replacement)*

b) EWEB Work Order Number.

c) Month and year drawing was last edited.

d) Designed by.

e) Drawn By.

f) Checked By.

3) Other Requirements

All Sheets shall include:

- a) *Professional Civil Engineer Stamp and signature from a professional engineer currently licensed in the state of Oregon.*
- b) *North Arrow. (oriented up or right)*
- c) *Graphic scale. (for verifying drawings are printed to scale)*
- d) *Street Names.*
- e) *Right of way and paving widths.*
- f) *Easement Types and Dimensions.*
- g) *Existing Infrastructure in dashed/gray line type.*
- h) *Proposed Infrastructure in bold line type.*
- i) *Page Numbers as "Sheet X of X".*

(B) Plan Sheet Requirements

1) Cover Sheet

- a) *Vicinity Map. (in upper right hand corner)*
- b) *Sheet index. (A graphical overview of the work location of each sheet and a list of all plan sheets with appropriate stationing)*
- c) *Map and tax lot numbers, Subdivision lots, and/or partition Plat Parcel numbers, as applicable, for properties adjacent to the work.*
- d) *City Limits and Urban Growth Boundary (UGB), as applicable.*
- e) *Contact information.*
 - i) *Owner's name, address, and phone number.*
 - ii) *Design Engineers Name, address, and phone number.*
 - iii) *Contractors name, address, and phone number. (Only required for record drawings)*
 - iv) *Design Team: contact information of all other design professionals on the project that may need to be contacted. (ie architect, surveyor, geotechnical engineer, etc)*

2) General Sheets

One or more sheets shall be provided with general information for the project (Minimum requirements will be included in template file) including but not limited to:

- a) *General Notes.*
 - b) *List of Abbreviations.*
 - c) *Legend (with all existing and proposed symbols and line types used on the plans).*
 - d) *Survey Benchmarks and Control Points.*
 - e) *Horizontal and Vertical Datum of project.*
 - f) *Summary of required inspections.*
- 3) **Plan and Profile Sheets**
- a) **General**
 - i) *Preferred Horizontal Scales shall be 1-inch = 10-feet, 20-feet, 30-feet, or 40-feet. New Construction shall be drawn at no less than 1-inch = 40-feet and work in existing developed right of ways shall generally be shown at 1-inch = 20-feet or 1-inch = 30-feet.*
 - ii) *Vertical scale shall be 1 inch = 4 feet, 5 feet, or 10-feet.*
 - iii) *The same scale shall be used on all plan and profile sheets.*
 - iv) *All projects shall be stationed along established or proposed city or county centerline stationing.*
 - v) *Stationing shall be consistent (either left to right or right to left) throughout the plans with work beginning at approximately station 1+00 and north oriented up or right.*
 - vi) *Where stationing intersects, provide a station equation.*
 - vii) *Plan and Profile shall be shown on the same sheet with the profile located directly below the plan view.*
 - viii) *Match lines between sheets shall not be placed in intersections or in the same location as valves, hydrants, or other features.*
 - ix) *All drawings shall be set up on Oregon State Plane Coordinates 83/91.*
 - x) *Minimum text height: 0.10-inch.*

b) Plan View

- i) All relevant topographic features shall be shown including contours.*
- ii) All existing and proposed utilities shall be shown including service lines.*
- iii) Curbs, property lines, right-of-way, easements, street intersections, and other pertinent features shall be shown.*
- iv) Show street trees and critical root zones when they may be impacted.*
- v) Show existing water system labeling with EWEB valve numbers and city of Eugene hydrant numbers. Label size and material of existing water lines. (Schematic base mapping provided by EWEB upon request)*
- vi) Provide stations and offsets for proposed pipe alignment, angle points, service lines, meter boxes, hydrants, and fittings including stationing and offset.*
- vii) Clearly indicate where private work is shown on the plans. Label work "PRIVATE-WATER".*
- viii) Location of waterways, stream and railroad crossings, utilities, culverts, that either cross the alignment or are within 250 feet of the end of the proposed extension, adjacent to the proposed extension or within 10 feet of the easement line. Show existing hydrants and proposed hydrants within 500 feet of the proposed extension. If available provide the 100 year flood elevation at stream crossings.*
- ix) Dimension Pipe Cover. Indicate typical pipe cover and indicate any locations where pipe cover varies from the typical cover.*
- x) Number all valves with a unique number.*

c) Profiles

- i) Profile shall be on the same horizontal scale as the plan view, on the same sheet, and drawn immediately below the plan.*
- ii) Provide a minimum of 1 inch of clearance to the title block and construction notes.*
- iii) Major vertical grid lines shall coincide with the 100 foot stations.*
- iv) Vertical grid shall be 0.1 foot, 0.2 foot, 0.25 foot or 1 foot.*
- v) Proposed Water improvements shall be shown in bold and include pipe diameter and slope. Provide station and offset for grade breaks, fittings, valves, hydrants, etc.*
- vi) All existing utilities in the right of way shall be shown on the profile in dashed or gray line type. Include vaults, manholes and other underground infrastructure.*
- vii) Existing ground profile shall be shown based on existing grades above proposed pipe alignment.*
- viii) Show backfill material on the profile.*

1.4.2 ELECTRONIC SUBMITTAL STANDARDS

Submittals and Drawings are accepted by EWEB in electronic format but must meet the following minimum requirements:

(A) Submittals:

- 1) Include a transmittal form with each submittal that includes the project name, EWEB work order number, and submittal number.
- 2) Sequentially number (starting at 1) each submittal. Resubmittals shall be assigned a sequential letter. Submittal 25 B for example, is the second resubmittal of submittal 25.
- 3) The transmittal form shall indicate any proposed material, equipment, or method of work that deviates from EWEB standards.
- 4) Submit one PDF electronic copy of the submittal for review and comment. If the electronic file is larger than 10 megabytes submit either on CD or DVD or make alternate arrangements with EWEB.

(B) Drawings:

- 1) All drawing submissions shall include a transmittal form that indicates the name of the project, EWEB work order number, and drawing submittal number (i.e. first, second, third, final).
- 2) All electronic drawings submitted shall be plotted to scale as 22-inch by 34-inch or 11 x 17 inch drawings in .pdf format and accompanied by a .dwg/dwf file, as required.
- 3) The drawings shall print accurately to scale when printed 1:1 on paper.
- 4) Resubmittals shall be assigned a sequential letter. Submittal 2B for example, is the second resubmittal of submittal 2.
- 5) Electronic files shall be no larger than 10 megabytes if they are to be delivered by e-mail. Larger files should be delivered on a CD or DVD. Contact EWEB to make special arrangements, if necessary.

1.4.3 RECORD DRAWINGS

Upon completion of water main improvements, the design engineer shall submit electronic files .dwg and .pdf of the record drawings to EWEB. The purpose of these drawings is to document and update the approved design drawings to be consistent with what was actually constructed. The record drawings shall clearly indicate changes and divergences of the constructed facilities from the original approved design and show the final constructed location of the sanitary sewer. Design Engineer and Contractor are responsible for recording locations and depths of water features prior to backfilling. Record drawings shall be consistent with EWEB's Drafting standards (Section 1.3.1) and submitted electronically consistent with EWEB's Electronic Submission Standards (Section 1.3.2).

(A) As-Constructed Survey

After construction of the water improvements, water infrastructure (i.e. valve covers, hydrants, vaults, meter boxes, valve nuts etc.) shall be surveyed and incorporated into the record drawings. These survey points shall be on a unique layer in the electronic drawings.

(B) Revisions

The design engineer is responsible for verifying the accuracy of the record drawings. Changes to the drawings shall be indicated by striking through original design information and adding the revised data.

The original design information must remain readable. EWEB will verify the changes match inspection records

(C) Title Block

Revisions shall be tracked in the title block with a description of the change and the date the document was changed. The title block shall also be updated to indicate the initials of the EWEB inspector.

(D) Engineers Stamp

Record drawings must be stamped by the professional engineer who stamped the original design drawings.

(E) Paper Copy

One high quality, reproducible paper copy of the record drawings shall be submitted. A high quality pdf scan of the paper copy shall be submitted at the same time.

(F) CAD File

One CAD (.dwg file) file of the record drawings shall be submitted electronically consistent with EWEB's Electronic Submission Standards (Section 1.3.2).

SECTION 2. TECHNICAL REQUIREMENTS

SECTION 2.1 DESIGN CRITERIA

This section outlines the design requirements for distribution pipelines and water services. These guidelines do not apply to pipelines 24-inch and larger which are classified as transmission mains.

2.1.1 REFERENCE DOCUMENTS

It is the design engineer's responsibility to make sure the design is consistent with other applicable standards and documents; unless otherwise noted the most recent version of these documents shall apply. The following documents are applicable to work and incorporated into these standards by reference.

- (A) City of Eugene Standard Drawings and Specifications*
- (B) City of Eugene Public Improvement Design Manual*
- (C) Oregon Standard Specifications*
- (D) EWEB Policies and Procedures*
- (E) EWEB Water System Master Plan*
- (F) OAR Chapter 333, Division 61, Public Water Systems*
- (G) LCOG Public Facilities Plan*
- (H) ANSI/NSF Standard 61*
- (I) AWWA Standards*

2.1.2 HYDRAULIC CAPACITY

(A) Service Pressures

Pipelines shall maintain service pressures between 40 and 120 pounds per square inch (psi) under normal operating conditions as measured at the water service or tap. The Oregon Health Authority mandates that a minimum pressure of 20 psi is maintained under all operating conditions including fire flows.

Areas that have service pressures under 40 psi require written authorization from the Water Engineering Supervisor and the Water Operations Manager, or their appointed designees before design can begin. Written authorization may require the following:

- 1) A booster pump in compliance with OAR 333 061 0050 Construction Standards.
- 2) A backflow prevention method in accordance with OAR 333 061 (8)(c) approved by an EWEB Cross Connection Specialist.

(B) Pipeline Capacity

The proposed pipeline shall have sufficient capacity to provide future domestic demands and the required fire flow. The following factors shall determine the required water system capacity:

- 1) Immediate and adjacent areas to be served.
- 2) Current and build out population within the areas to be served.
- 3) Current and build out land use.
- 4) Commercial, industrial, or institutional users.
- 5) Changes to the above within the foreseeable future.

The following Water Demand Table is excerpted from the 2015 Water Master Plan.

Table 1: Average Annual Water Demand Factors From 2015 Water Master Plan

Customer Type	Gallons Per Day/Acre	Gallons Per Day/Dwelling Unit
Single Family Residential	-	237
High Density Single Family Residential	-	147
Multi-Family Residential	-	106
Commercial	991	-
Industrial	447	-
Institutional	890	-
Landscape Irrigation	71	-
Other (transportation, airport, etc)	253	-

Source: Chapter 4 of the 2015 EWEB Water System Master Plan.

Table 2: Peaking Factors

Peaking Factor	Peaking Factor
Maximum Day Demand/Average Day Demand	2.1
Peak Hour Demand/Average Day Demand	3.2

Source: Chapter 4 of the 2015 EWEB Water System Master Plan. Note that upper level pressure zones may require the use of a higher peaking factor.

(C) Velocity

- 1) The pipeline shall not exceed the following velocity standards:
- 2) Peak Hour Flow: 5 feet per second (fps)
- 3) Fire Flow: 10 fps

(D) Headloss

When requested by EWEB, Head loss calculations shall be done using Hazen Williams Formula with a C-factor equal to 130. All head loss calculations should include minor losses for fittings. The maximum allowable head loss during peak hour demand conditions is 10-feet/ per 1000 feet of pipe.

(E) Fire Flow

The following are EWEB's minimum fire flows for new development.

- 1) Residential – 1,500 gpm
- 2) Commercial – 3,500 gpm
- 3) Industrial - 8,000 gpm

An exception may be granted, at EWEB's discretion, to the required fire flows with written approval from the Fire Marshal's office. Exceptions will not be granted where EWEB determines insufficient fire flow could have negative impacts on existing customers or future development.

(F) Hydraulic Analysis

The Design Engineer may be asked to perform a hydraulic analysis of the proposed pipe network demonstrating compliance with EWEBs velocity and head loss requirements. More detailed hydraulic analysis requiring EWEB's hydraulic model may be completed by EWEB for an additional fee. If these calculations are required, then they shall be submitted to EWEB during the plan review process for approval. EWEB will provide available pressure data, fire flow tests, and other relevant information, upon request. Developer may be required to pay for hydrant flow tests if data is unavailable.

(G) Pipe Network Analysis

EWEB may perform a system impact analysis during the plan review process to verify the planned improvements will not negatively impact EWEB's distribution system. If the proposed development causes or worsens deficiencies in the water system, the developer may be required to contribute to off-site improvements to rectify existing problems.

(H) Connections to Constant Run Pump Stations

Connections to systems supplied by a constant run pump station need to be approved by EWEB. EWEB will complete a hydraulic analysis of the pump station to determine if the proposed development meets the pump station design criteria. No more than 30 customers may be placed on a constant run pump station without EWEB approval. Offsite improvements such as constructing water storage may be required if the maximum number of customers will be exceeded.

2.1.3 PIPELINE LAYOUT

Distribution Mains shall meet the following criteria:

- (A) *All water mains shall be located within the public right-of-way or an approved easement.*
- (B) *The system shall be looped to the maximum extent practicable. Generally water mains should be placed on a 600-foot grid and shall be looped no less than every 1200-feet without approval. No more than 30 services shall be allowed on a dead end main unless an exception is granted by EWEB.*
- (C) *Water mains shall be extended to the limits of a development for the purpose of future extension and looping.*
- (D) *Permanent dead end mains should be avoided. Loop dead end mains back into the distribution system to the maximum extent practicable. Permanent dead ends will require an automated flushing assembly per EWEB standard details and an approved discharge connection to a storm sewer or drywell.*
- (E) *Water Mains shall typically be installed on the South and East Sides of Streets. Mains shall typically be installed in the street, 4-feet from the face of the curb to the centerline of the main.*
- (F) *No more than 4 valves shall be required to isolate a section of water main. Provide isolation valves in accordance with the following:*
 - 1) No more than 30 residential services can be affected when a section of main is isolated.
 - 2) No more than “one block” (approximately 400 feet) of commercial or industrial customers can be affected when a main is isolated. Reliability criteria may change for specialty uses.
 - 3) Maximum spacing on a straight run: 500 feet except as otherwise approved. 1000 feet spacing may be allowed on straight runs of pipe without service connections or branching.
 - 4) Valves installed on grades steeper than 10 percent are not allowed.
- (G) *Pipeline Deflection: Joints shall be deflected per the manufacturer’s recommendations.*
 - 1) Vertical Deflection
 - a) *Minimize bends by utilizing joint deflection whenever possible. Attempt to locate grade breaks at proposed fittings.*
 - 2) Laying pipe on Curves:
 - a) *Pipe may be laid on curves given the following conditions are met.*
 - i) *Pipe joint deflection shall not exceed manufacturer’s recommendations.*
 - ii) *Beginning and end of curves are identified on the plans*
 - iii) *The curve radius is shown on the plans*
- (H) *Minimum Pipeline Cover and Clearances*

- 1) Pipe Cover
 - a) Pipelines shall be installed with the following minimum amount of cover:
 - i) Residential and Minor Collector Streets: minimum 36-inches.
 - ii) Major Collector or Arterial Streets: minimum 42-inches of cover.
 - iii) Easements/Planter Strips: minimum 36-inches.
 - b) Exceptions may be made to minimum cover requirements on a case by case basis but EWEB may require concrete caps or other protection.

(I) Utility Clearances

- 1) General: design the pipeline to cross utilities as close to perpendicular as possible. Crossings less than a 45 degree angle are not permitted.
- 2) Storm drains, catch basins, electrical conduits, gas and telephone cables:
 - a) Vertical Clearance: minimum of 12 inches.
 - b) Horizontal Clearance: minimum distance of 2 feet clear separation from parallel utilities.
 - c) Concrete caps, and other measures may be required if necessary clearances cannot be attained.
- 3) Sanitary Sewers:
 - a) When building a water line across a sanitary sewer, comply with Oregon Administrative Rules (OAR) 333-061-0050 Construction Standards, Section 9.
 - b) Vertical Clearance: minimum 12 inches vertical separation.
 - c) Horizontal Clearance:
 - i) If Vertical separation of 18-inches above sewer or less: Provide a minimum 10 feet separation
 - ii) IF Vertical separation greater than 18-inches above sewer: provide a minimum 5 foot horizontal separation.
- 4) Exceptions
 - a) Where the above clearances cannot be met, EWEB may require concrete caps or other protection.

(J) Additional Clearances

- 1) Water line shall be kept a minimum of 5 feet clear from the outside edge of a buried water pipeline to above ground structures (retaining walls, signs, light posts, signal poles etc.)

2.1.4 STANDARD PIPE SIZES

The following table summarizes pipe sizes allowed in the distribution system and the preferred installation.

TABLE 2.1 STANDARD PIPE SIZES

Pipe Size	Installation
2-inch	Only allowed on a case by case basis where no fire hydrants are required and there is no possibility of future main extension. Pipe may not serve more than five 5/8-inch meter equivalents. (i.e. cul de sacs)
4-inch	Residential extensions less than 300-feet in length, with no fire hydrants and no possibility of future extension
6-inch	May be used in residential areas with no fire hydrants and looping at 600-feet max spacing.
8-inch	Standard residential distribution line
12-inch	Minimum pipe size in commercial/institutional areas
16-inch	Minimum pipe size in industrial areas

2.1.5 OBSOLETE PIPE SIZES

Except in unique circumstances, EWEB will no longer allow 10-inch, and 20-inch pipelines to be installed.

2.1.6 JOINT TRENCHING

Water Mains shall not be joint trenched with other utilities unless specifically required by the City of Eugene or EWEB.

2.1.7 CASED CROSSINGS

Install pipelines in a steel casing when crossing railroads, freeways, major arterials, retaining walls, sound walls or when open trenching is not an option. Support water main in casing with stainless steel or plastic spacers, restrain pipe, and seal both ends of the casing with a rubber boot.

2.1.8 CONNECTIONS TO EXISTING MAINS

All connections to the existing distribution system shall be completed by EWEB crews. Provide between a minimum of 10 and maximum of 18 feet of horizontal clearance between EWEB’s live distribution system and the new temporary pipeline blow off unless otherwise directed by EWEB. Install a temporary blow off in accordance with EWEB’s Standard Details. Temporary blow off shall be placed at approximately the same elevation as the existing main to allow the EWEB tie in without significant rework of the piping.

2.1.9 WATER QUALITY

New construction may not cause or worsen water quality issues. EWEB may require additional looping or automatic flushing valves to protect water quality.

2.1.10 MATERIALS

All materials used within the water system shall be approved for potable water service meeting NSF Standard 61 and all applicable AWWA standards. In addition, select materials must be pre-approved using EWEB's approved materials process and approved materials are listed in this document.

2.1.11 EASEMENTS

Where it is not practical to install facilities within a public right of way, EWEB may allow utilities to be installed in a dedicated easement. The following requirements must be met when installing water pipelines in easements:

- 1) Easements shall be centered on the water pipeline
- 2) Minimum easement width is 15 feet if the entire easement can be accessed via a vehicle (i.e. a parking lot or adjacent to the right of way) or 20 feet if the easement cannot be easily accessed by vehicle (i.e. between buildings, natural area, or other locations which can only be accessed via easement). If water line is in a public utility easement shared with other utilities and not adjacent to a right of way, then the waterline shall be centered in a 15-foot wide area unencumbered by other utilities. Difficult or unusual water pipeline installations may require larger easements at EWEB's discretion.
- 3) Vaults, hydrants and other structures shall have a minimum 5-foot easement on each side of the structure.
- 4) Easements shall grant EWEB the right to access, construct, operate, maintain, replace, repair, reconstruct, and remove any and all water system improvements
- 5) If adequate access to the easement is not available from a public right of way, then sufficient access easements shall be provided along the most direct route possible.
- 6) Easement documents shall be prepared by a Professional Land Surveyor. Easement Language and exhibits shall be subject to final approval by EWEB.

2.1.12 PERMITS

The Contractor, Design Engineer, or Developer is responsible for obtaining all permits necessary to perform the work. Submit to EWEB copies of the applicable permits at least 48 hours prior to beginning work. Contractor shall comply with all requirements of the City of Eugene, Lane County, or ODOT. Immediately notify EWEB of any requirements that conflict with EWEB's Standards.

2.1.13 PROTECTION OF EXISTING FACILITIES

Contractor is responsible for protecting EWEB's existing facilities from damage. Repair of damage to EWEB's facilities will be done at the Contractor's expense.

2.1.14 UTILITY COORDINATION

The Design Engineer shall coordinate all water system improvements with other existing and proposed utilities. The design shall be coordinated with the following authorities, as applicable:

- City of Eugene: storm sewer, sanitary sewer, streets, and street lights
- Springfield Utility Board/City of Springfield
- Lane Transit District
- EWEB: electric, fiber optic, and water
- Northwest Natural: gas
- Century Link: telephone.
- Comcast: cable television.
- Lane Electric Co-Op: electric in limited areas.
- EPUD: electric in limited areas.
- Williams Corp.: regional gas wholesale/transmission.
- AT&T: fiber optic.
- Water Districts (River Road and Santa Clara).

At a minimum perform the following investigations.

- 1) Request a pre-survey utility locate. Locate utilities from field markings and not from records.
- 2) Survey all field markings and visible utility infrastructure.
- 3) Pothole planned utility crossings and design to avoid conflicts.
- 4) Incorporate all utility information onto the water system drawings.

2.1.15 SAFETY

It is entirely the responsibility of the contractor performing the work to ensure that safe working conditions are provided. All reasonable precautions shall be taken to protect workers and the public from unsafe conditions. Contractors shall comply with all OSHA regulations. Contractors shall supply all barriers, lights, signs, flaggers, etc as may be necessary to protect the public.

2.1.16 WATER SERVICES

Provide a separate service to each parcel. Multiple buildings or houses may be served from a single meter if all buildings are on the same taxlot. Locate the service along the frontage of the street or easement in which there is a public water main. The service must enter the parcel it is to serve without offsets in alignment.

(A) Service Size

Properly size services to meet the needs of the intended use and in accordance with the current Uniform Plumbing Code. Service piping shall be a minimum diameter of 1-inch.

(B) Service Location

Locate service lines in a straight line from the tap towards the lot to be served and perpendicular to the main. Locate the service line along the front property line of the lot to be served. In a cul-de-sac, route the service line in the shortest practical distance from the tap to the lot served. Extend the service from the corporation stop on the main to the angle meter stop.

Provide a 3-inch schedule 40 PVC or HDPE sleeve for long side services and beneath all partial street crossings where open trench is utilized for construction. When boring long services, or where approved,

provide 2-inch minimum sleeves for each service installed. When copper services are used seal the ends of the sleeve with foam insulation.

(C) Meter Location

Locate meter boxes away from existing or future driveways. Generally water meter boxes shall be located approximately 3-feet off a property line and clustered with other utilities in order to avoid future conflicts. Where practicable, set meter boxes outside of hard surfacing.

(D) Areas with Service Pressure greater than 80 psi

Provide a customer maintained PRV on any water service that exceeds 80 psi in accordance with EWEB's Customer Service Policies and Procedures and Uniform Plumbing Code.

(E) Multiple Housing Complexes and Commercial Units

For developments on a single parcel where multiple units will be served, such as multiplex residential units, provide a master meter for the water service. Individual meters may be allowed with written approval from the Water Engineering Supervisor.

Where individual meters are approved, a meter vault will be installed on the owner or developers property and include an additional meter for the parcel's common uses such as irrigation. The meter vault should be installed in an easement and in accordance with EWEB's Customer Service Policies and Procedures Manual.

(F) Backflow Prevention

Service connections to facilities listed or defined in Table 42 of OAR 333 shall have backflow protection at the meter. Backflow protection is required in accordance with OAR 333-061-0070 Cross-Connection Control Requirements, Sections 1 thru 13 and 16. In addition, the following requirements apply:

- 1) New fire sprinkler systems and all private fire hydrants installed within EWEB customer facilities shall have proper backflow protection located within 10 feet of EWEB's point of connection.
- 2) Facilities with existing fire sprinkler systems that have backflow protection located in the fire riser shall relocate backflow protection within 10 feet of EWEB's point of connection when remodeling the facility.
- 3) Facilities with domestic meters rated for continuous flow of 160 gpm or more shall have proper backflow protection located at the meter.
- 4) Backflow assemblies installed as EWEB system protection shall be installed according to OAR 333-061-0071 Backflow Prevention Assembly Installation and Operation Standards, Sections 1 thru 10.
- 5) All backflow assemblies shall be tested using USC current edition test procedures.

(G) Private Streets

Water meters serving lots accessed from private streets shall be constructed in a grouped cluster at the intersecting edge of the public Right-of-Way line with the private street intersection. An easement shall be provided for the meter cluster if located outside of the street right of way.

(H) Minimum Water Service line Cover and Clearances

1) Service line cover

Service line shall be installed with the following minimum amount of cover:

- a) *Residential Streets and Minor Collector: minimum 36-inches.*
- b) *Major Collector or Arterial Streets: minimum 42-inches of cover.*
- c) *Easements/Planter Strips: minimum 36-inches.*

Exceptions may be made to minimum cover requirements on a case by case basis but EWEB may require concrete caps or other protection.

(I) Utility Clearances

1) Storm drains, catch basins, electrical conduits, gas and telephone cables:

- a) *Vertical Clearance: minimum of 12 inches.*
- b) *Horizontal Clearance: minimum distance of 2 feet clear separation from all utilities other than sanitary sewer (see below).*
- c) *Concrete caps, and other measures may be required if necessary clearances cannot be attained.*
- d) *Service lines shall not cross beneath or through storm drain features such as rain gardens or filtration swales.*

2) Sanitary Sewers:

- a) *Cross in accordance with Oregon Administrative Rules (OAR) 333-061-0050 Construction Standards, Section 9.*
- b) *Vertical Clearance: minimum 12 inches vertical separation.*
- c) *Horizontal Clearance:*
 - i) *If Vertical separation of 18-inches above sewer or less: Provide a minimum 10 feet separation*
 - ii) *If Vertical separation greater than 18-inches above sewer: provide a minimum 5 foot horizontal separation.*

(J) Structure Clearances

- 1) Above ground structures (storm drain facilities, retaining walls, signs, light posts, signal poles etc.) shall be kept a minimum of 3 feet clear from the outside edge of a buried water service line

2.1.17 WATER QUALITY STATIONS

Install water quality stations, when required by EWEB, in accordance with EWEB's Standard Details and AWWA C651-9.

2.1.18 AIR RELEASES

Provide manual air releases on high points of distribution lines to allow for filling and disinfection. Provide automatic air relief valves on high points when required by EWEB. Install Combination Air Release/Vacuum (CARV) valves in accordance with the standard details and specifications.

SECTION 2.2 – EXCAVATION AND BACKFILL

2.2.1 GENERAL

This section covers the requirements for trench excavation, backfilling, grading, and compaction.

2.2.2 MATERIALS

(A) Material Classifications

Furnish the following materials meeting the requirements of the current edition of the Oregon Standard Specifications:

Class A Backfill - Native or common material that, in the opinion of the Engineer, meets the characteristics required for the specific surface loading or other criteria of the backfill zone.

Class B Backfill - Granular material consisting of gravel or crushed rock. Designated size shall be 1" - 0 or 3/4" - 0.

Class C Backfill – not allowed.

Class D Backfill - Use pit run or bar run material, well graded from coarse to fine. The maximum dimension shall be 3 inches.

Class E Backfill - Use Controlled Low-Strength Material (CLSM) conforming to Section 00442 of the Oregon Standard Specifications for Construction.

(B) PIPE ZONE AND BEDDING

Pipe zone and pipe bedding shall be Class B material.

1) VAULT AND STRUCTURE FOUNDATIONS

Unless otherwise specified foundations for vaults and other structures shall be constructed of Class B backfill.

2) BACKFILL REQUIREMENTS

Unless otherwise specified by EWEB or required by right of way permit provide trench backfill material as follows:

Right of Way: Class B or Class E Backfill per the jurisdictional authority's requirements.

Improved Easements: Easements with driveways, sidewalks, or other improvements shall be backfilled with Class B backfill.

Unimproved Easements: Class A backfill may be used at the sole discretion of EWEB. If EWEB determines the native soil to be unsuitable then Class B backfill shall be used. The top 12-inches of the trench shall be clean top soil or imported loam. Top soil shall be natural, friable, sandy loam, obtained from well drained areas and free from objects larger than 1 ½", free of subsoil, weed seed, roots, grass, other foreign matter, hazardous or toxic substances, or other material that may be harmful to plant growth.

2.2.3 EXECUTION

(A) EXCAVATION:

Construct trench sides as nearly vertical as practicable. Do not slope the sides of trenches between the bottom of the trench and the elevation of the top of the pipe.

Minimum trench widths are shown on the standard details. Wider trench widths may be required by EWEB, the jurisdictional authority or the Design Engineer.

Grade bottom to allow for placement of the required bedding material

1) Removal of Surfacing and Obstructions

Cleanly saw cut and remove all pavement and other surfacings per the jurisdictional authority's requirements.

2) Excavation

Excavate to the line and depths indicated in the plan accounting for the required bedding material.

3) Sheeting, Shoring and Bracing

- a) *Trench safety is the sole responsibility of the contractor*
- b) *Shoring, sheeting, and bracing shall be installed as necessary to maintain a safe work environment compliant with all Federal and State safety regulations.*
- c) *Increase trench widths as necessary and remove or adjust shoring as backfill progresses to prevent disrupting backfill and creating voids.*
- d) *An OSHA competent person shall be onsite continuously during construction and be responsible for maintaining a safe excavation.*

4) Trench Foundation

Remove any soil along trench base that is soft or high in organic or deleterious material. Overexcavate soft, unsuitable material as necessary to provide a firm stable base. Stabilize trench foundation with compacted Class B backfill material as necessary

5) Vault Foundations

Place material in 6 inch lifts and compacted as required.

6) Control of Water

Keep excavations free from water during construction. Dispose of excess water in accordance with the jurisdictional authority's requirements.

(B) BACKFILL

This section covers the required backfill materials, pipe bedding, and compaction.

1) BEDDING AND TRENCH BACKFILL PROCEDURE:

- a) *Remove all loose material, wood, and debris from the trench prior to backfilling.*
- b) *Provide a minimum of 4-inches of Pipe Bedding material compacted as specified herein.*
- c) *Do not place bedding in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized.*
- d) *Excavate minimally sized bell holes as necessary so that the pipe barrel lies evenly on the compacted pipe bedding.*
- e) *Pipe Zone material shall extend to a minimum of 12 inches above the crown of the pipe.*
- f) *Shovel slice backfill material into the haunch areas of the pipe, continuous along the length of the pipe.*
- g) *Remove any temporary pipe support structures including timbers prior to backfilling.*
- h) *Backfill pipeline trenches to the level of the original ground surface or underside of the pavement base course.*
- i) *Place backfill material in the trench to the full excavated width. Place backfill material carefully from a low height in order to minimize damage to pipe coatings.*
- j) *Backfill simultaneously and uniformly on both sides of the pipe. Hand shovel sufficient material to securely anchor the pipe so that no movement will occur when the next section of pipe is being placed or when additional material is placed.*
- k) *Remove water collecting at the low points along the trench by pumping or other approved means in order to avoid softening of adjacent ground.*
- l) *Backfill trenches located within the public right of way within the shortest possible time so streets can be opened to traffic.*
- m) *Maximum lift, before compaction: 12 inches.*
- n) *Provide uniform and continuous support for each section of utility except at bell holes or depressions necessary for making proper joints.*
- o) *Protect the piping and protective coatings from damage.*
- p) *Compact each loose lift as specified below before placing the next lift.*

2) COMPACTION:

- a) *Compact by means of impact, vibration, or a combination of these methods. Take care to ensure no damage to the pipe or pipe coatings occurs during compaction procedures.*
- b) *Only hand-operated motor driven mechanical compacting equipment shall be used over pipelines until the backfill has been compacted to 12-inches over the crown of the pipe.*
- c) *Compaction by hydraulic jetting or ponding is not allowed.*

- d) *Moisture Content: When the moisture content of the fill material is below optimum moisture content as determined by the moisture density curves, add water until the moisture content as necessary to obtain the required compaction values. When the moisture content of the fill material is above optimum moisture content, aerate by blading or other approved methods until the moisture content is adequate to reach required compacting.*
- e) *Compaction shall be in accordance with the following:*

TABLE 4: COMPACTION REQUIREMENTS

Pipe Size	Installation
Subgrade	95%
Base Rock	
Gravel Road Surfacing	
Vault Foundation	
Pipe Zone	
Trench Backfill	85%
Pipe Bedding	

(C) INSPECTION AND QUALITY ASSURANCE

All water facilities shall be inspected by EWEB prior to backfilling. EWEB’s inspector may require the Contractor to take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these requirements. Test results may be required prior to proceeding with any paving. Design Engineer, when required, shall submit test results from an independent testing firm in accordance with the following:

TABLE 5: TESTING PROCEDURES

Test	Standard Procedure
Moisture content	ASTM D3017
Density in-place	ASTM D1556 or ASTM D2922
Moisture-density relationships	ASTM D698 (Standard Proctor)

SECTION 2.3 - SURFACE RESTORATION

2.3.1 GENERAL

This section includes requirements for restoration of work areas after installation and construction of new facilities.

Surface restoration includes temporary and permanent resurfacing of pipe trenches including replacement of pavement, curbs, sidewalks, rock surfacing, topsoil, landscaping and other features disturbed during pipe trenching operations or installation of vaults, conduits, or other subsurface facilities.

(A) JURISDICTIONAL AUTHORITY

The requirements of permits issued by the city, state, and/or county having jurisdiction of a right of way shall, where more stringent, supersede the requirements of this section.

Perform work in accordance with all referenced codes, specifications, standards and Right of Way permits.

2.3.2 MATERIALS

Unless otherwise required by the jurisdictional authority, furnish trench resurfacing materials to match material removed during trenching and meeting the following minimum requirements:

TABLE 6: MATERIAL REQUIREMENTS

Material	Oregon Standard Specification number
Aggregate	00641
Commercial Asphalt Concrete Pavement	00740
Concrete Pavement	00754
Concrete Sidewalks, Curbs, and Driveways	00759
Emulsified Asphalt Concrete	00735
Emulsified Asphalt Surfacing	00710
Emulsified Asphalt Tack Coat	00730
Asphalt Concrete Pavement	00744
Rock Surfacing	00641

2.3.3 EXECUTION

(A) SITE PREPARATION

The following requirements are the minimum requirements. Follow the jurisdictional authority's requirements when more stringent.

- 1) Notify the jurisdictional authority and EWEB a minimum of 2 business days before beginning pavement restoration.
- 2) Cut and remove pavement in neat lines to the minimum trench width.
- 3) Saw cut and remove an additional 12 inches on each side of the trench prior to placing permanent asphalt. Clean the edges of the saw cut of all mud, dirt, and dust before placing the surface material.
- 4) Edge Sealing: Seal all adjoining asphalt concrete pavement surfaces with an edge sealing tack coat. Place sufficient tack coat to seal the adjoining surfaces. Place clean sand, containing no visible silts or organic matter, over the tack coat. Reapply additional tack coat and sand cover any edges not completely sealed by the first application.

(B) PAVEMENT

- 1) General:
 - a) *Installation and replacement of pavement shall be in accordance with the requirements of the jurisdictional authority and the respective Standard Details.*
 - b) *Notify EWEB a minimum of 2 business days prior to paving for inspection.*
 - c) *Do not pave asphaltic concrete if ambient air temperature is less than 40 degrees Fahrenheit.*
- 2) Temporary Patching:
 - a) *Backfill and temporarily pave all trenches within roadways at the end the working day unless otherwise approved by EWEB and the jurisdictional authority.*
 - b) *Maintain the temporary paving for safe passage of vehicular and pedestrian traffic until permanent paving is placed.*
 - c) *Minimum temporary paving depth: 2 inches, 4-inches if in Right of Way, unless otherwise approved by the jurisdictional authority.*
 - d) *Temporary paving shall be smooth with surface variations no more than ½ inch from existing grade.*
- 3) Permanent Asphalt Concrete Paving:
 - a) *No pavement over the trench shall be left unrepaired for more than 2 weeks, or as required by the jurisdictional authority, whichever is shorter.*
 - b) *Minimum Pavement Thickness: 4-inches, 6-inches if in Right of Way.*
 - c) *Maximum Paving Lift: 2-inches.*
 - d) *Minimum Density: 92% Rice*

- 4) Permanent Portland Cement Concrete Paving:
 - a) *No pavement over the trench shall be left unrepaired for more than 2 weeks, or as required by the jurisdictional authority, whichever is shorter.*
 - b) *Minimum Pavement Thickness: 6-inches.*
 - c) *Provide concrete mix, doweling, and reinforcing per jurisdictional authorities requirements.*
- 5) Replacement of Surface Features:
 - a) *Restore all striping, street markings, signs, signal systems, curbs, gutters, etc., which have been disturbed by construction to their original condition within the time frame established by EWEB or the Jurisdictional Authority.*
- 6) Inspection and Testing
 - a) *Ponding: Run or spray water on asphalt concrete surfaces to detect low spots or ponding. Immediately correct any low spots to provide a smooth surface and eliminate ponding.*
 - b) *Deficient Work: Remove and correct all defective work.*

SECTION 2.4 – DISTRIBUTION WATER MAINS

This section includes requirements for furnishing and installing piping materials, thrust restraint devices, connections to existing facilities, and abandonment of existing facilities.

2.4.1 GENERAL

Water distribution mains shall meet the following minimum requirements and be on EWEB's approved materials list, where applicable.

TABLE 7: PIPE MATERIAL REQUIREMENTS

Pipe Size	Pipe Type/Class
2-inch	HDPE, CTS, SDR9, Blue, ASTM D2737
4-inch, 6-inch, and 8-inch	Class 51 Ductile Iron Pipe
8-inch, 12-inch, 16-inch	Class 50 Ductile Iron Pipe

2.4.2 MATERIALS

(A) Ductile iron pipe and Fittings

- a) *Ductile Iron Pipe shall comply with AWWA C151.*
- b) *Diameter gauged the full length.*
- c) *Nominal lengths: 18 or 20 feet.*
- 2) **Joints and Fittings:**
 - a) *Same material and class as the pipe to which they are joined. 250 Psi minimum design working pressure.*
 - b) *Manufactured in accordance with AWWA C110/ANSI A21.10 or AWWA C153/ANSI 21.53.*
 - c) *Flange joints: in accordance with AWWA C115 /ANSI 21.15.*
 - d) *Mechanical Joints with Joint Restraint: Mechanical joint with restraint provided by a follower gland with individually actuated wedges or mechanical joint with a gasket and follower gland that increases the resistance to pull-out as pressure or external forces increase.*
 - e) *Push-on Joint with Joint Restraint: Comply with AWWA C111/ANSI A21.11. Single gasket with individual stainless steel locking segments vulcanized into the gasket.*
- 3) **Gaskets:**
 - a) *Conform to AWWA C111/ANSI 21.11.*
 - b) *Flange gaskets: Full face, 1/8-inch thick red rubber.*
- 4) **Lining:**

a) *Cement mortar in conformance with AWWA C151.*

5) External Coating:

a) *Pipe: Zinc Coating per ISO 8179-1 (Ductile Iron Pipes-External zinc-based coating-Part 1: Metallic Zinc with Finishing Layer) and in accordance with AWWA C151.*

b) *Fittings: Asphaltic in accordance with AWWA C110/ANSI A21.10.*

c) *Lubricant: non-toxic, NSF 61 approved.*

(B) Polyethylene Encasement:

1) In accordance with AWWA C105.

2) Required, unless an exception is granted by EWEB.

3) Thickness: minimum 8-mil.

(C) Tracing wire:

1) Single strand 12 gauge copper wire with blue insulation.

2) Splice kit:

a) *Moisture resistant.*

b) *Fully encapsulated*

c) *Connector style: direct bury.*

d) *Maximum voltage rating: 600 volts.*

(D) Bolts

1) Flange bolts: 304 or 316 stainless steel.

2) All other bolts: Corrosion resistant high-strength low alloy steel.

(E) Approved Materials

1) In order to ensure consistency, compatibility, and long term durability within EWEB's distribution system, certain materials are tested and pre-approved. Only the specific materials listed below may be used within the listed material category. Models listed must also be equipped/configured to meet the technical requirements herein.

Material Class	Manufacturer	Models
Couplings for Repair	Krausz USA	Hymax Wide Range Repair Coupling
	Romac Industries	Macro HP
Pipe Restraints	Romac Industries	MJ Restraint: RomaGrip
	US Pipe	MJ Restraint: MJ Field LK Series DI
	EBBA Iron	Megalug
Tapping Sleeve	Romac Industries	SST with DI Flange
	Romac Industries	FTS 420 with 304 Stainless Steel Nuts & Bolts

2.4.3 EXECUTION

(A) General:

- 1) Inspect each pipe, fitting, lining and coating before installation.
- 2) Remove damaged items from the project site and replace with new undamaged items.
- 3) Remove foreign matter and dirt from inside of the pipe and keep clean during and after laying.
- 4) Prevent groundwater or other foreign matter from entering the pipe. Seal the open ends of pipe and fittings when work is not in progress. Seal shall be expandable and non-penetrable.
- 5) Handle the pipe carefully. Do not drop or dump pipe into trenches.
- 6) Place and support pipe at the proper lines and grades.
- 7) Furnish all materials including temporary blow-offs, test heads, joint swabbing balls, and all other equipment or tools used during construction unless otherwise specified or shown on the drawings.
- 8) Follow piping runs as closely as possible, except for minor adjustments to avoid conflicts. Any variance from approved plans requires EWEB's approval.
- 9) Trench for pipe installation after the roadway is graded to within 3-inches of compacted/stable subgrade unless otherwise specified or approved by EWEB.
- 10) An EWEB representative shall inspect all pipelines prior to backfilling.

(B) Locate Wire:

- 1) Provide for all pipe.
- 2) Install and tape wire within 6-inches from the center of the top of pipe along the entire length.
- 3) Wire terminations and connections per Standard Details and as shown on Contract Documents.
- 4) Splice wire using approved fully encapsulated splice kit.
- 5) Locator wire must be electrically continuous. Test the locator wire for continuity prior to paving. Repair and retest any locator wire that fails the continuity test.

(C) Pipe Restraint

- 1) Restrain all joints on water distribution mains including fittings, and valves. Joints shall be restrained using approved mechanical restraints or restraint gaskets.
- 2) Install restrained joint systems in accordance with the manufacturer's recommendations.
- 3) Thrust blocks, anchor blocks or a combination thereof are allowed only as indicated on the approved drawings or as approved by EWEB.

(D) Ductile Iron Pipe:

- 1) Install pipe and appurtenances in accordance with AWWA C600 and the manufacturer's instructions unless otherwise specified.
- 2) Maximum acceptable deflection: Manufacturer's recommendation

(E) Joints:

- 1) Mechanical Joints:
 - a) *Thoroughly clean the spigot, bell, and rubber gaskets.*
 - b) *Install per the manufacturer's recommendation.*
- 2) Pipe flanges:
 - a) *Set level, plumb, and aligned.*
 - b) *Set flanged fittings true and perpendicular to the axis of the pipe.*
 - c) *Bolt holes in flanges: straddle vertical centerline of pipes.*
- 3) General:
 - a) *Only EWEB staff shall work on the active distribution system.*
 - b) *Connections, shutdowns, valve turning, and taps on the active distribution system will be conducted by EWEB. Shutdowns and connections will not be made until preparatory work is inspected and approved by EWEB.*
 - c) *Maintain a minimum 10 feet of physical separation from the active distribution system until, testing, and flushing has been completed and approved by EWEB.*

(F) Exposing Existing Facilities:

- 1) Expose existing piping and appurtenances prior to trenching and installing new pipe. Do not expose existing pipe without notifying EWEB.
- 2) No excavations shall occur in the vicinity of existing concrete thrust blocks on the existing active system without prior approval from EWEB.

(G) Taps and Connections

- 1) All taps on existing EWEB mains shall be made by EWEB.
- 2) To request a tap, notify EWEB a minimum of 2 business days in advance.

(H) Abandonment of Existing Facilities

- 1) Cut and plug all pipes to be abandoned.

(I) Corrosion Control

- 1) All Water Mains shall be encased in polyethylene sheeting per AWWA C105. Exceptions may be granted for installations in non-corrosive soils as determined by EWEB.

- 2) In highly corrosive environments additional protective measures may be required such as cathodic protection.

(J) Testing and Disinfection

- 1) General

- a) *Perform cleaning, hydrostatic pressure testing upon completion and inspection of the pipeline installation including backfill to subgrade and construction of appurtenances.*
- b) *Cleaning and hydrostatic pressure testing shall be completed prior to EWEB disinfecting the main and connecting to the active water system.*
- c) *Provide all gauges, meters, and recording devices necessary to verify test results.*
- d) *Provide all other materials, equipment, and facilities required to perform the hydrostatic test including but not limited to bulkheads, restraints, anchors, temporary connections, pumps, and fittings.*
- e) *All cleaning and tests shall be witnessed and approved by EWEB. Notify EWEB a minimum of 2 business days in advance of testing.*
- f) *All work shall be completed in accordance with the latest edition of the following:*
 - i) *AWWA C600 – "Installation of Ductile-Iron Water Mains and Their Appurtenances"*
 - ii) *ASTM F2164 – Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure"*

- 2) Testing Plan

- a) *Submit hydrostatic test plan to EWEB for approval. Plan shall include but not limited to:*
 - i) *Procedure for testing.*
 - ii) *Testing location.*
 - iii) *Pipeline restraint methods and locations.*
 - iv) *Location of air relief valves, corporation stops or vents.*
 - v) *Test pressures and allowances.*
 - vi) *Reduced pressure backflow prevention device (RPBPD) test if required.*
 - vii) *Potable water truck certification, if applicable.*
 - viii) *Data on all equipment and recording devices used for testing including certification of gauge calibration with the date of last calibration.*

- 3) Test Water

- a) *Test water required for hydrostatic pressure testing and flushing supplied by either of the following:*

- i) *Temporary connection between EWEB's distribution system and the new main with a RPBD and water meter issued and installed by EWEB.*
 - ii) *Water Supplied by a Potable Water Truck.*
 - a. *Water trucks designated and used only for potable water. Certification shall be provided verifying that the water truck meets the requirements of the Oregon Drinking Water Program – Drinking Water Hauling Guidelines.*
 - b. *Fill water trucks from an authorized EWEB hydrant with a RPBD and water meter issued and installed by EWEB per EWEB's Temporary Water Service Policy.*
- 4) **Flushing**
- a) *Thoroughly clean the interior of the pipeline of all debris prior to testing.*
 - b) *Scour the pipeline by flushing with water at a minimum velocity of 3 ft/s using a minimum of 3 pipe volumes. Alternatively, the pipeline may be "pigged" by pushing a tightly fitted ball or swab through the pipe as specified by EWEB.*
 - c) *No further test should commence until the pipeline is cleaned to the satisfaction of EWEB.*
- 5) **Hydrostatic Pressure Testing**
- a) *Do not perform a hydrostatic test against closed valves connected to the active system, except as approved by EWEB.*
 - b) *No more than 1,200 linear feet of pipe shall be tested at a time.*
 - c) *Submit a completed "EWEB Flushing and Hydrostatic Test Record" documenting the hydrostatic testing. The form is included in Section 2.8 of these standards.*
 - d) **Ductile Iron Pipe Hydrostatic Test Procedure**
 - i) *Conduct all hydrostatic tests in accordance with AWWA C600.*
 - ii) *Provide EWEB at least 48 hours' notice of a planned pressure test.*
 - iii) *Disconnect all temporary connections to physically separate the new pipe from the existing water system.*
 - iv) *Provide temporary restraint of the pipeline at the connection points to the existing system or as directed by EWEB.*
 - v) *Open all air relief valves and/or corporation stops to vent air during filling.*
 - vi) *Slowly fill the pipeline with test water. Limit the flow rate to allow the air to vent slowly. Close all air release valves, vents or corporation stops after the air has been vented.*
 - vii) *Allow the pipeline to soak for a minimum of 24 hours under pressure prior to beginning hydrostatic test.*

- viii) *Call EWEB to witness the pressure test only after contractor is reasonably certain the test will pass. Repeated witnessing of failed pressure tests may result in additional EWEB charges.*
- ix) *Apply a minimum test pressure of 1.5 times the working pressure of the test section or 150 psi, whichever is greater, up to a maximum of 200 psi for a duration of 2 hours after the pressure in the pipeline has stabilized.*
- x) *Testing leakage allowance shall be in accordance with AWWA C600 as summarized by the equation below.*

$$L = \frac{SD\sqrt{P}}{148,000}$$

- L = allowable leakage (gallons per hour)
- S = Length of Pipe Tested (feet)
- D = Nominal Diameter of the pipe (inches)
- P = Average Test pressure during test (pounds per square inch, PSI)

Table 8: Allowable Leakage per 1000 ft. of Pipe (Gallons/Hour)

Nominal Pipe Size	Average Test Pressure (psi)		
	150	175	200
4	0.33	0.36	0.38
6	0.50	0.54	0.57
8	0.66	0.72	0.76
10	0.83	0.89	0.96
12	0.99	1.07	1.15
16	1.32	1.43	1.53
20	1.66	1.79	1.91
24	1.99	2.15	2.29

xi) In the event that the rate of loss of water is greater than allowed:

a. Locate all leaks, complete the necessary repairs and retest the pipeline.

xii) Remove and plug all temporary corporation stops following test acceptance.

6) Final Connections to the Potable Water System

a) EWEB will make the final connections to the active distribution system within 20 business days following the acceptance of the testing and disinfection.

b) If construction phasing or other delays prevent connection to the active distribution system within 10 business days, the system shall be retested as specified herein.

SECTION 2.5 - VALVES

This section summarizes requirements for distribution valves.

2.5.1 GENERAL

(A) Reference Standards

- 1) AWWA C504 "Standard for Rubber-Sealed Butterfly Valves"
- 2) AWWA C509 "Standard for Resilient-Seated Gate Valves for Water Supply Service"
- 3) AWWA C512 "Standard for Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service"
- 4) AWWA C515 "Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service"
- 5) NSF/ANSI 61 "Drinking Water System Components"

(B) Flushing and Maintenance

Valves required for flushing shall typically be located near fire hydrants and may require additional valving beyond the minimum required in this standard.

(C) Valve Size, Type and Location

- 1) Install valves as close as possible to the tee or cross fitting for pipes that intersect. Standard installations shall utilize flanged fittings and flange by mechanical joint valves. Provide a minimum of two valves for tee fittings and 3 valves for cross fittings. Valves shall be installed near street intersections whenever possible. For intersections with no crossing main, install a single mechanical joint in-line valve.
- 2) Install valves in the roadway, outside of parking areas, where feasible. If installed in pedestrian traffic areas, provide a non-slip coated valve lid. Do not install valves within the street gutter or curb line, sidewalk ramps, driveways, or where vehicles or obstacles can impede access.
- 3) Furnish valves at full line size unless specifically called out to be a reduced size.
- 4) Provide Gate Valves on mains 12 inches and smaller. Provide butterfly valves for all valves larger than 12 inches. Hot taps of all sizes will utilize gate valves.

(D) Hydrant Valves

For hydrant installations, provide three valves, two on the main run and one on the hydrant branch of the tee. Hydrant tee shall be flanged. One main run valve may be eliminated if another isolation valve is in close proximity with no services between the hydrant and isolation valve.

2.5.2 MATERIALS

(A) General Valve Requirements

- 1) Provide valves complete with all necessary hardware, valve boxes, and appurtenances which are required for installation.
- 2) Operating torque to operate any valve: maximum of 40 ft-lb.
- 3) Rotation to open the valve: counterclockwise unless otherwise indicated.
- 4) Hardware: Type 304/316 stainless steel.
- 5) Clean flange faces and joint sealing surfaces, body and seats before installation.
- 6) Operate all valves through five complete open-close cycles immediately before installation. Visually inspect each valve for proper operation and rotation.
- 7) Install valves on firm footing in the trench to prevent settling and strain on the pipe connection.
- 8) Close valve before installing.
- 9) Install valves in accordance with the manufacturer's recommendations.

(B) Gate Valves

- 1) 2-inch and larger:
 - a) *General: Resilient seat type non-rising stem meeting or exceeding AWWA C509 or AWWA C515 requirements.*
 - b) *Body: Ductile iron or gray iron.*
 - c) *Gate: Ductile iron or gray iron.*
 - d) *Resilient seat: Bonded or mechanically attached to the gate.*
 - e) *Stem: Bronze or stainless steel.*
 - f) *Seals: O-ring seals with two on top of the thrust collar and one below.*
 - g) *Shop coating and lining: Fusion bonded epoxy.*
 - h) *Operator: Equipped with a two-inch square wrench nut.*

(C) Butterfly Valves

- 1) Manufactured in accordance with the latest revision of AWWA C504, class 150B. The manufacturer shall have produced AWWA butterfly valves for a minimum of twenty years.
- 2) Valve shafts: fabricated of AISI Type 304 or 316 stainless steel. The use of shafts having a hexagonal cross section will not be acceptable.
- 3) Valve discs: secured to shafts by means of solid, smooth-sided stainless steel or monel taper pins or dowel pins. Each taper pin or dowel pin shall extend through the shaft and be mechanically secured in place.
- 4) Acceptable seating surfaces mating with rubber are AISI Type 304 or 316 stainless steel, monel, or plasma-applied nickel-chrome overlay for all valves, bronze and alloy cast iron.
- 5) Valve seat configurations which rely on the mating pipe flange to hold the seat in position in the valve body will not be acceptable.
- 6) Shaft seals will be of the chevron or o-ring type.
- 7) Provide each valve with one or more thrust bearings in accordance with the governing standard. Thrust bearings which are directly exposed to line liquid and which consist of a metal bearing surface in rubbing contact with an opposing metal bearing surface will not be acceptable.
- 8) Valves shall be shop painted with epoxy enamel coatings which are ANSI/NSF 61 certified, minimum 10 mils thickness.

(D) Valve Box Assemblies

- 1) Install a valve box assembly centered over the operator for all buried valves.
 - a) *Riser: 8-inch diameter ASTM 3034 PVC pipe.*
- 2) Valve box ring and lid:
 - a) *Ring: 10-inch diameter 12-inch high concrete.*
 - b) *Lid: Cast iron marked "water".*
- 3) Pavement Riser:
 - a) *ASTM A48 Cast iron Construction*
 - b) *H2O Load Rating*
 - c) *LID: cast iron marked with a "W"*

(E) Extension stems:

- 1) Use when nut depth exceeds 48-inches
- 2) 2-inch square fiberglass with a 2-inch AWWA square operating nut installed 18 to 24-inches below grade, or
- 3) Hot dipped galvanized round steel bar or pipe with a 2-inch AWWA square operating nut installed 18 to 24-inches below finished grade.

(F) Approved Materials

- 1) In order to ensure consistency, compatibility, and long term durability within EWEB's distribution system, certain materials are tested and pre-approved. Only the specific materials listed below may be used within the listed material category. Models listed must also be equipped/configured to meet the technical requirements herein.

Material Class	Manufacturer	Models
Resilient Wedge Gate Valve	American AVK	All
	Kennedy	All
	Mueller	All
	M & H	All
	American AVK	All
	Kennedy	All
	Mueller	All
Combination Air Release/Vacuum Valve	Vent-O-Mat	All
	Crispin	All
	ARI	All
Pressure Control Valve	Cla-Val	All
Valve Box Assembly	Brooks	3-RT
Pavement Riser	Olympic	VB910-18
	Sigma	
Butterfly Valve	Mueller	All
	Pratt	All
	Kennedy	All
	M & H	All

2.5.3 EXECUTION

(A) Gate and Butterfly Valve Installation

- 1) Install in accordance with EWEB Standard Details.
- 2) Before installation, the valves shall be thoroughly cleaned of all foreign material, and shall be inspected for proper operation to verify that the valves seat properly.
- 3) Valves shall be installed so that the stems are vertical, unless otherwise directed.

(B) Joints

- 1) Joints shall conform to ANSI/AWWA C600. Valves shall be installed in accordance with EWEB Standard Details.

- 2) Faces of flanges shall be cleaned thoroughly before flanged joint is assembled. After cleaning, the gasket shall be inserted and the nuts tightened uniformly around the flange.
- 3) After tightening nuts, three full threads shall be showing on the end of the bolt where it is exposed beyond the nut.
- 4) Joints shall be tested with the adjacent pipeline for leakage. If joints leak under test, valves shall be disconnected and reconnected, and the valve and/or pipeline retested.

(C) Valve Boxes

- 1) Install in accordance with EWEB Standard Details.
- 2) Center the valve boxes and set plumb over the wrench nuts of the valves. Valve boxes shall not rest on the valve body. Set the valve box covers flush with the surface of the finished pavement.
- 3) Cut extensions to the proper length so that the valve box does not ride on the extension when set at finished grade.
- 4) Backfill shall be the same as specified for the adjacent pipe. Place backfill around the valve boxes and thoroughly compact to a density equal to that of the adjacent trench, avoiding damage to or displacement of the valve box. Misaligned valve boxes shall be excavated, centered, plumbed, and backfilled.
- 5) Where the valve is located in an unpaved area, a concrete pad shall be poured around the valve box. The concrete shall be 24 inches square by 4 inches thick, and shall be placed on a base of four inches of compacted crushed rock.

(D) Air and Vacuum Release Valves

- 1) Install in conformance with EWEB Standard Details
- 2) Thoroughly compact the gravel beneath the concrete box and set the box so that it conforms to the elevation of the ground.
- 3) Place at least 12 inches of crushed rock beneath the air release valve. Crushed rock shall meet the requirements of Section 2.2.b.
- 4) Allow at least six inches of clearance between the street ell and the box top.
- 5) Test and disinfect air valve assemblies in conjunction with the pipeline.

SECTION 2.6 – FIRE HYDRANTS

This section summarizes the design and construction standards for fire hydrants.

2.6.1 GENERAL

(A) Location

- 1) The location and spacing of fire hydrants is based on guidelines from the Insurance Services Offices (ISO). Fire hydrants are required, at a minimum, every 500 feet (250 feet maximum from railroad tracks) or as required by the Fire Marshal.
- 2) For new construction, hydrants should only be installed on mains 8-inches or larger.
- 3) The preferred installation location is within the public right-of-way. Locate fire hydrants near street intersections at the curb return radius or at the property line. Maintain at least 5 feet from any above ground obstructions.
- 4) Provide a concrete pad per EWEB standard details.
- 5) Fire hydrants should be accessible and located to minimize the possibility of damage from vehicles or injury to pedestrians.
- 6) Hydrants installed in areas that cannot meet the minimum required fire flow require an evaluation by the EWEB.
- 7) Obtain written approval for the proposed fire hydrant location from the City of Eugene Fire Marshall. All relocations and replacements of hydrants are required to have written approval from the Fire Marshal. Relocations are to be done in kind, unless otherwise approved. Costs associated with relocations will be according to EWEB's Policies and Procedures.

(B) Fire Flow Pressure

- 1) Hydrants installed in areas with less than 40 psi of working pressure are not allowed without EWEB approval. Hydrants should not be installed in areas where the static pressure exceeds 120 psi.

(C) Minimum Flow for New Development

- 1) Provide supporting infrastructure to provide a minimum of 1,500 gpm fire flow to residential areas or as required by the Fire Marshal. Offsite Infrastructure improvements required to provide necessary flows are the responsibility of the developer.

(D) Hydrant Capacity

- 1) EWEB will Paint the bonnet tops in accordance with NFPA:
 - a) *Green: 1,000 – 1,499 gpm*
 - b) *Orange: 500 – 999 gpm*
 - c) *Red: Below 500 gpm*

- 2) Do not Paint Bonnets of Hydrants with greater than 1500 gpm

2.6.2 MATERIALS

(A) Approved Materials

- 1) Fire hydrants are approved by the City of Eugene. Contact Eugene’s Fire Marshal’s office with any questions regarding the approved Fire Hydrants. Only the specific materials listed below may be used within the listed material category.

Material Class	Manufacturer	Models
Fire Hydrant	Kennedy	K-81
	Mueller	A-423 Centurian
	M&H	129

2.6.3 EXECUTION

- (A) Install Fire Hydrants per EWEB standard details and AWWA standard C600.*
- (B) Install Hydrants in a 3-foot by 3-foot by 4-inch thick concrete pad.*
- (C) Set Hydrants plumb and level with pumper nozzle facing the curb and the other nozzles parallel with the curb.*
- (D) Set Hydrants so safety flange is between 2-inches and 7-inches above grade*
- (E) Install Hydrants with a minimum of 4 cubic feet of drain rock around the base of the hydrant.*

SECTION 2.7 – SERVICES AND METERS

This section outlines the requirements for services and meters.

2.7.1 GENERAL

- (A) *Small services (3/4-inch and 1-inch) and for large services with meters without a bypass, the service point of connection is the valve on the downstream side of the meter.*
- (B) *For services with a meter and a bypass, the service point of connection is the end of an 18-inch pipe length extended from the bypass valve tee located on the downstream side of the meter.*
- (C) *The service point of connection for a fire line is at the right-of-way/property line. If the existing main is located in a PUE adjacent to the property, the service point of connection is at the fire line valve off the water main.*

2.7.2 MATERIALS

(A) *Approved Materials*

- 1) In order to ensure consistency, compatibility, and long term durability within EWEB's distribution system, certain materials are tested and pre-approved. Only the specific materials listed below may be used within the listed material category. Models listed must also be equipped/configured to meet the technical requirements herein.

Material Class	Manufacturer	Models
Water Meter-Positive Displacement Meters 5/8" - 1"	SENSUS	SR2
	Badger Meter, Inc	Reco
Water Meter-Positive Displacement Meters 1.5"- 2"	SENSUS	SR
	Badger Meter, Inc	Reco
Electronic Meters 5/8"-1"	Sensus	iPERL
Electronic Meters 1.5"-10"	Sensus	OMNI
Water Meter Box and Cover	Armorcast Products	17x30x18" deep Protocast Mtr Box w/ knockout mouse holes
	Armorcast Products	17x30 RPM ploymer concrete non-skid cover 20k rated with h7 SENSUS AMR hole for Flexnet
	Armorcast Products	12x20x12" deep Protocast Mtr Box w/ knockout mouse holes
	Armorcast Products	Solid one piece ploymer concrete non-skid cover 20k rated with h7 SENSUS AMR hole for Flexnet

	Quazite	11x18x12 Meter box with mouse hole polymer concrete; 11x18 cover with hinged reader and AMR hole tiers
Corporation Stop	Mueller	300 Series
	Ford	All
	A.Y. McDonald	All
Angle Meter Stop	Mueller	110 Series
	Ford	All
	A. Y. McDonald	All
Couplings/Unions for Service	Mueller	All
	Ford	All
	A. Y. McDonald	All
HDPE Service Line	Rehau	All
	Centennial Plastics	All
	Interstate Plastics	All
Copper Service Line	Mueller	All
	Cambridge Brass	All
	Great Lakes Copper	All
Service Saddles-1"-2"	Romac	202BS w/stainless straps

2.7.3 EXECUTION

(A) Service Saddles

- 1) Thoroughly clean the pipe surface and apply a suitable gasket lubricant per the manufacturer's instructions.
- 2) Position the saddle body over the pipe, install the straps, install the nuts to finger tight, and check to ensure that the gasket is seated flat onto the pipe face.
- 3) Tighten the nuts evenly in 20 pound increments to the manufacturer's recommended torque specifications.

(B) Direct Taps

- 1) 1-inch direct taps are allowed on ductile iron pipe 6-inches and larger. All other taps require the use of a service saddle.

(C) Service Tubing Installation

- 1) Tubing shall be cut with square ends, reamed, cleaned, and made up tightly.
- 2) Assemble in full length segment without joints where possible. Where joints are required, use approved compression fittings and stainless stiffeners when using HDPE.
- 3) Care shall be taken to prevent the tube from kinking or buckling on short radius bends. Kinked or buckled sections of tube shall be cut and the tube spliced with approved brass fittings.

(D) Meter Boxes

Provide a meter box for each meter located within the public right-of-way or within a public utility easement; if those locations are not feasible then the meter box may be on the customer's property near the property line. All meter box locations require EWEB approval. Meter boxes in streets, driveways, or other areas where vehicle loads may occur are not allowed. Provide non-slip coating where subject to Pedestrian traffic.

(E) Meter Installation

- 1) Installation of meters will be withheld until EWEB has accepted the project.
- 2) Prior to connection of the meter, the angle valve shall be opened and the service line flushed of all foreign materials.
- 3) Depending on the elevation difference between the meter and the proposed building to be served, EWEB may require a gate valve or backflow assembly on the customer side of the meter at the meter box. Disinfection and hydrostatic tests shall be performed on the service connections and pipes prior to meter installation.

(F) Corrosion Protection

A copper service line crossing a cathodically protected utility will require protection against stray current corrosion. Install an 18 foot length of 3 inch diameter schedule 40 pvc or HDPE casing pipe for the service branch. The ends of the casing shall be sealed with foam insulation.

Copper services on non-metallic pipe or poly wrapped pipe shall be reviewed by EWEB to determine if corrosion protection is required. When possible, soil samples for corrosion shall be taken prior to water service installation. The copper service may need to be polyethylene coated/encased or high density polyethylene pipe may be required. All metallic fittings are required to be wrapped in wax tape when the pipe and/or service line are wrapped in polyethylene.

SECTION 2.8 REQUIRED FORMS

The following pages contain the necessary forms required in these design standards:

EWEB Pipeline Flushing and Hydrostatic Test Record

Date: _____

Project Name: _____	Project No.: _____ _____	Contractor: _____ _____
Pipeline Size & Name: _____ _____	Pipe Type: _____ _____ (DI, PVC, Steel, Copper, etc.)	Pipe Location/Description: _____ _____ (Attach sketch if needed)
Section Tested: From: _____ To: _____	First Test <input type="checkbox"/> Re-Test <input type="checkbox"/>	Length of Pipe Tested: _____ Ft.

Fill and Flush		
Date: _____	Time: _____	By: _____
Flushed Water: _____ kgal	Pressure Gauge: _____ psi	Residual: _____ ppm

Test Specifications	Test Results
Type of Test: _____	Start Pressure: _____ psi End Pressure: _____ psi
Test Pressure: _____	Start time: _____ Stop time: _____ Duration: _____
Duration: _____	Actual Leakage: _____ gph
Allowable Leakage: _____ gph	Flushed Water: _____ kgal

Notify the City of Eugene 48 hours prior to disposing water

Water Disposal if Applicable	
City of Eugene Notified:	Date _____ Time _____
Disposal Water:	Super Chlorinated <input type="checkbox"/> Dechlorinated <input type="checkbox"/> System Water <input type="checkbox"/>
Disposal Location:	Storm Sewer <input type="checkbox"/> Sanitary Sewer <input type="checkbox"/>

Test Passes	_____
Test Fails	_____

Comments: _____

Tested By: _____ **Test Witnessed By:** _____

Project Valve Spreadsheet

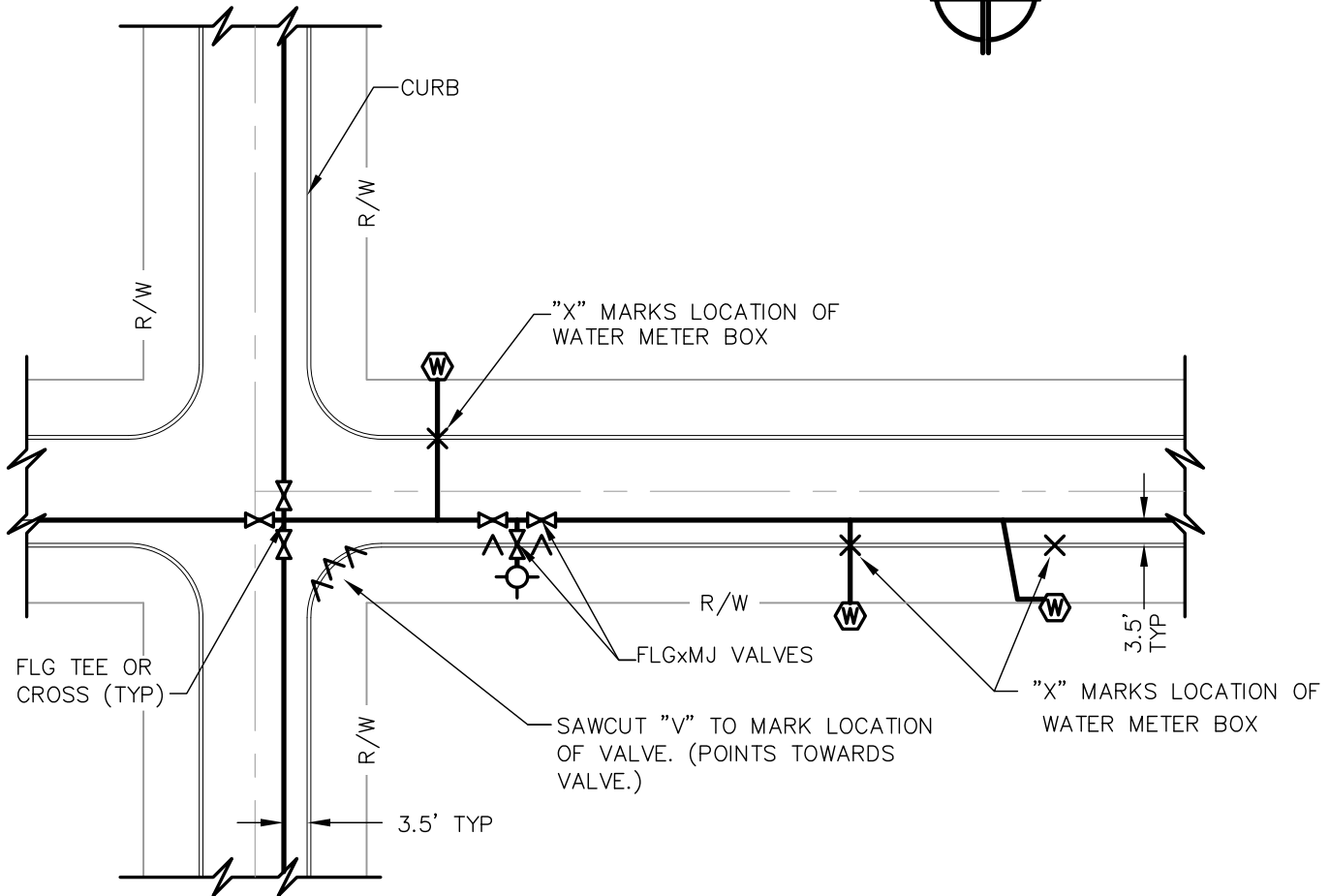
WO#: 140086

Project Name: example

Valve Number	Alignment	Design STA	Size	Turns to Close	Depth to Operator	Material	In Joint	Out Joint	Body	Function		Manufacturer	Open Direction	Normal Position	Operator
										System Valves	Control Valves				
1	example	1+34	8"	26.5	19	Ductile Iron	FLG	MJ	GATE	ISOLATION	n/a	MUELLER	LEFT	OPEN	NUT
2															
3															
4															
5															
6															
7															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

Note: This spreadsheet can be provided in .xls format with drop down menus.

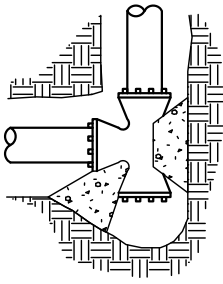
SECTION 3. STANDARD DETAILS



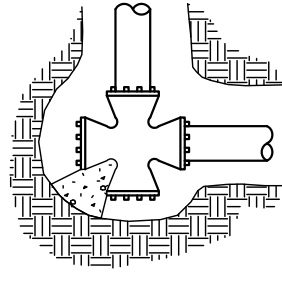
NOTES:

1. STREET CROSSING SERVICE TAPS, VALVES AND WATER METER BOX LOCATIONS SHALL BE MARKED WITH A SAW CUT INTO THE TOP SURFACE OF CURB.
2. SAW CUTS SHALL BE 1/8" WIDE AND 1/8" TO 3/16" DEEP.
3. VALVES SHALL NOT BE LOCATED IN SIDEWALK ACCESS RAMPS.
4. WHEN A VALVE IS ABANDONED, THE "V" THAT MARKS THE LOCATION SHALL BE TRANSFORMED INTO AN "A" WITH A SAW CUT.

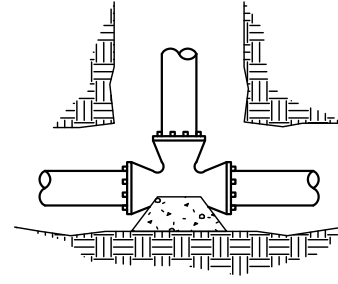
FUNC	BY	CHK	APP	<p>WATER STANDARDS CONSTRUCTION WATER DISTRIBUTION FACILITY TYPICAL PIPE LOCATION AND FIELD MARKINGS</p> <p>EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON</p>	SCALE: NTS			
DES	BIGELOW	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	ESR		
SPONSOR					REFORMAT AND UPDATE			
DATE: 06/11/10					DWG NO			REV
				WC10			1	



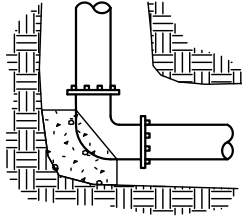
TEE



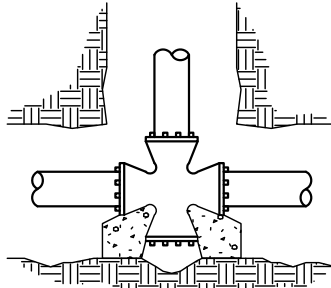
CROSS



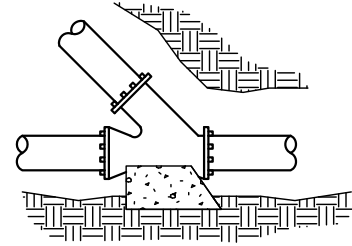
TEE



BEND



CROSS



WYE

NOTES:

1. USE ONLY WHEN SPECIFIED.
2. CONCRETE CAST AGAINST UNDISTURBED SOIL.
3. KEEP CONCRETE CLEAR OF FITTING ENDS.
4. DESIGN BASED ON 150 PSIG INTERNAL PRESSURE, FITTINGS AT 3' DEPTH WITH BAR RUN.
ANGLE OF INTERNAL FRICTION = 34°
5. SOIL BEARING PRESSURE = 2000 LB/SQ FT.
6. WHERE ASSUMED CONDITIONS ARE NOT VALID, ENGINEER SHALL DESIGN THRUST BLOCK.
7. PIPES LARGER THAN 16" REQUIRE THRUST BLOCKS TO BE DESIGNED BY AN ENGINEER.

BEARING AREA IN SQUARE FEET

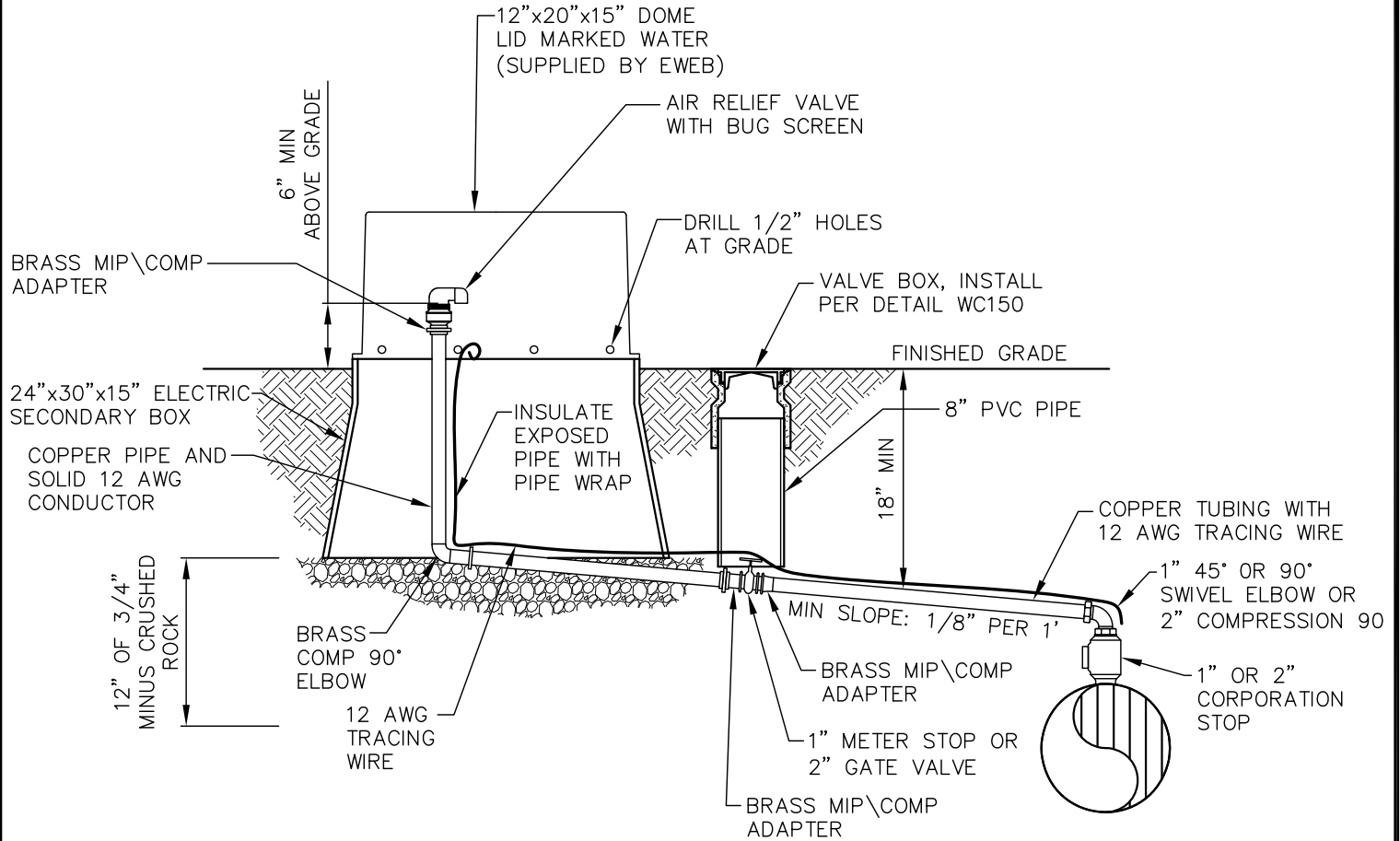
PIPE SIZE	PLUG, CAP, TEE, WYE, VALVE	90° BEND, PLUGGED CROSS	45° BEND	22.5° BEND	11.25° BEND
4"	1	2	1	1	0
6"	2	3	2	1	0
8"	4	6	3	2	1
10"	6	9	5	3	1
12"	9	13	7	4	2
16"	16	23	13	6	3

FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

WATER STANDARDS
 CONSTRUCTION
 GENERAL
 THRUST BLOCKS

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

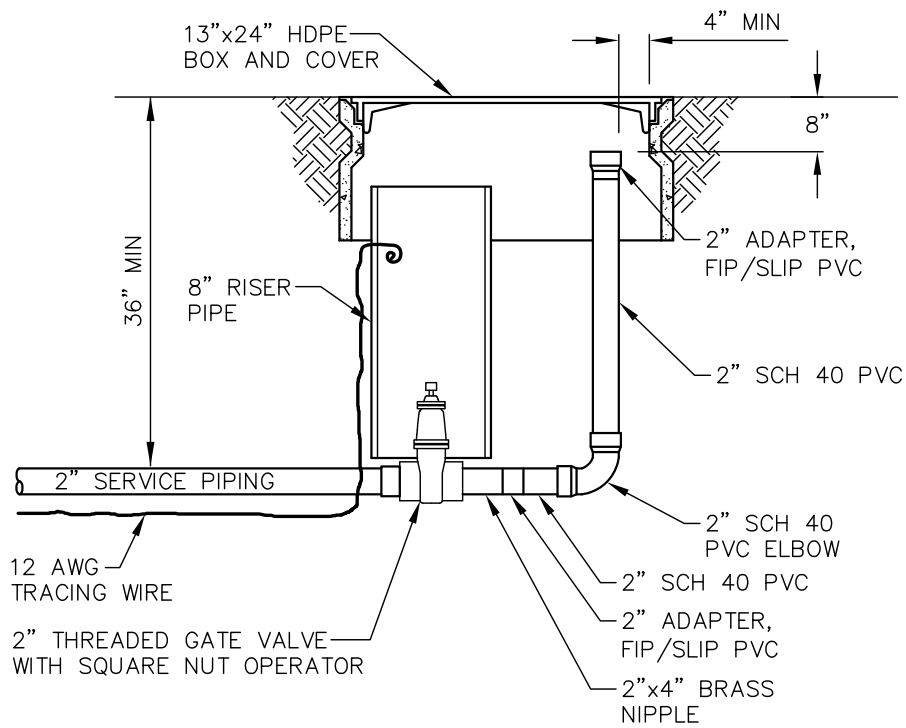
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REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC20			1



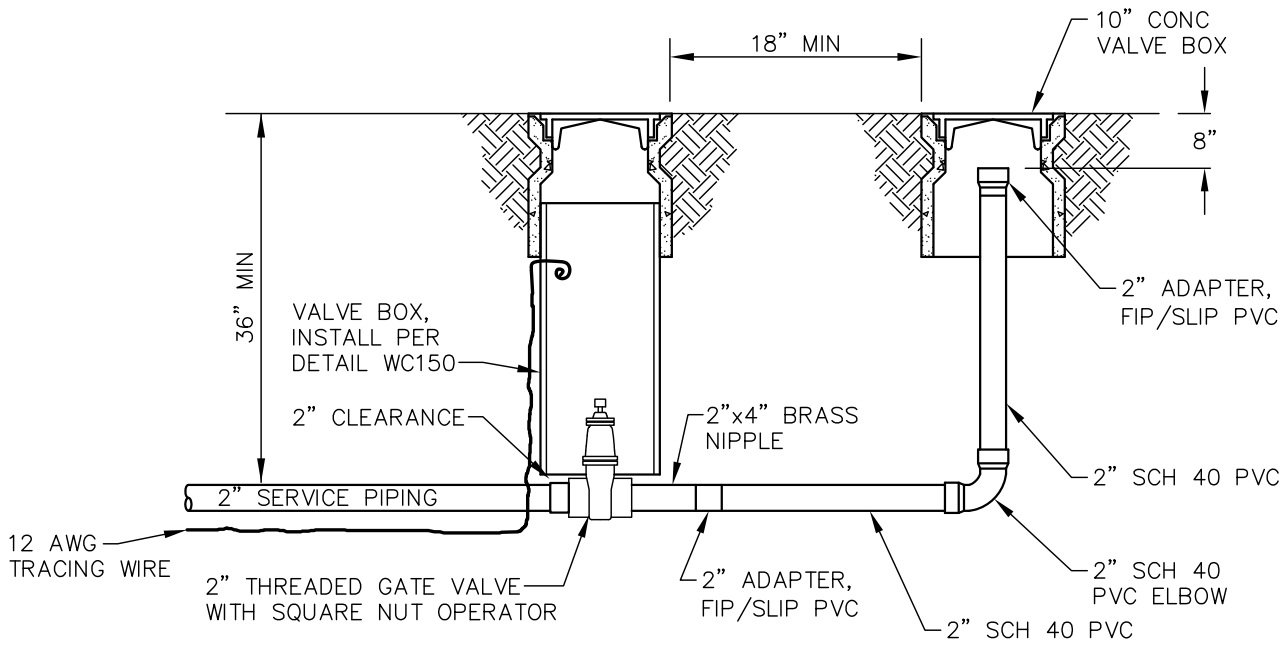
NOTES:

1. USE CORROSION CONTROL IF ON NON METALLIC MAIN – INSTALL POLYETHYLENE COATED OR WRAPPED COPPER PIPE AND WRAP ALL METALLIC FITTINGS WITH WAX TAPE, OR INSTALL CATHODIC PROTECTION.
2. LARGER AIR RELIEF VALVES TO BE DESIGNED ON A CASE BY CASE BASIS.

FUNC	BY	CHK	APP	<p>WATER STANDARDS CONSTRUCTION</p> <p>1" AND 2" COMBINATION AIR/VACUUM RELIEF VALVE</p> <p>EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON</p>	SCALE: NTS			
DES	WADE	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	ESR		
SPONSOR					REFORMAT AND UPDATE			
DATE: 06/11/10				DWG NO	REV			
				WC30	3			



LANDSCAPE APPLICATION



STANDARD INSTALLATION

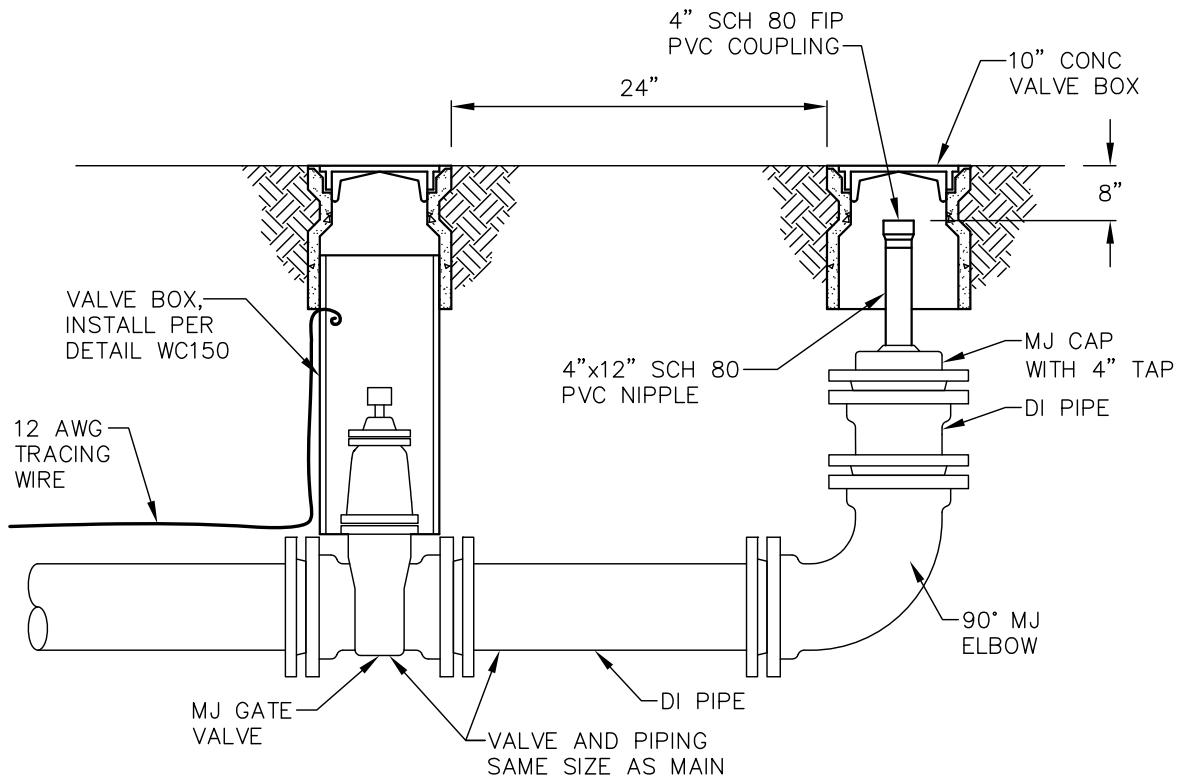
FUNC	BY	CHK	APP
DES	WADE	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

**WATER STANDARDS
CONSTRUCTION**

2" BLOW OFF

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

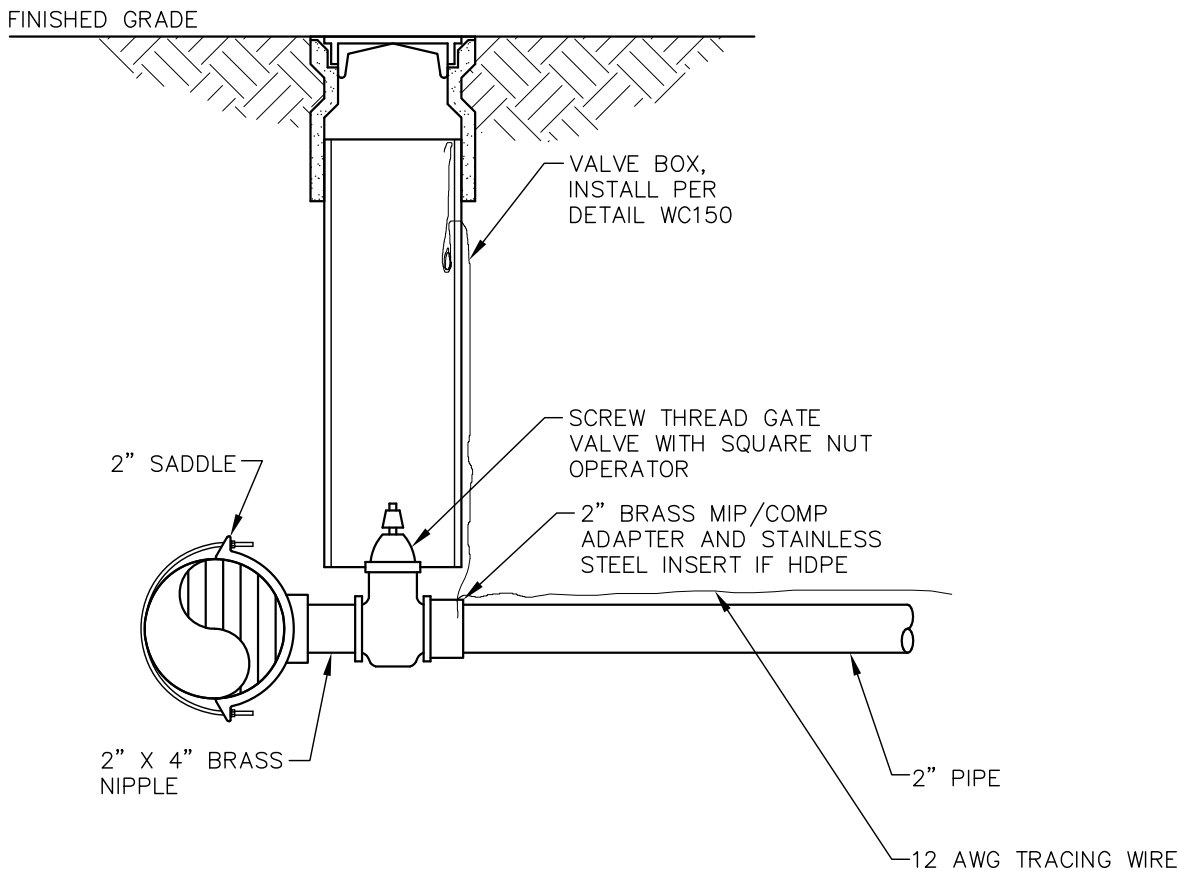
SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC40			2



NOTES:

1. 12" AND LARGER PIPING BLOW OFF REQUIREMENTS WILL BE DETERMINED ON A CASE BY CASE BASIS.
2. MECHANICALLY RESTRAIN ALL JOINTS.
3. FOR PERMANENT BLOW OFFS INSTALL TRACING WIRE PER VALVE BOX DETAIL WC150.
4. FOR TEMPORARY BLOW OFF INSTALLATIONS LEAVE 25' MINIMUM OF TRACING WIRE BELOW OPERATING NUT.

FUNC	BY	CHK	APP	<p>WATER STANDARDS CONSTRUCTION 4", 6", 8" AND 12" BLOW OFF</p> <p>EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON</p>	SCALE: NTS			
DES	BIGELOW	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	ESR		
SPONSOR					REFORMAT AND UPDATE			
DATE: 06/11/10					DWG NO			REV
				WC50			2	



FUNC	BY	CHK	APP
DES	WADE	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

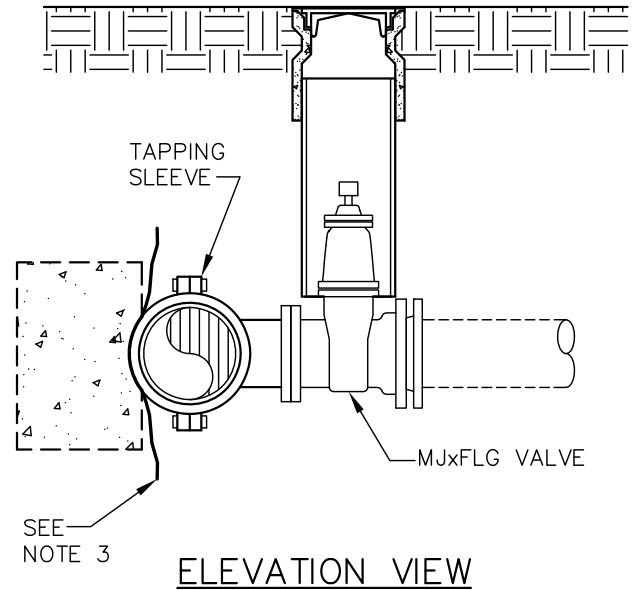
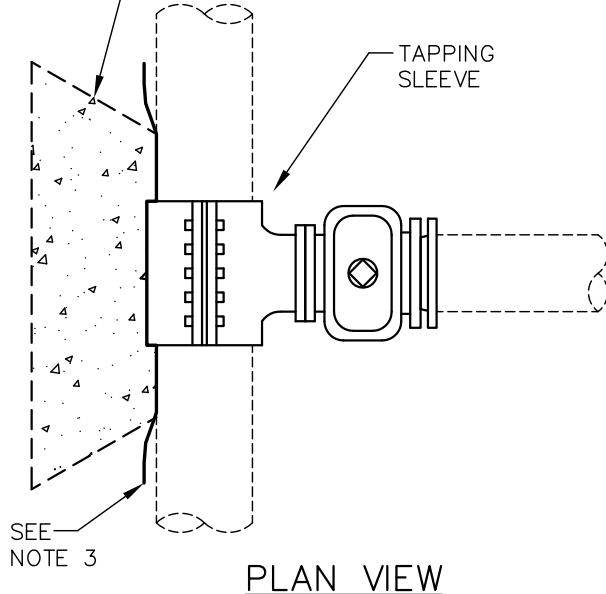
**WATER STANDARDS
CONSTRUCTION**

2" TAP OFF OF VARIOUS SIZED MAINS

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC60			2

CONSTRUCT THRUST BLOCK PER DETAIL WC20 FOR TEE INSTALLATION



NOTES:

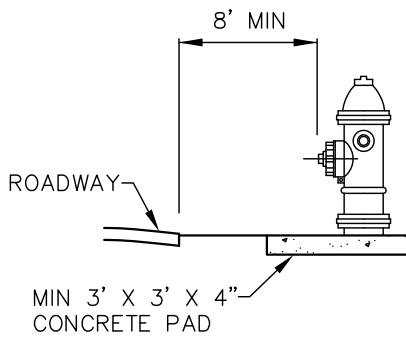
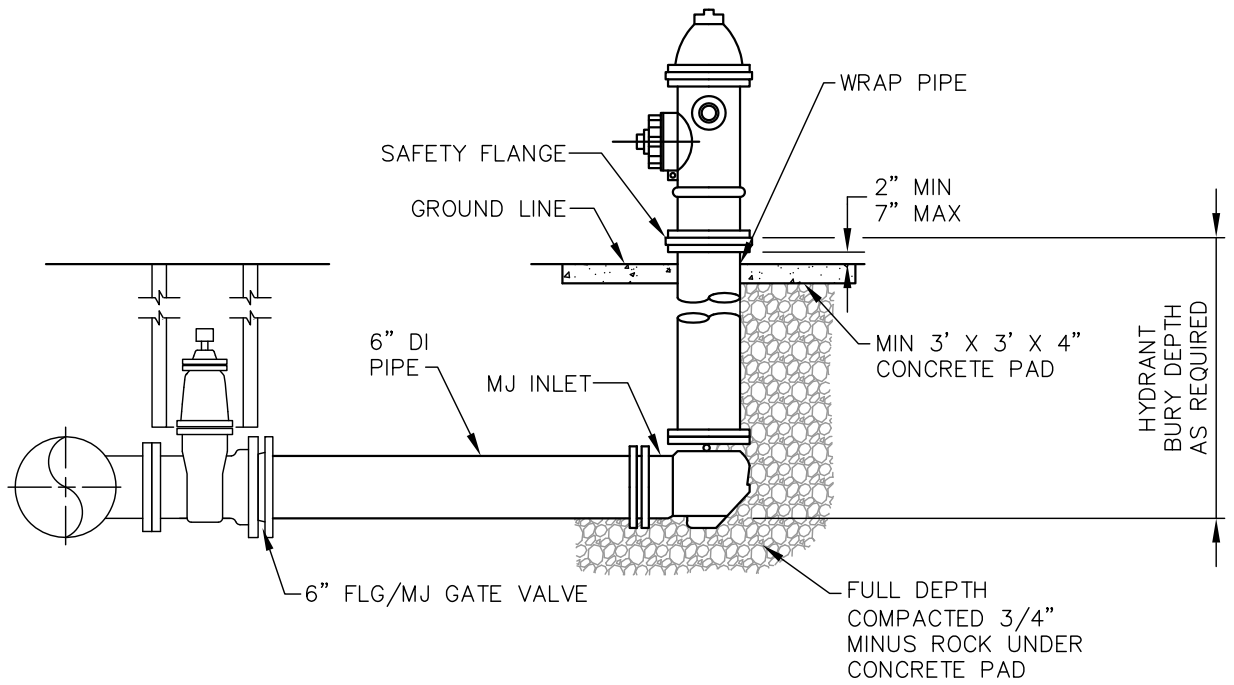
1. USE MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION OF ALL COMPONENTS.
2. VALVE SHALL BE POSITIONED SO TOP OF OPERATING NUT IS PLUMB WITH GROUND SURFACE.
3. PLACE 4 MIL PLASTIC SHEETING BETWEEN PIPE AND THRUST BLOCK.
4. THIS STANDARD DOES NOT APPLY TO CONCRETE CYLINDER PIPE

FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

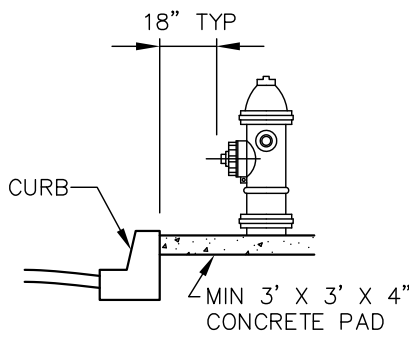
**WATER STANDARDS
 CONSTRUCTION
 TAPPING SLEEVE & VALVE
 4" AND LARGER TAPS (EWEB ONLY)**

EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

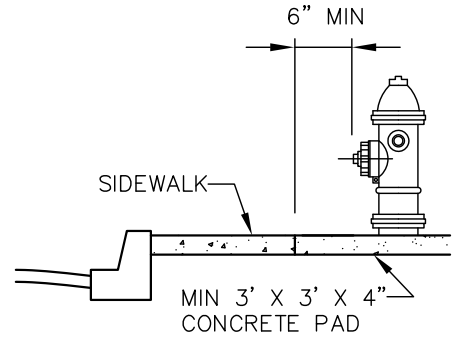
SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC70			2



CURBLESS ROAD



SET BACK SIDEWALK



CURB SIDEWALK

HYDRANT ORIENTATION

NOTES:

1. ALL JOINTS SHALL BE MECHANICALLY RESTRAINED.
2. HYDRANTS SHALL BE INSTALLED PLUMB AND LEVEL.
3. CENTER HYDRANT IN CONCRETE PAD

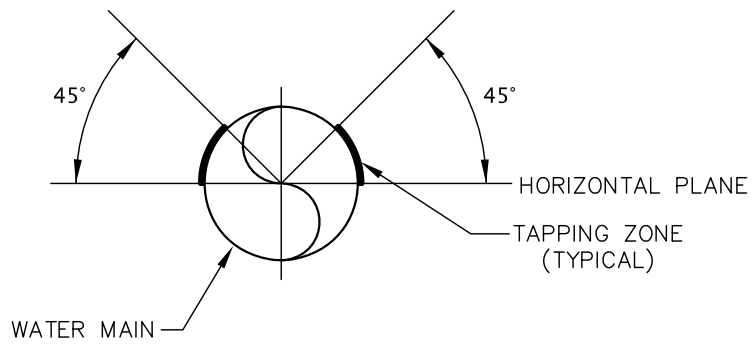
FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

**WATER STANDARDS
CONSTRUCTION**

FIRE HYDRANTS

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC80			2

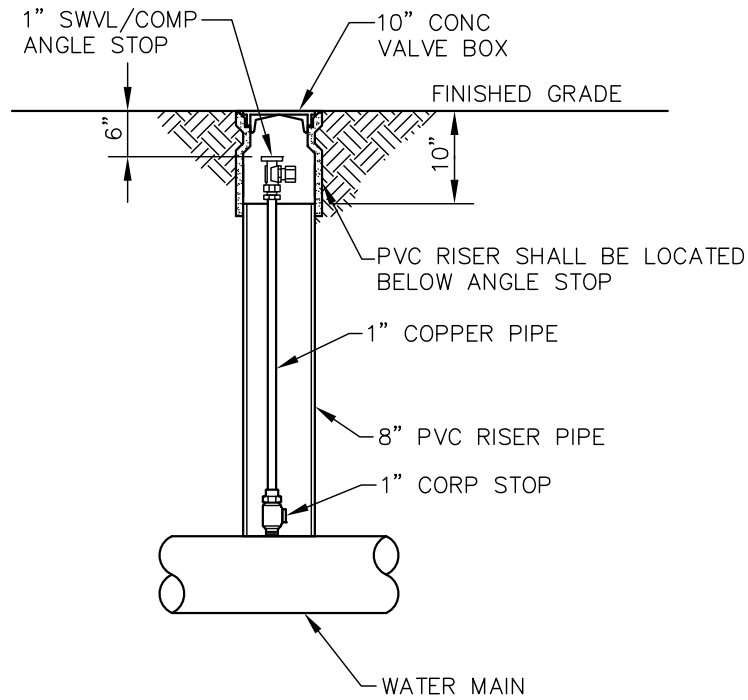


TYPICAL SECTION

NOTES:

1. ALL TAPS REQUIRE TAPPING SADDLES EXCEPT FOR 1" TAPS ON 6" AND LARGER DI MAINS WHICH MAY BE DIRECT TAPPED. 1" DIRECT TAPS SHALL HAVE MUELLER CC THREADS.
2. TAP TO BE ON SAME SIDE OF MAIN AS SERVICE.

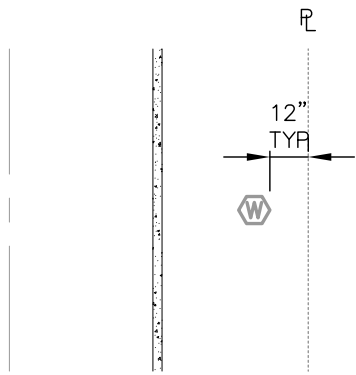
FUNC	BY	CHK	APP	WATER STANDARDS CONSTRUCTION GENERAL 1" & 2" TAPS EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON	SCALE: NTS			
DES	BIGELOW	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	ESR		
SPONSOR					REFORMAT AND UPDATE			
DATE: 06/11/10					DWG NO			REV
				WC90			1	



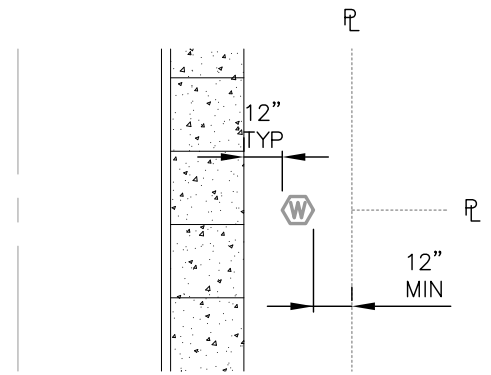
NOTES:

1. THE CORPORATION STOP SHALL BE INSTALLED IN THE OPEN POSITION.
2. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. OFFSET VALVE RISER PIPE APPROXIMATELY 2" TO ALLOW ACCESS TO CORP STOP OPERATOR.

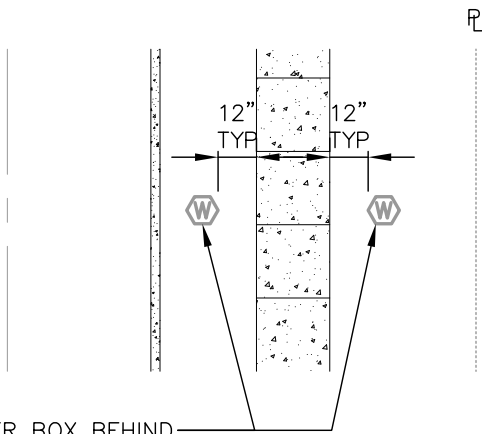
FUNC	BY	CHK	APP	WATER STANDARDS CONSTRUCTION 1" COPPER CHLORINATION SERVICE EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON				SCALE: NTS			
DES	WADE	CB	WM					REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM					09/23/15	ESR		
SPONSOR								REFORMAT AND UPDATE			
DATE: 06/11/10				DWG NO				REV			
				WC100				2			



NO SIDEWALK

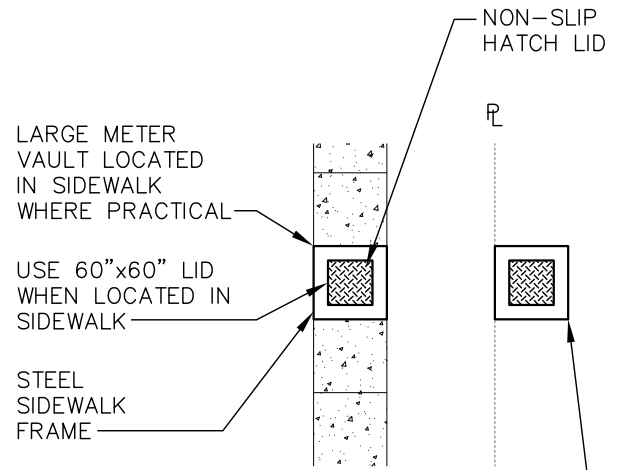


CURB SIDE SIDEWALK



INSTALL METER BOX BEHIND SIDEWALK IF ADEQUATE ROW AND SPACE AVAILABLE. OTHERWISE INSTALL IN PLANTER STRIP.

SETBACK SIDEWALK



IF A VAULT LOCATION IN OR BEHIND SIDEWALK IS IMPRACTICAL PLACE ON PRIVATE PROPERTY WITH EASEMENT EXTENDING A MINIMUM 5' BEYOND EWEB INFRASTRUCTURE.

LARGE METER BOX LOCATIONS

FUNC	BY	CHK	APP
DES	IRVIN	CB	WM
DWN	ESR	ESR	WM
SPONSOR			
DATE: 09/03/15			

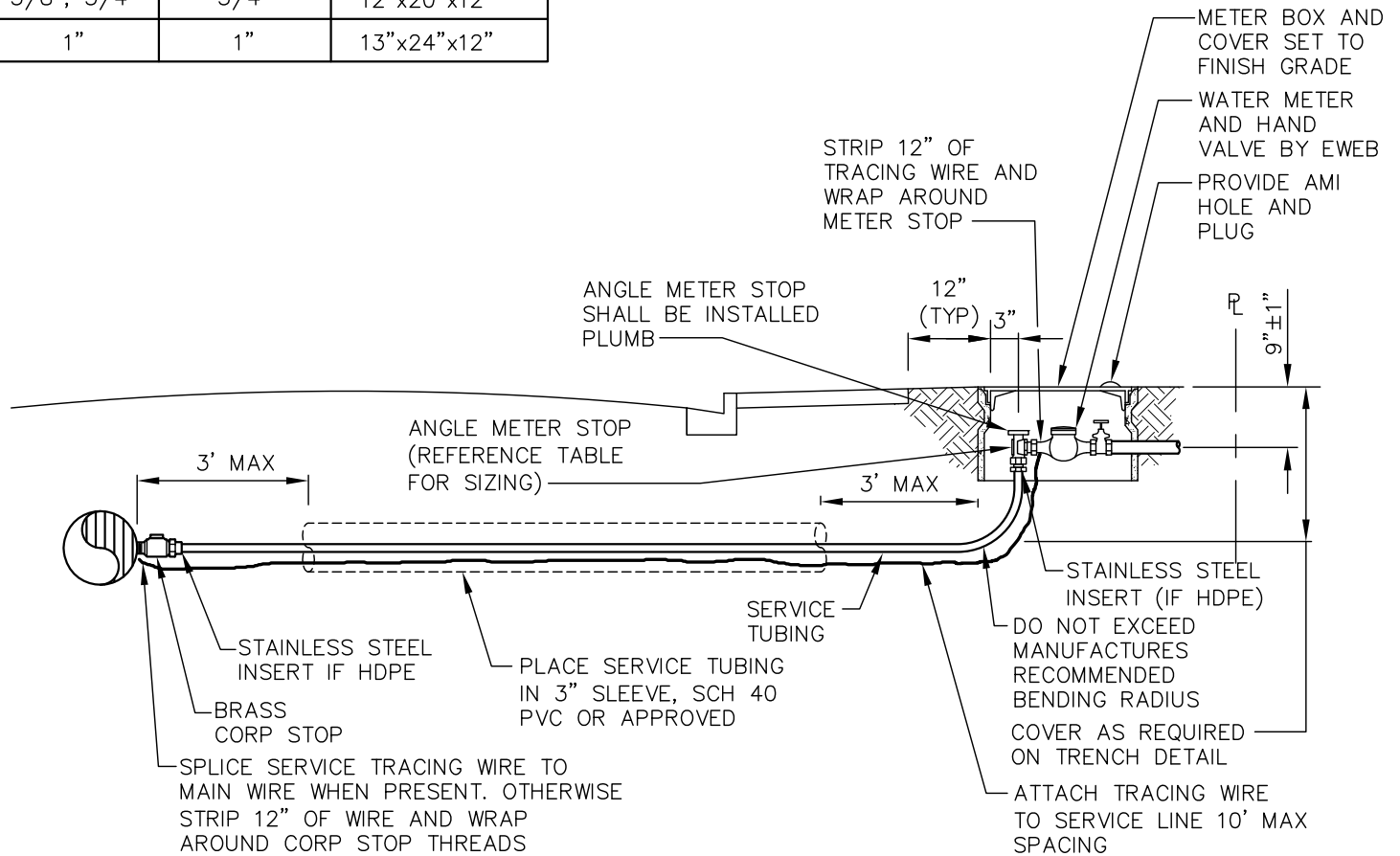
WATER STANDARDS
 CONSTRUCTION

 TYPICAL METER BOX LOCATION

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC109			0

METER SIZE	ANGLE METER STOP SIZE	REQUIRED METER BOX SIZE LxWxD
5/8", 3/4"	3/4"	12"x20"x12"
1"	1"	13"x24"x12"



NOTES:

1. THE CORPORATION STOP SHALL BE INSTALLED IN THE OPEN POSITION.
2. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. WRAP ALL BURIED METAL PARTS WITH WAX TAPE IF POLY WRAPPED MAIN.
4. ALL SERVICE TUBING SHALL BE BACKFILLED WITH 3/4" MINUS CRUSHED ROCK. EXTRA CARE SHALL BE TAKEN TO ENSURE PROPER SUPPORT OF THE HDPE PIPE SO THE PIPE MATERIAL WILL NOT DEFORM OVER TIME. ALL BACKFILL SHALL BE TO 95% COMPACTION.
5. CONNECT TRACING WIRE TO EXISTING TRACING WIRE ON PIPE OR TO METAL SURFACE OF METAL PIPE OR FITTING, WRAP EXPOSED WIRE.
6. BORED SERVICE CROSSINGS SUBJECT TO APPROVAL.
7. IF MAIN IS OUTSIDE OF STREET AND SERVICE LINE DOES NOT CROSS STREET, NO SLEEVE IS REQUIRED.
8. TAPS SHALL BE DONE IN ACCORDANCE WITH DRAWING WC90.
9. UP TO TWO SERVICES MAY BE INSTALLED IN THE 3" SLEEVE.

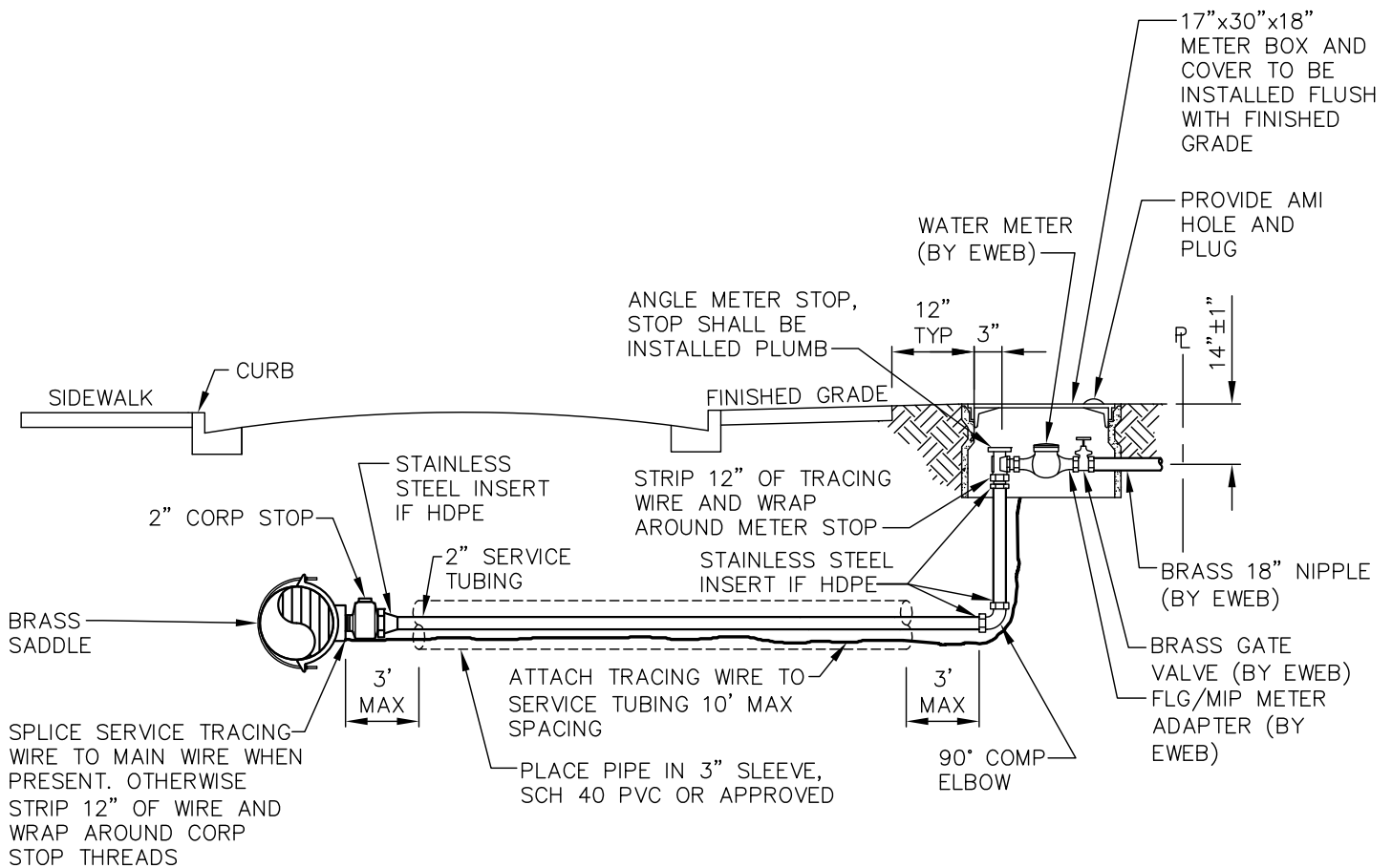
FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

**WATER STANDARDS
CONSTRUCTION**

1" SERVICES

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

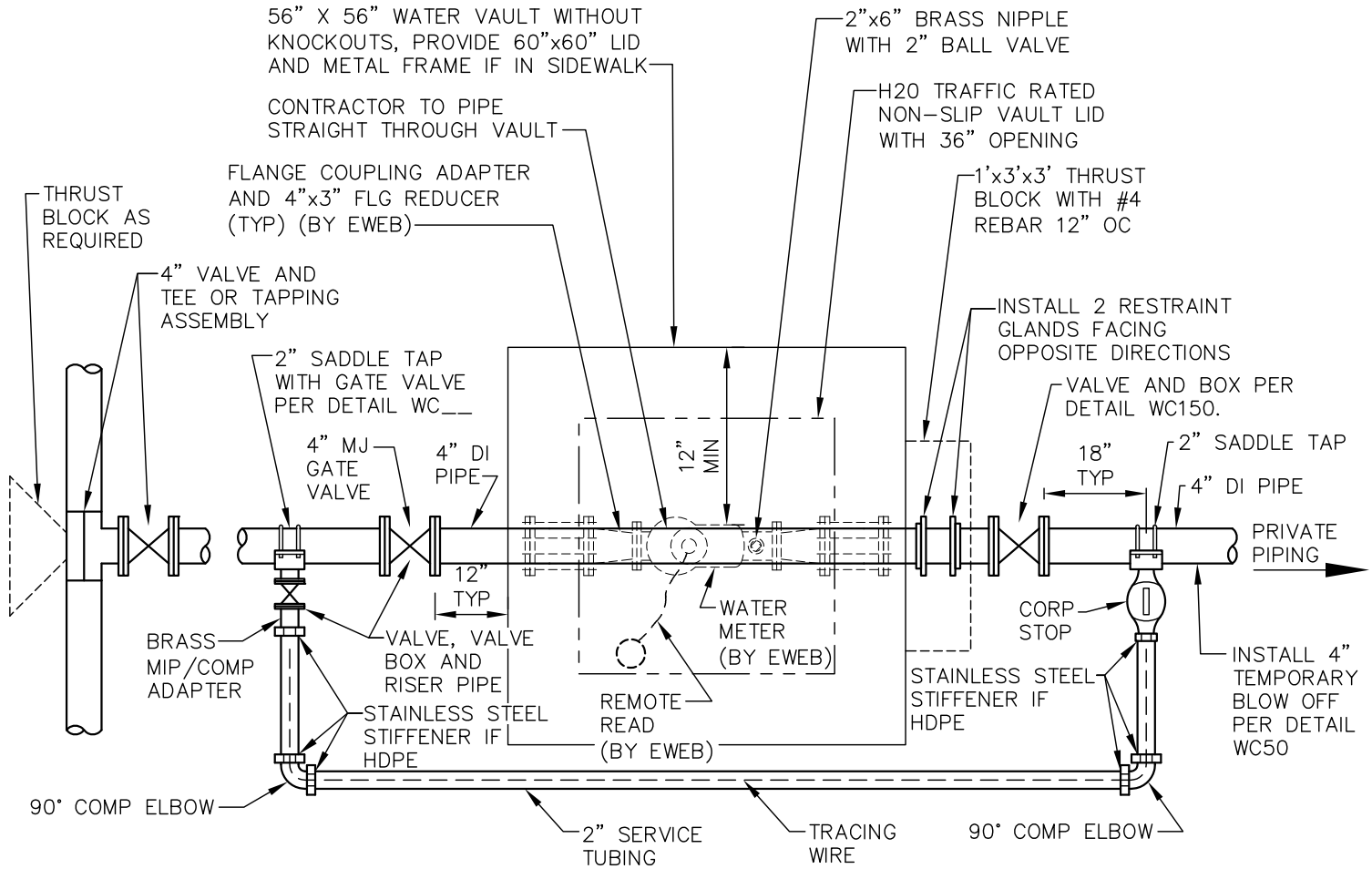
SCALE: NTS			
REV DATE	BY	CHK	APP
4-7-16	ESR		
ADDED TABLE & UPDATE ANGLE METER NOTES			
DWG NO			REV
WC110			3



NOTES:

1. THE CORPORATION STOP SHALL BE INSTALLED IN THE OPEN POSITION.
2. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. WRAP ALL BURIED METAL PARTS WITH WAX TAPE WHEN MAIN IS POLYWRAPPED.
4. EXTRA CARE SHALL BE TAKEN DURING BACKFILL TO ENSURE PROPER SUPPORT OF THE HDPE PIPE SO THE PIPE MATERIAL WILL NOT DEFORM OVER TIME.
5. FOR CRITICAL WATER USERS, AS DETERMINED BY EWEB, PREFAB METER SETTER ASSEMBLY WITH BYPASS MAY BE REQUIRED.
6. NO SLEEVE IS REQUIRED IF SERVICE IS LESS THAN 6" IN LENGTH.

FUNC	BY	CHK	APP	WATER STANDARDS CONSTRUCTION 1 1/2" AND 2" SERVICES EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON	SCALE: NTS			
DES	BIGELOW	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	ESR		
SPONSOR					REFORMAT AND UPDATE			
DATE: 06/11/10					DWG NO			REV
				WC120			3	



NOTES:

1. PAINT BY-PASS VALVE BOX YELLOW.
2. CORE DRILL ALL VAULT PENETRATIONS AND PROVIDE LINK SEALS WITH SST HARDWARE, OR APPROVED.
3. BYPASS NOT REQUIRED FOR IRRIGATION SERVICES.
4. PROVIDE 12" OF CLEARANCE BETWEEN PIPE AND FLOOR.
5. LOCATE METER VAULT IN SIDEWALK WHEN PRACTICABLE.

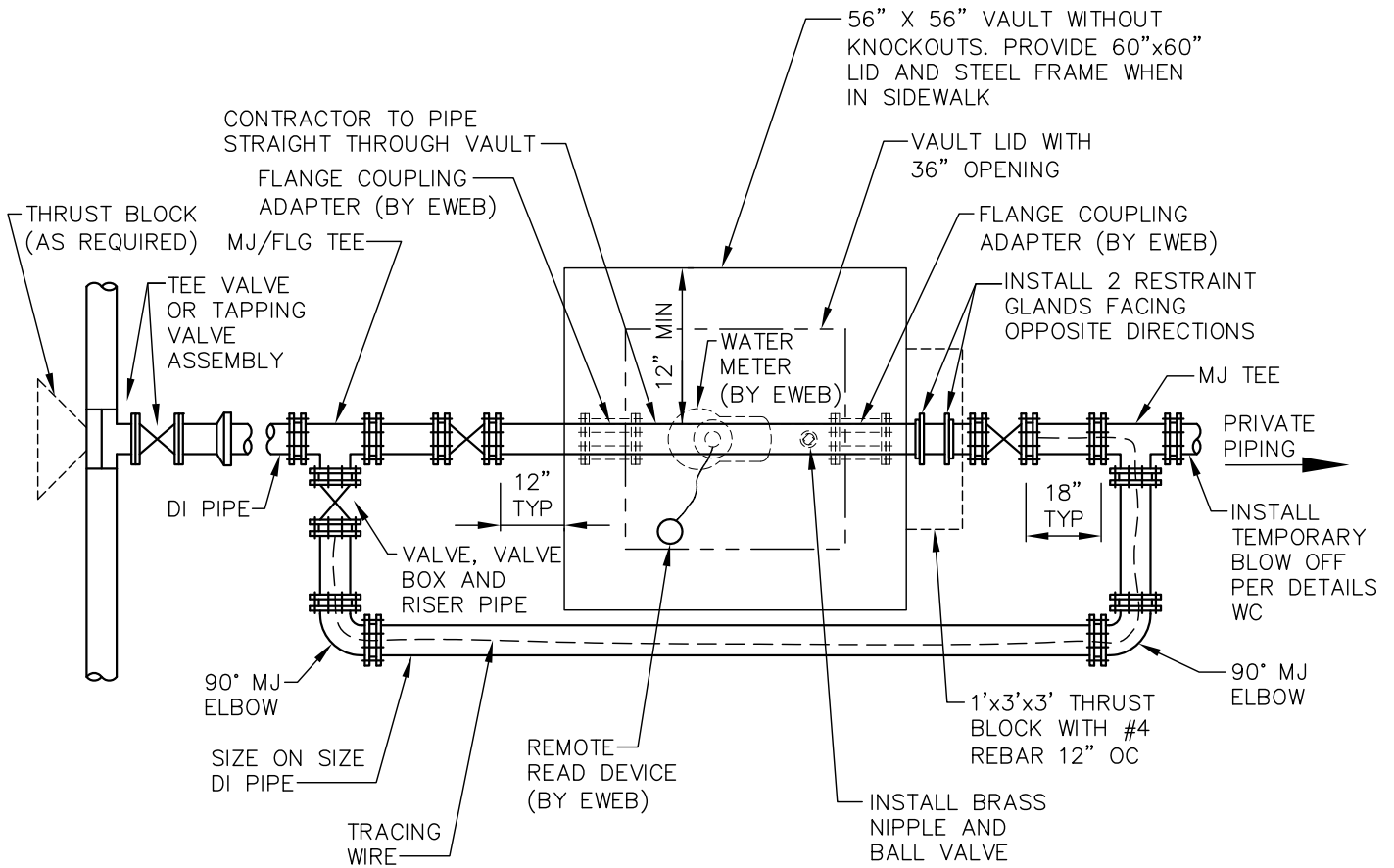
FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

**WATER STANDARDS
CONSTRUCTION**

3" SERVICES

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC130			2



NOTES:

1. PAINT BY-PASS VALVE BOX YELLOW.
2. BYPASS NOT REQUIRED FOR IRRIGATION SERVICES.
3. ALL PIPING AND VALVE TO MATCH METER SIZE.
4. RESTRAIN ALL JOINTS.
5. PROVIDE 12" CLEARANCE BETWEEN PIPE AND FLOOR.
6. CORE DRILL ALL VAULT PENETRATIONS AND PROVIDE LINK SEALS WITH SST HARDWARE.
7. LOCATE METER VAULT IN SIDEWALK WHEN PRACTICABLE.

FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

**WATER STANDARDS
CONSTRUCTION**

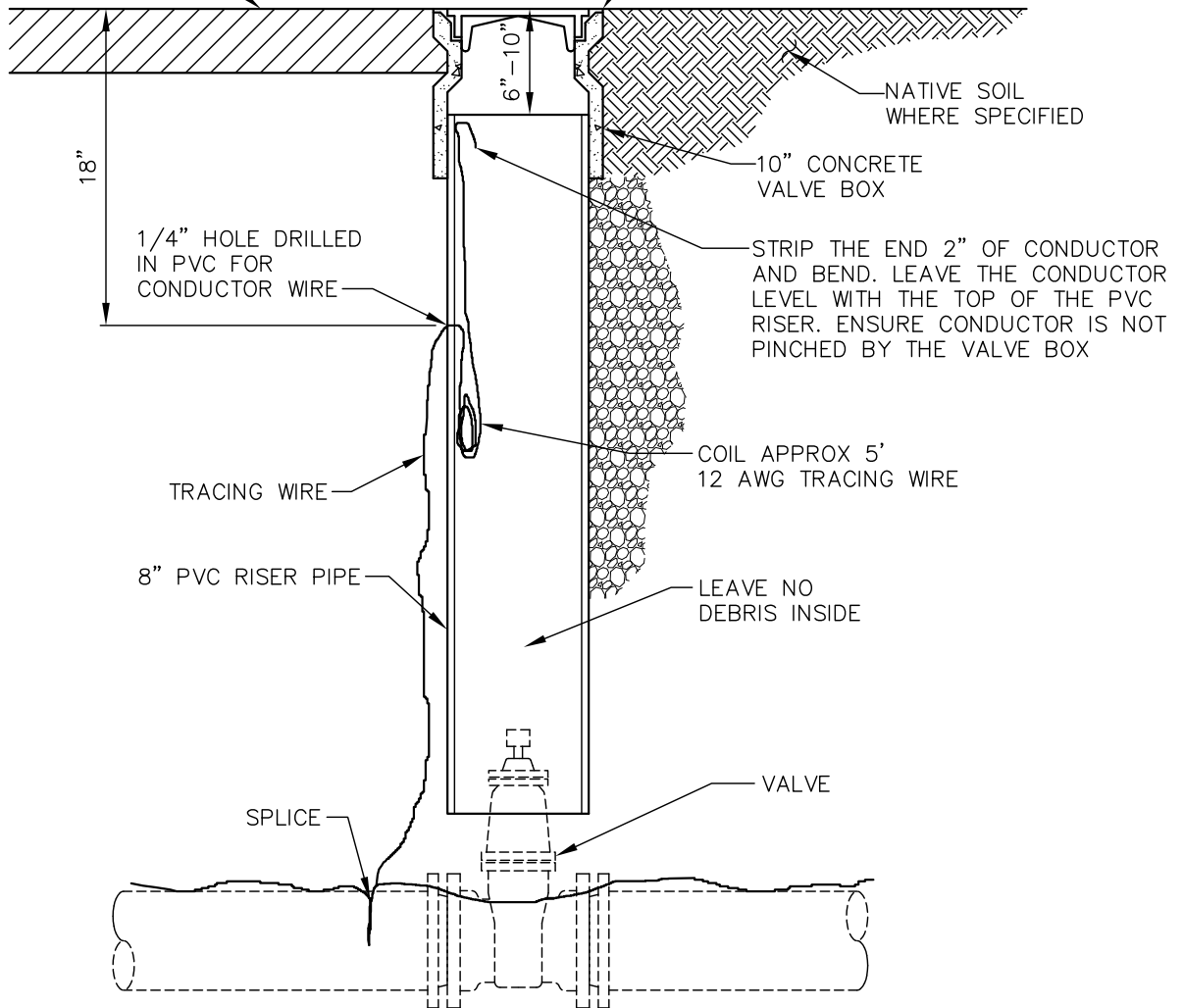
4" THROUGH 8" SERVICES

 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC140			2

SURFACE RESTORATION
AND BACKFILL PER
TRENCH DETAIL WC220

SET VALVE BOX FLUSH
WITH FINISHED GRADE



NOTES:

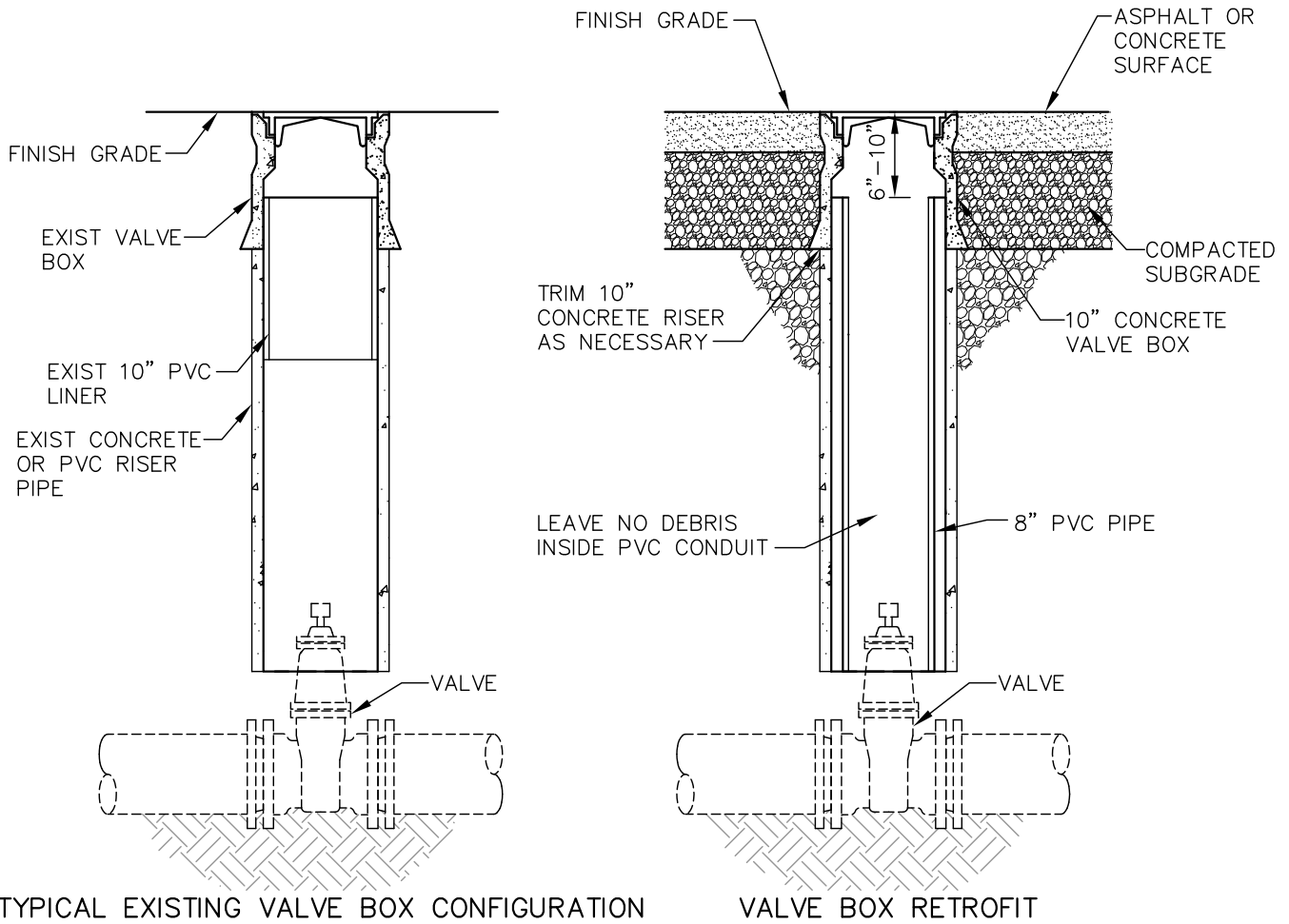
1. INSTALL VALVE BOX AND PVC PIPE IN A VERTICAL POSITION, CENTERED OVER VALVE NUT.
2. BACKFILL TO BOTTOM OF VALVE BOX USING 3/4"-0" CRUSHED ROCK.
3. CUT PVC PIPE TO REQUIRED LENGTH.

FUNC	BY	CHK	APP
DES	BIGELOW	CB	WM
DWN	NLN	SLA	WM
SPONSOR			
DATE: 06/11/10			

**WATER STANDARDS
CONSTRUCTION
VALVE BOXES
TYPICAL INSTALLATION**

EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	NLN		
REFORMAT AND UPDATE			
DWG NO			REV
WC150			3



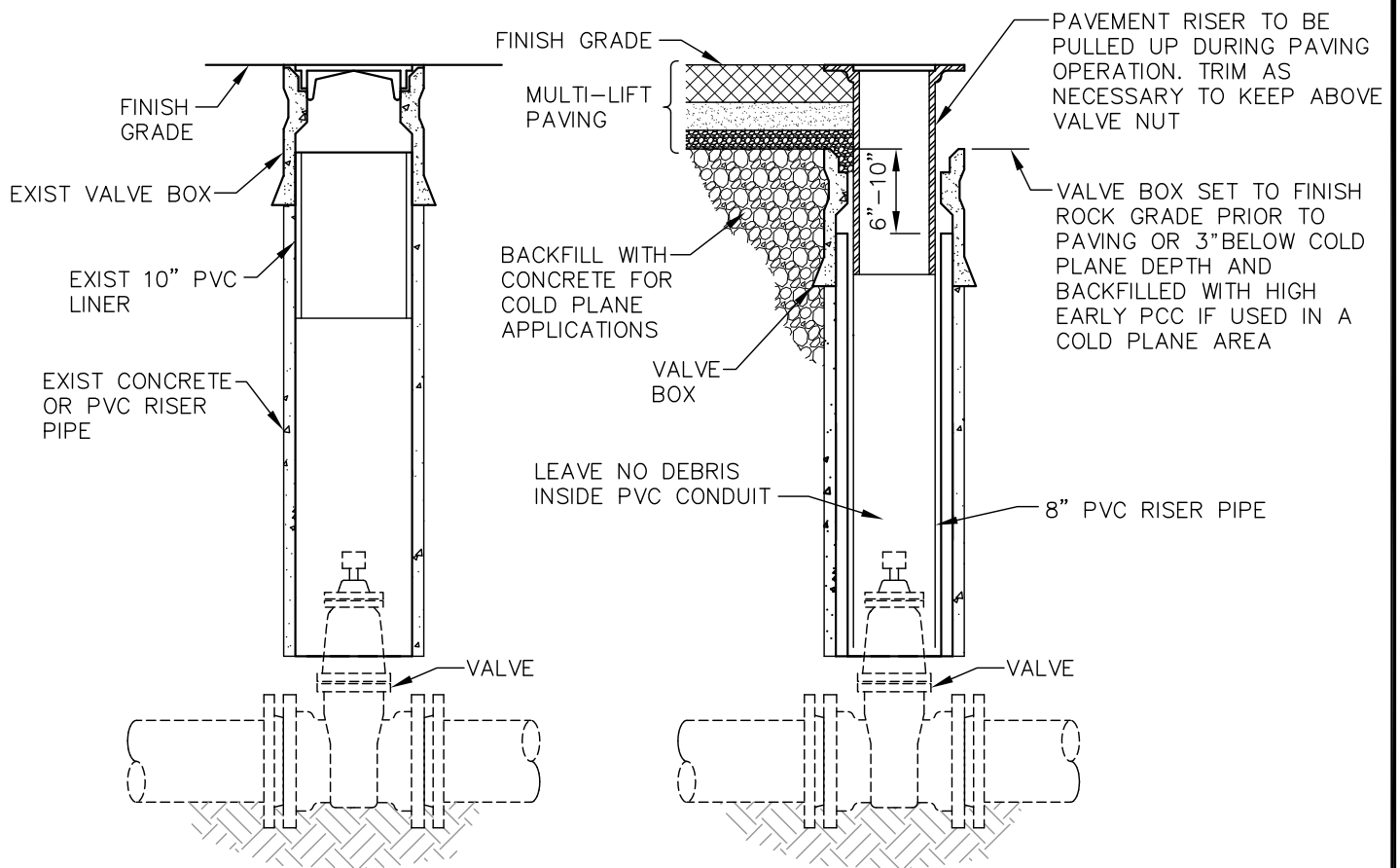
NOTES:

1. USE FOR STREET/SIDEWALK REBUILD WHEN VALVE BOX IS SET TO GRADE PRIOR TO PAVING OR PCC PLACEMENT.
2. REMOVE ALL MATERIAL AROUND VALVE BOX.
3. REMOVE EXISTING VALVE BOX AND DISCARD.
4. IF EXISTING RISER IS 8" PVC, IT MAY BE REUSED.
5. IF EXISTING RISER IS 10" CONCRETE THEN DO ONE OF THE FOLLOWING:
 - A. REMOVE EXISTING 10" CONCRETE RISER AND REPLACE IT WITH 8" PVC PIPE, CENTERED OVER VALVE NUT.
 - B. IF CONCRETE RISER IS CENTERED OVER VALVE NUT, INSTALL A NEW 8" PVC PIPE INSIDE EXISTING 10" VALVE RISER.
9. INSTALL NEW VALVE BOX AND LID TO FINISHED GRADE.

FUNC	BY	CHK	APP
DES	WADE		WM
DWN	NLN		WM
SPONSOR			
DATE: 01/08/15			

WATER STANDARDS
 CONSTRUCTION
 TYPICAL VALVE BOX RETROFIT
 ASPHALT/CONCRETE SURFACE REBUILD
 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	NLN		
REFORMAT AND UPDATE			
DWG NO			REV
WC160			1

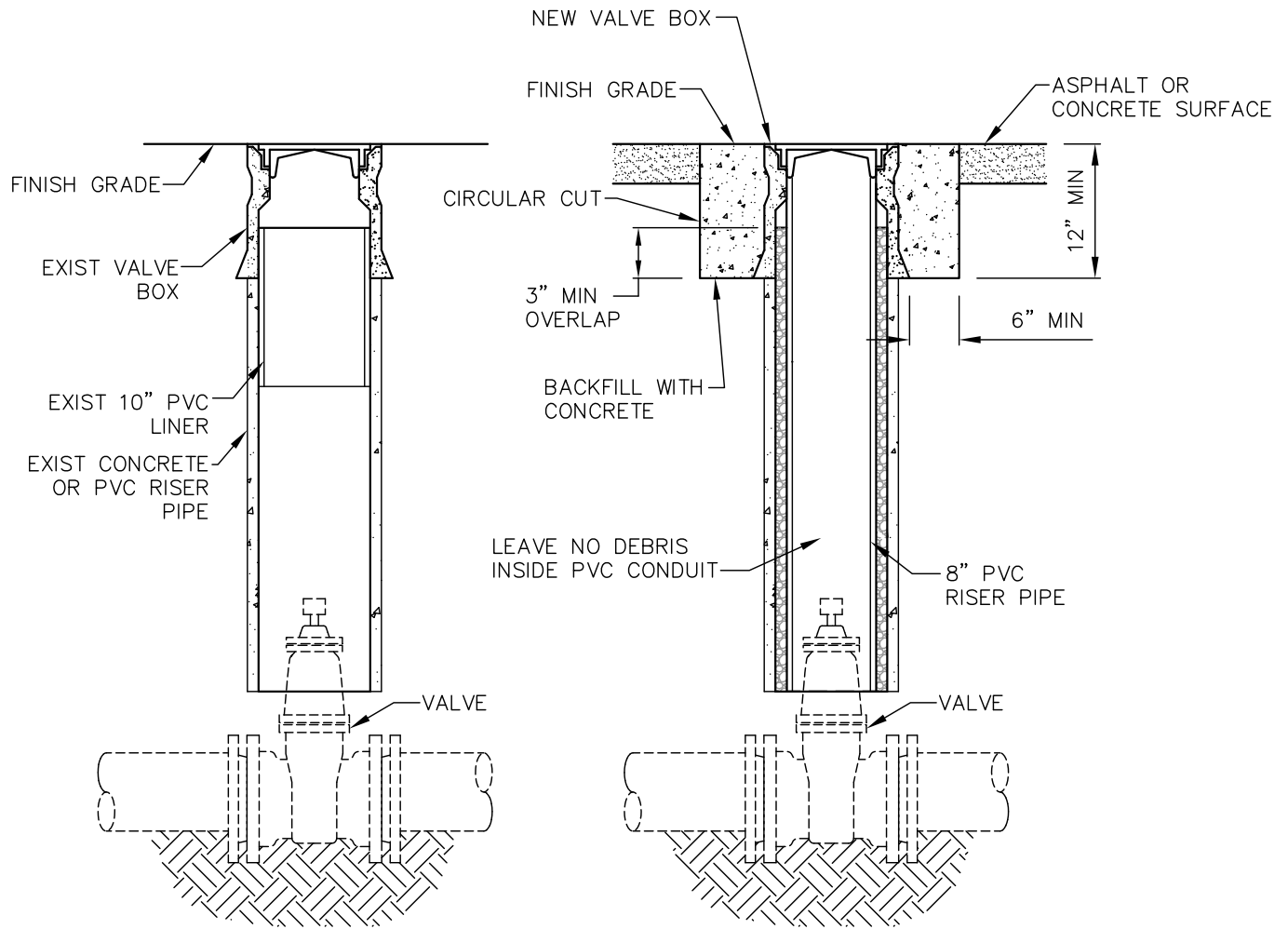


TYPICAL EXISTING VALVE BOX CONFIGURATION VALVE BOX RETROFIT

NOTES:

1. USE THIS STANDARD FOR STREET REBUILDS WITH MULTIPLE LIFT ASPHALT OR COLD PLANE WITH ASPHALT PAVING.
2. IDENTIFY AND DOCUMENT ALL VALVE LOCATIONS.
3. REMOVE ALL MATERIAL AROUND VALVE BOX.
4. REMOVE EXISTING VALVE BOX. DISCARD IF DAMAGED
5. IF EXISTING RISER IS 8" PVC, IT MAY BE REUSED. TRIM TO REQUIRED HEIGHT.
6. IF EXISTING RISER IS 10" CONCRETE THEN DO ONE OF THE FOLLOWING:
 - A. REMOVE EXISTING 10" CONCRETE RISER AND REPLACE IT WITH 8" PVC PIPE, CENTERED OVER VALVE NUT.
 - B. IF CONCRETE RISER IS CENTERED OVER VALVE NUT, INSTALL A NEW 8" PVC PIPE INSIDE EXISTING 10" VALVE RISER.
9. FOR STREET RECONSTRUCT, INSTALL NEW VALVE BOX TO FINISH ROCK GRADE. WHEN A COLD PLANING, INSTALL VALVE BOX 3" BELOW COLD PLANE DEPTH AND BACKFILL PORTLAND CEMENT CONCRETE TO TOP OF VALVE BOX GRADE. COVER WITH TEMPORARY ASPHALT UNTIL PAVING.
10. INSTALL NEW VALVE BOX PAVING RISER AND PULL UP WITH EACH NEW PAVING LIFT.

FUNC	BY	CHK	APP	WATER STANDARDS CONSTRUCTION TYPICAL VALVE BOX RETROFIT STREET REBUILD W/ MULTI LIFT ASPHALT OR COLD PLANE EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON	SCALE: NTS			
DES	WADE	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	NLN	WM		09/23/15	NLN		
SPONSOR					REFORMAT AND UPDATE			
DATE: 01/24/12					DWG NO			REV
				WC170			4	

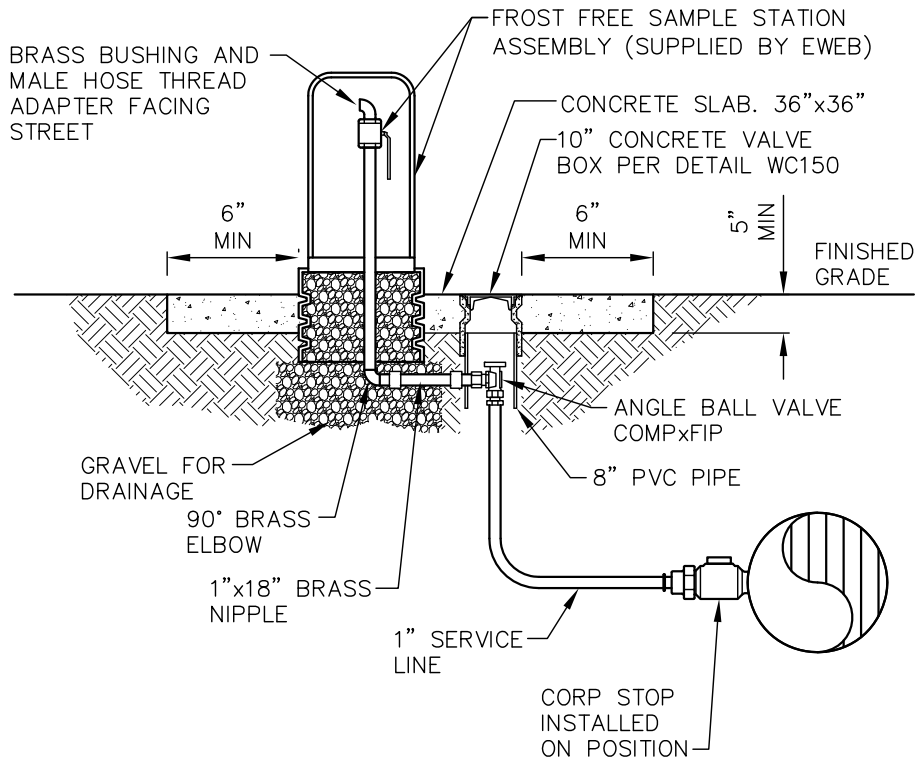


TYPICAL EXISTING VALVE BOX CONFIGURATION VALVE BOX RETROFIT

NOTES:

1. USE THIS STANDARD ANYTIME A STREET CUT IS REQUIRED TO REPLACE THE VALVE BOX.
2. IDENTIFY AND DOCUMENT ALL VALVE LOCATIONS. REMOVE OR LOWER VALVE BOX PRIOR TO COLD PLANING AS NECESSARY.
3. MAKE A CIRCULAR CUT THROUGH EXISTING PAVING AND PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE OUTSIDE OF THE VALVE BOX. AFTER THE CIRCULAR CUT IS MADE, REMOVE ALL MATERIAL TO DEPTH OF VALVE BOX.
4. REMOVE EXISTING VALVE BOX AND DISCARD.
5. IF EXISTING RISER IS 8" PVC, IT MAY BE REUSED.
6. IF EXISTING RISER IS 10" CONCRETE THEN DO ONE OF THE FOLLOWING:
 - A. REMOVE EXISTING 10" CONCRETE RISER AND REPLACE IT WITH 8" PVC PIPE, CENTERED OVER VALVE NUT.
 - B. IF CONCRETE RISER IS CENTERED OVER VALVE NUT, INSTALL A NEW 8" PVC PIPE INSIDE EXISTING 10" VALVE RISER.
9. INSTALL NEW VALVE BOX AND LID TO FINISHED GRADE.
10. CONCRETE COLLAR REQUIREMENTS, PER JURISDICTIONAL AUTHORITY REQUIREMENTS.

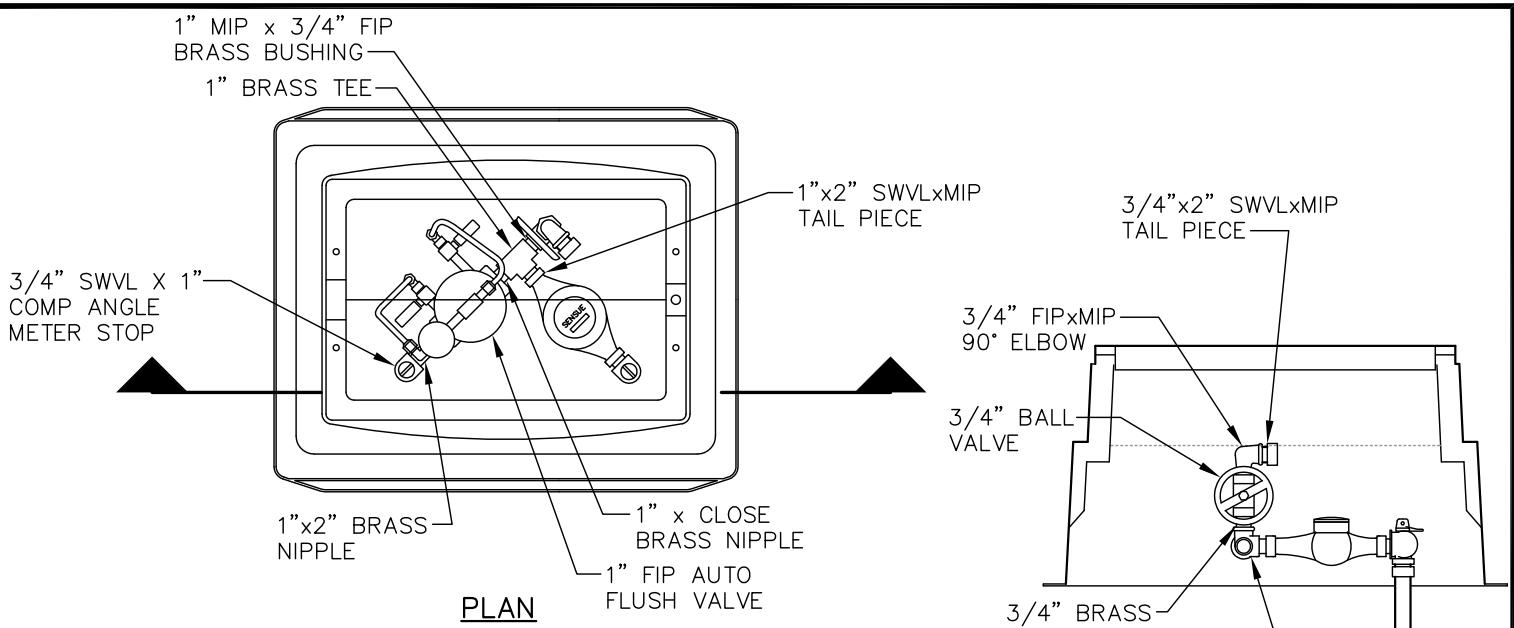
FUNC	BY	CHK	APP	<p>WATER STANDARDS CONSTRUCTION TYPICAL VALVE BOX RETROFIT WHEN CIRCULAR CUT IS REQUIRED</p> <p>EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON</p>	SCALE: NTS			
DES	WADE	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	NLN		
SPONSOR					REFORMAT AND UPDATE			
DATE: 01/24/12					DWG NO			REV
				WC171			0	



NOTES:

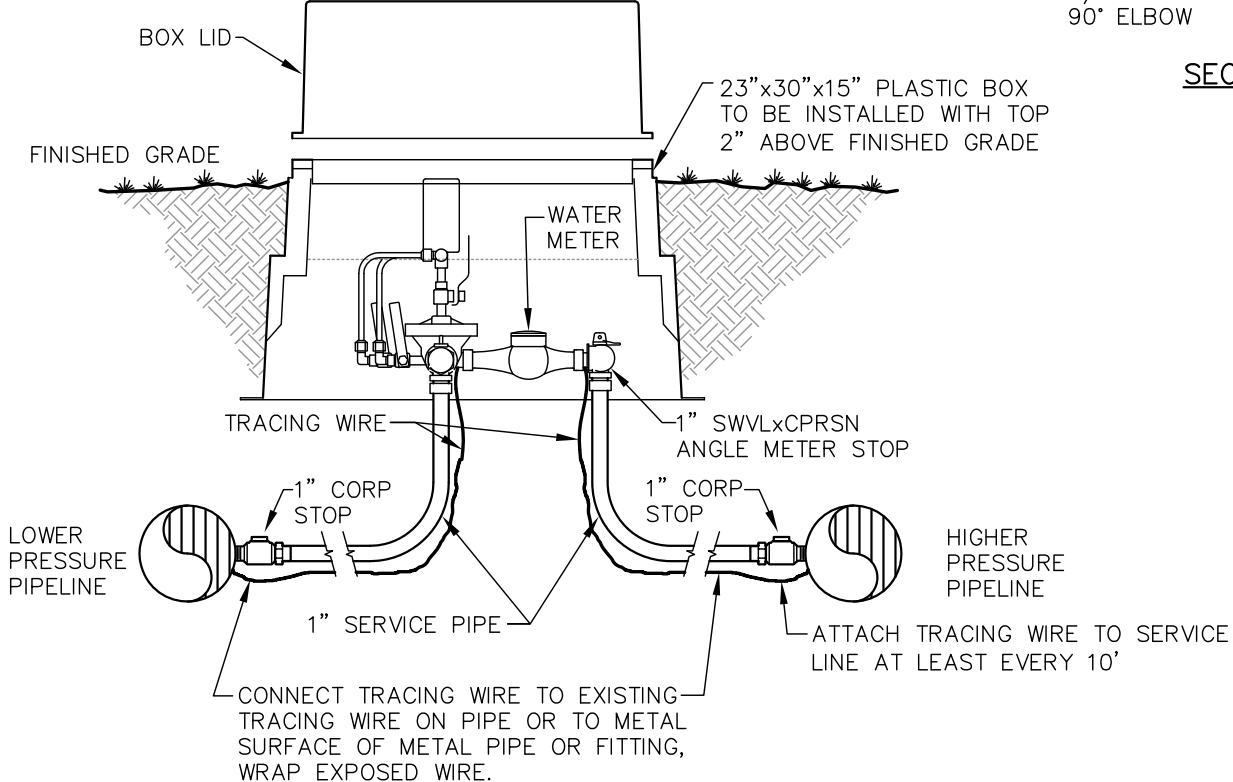
1. SAMPLE STATION MUST ADHERE TO CITY ADMINISTRATIVE RULE R-7.302-D FOR LOCATION OF ABOVE GROUND FACILITIES.
2. IF ON NON-METALLIC MAIN, INSTALL POLYETHYLENE COATED OR WRAPPED COPPER PIPE AND WRAP ALL METALLIC FITTINGS WITH WAX TAPE.

FUNC	BY	CHK	APP	<p>WATER STANDARDS CONSTRUCTION</p> <p>WATER SAMPLING STATION</p> <p>EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON</p>	SCALE: NTS			
DES	WADE	CB	WM		REV DATE	BY	CHK	APP
DWN	NLN	SLA	WM		09/23/15	NLN		
SPONSOR					REFORMAT AND UPDATE			
DATE: 06/11/10					DWG NO			REV
				WC180			2	



PLAN

SECTION



ELEVATION

NOTES:

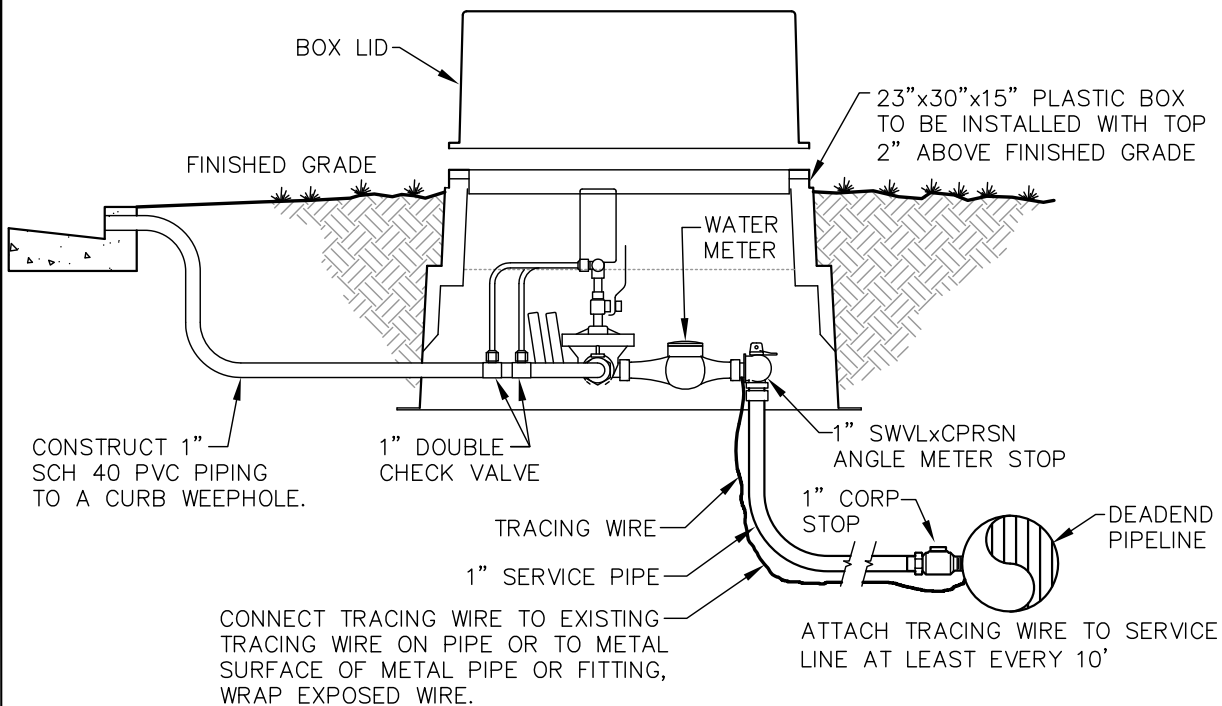
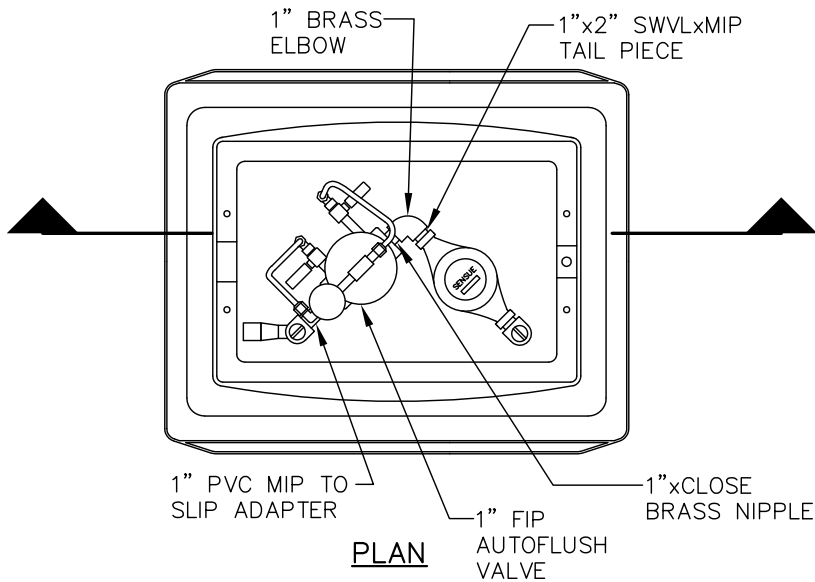
1. THE CORPORATION STOPS SHALL BE INSTALLED IN THE OPEN POSITION.
2. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. WRAP ALL METAL PARTS WITH WAX TAPE IF MAIN IS POLY WRAPPED, PVC, AC OR HDPE.
4. ALL HDPE SERVICE PIPE SHALL BE BACKFILLED WITH 3/4" MINUS CRUSHED ROCK. EXTRA CARE SHALL BE TAKEN TO ENSURE PROPER SUPPORT OF THE HDPE PIPE SO THE PIPE MATERIAL WILL NOT DEFORM OVER TIME. ALL BACKFILL SHALL BE TO 95% COMPACTION.

FUNC	BY	CHK	APP
DES	IRVIN		WM
DWN	NLN		WM
SPONSOR			
DATE: 07/22/15			

**WATER STANDARDS
 CONSTRUCTION
 AUTO FLUSH
 BETWEEN PRESSURE ZONES (EWEB ONLY)**

EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC190			0



NOTES:

1. THE CORPORATION STOP SHALL BE INSTALLED IN THE OPEN POSITION.
2. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. WRAP ALL METAL PARTS WITH WAX TAPE IF MAIN IS POLY WRAPPED, PVC, AC OR HDPE.
4. ALL HDPE SERVICE PIPE SHALL BE BACKFILLED WITH 3/4" MINUS CRUSHED ROCK. EXTRA CARE SHALL BE TAKEN TO ENSURE PROPER SUPPORT OF THE HDPE PIPE SO THE PIPE MATERIAL WILL NOT DEFORM OVER TIME. ALL BACKFILL SHALL BE TO 95% COMPACTION.
5. EWEB WILL SET METER AND AUTO FLUSH VALVE. ALL OTHERS WORK BY CONTRACTOR.

FUNC	BY	CHK	APP
DES	IRVIN		WM
DWN	NLN		WM
SPONSOR			
DATE: 07/22/15			

**WATER STANDARDS
 CONSTRUCTION
 AUTO FLUSH
 FOR DEADEND MAINS**

EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

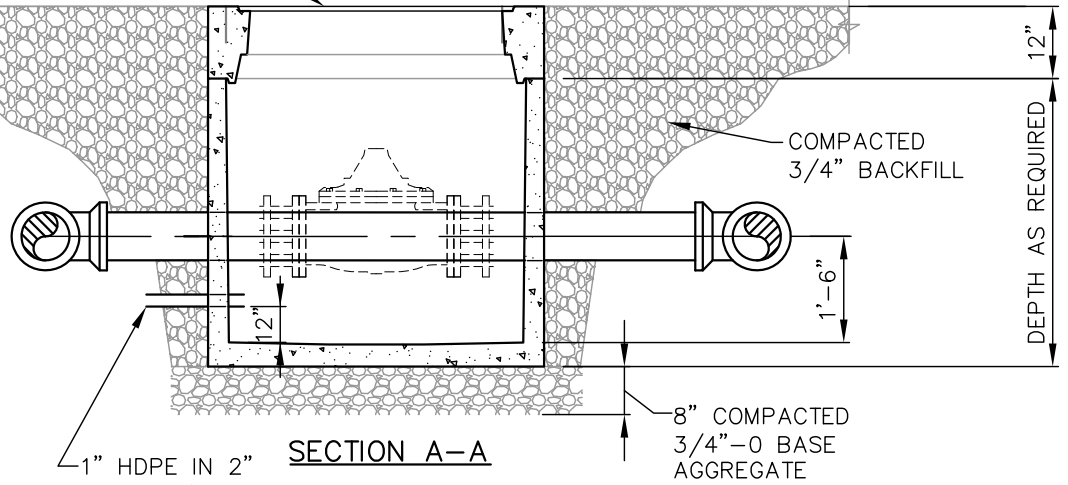
SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC200			0

DOUBLE DOOR 36"x36" GALVANIZED
H2O RATED ACCESS HATCH

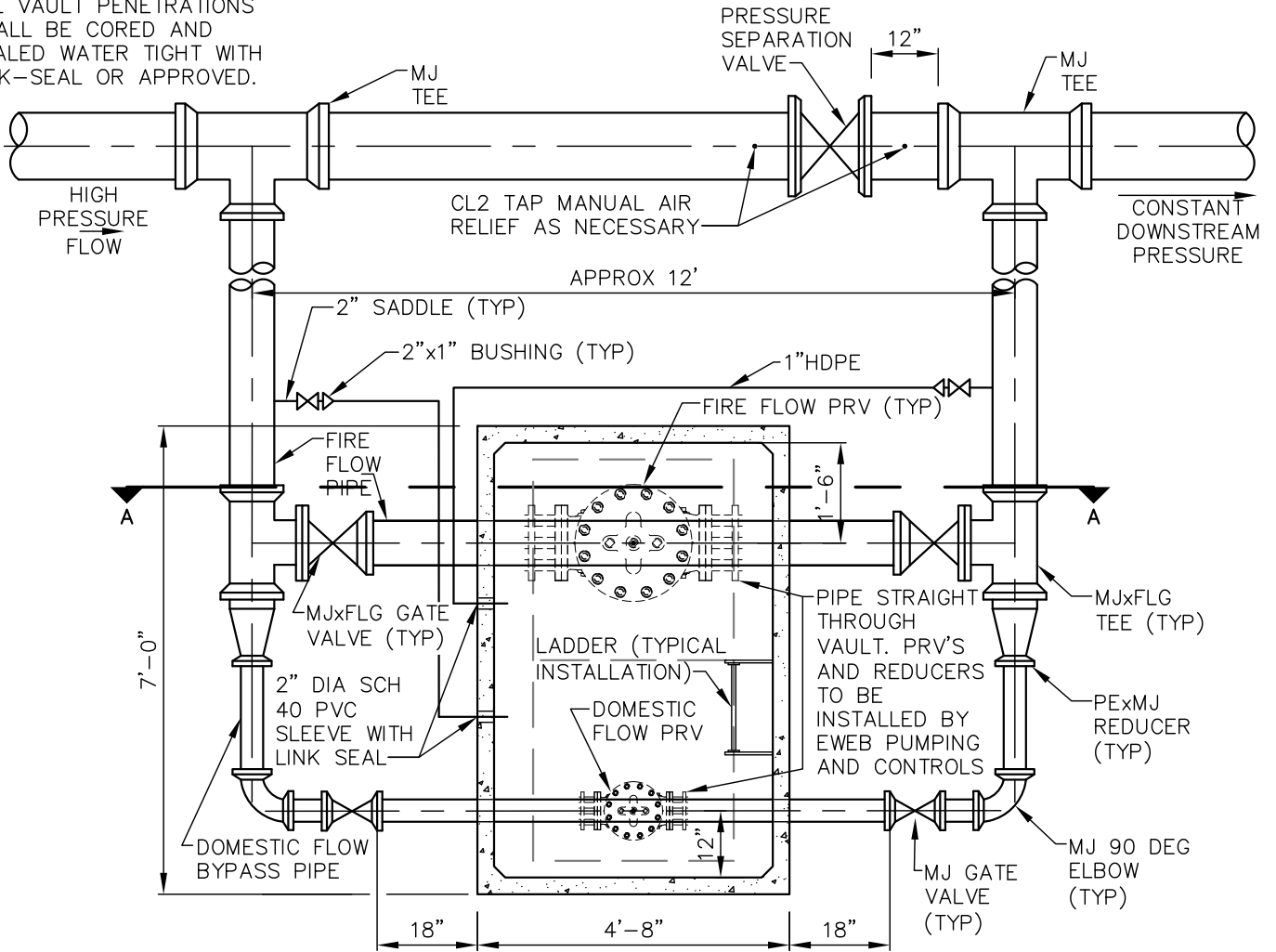
FINISH SURFACE TO
MATCH EXISTING GRADE

NOTES:

1. LEAVE APROX 10' OF 1" HDPE PROTRUDING THROUGH VAULT WALLS. CAP OR PLUG LINE FOR PRESSURE TESTING.
2. CENTERLINE OF DOMESTIC FLOW BYPASS SHALL MATCH CENTERLINE OF FIRE FLOW PIPE IN VAULTS.
3. ALL JOINTS SHALL BE RESTRAINED.
4. ALL VALVES SHALL BE PROVIDED WITH 2" OPERATING NUT AND VALVE BOX.
5. ALL VAULT PENETRATIONS SHALL BE CORED AND SEALED WATER TIGHT WITH LINK-SEAL OR APPROVED.



SECTION A-A



PLAN

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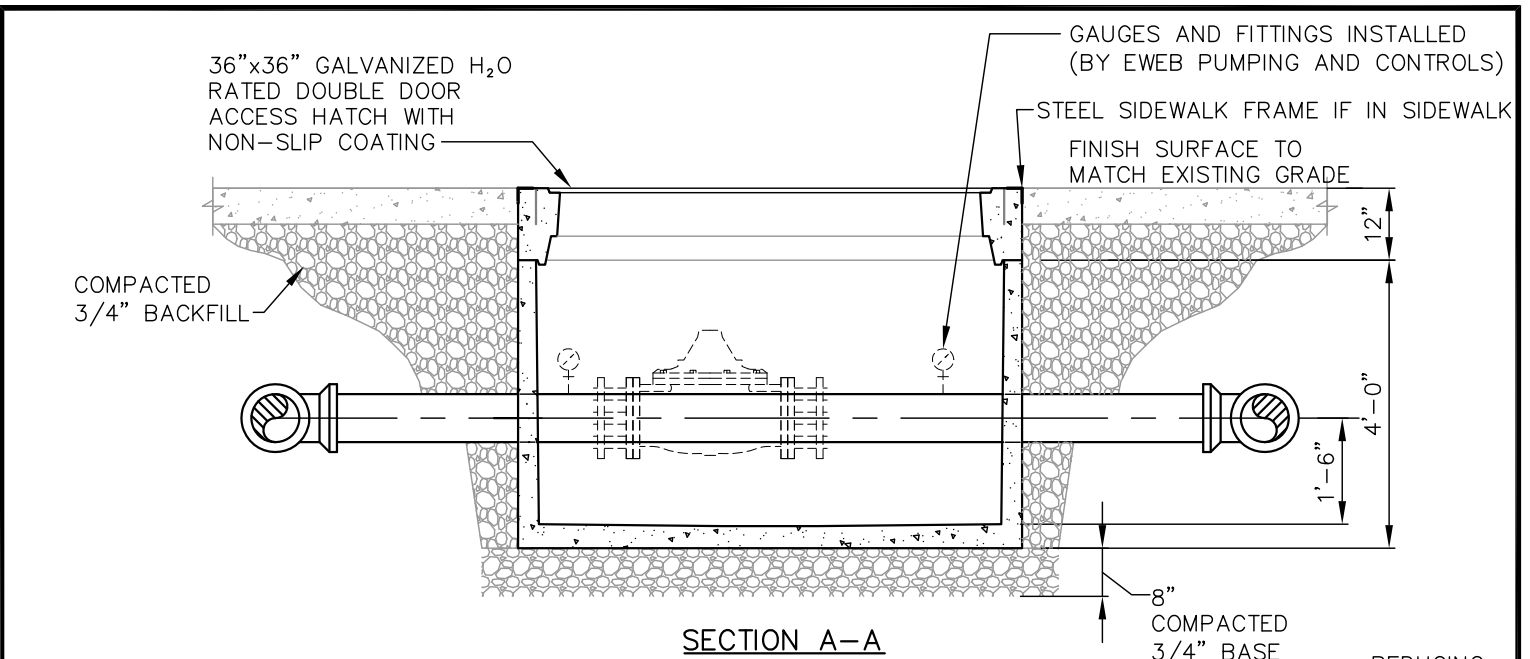
FUNC	BY	CHK	APP
DES	IRVIN		WM
DWN	NLN		WM
SPONSOR			
DATE: 07/22/15			

**WATER STANDARDS
CONSTRUCTION**

TYPICAL PRESSURE REDUCING VALVE VAULT

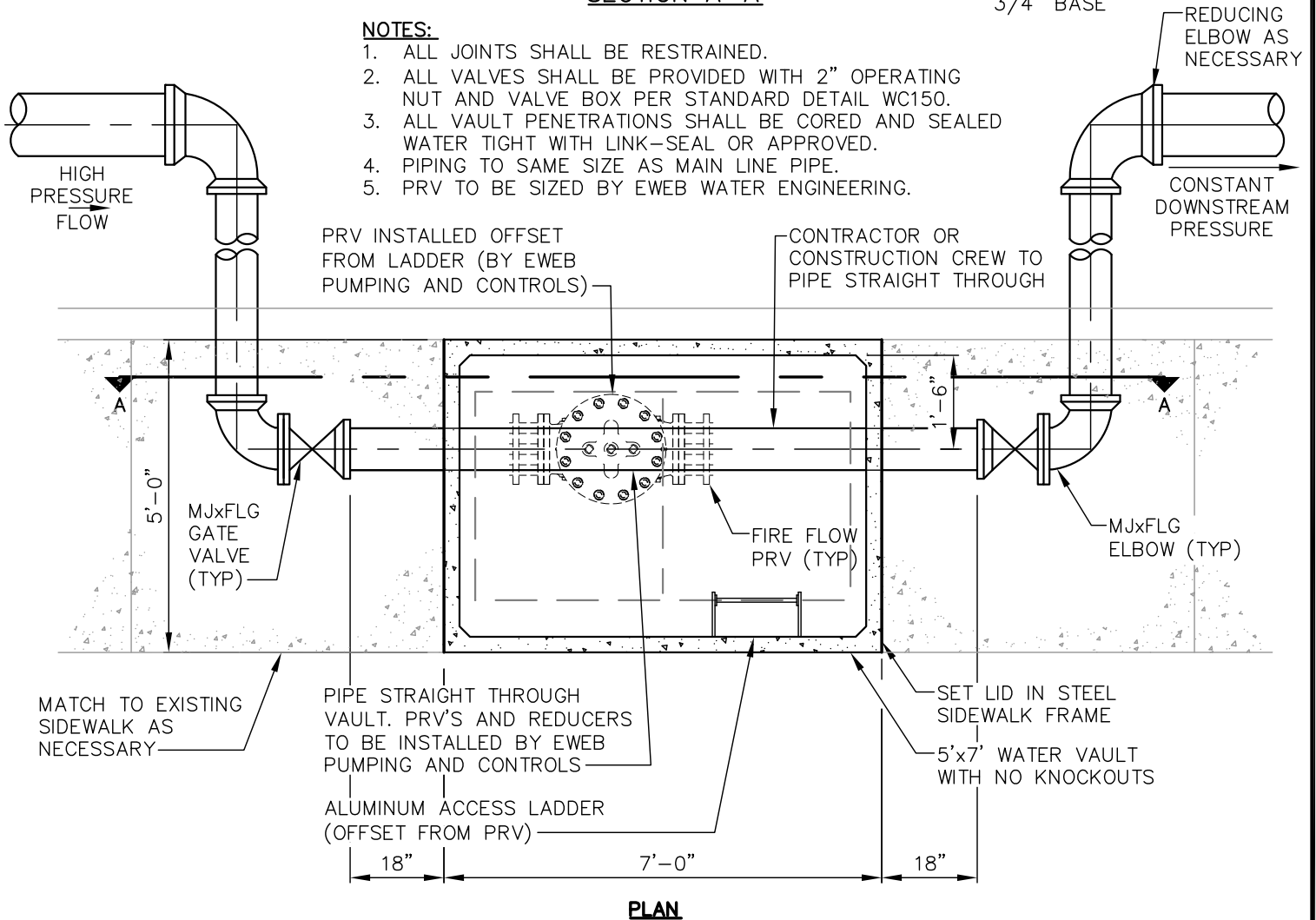
 EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC210			0



NOTES:

1. ALL JOINTS SHALL BE RESTRAINED.
2. ALL VALVES SHALL BE PROVIDED WITH 2" OPERATING NUT AND VALVE BOX PER STANDARD DETAIL WC150.
3. ALL VAULT PENETRATIONS SHALL BE CORED AND SEALED WATER TIGHT WITH LINK-SEAL OR APPROVED.
4. PIPING TO SAME SIZE AS MAIN LINE PIPE.
5. PRV TO BE SIZED BY EWEB WATER ENGINEERING.

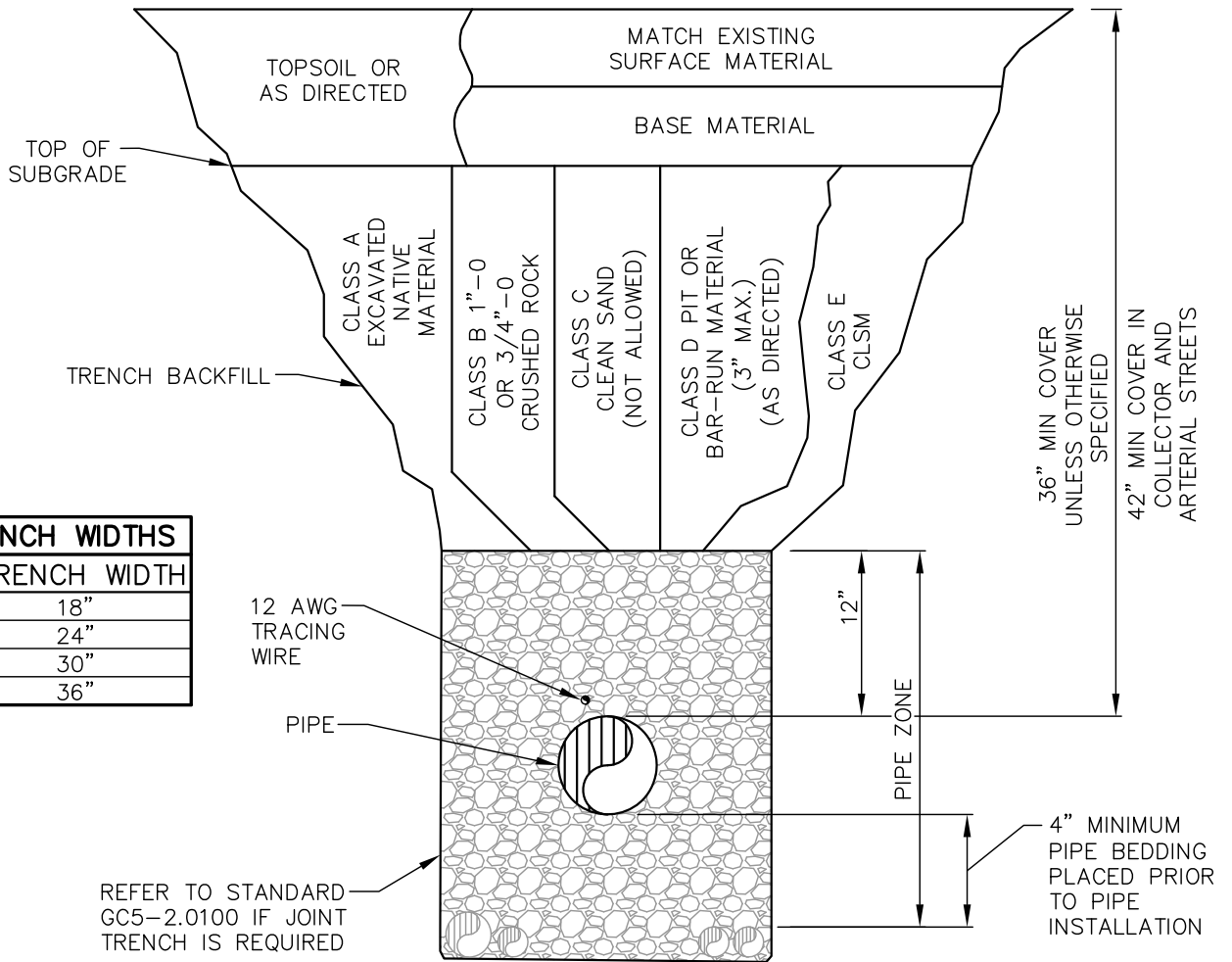


FUNC	BY	CHK	APP
DES	IRVIN		WM
DWN	NLN		WM
SPONSOR			
DATE: 07/22/15			

**WATER STANDARDS
 CONSTRUCTION
 TYPICAL PRESSURE REDUCING VALVE (PRV) VAULT
 WITH NO BYPASS**

EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON

SCALE: NTS			
REV DATE	BY	CHK	APP
09/23/15	ESR		
REFORMAT AND UPDATE			
DWG NO			REV
WC211			0



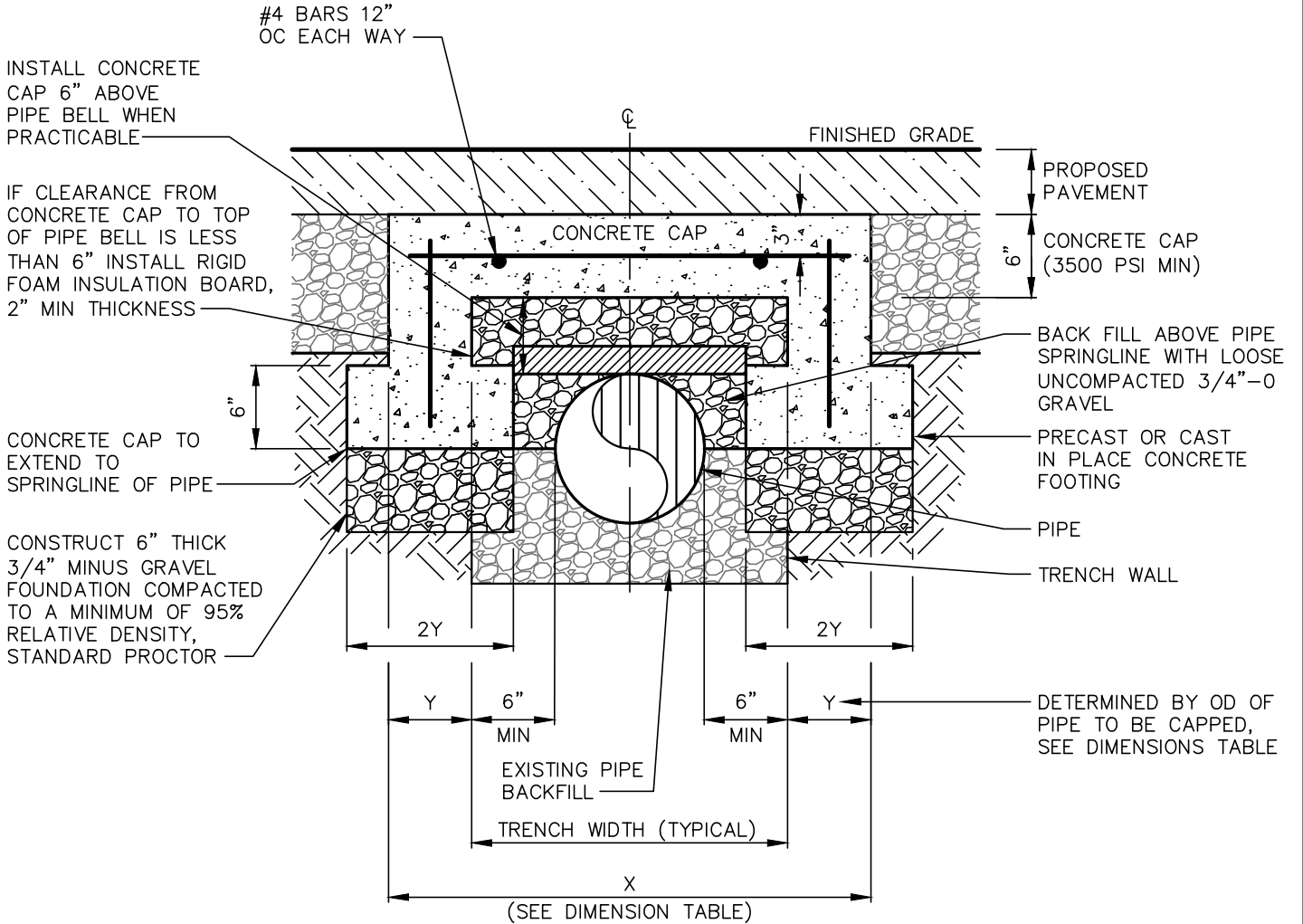
MINIMUM TRENCH WIDTHS	
PIPE SIZE	TRENCH WIDTH
< 4"	18"
4"-8"	24"
12"	30"
16"	36"

DETAIL SPECIFIC NOTES:

1. SEE JURISDICTION AUTHORITIES TYPICAL STREET CUT DETAIL OR PERMIT CONDITIONS FOR SURFACE RESTORATION REQUIREMENTS RELATED TO EACH PROJECT.
2. CALL 811 FOR LOCATES PRIOR TO GROUND DISTURBANCE.
3. RESTORE ALL DISTURBED SURFACES TO ORIGINAL OR BETTER CONDITIONS. PROVIDE 12" MINIMUM IMPORTED TOPSOIL AND MULCH/SOD TO MATCH OUTSIDE OF PAVED SURFACES.
4. FOR PIPELINES LARGER THAN 16", A TRENCH SECTION SHALL BE DESIGNED BY AN ENGINEER.
5. EXCAVATE TRENCH WALLS AS CLOSE TO VERTICAL AS PRACTICABLE.
6. BACKFILL USING 12" MAXIMUM LIFTS COMPACTED TO 95% OF AASHTO T99 OR AS REQUIRED BY JURISDICTIONAL AUTHORITY.
7. ONLY HAND OPERATED COMPACTION EQUIPMENT MAY BE USED IN PIPE ZONE.

FUNC	BY	CHK	APP	WATER STANDARDS CONSTRUCTION TYPICAL TRENCH SECTION EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON	SCALE: NTS								
DES	IRVIN		WM		<table border="1"> <tr> <th>REV DATE</th> <th>BY</th> <th>CHK</th> <th>APP</th> </tr> <tr> <td>09/23/15</td> <td>ESR</td> <td></td> <td></td> </tr> </table>	REV DATE	BY	CHK	APP	09/23/15	ESR		
REV DATE	BY	CHK	APP										
09/23/15	ESR												
DWN	NLN		WM	REFORMAT AND UPDATE									
SPONSOR				DWG NO	REV								
DATE: 07/22/15				WC220	0								

DIMENSIONS		
PIPE SIZE	X	Y
≤12"	36"	6"
16"-24"	54"	9"
24" AND LARGER	2x PIPE OD	12"



NOTES:

1. PIPE CAP MAY BE REQUIRED WHENEVER SUBGRADE EXCAVATION WILL OCCUR WITHIN 24" OF EXISTING PIPE, OR WHEN DEEMED NECESSARY BY EWEB.

INFORMATION SHOWN IS FOR EWEB USE ONLY AND IS NOT WARRANTED TO BE ACCURATE FOR UNINTENDED PURPOSES.

FUNC	BY	CHK	APP	WATER DISTRIBUTION WATER MAINS CONCRETE CAP TRENCH SECTION EUGENE WATER & ELECTRIC BOARD - EUGENE, OREGON	SCALE: 1"=1'-0"			
DES	IRVIN				REV DATE	BY	CHK	APP
DWN	ESR	ESR						
SPONSOR					DWG NO	REV		
DATE: 3-17-16					WC230	0		