



City of Astoria
Public Works Department

Engineering Design Standards

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Acknowledgments

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1 INTRODUCTION

The following Design Standards were developed by the City of Astoria's Public Works Department and established by City Resolution No. 15-30. This document is intended to facilitate the planning, design and implementation of public infrastructure projects and related facilities. The Design Standards are primarily intended for use by a Developer's Design Engineer. However, they will also be utilized by Design Consultants under contract with the City for preparation of public infrastructure designs.

The Design Standards cannot provide for all situations. They are intended to establish a consistent policy for implementing design of public improvements and related facilities, but do not substitute for competent work by design professionals. Engineers are expected to provide expertise and judgement from their respective disciplines. In addition to these standards, design consultants and engineers must comply with appropriate state and federal codes, safety regulations, environmental requirements and other applicable regulations. Note that this document refers to many other potentially applicable requirements, but references herein do not necessarily comprise a comprehensive list.

Design professionals are encouraged to read this document prior to the project planning phase so that potential compliance issues may be identified and resolved early. The City's unique terrain, geology, climate and historic context make project development to modern standards a challenging endeavor. The City recognizes these challenges and encourages designers to actively collaborate with the Public Works Department as new projects are planned, designed and constructed.

The City Engineer or authorized designee has authority to periodically update and interpret the provisions of this document. Future modifications are intended to promote uniformity in the application of the Design Standards.

These standards are not intended to unreasonably limit any innovative or creative effort which could result in better quality, cost savings, or both. The City Engineer will evaluate any proposed departure from these standards based on the design exception process detailed in Chapter 2.

Other permits and standards may be applicable to specific projects. The design professional bears the responsibility to obtain necessary permits and to comply with all applicable standards related to specific projects.

2 GENERAL REQUIREMENTS

This chapter provides procedural requirements for public works projects, from design through construction. Requirements for preparation, submittal and review of required documents are included, along with administrative procedures for design exceptions, design approval, construction coordination and final project acceptance by the City.

2.1 DEFINITIONS AND ABBREVIATIONS

AASHTO: American Association of State Highway and Transportation Officials.

ADA: Americans with Disabilities Act.

ADS. Advanced Drainage Systems, a manufacturer of storm water and sanitary sewer materials.

Alley: A narrow street through a block which affords only secondary means of access to abutting property at the rear or sides thereof.

All-Weather Surface: An improved roadway surface, with sufficient ballast and structural support to be used under all weather conditions. The uppermost layer of an all-weather surface may be concrete or asphalt pavement, or in some cases gravel.

Appurtenance: Equipment and/or accessories that are part of an operating system or subsystem.

APWA: American Public Works Association.

ARTA: Astoria Riverfront Trolley Association.

Arterial: A street of considerable continuity which is primarily a main traffic route for intercommunication among large areas; used predominantly for the movement of through traffic with less emphasis on access to abutting properties. (In Astoria, all arterial streets are State highways managed by ODOT.)

ASCE: American Society of Civil Engineers.

Asphalt Institute: A United States based association of international petroleum asphalt producers, manufacturers and affiliated businesses.

ASTM: American Society for Testing and Materials.

AWWA: American Water Works Association.

Backflow: The flow of water or other liquids, mixtures or substances into the distribution pipes of the potable water supply from any source other than its intended source, and which is caused by back-siphoning or back-pressure.

Backflow Prevention Assembly: An effective assembly used to prevent backflow into a potable water system.

Boardwalk: Elevated walkway located over land or on submersible land, primarily for pedestrian use similar to a sidewalk or trail, not otherwise covered by pier or wharf.

Buildable Lot: See Lot, Buildable.

Building Code: The Oregon Structural, Mechanical, Electrical, Plumbing and Residential Specialty Codes.

Building Official: The officer or other designated authority charged with the administration and enforcement of the Building Code, or a regularly authorized deputy.

Chair Wall: Subsurface concrete structures which were built after Astoria's 1922 fire to support the City's downtown street system. Curbs and sidewalks for many downtown streets are integral with the structural chair walls. The chair wall system also includes concrete tunnels for utilities.

City: The City of Astoria, Oregon.

City Engineer: The duly appointed City Engineer of the City of Astoria.

City Water Service Line: Any pipe, valves and fittings leading from the water main to the water meter or customer water service line.

Clearing: Any activity that removes vegetative cover while leaving the root system intact.

Collector: A street with a functional purpose that balances through traffic and access to abutting properties. The proportion of through traffic on collector streets is generally greater than local streets, but less than arterial streets. Collector streets may serve residential, mixed use, or commercial/industrial areas.

Community Development Director: The duly appointed Community Development Director, chief land use regulatory officer, and designated authority responsible for enforcement of the Development Code of the City of Astoria.

Contractor: The person, partnership, firm or corporation licensed in Oregon contracting to do work under these Standards. The term shall also include the Contractor's agents, employees and subcontractors.

Cul de Sac: A short street or dead end street having one end open to traffic and terminating in a vehicle turnaround. This definition includes circular and hammerhead style turnarounds.

Curb Ramp: A short, depressed section of curb and sidewalk, normally placed at street intersections, designated to facilitate travel of disabled persons.

Customer Water Service Line: Pipe, valves and fittings leading from the water meter or city water service line into the premises served or the point of ultimate use.

CWA: Clean Water Act, a federal law enacted in 1972 which establishes the structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

Design Engineer: A Professional Engineer licensed by the OSBEELS.

DEQ: Oregon Department of Environmental Quality.

Detention Facility: A storm water basin or structure where excess storm water is stored or held temporarily and then slowly drains when water levels in the receiving piping system or channel recede. A detention facility is typically dry between storm events.

Development Agreement: An agreement between the City and a private Developer as provided in ORS Chapter 94.

Developer: Any individual, company, partnership, joint venture, corporation, association, society or group that has made, or intends to make, application to the City for a development proposal, permit or approval.

Dock: A secured float or floats for boat tie-up or other water use.

Drain: A structure intended to receive only storm waters, surface run-off, street wash waters and drainage.

Drain, Private: Privately owned drain that is not maintained by the City.

Driveway: Private vehicular travel way that provides vehicular access from a public or private road.

Driveway Apron: A concrete section of depressed sidewalk constructed in the City right-of-way to provide a transition between the City street and a private driveway.

Dwelling Unit: Refer to Astoria Development Code definitions for dwelling.

Easement: A grant of the right to use a piece of land for specific purposes.

Erosion: Movement of soil by water or wind.

Excavation: Removal of topsoil, gravel, sand, rock or any other type of soil material. Also includes removal of roots.

Existing: Buildings, facilities or conditions, which are already in existence, constructed or officially authorized prior to the adoption of these Standards.

Fence: An accessory structure, including landscape planting, designed and intended to serve as a barrier or as a means of enclosing a yard or other area, or other structure; or to serve as a boundary feature separating two or more properties.

Fill: Placement of topsoil, gravel, sand, rock or any other type of soil material.

Fill, Structural: Fill that is intended to support structures.

Fire Apparatus Access Road: A road that provides access for fire department vehicles and equipment from a fire station to a facility, building or portion thereof. This is a general term inclusive of all other terms such as fire lane, public street, private street, parking lot lane and access roadway.

Fire Code Official: The City's Building Official or other designated official appointed by the Astoria City Council who is charged with the administration and enforcement of the Oregon Fire Code.

Fire Lane: A road or passageway developed to allow the passage of fire apparatus. A fire lane is not necessarily intended for vehicular traffic other than fire apparatus.

GPM: Gallons per minute.

Grading: Any combination of excavation and/or fill activities.

Hammerhead: See cul de sac.

HDPE: High-density polyethylene.

Landscaping: Preservation, planting and maintenance of trees, shrubs, groundcovers, and lawns, and associated walkway, benches, decks, fences, fountains, sculptures, courts, plazas or interpretive displays.

Lot: A parcel or tract of land as shown on a legally recorded plat of a subdivision, or a parcel or tract of land under one ownership.

Lot, Buildable: A parcel or combination of parcels that meet the minimum standards for construction. This definition does not imply the site is suitable for a building.

Lot, Platted: A parcel or tract of land as shown on a legally recorded plat of a subdivision.

Lot, Tax: A parcel of land that is designated for tax purposes only.

Luminaire: A complete street lighting unit, including lamps, sockets, wiring, poles, foundations and other parts needed to hold the lamp in place, and protect it.

MUTCD: Manual on Uniform Traffic Control Devices.

Natural Outlet: Any non-manmade discharge into a watercourse, pond, ditch, lake or other body of surface water.

NAVD: North American Vertical Datum. Refers to NAVD 88, the North American Vertical Datum of 1988, which is the vertical control datum established in 1991 by the National Geodetic Survey for surveying in the United States.

NRS: Non-Rising Stem, a type of water valve operation.

NVGD: National Geodetic Vertical Datum. Refers to the Sea Level Datum of 1929, which was adjusted in 1947, and later renamed as the National Geodetic Vertical Datum of 1929 on May 10, 1973. NVGD was used by the National Geodetic Survey prior to 1991.

NW POINT: Northwest Public Oregon Intercity Transit.

OAR: Oregon Administrative Rules.

ODOT: Oregon Department of Transportation.

OFC: Oregon Fire Code.

OPSC: Oregon Plumbing Specialty Code.

ORS: Oregon Revised Statutes.

OSBEELS: Oregon State Board of Examiners for Engineering and Land Surveying.

Owner: Those individuals, partnerships, corporations or public agencies holding fee simple title to property, or a purchaser under a recorded instrument of sale. Owner does not include those holding easements, leaseholds, or purchasers of less than fee interest.

Pathway: A travel corridor provided for non-motorized use. Pathways typically accommodate both bicycles and pedestrians.

Pedestrian Zone: See Walking Zone.

Pier: A structure, usually of greater length than width and projecting from the shore into a body of water with direct access from land that can be either open deck or provided with a superstructure.

Planting Strip: A vegetated area located between the back of curb and sidewalk within the Walking Zone.

Platted Lot: See Lot, Platted.

POINT: Public Oregon Intercity Transit.

Private Drain: See Drain, Private.

Private Sewer: See Sewer, Private.

Private Street: See Street, Private.

Public Works Director: The duly appointed Public Works Director of the City of Astoria.

Public Works Superintendent: The duly appointed Public Works Superintendent of the City of Astoria.

PVC: Polyvinyl Chloride.

Retention Facility: A basin, structure or pond which stores water on a permanent or semi-permanent basis. Water often remains in a retention basin indefinitely, with the exception of volume lost to evaporation or absorbed into soils. Retention facilities typically contain water between storms, as opposed to detention facilities which typically drain after the peak of the storm flow has passed and are usually dry between storms.

Right-of-Way: Land, property or interest therein, usually in a strip, acquired for public benefit and typically devoted to transportation purposes.

Riprap: A layer, facing, or protective mound of stones randomly placed to prevent erosion, scour or sloughing of a structure or embankment; also, the materials so used.

River Walk: The developed walkway along the Columbia River waterfront from 11th Street to 17th Street.

River Trail: The entire developed walkway along the Columbia River waterfront.

Roadway: See Street.

ROW: See Right-of-Way.

Sanitary Sewer: See Sewer, Sanitary.

SDR: Standard Dimension Ratio.

SDWA: Safe Drinking Water Act, the main federal law that ensures the quality of drinking water.

Sedimentation: Deposition of soil moved by water or wind from its site of origin.

SETD: The Sunset Empire Transportation District.

Sewer, Private: Privately owned sewer that is not maintained by the City.

Sewer, Sanitary: A pipe or conduit intended to carry liquid and water-carried wastes from residences, commercial buildings, industrial plants and institutions together with minor quantities of ground, storm and surface waters that are not intentionally admitted.

Shall: A requirement.

Sharrows: A shared lane marking, placed on the street pavement to indicate where bicyclists should position themselves in the travelled way.

Should: A requirement, unless it can be shown that to comply with the requirement would be unreasonable, impractical, or unfeasible. Economic hardship alone shall not be justification for noncompliance with the requirement, but may be considered in conjunction with other reasons for noncompliance.

Sidewalk: A pedestrian walkway improved with rock, decking or paved surfacing that is located adjacent to or offset from and parallel to a street.

Standard Details: City of Astoria Engineering Division standard detail drawings.

Storm Drain: A conduit intended to carry only storm waters, surface run-off, street wash waters and drainage.

Storm Sewer: See Storm Drain.

Street: The improved portion of a public right-of-way that is developed for multi-modal travel. Synonymous with the terms road, highway, avenue, lane, drive, and other similar designations. A Street includes both a vehicular zone and a walking zone.

Street, Private: Privately owned street that is not maintained by the City, or privately-maintained street improvements within the public right-of-way.

Sunset Empire Transportation District: Public transportation provider serving Clatsop County.

Surveyor: A Professional Land Surveyor licensed by the OSBEELS.

Tax Lot: See Lot, Tax.

Trail: A pedestrian walkway improved with rock, decking, bark chips or paved surfacing not otherwise covered by sidewalk or boardwalk.

Trestle: A complex bridge structure, usually wooden, that is used to support a transportation corridor over water, a ravine, etc.

TSP: The City of Astoria Transportation System Plan.

Uni-Bell: The Uni-Bell PVC Pipe Association.

Utilities: Overhead or underground facilities such as towers, lines for communication and power transmission, sanitary sewers, storm drains, water lines, drains, gas lines, and other similar pipes, wires conduits, vaults, etc.

Vehicular Zone: The portion of a City street from face of curb to face of curb. The vehicular zone includes travel lanes for motorized vehicles and bicycles, and may also include median and parking areas.

Walking Zone: The portion of a City street behind the face of curb that provides sidewalk, roadside landscaping, and other amenities for pedestrian travel.

Water Main: Any pipe owned by the City of Astoria laid in a street, alley or easement, and used or intended to be used for the transmission and distribution of water to customers.

Water Meter: Any device used for the measurement of water delivered to an individual location or user (service).

Water Service Line: Combined facility made up of both the city water service line and the customer water service line.

Water Service Line, City: See City Water Service Line.

Water Service Line, Customer: See Customer Water Service Line.

Wharf: A structure at the shoreline, having a platform built alongside and parallel to a body of water that may have an open deck or a superstructure.

2.2 CODE COMPLIANCE AND PERMITTING

Private developments and public facilities must comply with all City codes, plans and permits.

Developers are also responsible for obtaining any necessary state and federal permits that may be required for construction near wetland areas, streams or other waterways, or if hazardous materials are present on the property. The following agencies should be contacted to determine if state or federal permitting regulations apply:

Department of State Lands

Department of Environmental Quality

US Army Corps of Engineers

Environmental Protection Agency

Oregon Department of Transportation

National Marine Fisheries Services

Oregon Department of Fish and Wildlife

U.S. Fish and Wildlife Services

2.3 CONSTRUCTION STANDARDS

The City has adopted the 2015 Oregon Standard Specifications for Construction with supplemental City General Conditions and Special Provisions. See Appendix B for City of Astoria Special Provisions. These specifications shall be used for all City public works projects.

2.4 DESIGN SUBMITTAL REQUIREMENTS

Three sets of plans shall be submitted to the City Engineer for review. Plans shall be twenty-two inches by thirty-four inches (22" X 34"). A scale of one inch equals twenty feet (1"=20') is preferred, one inch equals thirty feet (1"=30') and one inch equals ten feet (1"=10") are also acceptable. Other scales may be used only with the approval of the City Engineer.

At minimum, interim plans shall be submitted for City review at the 60% design stage. Interim plan submittals at 30% and 90% are encouraged.

2.4.1 General Plan Requirements

The following general items shall be shown on all plan sets submitted:

- a. Vicinity Map: On first sheet of plan set.
- b. Index of Plan Sheets: On first sheet of plan set.
- c. Title Block: Including project name, Design Engineer, file number, sheet number, date and revision block, Oregon Registered Professional Engineer's Stamp and Signature.
- d. North Arrow: On each sheet, as applicable.
- e. Elevations shall be referenced to the City of Astoria datum (NAVD 88) or NGVD (with conversion to City datum supplied), with benchmarks identified on the plans.

2.4.2 Utility Information

Subsurface utilities shall be depicted on design drawings per ASCE/CI 38-02 Quality Level C. Refer to ASCE Standard Guidelines for the Collection and Depiction of Existing Subsurface Utilities.

2.4.3 Street Plans

Street plans shall have both plan and profile views on the same sheet. Typical section and signing and striping information is also required.

Plan views shall contain the following information:

- a. Right-of-way, property lines, and easements (existing and construction).
- b. Section, township and range.
- c. Street centerline with 100-ft stationing.
- d. Horizontal alignment data for centerline, curb returns and cul-de-sacs, including tangent bearings.
- e. Curb/gutter elevations at intersections and cul-de-sacs.
- f. Location of existing and proposed underground and overhead utilities, roadways, driveways, sidewalks, structures, watercourses, survey monuments, fences and vegetation within the right-of-way and outside right-of-way, if affected by construction.
- g. Storm drainage facilities with station and offset referenced to street centerline.
- h. Existing contours and spot elevations, cut/fill limits. A minimum contour interval of 2 feet is required.

- i. Sidewalk ramp locations.

Profile views shall show the following information:

- j. Proposed street centerline profile (bold) with tangent grades, vertical curve data (including k value, length and beginning and ending stations and elevations) and high/low points.
- k. Original ground at centerline.
- l. Proposed (bold) and existing storm drainage facilities with information on type, inverts, rim/grate elevations, slopes, pipe material, and trench backfill.
- m. Existing utility crossings.
- n. Continuation of profile 200 feet beyond project limits if street is being reconstructed or if it may be extended in the future.

Typical cross-sections shall show the following information:

- o. Dimensions of traffic lanes, shoulders, gutters, sidewalks, swales, depths of planting strips, easements, right-of-way, etc.
- p. Cross slope of all elements, such as pavement, sidewalks, planting strips, etc.
- q. A separate full-width roadway typical section, for each street or portion of the street that differs significantly. Station ranges shall be provided for each typical section.

The following signing and striping information shall be provided:

- r. Locations of all public and privately maintained signs to be installed, including sign details and/or MUTCD sign designation number, where applicable.
- s. Location and dimensions of all pavement markings.
- t. For simple projects, signing and striping information may be combined on the plan views, provided that information is legible and does not overcrowd the sheet. For collector facilities and local access streets that may intersect with City collector routes or State highway facilities, separate signing and striping plans may be required by the City Engineer.

2.4.4 Water, Sanitary Sewer and Storm Drain Plans

Water, sanitary sewer and storm drain plans shall have plan and profile views. Profiles shall be to the same horizontal scale on the same sheet and drawn immediately below the corresponding plan view to a typical vertical scale of 1" = 5' with stationing increasing from left to right. In areas of significant elevation change, a vertical scale of 1" = 10' may be used. City Engineer approval is required for any other proposed vertical scale.

Water, sanitary sewer and/or storm drain plans may be combined into a single set of utility plans, provided that information is legible. Utility design information may also be incorporated into street plans, provided that all required information can be provided legibly and without overcrowding the sheet.

Plan views shall contain the following information:

- a. Right-of-way, property lines, and easements (existing and construction).
- b. Pipe centerline with stationing and reference to street stationing where appropriate.
- c. Pipe material, length, invert elevation and slope.
- d. Location of existing and proposed (bold) underground and overhead utilities, roadways, driveways, sidewalks, structures, watercourses, survey monuments, fences and vegetation within the right-of-way and outside right-of-way, if affected by construction.
- e. Existing and proposed contours and spot elevations. A minimum contour interval of 2 feet is required.

Profile views shall show the following information:

- f. Pipe invert profile with grades.
- g. Existing and proposed (bold) ground at centerline.
- h. Existing and proposed manholes, catch basins, field drains and inlets, with information on type, inverts, rim elevations, slopes, materials, and trench backfill.
- i. Existing and proposed water, storm drain, sanitary sewer, gas, power, cable and other utility crossings. Show separation requirements where appropriate.
- j. Continuation of profile 200 feet beyond project limits if sanitary sewer, water or storm drain may be extended in the future.

2.4.5 Storm Water Management System Plans

Structural detention and retention facility plans must show:

- a. Facility dimensions and setbacks from property lines and structures
- b. Profile view of facility, including typical cross-sections with dimensions.
- c. All storm water piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection.
- d. Additional detail as determined by the City Engineer, depending on individual site conditions.

For projects that include vegetated storm water management facilities, catch basin pre-treatment inserts or storm water retention/detention facilities, a plan outlining the scope of activities, schedule and responsible parties for periodic inspection and maintenance of those

facilities shall be included with the construction submittal. This plan shall cover vegetation management, structural repairs, sediment removal/disposal and other activities necessary for the continued long-term function of the storm water facilities.

2.4.6 Additional Storm Water Design Documentation

Storm water documentation prepared in accordance with the ODOT Hydraulics Manual shall be submitted, including but not limited to a hydraulics report, bridge and culvert studies, supporting data, and other storm water design documentation, as applicable.

2.5 PHASED PROJECT SUBMITTALS

For large developments intended to be implemented in phases over multiple years, a phased design submittal process will be considered by the City Engineer on a case by case basis. Ultimate traffic volumes, water usage, sanitary sewer flows and storm water runoff shall be estimated for the entire project prior to approval of a phased approach. Design of each phase shall accommodate the ultimate build-out condition.

2.6 DESIGN EXCEPTIONS

A documented design exception is required for any design or construction deviation from these City design standards. Exceptions may be granted by the City Engineer upon evidence that such adjustments are in the public interest. Requirements for safety, function, fire protection, transit needs, appearance and maintainability based upon sound engineering and technical judgment must be fully met.

2.6.1 Design Exception Submittal Requirements

Design exception requests must be submitted in writing and shall include the following:

- a. Complete description of the desired modification.
- b. Identified sections of the Design Standards that are relevant to the proposed alternative.
- c. Reason for the request.
- d. Comparison between the specification/design standard and the modification addressing the performance, particularly in regard to public safety. Document nationally accepted design standards, such as AASHTO and ASTM, where applicable.
- e. Additional design exception considerations specific to individual topics are provided in the applicable chapter of these Design Standards.
- f. It is the responsibility of the applicant to provide sufficient, clear and accurate supporting information.

The City Engineer will review the design exception request and will allow a modification if one or more of the following requirements is met:

- g. The specification or design standard does not apply in the particular application.
- h. Topography, right-of-way or other conditions specific to the site impose an undue economic hardship on the applicant and an equivalent alternative, which can accomplish the same design objective while not adversely affecting public safety, is available.

The City Engineer will approve the application as is, approve with changes, or deny with an explanation.

2.6.2 Appeal Process

If the applicant is unsatisfied with the City Engineer's decision, the appeal process is as follows:

- a. Written request addressed to the Public Works Director;
- b. If not resolved at Public Works Director level, a written appeal shall be submitted to the City Manager;
- c. If not resolved at the City Manager level, the applicant shall submit a written appeal to the City Council.

2.7 DESIGN APPROVAL

Written acceptance of design plans and specifications by the City Engineer is required.

2.8 CONSTRUCTION SURETY

Prior to construction, the Developer shall provide a performance bond to protect against:

- a. Adverse construction events that may disrupt City systems and services;
- b. Failure to complete the project due to insolvency of the Developer or contractors; or
- c. The project's failure to meet approved design requirements or contract specifications.

A warranty is also required to guarantee against project defects for a designated period of time after project acceptance by the City Council. Refer to the Oregon 2015 Standard Specifications for Construction and City Supplemental General Conditions for performance bond and warranty requirements.

Surety requirements covered by a City Council-Approved Development Agreement may supersede the standards of this section.

2.9 CONSTRUCTION SUBMITTAL

A complete set of construction documents shall be submitted to the City Engineer prior to beginning construction. The construction submittal package shall include:

- a. Two (2) copies of the construction plan set with Design Engineer's seal and original signature.
- b. Complete construction specifications and contracting documents, including cover sheet with Design Engineer's seal and original signature.
- c. List of construction materials, including manufacturer, to be installed by the Developer and accepted by the City.
- d. Copy of City Engineer's design approval letter.
- e. Performance bond.

Construction activities shall not commence prior to City review of the construction submittal package and written authorization to proceed from the City Engineer. The City will stamp the construction plans when the construction submittal is approved. The original construction plans bearing the City's stamp shall be kept at the project site and made available to City representatives upon request.

2.10 CONSTRUCTION COORDINATION AND INSPECTION

A preconstruction meeting is required unless waived by the City Engineer. The Developer shall notify the Engineering Division at (503) 338-5173 to schedule the preconstruction meeting.

The following requirements apply during construction:

- a. Materials submittals are required and must be accepted by the City Engineer prior to construction of any facilities which are intended to be accepted by the City for public use. Refer to the Oregon 2015 Standard Specifications for Construction and City Supplemental General Conditions for material submittal requirements.
- b. The Engineering Division will need to observe the following construction work, and must be called at least two working days in advance to schedule an inspection for:
 - i. Installation of new storm drains, sanitary sewer systems, and water facilities.
 - ii. Connections to existing storm and sanitary sewers, and existing water facilities.
 - iii. Forms for concrete curb, gutter and sidewalk
 - iv. Roadway subgrade, crushed rock base course and asphalt paving
- c. Subgrade and base rock compaction tests shall be performed by an independent testing laboratory during construction, and results provided to the City Engineer.
- d. Pilings require inspection by a licensed professional engineer. Copies of all piling inspection reports shall be provided to the City Engineer.

- e. The City's Operations Division at (503) 325-3524 must be contacted to open or close any water valves, including hydrants, and must be called at least two working days in advance.

2.11 AS-BUILT DOCUMENTS

Upon construction completion, the following documents shall be submitted to the City Engineer:

- a. As-built drawings showing actual constructed locations and elevations of all street facilities, pipes, manholes and laterals. Two paper copies shall be submitted along with an AutoCAD compatible file on CD or USB drive.

As-built drawings shall be twenty-four inches by thirty-six inches (22" X 34"). A scale of one inch equals twenty feet (1"=20') is preferred, one inch equals thirty feet (1"=30') and one inch equals ten feet (1"=10") are also acceptable. Other scales may be used only with the approval of the City Engineer.

- b. Written certification from the Developer's engineer confirming that the project was constructed in accordance with approved plans and specifications.
- c. City utility services will not be provided until as-built documents have been provided to, and accepted by, the City Engineer.

2.12 FINAL PROJECT ACCEPTANCE

Following receipt of as-built documents, the City Engineer will forward a project acceptance and street adoption recommendation to the Astoria City Council. The City will not assume maintenance responsibility for constructed facilities prior to Council acceptance.

3 TRANSPORTATION FACILITIES

This chapter provides information for the design of street improvements as well as non-motorized facilities and transit infrastructure. Transportation design plans are reviewed and approved by the Engineering Division. Design criteria for storm water facilities serving transportation corridors are discussed in Chapter 5.

The following standards are based on the City's adopted Transportation System Plan (TSP), and have been developed with the goals of improving motorist and pedestrian safety, and minimizing long term maintenance costs while also considering the initial cost of construction. The main purpose of these standards is to provide the requirements for geometric design of the streets to meet safety and construction guidelines, and to promote active transportation through integration of facilities for pedestrians, bicyclists and transit users.

Traffic impact studies for new developments may be required by the City Engineer as provided in Section 3.015 of the City's Development Code.

Compliance with these standards does not relieve the Design Engineer of the responsibility to apply conservative and sound professional judgment. These are minimum standards and are intended to assist, but not substitute for competent work by design professionals. The City may, at its sole discretion due to special conditions and/or environmental constraints, require more stringent requirements than would normally be required under these Standards.

This chapter is intended to be consistent with and a supplement to the following policies and standards:

| | |
|--------|--|
| AASHTO | American Association of State and Transportation Officials |
| ADA | Americans with Disabilities Act |
| APWA | American Public Works Association |
| ASTM | American Society for Testing and Materials |
| MUTCD | Manual on Uniform Traffic Control Devices |
| OAR | Oregon Administrative Rules |
| ODOT | Oregon Department of Transportation |
| OFC | Oregon Fire Code |

| | |
|-----|------------------------------------|
| TSP | Astoria Transportation System Plan |
| | Astoria Development Code |
| | Astoria City Code |
| | Astoria Comprehensive Plan |

Where conflict exists between these Design Standards and the above referenced documents, the most stringent requirements shall take precedence.

3.1 CITY STREETS

3.1.1 Street Classifications

The City has adopted the following multi-modal street classifications based on the context of the surrounding land use:

- a. Residential Collector
- b. Residential Local Street
- c. Mixed Use Collector
- d. Mixed Use Local Street
- e. Commercial/Industrial Collector
- f. Commercial/Industrial Local Street
- g. Arterial (Only State highway facilities under ODOT jurisdiction have Arterial designation in the City's TSP. Refer to ODOT for design criteria on these facilities.)

Refer to the TSP for a map showing the City's multi-modal street designations.

The Engineering Division will determine the classification of any new streets which are not indicated in the TSP prior to design.

3.1.2 Vehicular Zone

3.1.2.1 Vehicular Zone Cross Section

The vehicular zone width is defined as the horizontal distance from face of curb to face of curb, measured perpendicular to the centerline. The vehicular zone includes paved travel lanes for motorized vehicles and bicycles, and may also include median spaces and paved areas for on-street parking. The width of the vehicular zone shall be sufficient to allow for the safe passage of normal multi-modal traffic and emergency vehicles.

Required lane widths and configuration are shown in Table 3-1 and **Detail ST-2**. Streets should be centered within the right-of-way; however, design exceptions may be considered due to topography or other physical constraints. The City’s design exception process in Section 2.6 will apply. Street width design exceptions require review and approval of both the City Engineer and City Fire Code Official. Design exceptions may require approved fire suppression, such as fire sprinkler systems, to be installed in structures to be accessed, including garages.

Table 3-1. Lane Widths and Configuration in the Vehicular Zone

| Street Classification | Travel # Lanes – Width | Parking # Lanes - Width | Bicycle Config. or # Lanes - Width | Total Pavement Width | Right-of- Way Width ⁽²⁾ |
|---|------------------------------|-------------------------------|--|----------------------------|--|
| Residential Local Street In-fill development, 3 units or less | 2 - 10' | - | Shared, not marked | 20' ⁽¹⁾ | 40' |
| Residential Local Street | 2 – 10' | 2 – 7' | Sharrows | 34' | 54' |
| Residential Collector | 2 – 10' | 2 – 7' | 2 – 6' | 46' | 66' |
| Mixed Use Local Street | 2 – 10' | 2 – 8' | Sharrows | 36' | 60' |
| Mixed Use Collector | 2 – 10' | 2 – 8' | 2 – 6' | 48' | 72' |
| Commercial/Industrial Local Street | 2 – 12' | - | Shared, not marked | 24' ⁽¹⁾ | 44' |
| Commercial/Industrial Collector | 2 – 12' | - | 2 – 6' | 36' | 62' |
| ¹ Written authorization from the City’s Fire Code official is required for roadways with a paved width less than 26 feet. ² If a proposed roadway is not located within an existing public right-of-way, or if the existing right-of-way is less than indicated, right-of-way must be dedicated. | | | | | |

3.1.2.2 Design Speed

The design speeds listed in Table 3-2 have been selected for the various street classifications. Posted speed may differ and will be designated by the City Engineer. Designers shall use the design speed to select horizontal and vertical alignments.

Table 3-2. Design Speed

| City TSP Street Classification | Design Speed (mph) |
|------------------------------------|--------------------|
| Residential Local Street | 25 |
| Residential Collector | 30 |
| Mixed Use Local Street | 25 |
| Mixed Use Collector | 30 |
| Commercial/Industrial Local Street | 25 |
| Commercial/Industrial Collector | 30-35 |

3.1.2.3 Pavement Section

The minimum allowable section is as shown on **Detail ST-1**.

The pavement section may vary depending on soil conditions. If, in the opinion of the City Engineer, soil subgrade conditions are potentially unsuitable, soil testing and pavement design will be required. The Design Engineer will have the responsibility for obtaining traffic figures for pavement design. The ODOT Pavement Design Guide and the Asphalt Institute method are acceptable pavement design references. Concrete streets shall be designed using the guidelines and requirements of the Portland Cement Association.

3.1.2.4 Crown

A minimum crown slope of two percent (2%) shall be provided. A standard center crown section is recommended, but an offset crown or a curb crown (shed) configuration may be permitted with approval of the City Engineer for areas with steep side slopes. Maximum crown slope shall be four percent (4%). An inverted crown section is typically not allowed, but may be considered for alleys with City Engineer's approval.

3.1.2.5 Vertical Clearance

Vertical, unobstructed clearance over the traveled roadway width must be a minimum of 14 feet.

3.1.2.6 On-Street Parking

On-street parking shall be provided as shown in Table 3-1. The minimum dimension of a standard parallel on-street parking stall is 7 feet wide in residential areas, 8 feet wide in all other areas, by 20 feet long. Smaller dimensions may be allowed when additional

maneuvering area is available. Disabled on-street parking stalls may be required and must meet current ADA standards.

Where parking is restricted on one or both sides of the street, no-parking signs shall be installed by the Developer. A minimum of three (3) no-parking signs, equally spaced, are required per block. The City will maintain no-parking signs after the street is accepted by City Council.

3.1.2.7 Signing and Striping

Street signing and pavement markings shall be designed in accordance with the current MUTCD. Where required, the Developer shall install signing and striping. The City will maintain signing and striping after acceptance of the street by City Council. A sign order approved by the City Engineer is required for any new sign or pavement marking on existing facilities.

Special installation protocol may be required when installing signage on existing streets in downtown Astoria. Many downtown streets are supported by structural chair walls resulting in a hollow-type sidewalk configuration. Installation of new signs or modification of existing signs in these areas requires approval of the City Engineer and will be considered on a case-by-case basis.

3.1.3 Walking Zone

The walking zone is defined as the portion of a City street behind the face of curb that provides sidewalk, roadside landscaping, and other pedestrian travel amenities.

3.1.3.1 Walking Zone Cross Section

Improvements required within the walking zone are shown in Table 3-3. Walking zone improvements are required on both sides of the street except for infill developments of three units or less, where walking zone improvements may be omitted from one side of the street with the City Engineer's approval. Sidewalk and landscaped areas within the walking zone shall have a maximum cross-slope of two percent (2%), draining towards the street.

Table 3-3. Required Walking Zone Improvements and Widths

| Street Classification | Curb/Edge Width (Measured from Face of Curb) | Landscape Buffer Configuration and Width | Sidewalk Width | Total Walking Zone Width |
|---|--|--|----------------|--------------------------|
| Residential Local Street In-fill development, 3 units or less ¹ | 0.5' | 3.5' Planting Strip (optional) | 5' | 9' |
| Residential Local Street | 0.5' with optional 1' hardscaped edge area behind curb | 3.5' Planting Strip (2.5' if optional edge area is provided behind curb) | 6' | 10' |
| Residential Collector | 0.5' with optional 1' hardscaped edge area behind curb | 3.5' Planting Strip (2.5' if optional edge area is provided behind curb) | 6' | 10' |
| Mixed Use Local Street | 0.5' | 3.5' Hardscaped with trees spaced at 25' intervals | 8' | 12' |
| Mixed Use Collector | 0.5' | 3.5' Hardscaped with trees spaced at 25' intervals | 8' | 12' |
| Commercial/Industrial Local Street | 0.5' | 3.5' Planting Strip | 5' | 9' |
| Commercial/Industrial Collector | 0.5' | 6.5' Bioswale | 5' | 12' |
| ¹ For infill developments serving 3 units or less and where the constructible width is limited by terrain or other constraints, sidewalk width may be reduced to 4 feet with a 5 foot by 5 foot passing space at 200-foot intervals. Also, in infill areas, sidewalk may be omitted from one side of the roadway with approval of the City Engineer. | | | | |

3.1.3.2 Curb, Gutter and Edge Area

Standard curb is required on both sides of streets within the City of Astoria (see **Detail ST-4**). Rolled curb is not allowed unless approved through the design exception process described in Section 2.6.

Curb and gutter is required on streets with longitudinal (flow line) slopes less than 1.5% (see **Detail ST-4**).

Where curb is adjacent to landscaped areas, a 1-foot wide edge area with compacted backfill may be provided behind the curb to facilitate egress from parked vehicles. Where compacted materials cannot sustain adjacent plantings, hardscape or other surface treatments should be used in the edge area to discourage weeds.

3.1.3.3 Landscaped Buffer

A landscaped area shall be provided between the curb/edge area and the sidewalk as indicated in Table 3-3. The provisions of Section 3.5 apply to any landscaping in the public right-of-way. Existing landscape buffers should be retained.

3.1.3.4 Sidewalk

Sidewalks are required on both sides of the street (see **Details ST-3, ST-5 and ST-6**), except in residential infill areas serving 3 units or less. Curb ramps meeting ADA requirements are required at all intersections (see ODOT Standard Drawings).

Placement of utility poles, hydrants and other obstructions should avoid sidewalk areas. Any sidewalk obstruction requires the prior approval of the City Engineer and a minimum unobstructed clear passage width of 48 inches must be maintained around any obstruction.

The standard sidewalk longitudinal grade and cross slope shall comply with current ADA standards. The back of sidewalk grade shall be maintained parallel to the gutter grade at driveways (**Details ST-5 and ST-6**). In some locations where the elevation of the adjacent property is much lower than the street, a dip in the sidewalk may be permitted. In this case, the driveway shall have the standard ½ inch lip and slope at a two percent (2% maximum) grade towards the street. The transition from the driveway back to the normal sidewalk grade shall be in accordance with ADA slope requirements.

Sidewalks shall be constructed of concrete (**Detail ST-3**). Alternative materials, such as asphalt or wood, require City Engineer approval.

3.1.3.5 Differential Grade Sidewalks

Differential grade sidewalks will be evaluated by the City Engineer on a case-by-case basis and may be allowed in certain situations where it is necessary to match existing improvements.

3.1.3.6 Grading Adjacent to Sidewalks

Section 3.3 of the City’s Development Code applies to grading activities for both publicly and privately developed transportation facilities. Slopes behind the sidewalk shall start one foot (1’) beyond the edge of the sidewalk or curb and shall not be steeper than 1.5:1 (horizontal: vertical) in a cut condition and 2:1 for a fill condition with cohesive soils. Sand or other non-cohesive soils shall be sloped no steeper than 3:1. **(Detail ST-1.)**

If a grading plan is required for the site per the City’s Development Code, the Geologist/Geotechnical Engineer’s recommendations may replace the above slope requirements with the approval of the City Engineer.

A pedestrian guardrail or barrier shall be installed when the slope within 2 feet of the back of a sidewalk exceeds 2:1 for a height of 30-inches or greater. Protection for pedestrians is recommended when slopes are vertical and exceed 18 inches in height. Pedestrian guardrail shall meet or exceed the minimum requirements of the current edition of the Building Code.

3.1.4 Horizontal Alignment of Streets

The centerline of street improvements shall coincide with the centerline of the public right-of-way unless approved by the City Engineer.

Minimum centerline curve radius shall be as follows:

Table 3-4. Minimum Horizontal Curve Radius

| <u>Design Speed (mph)</u> | <u>Minimum Horizontal Curve Radius (ft)</u> |
|---------------------------|---|
| 25 | 200 |
| 30 | 300 |
| 35 | 480 |

Centerline radii of curves shall not be less than 200 feet on collectors, or 100 feet on local streets, and shall be designed to an even 10 feet. For any development over 3 units, regardless of whether it is a subdivision, refer to the requirements of the *Development Code*

Article 13 concerning General Regulations and Design Standards for Subdivisions and Land Partitions.

Super-elevation may be allowed for the purpose of reducing minimum required radius providing that it can be shown that there are no adverse impacts on access to adjacent property, storm drainage and intersections.

Sufficient sight distance must be provided to allow drivers time to avoid obstacles, other vehicles or people in their path. Sight distance shall be considered in horizontal alignment design. Stopping sight distances shall be provided in accordance with the following table:

Table 3-5. Stopping Sight Distance

| <u>Design Speed (mph)</u> | <u>Required Stopping Sight Distance (ft)</u> |
|---------------------------|--|
| 25 | 155 |
| 30 | 200 |
| 35 | 250 |

Adapted from AASHTO Table 3-1

3.1.5 Vertical Alignment of Streets

Minimum longitudinal grade of streets shall be one percent (1%). Maximum street grades are shown in the following table:

Table 3-6. Maximum Street Grades

| Street Classification | Maximum Grade (%) |
|---------------------------------|--------------------------|
| Residential Local | 12 |
| Residential Collector | 10 |
| Mixed Use Local | 10 |
| Mixed Use Collector | 10 |
| Commercial/Industrial Local | 10 |
| Commercial/Industrial Collector | 8 |

Vertical curves shall be provided at changes of grade exceeding two percent (2%) and shall provide the stopping sight distance required in Table 3-5. The grade of the through street at intersections shall be maintained through the intersection. Intersecting streets shall

match the curb flow line of the through street and be provided with a landing area. The landing shall extend 25 feet from the pavement edge of the through street and have a grade of five percent (5%) or less. Alternative geometry may be necessary at intersections on steep slopes and should be coordinated with the City Engineer.

Streets shall be graded to provide adequate storm water drainage in accordance with Section 3.1.11 and Chapter 5. Accumulated storm water shall not be allowed to flow across travel lanes. Special care should be taken in the design of vertical curves to avoid long flat grades at the crest or sag of curves.

Curb or gutter grade information shall be provided in design plans for curb returns at intersections and for cul-de-sacs.

Due to the City's challenging topography, consideration will be given to exceeding vertical alignment standards providing that it can be shown that there will be no adverse impacts on traffic safety and emergency vehicle access. Requests for modification of standards shall be submitted in accordance with the design exception process provided in Section 2.6. Design exception requests shall include numeric and graphical sight distance analyses showing existing topographic features that are proposed to remain after development of the street, as well as any future features anticipated. Road grade design exceptions require approval of both the City Engineer and the City's Fire Code Official.

3.1.6 Roadway Intersections

3.1.6.1 Intersection Geometry



The interior angle between centerlines at intersecting streets shall be kept as near to ninety degrees (90°) as possible and in no case shall it be less than seventy-five degrees (75°). The centerlines of intersecting streets must be spaced at least 150 feet apart.

Horizontal point of curvature (PC) must be located a minimum of 25 feet from the right-of-way of intersecting streets.

An arterial or collector street intersecting with another street shall have at least 100 feet of tangent adjacent to the intersection unless topography requires a lesser distance. Other streets, except alleys, shall have at least 50 feet of tangent adjacent to the intersection.

The curb radius at the intersection of two streets shall be as shown in Table 3-7, unless otherwise approved by the City Engineer.

Table 3-7. Design Curb Radius

| Approach/Entering Street at Intersection  | No Parking or Bicycle Lane | With Bicycle Lane | With Parking Lane | Both Parking and Bicycle Lane |
|--|--------------------------------|-------------------|-------------------|-------------------------------|
| Exiting Street  | Design Curb Radius (ft) | | | |
| No Parking or Bicycle Lane | 30 | 25 | 20 | 10 |
| With Bicycle Lane | 25 | 12 | 8 | 5 |
| With Parking Lane | 20 | 8 | 5 | 5 |
| Both Parking and Bicycle Lane | 10 | 5 | 5 | 5 |

The intersection of more than two streets at any one point is not allowed.

Bulbed-out intersections for improved pedestrian crossings may be required at intersections specified by the Community Development Department or Engineering Division. Additional traffic calming measures may be required by the City Engineer.

3.1.6.2 Clear-Vision Area

A clear-vision sight triangle must be maintained at the intersections of any two streets, at a street and a railroad crossing, or where a driveway enters a street. Refer to Article 3 of the *Development Code* for specific requirements.

3.1.7 Illumination and Signalization

The City Engineer will consider factors such as traffic, crash data, and roadway characteristics to support lighting installation decisions. AASHTO provides the threshold or minimum conditions of when to consider lighting. Refer to the ODOT *Lighting Policy and Guidelines*. Street lighting requirements of Article 13 of the *Development Code* also apply for subdivisions and land partitions.

The City accepts Pacific Power’s standard luminaires, and will pay for power and maintenance of street lights that have been approved by the City Engineer and installed by the electric utility company in City rights of way. Where specialty light fixtures are desired, financial responsibility for monthly power and maintenance costs shall be determined prior to design approval.

Signals shall be designed by a Professional Engineer in accordance with the *ODOT Traffic Signal Design Manual*.

3.1.8 Access to City Streets

Proposed driveway or private street access to a City street requires a permit from the City. State highway access requires a permit from ODOT.

3.1.8.1 Driveway Access

Driveways shall meet the requirements of Chapter 2.0 of the *Astoria City Code*. Driveways greater than 150 feet in length shall meet the design requirements for Private Streets provided in Section 3.2.

Maximum and minimum driveway dimensions are detailed in Table 3-8.

Table 3-8. Driveway Apron Width

| Property Frontage | Minimum width (ft) | Maximum width for single driveway (ft) | Maximum width each for two driveways (ft) |
|-------------------|-----------------------|--|---|
| Less than 50 feet | 12 | 20 | N/A |
| 50 to 75 feet | 12 | 25 | 20 |
| More than 75 feet | 12 | 30 | 20 |

Widths in this table do not include sloped wings.

Properties with 50 to 100 feet of right-of-way frontage are allowed a maximum of two driveways. The maximum width for each driveway is 20 feet.

Each additional 100 feet of frontage for contiguous property is considered a separate frontage and shall meet the requirements above.

Requests for additional or wider driveways other than those allowed above must be approved through the design exception process (see Section 2.6).

Restrictions may be imposed on additional driveways, such as limited turn movements, shared access between uses, closure of existing driveways or other access management actions.

Design and construction of the driveway apron shall conform to **Details ST-5** and **ST-6**. Driveways shall meet applicable ADA guidelines.

3.1.8.2 Access from Alleys and Private Streets

Alley and private street connections to the public street shall be designed in accordance with **Detail ST-6**.

3.1.8.3 Controlled Access

Controlled or gated access is not permitted on public or private streets except as approved for emergency-only access or public utility access. Gated communities and gated neighborhoods are not allowed. Any proposed controlled access devices will be evaluated through the design exception process.

3.1.9 Cul-de-sacs

Dead-end streets over 150 ft in length shall terminate in an approved turnaround (see Appendix D of the Oregon Fire Code) to provide adequate emergency vehicle access. The maximum length of a dead-end street shall be 400 feet unless approved through the design exception process (see Section 2.6). This length shall be measured from the centerline of the intersecting street along the centerline of the dead end street to the center of the turnaround.

No islands or other obstructions are allowed in the centers of cul-de-sacs.

The entire cul-de-sac or hammerhead must be contained within the public right-of-way and signed appropriately to restrict parking. Refer to Section 3.1.2.7 for information regarding sign installation responsibilities.

3.1.10 Alleys

Alleys must be a minimum of 20 feet wide with a 5-ft curb radius at the intersection of the public road. Alleys shall be constructed using the pavement section required for residential local streets. (Refer to pavement section information on **Detail ST-1**.) The City will not construct or maintain alleys.

3.1.11 Roadway Drainage

Storm water disposal from streets requires a collection and piping system. Roadway storm drain facilities shall be separate from the City's sanitary sewer lines. Discharge points for all roadway storm drains shall be approved by the City Engineer. Refer to Chapter 5 for storm water system design standards.

Bioswales and other storm water infiltration systems shall be employed only in commercial/industrial collector streets in areas designated by the City Engineer. Bioswales (where allowed) shall be designed in accordance with Chapter 14 Appendix B of the ODOT Hydraulics Manual. Landscaping of bioswales (where allowed) shall meet the standards provided in Section 3.5.

3.2 PRIVATELY-MAINTAINED STREETS

The City will not construct or maintain streets or access roads unless they meet all standards provided in Section 3.1. In addition, the Astoria Development Code discourages private streets. However, in cases where public street standards cannot be met, the Developer may elect to construct a privately-maintained access road to serve an infill development.

With the approval of the City Engineer, privately maintained streets may be allowed within an existing public right-of-way. Or, privately maintained streets may be developed exclusively within private property. In either case, the following conditions shall apply:

- a. The maximum number of dwelling units served by the access road shall be three. Streets serving more than three dwelling units must meet the requirements in Section 3.1.
- b. Sidewalks are not required.
- c. The street or access road surface must be constructed of an all-weather surface, as approved by the City Engineer and City Fire Code Official.
- d. Any new development on a private street shall have a fire suppression system approved by the City Engineer and City Fire Code Official.
- e. The traveled way of a private road shall be designated as a fire lane under the Oregon Fire Code. Private streets must have a minimum of 20 feet unobstructed width with 14 feet of vertical clearance.
- f. With the approval of the City Fire Code Official, the travel surface of the access road may be reduced to 16 feet if two or three dwelling units will be served, or 14 feet if only one dwelling unit will be served. The total length of any access road with a reduced pavement width must be 400 feet or less. Access roads in excess of 400 feet must have a paved surface at least 20 feet wide.
- g. A standard turnaround shall be required at any dead end. (See Section 3.19)
- h. A maximum profile grade of 12% is allowed.
- i. All runoff from new access roads must be controlled and directed to appropriate storm drains, combined sewers or existing natural drainage channels. Connection to a combined sewer or natural drainage requires City Engineer approval.
- j. Construction of privately-maintained improvements within existing public rights of way must not obstruct or reduce access to existing homes.
- k. The Developer shall arrange for future maintenance and repair of the access road, through a recorded road maintenance agreement or other legal mechanism to ensure perpetual maintenance. The maintenance agreement shall be binding upon all subsequent property owners and shall clearly specify that the City may remove any road improvements as needed to construct, repair or maintain City utilities in the right-of-

way. Restoration or repair of any roadway damage caused by City utility work will be the responsibility of the parties to the maintenance agreement.

- l. In areas where additional development is anticipated, a City-maintained standard street may someday be needed. Therefore, if a privately-maintained access road is permitted within a public right-of-way, the Developer must also agree to financially participate in any future street improvements. Covenants shall be placed on lots within the development so that this responsibility passes to subsequent owners.
- m. Street improvements constructed in the public right-of-way should be positioned to allow for future widening, if additional development is anticipated.
- n. Developers shall install their own signs in accordance with the MUTCD and City Standards, including a street identification sign at all intersections. City Engineer approval is required when installing signs at intersections with public roads. Once installed, the City will assume maintenance responsibility for traffic control signs and devices and street name signs located at the intersection with a City street. The City will not furnish, install or maintain other signs for private streets.

3.3 NON-MOTORIZED FACILITIES

3.3.1 Sidewalks

Sidewalks in City street corridors shall be designed in accordance with Section 3.1.3.

3.3.2 Bicycle Facilities

Bicycle facilities in City street corridors shall be designed in accordance with Section 3.1.2.1.

3.3.3 Multi-Use Pathways

Multi-use pathways within the City are intended for non-motorized use by bicycles and pedestrians. As land is developed, publicly accessible multi-use pathways may be required by the City's Community Development Department, to facilitate non-motorized circulation and connectivity. ADA requirements apply to these facilities. Design of new multi-use pathways shall include logical connections to existing or planned pedestrian and bicycle facilities in street corridors.

General requirements for multi-use pathways are provided in Table 3-9. For additional design guidance, refer to the AASHTO Guide for the Development of Bicycle Facilities, and the Oregon Bicycle and Pedestrian Design Guide.

Table 3-9. Multi-Use Pathway Design Elements

| Pathway Element | Requirements |
|----------------------------|---|
| Surfacing | Stable, firm and slip resistant. Asphalt or concrete are preferred. Other materials require City Engineer approval. |
| Maximum Longitudinal Slope | 4.5% |
| Maximum Cross Slope | 1.5% |
| Clear Width | 10' minimum; 12' preferred; in areas of significant walking or biking demand the clear width should be 16'. |

3.3.4 River Walk/River Trail

The City's River Walk and River Trail are unique multi-use facilities consisting of both paved shoreline segments and structural sections which traverse wharf and trestle areas. The Astoria Riverfront Trolley (see Section 3.4) operates adjacent to portions of the River Walk and River Trail, and in some instances shares the travel space with non-motorized users.

ADA standards apply to design of new or altered River Walk/River Trail areas. In addition, the multi-use pathway standards provided in Section 3.3.3 shall apply to River Trail segments that are constructed on land. Design of segments in wharf or trestle areas shall be performed by an Oregon-licensed engineer.

3.3.5 Public Stairways

New pedestrian facilities and alterations to existing pedestrian facilities within the public right-of-way shall conform to ADA Standards. Due to the City's topographical setting however, hillside conditions may constrain modification or addition of pedestrian features in full and strict compliance with minimum ADA standards. In cases where ADA compliance is technically infeasible, stairway access for pedestrians may be considered by the City Engineer. Where allowed, public stairways shall conform to ADA requirements for general site and building elements.

3.3.6 Street Crossings

Enhanced street crossings are required on roadways with high traffic volumes and/or speeds in areas with nearby transit stops, residential uses, schools, parks, shopping and employment destinations. These crossings shall include treatments such as marked crosswalks, high visibility crossings, and/or curb extensions as determined by the City Engineer.

3.4 TRANSIT FACILITIES

Public transportation services within the City include bus service operated by Sunset Empire Transportation District (SETD), the Astoria Riverfront Trolley operated by the non-profit Astoria Riverfront Trolley Association (ARTA), and intercity motor coach provided by the Northwest Public Oregon Intercity Transit (NW POINT).

Documented coordination with transit providers is required for design of street and other transportation facilities that are located within 100 feet of existing or planned transit routes and stops. ADA-accessible transit stop improvements, pedestrian connections to transit stop locations and furnishings such as shelters, benches, bicycle racks and/or other amenities may be required by the City Engineer.

3.5 LANDSCAPING WITHIN THE RIGHT-OF-WAY

In addition to the guidelines in this section, landscaping within the right-of-way must meet the requirements of *City Code* Chapter 2 and *Development Code* Article 3.

3.5.1 General Requirements

Landscaping within the right-of-way may be a requirement of a development or installed at the request of property owners. If landscaping is a requirement of a development, it may only be removed if it is replaced elsewhere and approved by the Community Development Director and City Engineer.

Landscaping within the right-of-way must be maintained by the adjacent property owner. Irrigation in the right-of-way must comply with the OPSC and also be maintained by the adjacent property owner. Refer to *City Code* Chapter 2 for further information and clarification.

3.5.2 Clearance

Landscaping within the right-of-way must meet the Clear-Vision Area requirements in the *Development Code* Article 3. Vegetation must be maintained so all branches and foliage are removed to a height of 7 feet above the sidewalk and 14 feet above the roadway.

3.5.3 Street Tree Installation

Both underground and overhead utilities need to be considered when choosing the type and location of landscaping. A root barrier shall be installed to prevent heaving of the sidewalk or roadway and may be required when underground utilities are located near the root system. A 24" deep barrier is required adjacent to public sidewalks and a 36" deep barrier is required adjacent to the roadway. Barrier specifications shall meet requirements of DeepRoot[®] UB 24-2 and UB 36-2, or approved equal.

Street trees installed within Mixed Use Collector or Mixed Use Local streets require tree grates. Grates must have removable rings to accommodate the growing width of the tree trunk. Potted trees may be allowed within sidewalk buffer areas if the pots are constructed for permanent installation.

3.5.4 Suggested Types of Trees

Native vegetation is recommended to reduce watering and maintenance requirements. Trees should not be fruit bearing to avoid debris on the sidewalk. A list of acceptable tree types for planting in the public right-of-way may be obtained from the City's Community Development Department.

3.6 TRANSPORTATION FACILITY CONSTRUCTION AND MAINTENANCE RESPONSIBILITIES

Developers are responsible for constructing, signing and striping new street facilities and improving existing roadways as required for developments such as subdivisions and commercial buildings. Maintenance of roadway improvements within dedicated right-of-way is the responsibility of the Developer (or designated private parties) until formal acceptance of the roadway by City Council. Any non-standard roadway within the right-of-way that is not accepted by the City Council must be maintained by the Developer (or designated private parties) in perpetuity or until the roadway is improved and accepted by City Council. Maintenance responsibility needs to be documented, recorded and a copy provided to the City prior to any final inspections or occupancy of the associated development.

Transportation facilities within the vehicular zone of street corridors that are located within the public right-of-way and that are formally accepted by City Council are maintained by the City. This includes pavement, gutter, signing, striping and signalization. State highways are maintained by ODOT.

Transportation facilities within the walking zone of street corridors are maintained by adjacent property owners.

Private roads and alleys must be maintained in perpetuity by the Developer, adjacent property owners, homeowners association or other designated party. A maintenance agreement shall be submitted to the City with any new development project.

Table 3-10. Maintenance Responsibilities

| Facility | Location | Accepted by City Council? | Maintenance Responsibility |
|---|-------------------------------|---------------------------|----------------------------|
| Standard street vehicular zone improvements | Public Right-of-way (ROW) | Yes | City |
| Standard street walking zone improvements | Public ROW | Yes | Private ¹ |
| Sub-standard street, private street or alley | Public ROW | No | Private ¹ |
| Multi-use pathway | Public ROW, easement or tract | TBD ² | TBD ² |
| State highway | State ROW | N/A | ODOT |
| ¹ Developer, owners of properties served by the street, or other designated parties. ² To be determined prior to design approval | | | |

3.7 FORMAL ACCEPTANCE OF TRANSPORTATION FACILITIES

Astoria Code 2.360(6) provides for acceptance of new street facilities by City Council. Only improvements that have been constructed in accordance with City standard specifications (2015 Oregon Standard Specifications for Construction) and inspected and approved by the Engineering Division shall be recommended for Council acceptance by the City Engineer. Upon City Council approval, the City will provide a formal letter of acceptance. The City will not maintain or repair any facilities until they have been formally accepted.

4 SANITARY SEWERS

This chapter provides information for the design of public sanitary sewers. Public sanitary sewer design plans are reviewed and approved by the Engineering Division.

All new common sanitary sewers serving more than one lot of record must be public sanitary sewers. If allowed by the City, private sanitary sewers constructed on private property within a single lot of record must be designed according to the Oregon Plumbing Specialty Code.

The following sanitary sewer design standards have been developed with the goals of proper sizing for current and future flows, correct installation for long life, ease of access for maintenance and repair while taking into account construction costs.

Compliance with these standards does not relieve the Design Engineer of the responsibility to apply conservative and sound professional judgment. These are minimum standards and are intended to assist, but not substitute for competent work by design professionals. The City may at its sole discretion due to special conditions and/or environmental constraints, require more stringent requirements than would normally be required under these standards.

This chapter is intended to be consistent with and a supplement to the following documents:

| | |
|------|---|
| APWA | American Public Works Association |
| ASTM | American Society for Testing and Materials |
| OAR | Oregon Administrative Rules City of Astoria Sewer Service Resolution |
| OPSC | Oregon Plumbing Specialty Code |
| DEQ | Oregon Department of Environmental Quality Water Quality Program Rules ¹ |

Where conflict exists between these Design Standards and the above referenced documents, the most stringent requirements shall take precedence.

¹ Oregon Department of Environmental Quality, *Water Quality Program Rules – Division 052*
<http://www.deq.state.or.us/regulations/rules.htm>

4.1 DESIGN FLOWS

The entire basin to be served by a sanitary sewer must be taken into account when developing design flows for new or replacement sanitary sewers. In Astoria, basin sizes are generally small and slopes sufficient to allow an 8-inch diameter line to adequately serve most areas. Much of the existing sanitary sewer system is combined sanitary and storm, but all new construction must be separated. If upstream tributary areas are not separated, the sanitary sewer must be designed to handle sanitary as well as the 25-year storm flows.

Flow calculations prepared by a Professional Engineer are required for all lines serving 10 or more residences and all commercial or industrial facilities with flows in excess of 3,600 gallons per day (gpd). Table 4-1 includes suggested residential sanitary sewer flow generation rates for sanitary sewers up to 12 inches in diameter.

Table 4-1. Suggested Flow Generation Rates

| | |
|-------------------------|---------------------------------------|
| Average Flow Generation | 120 gallons per capita per day (gpcd) |
| Peak Flow Factor** | 1.8 to 4 |

**Peak flow factors are referenced from OAR52 Appendix A and vary depending on the type and size of the development.

The sanitary sewer flow rates above are suggested. The Design Engineer should use judgment to determine if they are appropriate for the pipe being designed. The Design Engineer shall provide a map of the basin served by the sanitary sewer and take into account existing and potential connections. Future connections shall be estimated by the existing lot layout or zoning of undeveloped areas. An estimate of infiltration and inflow shall be included in the design flows. Surcharging shall not be designed into the system for flows up to the expected peak.

4.2 SANITARY SEWER PIPES

4.2.1 Sanitary Sewer Pipe Material

The standard pipe material to be used for sanitary sewers is PVC meeting the requirements of ASTM D3034 SDR35. High-density polyethylene (HDPE) pipe with fused joints is also acceptable. All HDPE pipe shall be de-beaded. Minimum wall thickness class of HDPE pipe is SDR 26. Other pipe materials may be considered where appropriate and must be approved by the City Engineer. Tracer wire shall be a minimum 14-gauge, solid core, green-coated copper wire with thermoplastic insulation recommended for direct burial, and shall be installed with all sanitary sewer pipes.

4.2.2 Sanitary Sewer Pipe Size

Sanitary sewers shall be sized to adequately handle the expected flows. The minimum sanitary sewer diameter is 8 inches. For dead-end lines up to a maximum length of 250 feet, that have no possibility of future extension and serve less than 6 houses or have limited flow, 6 inch lines will be allowed providing that they can be shown to have sufficient capacity and flow velocity.

4.2.3 Sanitary Sewer Pipe Slope

Sanitary sewers shall be sloped to provide a minimum velocity of 2 feet per second (fps) for the average daily flow using a Manning's roughness coefficient of 0.013 or greater. In no case shall the slope be less than shown in Table 4-2.

Table 4-2. Minimum Pipe Slopes

| Pipe Diameter (inches) | Minimum Slope (%) |
|------------------------|-------------------|
| 6 | 0.75 |
| 8 | 0.40 |
| 10 | 0.35 |
| 12 | 0.30 |

Slopes shown are an absolute minimum. Calculations shall be provided to show that minimum flow velocity requirements can be met. Sizing pipes larger than needed for the anticipated flow to allow installation at a reduced slope is not acceptable. Sanitary sewer diameters may not be reduced in a downstream direction even if steeper slopes allow a smaller diameter pipe to have sufficient capacity for the design flow.

Flow velocities greater than 15 fps under daily peak flows should be avoided. This may not be possible with Astoria's steep topography and allowances will be made if steep pipe slopes are unavoidable. A velocity over 15 fps in sanitary sewer pipes requires special consideration for pipe scour control (and manhole scour, see Section 4.3.4). Pipe restraints or anchors may be required for pipe slopes in excess of 20%.

4.2.4 Sanitary Sewer Depth

Sanitary sewers shall be installed with a minimum of 36 inches of cover from the top of the pipe to the finish surface. Maximum cover from top of pipe to finish grade shall not exceed 6 feet, unless approved by the City Engineer. The depth should be sufficient to provide for access by gravity from all adjacent properties in the area whether proposed or existing. Sanitary sewer main depth shall be designed to avoid conflict with other existing and

proposed utilities as provided in Section 4.4.2. Conflicts between sanitary sewer laterals and other utilities must also be taken into account in the design.

4.2.5 Sanitary Sewer Laterals

Sanitary sewer laterals shall be a minimum of 4-inch diameter for residential areas and 6-inch diameter for commercial areas, see **Detail S-8**. Side sewer stubs shall have a minimum slope of 2% and extend from main line to the property line. Sanitary sewer laterals shall terminate in an in-line clean out at the property line. Sanitary sewer laterals shall have at least 36 inches of cover in all traveled ways and not less than 2 feet of cover in other areas. Sanitary sewer lateral materials must meet the requirements of Section 4.2.1.

4.3 MANHOLES AND CLEANOUTS

4.3.1 Location

Manholes shall be installed at the following locations:

- a. All changes of pipe size, direction, alignment and grade
- b. At the upstream end of the pipe
- c. Maximum spacing of 300 feet
- d. Each intersection or junction of sanitary sewer mains
- e. Any intersection of a service or private sewer of 8 inches or larger

Manhole placement within the street right-of-way should allow easy access without blocking both traffic lanes. Manhole covers shall not be located in the normal wheel path for the street nor within a crosswalk. Place manholes to avoid surface runoff or storm water ponding. In certain situations, a cleanout may be allowed in lieu of a manhole, as approved by the City Engineer.

4.3.2 Standard Manhole

Manholes shall be 48 inches in diameter for main sizes up to 24 inches, see **Details S-1, S-2, S-3, S-4 and S-5**. For line sizes in excess of 24 inches, the Design Engineer shall submit manhole designs. A maximum of two sanitary sewer laterals may be connected directly to the manhole as long as channels are provided. A minimum 0.1 foot drop in inverts across the manhole is required where the angle between the upstream and downstream pipe is less than 90 degrees. Provide at least a 0.2 foot drop in inverts where the outlet pipe is 90 degrees from the inlet pipe, or where manholes larger than 48 inches have been approved for use by the City Engineer. Designs for connections to existing manholes shall show the location of the cover and ladder and the elevations of all pipe inverts, channels, ledge and rim. When different size pipes enter/exit a manhole, the elevation of the crowns of the pipe shall match.

Flat top manholes should be used when there is less than 6 feet from the pipe invert to the top of the manhole.

4.3.3 Drop Manhole

The maximum permitted channelized drop across a manhole is 24 inches. For drops in excess of 24 inches, a drop manhole is required; see **Detail S-6**. Inside drops are only permitted when adequate room is available within the manhole and when site conditions make an outside drop extremely difficult to construct, see **Detail S-7**. Only one inside drop is permitted in each manhole. Inside drops require approval by the City Engineer.

4.3.4 Manhole Scour Protection

Internal manhole scour protection, such as HDPE flat plate (1/4 inch thick), epoxy coating or energy dissipation mechanisms shall be provided whenever entering flows exceed 15 feet per second. Scour protection treatments require approval by the Engineering Division.

4.3.5 Cleanout

Cleanouts may be used instead of manholes at the upper end of a 6 or 8-inch lateral that is less than 250 feet in length, see **Detail S-9**. Cleanout size shall match the pipe size for diameters up to 8 inches.

4.3.6 Connections to Existing Manholes

When connecting new lines to existing manholes, the manhole wall must be core drilled cleanly, and grouted or otherwise sealed to prevent groundwater inflow and infiltration.

4.4 SANITARY SEWER ALIGNMENT

Sanitary sewer lines shall have a straight alignment with a constant grade between manholes. Curved alignment will not be allowed unless there are no reasonable alternatives and must be approved by the City Engineer. Sanitary sewer alignment shall be in a street right-of-way whenever possible. Sanitary sewer lines shall be located no closer than 5 feet from the right-of-way or easement line.

4.4.1 Sanitary Sewer Easements

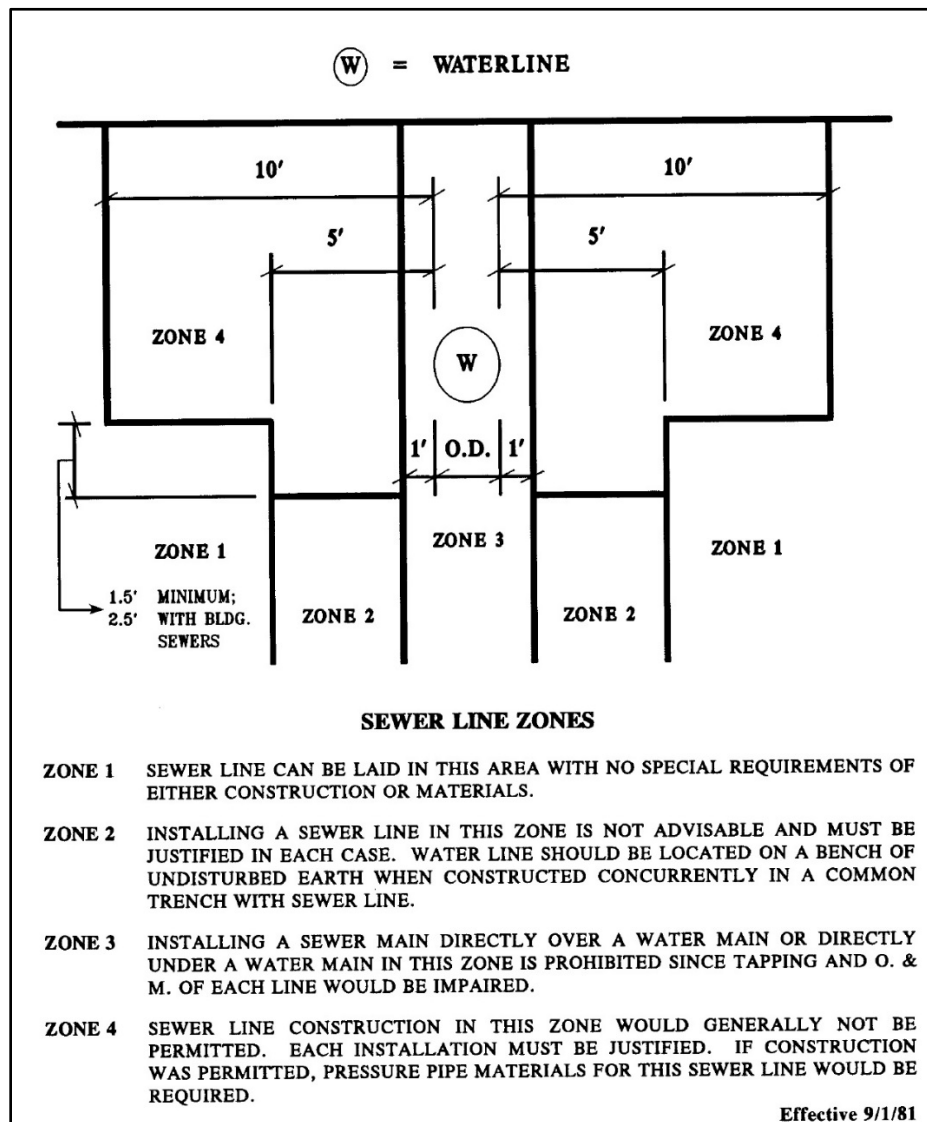
If due to topographic constraints the sanitary sewer must run along the alignment of a property line, adequate access must be provided. A minimum 20-foot wide sanitary sewer easement is required for legal access and an adequate surface is required for physical access. A wider sanitary sewer easement may be required based on the depth of the pipe. Sanitary sewer pipe shall be located in the center of the easement. The sanitary sewer alignment must be graded to permit travel by utility trucks and backhoes. The sanitary sewer alignment should be offset from the property line to avoid conflicts with survey monuments. The easement description must hold the City harmless for any damage to or

removal of fences, retaining walls, trees or other improvements constructed in the easement area. Easements need to be shown on the final plat or recorded easement document prior to City acceptance.

4.4.2 Clearance from Other Utilities

Separation of parallel water and sanitary sewer lines shall meet the requirements of OAR 340-052 Appendix A, as shown in Figure 4-1.

Figure 4-1. Sanitary Sewer Line Separation from Parallel Water Lines²



Water and sanitary sewer line crossings shall be in accordance with the OAR 340-052 Appendix A. Sanitary sewer/water line crossings shall be as near to 90 degrees as practical.

² Oregon Administrative Rules, Chapter 340, Division 52, Appendix A, September, 1981.

A minimum of 18 inches of clearance is required from the top of the sanitary sewer line and the bottom of the water line. If at least 18 inches of separation cannot be maintained, the crossing shall meet the requirements of OAR 340-052 Appendix A.

Adequate separation is required from other utilities. All clearances listed below are from edge of pipe to edge of pipe:

Table 4-3. Minimum Horizontal Clearance from Sanitary Sewer

| Utility | Min. Distance (ft) |
|------------------------|--------------------|
| Cable TV | 5 |
| Gas | 5 |
| Power | 10 |
| Storm | 5 |
| Telephone, Fiber Optic | 10 |

Table 4-4. Minimum Vertical Clearance from Sanitary Sewer

| Utility | Min. Distance (ft) |
|------------------------|--------------------|
| Cable TV | 1 |
| Gas | 1 |
| Power | 1 |
| Storm | 1 |
| Telephone, Fiber Optic | 1 |

4.5 SANITARY SEWER CONNECTIONS

In accordance with the Astoria Sewer Resolution, each residential, commercial or industrial building is required to have a separate connection to the public sanitary sewer. Private sewers serving more than one lot are not allowed, unless the lots are combined as one buildable lot of record as approved by the City. See OPSC, Section 721 for exceptions.

A number of older homes in Astoria are connected to common private sewers. The OPSC requires that two buildings under different ownership must have their own separate

connections to the public sewer. New connections will not be permitted on these private lines.

4.5.1 Connection of Sanitary Sewer Laterals

Connection of sanitary sewer laterals to the public sanitary sewer main is shown in **Detail S-8**. The cost of new lateral connections or extensions is the responsibility of the property owner.

City responsibility for sanitary sewer maintenance is limited to public sanitary sewer mains. Sanitary sewer laterals from the point of connection at the sanitary sewer main, back to the building are the responsibility of the property owner.

4.5.2 Connection of New Sanitary Sewer Mains

Connections of new sanitary sewer mains to existing pipes must be done with a manhole. There is a possibility of surcharging in some existing sanitary sewer lines, particularly the interceptor. This must be taken into account when designing new connections and measures such as storage or backflow prevention constructed to avoid problems.

4.5.3 Pre-Treatment Requirements for Sanitary Sewer Connections

Astoria City Code section 5.555 (9) prohibits the introduction of mastics, oil, grease or petroleum products into the public sanitary sewer by any user connected to the sanitary sewer system. Industrial, commercial and/or retail operations, regardless of size, that generate petroleum/animal/vegetable fats, oils or grease (FOG) waste, must pre-treat wastewater prior to discharging to the public sanitary sewer. Pre-treatment systems are reviewed and approved by the City Building Official. Ongoing maintenance and repair of pretreatment systems to ensure proper function is the responsibility of the property owner.

4.6 WASTEWATER PUMP STATIONS

Pump stations will be evaluated on a case-by-case basis by the City Engineer and Public Works Superintendent. Pump station design plans require DEQ approval in addition to City approval.

Wastewater pump stations must be designed by an Oregon Registered Professional Engineer and must meet DEQ standards for design and construction of wastewater pump stations. Operation and maintenance manuals meeting DEQ guidelines must also be provided. Contact the Public Works Superintendent for additional specifications on pump station controls and appurtenances required by the City.

4.7 SANITARY SEWER SYSTEM TESTING

All new sanitary sewer pipes and manholes must be tested for watertightness prior to City acceptance, using a DEQ-approved method. (Refer to Appendix A of OAR 52.)

In addition, new sewer pipes must be thoroughly flushed and inspected by video, after trench backfilling is complete and prior to City acceptance. This includes video confirmation that the line is free from sags, irregular joints and connections, obstructions, restrictions or other anomalies that may cause solids to accumulate.

Pump station inspection and testing shall be performed to manufacturer's specifications in the presence of the City Public Works Superintendent or designated representative. Testing documentation must be provided to the City Engineer for approval prior to City acceptance.

5 STORM WATER MANAGEMENT SYSTEMS

5.1 GENERAL GUIDELINES

Plans for temporary and permanent storm water management shall be provided for every street improvement and land development proposal.

In areas where storm drains exist within 100 feet of proposed residential development or 200 feet of proposed commercial/industrial development, the storm drain shall be extended to serve the new development. The City Engineer may require longer line extensions and/or additional design parameters for larger developments that have the potential to significantly impact the City's infrastructure. The City will accept maintenance of new storm drains installed within dedicated street rights-of-way, provided that construction is in accordance with City standards.

In areas where public sanitary and storm drains are combined, storm water may be directed to the combined sewer system only with the approval of the City Engineer. Storm water and sanitary sewer originating on private lots shall be piped separately to the property line. At the property line, storm and sanitary sewer lines may be joined and then connected to the public combined sewer line with a single sewer lateral. Street runoff in combined sewer areas shall be captured in catch basins and routed to an existing sanitary sewer structure designated by the City Engineer.

In addition to adhering to the standards provided below, storm water designs should identify the potential overland flow path in the event the storm water infrastructure becomes plugged or fails, and provide safeguards to minimize property damage.

Runoff from streets and other impervious surfaces may not be directed to a natural drainage channel, without prior approval of the City Engineer. If approved, runoff directed to natural drainage channels shall be pre-treated using a pollution control structure or biofiltration method. Riprap or other energy dissipation facilities may be required at storm water discharge points to prevent erosion.

5.2 STORM WATER DESIGN DOCUMENTATION

Hydraulics reports and other storm water design documentation documents shall be prepared in accordance with the ODOT Hydraulics Manual.

5.3 TEMPORARY STORM WATER AND EROSION CONTROL

Management of storm water during construction shall adhere to the Oregon Department of Environmental Quality's Construction Stormwater Best Management Practices Manual.

A plan for temporary slope stability and erosion control, along with a plan for permanent slope stability, erosion control and plant establishment, is required as part of the construction submittal. A grading permit must be obtained from the Engineering Division before any site work, including clearing and grubbing, begins.

If a geological study is required by the City's Development Code, the study shall address both local and global slope stability, before, during, and after development. Geological recommendations shall include methods for maintaining slope stability and managing storm water during construction. All geological recommendations shall be incorporated in the Developer's grading permit application, and approved by the geologist or engineer upon completion of construction.

5.4 PERMANENT STORM WATER MANAGEMENT SYSTEMS

5.4.1 Flow Calculations and Sizing Methodology

Runoff calculations and pipe sizing performed by a registered engineer are required, and should be based on anticipated build-out. All future anticipated impervious surfaces in the development such as streets, walkways, driveways, roofs, patios, etc. should be accommodated when designing storm water improvements.

Refer to the ODOT Hydraulics Manual for acceptable hydrologic methods for calculating peak flows. Selection of methodology is at the discretion of the Design Engineer. Calculations should be confirmed using a second analysis method, also selected at the discretion of the designer.

5.4.2 Inlets, Catch Basins and Storm Water Pre-Treatment

Inlets and catch basins in the public right-of-way shall be constructed as shown in **Details SD-1 through SD-5**. Inlets and catch basins on private property shall comply with Plumbing Code requirements.

Pre-treatment of storm water destined for conveyance in a public sanitary sewer or storm drain system is not standard for the City, but may be required by certain funding sources for public projects. If required, pre-treatment may be accomplished through the use of biofiltration swales, catch basin inserts, or other methods approved by the City Engineer which are designed to remove oil and grease, trash, debris and sediment. If catch basin inserts are used, filter systems shall encapsulate contaminants and shall be designed for easy

installation, removal and disposal. Any catch basin inserts proposed for use on public facilities require approval of the Public Works Superintendent.

5.4.3 Storm Drain Manholes

Storm drain manholes shall meet the requirements of Section 4.3 and **Details S-1 through S-7**. Channelization is not required in storm drain manholes. A sump is required with a 12" minimum depth.

5.4.4 Storm Drain Pipes

The City allows the use of the following materials for storm drain piping:

- a. Pipe meeting ASTM D3034 SDR 35 specifications
- b. High-density polyethylene (HDPE) pipe with fused joints. Joints shall be de-beaded.
- c. Dual wall corrugated HDPE pipe with smooth interior wall (for example, ADS N-12 piping for diameters of 24" and less; and ADS SaniTite for diameters of 30" and larger.)

Storm drain piping shall otherwise meet the requirements of Section 4.2, except that the minimum storm drain pipe size shall be 8 inches.

White locate wire shall be installed as shown in **Detail UT-1**.

5.4.5 Connection of Private Drains to the Public Storm Drain

For Commercial/Industrial developments, storm water originating on private property shall be treated on-site.

Private drains may be connected directly to the public storm water system, if approved by the Engineer. Drain pipes 10-inch diameter and larger, shall be connected at a nearby manhole or catch basin rather than directly to public storm water pipelines. All connection points shall be approved by the City Engineer.

For private developments adjacent to Mixed Use and Residential Streets, small private drains for individual lots may be piped under the sidewalk and through the curb, for discharge to the street gutter, provided that the street cross section does not allow sheet flow across the travelled way. Gutter discharge points shall be approved by the City Engineer. The City Engineer may require connection to the public storm water system where gutter discharge has the potential for detrimental effects.

5.4.6 Vegetated Storm Water Facilities

Biofiltration swales shall be provided for storm water treatment in the public right-of-way along Commercial/Industrial streets where well-draining soils exist. Refer to the water quality section of the ODOT Hydraulics Manual for swale sizing and design guidelines.

If infiltration is planned to reduce the volume of storm water directed to the public sanitary sewer, at least one onsite infiltration test shall be conducted to estimate the rate of infiltration before selecting and sizing infiltration facilities. Selection of a standard infiltration test procedure shall be at the discretion of the designer, provided that the method selected is appropriate for the facility being designed. Refer to technical guidance published by the Oregon State Extension office³.

Along Residential and Mixed Use streets, the City Engineer may consider the use of swales, rain gardens and other non-traditional planting strip treatments for collection and treatment of storm water from the public right-of-way. In hillside areas, these facilities shall be designed as flow-through facilities, either lined with an underdrain, or unlined at the City's discretion. Lined facilities may be required to prevent infiltration in geologically active locations or areas where underground contaminants may be present. Design shall include energy dissipation elements and discharge connections to the public storm drain or combined sanitary sewer system.

For new subdivisions, maintenance of vegetated storm water areas within the public street right-of-way is the responsibility of the Developer and the subsequent property owners' association. This includes keeping any storm water treatment and conveyance elements within planted areas in a state of good repair. In existing City streets where a vegetated storm water treatment area is installed to help the City meet storm water management goals, the City will assume responsibility for maintaining the vegetated area.

In designated geohazard areas, vegetated facilities for storm water infiltration or partial infiltration are not allowed.

5.4.7 Retention and Detention Facilities

The City's preference is unrestricted conveyance of storm drainage to the Columbia River or Young's Bay without the use of detention or retention structures. Therefore design efforts should first seek to address any limiting downstream capacity impediments within the City's storm water conveyance system. The following treatments require City Engineer approval and will be considered for storm water detention or retention only when it is not feasible to resolve downstream capacity issues in the public storm drain system.

³ "Infiltration Testing", Low Impact Development Fact Sheet, Document Number ORESU-G-11-008; Oregon Sea Grant, Corvallis, OR
<http://extension.oregonstate.edu/stormwater/sites/default/files/Infiltration%20Testing.pdf>

5.4.7.1 Basins

Storm water retention and detention basins are uncommon in Astoria and will be considered by the City Engineer on a case by case basis. If allowed, basins intended as storm water management facilities shall meet the design criteria provided in the ODOT Hydraulics Manual.

5.4.7.2 Detention Flow Control Structures

Structural detention facilities such as tanks, vaults and oversized pipes shall be designed to prevent surcharge of downstream piping systems during storm events.

The following criteria apply to detention tank, vault, and oversized pipe design:

- a. All areas within a tank or vault shall be within 50 feet of a rectangular hatch with a 30 x 36 minimum opening. All access openings shall have solid locking lids.
- b. Publicly owned detention tanks, vaults, and pipes are permitted within public rights-of-way. If developments are served with publicly operated and maintained tanks and vaults that are not located within the right-of-way, the tanks/vaults shall be located in separate open space tracts with public sanitary sewer easements that are dedicated to the City of Astoria. All privately owned and maintained facilities shall be located to allow easy maintenance and access.
- c. Minimum size for a public detention pipe shall be 36 inches.
- d. The minimum internal height of a vault or tank shall be 3 feet, and the minimum width shall be 3 feet. The maximum depth of the vault or tank invert shall be 20 feet.
- e. Where the tank or vault is designed to provide sediment containment, the structure shall be designed with a sump to facilitate cleaning.
- f. Pipe materials shall conform to Section 5.4.4
- g. Detention vaults shall be constructed of structural reinforced concrete (3000 psi, ASTM 405). All construction joints shall be provided with water stops.
- h. In soils where groundwater may induce flotation and buoyancy, measures shall be taken to counteract these forces with concrete ballast, earth backfill, concrete anchors, or other counteractive measures. Calculations demonstrating stability shall be submitted to the City Engineer.
- i. Tanks and vaults shall be placed on stable, consolidated native soil with suitable bedding. For installation in fill slopes, a geotechnical analysis shall be performed to confirm stability and determine construction practices.

Flow control structures must be approved by the City Engineer and must meet the following design criteria:

- j. Refer to the ODOT Hydraulics Manual for orifice and weir flow control equations.

- k. Weir structures must be enclosed in a catch basin, manhole, or vault and must be accessible for maintenance.
- l. The control structure shall be designed to pass the 100-year storm event as overflow, without causing flooding of the contributing drainage area.

5.4.8 Operation and Maintenance Plans

A plan outlining the scope of activities, schedule and responsible parties for periodic inspection and maintenance of permanent storm water facilities shall be prepared and included with the construction submittal. This plan shall cover vegetation management, structural repairs, sediment removal and other activities necessary for the continued long-term function of the storm water facilities.

5.4.9 Storm Drain System Testing

All new storm drain pipes and manholes must be tested for watertightness prior to City acceptance using a water exfiltration test procedure.

In addition, new storm drain pipes must be thoroughly flushed and inspected by video, after trench backfilling is complete and prior to City acceptance. This includes video confirmation that the line is free from sags, irregular joints and connections, obstructions, restrictions or other anomalies that may cause solids to accumulate.

6 WATER SYSTEMS

This chapter provides information for the design of public water systems. Private water systems must be designed according to the State Specialty Plumbing Code. Public water design plans are reviewed and approved by the Engineering Division and the Oregon Health Authority Drinking Water Program.

The following water design standards have been developed with the goals of proper sizing for current and future flows, correct installation for long life, ease of access for maintenance and repair while taking into account construction costs.

Compliance with these standards does not relieve the Design Engineer of the responsibility to apply conservative and sound professional judgment. These are minimum standards and are intended to assist, but not substitute for competent work by design professionals. The City may, at its sole discretion due to special conditions and/or environmental constraints, require more stringent requirements than would normally be required under these standards.

This chapter is intended to be consistent with and a supplement to the following documents:

| | |
|------|--|
| SDWA | Safe Drinking Water Act |
| CWA | Clean Water Act |
| APWA | American Public Works Association |
| ASTM | American Society for Testing and Materials |
| AWWA | American Water Works Association |
| OAR | Oregon Administrative Rules |
| ORS | Oregon Revised Statutes |
| | Oregon Fire Code |
| | City of Astoria Water Resolution |
| OPSC | Oregon Plumbing Specialty Code |

Where conflict exists between these Design Standards and the above referenced documents, the most stringent requirements shall take precedence.

6.1 CITY PRESSURE ZONES

Contact the Engineering Division for pressure zone information. The City has several pressure zones within the water system.

6.2 DESIGN FLOW RATES

Water system design shall meet distribution needs for projected maximum daily demand plus fire flow within a given service area. New water systems shall allow for future extensions beyond present development that are consistent with the *Development Code*. Flow testing at peak demand may be required by the Fire Department.

For reference, the average domestic water use in Astoria is 320 gpd per Equivalent Dwelling Unit. The City's Water Resolution provides water consumption estimates for specific individual uses, which may be used for design purposes. An appropriate peak hour factor shall be used for water system design.

6.3 WATER PIPES

6.3.1 Water Pipe Size

Water distribution main sizes shall generally conform to the following:

- a. **4-inch** – May only be used with approval of the City Engineer in residential zones on dead-end streets less than a centerline distance of 250-feet measured from the center of the intersection street to the radius point of the cul-de-sac and that serves 12 or fewer single-family residences. All 4-inch mains shall be connected to a looped minimum 6-inch main. Fire hydrants are not permitted on 4-inch lines. All 4-inch lines shall terminate with a standard blow-off (**Detail W-6**).
- b. **6-inch** – Minimum size residential subdivision distribution water main for the grid (looped) system, limited to single family residential. A 6-inch line shall not be permanently dead-ended. Looping of the distribution grid shall be at least every 600 feet.
- c. **8-inch** – Minimum size for permanently dead-ended mains supplying fire hydrants and mains in residential subdivisions. Dead-end pipe length shall not exceed 600 feet.
- d. **10-inch and larger** – As required for mains in subdivisions, industrial areas, and commercial areas.

Standard design velocity in distribution mains shall not exceed 5 feet per second (fps) for maximum daily demand. Designs that propose occasional short term velocity increases of an additional 2 fps to meet required fire flows may be considered by the City Engineer. Velocity in service lines shall be designed not to exceed 10 fps.

For portions of the water system with mid-range to low-static pressures, required flows may not be achievable while still maintaining a minimum system residual of 20psi. Oversizing of waterlines may be required to achieve the required flows.

Standard pipe sizes for distribution mains are 4" (limited to cul-de-sacs where the City's Fire Code Official has determined that fire hydrants are not required), 6", 8", 10", 12" and sometimes 18".

Standard sizes for transmission mains are 18" and 24". In some instances, 12" distribution mains are designed to serve as transmission mains.

Design exceptions to standard sizes may be allowed in cases of a bridge crossing or other conditions where a standard size would be infeasible, or would limit the capacity below that needed.

Water main, service line and meter sizes are based on the City's Water Resolution, and must be approved by the Engineering Division.

6.3.2 Water Pipe Material

All public water distribution systems shall be constructed with HDPE pipe meeting AWWA standards. **HDPE** pipe, 4-inches to 63-inches shall conform to AWWA C906. All HDPE water pipe shall have a standard dimension ratio no greater than 11.

Exceptions may be approved for special circumstances. Ductile iron pipe or PVC pipe may be approved for use in situations where HDPE pipe is not feasible. If approved, ductile iron and PVC pipe must have restrained joints and meet the following requirements.

- a. **Ductile iron** pipe shall be Class 52, cement mortar-lined with push-on or mechanical type joints, and conform to AWWA C151.
- b. **PVC** pipe, 4-inches to 12-inches shall conform to AWWA C900 and Uni-Bell standards. PVC pipe, 14-inches to 36-inches shall conform to AWWA C905 and Uni-Bell standards. All PVC pipe shall have a dimension ratio no greater than 18, with an outside diameter identical to cast iron pipe.

Tracer wire shall be 14-gauge, solid core, blue-coated copper wire with thermoplastic insulation recommended for direct burial, and shall be installed with all PVC and HDPE water pipe.

Service lines 1-inch and smaller are to be type "K" copper or HDPE. 2-inch service lines must be HDPE or brass. Service lines larger than 2 inches can be ductile iron, HDPE or PVC.

When a potential corrosive condition is encountered, all ductile iron pipe and fittings will be polyethylene encased with an 8-mil tubing meeting manufacturer and AWWA Standards. Where an active cathodic protection system is encountered as a result of other utilities, a deviation from the normal water pipe design/material/installation practice may be required by the City Engineer. PVC pipe or HDPE pipe shall be used where an active cathodic protection system is encountered.

6.3.3 Water Pipe Depth

The minimum cover over buried water mains shall be 30 inches within the road right-of-way from finish grade. Maximum depth for buried water mains shall be 42 inches unless otherwise approved by the City Engineer.

6.4 WATER LINE ALIGNMENT

The distribution system mains shall be looped at all possible locations. All developments will be required to extend mains across existing or proposed streets for future extensions of other developments. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended.

Dead-end mains that are permanent or that will be extended in the future shall be provided with a properly sized blow-off. See **Detail W-6**.

The installation of permanent or long-term, dead-end mains greater than 250-feet, upon which fire protection depends, and single mains serving relatively large areas will not be permitted unless otherwise approved by the City Engineer.

No more than 20 single-family residences shall be served from an un-looped waterline, unless approved by the City Engineer.

Unless otherwise directed or approved by the City Engineer, water mains shall be located within the public right-of-way for ease of maintenance and access, control and operation of the facility, and to permit required replacement and/or repair.

6.4.1 Water Line Easements

If due to unavoidable constraints the water main must run along a property line, adequate access must be provided. A minimum 20-foot wide water easement approved by the City is required for legal access and an adequate surface is required for physical access. Wider easements may be required for deeper pipes. The water alignment must be graded to permit travel by utility trucks and backhoes. The easement description must hold the City harmless for any damage to or removal of fences, retaining walls, trees or other

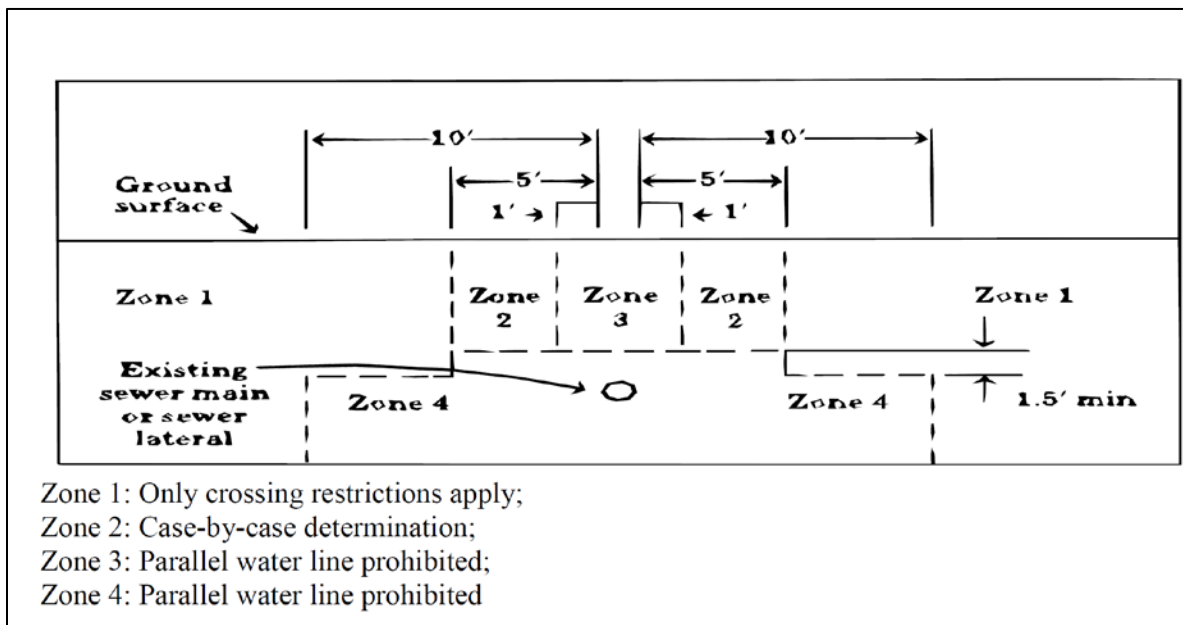
improvements constructed in the easement area. Easement needs to be shown on final plat or recorded easement document prior to acceptance of the water line by the City.

6.4.2 Clearance from Other Utilities

Water and sanitary sewer line crossings shall be in accordance with the OAR 333-061-0050(9). Sanitary sewer/water line crossings shall be as near to 90 degrees as practical. The bottom of the water line shall be 1.5 feet or more above the top of the sanitary sewer line and one full stick of water line shall be centered at the crossing.

Horizontal separation of parallel water and sanitary sewer lines shall meet the requirements of Figure 6-1. In areas where separation requirements are unable to be met, construction shall comply with OAR 333-061-0050(9)(B & C) and will require City Engineer approval.

Figure 6-1. Water Line Separation from Parallel Sanitary sewer Lines⁴



No new utility pole shall be located within 5 feet of an existing hydrant or within 8 feet of an existing water line.

Adequate separation is required from other utilities. All clearances listed below are from edge-to-edge of each pipe:

⁴ Oregon Administrative Rules 333-061-0050, Construction Standards Figure 1, <[http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_333/ tables_333/333-061-0050_1-25.pdf](http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_333/tables_333/333-061-0050_1-25.pdf)> (Accessed: October 15, 2014).

Table 6-1. Minimum Horizontal Clearance from Water Main

| Utility | Min. Horizontal Distance from Water Main (ft) |
|------------------------|---|
| Cable TV | 5 |
| Gas | 5 |
| Power | 5 |
| Storm | 5 |
| Telephone, Fiber Optic | 5 |

Table 6-2. Minimum Vertical Clearance from Water Main

| Utility | Min. Vertical Distance from Water Main (ft) |
|------------------------|---|
| Cable TV | 1 |
| Gas | 2 |
| Power | 1 |
| Storm | 1 |
| Telephone, Fiber Optic | 1 |

6.5 VALVES

Valves shall be installed in accordance with **Detail W-1**. Gate valves are required on water lines from 2" to 12" diameter and shall meet the requirements of AWWA C509 or C515. Butterfly valves are required on water lines larger than 12" diameter and shall meet the requirement of AWWA C504. Valves shall be 2" square nut Non-Rising Stem (NRS) operating, unless specified otherwise. Valves must be tested to ensure proper movement prior to installation.

6.6 FITTINGS

All ductile iron mechanical joint fittings shall be pressure rated at 350 psi and meet the requirements of AWWA C153. All flanged fittings and cast iron mechanical joint fittings shall be manufactured domestically and meet the requirements of AWWA C110 and C111. All fittings shall be factory cement mortar lined and coated.

6.7 FIRE HYDRANTS

Required fire flows are determined by the City's Fire Code Official.

The distribution of hydrants shall be based upon the required average fire flow for the area served. Design coverage shall result in hydrant spacing that meets the Oregon Fire Code of no greater than 400 feet in residential areas and approximately 300 feet in commercial or industrial areas. Additional hydrants shall be placed as required by the Fire Department, Building Division and/or Engineering Division.

No fire hydrant shall be installed on a main of less than 8-inch inside diameter. The hydrant lateral shall be a minimum of 6 inches nominal diameter.

Private fire hydrants are limited to large commercial or industrial developments where public access is not feasible, or as approved by the City's Fire Code Official.

All fire hydrants will be located at the back of the existing or proposed sidewalk, or in the planter strip. Where there is no sidewalk, fire hydrant shall be located a minimum of 2 feet from the face of curb, as shown in **Detail W-2**. If any public hydrant encroaches on private property, an easement must be provided to the City. In general, fire hydrants will be located at or near the point of curvature of the curb return or at a common property line. The pumper port of each fire hydrant shall be perpendicular to the curb line or shoulder as applicable.

No hydrant shall be installed within 5 feet of any above-ground utility, nor shall any utility install facilities closer than 5 feet to an existing hydrant. Hydrants shall not be blocked by parking, fences or other obstructions.

Hydrant installation shall conform to **Detail W-2**. Public fire hydrants shall be painted yellow and private hydrants shall be painted red. Private hydrants must be maintained in accordance with the Oregon Fire Code. Installation of hydrant extensions will not be allowed, unless approved by the City Engineer.

Unless connected to a fire line/fire sprinkler service, fire hydrants shall be placed on the same side of the right-of-way as the waterline serving the fire hydrant. Other proposed locations must be approved by the City Engineer.

Each fire hydrant shall have an auxiliary valve and valve box that will permit repair of the hydrant without shutting down the main supplying the hydrant. The auxiliary valve shall be a resilient-wedge gate valves. See **Detail W-2**.

Guard posts, a minimum of 3-feet high, shall be required for protection from vehicles when necessary (see Oregon Fire Code). Such protection shall consist of 6-inch diameter steel

pipes 6-feet long, filled with concrete, buried a minimum of 3-feet deep in concrete and located at the corners of a 6-foot square with the hydrant located in the center. Use of posts other than at the 4 corners may be approved by the City Engineer.

6.8 COMBINATION AIR/VACUUM RELEASE VALVES

Combination air/vacuum release valve units are required on all transmission and distribution lines, at all high points in grade and at other points as determined by the City Engineer. See **Detail W-7**.

6.9 PRESSURE-REDUCING VALVES

The City's water distribution system is divided into several pressure zones. Where water systems cross these zone lines, a pressure-reducing valve (PRV) station is required. The specific design and location for such valves will be reviewed and approved by the City Engineer. Combination air-vacuum units must be installed downstream of each PRV.

6.10 WATER SERVICE LINES

Water service line refers to the combined facility made up of both a "City water service line" and a "customer water service line." The City service line extends from the water main to the water meter. The customer service line extends from the water meter to the point of use. Customer service lines shall meet the standards of the current edition of the OPSC.

6.10.1 City Service Lines and Meters

Allowable water service line sizes are ¾-inch, 1-inch, 2-inch, 4-inch, 6-inch, 8-inch, 10-inch and 12-inch. Corresponding meter sizes are shown in Table 6-3. A minimum of 30 inches of cover is required for all water service lines. All meters 3 inches and larger require a bypass line as shown in **Detail W-5**. Water service lines will be reviewed for impacts on the distribution system and shall not be greater in size than the distribution main.

Domestic service lines ¾-inch, 1-inch and 2-inch shall extend from the main to behind the curb, with a meter curb stop and meter box located at the termination of the service connection (**Details W-3 and W-4**). Meter shall be provided and installed by the City. Meter boxes are to be provided by the City. Whenever possible, individual service connections shall terminate in front of the property to be served along the street frontage where property is addressed. Meter boxes should be located outside a vehicle travel way. Water service via an easement across a separate parcel under separate ownership, or capable of being sold off, is not allowed unless otherwise approved by the City Engineer.

For services 4-inch and larger (3-inch and larger meters), a design drawing must be submitted to the City showing the vault and fitting requirements with the expected flow

(normal and maximum daily flow) requirements and proposed usage. Meter vaults shall be placed at the entrance to the property being served, unless otherwise approved by the City Engineer. See **Detail W-5**.

Multiple service connections to a premises shall be laid out to follow a logical sequence of addresses to facilitate matching of service connection to building(s). On-site water lines shall be laid out to facilitate a logical matching of service connection to building and address. Each meter must have its own service line and connection to a water main. Manifolds require approval of the City Engineer.

Where an active cathodic protection system is encountered, the service line material shall be HDPE.

Table 6-3. General Design Criteria for Water Service and Meter Sizing

| Water Service Size (inches) | Meter Size (inches) | Max Design Flow (GPM)* |
|--|--|------------------------|
| 3/4 | 5/8 x 3/4 | 30 |
| 1 | 1 | 50 |
| 2 | 1 ½ | 100 |
| 2 | 2 | 160 |
| 4 | 3 | 320 |
| 4 | 4 | 500 |
| 6 | 6 | 1,000 |
| 8 | 8 | 1,600 |
| Larger than 8 | Reviewed and approved on a case-by-case basis. | |
| <i>*Continuous flow not to exceed 30% of max design flow for ¾-inch to 2-inch disk meters. Continuous flow not to exceed 50% of max design flow for all compound meters.</i> | | |

6.10.2 Fire Service Lines

Water system design shall provide adequate flow for fire protection during projected maximum water usage and consumption. Required water system demands shall be met while maintaining the minimum operating pressures of 20 psi required by the State of Oregon (OAR 333-061-0050). Refer to the most current edition of the Oregon Fire Code for fire flow requirements.

There are 4 categories of private fire services: (1) hydrants, (2) fire sprinkler lines, (3) combination hydrant and fire sprinkler lines, and (4) combination hydrant, fire sprinkler and domestic service lines. Table 6-4 provides general design criteria for fire line and fire sprinkler system services.

The City portion of a fire service line shall extend from the main to the property line and end with a vault, metering device, and valves. An approved backflow prevention assembly is required for the property being served, and must be located at the property line. The property owner is responsible for maintenance.

Fire lines serving only fire sprinkler systems shall be metered by a detector meter on the approved backflow assembly. Valves controlling fire suppression water supplies shall be monitored in accordance with the Oregon Fire Code.

Whenever possible, the fire service shall be located along the street frontage where the parcel is addressed.

Fire sprinkler systems for one and two family dwellings shall be served through a standard metered service. The fire sprinkler system may be served through the domestic service for the same residence. The combined domestic, irrigation, and fire sprinkler flow demands may not exceed the City of Astoria allowable flow for that particular size of service and meter.

Table 6-4. General Design Criteria for Fire Line and Fire Sprinkler System Services

| Fire Service Size (inches) | Double Detector Check Valve Assembly or Reduced Pressure Assembly (inches) | Max Design Flow (GPM)* |
|---|--|------------------------|
| 1 | ¾ | 30 |
| 1 | 1 | 50 |
| 2 | 1 ½ | 100 |
| 2 | 2 | 160 |
| 4 | 4 | 500 |
| 6 | 6 | 1,000 |
| 8 | 8 | 1,600 |
| 10 | 10 | 2,500 |
| Larger than 10 | Reviewed and approved on a case by case basis | |
| <p><i>*Continuous flow not to exceed 30% of max design flow for ¾-inch to 2-inch disk meters. Continuous flow not to exceed 50% of max design flow for all compound meters.</i></p> | | |

6.10.3 Fire Vaults

A vault for a 3-inch and larger double detector check valve assembly will be required when a development provides fire sprinklers. The vault drawing will be included on construction drawings submitted to the City.

6.11 BACKFLOW PREVENTION

A backflow prevention device is required for any system with potential to backflow, such as commercial, some residential and stand-alone fire suppression systems. Refer to the City Water Resolution for requirements pertaining to backflow prevention. Installation of backflow prevention devices shall conform to the OPSC when located on private property.

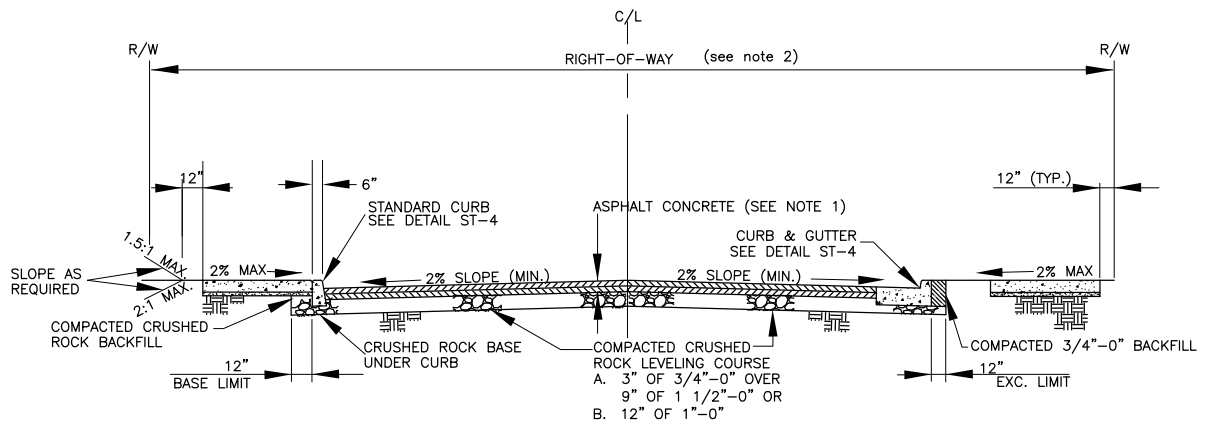
6.12 BOOSTER STATIONS

Booster stations must be designed by an Oregon Registered Professional Engineer and will be evaluated on a case-by-case basis by the City Engineer and Public Works Superintendent. Contact the Public Works Superintendent for specifications on booster station controls and appurtenances required by the City.

6.13 WATER SYSTEM TESTING

All new water systems (including lines, valves, hydrants and services) shall be individually pressure tested, chlorinated, and tested for bacteria. All testing shall be performed in accordance with AWWA C600 and C651, in the presence of a City Inspector.

APPENDIX A - STANDARD DETAILS



NOTES:

1. ASPHALT SHALL BE LEVEL 2, 1/2" DENSE HMAC WITH THE FOLLOWING THICKNESS:
 3" MIN. ON RESIDENTIAL LOCAL STREETS.
 4" MIN. ON RESIDENTIAL COLLECTOR AND MIXED USE STREETS.
 4" MIN. IN COMMERCIAL AND INDUSTRIAL AREAS.
2. SEE STANDARD DETAIL ST-2 FOR STANDARD WIDTH DIMENSIONS.
3. SOIL TESTING TO DETERMINE STRUCTURAL SECTION MAY BE REQUIRED BY THE CITY ENGINEER.
4. UNSUITABLE SUBGRADE MATERIAL SHALL BE REMOVED AND REPLACED WITH COMPACTED 2.5"-0" CRUSHED ROCK AT ENGINEER'S DIRECTION.



City of Astoria
Public Works Department
 1095 Duane Street

Street Cross Section Detail

Date Adopt. 11/01/12

Date Rev. 11/20/15

DWG. NO.

Dwg. Name: ST-1 Street Cross Section.dwg

ST-1

SEE CITY OF ASTORIA TSP ADOPTED
APRIL 21, 2014 - VOLUME 1, SECTION 6
"STANDARDS"



City of Astoria
Public Works Department
1095 Duane Street

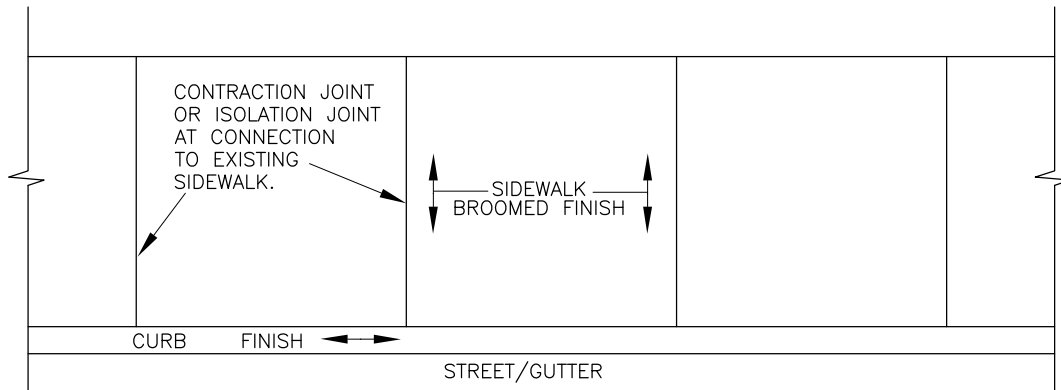
Typical Street Widths

Date Adopt. 11/01/12 | **Date Rev.** 07/24/14

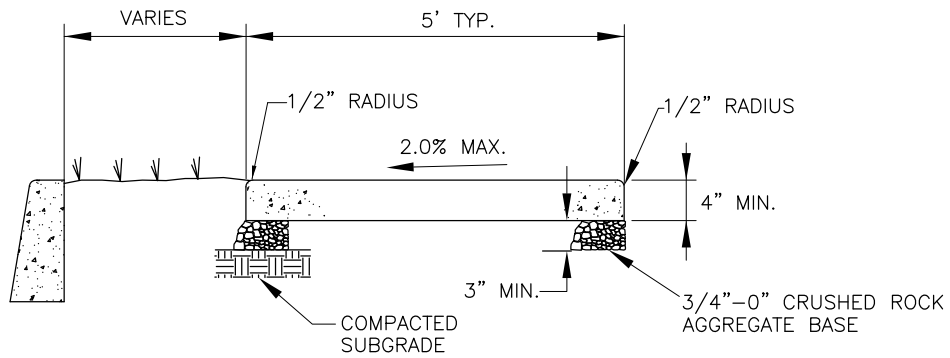
Dwg. Name: ST-2 Typical Street Widths.dwg

DWG. NO.

ST-2



PLAN



PROFILE

NOTES:

1. PORTLAND CEMENT CONCRETE SHALL ATTAIN A 28-DAY COMPRESSIVE STRENGTH OF 3300 P.S.I.
2. CONTRACTION JOINTS SHALL BE PLACED SO AS TO MAKE SQUARE BLOCKS FOR WALKS UP TO 8' WIDE AND ALSO AT ALL CHANGES IN DIRECTION AND POINTS OF CURVATURE. JOINT SHALL BE 1/8" TO 1/4" WIDE WITH A MINIMUM DEPTH OF 1/3 OF THE CONCRETE THICKNESS.
3. ISOLATION JOINTS SHALL BE PLACED AT CONNECTIONS TO EXISTING SIDEWALK, EDGES OF DRIVEWAYS AND ALL STRUCTURES WITHIN SIDEWALK. JOINTS SHALL CONSIST OF A PREFORMED FILLER MATERIAL WITH MINIMUM 1/2" THICKNESS.



City of Astoria
Public Works Department
 1095 Duane Street

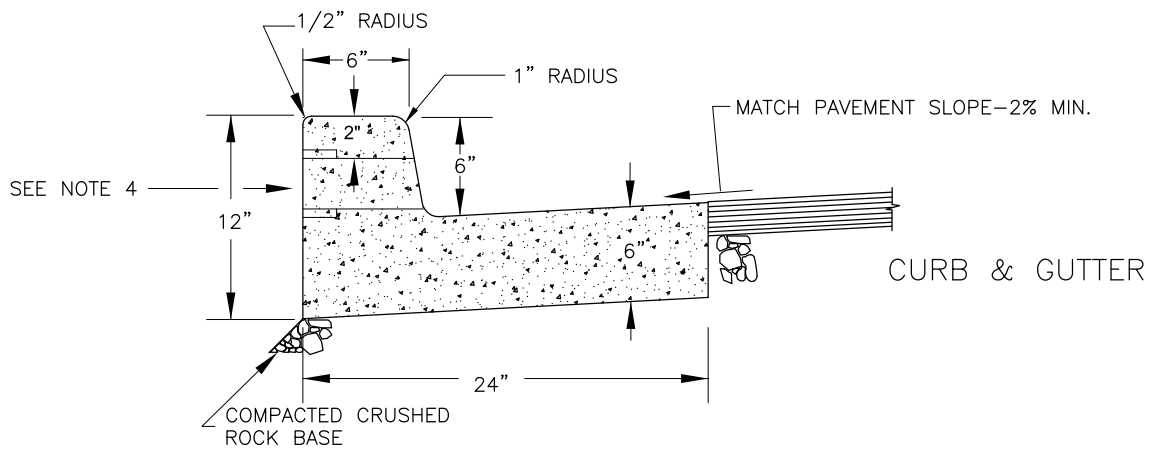
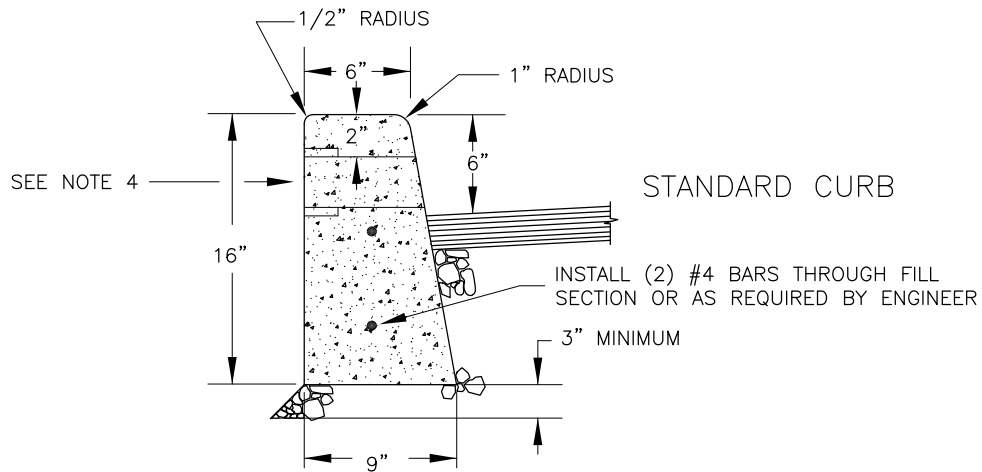
Sidewalk Detail

Date Adopt. 11/01/12 Date Rev. 11/10/15

Dwg. Name: ST-3 Sidewalk.dwg

DWG. NO.

ST-3



NOTES:

1. PORTLAND CEMENT CONCRETE SHALL ATTAIN A 28-DAY COMPRESSIVE STRENGTH OF 3300 P.S.I..
2. CONTRACTION JOINTS SHALL BE PLACED AT 15 FOOT MINIMUM INTERVALS WITH 1 1/2" DEPTH. MATCH SIDEWALK JOINTS.
3. PLACE CONTRACTION JOINT IN CURB OVER CENTER OF PIPE EXTEND PIPE TO BACK OF SIDEWALK IF SIDEWALK IS ADJACENT TO CURB.
4. DRAINAGE BLOCKOUT 3" I.D. PLASTIC PIPE W/BELL. LOCATED AS DIRECTED IN THE FIELD. GENERALLY NOT LESS THAT 2 PER LOT.



City of Astoria
Public Works Department
 1095 Duane Street

Curb Detail

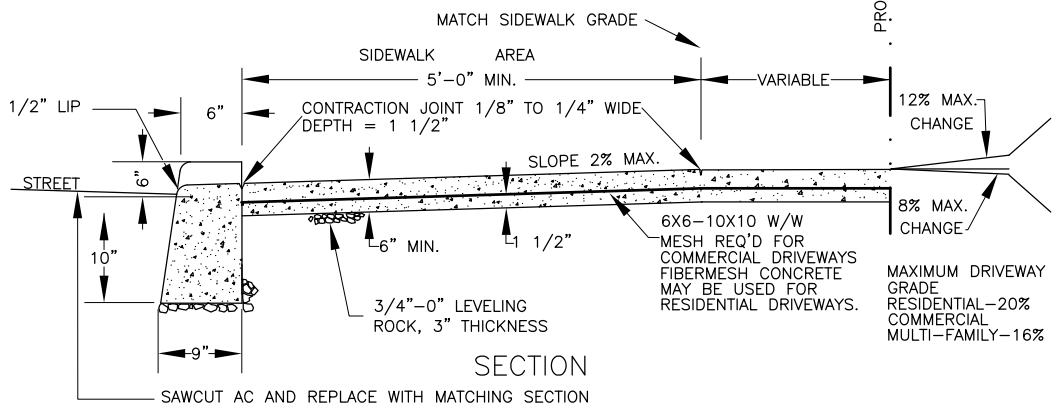
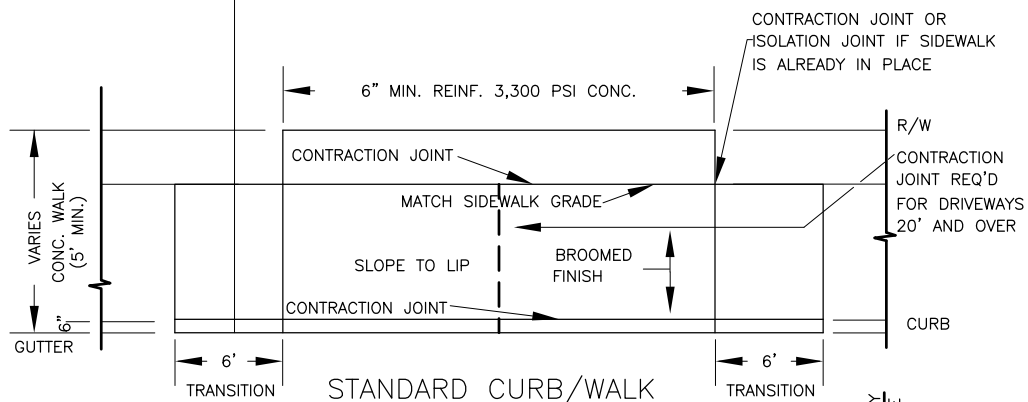
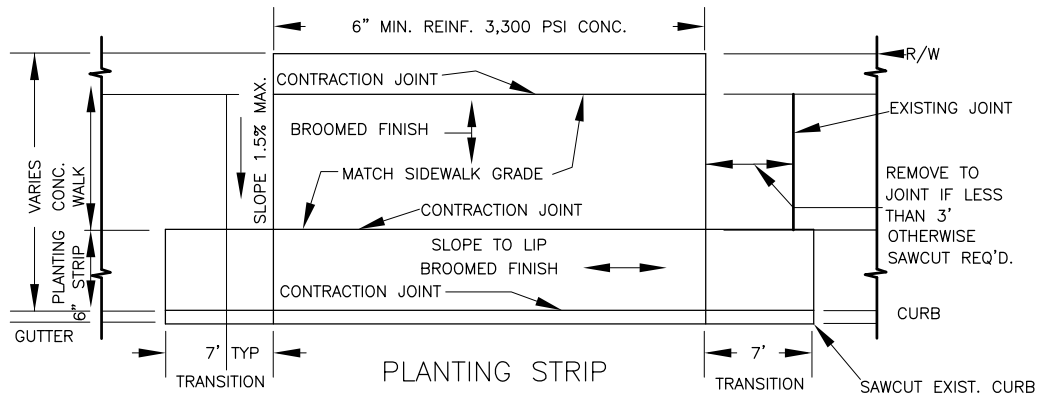
Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: ST-4 Curb.dwg

ST-4



City of Astoria
Public Works Department
 1095 Duane Street

Driveway Apron Detail

Date Adopt. 11/01/12

Date Rev. 11/10/15

DWG. NO.

Dwg. Name: ST-5 Driveway Apron.dwg

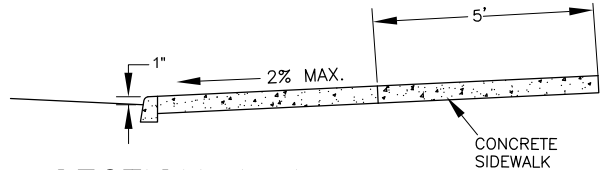
ST-5

CURB AND
SIDEWALK

PUBLIC ROAD

RIGHT-OF-WAY

15' MIN. RADIUS



SECTION A-A

CONCRETE
SIDEWALK

TRUNCATED DOMES
SEE ODOT STD. DETAIL
RD759

1" EXPOSURE

PCC CONC. APRON
STRUCTURAL SECTION
TO MATCH DETAIL ST-5

A.C. OR P.C.C.
DRIVEWAY

VARIES

A

A

CONTRACTION JOINT

0" LIP

0" LIP

MAINTAIN BACK OF SIDEWALK GRADE

TAPER CURB

TRUNCATED DOME
SEE ODOT STD.
DETAIL RD759

6" CURB

15' MIN. RADIUS

INSTALL SIDEWALK (DETAIL ST-3)

LANDSCAPED PLANTING STRIP

PLANTING STRIP
SIDEWALK

NOTES:

THIS TYPE OF APPROACH TO BE USED FOR HIGH VOLUME
TRAFFIC GENERATORS WITH APPROVAL OR AS REQUIRED BY
THE CITY ENGINEER.



City of Astoria
Public Works Department
1095 Duane Street

Curb Return Driveway Detail

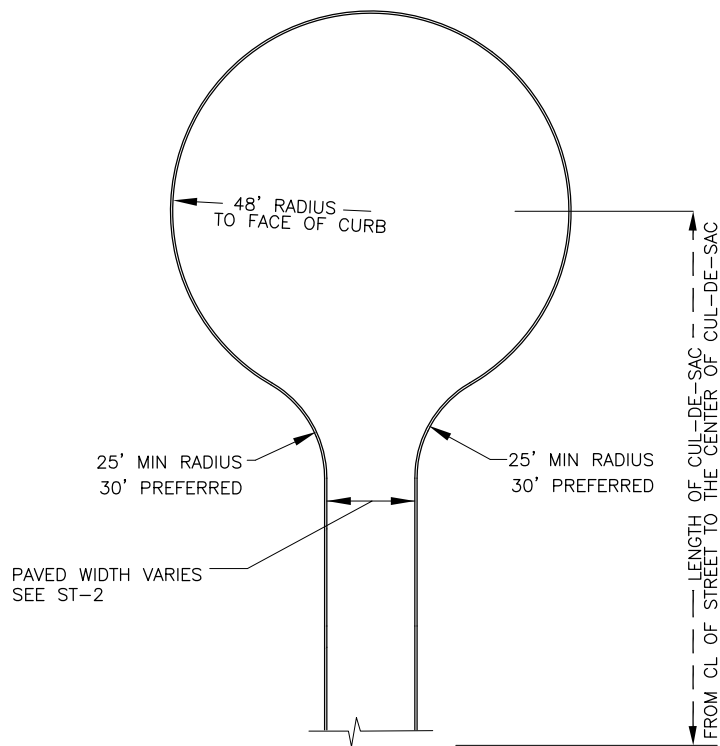
Date Adopt. 11/01/12

Date Rev. 11/10/15

DWG. NO.

Dwg. Name: ST-6 Curb Return.dwg

ST-6



NOTES:

1. LENGTH OF CUL-DE SAC NOT TO EXCEED 400 FEET
2. NO PARKING SIGNS REQUIRED AROUND BULB OF CUL-DE-SAC
3. THE DIMENSION OF THE CUL-DE-SAC BULB MAY BE REDUCED IF ADDITIONAL FIRE SUPPRESSION IS PROVIDED. FIRE SUPPRESSION MUST BE APPROVED BY THE FIRE MARSHAL.



City of Astoria
Public Works Department
 1095 Duane Street

Cul-de-Sac Detail

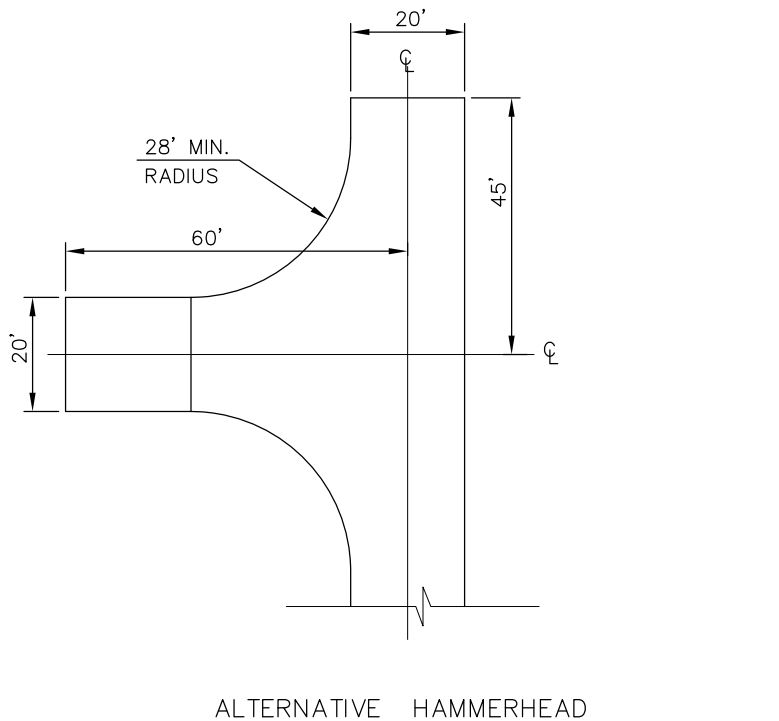
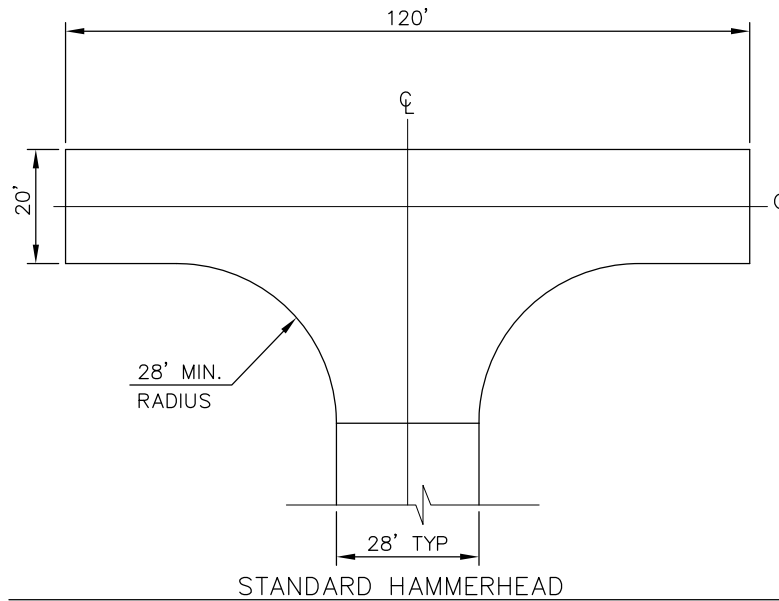
Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: ST-7 Cul-de-Sac.dwg

ST-7



NOTES:

1. HAMMERHEAD WIDTH RANGES BETWEEN 90' TO 120', DEPENDENT UPON ROADWAY LENGTH. SIDEWALKS AND UTILITIES MAY BE LOCATED WITHIN PUBLIC EASEMENTS.
2. ALTERNATIVE DESIGNS BY APPROVAL OF CITY ENGINEER AND FIRE MARSHAL.
3. TURNAROUND FACILITIES CANNOT BE LOCATED ON DRIVEWAYS.
4. ALL STREET ENDS SHALL BE SIGNED PER THE MUTCD.
5. NO PARKING SIGNS REQUIRED IN TURNAROUND AREAS.



City of Astoria
Public Works Department
 1095 Duane Street

Hammerhead Detail

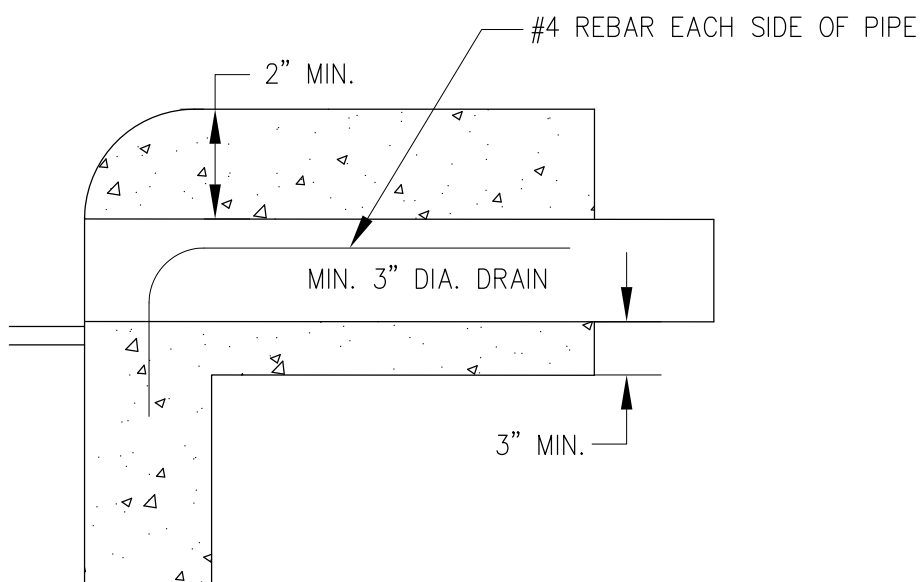
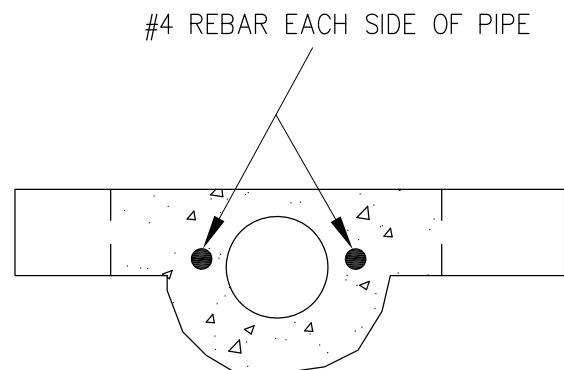
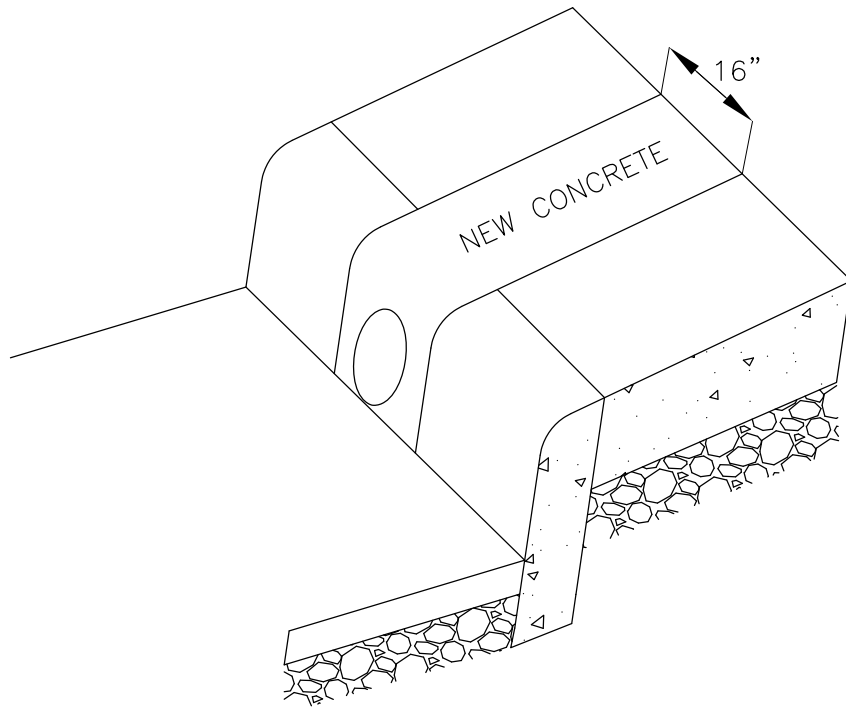
Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: ST-8 Hammerhead.dwg

ST-8



- NOTE:
1. DRAINS WILL BE SIZED ACCORDING TO FLOW FROM ROOF DRAINS, WHERE REQUIRED MULTIPLE RAIN DRAINS SHALL BE INSTALLED.
 2. SIDEWALKS SHALL BE SAWCUT.



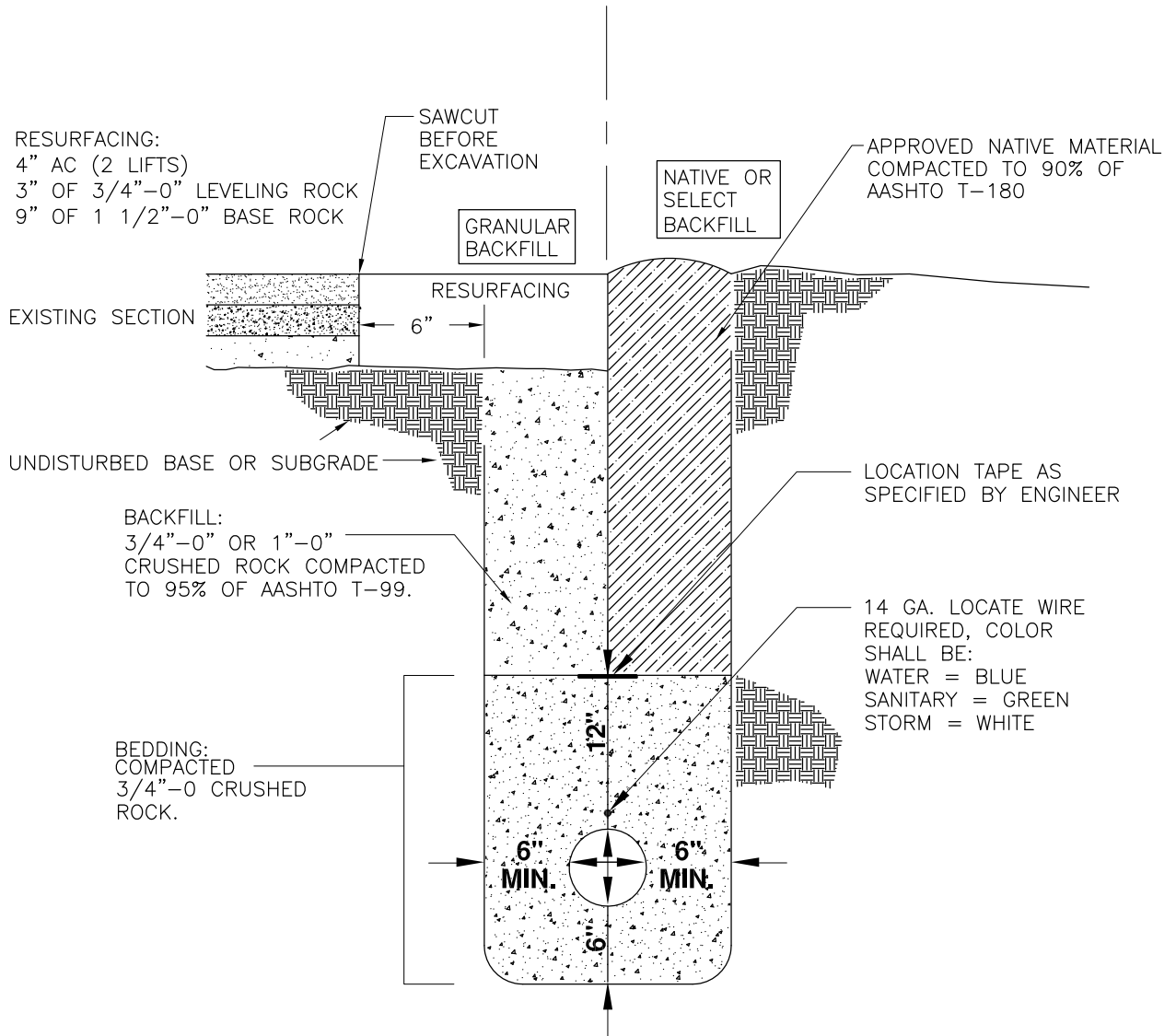
City of Astoria
Public Works Department
 1095 Duane Street

Curb Rain Drain Detail

| | | |
|--|---------------------------|-----------------|
| Date Adopt. 11/01/12 | Date Rev. 11/13/15 | DWG. NO. |
| Dwg. Name: ST-9 Curb Rain Drain.dwg | | ST-9 |

IN PAVED AREAS

LANDSCAPED OR UNIMPROVED AREAS



NOTE:

1. CONTRACTOR SHALL TACK EDGES OF TRENCH AND PLACE AND COMPACT ASPHALT IN ACCORDANCE WITH ODOT STANDARD SPECIFICATIONS.
2. REPLACE CONCRETE ROADWAY AS ENCOUNTERED, EQUIVALENT SECTION. CONCRETE TO BE CLASS 3300, 1 1/2" MAX AGGREGATE.
3. IN ROADWAY SHOULDERS AND GRAVEL DRIVEWAYS IN RIGHT-OF-WAY USE GRANULAR BACKFILL AND SURFACE WITH 6" OF 3/4"-0" CRUSHED ROCK.



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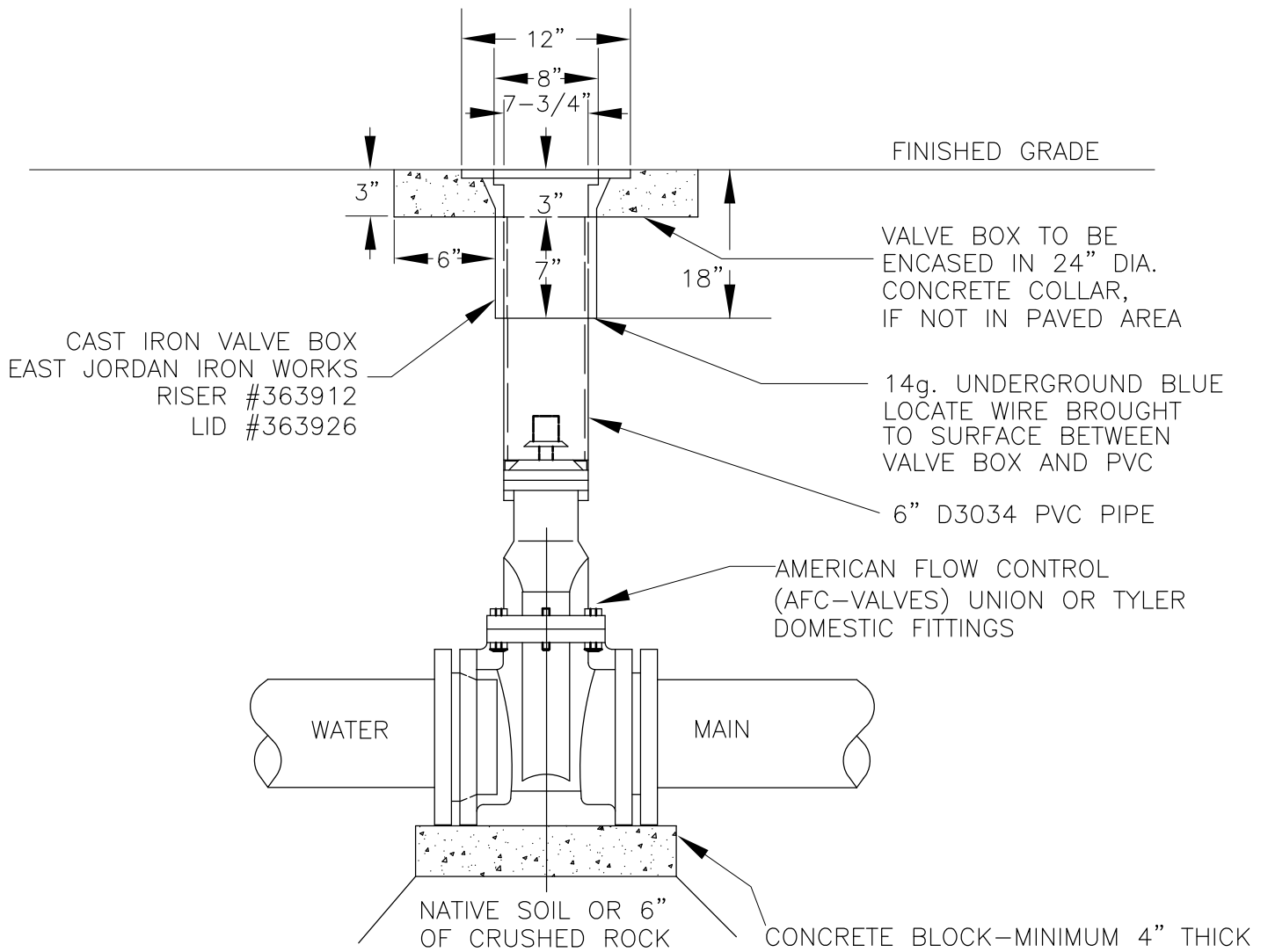
Utility Trench Detail

Date Adopt. 11/01/12 Date Rev. 11/20/15

Dwg. Name: UT-1 Utility Trench.dwg

DWG. NO.

UT-1



CAST IRON VALVE BOX
 EAST JORDAN IRON WORKS
 RISER #363912
 LID #363926

FINISHED GRADE

VALVE BOX TO BE ENCASED IN 24\"/>

14g. UNDERGROUND BLUE LOCATE WIRE BROUGHT TO SURFACE BETWEEN VALVE BOX AND PVC

6\"/>

AMERICAN FLOW CONTROL (AFC-VALVES) UNION OR TYLER DOMESTIC FITTINGS

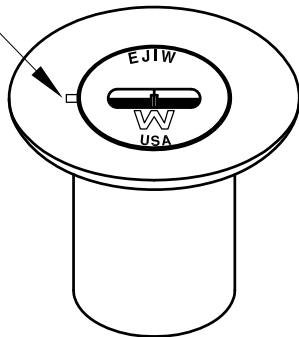
WATER

MAIN

NATIVE SOIL OR 6\"/>

CONCRETE BLOCK-MINIMUM 4\"/>

NOTCH 1/16\"/>



VALVE BOX

NOTES:

1. VALVE BOXES SHALL BE PLUMB & CENTERED DIRECTLY OVER THE VALVE NUT IN A VERTICAL POSITION.
2. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.



City of Astoria
Public Works Department
 1095 Duane Street

Water Valve Detail

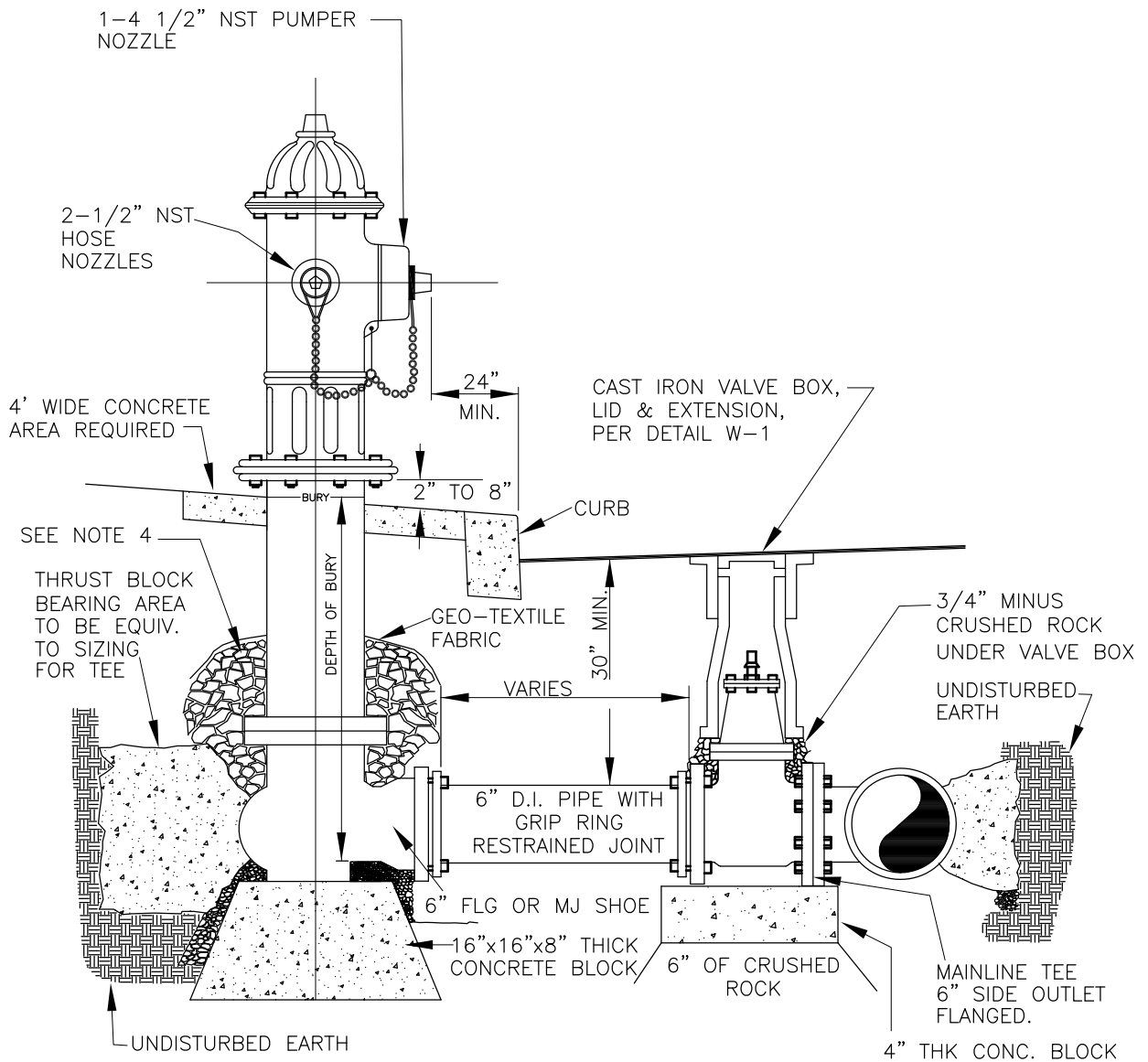
Date Adopt. 10/31/12

Date Rev. 11/13/15

DWG. NO.

Dwg. Name: W-1 Water Valve.dwg

W-1



NOTES:

1. HYDRANTS TO BE MUELLER SUPER CENTURION A423-PN, INLET 6" - 5 1/4" MVO, 1-1/2" PENTAGON OPERATING NUT OPEN LEFT.
2. HYDRANTS ARE YELLOW AND PRIVATE HYDRANTS ARE RED.
3. RESTRAIN JOINTS BY USING FLANGED HYDRANT SHOE, SPOOL, AND GATE VALVE -OR- WITH GRIP RING GASKET JOINT RESTRAINTS.
4. ALL FITTINGS IN CONTACT WITH CONCRETE SHALL BE WRAPPED IN PLASTIC. HYDRANT DRAIN HOLES TO REMAIN OPEN TO DRAIN ROCK AND OPERATIONAL.
5. 1 1/2" - 3/4" CLEAN DRAIN ROCK SHALL BE PLACED A MINIMUM OF 6" ABOVE DRAIN OUTLET 1 YD. MINIMUM AREA.
6. WHERE PLANTER STRIP EXISTS HYDRANT SHALL BE PLACED SO FRONT PORT IS A MINIMUM OF 24" BEHIND FACE OF CURB.
7. BURY OF HYDRANT SHALL BE MEASURED FROM FINISHED GRADE TO BOTTOM OF CONNECTION PIPE.
8. THRUST BLOCK AT FIRE HYDRANT TEE SHALL HAVE A 3.7 SQ. FT BEARING AREA.
9. HYDRANT VALVE SHALL BE AMERICAN FLOW CONTROL RESILIENT SEAT GATE VALVE ONLY.
10. PIPING BETWEEN HYDRANT AND VALVE TO BE SAME PRESSURE CLASS AND MATERIAL AS WATER MAIN OR GREATER.
11. HYDRANT MAY NOT BE LOCATED WITHIN 3' OF ANY OBSTRUCTION.



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Public Works Department
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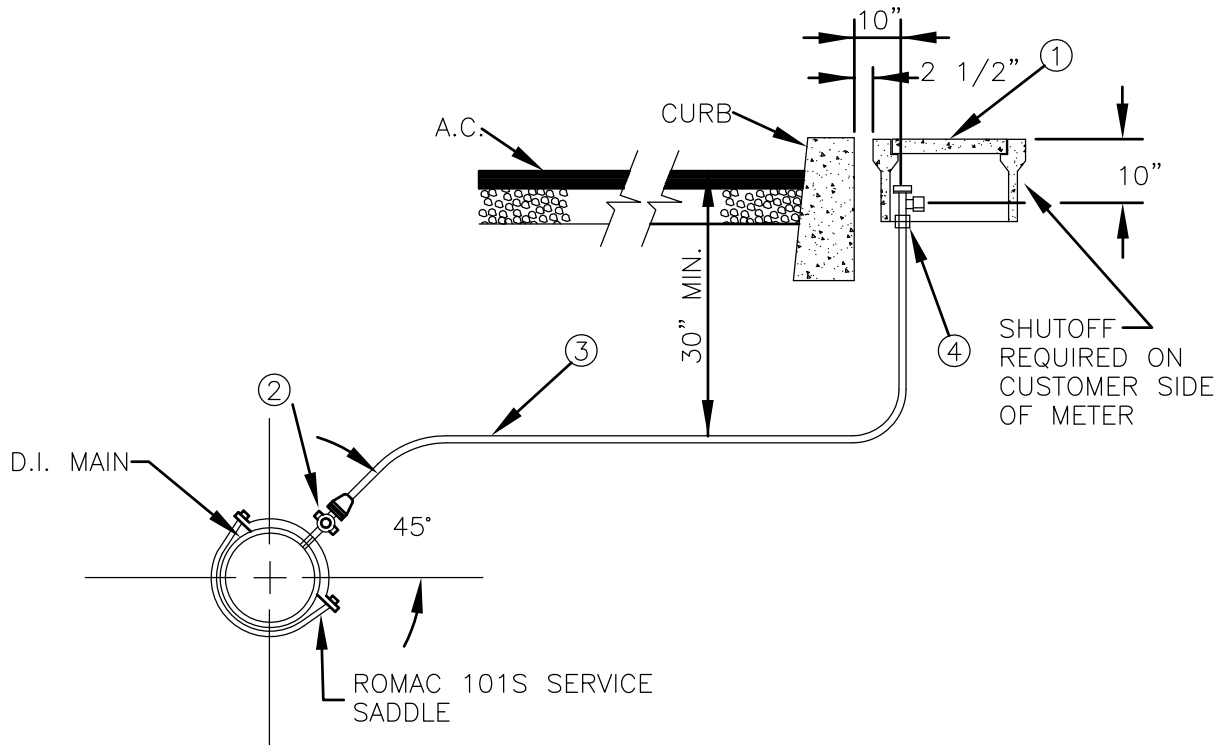
Fire Hydrant Detail

Date Adopt. 10/31/12 Date Rev. 11/13/15

Dwg. Name: W-2 Fire Hydrant.dwg

DWG. NO.

W-2



MATERIALS:

1. ARMOR CAST POLYMER CONCRETE METER BOX AND LID.
 - A. 3/4" SERVICE – 12"X20"X12" BODY NO. A6000485 20K AND CAST IRON READ COVER NO. A6000484TRC1 20K.
 - B. 1" SERVICE – 13"X24"X12" BODY NO. A6001946PCX12 20K AND CAST IRON READ COVER NO. A6001969RC1 20K.
 - C. FOR IRRIGATION APPLICATIONS OR UPON ENGINEER'S APPROVAL USE A CARSON 3/4" METER BOX: 1419-12 (GREEN) BODY WITH A 1419-3 (GREEN) NO BOLT FLUSH COVER.
2. MUELLER CORP. STOP NO. H-15028N
3. 3/4" & 1" CTS SDR 9 (200 PSI) PE TUBING OR SOFT TEMPER, TYPE 'K' COPPER TUBING COMPLYING WITH ASTM B-88 UPON ENGINEERS APPROVAL.
4. MUELLER ANGLE METER STOP NO. H-14258N (3/4" AND 1")

NOTES:

1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE CITY ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" MINUS CRUSHED AGG. AND COMPACTED TO 95% MAX. DENS. AS DETERMINED BY AASHTO T-180.
3. METER BOX SHALL BE CENTER OVER THE COMPLETED METER ASSEMBLY.
4. WATER METERS THAT ALSO PROVIDE FIRE SUPPRESSION MUST BE TAGGED WITH "SUPPLIES FIRE SUPPRESSION." TAG SHALL BE MIN. 2.5" X 5", WEATHERPROOF, HEAVY DUTY RED PLASTIC. PRE-DRILL AND SECURED TO THE METER WITH PLASTIC CABLE TIES.



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Public Works Department
 1095 Duane Street

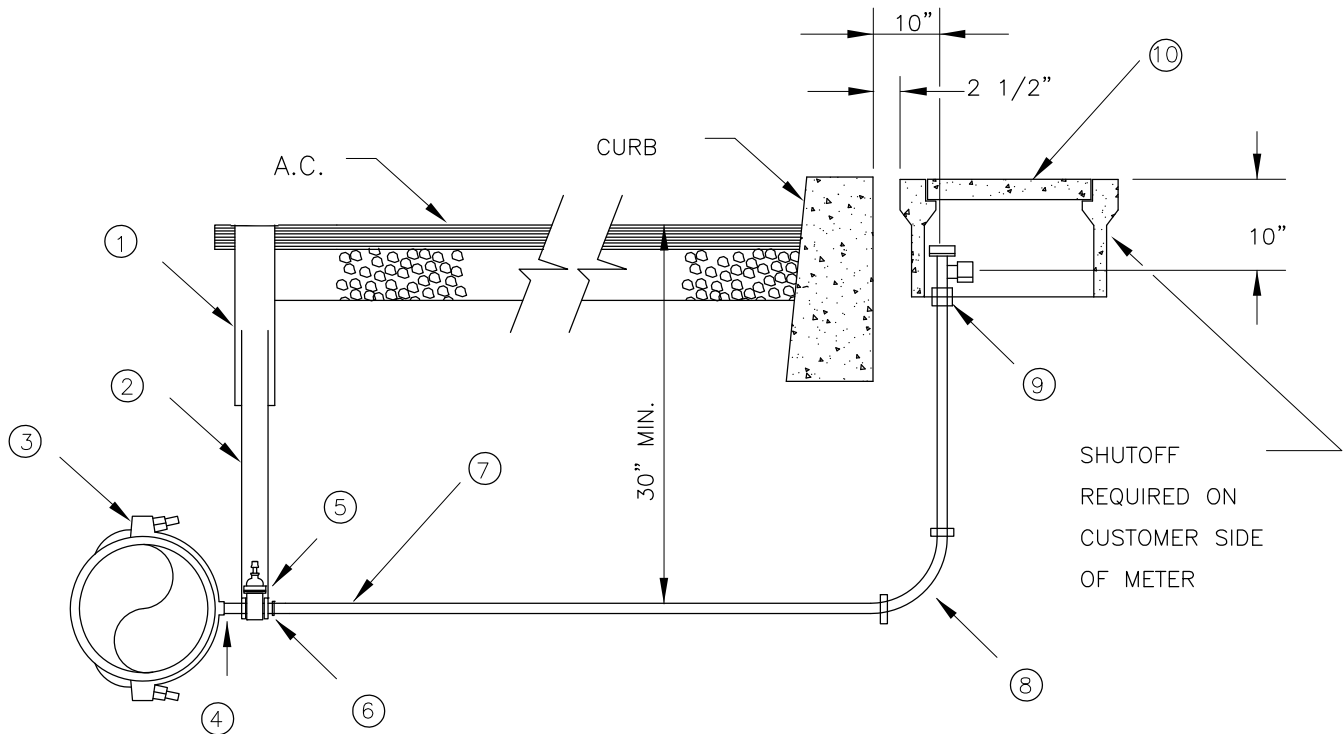
3/4" & 1" Water Service Detail

Date Adopt. 11/01/12 **Date Rev.** 11/16/15

Dwg. Name: W-3 1 Inch Water Service.dwg

DWG. NO.

W-3



NOTES:

1. EJIW - 18" VALVE BOX TOP WITH COVER
2. 6" PVC D3034 SEWER PIPE
3. PIPE SIZE-ROMAC 202S STYLE SERVICE SADDLE DOUBLE STRAP STAINLESS STEEL-TAP 2" I.P. THREAD.
4. 2" BRASS CLOSE NIPPLE
5. 2" C.I. GATE VALVE WITH 2" OPERATING NUT, BOTH ENDS FEMALE I.P. THREADS-AMERICAN FLOW CONTROL
6. 2" MUELLER COMPRESSION #110 COUPLING, MALE I.P. THREADS #15428N.
7. 2" HDPE TUBING CTS SIZE SDR 9 (200 PSI).
8. IF NEEDED 2" QUARTER BEND UNION, COMPRESSION CONNECTOR CTS O.D. TUBING BOTH ENDS-#H15526N
9. 2" GROUND KEY ANGLE METER STOP MUELLER 110 COMPRESSION, FOR CTS O.D. TUBING, METER FLANGE 180 TURN CHECK-LOCK WING-#H14277N.
10. ARMORCAST 17" X 30" X 12" POLYMER CONCRETE METER BOX (A6001640PCX12) AND COVER W/ CAST IRON READ LID (A6001947TRC1)
11. WATER METERS THAT ALSO PROVIDE FIRE SUPPRESSION MUST BE TAGGED WITH "SUPPLIES FIRE SUPPRESSION." TAG SHALL BE MIN. 2.5" X 5", WEATHERPROOF, HEAVY DUTY RED PLASTIC. PRE-DRILL AND SECURED TO THE METER WITH PLASTIC CABLE TIES.



City of Astoria
Public Works Department
 1095 Duane Street

2 Inch Water Service Detail

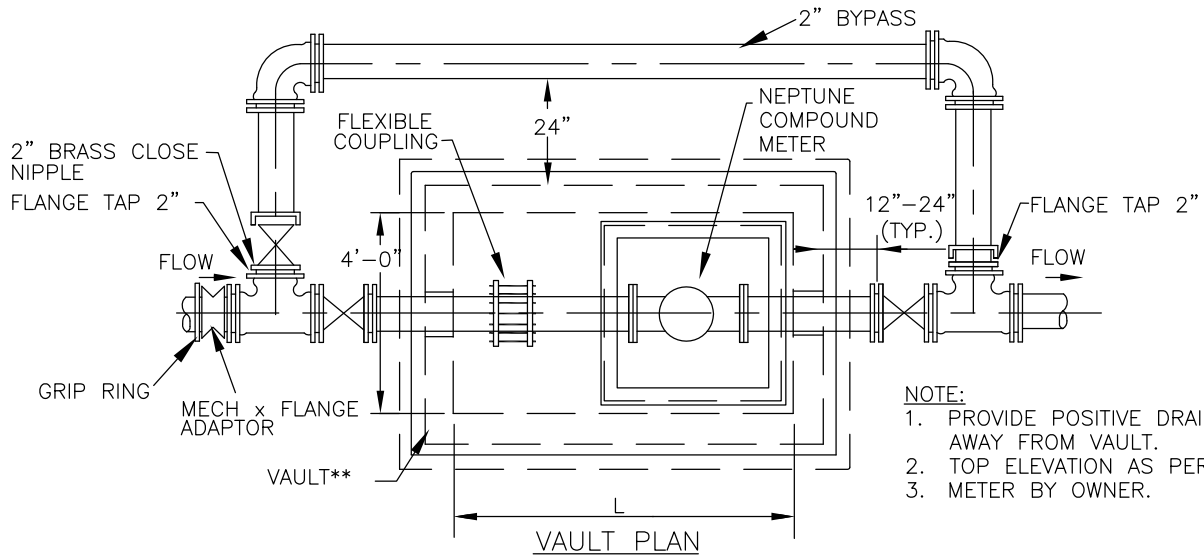
Date Adopt. 11/01/12

Date Rev. 11/16/15

DWG. NO.

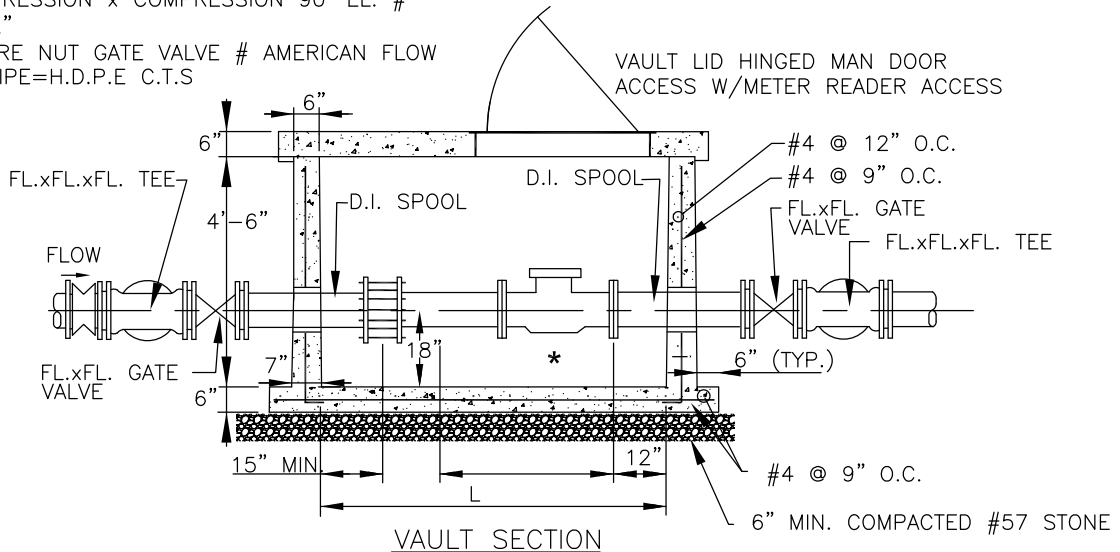
Dwg. Name: W-4 2 Inch Water Service.dwg

W-4



- NOTE:**
1. PROVIDE POSITIVE DRAINAGE AWAY FROM VAULT.
 2. TOP ELEVATION AS PER PLAN.
 3. METER BY OWNER.

2" BYPASS (SIZE OF BYPASS TO BE DETERMINED BY ENGINEER).
 2-2" COMPRESSION x I.P. MALE #H15428N-2"
 2-2" COMPRESSION x COMPRESSION 90° EL. # H15526N-2"
 1-2" SQUARE NUT GATE VALVE # AMERICAN FLOW
 CONTROL PIPE=H.D.P.E C.T.S



VAULT** MINIMUM 1 FT. CLEARANCE ON FLANGED ENDS AND SIDES OF 3" & 4" METERS .
 MINIMUM 2 FT. CLEARANCE ON FLANGED ENDS AND SIDES OF 6" AND LARGER METERS.
 VAULT TO HAVE ATTACHED LADDER IF OVER 3' DEEP WITH 3' REMOVABLE SECTION THAT WILL EXTEND ABOVE VAULT LID.
 METER TO BE SET 18" FROM TOP OF LID.
 METER READER ACCESS DOOR TO BE CENTERED EVER METER REGISTER.
 FLOOR TO HAVE DRAIN OR SUMP PUMP MAINTAINED BY CUSTOMER.
 VAULT TO BE SET AT FINISHED GRADE.
 *METER MIN.1' ABOVE BOTTOM OF VAULT
 CONCRETE PAD AROUND GATE VALVE BOXES, SEE W-1



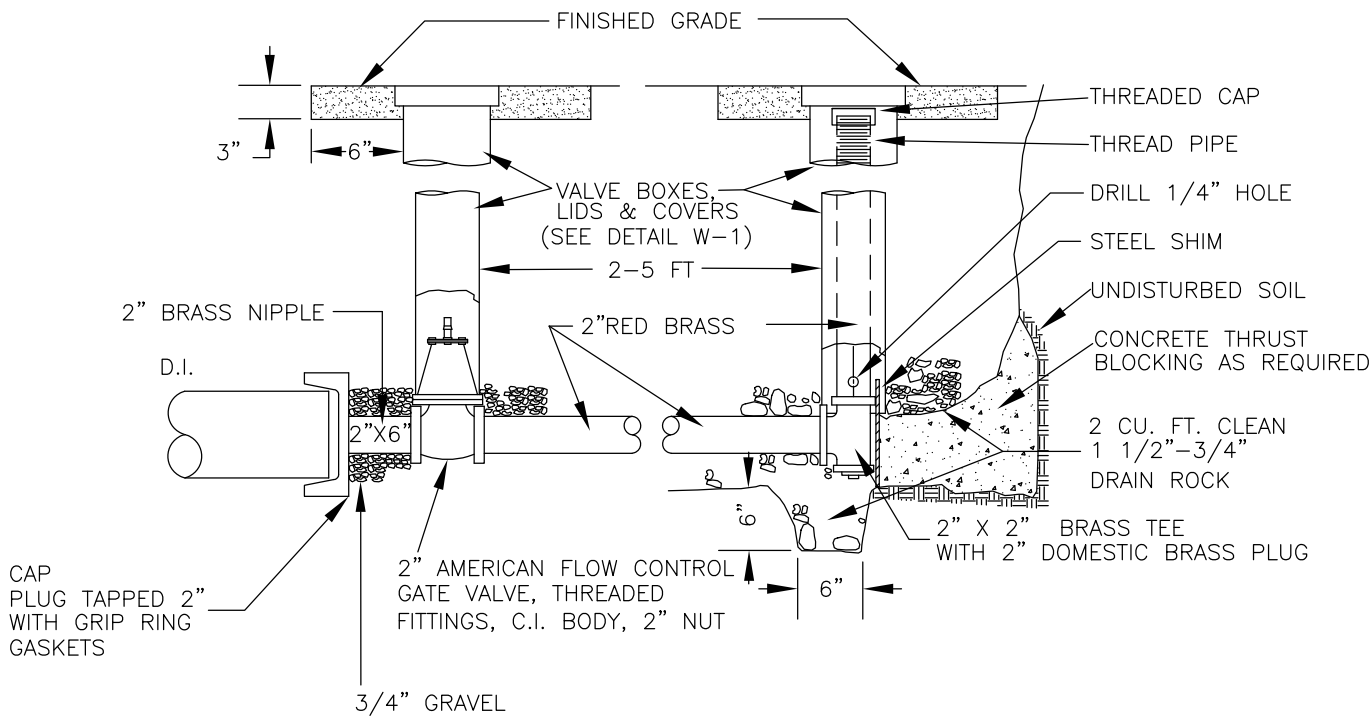
City of Astoria
Public Works Department
 1095 Duane Street

3 to 10 Inch Water Service Detail

Date Adopt. 11/01/12 Date Rev. 10/23/14

Dwg. Name: W-5 3 to 10 Inch Water Service.dwg

DWG. NO.
W-5



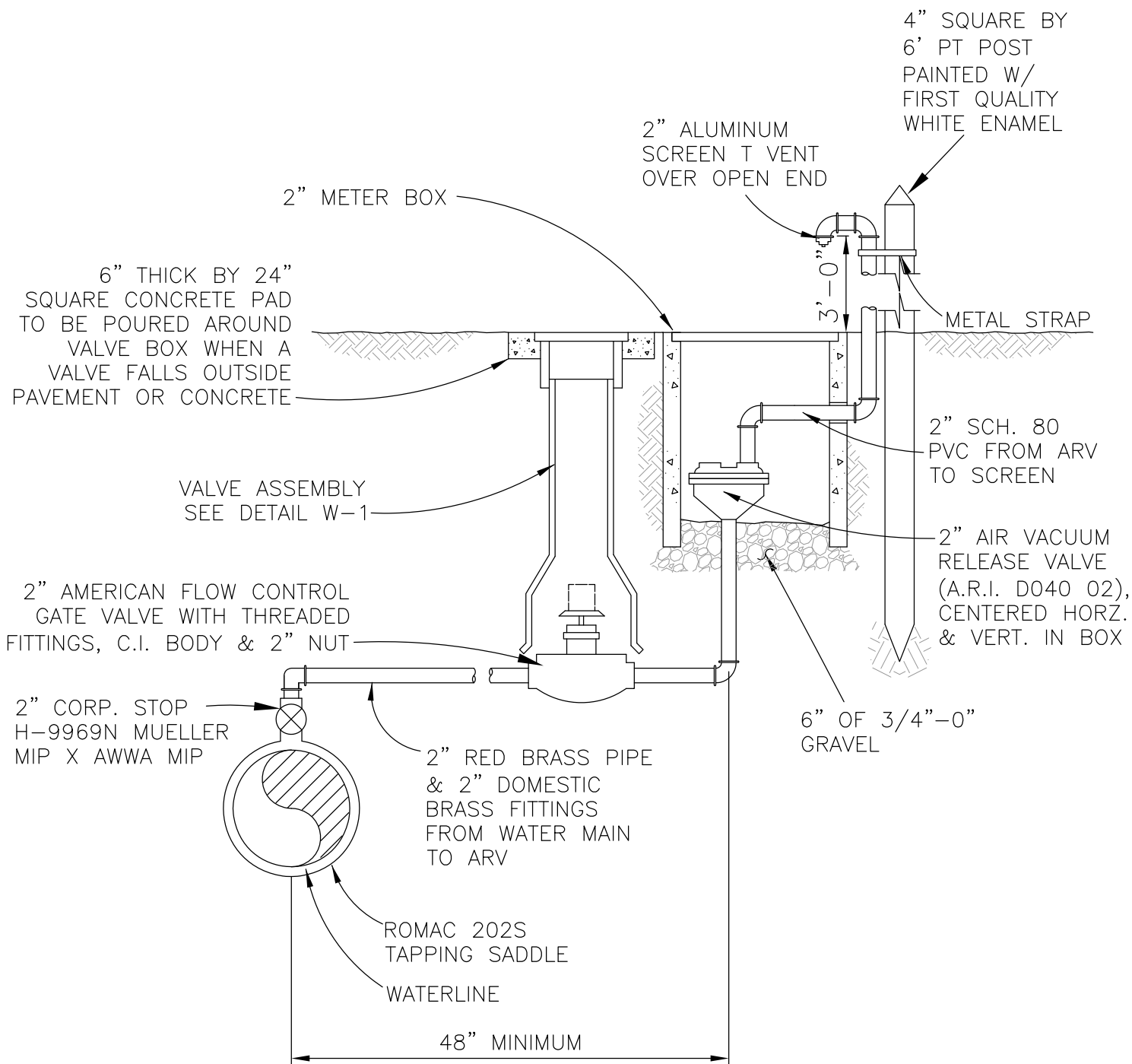
- NOTES:
1. VALVE BOX SHALL BE PER STANDARD DETAIL W-1.
 2. BLOW-OFF UNIT SHALL BE GRAVEL BACK FILLED AND COMPACTED AS SHOWN.



City of Astoria
Public Works Department
 1095 Duane Street

Blow Off Detail

| | | |
|------------------------------------|-----------------------|-------------------------------|
| Date Adopt. 11/01/12 | Date Rev. ---- | DWG. NO. W-6 |
| Dwg. Name: W-6 Blow Off.dwg | | |



City of Astoria
Public Works Department
 1095 Duane Street

Air/Vacuum Release Valve Detail

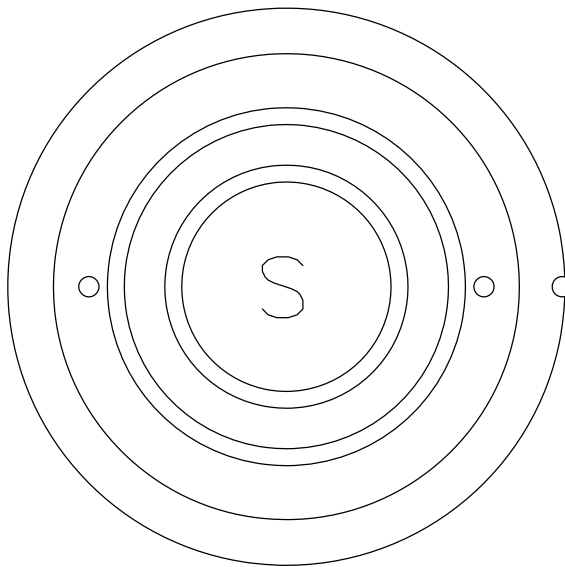
Date Adopt. 09/23/15

Date Rev. ----

DWG. NO.

W-7

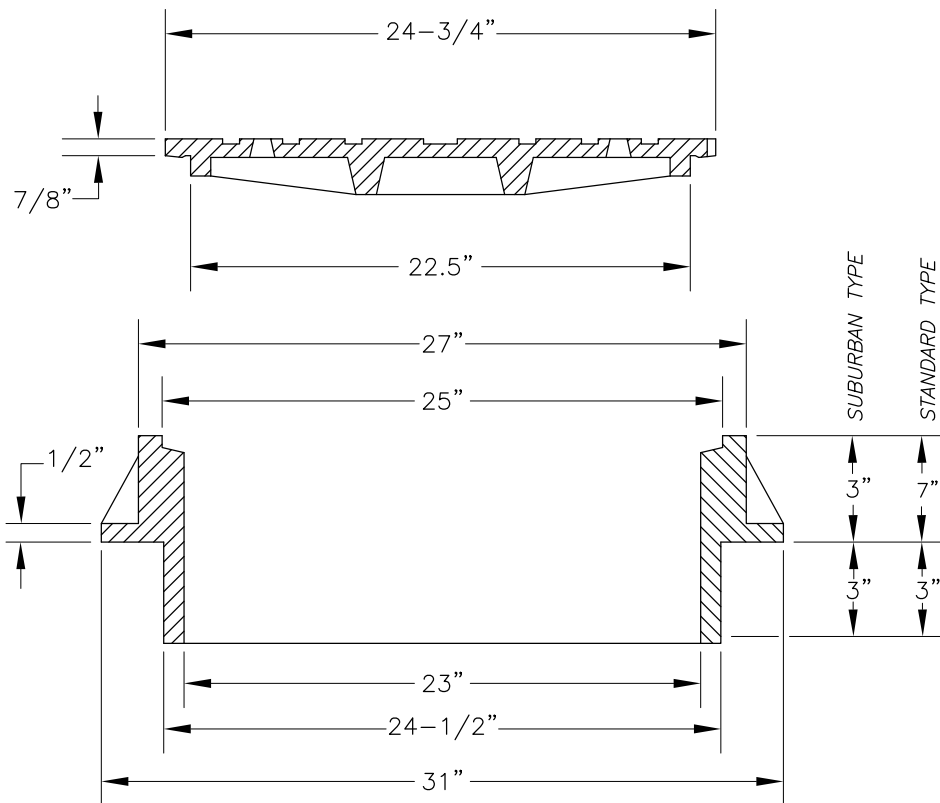
Dwg. Name: W-7 Air Release.dwg



SANITARY



STORM



NOTES:

1. USE SUBURBAN TYPE ONLY IN NON-TRAFFIC AREAS.
2. COVER & FRAME SHALL BE GRAY CAST IRON ASTM A-48 CLASS 30.
3. COVER & FRAME TO BE MACHINED TO A TRUE BEARING ALL AROUND.
4. NOTCH LID FOR LIFTING HOOK.



City of Astoria
Public Works Department
 1095 Duane Street

Manhole Frame & Cover Detail

Date Adopt. 11/01/12

Date Rev. 12/09/15

DWG. NO.

Dwg. Name: S-1 Manhole Frame & Cover.dwg

S-1

MANHOLE TO CONFORM WITH
ASTM C-478

48" FOR PIPE 24" OR LESS
AS SPEC'D FOR PIPE 27" OR LARGER

KEYLOCK JOINT FOR 48",
MORTAR JOINT FOR 60" AND
LARGER

STANDARD
MANHOLE
STEPS

4 5/8"

12" TYPICAL

5"

RUBBER PIPE BOOT
(AS SHOWN IN
DETAIL S-3)

PIPE
O.D.

BEST SEAL MASTIC JOINT SEALER
OR GROUT

INLET

12"

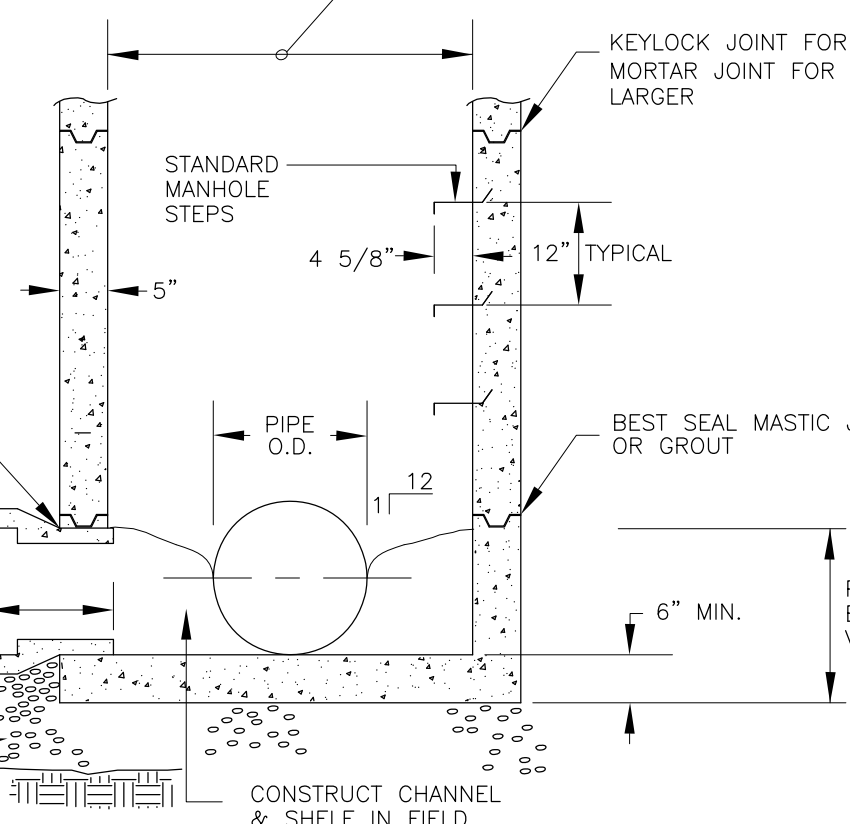
12

6" MIN.

PRECAST MH
BASE HEIGHT
VARIABLE

12" of 3/4"-0"
CRUSHED ROCK

CONSTRUCT CHANNEL
& SHELF IN FIELD



City of Astoria
Public Works Department
1095 Duane Street

Precast Manhole Base Detail

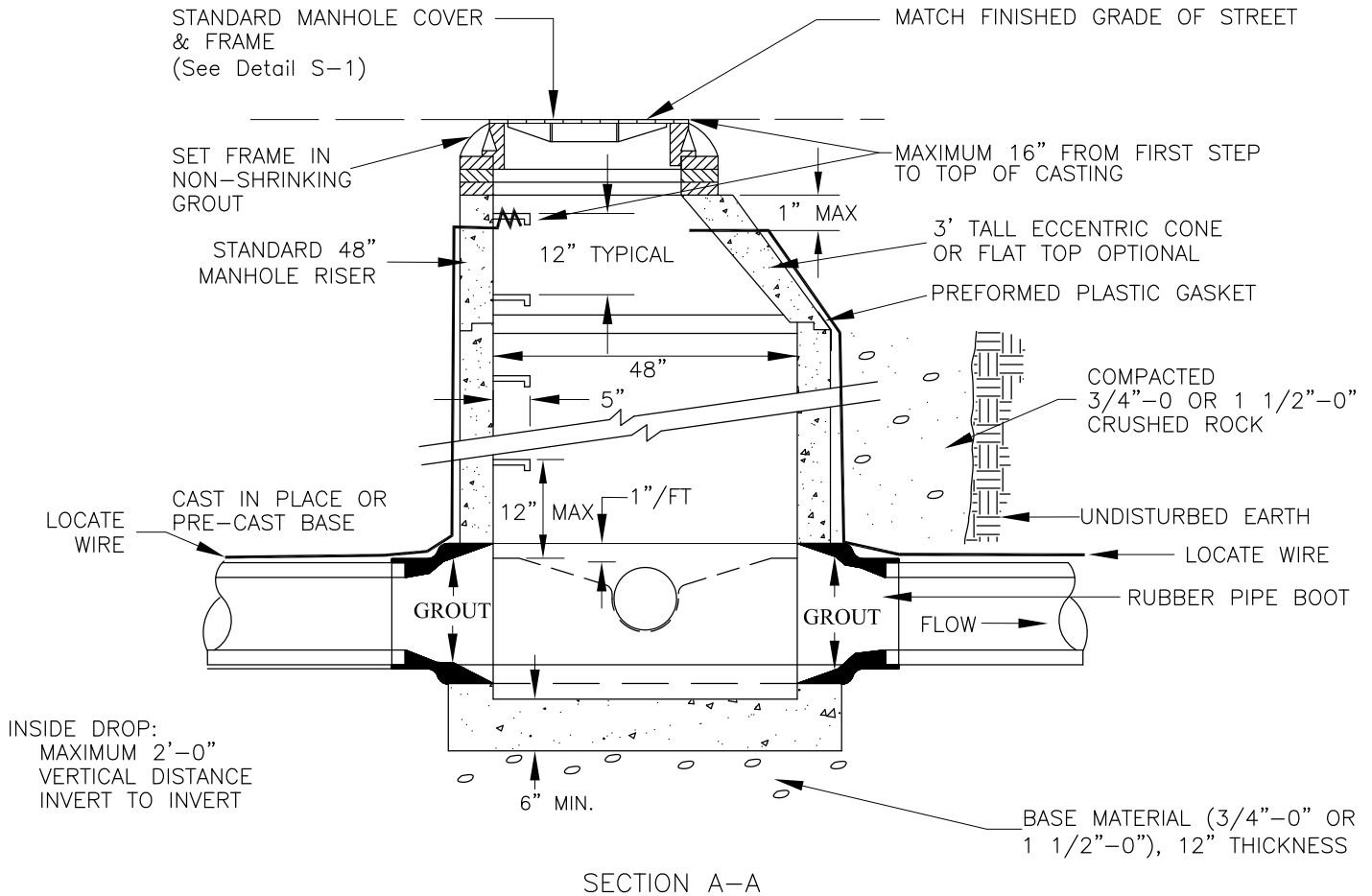
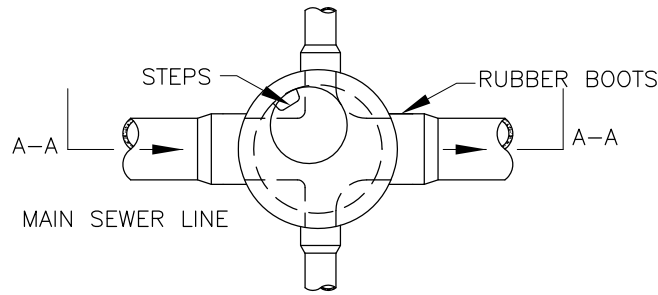
Date Adopt. 11/01/12

Date Rev. 11/16/15

DWG. NO.

Dwg. Name: S-2 Precast Manhole Base.dwg

S-2



NOTES:

1. THIS TYPE OF MANHOLE SHALL BE USED ONLY FOR PIPE SIZE OF 24" OR LESS.
2. GROUT INSIDE AND OUTSIDE AT PENETRATION IF NO BOOT, GROUT INSIDE IF THERE IS A BOOT, GROUT INSIDE WHERE SECTIONS COME TOGETHER AND PICK HOLES.
3. LOCATE WIRE SHALL BE 14 GAGE GREEN, DRILL NO MORE THAN 1" BELOW FRAME, LEAVE ENOUGH WIRE TO GET TO TOP, GROUT HOLES.
4. CONSTRUCT CHANNEL AND SHELF IN FIELD.
5. FLAT TOP MANHOLE SLABS SHALL HAVE A 25" OPENING, OFFSET TO ONE SIDE.



City of Astoria
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Standard Manhole Detail

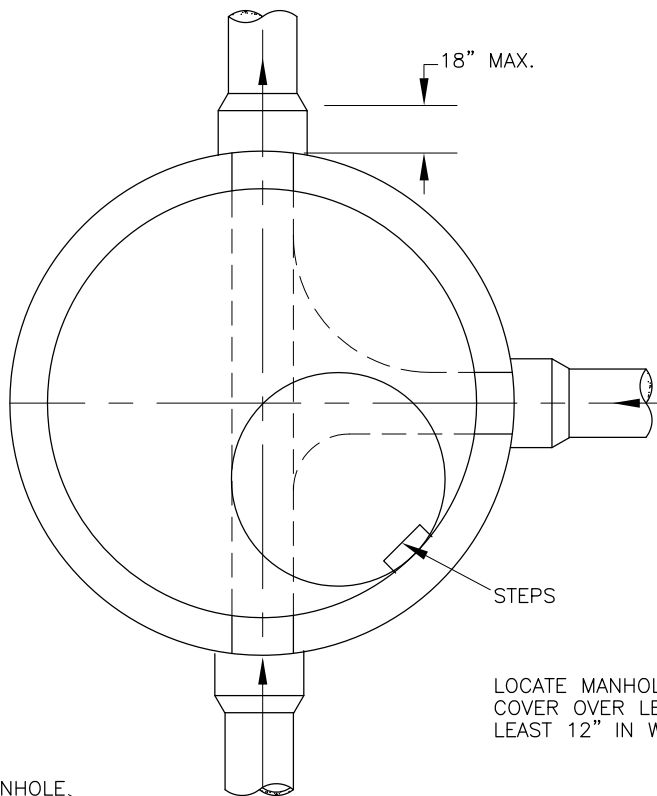
Date Adopt. 11/01/12

Date Rev. 11/20/15

DWG. NO.

Dwg. Name: S-3 Standard Manhole.dwg

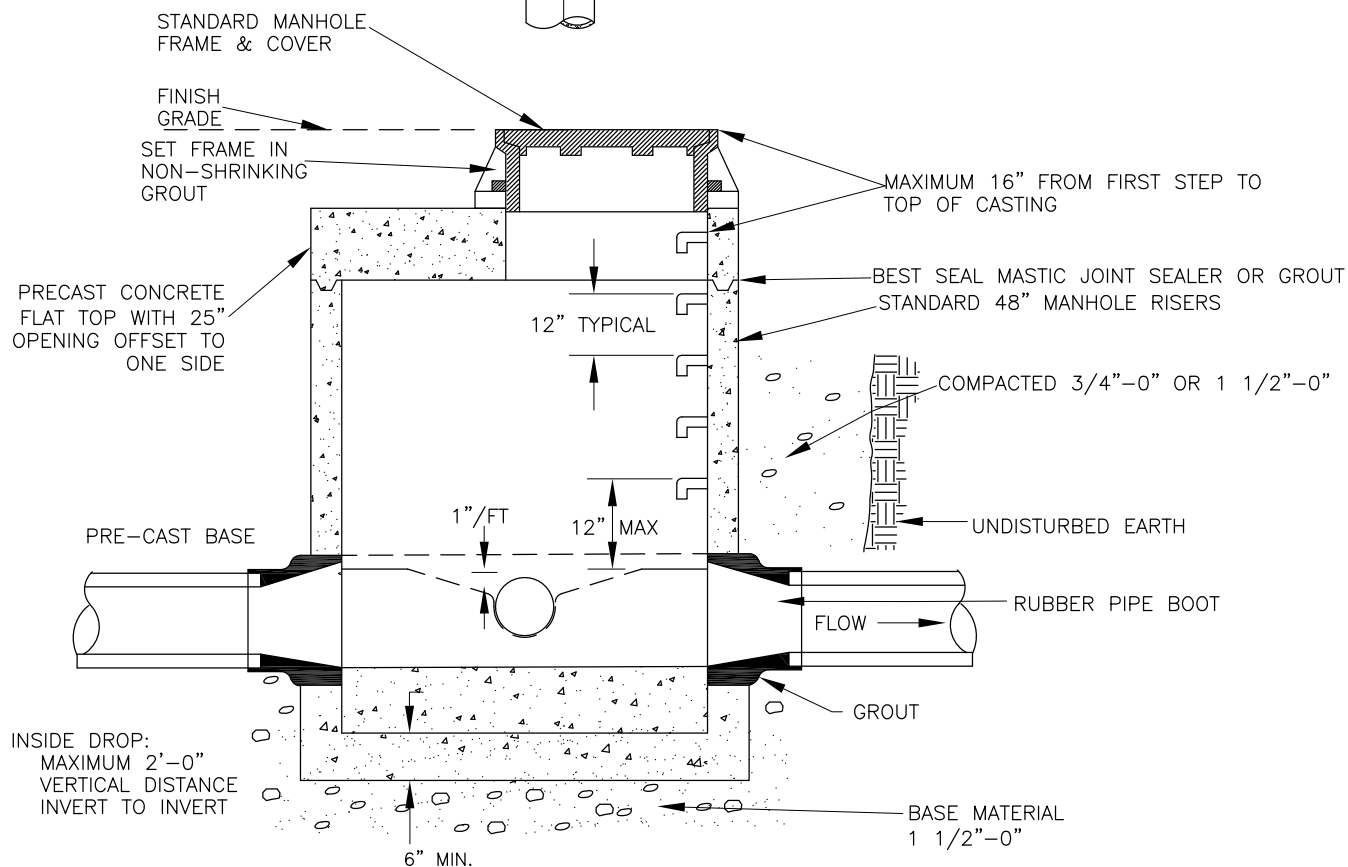
S-3



MAKE SURFACE OF GROUT FILLET SMOOTH & FORM GROOVED INVERT TO DIRECTION OF FLOW

NOTE: INLETS/OUTLETS AS REQUIRED.

LOCATE MANHOLE FRAME & COVER OVER LEDGE OF AT LEAST 12" IN WIDTH.



INSIDE DROP: MAXIMUM 2'-0" VERTICAL DISTANCE INVERT TO INVERT



City of Astoria
Public Works Department
 1095 Duane Street

Flat Top Manhole Detail

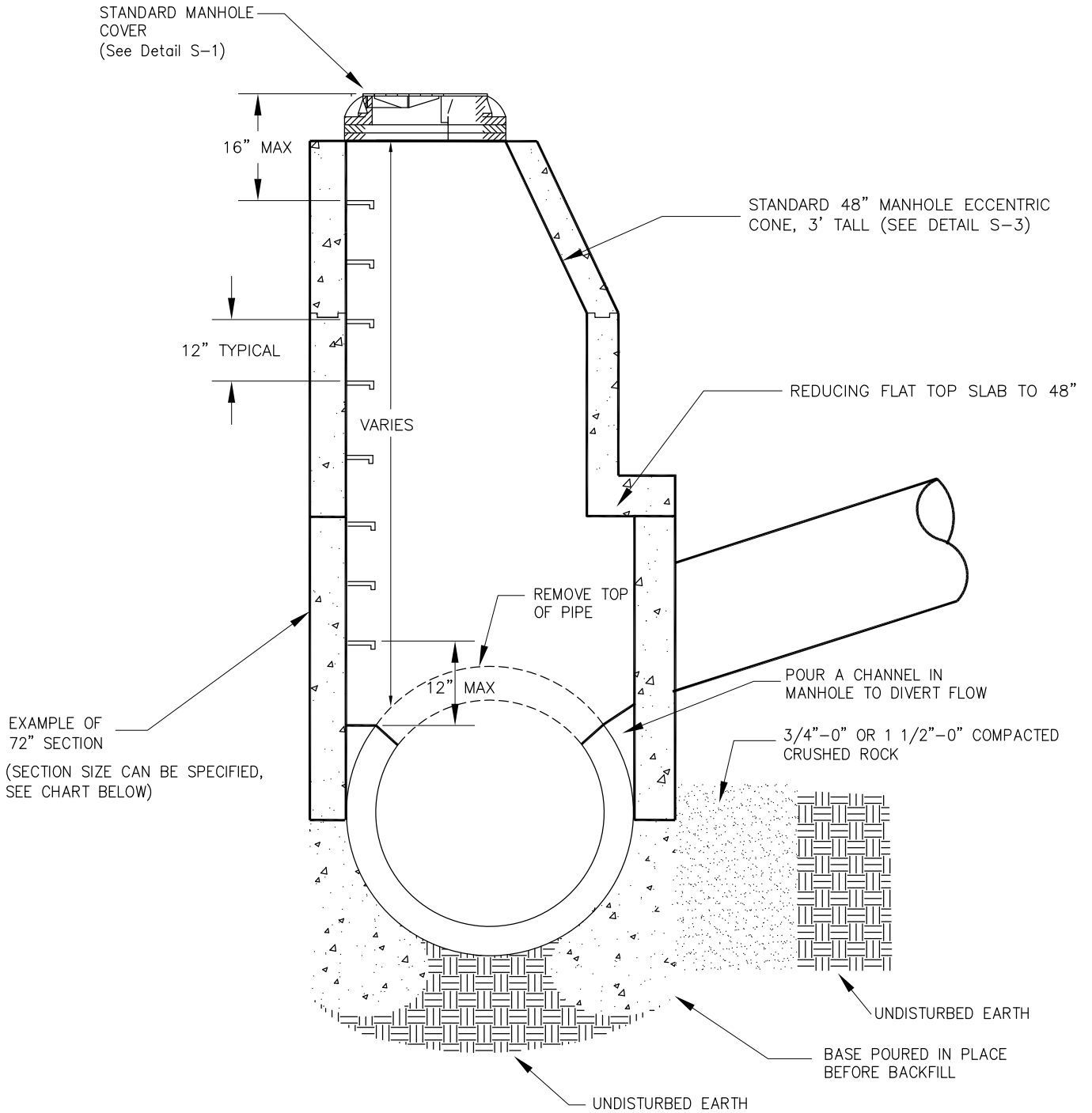
Date Adopt. 11/01/12

Date Rev. 11/15/12

DWG. NO.

Dwg. Name: S-4 Flat Top Manhole.dwg

S-4



| Manhole Sizing | Manhole Sizing |
|---------------------------|---------------------------|
| 36" Hole in a 48" Manhole | 60" Hole in a 72" Manhole |
| 42" Hole in a 54" Manhole | 72" Hole in a 84" Manhole |
| 48" Hole in a 60" Manhole | 84" Hole in a 96" Manhole |

| Largest diameter hole that a 90° will fit | |
|---|----------------------------|
| 2-28" holes in 48" Manhole | 2-36" holes in 60" Manhole |
| 2-32" holes in 54" Manhole | 2-42" holes in 72" Manhole |



City of Astoria
Public Works Department
 1095 Duane Street

Manhole Over Existing Sewer Detail

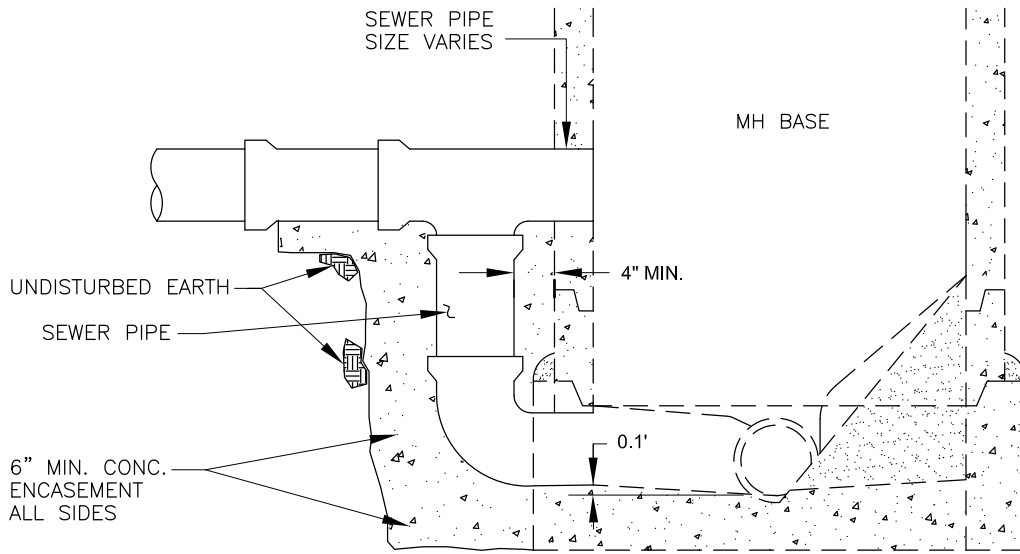
Date Adopt. 11/01/12

Date Rev. 11/15/12

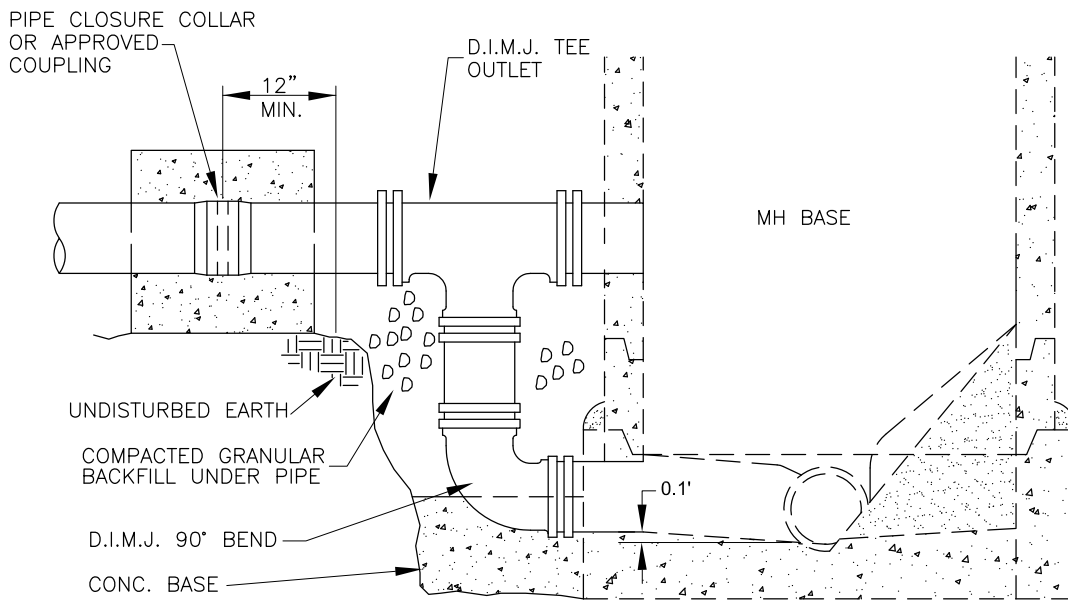
DWG. NO.

Dwg. Name: S-5 Manhole Over Existing Sewer.dwg

S-5



CONCRETE OR P.V.C. PIPE DROP



DUCTILE IRON PIPE DROP



City of Astoria
Public Works Department
 1095 Duane Street

Outside Drop Connection Detail

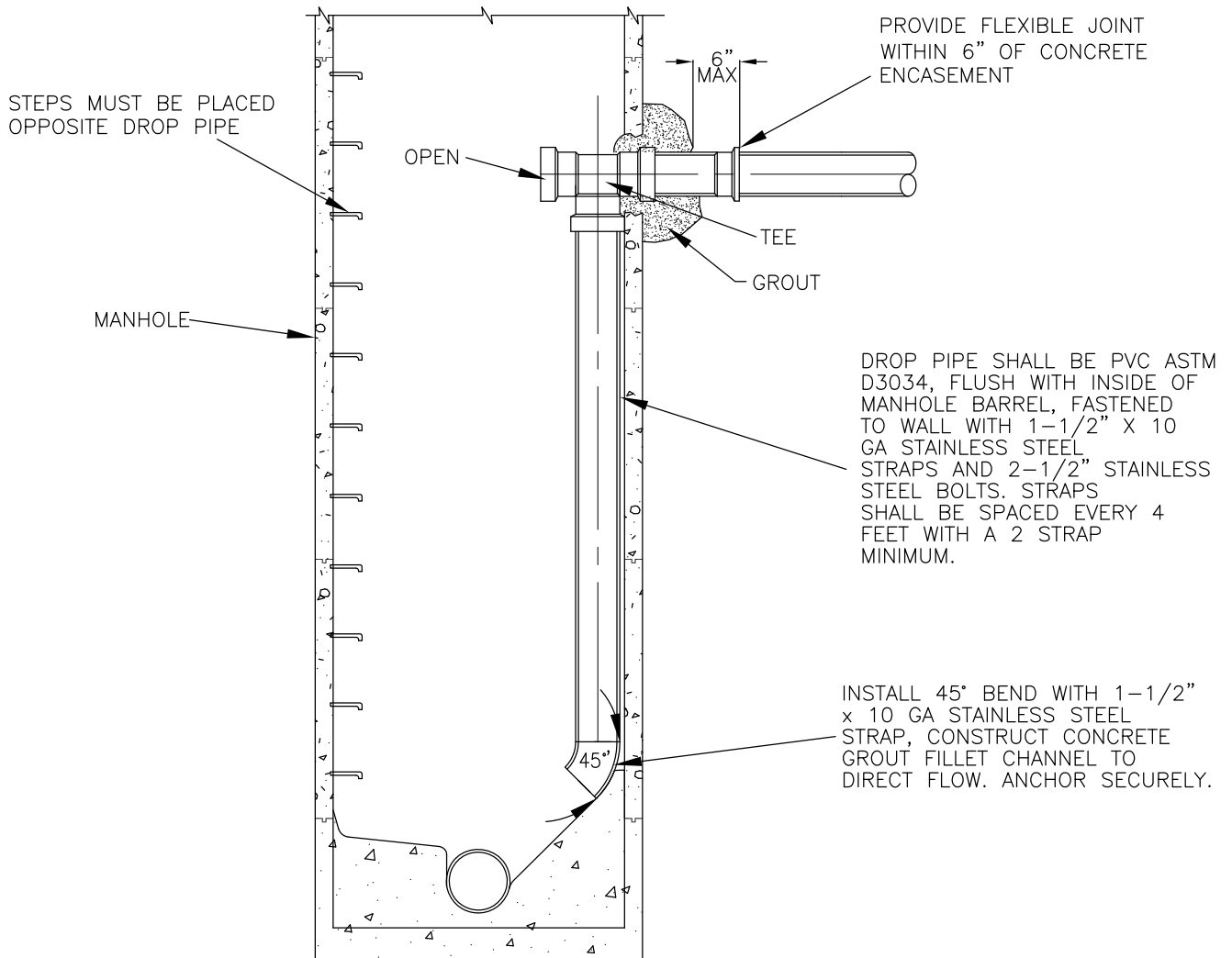
Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: S-6 Outside Drop Manhole.dwg

S-6



NOTE

1. ONLY ONE INSIDE DROP CONNECTION ALLOWED PER MANHOLE.
2. MINIMUM MANHOLE DIAMETER WITH DROP CONNECTION SHALL BE 48 INCHES.
3. MAXIMUM DROP PIPE DIAMETER SHALL BE 8 INCHES.



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 1095 Duane Street

Inside Drop Connection Detail

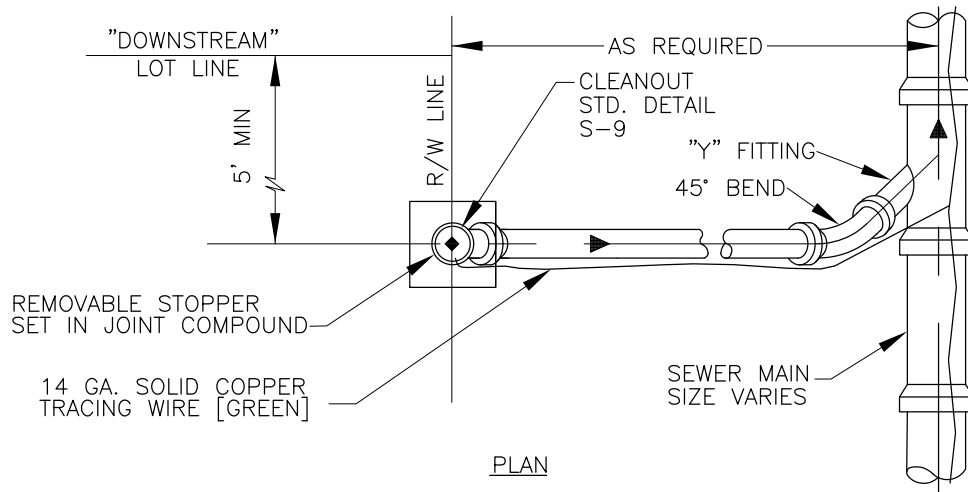
Date Adopt. 11/01/12

Date Rev. 10/06/14

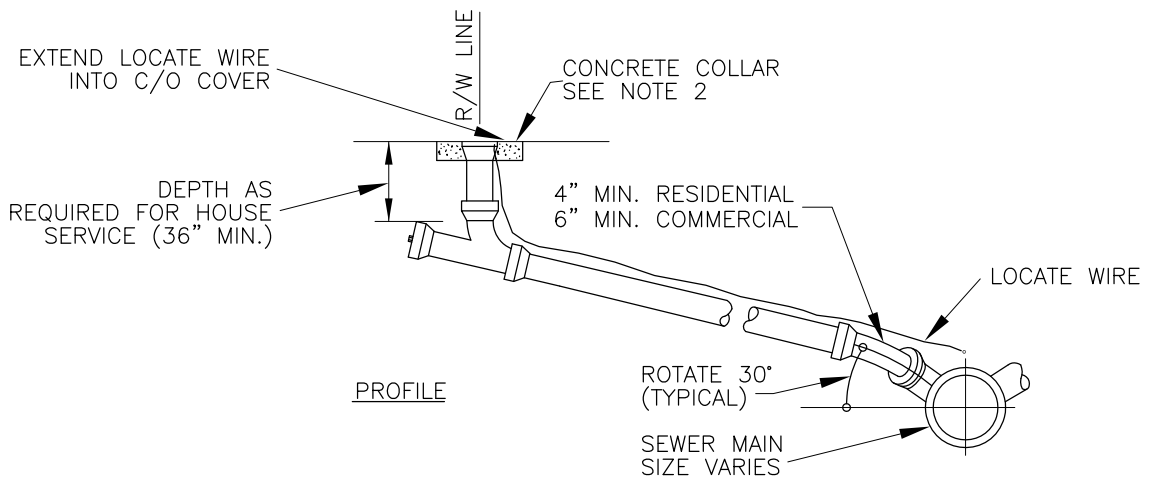
DWG. NO.

Dwg. Name: S-7 Inside Drop Manhole.dwg

S-7



PLAN



PROFILE

NOTES

1. SERVICE CONNECTION DETAILS ARE BASED ON GASKETED PVC PIPE AND FITTINGS. SEWER LATERAL PIPE SHALL BE PVC ASTM D3034.
2. SEWER CLEAN-OUTS NOT IN PAVEMENT SHALL HAVE CONCRETE COLLAR 18"x18"x4" AROUND THE COVER AND MUST BE INSTALLED AND ADJUSTED TO FINISHED GRADE AT THE RIGHT-OF-WAY/PROPERTY LINE.
3. CONNECTION TO EXISTING SANITARY SEWER PIPE SHALL BE MADE AS FOLLOWS:
 - *6" SS MAIN – PVC WYE AND FERNCO COUPLERS WITH SHEAR RINGS OR APPROVED EQUIVALENT
 - *8" AND LARGER SS MAIN – INSERT-A-TEE OR APPROVED EQUIVALENT
4. ALL PVC TO CLAY SERVICE CONNECTIONS UNDER LOAD BEARING SURFACES SHALL USE FERNCO TYPE CONNECTORS WITH STAINLESS STEEL SHEAR RINGS OR APPROVED EQUAL.
5. 90° FITTINGS ARE PROHIBITED. MINIMUM 6" PIPE LENGTH BETWEEN 45° FITTINGS.



City of Astoria
Public Works Department
 1095 Duane Street

Typical Sewer Connection Detail

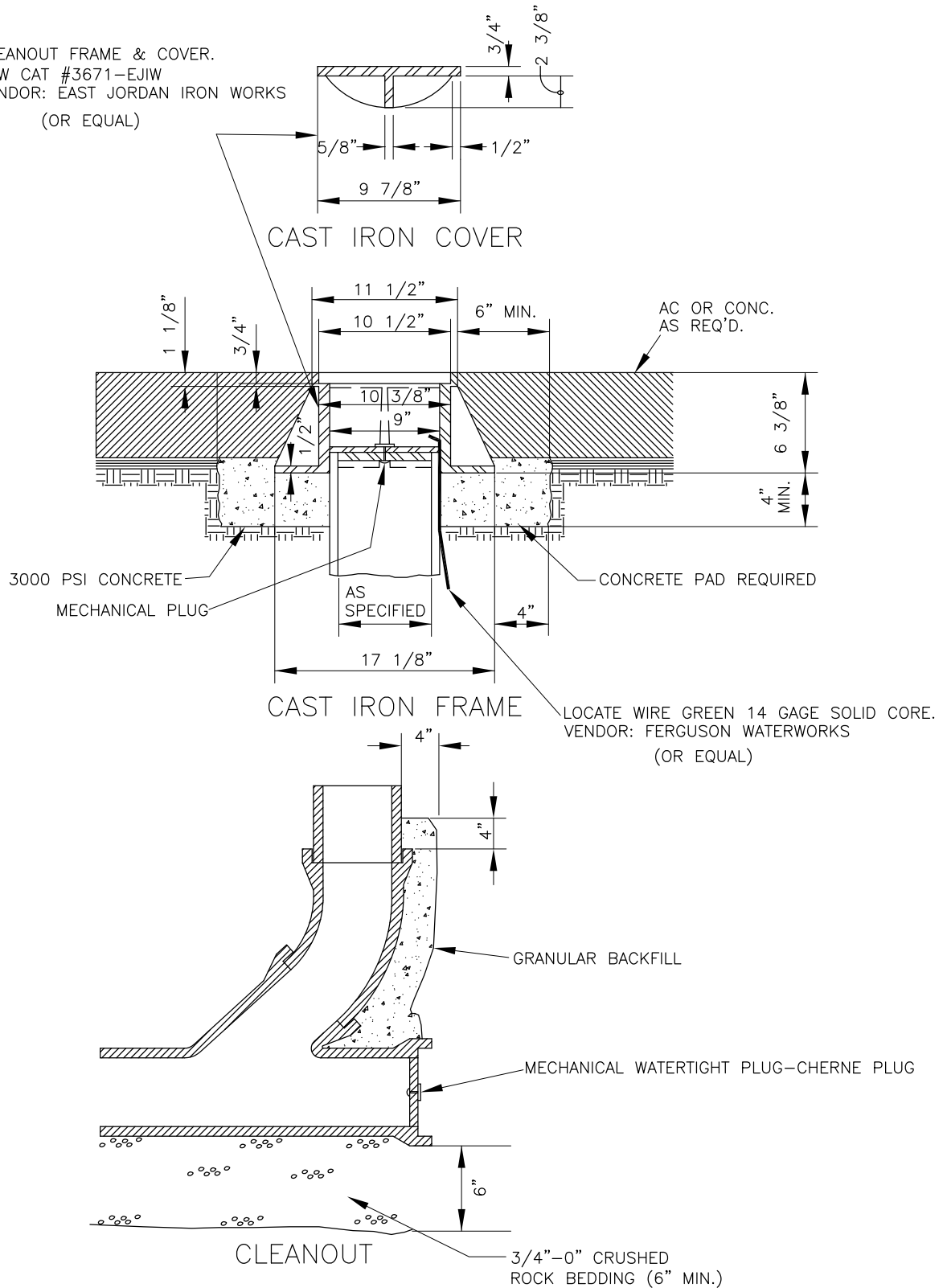
Date Adopt. 11/01/12 Date Rev. 01/09/17

Dwg. Name: S-8 Typical Sewer Connection.dwg

DWG. NO.

S-8

CLEANOUT FRAME & COVER.
 NEW CAT #3671-EJIW
 VENDOR: EAST JORDAN IRON WORKS
 (OR EQUAL)



NOTES:
 ALL CLEANOUT MATERIAL TO
 BE SAME AS CARRIER PIPE



City of Astoria
Public Works Department
 1095 Duane Street

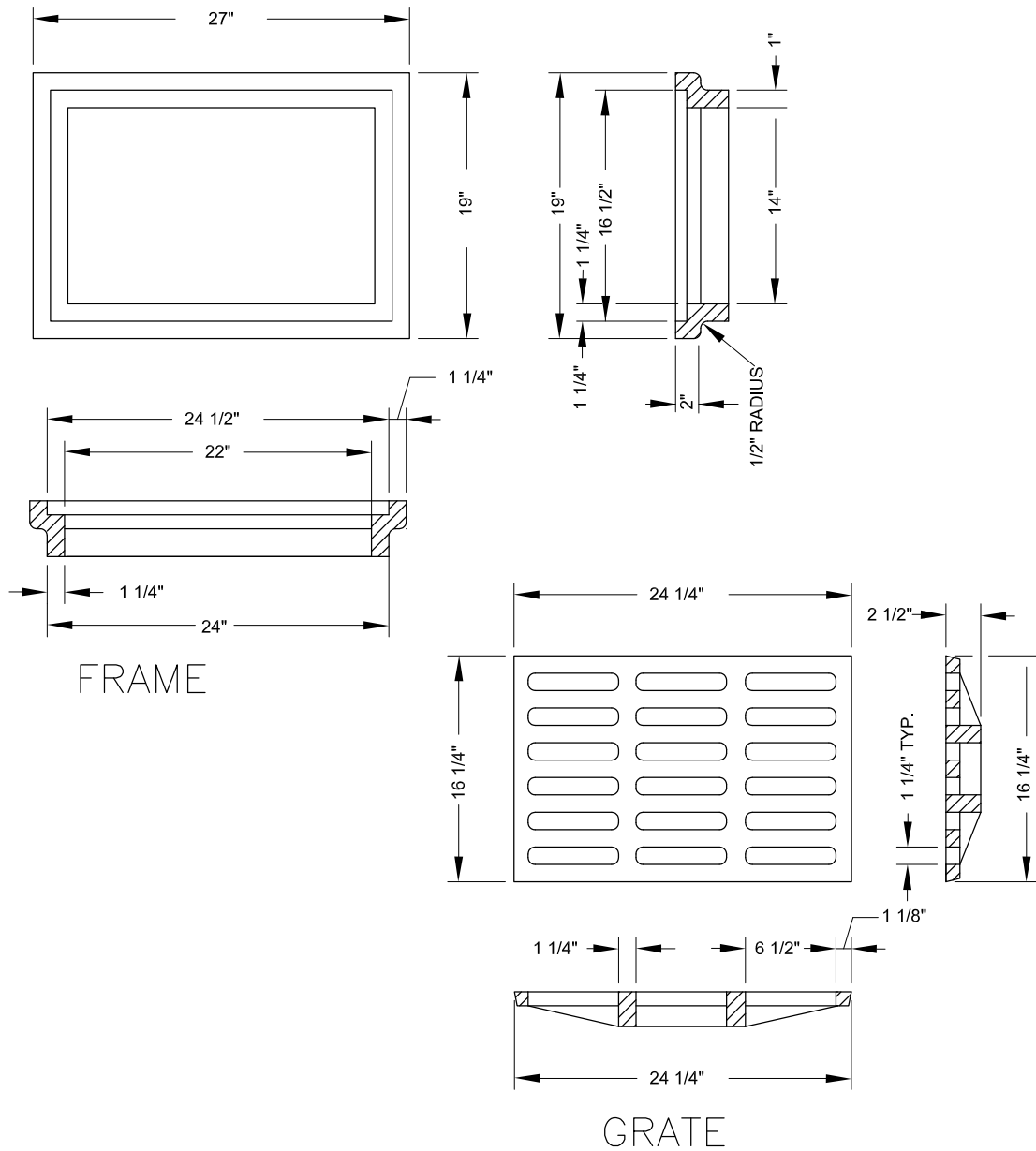
Clean Out Detail

Date Adopt. 11/01/12 **Date Rev.** 11/16/16

Dwg. Name: S-9 Clean Out.dwg

DWG. NO.

S-9



NOTES:

1. ALL CASTINGS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A48, CLASS 30B.
2. ROUNDS, FILLETS, TAPERS AND OTHER MINOR MODIFICATIONS TO THE DEMINSIONS SHOWN MAY BE MADE TO CONFORM TO COMMON SHOP PRACTICES.
3. GRIND SMOOTH FINISH BEARING SURFACES.
4. AVAILABLE THROUGH OLYMPIC FOUNDRY INC., PART NO. SM41.



City of Astoria
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 1095 Duane Street

Catch Basin Frame & Grate Detail

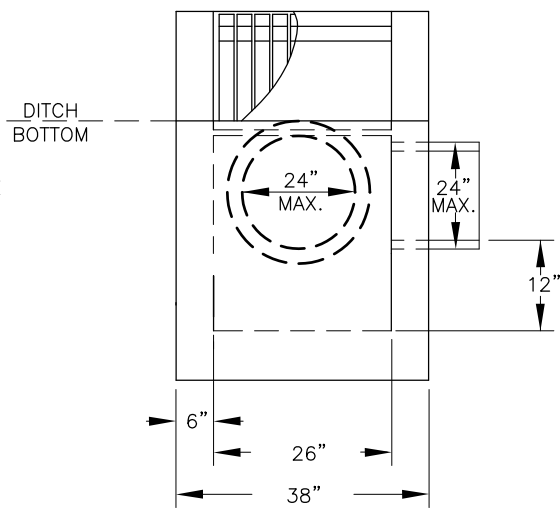
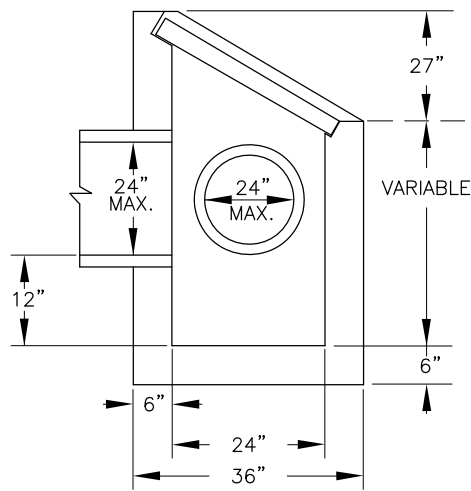
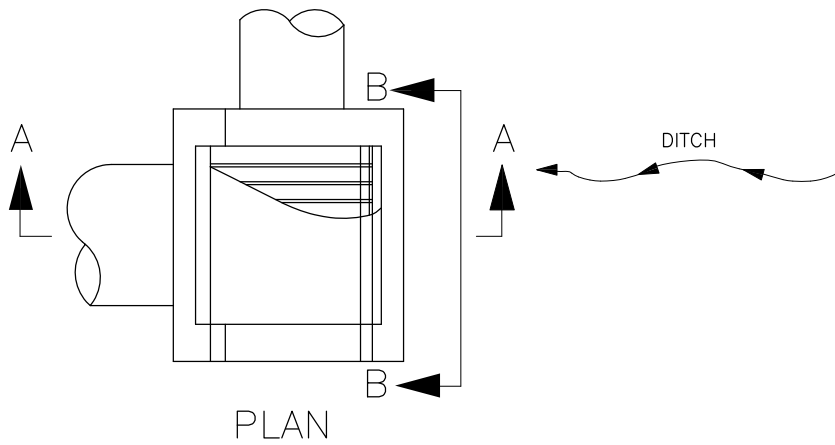
Date Adopt. 11/01/12

Date Rev. 11/16/15

DWG. NO.

Dwg. Name: SD-1 CB Frame & Grate.dwg

SD-1



- NOTES:
 1. CONCRETE SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 3300 P.S.I. IN 28 DAYS.



City of Astoria
Public Works Department
 1095 Duane Street

Field Inlet Detail

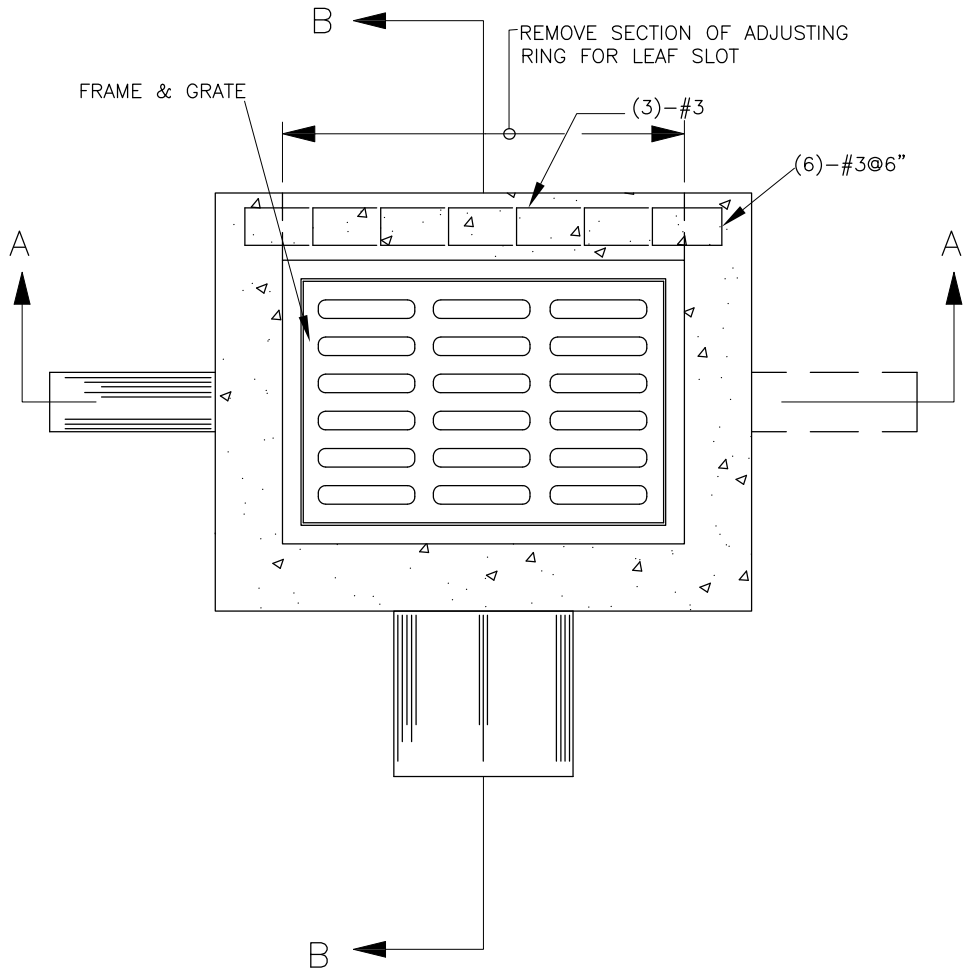
Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: SD-2 Field Inlet.dwg

SD-2



PLAN



City of Astoria
Public Works Department
 1095 Duane Street

Catch Basin Detail

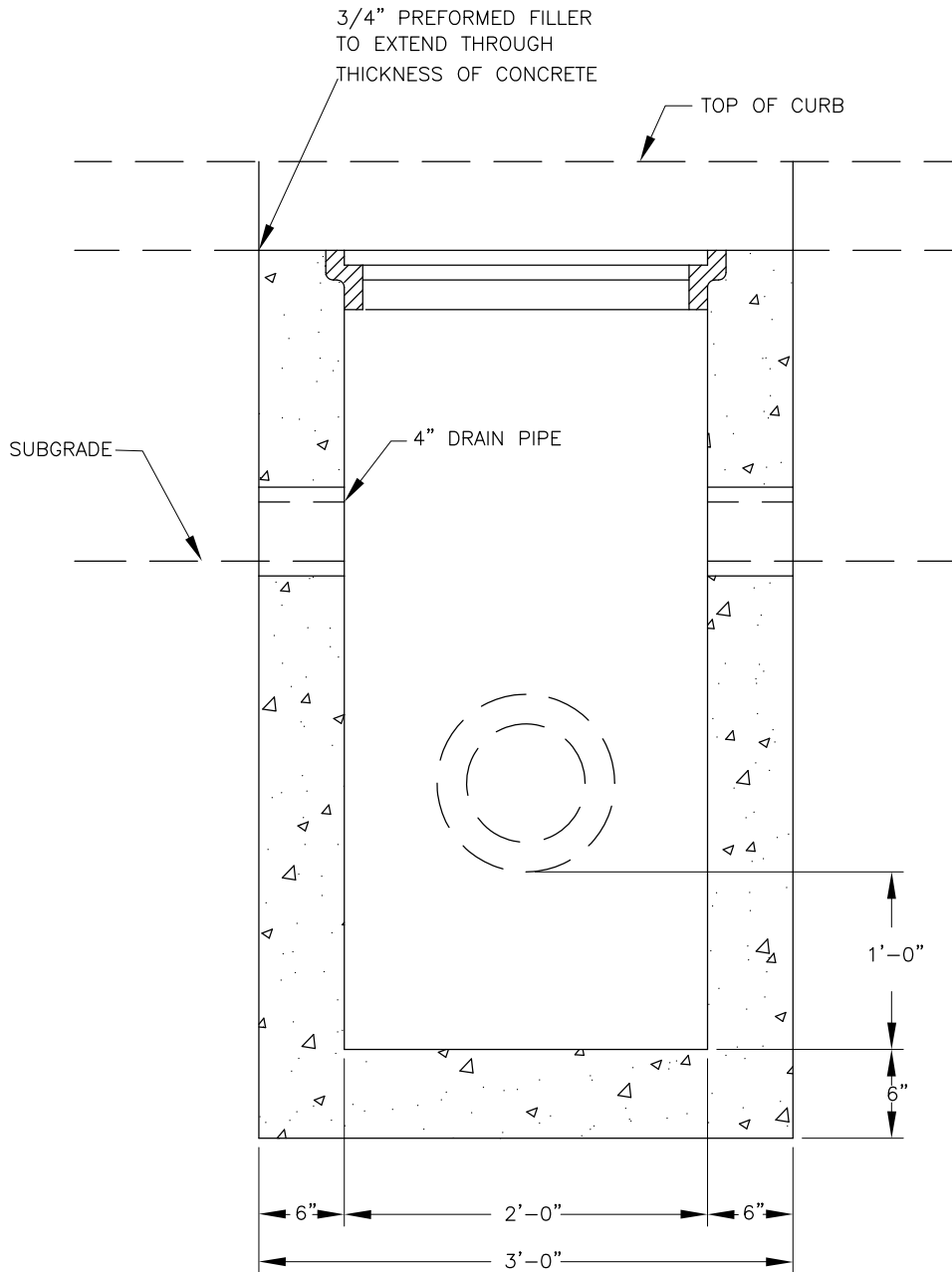
Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: SD-3 Catch Basin.dwg

SD-3



SECTION A

NOTES:

1. SUMP REQUIRED IN CATCH BASINS WITH OUTLET PIPE ONLY. FOR CATCH BASINS WITH INLET AND OUTLET PIPES FORM CHANNELS TO DIRECT FLOW.
2. CATCH BASIN BASE SHALL BE CITY OF SALEM TYPE 1, SHORT 36".



City of Astoria
Public Works Department
 1095 Duane Street

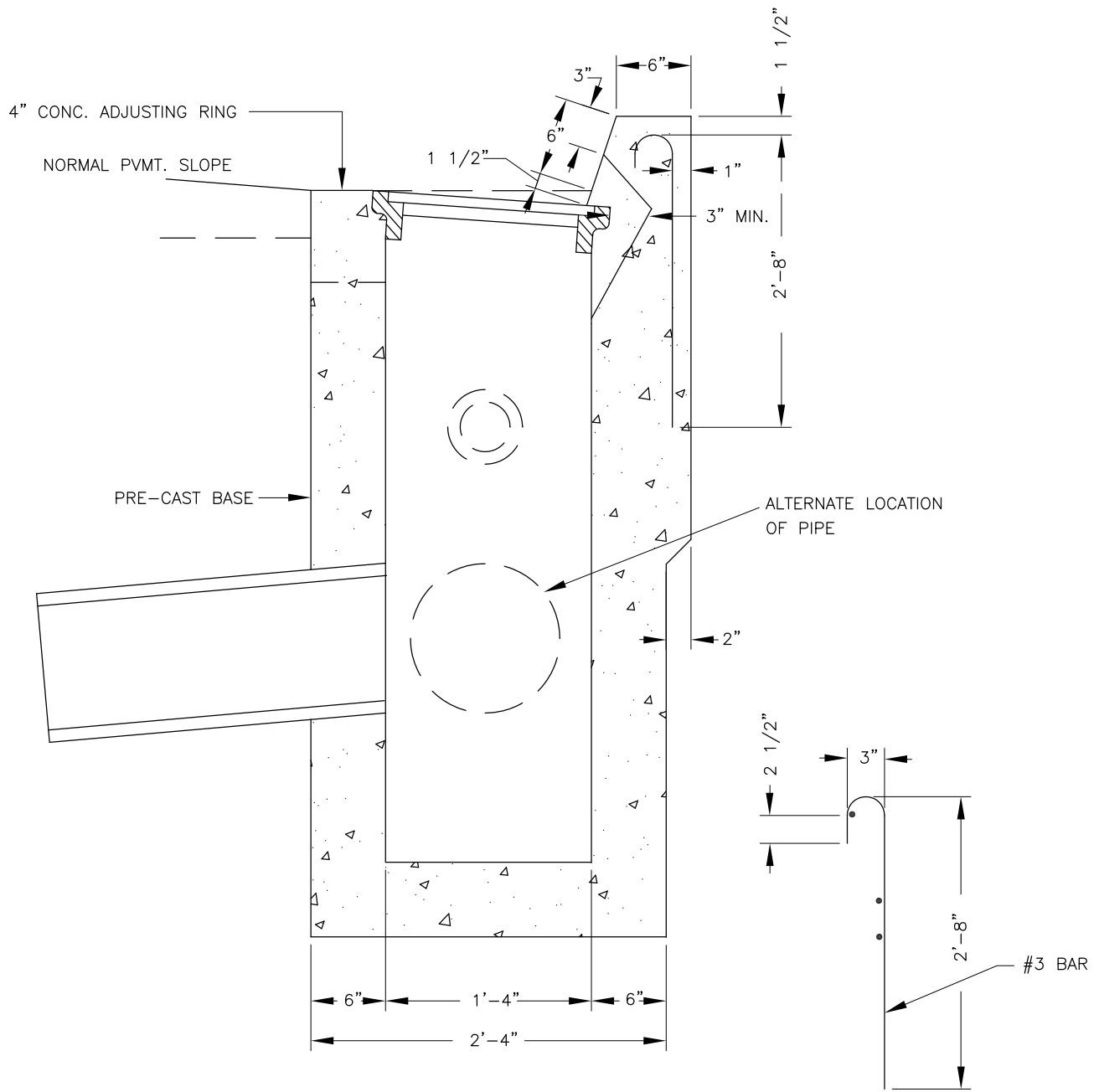
Catch Basin Detail

Date Adopt. 11/01/12 | **Date Rev.** 11/16/12

Dwg. Name: SD-4 Catch Basin.dwg

DWG. NO.

SD-4



SECTION B



City of Astoria
Public Works Department
 1095 Duane Street

Catch Basin Detail

Date Adopt. 11/01/12

Date Rev. ----

DWG. NO.

Dwg. Name: SD-5 Catch Basin.dwg

SD-5

APPENDIX B – CITY STANDARD SPECIAL PROVISIONS

STANDARD SPECIAL PROVISIONS

PART 00200 – TEMPORARY FEATURES AND APPURTENANCES

Section 00220 – Accommodations for Public Traffic

00220.02 Public Safety and Mobility - In the eighth “bulletized” item, delete the words “as shown on the Plans”.

00220.40(d) Adjacent to Excavations - In the first “bulletized” item, delete the words “as shown on the standard drawings”.

00220.40(e)(1) Closed Lanes - Add the following to the subsection:

Unless otherwise authorized by the City Engineer, the Contractor shall maintain two lanes of traffic on all streets affected by construction between the hours of 6:00 p.m. and 7:00 a.m.

Detours and closures will be allowed, but must be approved by the City Engineer in advance.

Section 00225 – Work Zone Traffic Control

00225.00 Scope - Delete the phrase “according to the standard drawings, the traffic control plan (TCP) for the Project, these Specifications, or as directed” and replace with the phrase “traffic control plan (TCP) for the Project submitted by the Contractor and accepted by the City Engineer, these Specifications, or as directed”.

00225.05 Contractor Traffic Control Plan - Delete the subsection in its entirety and replace with the following:

The Contractor shall submit a proposed TCP prepared by an engineer currently licensed in Oregon for the City Engineer’s review and acceptance at least 14 days prior to start of any construction. The proposed TCP shall address all operational aspects of the Contractor’s work, and shall include provisions for areas used by the Contractor for staging and storage of materials and equipment. The proposed TCP shall include order and duration of the TCP, all TCMs, TCDs, lane and street closures, and detours. If additional modifications are proposed by the Contractor to the Contractor’s TCP as accepted by the City Engineer, submit modifications prepared by an engineer currently licensed in Oregon at least 7 days before beginning the construction activities that require the TCP changes.

The following parameters shall apply to the Contractor’s Traffic Control Plan:

- Traffic control shall be designed to move traffic past the area smoothly, with proper and adequate advance signing.
- Wherever the existing roadway surface is disturbed by construction and except where temporary paving is required, the Contractor shall regularly grade and maintain a smooth gravel surface for vehicular traffic traveling through and within the project area until the project is complete.
- Access for Emergency vehicles shall be accommodated at all times.
- The Contractor shall have the responsibility of coordinating the needs of the abutting residents and businesses for parking and access. Temporary on-street parking changes during construction may be allowed, but must be approved by the City Engineer.
- The Contractor shall retain a Traffic Control Supervisor for the project, with responsibility and authority to continuously monitor and direct traffic control operations at all times on the project. The Traffic Control Supervisor shall have specific training in temporary traffic control for construction. The Contractor shall provide the Traffic Control Supervisor’s name and phone number and training credential documentation to the City Engineer at the pre-construction conference. The Traffic Control Supervisor shall not be changed

by the Contractor without prior notification to the City Engineer and providing the same information for the new Traffic Control Supervisor and receiving City Engineer acceptance of the change.

Section 00280 – Erosion and Sediment Control:

00280.04 Erosion and Sediment Control Plan on City Controlled Lands - In the last sentence of the first paragraph, delete “before” and replace with “after”.

00280.05 Erosion and Sediment Control Plan on Non-City Controlled Lands - In the last sentence of the first paragraph, delete “before” and replace with “after”.

00280.30 Erosion and Sediment Control Manager - In the second paragraph, delete “10 days before” and replace with “at”.

Section 00290 – Environmental Protection

00290.20(b) Fuel Storage – Delete the second sentence of the second paragraph.

00290.30(b) Pollution Control Plan: In the first paragraph, delete the phrase “for approval 10 calendar days before the preconstruction conference”.

Delete the last paragraph which begins “A Pollution Control Plan Contractor Packet...”

00290.32 Noise Control – Delete the first “bullet” and replace with the following:

The Contractor shall comply with all requirements regarding noise control, as in accordance with Chapter 5, Offenses, in the Astoria Code.

PART 00300 – ROADWORK

Section 00310 – Removal of Structures and Obstructions

00310.42 Salvaging Drainage Structure Fittings – Add the following to subsection:

Manhole frames and lids, and catch basin frames and grates not reused on new structures shall be salvaged and provided to the City at its maintenance shop at 550 30th Street, Astoria, OR 97103.

00310.44 Earthwork in Connection with Removal – Add the following to subsection:

Catch basins and manholes removed shall be backfilled with compacted Class B Backfill in accordance with 00405.14 from the bottom of the excavation to the top of the street subgrade.

Section 00330 – Earthwork

00330.41(a)(9)c Unstable Subgrade Material - Add the following to subsection:

Where unsuitable foundation is encountered and over-excavation is required, the Contractor shall excavate to a depth as directed by the City Engineer and replace the resultant void with 2-1/2" – 0" aggregate base material.

Section 00350 – Geosynthetic Installation

00350.10 Materials – Add the following to subsection:

Woven geotextile in accordance with 02320.20 (Table 02320-4) shall be used for separation between subgrade and aggregate base material.

PART 00400 – DRAINAGE AND SEWERS

Section 00405 – Trench Excavation, Bedding, and Backfill

00405.02 Definitions

Pipe Bedding: Add the following:

The total bedding depth shall be a minimum of 6 inches below the bottom outside surface of the barrel of the pipe for the full width of the trench.

Pipe Zone: Delete “8 inches” and replace with “12 inches”.

Trench Backfill: Add the following:

Imported Trench Backfill shall be imported crushed aggregate materials free from wood waste, organic material, and other extraneous or objectionable materials.

Lateral Restraint Shoring System: Add the following:

Lateral Restraint Shoring System is defined as a shoring system with full face braced shields tightly against the trench sidewalls throughout trench excavation and pipe installation to maintain lateral stability.

00405.11 Trench Foundation - Delete the four “bulleted” items and replace with the following: 2-1/2”-0 base aggregate in conformance with 02630.10.

00405.12 Bedding – Add the following to subsection:

Pipe Bedding material shall be ¾” – 0 base aggregate material in conformance with 02630.10.

00405.13 Pipe Zone Material – Add the following to subsection:

Pipe Zone Material shall be ¾” – 0 base aggregate material in conformance with 02630.10.

00405.14 Trench Backfill - Add the following to subsection:

Trench Backfill shall be Class B Backfill.

00405.16 Pipe Zone Locate Wire – Add this subsection:

The Contractor shall install 14 gauge locate wire 6 inches above all non-ferrous pipe. Sanitary Sewer wire shall be green, water wire blue, storm drain wire white. Run wires into valve, cleanout and meter boxes, manholes and other structures to a point accessible from the cover. Locate wires to not hinder access into manholes.

00405.41(c) Trench Width – Delete third and fourth sentences of subsection.

00405.41(f) Trench Excavation, Trench Protection - This section is supplemented with the following:

The Contractor shall be responsible for providing Trench Protection as follows:

1. The Contractor is solely responsible to design, install and maintain shoring, sheeting, bracing and sloping necessary to support the sides of the excavation and to prevent any movement that may trigger landslides, damage adjacent structures and facilities, endanger life and health, or pose a threat to the environment. Conform to the requirements of applicable governmental regulations and agencies.
2. All sheeting, bracing, shoring and trench shields shall be designed or certified by a currently registered Oregon professional engineer and meet the requirements of all applicable local, state, and federal safety codes. The designer shall comply with all applicable codes, ordinances and statutes, and bear sole responsibility for any and all penalties imposed for noncompliance.
3. Do not install sheeting and shoring using vibratory methods.
4. Make and maintain all excavations in a safe manner.
5. Carefully reconsolidate the bedding and side support outside a trench shield prior to placing backfill.

6. Leave in place those portions of sheeting extending below the crown elevation of the pipe, unless the bedding and side support can be reconsolidated to the satisfaction of the City Engineer.
7. Where removal of sheeting would result in damage to adjacent utilities or other property, the Engineer may order all or a portion of sheeting to be cut off and left in place.
8. Do not use horizontal strutting below the barrel of a pipe.
9. Do not use the pipe as support for trench bracing.
10. Contractor shall restore all existing facilities damaged, destroyed, or altered by soil movements resulting from temporary shoring movements or nonperformance.
11. Detrimental Movements or Settlements: Work shall be stopped immediately and the causes of detrimental movements be ascertained if:
 - (a) Damage is noted on adjacent structures.
 - (b) Total settlements of an adjacent structure are noted to be 1/4-inch or larger.
 - (c) Total horizontal movements of an adjacent structure are noted to be 1/4-inch or larger.
 - (d) Shoring systems horizontal movements are noted to be 1/4-inch or larger.
 - (e) Total ground settlements, when measured at settlement measurement points, are noted to be 1/2-inch or larger.
 - (f) There is a trend or a rate of change of any settlement or movement that indicates the maximum movements given above will be exceeded.
 - (g) Work is directed to stop by the City Engineer due to other detrimental effects or factors.
12. The causes of the detrimental movements or excessive settlements must be identified by the Contractor. Corrective measures must be proposed to and approved by the City Engineer before further Work.

00405.43 Dewatering - This section is supplemented as follows:

Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work.

1. The Contractor is solely responsible to design, furnish, install, maintain, and operate all necessary dewatering wells, sump/pumps and other devices for dewatering all excavations. The Contractor's plan for the dewatering system shall be submitted to the City Engineer for review.
2. At all times have on the project sufficient dewatering devices for immediate use, including standby pumps in case other pumps become inoperable.
3. Provide a sufficient number of dewatering devices so as to hold the groundwater level at an elevation of not less than 1 foot below the lowest elevation of the pipe or other material to be placed. When groundwater is encountered, the Contractor shall assess the situation and develop a plan to accommodate dewatering. The Contractor shall be solely responsible for control of groundwater through dewatering and trench excavation control Plan.
4. The dewatering operation shall be continuous, so that the excavated areas shall be kept free from water during subgrade preparation, while pipes are installed, and until backfill has been placed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
5. Continue dewatering during backfilling operations such that the groundwater is at least 1 foot below the level of the compaction effort at all times. No compaction of saturated materials will be allowed.
6. If pumping is required on a 24 hour basis, requiring engine drives, then engines shall be equipped in a manner to keep noise to a minimum.
7. Dewatering devices must be adequately filtered to prevent the removal of fines from the soil.
8. Settle and/or filter all dewatering system collected flow through Contractor provided settling tanks and systems in order to meet Water Quality Standards; Beneficial Uses, Policies, and Criteria for Oregon (OAR 340-041-0036) prior to discharging.

9. Dispose of water in such a manner as to cause no injury or nuisance to public or private property, or be a menace to the public health.
10. The Contractor shall be responsible for any damage to existing structures, pavement, utilities, or of the new works caused by Contractor's dewatering activities or failure of any part of the Contractor's dewatering activities.

The Contractor shall be responsible for furnishing temporary drainage facilities to convey and dispose of surface water falling on or passing over the site.

00405.44 Trench Foundation - Delete the third sentence of the second paragraph and replace with the following: Place the trench foundation material in no more than 12-inch layers and compact according to 00330.43.

00405.45 Pipe Bedding - Add the following paragraph to subsection:

The Contractor shall place subsequent lifts of not more than 6-inches in thickness up to one foot above the top of the pipe, bringing lifts up together on both sides of the pipe.

Bedding material shall be compacted to 95% of the Standard Proctor maximum dry density (ASTM D698, AASHTO T-99). For the case that bedding material is not density testable, procedures in accordance with 00405.46(c) (2) shall be followed. In this case, the bedding materials should be compacted using suitable compaction equipment until non-yielding.

Bedding disturbed by pipe movement, by removal of shoring, or by movement of a trench box or shield shall be recompacted prior to backfill. Special care shall be taken to provide adequate bedding support at wye or tee connections, at Fernco connections and adjacent to other structures so as to avoid bending or shearing stresses at these critical points. The Contractor shall prevent pipe movement either horizontally or vertically during placement and compaction of pipe bedding material.

00405.46(b) Pipe Zone - Add the following to the subsection:

Pipe zone material shall be compacted to 95% of the Standard Proctor maximum dry density (ASTM D698, AASHTO T-99).

00405.46(c)(2) Class A, B, C, or D Backfill – Delete the second paragraph of the subsection and add the following:

Within rights of way and paved surfaces, trench backfill shall be compacted to 98% of the Standard Proctor maximum dry density within two feet of final pavement subgrade elevation and to 95% of the Standard Proctor maximum dry density below two feet of final pavement subgrade elevation. Water jetting is not acceptable as a method of compaction.

Contractor shall remove and recompact material that does not meet specified requirements.

For materials where a compaction curve cannot be developed in accordance with ASTM D698 or AASHTO T-99, compaction and field verification procedures for non-testable soils in ODOT Section 00330.43(c) should be followed. Deflection testing is not required.

When the backfilling is complete, the Contractor shall finish the surface area as specified. In paved areas, the Contractor shall maintain the surface of the trench backfill level with the existing grade, until final pavement replacement is completed and accepted by the City Engineer.

Add the following at the end of the subsection:

When crossing below an existing natural gas pipeline main or service of any size, the Contractor shall provide and install sand drainage material conforming to 00360.10 to provide a 12-inch envelope in all directions around the existing gas piping.

00405.48(c) Pavement, Curb and Sidewalk

Add the following to the first paragraph, after the second sentence:

Saw cut to nearest joint, panel or as indicated in the Standard Drawings.

In second paragraph, delete "6 inches" and replace with "12 inches" and add the following:

The Contractor is responsible for any damage to the sawcut trench edges between the time of excavation and paving. Trenches excavated for paving may not be left open for more than one day without steel plates or backfilling.

Section 00415 – Video Pipe Inspection

00415.00(c) Inspection – Delete the last sentence of the first paragraph and replace with the following:
Stop and inspect the full circumference of all pipe joints.

Section 00430 – Subsurface Drains

00430.10 Materials - Interceptor drain, underdrain/slotted pipe and drain pipe shall be Perforated Polyvinyl Chloride Pipe.

00430.11 Granular Drain Backfill Material - Material shall be 1-1/2" - 3/4" size.

00430.46(a) Special Filter Material - Material is not required.

Section 00445 – Sanitary, Storm, Culvert, Siphon, and Irrigation Pipe

00445.11 Materials – Sanitary sewer and storm drain pipe shall be Polyvinyl Chloride Pipe (PVC) conforming to ASTM D 3034.

00445.11(e) Tracer Wire

In first sentence, delete "12-gauge" and replace with "14-gauge".

Delete the second sentence and replace with the following:

The HMW-PE insulated cover shall be green for sanitary sewer and white for storm drain and a minimum 45 mil thick.

00445.11(h) Sanitary Sewer Laterals – Add this subsection:

Construct sanitary sewer laterals per the Standard Drawings - Detail S-8 including the "Y" fitting in the main. Tee's consisting of a PVC hub, rubber sleeve and stainless steel band are not acceptable.

00445.43(a) General – Add the following to subsection:

Replace existing sewer laterals that are disturbed by new pipe construction a minimum of 2 feet outside the new pipe trench.

00445.48 Tracer Wire - Add the following to the first paragraph:

Run wires into cleanouts, manholes and other structures to a point accessible from the cover and not to impede access.

In the second sentence of the first paragraph, delete "and on top of the pipe zone" and replace with "as shown in the Standard Drawings".

Section 00470 – Manholes, Catch Basins and Inlets

00470.00 Scope – Add the following to subsection:

This Work shall consist of installing storm sewer and sanitary sewer manholes.

Storm sewer manholes shall be constructed per the Standard Drawings – Details S-3 and S-4, 12-inch depth sump.

Sanitary sewer manholes shall be constructed per Standard Drawings – Details S-3 and S-4.

Catch basins shall be constructed per the Standard Drawings.

00470.10 Materials – Grout shall be Hey'di Powder X System mix for grouting inside of manholes and catch basin structures.

00470.11 Precast Concrete Manholes and Bases – Storm sewer manholes shall be core drilled in the field for catch basin laterals.

00470.72 Adjusting Manholes and Catch Basins to Grade – Add this subsection:

Manhole structures and catch basins shall be set to grade of preliminary asphalt surface and adjusted to final grade of surface at the time of final asphalt paving.

Section 00490 – Work on Existing Sewers and Structures

00490.40 General – Add the following to subsection:

Contractor shall be solely responsible for safety during the performance of the Work. No one shall enter into any sewer segment, or structure, where hazardous conditions may exist until such time as the source of these conditions is identified and eliminated by the Contractor and/or City. The Contractor shall perform all tests that may be required to identify and assess unsafe conditions and shall perform all work in accordance with the latest OSHA confined space entry regulations. Contractor will coordinate its work with local fire, police and emergency rescue units so they are aware of his working conditions. Access for cleaning purposes shall be via existing manhole openings.

00490.43 Abandoning Pipe in Place - Abandoned pipes shall be filled with controlled low-strength material in accordance with Section 00442 and capped.

00490.50 Sanitary Sewer and Storm Drain Connections – Add this subsection:

Connecting new sanitary sewer or storm drain pipe larger than 6-inch diameter to existing sanitary sewer or storm drain pipe shall be with a Romac 501 coupling, Romac Macro HP coupling or Fernco coupling with shear rings. Connecting new PVC pipe to existing tile drains shall be with a Fernco coupling (shear rings not required).

Section 00495 – Trench Resurfacing

00495.10 Materials - Permanent trench surfacing materials in existing paved areas shall be Asphalt Concrete Pavement (ACP) to in accordance with Section 00744.

PART 00600 – BASES

Section 00610 – Reconditioning Existing Roadway

00610.40 Removal and Replacement of Unsuitable Materials - Delete the last three sentences of the subsection and replace with the following:

Replace the removed materials with successive courses of 2-1/2"-0 base aggregate.

Section 00641 – Aggregate Subbase, Base, and Shoulders

00641.10(a) Base and Shoulder Aggregate - After the second sentence, add the following:

Base aggregate shall consist of both leveling rock and base rock as shown on the Standard Drawings. Leveling rock and base rock shall conform to Section 02630.10 for 3/4"-0 and 1-1/2"-0, respectively.

PART 00700 – WEARING SURFACES

Section 00744 – Asphalt Concrete Pavement

00744.12(a) Mix Type - Mix Type shall conform to 1/2" ACP.

00744.13 Job Mix Formula Requirements - JMF shall conform to Level 3.

00744.42 Tack Coat - Delete the last sentence of the first paragraph and replace with the following:

Tack coat asphalt shall be approved by the Engineer prior to application. Hot tack is required prior to all applications of asphalt concrete pavement.

00744.43(c) Placing - In last paragraph of subsection, delete the third sentence and replace with the following:

Where 4-inches of ACP is required for trench pavement patching or street section, place in two separate 2-inch lifts.

Section 00748 – Asphalt Concrete Pavement Repair

00748.10 Materials - Add the following to subsection:

Aggregate base shall consist of both leveling rock and base rock as shown on the Standard Drawings.

Leveling rock and base rock shall conform to Section 02630.10 for 3/4"-0 and 1-1/2"-0, respectively.

Asphaltic Concrete Pavement shall conform to Section 00744.

Emulsified Asphalt Concrete shall not be allowed.

Section 00759 – Miscellaneous Portland Cement Concrete Structures

00759.12 Sidewalk Ramp Treatment - Detectable warning surfaces shall be color red.

00759.41 Earthwork - Excavation for curb shall be performed at the same time as excavation for roadway section, and shall extend to 1-foot beyond the back of curb.

00759.42 Foundations - Delete the words "using selected granular backfill material according to Section 00330 or".

00759.50(b) Curbs, Islands, and Stairs - Curbs shall be stamped with the letters "SS", while the concrete is still wet, at the location where sanitary sewer side laterals cross beneath the curb.

PART 00800 – PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES

Section 00850 – Common Provisions for Pavement Markings

00850.50 General – Add the following to subsection:

Temporary pavement markings shall be maintained in serviceable condition throughout the project until permanent pavement markings are installed. Temporary pavement markings that are damaged shall be repaired or replaced by the Contractor immediately.

00850.75 Manufacturer's Warranty – In the first sentence, delete “on Agency supplied warranty forms”. Delete the last sentence.

Section 00865 – Longitudinal Pavement Markings – Durable

00865.00 Scope – Add the following to subsection:

Continental style crosswalks shall be High Skid Resistant Pre-formed Thermoplastic.

Crosswalks with standard bars and diagonal striping shall be constructed with a City provided legend using white paint with reflective glass beads.

If any portion of a crosswalk marking is removed or damaged during construction, the entire crosswalk marking shall be replaced with thermoplastic or paint, as applicable. All four sides of the crosswalk marking are to remain consistent.

00865.45 Installation - Method B: Spray Markings, shall apply to this project.

Paint for school crosswalks with standard bars and diagonal crosswalks shall be “Legend Build” by Ennis Flint, white, 985611-5A-5P.

Paint for yellow curb shall be “Legend Build” by Ennis Flint, yellow, 985612-5A-5P.

Paint for centerline striping shall be ORW-21-M-4 waterborne paint by Ennis Flint, applied at 10-11 gallons per mile with 4 pounds of beads/mile.

Section 00867 – Transverse Pavement Markings – Legends and Bars

00867.45 Installation - Type B-HS: Preformed, Fused Thermoplastic Film High Skid material shall apply.

PART 01000 – RIGHT OF WAY DEVELOPMENT AND CONTROL

Section 01040 - Planting

01040.00 Scope - All planting, including sod lawn installation, shall be completed by a professional/licensed landscape company.

01040.48(c) Method “C” (Sod Lawn and Seeded Lawn Areas) – All lawn replacement shall be in accordance with Method “C” for sod lawn.

01040.55(k) Site Specific Restoration – Add this subsection:

At any point of connections to private storm drain catch basins, storm drain lines, water or sewer services, or other facilities, restore the site of connection to existing conditions or better. Lawn sod shall be used for all grass restoration.

PART 01100 – WATER SUPPLY SYSTEMS

Section 01140 – Potable Water Pipe and Fittings

01140.10 Materials – Modify this subsection as follows:

All water lines shall be ductile iron thickness Class 52 meeting the requirements of Section 02470.20.

All ductile iron pipe and fittings and all brass fittings shall be manufactured within the U.S.

01140.40(a) Dewatering Trenches – This section is supplemented with the following:

See subsection 00405.43 Dewatering for additional requirements.

01140.41(a) General – Add the following to subsection:

Pipe shall be installed with 30 inches minimum and 48 inches maximum cover from the top of the pipe to finished grade unless otherwise approved by the Engineer.

01140.41(c) Polyethylene Encasement – Delete this subsection in its entirety.

01140.43 Polyethylene Encasement – Delete this subsection in its entirety.

01140.44(b) Restrained Joints – Delete the first sentence and replace with the following:

In addition to concrete thrust blocks as required in subsection 01140.44(a), mechanically restrain all joints at bends, tees, dead ends and crosses.

01140.47(a) Notification - Delete and replace with the following: The Agency will notify customers impacted by a shutdown, turn off meters as necessary, close valves in the existing system and assist with refilling the line and expelling air.

01140.47(b) Permission – Delete and replace with the following:

The City will be responsible for shutting down the existing water system when necessary for connection of a new waterline. The Contractor shall notify the City Engineer at least 2 working days in advance of each requested shutdown. Shutdowns shall not be scheduled on Friday or the day before a holiday and shall be planned to take place early in the day. Shutdowns may also have to be scheduled during times other than normal working hours. To minimize the inconvenience to water customers, the Contractor shall plan carefully for the installation of the new pipe by exposing the existing pipe in advance and making sure to have all necessary fittings, tools, equipment and personnel to make the connection in as short a time period as possible. The Contractor shall notify the City Engineer of any changes to the schedule prior to customer notification. If the schedule is changed after Agency staff has spent time or resources preparing for the shutdown, the Contractor will reimburse the City for personnel and equipment time and other expenses. Reimbursement will not be required if circumstances beyond the control of the Contractor cause the schedule change.

01140.51 Hydrostatic Testing – Delete and replace with the following:

Test Pressure - In accordance with AWWA C600, the line shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure. The test pressure shall be based on the lowest elevation (maximum static pressure) of the section of line to be tested. It is also necessary to carefully choose test sections in lines with large elevation differences to insure compliance with AWWA C600 where it says "the test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section" wherever possible. Water service testing shall be done after all taps and service lines are completed.

For example, a section of line has a working pressure at the low end of 110 psi and 70 psi at the high end. The test pressure at the low end should be 1.5 x 110 psi or 165 psi. This will result in a pressure of 125 psi at the high end which easily exceeds the 1.25 times the working pressure requirement of 87.5 psi.

Required Length of Test - 2 hours

Pass/Fail Determination - If there is any pressure drop during the 2-hour test period, the determination of whether the line can be accepted will be made on the amount of leakage that occurred. The allowable leakage is based on the length of line, diameter and test pressure as shown in Section 4.16 of AWWA C600. The leakage may be measured by pumping the line back to test pressure from a vessel which will permit the determination of the volume of makeup water pumped. Leakage may also be determined by pumping the line back up to test pressure and then measuring the amount of water that must be released to create the same drop in pressure that occurred over the 2-hour test.

The preceding paragraphs are intended to clarify certain portions of AWWA C600. All requirements of AWWA C600 apply to testing of waterlines.

Hydrostatic testing of HDPE pipe shall be to 150% of the working pressure of the piping system at the lowest elevation of the section being tested but not less than 1.25 times the working pressure at the highest point of the test section and shall be performed on all installed pipelines in accordance with the manufacturer's written instructions.

01140.52 Disinfecting – Delete and replace with the following:

Prior to placing new water mains in service, the Contractor shall disinfect new mains, and any repaired portions of, or extensions to, existing mains, and obtain two satisfactory bacteriological reports. Disinfection shall be performed in accordance with AWWA C651, or as directed by the City Engineer. The first sample will be collected and bacteriological tests obtained by the City at its cost. The second sample shall be collected by the Contractor and the Contractor shall be responsible for having the bacteriological test conducted by a State of Oregon certified laboratory at the Contractor's cost. The Contractor shall notify the City Engineer at least 24 hours in advance to schedule bacteriological testing.

No connections will be made to the existing water system until the Contractor has successfully passed specified pressure and bacteriological testing. Temporary piping, valves and connections may be required to maintain water service and complete testing. Contractor is responsible for detailing and providing all temporary piping, valves and connections required.

Section 01160 – Hydrants and Appurtenances

01160.49 Existing Hydrants and Appurtenances – Add this subsection:

The Contractor shall leave existing hydrants in service while the existing water main is in service or until just prior to removing and reinstalling the new hydrant to minimize the length of time the hydrant is non-functional.

Where existing hydrants are shown to be removed, the removal shall include removing and disposing of the existing hydrant and appurtenances including the existing auxiliary gate valve.

Section 01170 – Potable Water Service Connections, 2 inch and Smaller

01170.40 General – Add the following to subsection:

Connect to all water mains, including Class 52 ductile iron, using saddles. Direct taps are prohibited.

01170.40(b) Installation – Add the following to subsection:

When copper tubing is used for service connections, the tubing shall only be bent by using a suitable copper tubing tool to bend. Any divots for bends found in the copper tubing upon installation will be unacceptable. The Contractor shall replace the damaged tubing.

PART 02000 – MATERIALS

Section 02320 – Geosynthetics

02320.10(a)(2) Geogrids – Geogrids shall be TriAx 160 as manufactured by Tensar Corporation, or equal.

Section 02470 – Potable Water Pipe Materials

02470.20(a) General - Delete the last sentence of the subsection and replace with the following:

Ductile iron pipe shall be Standard Thickness Class 52. All ductile iron pipe and fittings shall be manufactured within the United States.

Section 02475 - Potable Water Fitting Materials

02475.20 Ductile Iron Pipe Fittings – Delete the first sentence and replace with the following:

All ductile iron fittings shall meet the requirements of AWWA C153.

02475.50 Restrained Joints – Delete subsection and replace with the following:

Restrained mechanical joints shall be restrained with Romac Grip Rings. Romac Grip Rings are an Agency standard and no substitutions will be accepted.

Restrained push on pipe joints shall be restrained with Field LOK gaskets or equal.

02475.60 Bolted, Sleeve-Type Couplings for Plain-End Pipe - Add the following to subsection:

When connecting ductile iron pipe to ductile iron pipe, the transition couplings shall be a mechanical joint ductile iron Class 350 long body sleeve fitting. If a long sleeve cannot be used to connect to the existing piping material use a Romac Macro HP two bolt wide range coupling or equal.

Transition couplings shall be ALPHA Wide Range Restrained Joints as manufactured by Romac Industries.

Flanged coupling adapters (FCA's) shall be Megaflange 2100 series as manufactured by EBAA Iron or approved equal.

Section 02480 – Potable Water Valve Materials

02480.10 General – Valves shall be manufactured by American Flow Control (AFC).

02480.25 Valve Boxes – Valve boxes shall be East Jordan Iron Works (Riser #363912; Lid #363926) 18-inch overall in accordance with the Standard Drawings.

02480.26 Valve Stem Extensions – Delete last sentence and replace with the following:

Valve stem extensions shall be provided to raise the operating nut to no more than 2 feet below the finished grade.

Section 02485 – Hydrant and Appurtenance Materials

02485.10 Fire Hydrants – Add the following to subsection:

Hydrants shall be Mueller Super Centurion A-423. The fire hydrant tee shall be flanged or mechanical joint as shown on the Standard Drawings.

Section 02490 – Potable Water Service Connection Materials, 2 Inch and Smaller

02490.10 General – Service line materials shall be designed for a minimum working pressure of 150 psi.

02490.20 Saddles – Add the following to subsection:

3/4-inch and 1-inch service saddles shall be Romac 101S. 2-inch service saddles shall be Romac 202S.

This specification for saddles includes saddles shown for installation of blow off assemblies and connecting waterlines 2-inch or smaller as shown on the Standard Drawings.

02490.30(a) Less Than or Equal to 1 Inch – Corporation stops shall be Mueller No. H-15028N.

02490.40 Service Pipe and Fittings – Supplement this subsection with the following:

- (a) Copper Tubing Service Pipe - 3/4-inch and 1-inch services shall be copper; Type K. The tubing shall only be bent by using a suitable copper tubing tool to bend. Any divots or bends found in the copper tubing upon installation will be unacceptable. The Contractor shall replace the damaged tubing.
- (b) Polyethylene Tubing Service Pipe - 2-inch services shall be HDPE tubing, CTS Size, SDR9, 200 PSI, Blue.
- (c) Service Fittings - Service connection fittings shall be low-lead brass. Fittings for copper tubing shall be compression-type. Fittings for polyethylene tubing shall be compression-type (Mueller 110). Fittings for polyethylene tubing shall be same DR as service line tubing.

02490.70 Meter Boxes - Delete subsections (a) and (b) and replace with the following:

Meter boxes shall be in conformance with Standard Drawings – Details W-3 and W-4.

02490.72 Meters – Add this subsection:

Meters shall be Badger Model 25 with cast iron bottom, low lead and read in gallons. 2-inch water services shall be provided with 1-1/2 inch meters, unless approved otherwise by the Engineer.