CITY OF MILWAUKIE

PUBLIC WORKS STANDARDS

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PUBLIC WORKS STANDARDS

REVISIONS LIST

SECTION **LAST REVISED**

CONSTRUCTION STANDARDS

DIVISION 1—GENERAL REQUIREMENTS.....removed, January 2, 2024
General Requirements for Construction is now a separate city document.

SECTION 1—GENERAL REQUIREMENTS .....January 2, 2024
SECTION 2—STORMWATER STANDARDS .....January 2, 2024
SECTION 3—WASTEWATER STANDARDS .....January 2, 2024
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PUBLIC WORKS STANDARDS

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STANDARD DRAWINGS

SECTION 1—GENERAL REQUIREMENTS STANDARDS

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1.0000 GENERAL

1.0010 AUTHORITY AND PURPOSE

The City of Milwaukie's Public Works Standards will establish and provide specific, technical direction for the design and construction of all streets and associated utility projects. The City Council is, through the adoption of these standards, endorsing a comprehensive set of design and construction practices that are designed to deliver high quality improvements to the citizens of Milwaukie.

Public works improvements are conditioned through the development review process, these Standards, City ordinances, and other City policies adopted by the City Council or the City Engineer. No street, bridge, or utility construction will commence prior to the City approval of the construction plans. Designs submitted will be stamped by a Professional Engineer licensed to practice by the State of Oregon. Bridge or elevated path plans will be stamped by a Structural Engineer licensed to practice by the State of Oregon. Planting plans will be stamped by a Registered Landscape Architect licensed to practice by the State of Oregon.

The purpose of these Standards is to provide a consistent policy under which certain physical aspects of public facility design will be implemented. Most of the elements contained in these standards are public works oriented and it is intended that they apply to both public improvements under City contracts and public improvements under private contract designated herein.

These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. It is expected that engineers will bring to each project the best of skills from their respective disciplines.

The Standards are also not intended to unreasonably limit any innovative or creative effort, which could result in better quality, better cost savings, and/or better life cycles. Any proposed departure from the Standards will be judged, however, on the likelihood that such variance will produce a compensating or comparable result in every way adequate for the user and city resident. Alternate materials and methods will be considered for approval by the City Engineer as the need arises and conditions warrant modification. This consideration will be on a case-by-case basis and require sufficient justification prior to approval.

1.0020 PROFESSIONAL LICENSE POLICY

It will be the policy of the City of Milwaukie to require compliance with ORS 672 for professional engineers and ORS 671 for registered landscape architects.

All plans, reports, or documents will be prepared by a registered professional, or by a subordinate employee under the registered professional's direction and will be signed and stamped with the state approved seal to indicate responsibility for them. This registered professional is designated by these Standards to be the Design Engineer. It will be the Design Engineer's responsibility to review any proposed public facility extension, modification, or other change with the City prior to engineering or proposed design work to determine any special requirements or whether the proposal is permissible. A "Preliminary Review" and/or a "Plans Approved for Construction" stamp of the City on the plans, etc., for any job, does not in any way relieve the Design Engineer of responsibility to meet all requirements of the City or obligation to protect life, health, and property of the public. The plan for any project will be revised or supplemented at any time if it is determined that the full requirements of the City have not been met.

1.0030 APPLICABILITY

These Standards will govern all construction and upgrading of all public and privately financed public facilities in the City of Milwaukie and applicable work within its service areas.

1.0040 CONFLICTING CODES

Where these Standards conflict with other applicable codes, the more restrictive code will prevail.

1.0050 STANDARD SPECIFICATIONS

All construction design detail, workmanship, and materials will be in accordance with the current edition of the City of Milwaukie Public Works Standards. All work which these Standards do not discuss but for which they apply will conform to the latest revision of the Oregon Standard Specifications for Construction (OSSC).

1.0060 APPROVAL OF ALTERNATE MATERIALS OR METHODS

Any substitution material or alternate method not explicitly approved herein will be considered for approval as set forth in Subsection 1.0010 (Authority and Purpose). Persons seeking such approvals will make an application in writing. Approval of any major deviation from these Standards will be in written form. Approval of minor matters will be made in writing if requested.

Any alternate must meet or exceed the minimum requirements set in these Standards.

The written application will include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, and other pertinent information.

Any deviations or special problems will be reviewed on a case-by-case basis and approved by the City Engineer. When requested by the City, full design calculations will be submitted for review with the request for approval.

1.0070 SPECIAL DESIGN PROBLEMS

Special applications not covered in these Standards require review and approval by the City Engineer. Submittal of full design calculations, supplemental drawings, and information will be required prior to any approval.

Such applications which may require special review and approval are among, but not limited to, the following.

Sewer Force Mains
Relining of Existing Sewers
Internal Sealing of Existing Sewers
Sewer Regulatory Devices
Sewage Pump Stations
Sewer Siphons
Sewage Treatment Plants
Sewer Flow Measurement/Monitoring Devices
Water Distribution Pump Stations
Relining of Existing Water Mains
Water Pressure Regulating Devices
Energy Dissipaters
Water Reservoirs
Water Treatment Plants
Water Flow Measurement/Monitoring/Telemetry Devices
Storm Sewer

1.0080 REVISIONS TO STANDARDS

It is anticipated that revisions to these Standards will be made from time to time. The date appearing on the cover page and footer is the date of the latest revision. Users should apply the latest published issue to the work contemplated.

1.0090 DEFINITIONS AND ABBREVIATIONS

2-Year Storm Event
Flood event that statistically has a 50% chance of occurring in any given year.

5-Year Storm Event
Flood event that statistically has a 20% chance of occurring in any given year.

10-Year Storm Event
Flood event that statistically has a 10% chance of occurring in any given year.

25-Year Storm Event
Flood event that statistically has a 4% chance of occurring in any given year.

50-Year Storm Event
Flood event that statistically has a 2% chance of occurring in any given year.

100-Year Storm Event
Flood event that statistically has a 1% chance of occurring in any given year.

Acceptance of work
All work required by the contract documents and/or conditions of approval will be considered accepted upon approval of the Certificate of Completion by the City.

Acts of God
An act of God is to be construed to mean an earthquake, flood, cloudburst, tornado, hurricane, or other phenomenon of nature of catastrophic proportions or intensity.

Advertisement
The public announcement inviting bids for work to be performed or materials to be furnished.

Alley
A public access easement or right-of-way not more than 20 ft and not less than 12 ft in width, which intersects with a public street. A street primarily intended to provide secondary access to another street or side of lots or buildings not intended for normal through vehicular traffic. An alley will have a minimum 20-ft turning radius.

Approved backflow prevention device
A backflow prevention device that has been investigated and approved by the Oregon State Health Division.

Arterial street
A major facility for moving intra-area traffic and for moving traffic to and from the freeway/expressway system as designated in the Transportation System Plan (TSP).

As-built plans
Plans signed and dated by the Design Engineer indicating that the plans have been reviewed and revised, if necessary, to accurately show all as-built construction details.

Attorney
The City Attorney of the City of Milwaukie, Oregon.

Back siphonage
Backflow that results from negative pressure (partial vacuum) in the supply piping system.

Backflow
The reverse of flow from its normal or intended direction of flow. Backflow can be caused by back pressure or back siphonage.

Backflow preventer
An approved device or means to prevent backflow into the potable water system.

Bike lanes
A delineated travelway for bicyclists which is established within the roadway directly adjacent to the outside vehicular lane or on the shoulder.

Bikeway/bike path
A designated travelway for bicyclists which is completely separated from the vehicular travel lanes and is within independent rights-of-way.

Building service lateral
A private sanitary sewer beginning at the sewer main and extending to a building.

Building sewer
A private sanitary sewer from a building to the sewer main.

Building supply
A pipe carrying potable water from a water meter or other source of water supply to a building or other point of use or distribution on a lot. Building supply will also mean customer line.

CBE
Crushed based equivalent (CBE) is the number that directly relates the traffic coefficient to the number of inches of rock.

CDF
Controlled Density Fill

Certificate of Completion
Standard City form, which must be signed by the Contractor.

Certificate of Compliance
Standard City form, which must be signed by the Contractor, stating compliance with the contract documents and/or conditions of approval.

CFS
Cubic feet per second.

Change order
A written order issued by the City Engineer to the Contractor directing changes in the work, subject to approval of City.

City
The City of Milwaukie, Oregon.

City Engineer
The City Engineer of the City of Milwaukie acting either directly or through authorized representatives.

City street
A city street is a street that is maintained by the City. A private street is not maintained by the City but is designed and constructed to the same standards as a city street.

Collection systems
Facilities maintained by the City of Milwaukie connected thereto for the collecting, pumping, conveying, and controlling of wastewater.

Collector sewer
The portion of the public sewerage system which is primarily installed to receive wastewater directly from individual residences and other individual public or private structures.

Collector street
A facility that allows traffic within an area or neighborhood to connect to the arterial system.

Community development code
The sections of the City of Milwaukie Municipal Code (MMC) designed to set forth the standards and procedures governing development and use of land in Milwaukie and to implement the Comprehensive Plan. These include Titles 14 (Signs), 17 (Land Division), and 19 (Zoning).

Comprehensive Plan
The official document of Milwaukie that includes goals and policies that direct how Milwaukie will develop. It may also include action measures or strategies for implementing the goals and policies. The Comprehensive Plan is adopted by ordinance and is the basis for the community development code.

Constructed wetlands
Those wetlands developed as a water quality or quantity facility, subject to change and maintenance as such, and which are defined and/or separated from naturally occurring or created wetlands.

Contract
The document entitled "contract" or "agreement" which is executed by the Contractor and the City; authorizing ordinance; advertisement calling for bids; bid; instructions to bidder; plans; and all specifications, addenda, permits, performance bond, insurance certificates, and change order for any approved revisions made during the performance of the work to any of the above listed documents, collectively referenced as the "contract documents."

Contract cost
The aggregate amount of price promised to be paid by the City to the Contractor upon fulfillment of the Contract.

Contract item
A specific unit of work for which a price or basis of payment is provided in the Contract.

Contractor
Any individual, firm, copartnership, corporation, or any combination thereof who has entered a Contract with the City for a particular project. In the case of work being done under a permit issued by the City, the permittee shall be construed to be the Contractor.

Core
To cut and remove a portion of pipe with a circular hollow drill.

Created wetlands
Those wetlands developed in an area previously identified as non-wetland to replace or mitigate wetland destruction or displacement and which are regulated and managed the same as a natural wetland.

Cross-connection
Any actual or potential physical connection between a potable waterline and any pipe or vessel containing a nonpotable or potable (e.g., well) fluid (suspended solid or gas) so that it is possible to introduce the nonpotable fluid into the potable fluid by backflow.

CTB
Cement Treated Base.

Cul-de-sac
A dead-end street having a turnaround area at the end.

Curb
The concrete structure indicating the edge of the vehicular roadway within the overall right-of-way.

Cut sheets
Sheets of tabulated data, indicating stations, structures, fittings, angle points, beginning of curve, points on curve, end of curves, storm drain slope, staking offset, various elevations, offset cuts, and storm drain depths for streets, waterlines, sanitary sewers, and storm drains.

Datum
The vertical elevation control.

Day
Calendar day; i.e., any and every day shown on the calendar, Sundays and holidays included.

Dead-end street
A street or series of streets which can be accessed from only one point. Dead-end streets can be either temporary (intended for future extension as part of a future street plan) or permanent.

Dedication
The legal conveyance of land, typically from a private property owner to the City.

Definition of words
That, whenever, in these Standards, the words "directed", "required", "permitted", "ordered", "designated," or words of like import are used, they will be understood to mean the direction, requirement, permission, or order of designation of the City Engineer. Similarly, the words "approved", "acceptable", or "satisfactory", will mean approved by, acceptable to, or satisfactory to the City Engineer.

Design Engineer
The engineer, licensed by the State of Oregon as a Professional Engineer under whose direction plans, profiles, and details for the work are prepared and submitted to the City for review and approval, or who is in charge of and responsible for construction of the improvement.

Designated arterial or collector street
A street designated as an arterial or collector in the Comprehensive Plan.

Detention
The holding of runoff for a designed period of time and then releasing it to the natural water course.

Development
Any manmade change defined as buildings or other structures, mining, dredging, paving, filling, or grading in amounts greater than 10 cubic yards on any lot or excavation. Development does not include the following: a) Stream enhancement or restoration projects approved by cities and counties; b) Farming practices as defined in ORS 30.930 and farm use as defined in ORS 215.203, except that buildings associated with farm practices and farm uses are subject to the requirements of Title 3; and c) Construction on lots in subdivisions meeting the criteria of ORS 92.040(2).

Domestic sewage
The liquid and water-borne waste derived from ordinary living processes, free from industrial wastes, and of such character to permit satisfactory disposal without special treatment into the public sewer or by means of a private sewage disposal system.

Double check detector check valve assembly
A line-sized, approved, double check valve assembly with a parallel meter and meter-sized, approved, double check valve assembly. The purpose of this assembly is to provide backflow protection for the distribution system and, at the same time, provide a metering of the fire system showing any system leakage or unauthorized use of water.

Double check valve assembly
An assembly composed of 2 single, independently acting, approved check valves, including tightly closing shutoff valves located at each end of the assembly and fitted with properly located test cocks.

Drainage facilities
Pipes, ditches, detention basins, creeks, culvert bridges, etc., used singularly or in combination with each other for the purpose of conveying or storing storm water runoff.

Easement
Areas located outside of dedicated rights-of-way, which are granted to the City for special uses. The right to use a defined area of property for specific purpose or purposes as set forth in the specifications.**(Private) Easement**
An area on a parcel that benefits other parcel(s) by granting special uses.

Erosion control, post construction
The re-establishment of groundcover or landscaping prior to the removal of temporary erosion control measures.

Erosion prevention and sediment control
Measures that are required for construction sites where the ground surface will be disturbed with clearing, grading, fills, excavations, and other construction activities, to prevent and/or control eroded material and sediment from leaving the construction site and entering the City stormwater system and/or a water quality resource area.

Erosion Prevention and Sediment Control Planning and Design Manual
Manual developed through a partnership between Clackamas County Water Environmental Services (WES), Clean Water Services, Oak Lodge Sanitary District, and the cities of Gladstone, Happy Valley, Lake Oswego, Milwaukie, West Linn and Wilsonville.

Erosion, visible or measurable
Includes, but is not limited to: deposits of mud, dirt, sediment, or similar material, exceeding ½ cubic foot in volume on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dropping discharge, or as a result of the action of erosion.

Expansion joint
A joint to control cracking in the concrete surface structure and filled with preformed expansion joint filler.

FDR
Full Depth Reclamation

FPS
Feet per second.

Fire hydrant assembly
The fire hydrant and attached auxiliary valve from a water main to a hydrant.

Fire protection service
A metered connection to the public water main intended only for the extinguishment of fires and the flushing necessary for its proper maintenance.

Flood or flooding
A general and temporary condition of partial or complete inundation or normally dry land areas from the overflow of inland or tidal waters, and/or the unusual and rapid accumulation of runoff of surface waters from any source.

French drain or leach line
A covered underground excavated trench filled with washed gravel that surrounds a perforated pipe.

GPM
Gallons per minute.

GPS
Global Positioning System.

Grade
The degree of inclination of a road or hillside.

HDPE
High Density Polyethylene.

Impervious areas
Those hard surface areas located upon real property which either prevent or retard saturation of water into the land surface and cause water to run off the land surface in greater quantities or at an increased rate of flow from that present under natural conditions preexistent to development.

Improvement
General term encompassing all phases of work to be performed under a Contract for a Local Improvement District and synonymous with the terms "project" or "work."

Industrial street
A street which functions primarily to provide access to local abutting industrial land and is designed to accommodate industrial traffic.

Industrial waste
Solid, liquid, or gaseous waste resulting from any industrial, manufacturing, trade, or business process due to development, recovery, or processing of natural resources.

Inspector
The authorized representative of the City Engineer whose authority, instructions, and decisions shall be limited to the particular duties and responsibilities entrusted to them in making detailed inspections of any or all portions of the work or materials therefor.

Interceptor sewer
The primary public sanitary sewer which conveys wastewater directly into the wastewater treatment plant.

Intersection
The area formed by 2 or more streets intersecting. This area is defined by the intersection of right-of-way lines. For design purposes, an intersection is not formed by naming 2 approaches of a continuous street on a curve or some other point with different street names.

Irrigation service
A metered connection intended for seasonal use and delivering water, which is not discharged to the sanitary sewer.

Lateral sewer
A building service lateral.

Local or residential street
A facility designated to serve primarily direct access to abutting land. Through-traffic movement is deliberately discouraged on local residential streets.

Longitudinal joint
A joint which follows a course approximately parallel to the centerline of the roadway.

Lump sum
A method of payment providing for one all-inclusive payment for the work described to be done, complete, and accepted without further measurement, as such work is covered under the applicable lump sum pay item.

Manager
The City Manager of the City of Milwaukie acting either directly or through authorized representatives.

MMC
Milwaukie Municipal Code.

MS4
Municipal Separate Storm Sewer System.

Multi-use Path
An ADA-compliant shared path for pedestrians and bicyclists that is within a public right-of-way but completely separate from the vehicular travel lanes.

MUTCD
Manual on Uniform Traffic Control Devices, current edition.

Natural drainageway
A natural depression which collects drainage of surface water. It may be permanently or temporarily inundated.

Natural grade
The grade of the land in an undisturbed state.

Natural resource
A functioning natural system such as a wetland or stream.

Natural resource area
The land containing the natural resources to be protected.

Notice
A written communication delivered, by hand or by mail, to the authorized individual, member of the firm, or officer of the corporation for which it is intended. If delivered or sent by mail it shall be addressed to the last known business address of the individual, firm, or corporation. In the case of a Contract with two or more persons, firms, or corporations, notice to one shall be deemed notice to all.

NPDES
National Pollutant Discharge Elimination System.

Onsite detention
The storage of excess runoff on a development site prior to its entry into a public storm drain system. Stored runoff is gradually released after the peak of the runoff has passed.

OSHD Standard Specification
The latest edition of the Specification Document published by the State of Oregon entitled Standard Specifications for Highway Construction, Oregon State Highway Division. This document is available from the Oregon State Highway Division, Salem, Oregon.

OSSC
The most current version of the Oregon Standard Specifications for Construction published jointly by the Oregon Chapter of the American Public Works Association (APWA) and the Oregon Department of Transportation (ODOT)

Owner
The owner of record of real property as shown on the latest tax rolls or deed records of the county or a person who furnishes evidence that they are purchasing a parcel of property under a written recorded land sale contract.

Partition
To divide an area or tract of land into 2 or 3 parcels within a calendar year when such area or tract of land exists as a unit or contiguous units of land under single ownership at the beginning of such year.

Peak runoff
The maximum water runoff rate (CFS) determined for the design storm.

Person
Individual firm, corporation, association, agency, or other entity.

Plans
Construction plans, including system plans, sewer plans, and profiles, cross sections, detailed drawings, etc., or reproductions thereof, approved or to be approved by the City Engineer, which show the location, character, dimensions, and details for the work to be done, and which constitute a supplement to these standards.

Potable water
Water which is satisfactory for drinking, culinary, and domestic purposes and meets the requirements of the health authority having jurisdiction.

Private collection system
A privately owned and maintained lateral sewer system installed to serve multiunit structures on single ownership properties which cannot legally be further divided.

Private storm drain
A storm drain located on private property serving one or more structures or inlets and is not owned or maintained by the City.

Project
General term encompassing all phases of the work to be performed under the Contract and is synonymous with the terms "improvement" or "work."

Provide
When related to an item of work, the word "provide" shall be understood to mean furnish and install the work complete in place.

PROWAG
Public Right-of-way Accessibility Guidelines

Public sanitary sewer
Sanitary main in public right-of-way or easement operated and maintained by the City for carrying sewage and industrial waste.

Public storm drain
Any storm sewer in public right-of-way or easement operated and maintained by the City.

PUD
Planned Unit Development.

PVC
Polyvinyl Chloride.

Receiving Body of Water
Creeks, streams, lakes, and other bodies of water into which runoff is naturally or artificially directed.

Reference specifications
Bulletins, standards, rules, methods of analysis or test, codes and specifications of other agencies, engineering societies, or industrial associations referred to in the contract documents. All such references specified herein refer to the latest edition thereof, including any amendments thereto which are in effect and published at the time of advertising for bids or of issuing the permit for the project.

Release rate
The controlled rate of release of drainage, storm, and runoff water from property, storage pond, runoff detention pond, or other facility during and following a storm event.

Right-of-way
All land or interest therein which (by deed, conveyance, agreement, easement, dedication, usage, or process of law) is reserved for or dedicated to the use of the public for sidewalk, utility, and/or roadway purposes. A general term denoting public land, property, or interest therein, acquired for or devoted to a public street, public access, or public use.

Riparian areas
Lands which are adjacent to rivers, streams, lakes, ponds, and other water bodies. They are transitional between aquatic and upland zones and may contain elements of both ecosystems. They may have high water tables because of their proximity to aquatic systems, soils which are usually largely of water-carried sediments, and some vegetation that requires free (unbound) water or conditions that are more moist than normal.

Roadway
The portion of the right-of-way used or to be used primarily for vehicle movement which exists between the curbs, proposed curb lines, or edges of pavement.

Sedimentation
Deposition of debris and soil.

Sewage
Water-carried wastes from residences, business buildings, institutions, and industrial establishments, except industrial wastes.

Shared roadway
A roadway where bicyclists and motorists share the same travel lanes. These are provided where bike lanes may be warranted, but there is inadequate width to provide them.

Shop drawings and submittals
Supplementary plans or data or other information which the Contract requires the Contractor to submit to the City Engineer.

Shown
As used herein, the word "shown," or "as shown," shall be understood to refer to work shown on the Plans in the Contract.

Side path
A shared-use path for pedestrians and bicyclists that runs parallel and adjacent to a roadway.

Sidewalk
A walkway or raised path along the side of a road for pedestrians. A right-of-way deeded, dedicated, and designated for the use of nonmotorized vehicles and pedestrians.

Silt
Fine textured soil particles, including clay and sand, as differentiated from coarse particles of sand and gravel.

Siltation
Deposition of (silt) fine textured waterborne sedimentation.

Special Specifications
Requirements peculiar to the project and changes and modifications of the Standard Specifications.

Specified
As used herein, the word "specified," or "as specified," means as required by the Contract.

Standard Drawings
The drawings of structures or devices commonly used on public improvements and referred to in these Public Works Standards.

Standard Specifications
The terms, directions, provisions, and requirements set forth herein.

Station
A distance of 100 ft measured horizontally along the established centerline of a street, sewer, or other work, unless specified otherwise.

Stream
A body of running water moving over the earth’s surface in a channel or bed, such as a creek, rivulet, or river. It flows at least part of the year, including perennial and intermittent streams. It is dynamic in nature and its structure is maintained through build-up and loss of sediment.

Street
Any street, avenue, boulevard, alley, lane, bridge, bicycle path, road, public thoroughfare, or public way and any land over which a right-of-way has been obtained or granted for any purpose of public travel.

Structures
Those structures designated on the standard plans such as catch basins, manholes, etc.

Subcontractor
An individual, partnership, firm, corporation, or any combination thereof, to whom the Contractor sublets part of the Contract.

Subdivision
To divide an area or tract of land into 4 or more lots within a calendar year when such area or tract of land existed as a unit or contiguous units of land under a single ownership at the beginning of such year.

Substantial completion
The work (or a specified part thereof) has progressed to the point where, in the opinion of the City Engineer, it is sufficiently complete in accordance with the contract documents and/or conditions of approval, so that the work (or specified part) can be utilized for the purposes for which it is intended.

Superelevation
Sloping of a road cross section to improve drivability around a curve or spiral. The amount by which the outer edge of a curve on a road or railroad is banked above the inner edge.

Surety
The corporate body which is bound with and for the Contractor, for the acceptable performance of the Contract, and for their payment of all obligations arising out of the Contract.

Traffic coefficient
A number used in determining the structural section of a street.

Transition area
The land adjacent to a natural resource area that constitutes a buffer to protect the resource from conflicting development and activities.

Transverse joint
A joint, which follows a course approximately perpendicular to the centerline of the roadway.

Traveled way
That portion of the roadway for the movement of motorized vehicles, exclusive of shoulder and the median.

Trunk sewer
(Interceptor) A sanitary sewer which is primarily intended to receive wastewater from a collector sewer, another trunk sewer, an existing major discharge of raw or inadequately treated wastewater, or water pollution control facility.

Turnaround area
A paved area of sufficient size and configuration that a motor vehicle may maneuver so as to travel in the opposite direction.

Uniform Plumbing Code or Oregon Plumbing Code
The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials (current edition), as revised by the State of Oregon, called the "Oregon State Plumbing Specialty Code".

Unit price
A contract item of work providing for payment based on specific unit of measurement; e.g., linear foot or cubic yard.

Use of pronoun
As used herein, the singular shall include the plural, and the plural the singular; and the term "person" includes natural person or persons, firm, copartnership, corporation, or association, or combination thereof.

Utility
Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, owned, operated, or maintained in or across a public right-of-way or easement.

Wastewater
The total fluid flow in the sanitary sewerage system which includes industrial waste, sewage, or any other waste (including that which may be combined with any ground water, surface water, or stormwater) that may be discharged into the sanitary sewerage system.

Water distribution system
Water pipelines, pumping stations, reservoirs, valves, and ancillary equipment used to transmit water from a supply source through a service meter.

Water main
A water supply pipe for public use.

Water service line
The pipe connection from the City water main to the users' water meter, hydrant, backflow prevention device, or fire sprinkler double check valve.

Water Course
A natural or artificial channel through which water flows.

Wetlands
Those lands adjacent to watercourses or isolated therefrom which may normally or periodically be inundated or saturated by the waters from the watercourse or the drainage waters from the drainage basin in which it is located. These include swamps, bogs, sinks, marshes, and lakes, all of which are considered to be part of the watercourse and drainage system of the City and will include the headwater areas where the watercourse first surfaces. They may be, but are not necessarily, characterized by special soils such as peat, muck, and mud and under normal circumstances support a prevalence of vegetation typically adapted for a life in saturated soil conditions.

Work
All material, labor, tools, equipment, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and satisfactory system or structure.

Working day
Calendar day, any and every day shown on the calendar, excluding Saturdays, Sundays, and legal holidays.

ABBREVIATIONS

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act of 1990
AGA	American Gas Association
AGC	Associated General Contractors of America
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association

COM	City of Milwaukie
CRSI	Concrete Reinforced Steel Institute
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
ITE	Institute of Traffic Engineers
MMC	Milwaukie Municipal Code
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NLMA	National Lumber Manufacturer's Association
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
OSHD	Oregon State Highway Division
PCA	Portland Cement Association
PROWAG	Public Right-of-Way Accessibility Guidelines
UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
USASI	United States of America Standards Institute
WWPA	Western Wood Products Association

1.1000 CONSTRUCTION PLANS

1.1010 GENERAL INFORMATION

Prior to any construction work and plan approval, complete construction plans, specifications and all other necessary submittals will be submitted to the City Engineer for review. Submittal requirements consist of design plans (where required), drainage calculations, and other information as necessary. Conditions of approval from the Development Plan Review process, or as specified by the City Council, the Planning Commission, Hearings Officer, or the Planning Director will be shown on the design plans.

1.1020 PLAN PREPARATION

Construction plans and specifications will be prepared by a professional engineer licensed by the State of Oregon, as specified in Subsections 1.1020 (Plan Preparation) and 1.1030 (Required Sheets).

1.1021 Sheet Size

All construction plans will be clearly and legibly drawn in ink on 22 x 34 inch or 24 x 36 inch size sheets. Digitally submitted construction plans are also acceptable. Sheets will have a 1½-inch clear margin on the left edge and a ½-inch margin on all other edges.

1.1022 Scale of Plans

When plans are prepared for developer financed projects, the scale of drawings will be as follows:

Horizontal scales will be 1" = 20' or 30', vertical scales will be 1" = 5' or 10'.

For subdivision plans, it is preferred that all plan views and profile views of the plan set are drawn at a common scale.

When a scale is used which is smaller than 1" = 20' (e.g., 1" = 40') intersection details showing fittings and valves will be provided at a larger scale.

Architectural scales (e.g., ¼" = 1'0") are not permitted unless approved.

Letter size will not be smaller than 0.10 inch.

1.1023 Spatial Reference Requirements

Projected Coordinate System: NAD_1983_HARN_StatePlane_Oregon_North_FIPS_3601_Feet_Intl

Geographic Coordinate System: GCS_North_American_1983_HARN

Datum: D_North_American_1983_HARM

1.1024 Elevation Data Requirements

The North American Vertical Datum of 1988 (NAVD88)

1.1030 REQUIRED SHEETS

Construction plan submittals will contain the following minimum sheets: title sheet (unless not required by the City Engineer) plan and profile sheet(s), and detail sheet(s). A title block will appear on each sheet of the plan set and will be placed on the lower right-hand corner of the sheet, across the bottom edge of the sheet or across the right-hand edge of the sheet. The title block will include the names of the project, the engineering firm, the owner, the sheet title, and page number.

The seal and signature of the Design Engineer responsible for preparation of the plans will appear on each sheet as well as the Design Engineer's phone number.

The description and date of all revisions to the plans will be shown on each sheet affected and will be approved and dated by the Design Engineer as evidenced by signature or initial.

1.1031 Title Sheet

All subdivision projects and multiple sheet improvement projects will have a title sheet as the first page of the construction plans. This sheet will contain the following minimum information.

1. Site plan of entire project with street right-of-way and/or subdivision layout at a 1" = 100' scale. A 1" = 200' scale may be used if project size is too large. The site plan will also be a composite utility plan showing all properties served by proposed sewer, water, and storm facilities, in addition to the proposed facility.
2. Vicinity map at a 1" = 1000' scale or greater. Map will show the location of the project in respect to the nearest major street intersection.
3. Index of sheets with sheet and page numbers.
4. Complete legend of symbols used.
5. General and construction notes pertinent to project, space permitting. If space does not permit, a separate note page will be used.
6. Temporary and/or permanent benchmarks used along with their descriptions, elevations of benchmark, and datum.
7. Design Engineer's name, address, phone number, and seal.
8. Developer's/owner's name, address, and phone number for public improvements with private financing.
9. Statement referencing City of Milwaukie Public Works Standards and Oregon Standard Specifications for Construction.
10. Provide contact phone numbers for all affected utility companies. Include "Call before you dig" notice for utilities.
11. Show tax lot numbers or lot and block designations.
12. Conditions of approval.

1.1032 Plan Sheet

The plan view of each sheet will be drawn at the appropriate scale showing the following minimum information:

1. Adjacent street curbs, property lines, right-of-way lines, utility easements referenced to property lines, street centerlines, and intersections. Show property corner and curb elevations to determine water service level, serviceability of lot/property for sanitary sewer, points of disposal for building storm drains, and how new curbs will join to existing curbs.

2. Location of all underground utilities within 100 ft of project (if they are affected by the project), existing power/telephone poles and guy anchors, valves, manholes, catch basins, fire hydrants, meter boxes and vaults, signs, etc.

3. Location of all water courses, wetlands, railroad crossings, culverts, bridges, large water transmission pipes and gravity sewers, and/or storm drains within 200 ft of proposed gravity sewer and storm drain extensions if they affect the design of the project. All water courses will show the 100-year flood plain as indicated on the U.S. Army Corps of Engineers and Federal Emergency Management Agency (FEMA) maps.

4. On sewer and storm drain plans, each manhole, catch basin, and cleanout will be numbered and stationed. Stationing will tie to existing street monuments, property corners, or manholes. Each separate line will be separately designated (e.g., sewer line 'A', storm line 'A', etc.).

5. On street plans, horizontal stationing will show points of tangency and curvature for centerline; curve data will show tangent length, radius distance, centerline curve length, and delta angle. Centerline intersection stationing, in both directions, will be shown.

6. Where streets are being widened, edge of pavement elevations will be shown to determine pavement cross-slope to new curb or pavement edge.

7. On water plans, show all fittings and valves and identify by type (e.g., MJ x MJ, FLG x MJ, etc.); fire hydrants; intersection details for valves and fittings (required when scale of plans is smaller than 1" = 20', e.g., 1" = 40').

8. On all plans, show stub-outs and blockouts for future developments.

1.1033 Profile Sheet

Profiles for construction plans will be the same horizontal scale as the plan sheet. Where profiles are drawn on the same sheet as the plan view, the profile will be immediately below the plan view. The following minimum information will be shown.

1. For sewers and storm drains, show locations of manholes, catch basins, and cleanouts, with each numbered and stationed as indicated in Subsection 1.1032 (Plan Sheet) item 4.

2. Existing profile at centerline of proposed utility or street. Profiles at the right-of-way lines will be required if grade differences are significant.

3. Proposed profile grade, as appropriate, for all sewers, storm drains, and waterlines, giving pipe size, length between structures or fittings, slope, backfill and pipe material, sewer inverts, rim elevations, etc. Extension of the profile of streets for future extensions (stub streets) will be extended at least 200 ft for local streets or as required by the City Engineer.

4. Existing underground utilities that cross the alignment of the proposed facility.

5. Beginning of all vertical curves, points of vertical intersection, end of vertical curve, low point of sag curve, and length of vertical curve. Profiles of existing centerline grade will extend a minimum of 250 ft beyond the end of the improvement.

6. Clearly show all potential conflicts with existing public and private utilities (i.e., pipes, conduits, vaults, cathodic protection systems, etc.) that impact proposed design.

7. Profiles for ditch and creek flowlines will extend a minimum of 200 ft beyond the project, both upstream and downstream. Typical cross sections at 50-ft intervals will also be submitted.

SPECIAL NOTE: City of Milwaukie as-builts are only to be used as an aid to the Design Engineer. When a potential conflict may occur, the Design Engineer will field locate, or cause to be located, and verify the alignment, depth, and inverts of all existing facilities shown on the plans that will be crossed by the proposed facility.

1.1034 Detail Sheets

Detailed drawings will be included with all construction plans where City of Milwaukie standard drawings do not exist. If a standard drawing, such as sewer manholes, must be modified to fit existing or unique conditions, the modified drawing will be shown on the plans. When appropriate, due to required detail complexity, a separate detail sheet will be drawn. When City or Oregon Standard Drawing appurtenances or construction installations are to be used, a reference to the specific standard drawing number will be made on the title sheet.

1.1040 SUPPORTING INFORMATION

The Design Engineer will submit sufficient supporting information to justify the proposed design. Such information will include, but not be limited to, the following:

1. Design calculations.
2. Hydrology and hydraulic calculations with basin maps.
3. Alternate materials specifications including manufacturer's design application recommendation.
4. Grading plan support information to include as appropriate.
   a. Soils classification report
   b. Hydrology report
   c. Geotechnical engineer’s report

1.1041 Facility Plan

When designing sanitary or storm sewer facilities, a facility plan will be submitted with the construction plans when required by the City Engineer. This plan will be used to identify and analyze the proposed extension of facilities. The topographic plan will show all upstream and tributary areas within no less than 200 ft of the proposed development.

The plan will include existing contours at 2-ft intervals, or as approved by the City Engineer, including location of existing structures and public and private utilities.

1.1042 Erosion Control Plan

The erosion control plan will address the measures as required by the Erosion Prevention and Sediment Control Planning and Design Manual (Clackamas County Water Environment Services, Clean Water Services, Oak Lodge Water Service District, and various cities, Current Edition). Construction projects beginning prior to May 1 or those projects anticipating construction activity between October 1 and May 31 will be required to submit a plan addressing "wet weather" measures as outlined in the Erosion Prevention and Sediment Control Planning and Design Manual. Construction activity is assumed to be "active" until all permanent vegetation and/or erosion protection is established.

The plan will include existing contours at 2-ft intervals, or as approved by the City Engineer, including location of erosion control facilities (i.e., silt fence, straw mulch, sediment ponds, etc.); outlet structures (i.e., catch basins, culverts, creeks, etc.); and existing public and private utilities.

1.1043 Franchise Utility Plans

Franchise utility company plans—including, but not limited to, telephone, natural gas, power, and cable television—will be submitted to and approved by the City Engineer prior to any construction of these utilities.

1.1050 PLAN SUBMITTAL AND REVIEW PROCEDURES

Construction plans for all privately financed public works facility improvements will be submitted to the City Engineer. The City Engineer will coordinate the plan review and approval of all construction plans which will include review for compliance with all Milwaukie Public Works Standards, the Milwaukie community development code, MMC, Ordinances, and the project conditions of approval.

All plan submittals will include information required in Subsection 1.1040 (Supporting Information) along with all other information requested by the City Engineer. This information is to include, but not be limited to, construction cost estimates, easement documents, right-of-way dedications, executed agreements, and a plan check and inspection fee. All submittals will be reviewed for completeness and the Design Engineer notified if required information is missing. Submittals should be made in a timely manner as lack of information to the City may impede the review process.

One set of completed construction plans will be submitted for review. A complete construction cost estimate will be submitted for review and determining review fees. Once the plans are deemed complete, a detailed review will begin on a “first-in, first-out” basis. If the submittal is not complete, notification will be given by the City to the Design Engineer specifying information needed.

Upon completion of the detailed review, the City will notify the Design Engineer, by way of letter, any revisions or “Red-line comments” the City Engineer may have. The Design Engineer will revise the plans, addressing all items in the City’s letter, and return 6 sets of revised plans to the City Engineer for approval.

1.1060 AS-BUILT PLAN REQUIREMENTS

For all public works facility improvements, the Design Engineer or Contractor will submit certified as-built drawings for all plans, which were approved for construction and a copy of the recorded plat. One full-size set of as-built drawings will be submitted for preliminary review. If the first submittal is not acceptable, the City Engineer will notify the Design Engineer of information needed for resubmittal.

As-built drawings will meet the requirements of Subsections 1.1020 (Plan Preparation), 1.1030 (Required Streets), and 1.1060 (As-Built Plan Requirements) and will be of archival quality. Final deliverables include a PDF version. The raw CAD data as well as) will be submitted for approval.

Final deliverables of electronic as-built drawings including a PDF copy of the final plat and raw CAD data as well as geodatabase format (GDB) will be submitted to the City Engineer. As-built drawings will include all field changes.

The Design Engineer will submit, along with the as-built drawings, a statement certifying that all work for which plans were approved has been completed in accordance with these Public Works Standards.

The words "as-built drawing" will appear as the last entry in the revision block along with the month, day, and year the as-built drawing was prepared.

Design calculations and a complete report of all test results will be provided to the City Engineer.

NOTE: Actual location and depth from finish grade of all utilities encountered during construction will be shown and noted on both plan and profile of the as-built drawings.

1.1061 Street

The following minimum information will be noted on street as-built drawings.

1. Change in horizontal alignment, curve data, and stationing of primary control points (e.g., PC, PI, PT, PRC).
2. Vertical curve or grade changes; change in location of low point in sag vertical curve.
3. Change to approved thickness for street structural section components. Show station limits where changes in structural section have occurred.

4. Change to driveway locations or widths.

5. Other changes altering the approved plans.

1.1062 Storm Drains

The following minimum information will be noted on storm drain as-built drawings:

1. Station of wye or tee into main line. Tie the end of branch line to nearest property corner at right-of-way line and distance back from the face of curb.

2. Alignment changes, grade changes, and changes in construction materials. If changed alignment results in station changes, a station equation will be shown as appropriate at a manhole.

3. Other changes altering the approved plans.

1.1063 Sanitary Sewer

The following minimum information will be noted on sanitary sewer as-built drawings:

1. Station of wye or tee into main line. Tie the end of service lateral to nearest property corner at right-of-way line and distance back from the face of curb.

2. Depth at the end of service lateral measured from existing ground to invert of pipe. When required by the City Engineer, invert elevations will be noted.

3. Length of service lateral measured from centerline of sewer main to end of pipe.

4. Alignment changes, grade changes, and changes in construction materials. If changed alignment results in station changes, a station equation will be shown as appropriate at a manhole.

5. Other changes altering the approved plans.

6. Type of pipe, backfill material and location.

7. All rim and invert elevations on manholes, catch basins, and clean outs.

1.1064 Water Main

The following minimum information will be noted on water main as-built drawings:

1. Station and/or property line/corner to valves (not at standard location), all fittings, blow-offs, and dead-ended lines.

2. All changes from standard 36-inch depth cover. Limits will be shown on the plan with annotated reasons for change. Actual pipe elevation (top of pipe) will be taken at every fitting.

3. Show alignment changes, grade changes, and changes in construction materials. If changed alignment results in station changes, a station equation will be shown as appropriate at a valve.

4. Identify types of fittings (i.e., MJ x MJ, FLG x MJ, etc.); provide information in the form of an inventory list on construction drawings.

5. Other changes alter the approved plans.

END OF SECTION

SECTION 2—STORMWATER STANDARDS

TABLE OF CONTENTS

2.0000 STORMWATER SYSTEM

2.0010 GENERAL DESIGN REQUIREMENTS

Performance Standards: Storm drainage design within a development area must include provisions to adequately control runoff from all public and private streets and the roof, footing, and area drains of residential, multifamily, commercial, or industrial buildings. The design must ensure future extension of the drainage system to the entire drainage basin in conformance with the most current adopted Stormwater Master Plan and these Public Works Standards. These provisions include:

1. Surface or subsurface drainage, caused or affected by the changing of the natural grade of the existing ground or removal of natural ground cover or placement of impervious surfaces, will not be allowed to flow over adjacent public or private property in a volume or location materially different from that which existed before development occurred, but will be collected and conveyed in an approved manner to an approved point of disposal.

2. Surface water entering the subject property will be received at the naturally occurring locations and surface water exiting the subject property will be discharged at the natural locations with adequate energy dissipaters within the subject property to prevent downstream damage and with no diversion at any of these points.

3. The approved point of disposal for all stormwater may be a storm drain or a detention or retention pond or underground injection control (UIC) approved by the City Engineer. Existing open channels, creeks, or streams are approved points of disposal after the stormwater has been treated for water quality. Acceptance of suggested systems will depend upon the prevailing site conditions, capacity of existing downstream facilities, and feasibility of the alternate design.

4. When private property must be crossed in order to reach an approved point of disposal, it will be the developer's responsibility to acquire a recorded drainage easement of dimensions in accordance with those included in Subsection 2.0024 (Easements). Temporary drainage ditch facilities, when approved, must be engineered to contain the storm water without causing erosion or other adverse effects to the private property.

5. The peak discharge from the subject property may not be increased from conditions existing prior to the proposed development and must meet all City of Milwaukie's Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit conditions.

6. Retention/detention facilities will be required where necessary to maintain surface water discharge rates at or below the existing design storm peak discharge and must meet all City of Milwaukie MS4 NPDES Permit conditions.

7. Permanent stormwater quality control facilities will be required for all new developments.

8. Unless approved by the City Engineer, drainage from roofs, footings, and downspouts will drain to a private stormwater management system. Stormwater systems other than residential drywells will be designed by an engineer and reviewed by City Engineering staff for approval.

9. Vegetation will be established on areas disturbed by or on areas of construction, as necessary, to minimize erosion in accordance with Title 16 of the Milwaukie Municipal Code.

10. All storm drain system designs will make adequate provisions for collecting all stormwater runoff. The system will accommodate all runoff from upstream tributary areas whether or not such areas are within the proposed development. The amount of runoff to be accommodated will be based upon ultimate development of all upstream tributary areas. Proposed storm drain systems will not discharge flows into inadequate downstream systems unless approved by the City Engineer.

11. Public storm lines will be located within the public right-of-way as directed by the City Engineer, per Subsection 2.0021 (Right-of-Way Location). These lines are placed in the public right-of-way for ease

of maintenance and access, control of the facility, operation of the facility, and to provide required replacement and/or repair.

12. Applicants must obtain all necessary federal and state permits.

2.0011 Site Drainage Plans

A. Existing Drainage Plan

Provide a topographical contour map defining existing conditions to include the following minimum information:

1. 2-ft contour intervals; slopes over 10% may use 5-ft intervals; extend contours a minimum of 100 ft beyond property.
2. All structures, buildings, parking lots, and utilities on the property.
3. Locations of all existing drainage facilities and watercourses, including wetlands and floodplain areas.
4. Locations of all subsurface water outlets (e.g., springs).
5. Arrows to indicate direction of flow for all drainage information.

B. Proposed Drainage Plan

Show proposed site grading and drainage facilities on a topographical contour map. Unless the details for proposed improvements obscure the conditions shown on the existing drainage plan, proposed site grading and drainage may be shown on the existing drainage plan. The following minimum information will also be shown:

1. Finished contours of the property, after development, at 2-ft or 5-ft intervals as required.
2. Percent grade for graded slopes; elevations, dimensions, and locations for all graded slopes.
3. Cut/fill areas; structural fill placement areas; erosion/sedimentation control methods; reseeding areas.
4. All proposed drainage facilities—public and private systems; paved areas, curbs, sidewalks; drainage ditches, culverts, etc.

C. Drainage Calculations

Furnish such supporting information as required per Subsection 1.1040 (Supporting Information) of these Design Standards.

D. Detention Requirements

All proposed development will be required to use adequate drainage management practices. Developments located within a master planned drainage basin will follow the recommendations adopted in that plan. Onsite storm detention will be constructed to ensure that new construction and development does not increase flooding or erosion downstream.

E. Water Quality Requirements

New development and other activities that create new impervious surfaces will construct permanent water quality facilities to reduce contaminants entering the storm and surface water system.

Exemptions to this requirement include:

- Residential structures being re-built following fire damage, flooding, earthquake, or other natural disaster, as long as the structure is rebuilt at the same scale and discharges to the same disposal point. Expansions to the original footprint, such as an addition or alteration to the original structure, trigger stormwater management requirements for the new impervious area.
- Maintenance activities, such as top-layer grinding (grind and overlay), repaving, or reroofing when the structure or existing plumbing is not altered. However, when an ecoroof or other stormwater management facility is added as part of a maintenance activity, the requirements for owner-initiated stormwater retrofits apply.
- Maintenance of existing culverts or water crossing structures in drainageways are exempt from drainage requirements. Replacement of culverts or water crossing structures may trigger conveyance requirements through review of the proposed channel encroachment.
- Standalone projects that consist solely of safety improvements or to follow the Public Right-of-Way Accessibility Guidelines (PROWAG) for stairs, ramps, curbs, corners, or medians that install accessibility and pedestrian safety features.
- Standalone projects that consist solely of linear utility trenching in paved public rights-of-way or on private property.
- Replacing catch basins or inlets that discharge to the same storm or drainage system are not considered a new connection or a new offsite discharge if the cumulative impact to the receiving system remains the same following project completion.

2.0012 Pipe Materials and Size

All public storm drains will be constructed with concrete; PVC; or HDPE smooth interior, corrugated exterior pipe. Ribbed PVC pipe is the preferred pipe for storm drains of 24 inches or less in diameter. Where required for additional strength, ductile-iron pipe or concrete pipe meeting the requirements of OSSC Section 445 will be used.

Culverts should be reinforced concrete, but corrugated aluminum alloy pipe may be used for culvert applications if material is specified as having a 75-year design life and is specifically approved by the City Engineer. Culvert sizes will meet the requirements of Section 2.0014

Private storm drainpipe will meet the requirements of the Uniform Plumbing Code.

All public storm drain mainlines will be a minimum of 12 inches in diameter. All lateral lines to catch basins and other inlet structures will be a minimum of 10 inches in diameter. Storm service laterals, which convey water from building rain drains and/or footing drains, may be a minimum of 4 inches in diameter, except where 3-inch lines are acceptable under sidewalks and curbs. All pipes will have rubber gasket joints.

New construction and reconstruction of light rail and freight rail may require improvements to the storm drainage system at utility crossing locations. Existing pipes in the second half of their useful life within the rail zones must be replaced to current standards. Metallic or conductive pipe materials are not approved pipe materials at light rail crossings.

Pipes are to be centered under rail tracks to avoid joints located underneath rail lines. All new pipe installations will identify practical future replacement options for the pipe under rail lines. All pipes will be sized for full build-out and future flows. This sizing includes allowance for trenchless technologies. Where lining is anticipated, add pipe size to account for lining thickness.

2.0013 Minimum Design Criteria

A. Storm Detention Facility

Storm detention facilities will be designed to provide storage up to the 25-year storm event, with the safe overflow conveyance of the 100-year storm event. Calculations of site discharge for both the existing and proposed conditions will be required using the Unit Hydrograph Method. Storms to be evaluated will include the 2-, 5-, 10-, 25-, and 100-year storm events. Allowable post-development discharge rate for the 2-, 5-, 10-, and 25-year storm events will be that of the predevelopment discharge rate. An outfall structure such as a “V-Notch” weir or a single or multiple orifice structure will be designed to control the release rate for the above events. No flow control orifice smaller than 1 inch will be allowed. If the maximum release rate cannot be met with all the site drainage controlled by a single 1-inch orifice, the allowable release rate provided by a 1-inch orifice will be considered adequate as approved by the City Engineer.

B. Stormwater Quality Facility

All stormwater quality facilities will meet the design requirements of the current City MS4 and NPDES permit.

C. Conveyance Piping

1. Time of Concentration

Overland flow of runoff to the initial catchment point into the storm drain system will be a minimum of 5 minutes.

2. Velocity and Slope

All storm drains will be on a grade which produces a mean velocity when flowing full, of at least 3 ft per second. The slope will not be less than .002.

3. Velocity in Natural Channels

Control of discharge from developed areas to natural channels will be such that the average velocity resulting from all design storms less than or equal to the 10-year storm event remains below the erosive velocity of the channel.

4. Manning’s Equation

When calculating minimum pipe slopes and velocities, the Design Engineer will use the Manning pipe friction formula.

5. Pipe Coefficient

The storm drainpipe roughness coefficient to be used in the Manning formula will be not less than 0.013.

D Outfall Erosion Control Measures

Riprap splash pad is based on pipe size and flow velocity; and include an underlain with nonwoven geotextile fabric.

2.0014 Culverts

Culverts at road crossings in natural, perennial channels will be designed to pass the peak discharge for the 25-year design storm such that the headwater:

1. does not exceed 1.5 times the culvert diameter; or
2. remains at least 1 ft below the roadway subgrade, whichever is less; and
3. does not go over top of the road for a 100-year storm event.

Culverts must allow for fish passage and must meet the requirements of the Division of State Lands, Army Corps of Engineers, and Oregon Division of Fish and Wildlife. Culverts and Outfalls with pipelines larger than 18-inches will install grates at openings.

2.0015 Bridges

New and replacement bridges over natural, perennial channels will be designed to pass the 100-year peak discharge from the tributary area assuming full development. Vertical clearance between the design water surface and the bottom of any part of the bridge will be a minimum of 2 ft, or 25% of the mean channel width between ordinary high-water marks at the crossing, whichever is greater.

2.0020 ALIGNMENT AND COVER

2.0021 Right-of-Way Location

Storm drain lines will generally be located 5 ft south and east from right-of-way centerline. All changes in direction of the pipe will be made at an approved structure.

2.0022 Curvature

Storm drain lines will not be curved between structures.

2.0023 Minimum Cover

All storm drains will be laid at a depth sufficient to protect against damage by traffic, including rail traffic, and to drain building footings where practical. Sufficient depth will mean the minimum cover from the top of the pipe to finish grade at the storm drain alignment.

The minimum cover will be 30 inches above the top of the bell of pipe in paved areas and 36 inches at all other locations. If minimum cover requirements cannot be met, then additional strength measures will be required. The minimum cover at rail crossings is 5 ft.

In areas of relatively flat terrain, the Design Engineer will show that sufficient depth is provided at the boundary of the development to properly drain the remainder of the upstream basin tributary area to the site.

2.0024 Easements

When it is necessary to locate storm drains in easements, the storm drain will be centered in the easement. All storm drain easements will be exclusive and will not be used for any purpose that would interfere with the unrestricted use of the storm drain line. Exceptions to this requirement will be reviewed on a case-by-case basis (e.g., a utility corridor in a new subdivision).

Easements for storm drain lines 18 inches or less in diameter will have a minimum width of 15 ft. All pipelines greater than 18 inches in diameter will have a minimum width of 20 ft. Larger widths may be required for special circumstances, such as excessively deep pipe or location of building near the easement.

Open channels will have easements sufficient in width to cover the 100-year floodplain line when a 100-year design storm is required, or 15 ft from the waterway centerline, or 10 ft from the top of the recognized bank, whichever is greater. A 15-ft wide access easement will be provided on both sides of the channel for channel widths greater than 14 ft at the top of the recognized bank.

Easement locations for public storm drains serving a PUD, apartment complex, or commercial/industrial development will be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance.

All easements must be furnished to the City Engineer for review and approval prior to recording.

The minimum width of an access easement from an existing public road to a drainage facility will be 15 ft.

Easements will state that the City will not in any way be responsible for replacing landscaping including any shrubs or trees, fencing, or other structures that may exist or have been placed in the easement.

2.0025 Relation to Watercourses

Storm drain lines will enter a creek or drainage channel at 90 degrees or less to the direction of flow. The outlet outfall will not be submerged during normal flows of the receiving stream. The outlet will have a head wall and scour pad or rip rap to prevent erosion of the existing bank or channel bottom. The size of pipe or channel being entered will govern which protective measures are required. All protective measures must conform to the requirements of the Milwaukie Municipal Code.

2.0030 STRUCTURE LOCATION

2.0031 Manholes

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

Manhole inside drop will not exceed 4 ft.

Manhole spacing will not be greater than 400 ft.

Standard manholes are required when rim to crown of pipe elevations exceed 4 ft at pipe junctions. Flat-top manholes will be used when rim to crown of pipe elevations are less than 4 ft.

Manhole steps are not necessary. Ladders are required to access manholes.

At locations where the downstream pipe size is greater than the upstream pipe size, the crown of all upstream pipes will not be lower than the crown of the downstream pipe.

Manholes will not have open grate lids with the intent to receive surface flows except in special circumstances approved by the City Engineer. Catch basins or curb inlets will typically be used.

Manholes connected to drywells or other underground injection control (UIC) devices will have 2-hole lids. Manholes connected to storm systems that outfall to surface waters will have the City of Milwaukie “Fish” lid. “Fish” lids will be obtained from the City’s manufacturer, Olympic Foundry. Tamper proof lids will be required on manholes outside vehicle or pedestrian travel ways. Rims will be 1 ft above the finished grade if not in a paved area.

All accessible structures must be located a minimum of 15 ft from railroad crossing gate arms outside of the rail area, at least 25 ft from a light rail track centerline, and 50 ft from the rail track centerline for freight and higher speed trains.

2.0032 Curb Inlets/Catch Basins

Curb inlets will be located in streets at the curbline to receive storm water runoff and convey it to the main storm drain. Where curb inlets cannot be installed because of physical limitations, stand-alone catch basins may be installed with approval from the City Engineer.

Curb inlets or catch basins will be located at the following locations, but in no case be spaced further than 400 ft apart.

1. At curb returns on the upstream side of an intersection.
2. At the ends of all dead-end streets with a descending grade.
3. At intermediate locations so that storm flows at the curbline do not exceed 3 ft in width (measured from the curb face) or 3 inches in depth (measured at the curb face) for a 10-year storm, whichever is less.

Curb inlets or catch basins will have a depressed gutter at opening and will be capable of intercepting completely the designed storm flow at the curb. The City Engineer may require multiple or oversized inlets or other special considerations for sags and “downhill” cul-de-sacs.

All accessible structures must be located a minimum of 15 ft from railroad crossing gate arms outside of the rail area, at least 25 ft from a light rail track centerline, and 50 ft from the rail track centerline for freight and higher speed trains**.**

2.0033 Service Lateral

Service laterals are private storm drain lines to which a private building storm drain connects.

The minimum inside diameter of a storm drain service lateral will be 4 inches and will be equal to or greater than the building storm drain diameter. Service laterals will be built to the same construction standards and of the same materials as the storm drain mainline. Service laterals will have a debris trap outlet cover. This cover will include a 4-inch minimum diameter trapdoor access point. Service laterals in general will be placed at 90° to the mainline to avoid excessive exposure to other utilities during excavation for construction or maintenance of the service lines. Angles other than 90º (45º minimum) may be approved for special conditions such as cul-de-sac lots. Service line connections may be made at manholes (90º to storm drain mainline) if such placement would not interfere with other present or future connections to the manhole.

The minimum slope of sewer service lines will be 2% (¼ inch per foot), except for unusual conditions, when a slope of 1% (⅛ inch per foot) may be approved. It will be necessary, however, for the Design Engineer to provide a complete analysis of the need for any storm drain service lateral slope less than 2%. The maximum slope will be 100% (45º or 1 ft per foot) (see Standard Drawing 210). Deep connection risers or drop connections to manholes must be used where service line slopes would exceed 100%.

Tees for service laterals will be installed at 100% slope, and $\frac{1}{16}$ or ⅛ bends installed to provide proper grade for service lateral. Service laterals will be installed to end beyond the street right-of-way line or easement line where storm drain is installed in an easement. A watertight plug will be installed in end of the lateral and a 2x4-inch wood marker will be placed at lateral end from pipe invert to at least 36 inches above the finish grade. The 2x4-inch top will be painted white and marked with the depth of the lateral measured from ground to invert of pipe.

Service laterals must be located a minimum of 15 ft from rail crossing gate arms outside of the rail crossing. The City may require a cleanout on a private service lateral if the lateral is under a major street or highway, under a light rail or other rail track, or adjacent to a major utility that limits the use of conventional open-cut excavation methods.

2.0040 STORMWATER DETENTION/RETENTION

2.0041 Development Not Requiring Detention

In general, all developments will be required to provide onsite detention, unless the developer can demonstrate by a hydraulic analysis that proposed development will not increase stormwater runoff volumes or peak discharge and meets all requirements of the City’s MS4 permit.

However, pollution reduction facilities may still be required.

2.0042 Floodplain Information

Floodplain information, delineating the 100-year floodplain limits, will be shown where it occurs within the development. Floodplain limits will be based on maps prepared by the U.S. Army Corps of Engineers and the Federal Emergency Management Agency (FEMA). Where better information is available, it will be used by the Design Engineer.

2.0043 Emergency Overflow

The Design Engineer will assess the impacts of system failure for onsite detention. Overflow may occur due to rainfall intensity which exceeds the design storm, debris blockage of storm drain system, or some other reason.

The storm drain system will be designed such that overflows do not cause inundation of neighboring properties. Potential overflow routes will be adequately protected from erosion.

If surface detention (e.g., pond) is used, an overflow system will be included to provide controlled discharge of the 100-year, 24-hour design storm event for developed conditions, without overtopping any part of the pond embankment or exceeding the capacity of the emergency spillway. The overflow design will assume failure of the normal outlet control structure. An emergency spillway will be able to safely pass all flows over the pond embankment without overtopping the embankment. Sufficient armoring will be required to the toe on each face of the embankment to prevent failure of the embankment from erosion.

2.0044 Detention Facilities

Detention volume storage methods, in order of preference, are the following.

1. Surface storage—pond
2. Underground storage by tank or vault will be approved by the City Engineer only when a pond is impracticable.

2.0045 Infiltration Facilities [Underground Injection Control (UIC)]

Infiltration facilities, also known as Underground Injection Control or UIC facilities (UICs) are governed by the Oregon Department of Environmental Quality (DEQ) pursuant to OAR 340-040 and OAR 340-044. Stormwater UICs include drywells, storm sumps, french drains, infiltration trenches and galleries, and other devices designed or intended to dispose of stormwater directly below the soil without the benefit of surface infiltration.

Any person seeking to install a UIC within the City must first obtain appropriate permits and documentation from the City and State and pay all fees pertaining to such permits. The applicant must demonstrate that the proposed UIC will have a minimum 5-ft vertical clearance between the bottom of the UIC and the seasonal high-water table and does not intersect the groundwater during seasonal high-water table. In addition to any state or city requirements, the City will only issue permits for UICs that accept stormwater from footing drains and roof drains. All other UICs, including those that accept stormwater from any residential driveway, commercial parking lot, street, etc., must be registered and permitted or rule authorized by DEQ.

All newly constructed UICs, at the discretion of the City Engineer, will be tested prior to paving in order to determine their in-place capacity. Testing of both new and existing drywells will follow the procedure outlined below. **The City must be notified at least 24 hours prior to conducting the above test.** Only clean water will be delivered to the sump or sedimentation manhole for testing. The introduction of silts, sediments, gravels, or any other foreign material will not be permitted.

Step 1

Fill sump with water at an initial rate equivalent to the minimum required flow rate for the sump, or 300 GPM, whichever is less, and record the water surface elevation below the sump rim after 5 minutes. Maintain the initial flow rate, recording the water surface elevation every 5 minutes until the elevation stabilizes.

Step 2

After the water surface elevation stabilizes, increase the flow rate by 300 GPM and record the water elevation as in step 1.

Step 3

Repeat step 2 until one or more of the following criteria are met.

1. The sump has met the design capacity as determined by the City.
2. The sump has reached the maximum allowable capacity for a single drywell.
3. The sump has reached its actual in-place capacity.
4. The maximum flow rate from the water source has been reached.

(Note: The minimum peak inflow for a test to be considered valid will be 600 GPM unless this exceeds the design capacity of the sump.)

Step 4

Cease discharge of water to the sump and record the water surface elevation every minute until the sump is empty or the water surface has remained constant for a period of 5 minutes.

Step 5

Provide the City with all recorded test data within 24 hours following the test.

Step 6

If the tested capacity of the drywell is less than the design capacity, inform the City immediately.

2.0050 EROSION CONTROL

All development will be preceded by an approved erosion control permit and plan, including erosion prevention measures and sediment control practices during all phases of construction to prevent and restrict the discharge of sediments in accordance with MMC Chapter 16.28 and OAR 340-041-0345.

2.0060 PRIVATE DRAINAGE SYSTEMS

2.0061 Subdivisions

When subdivision lots drain to the rear, it may be necessary to provide a private drainage system in private easements. This system will be for collection of roof drains, footing drains, and surface runoff. This system will be designed to meet the appropriate sections of the current Oregon Plumbing Specialty Code (OPSC) found in the State of Oregon's Building Code Division's webpage: oregon.gov/bcd/.

2.0062 Subsurface Drainage

Subsurface drains (underdrains) will be provided at the following locations:

1. Where existing springs and field tile are intercepted during construction activity for other facilities; i.e., sewer, water, mains, street excavations, foundations, etc. Subsurface drains are not needed if the tile is removed.

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

END OF SECTION

SECTION 3—WASTEWATER STANDARDS

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3.0000 WASTEWATER SYSTEMS

3.0010 GENERAL DESIGN REQUIREMENTS

Performance Standards: All wastewater system design will meet the policies and guidelines of the most current adopted City of Milwaukie Wastewater System Master Plan (WWSMP) and its updates.

All wastewater system design will also comply with Oregon Department of Environmental Quality (DEQ) sewer design guidelines, OAR 340 Division 52, and the requirements of Clackamas County Service District Water Environment Services (WES).

Wastewater systems will be designed to provide gravity service to all areas of development unless approved by the City Engineer. City Engineer approval will be required for any wastewater lift or pump stations.

All sewer mainlines will be located within the public right-of-way or public easement as directed by the City Engineer.

As a condition of wastewater service, all developments will be required to provide a wastewater mainline to adjacent upstream parcels to provide for an orderly development of the drainage area. This will include trunk sewers that are oversized to provide capacity for upstream development.

Wastewater systems will be designed to remove the domestic sewage and industrial wastes from basements of houses, where practical, commercial or industrial buildings, and all public and private establishments where possible.

Storm water, including street, roof, or footing drainage, will not be discharged into the wastewater system.

Unpolluted or noncontact cooling waters will not be discharged into the wastewater system.

The overflow drains and filter backwash lines of swimming pools and hot tubs will drain into the wastewater system.

3.0011 Easements

Sewers placed in easements along a property line will have the easement centered on the property line and the sewer will be offset 18 inches from the property lines. For sewers placed in easements located other than along a property line, the sewer will be placed in the center of the easement.

Easements for sewers less than 12 inches in diameter will have a minimum width of 15 ft. Sewers greater than 12 inches in diameter will have a minimum easement width of 20 ft. In some instances, larger width easements may be required, such as excessively deep pipes or location of a building near the easement.

Easement locations for public sewer mains serving a planned unit development (PUD), apartment complex, or commercial/industrial development will be in parking lots, private drives, or similar open areas which will permit an unobstructed vehicle access for maintenance by City personnel.

All easements must be furnished to the City Engineer for review and approval prior to recording. Easements will state that the City will not in any way be responsible for replacing landscaping including any shrubs or trees, fencing, or other structures that may exist or have been placed in the easement. The conditions of the easement will be such that the easement will not be used for any purpose which would interfere with the unrestricted use for sewer main purposes. Under no circumstances will a building or structure be placed over a wastewater mainline or sewer easement. This will include overhanging structures with footings located outside the easement.

3.0012 Alignment

Wastewater lines will be in the street right-of-way, 5 ft north and west of centerline whenever possible. All changes in direction of pipe will be made at a manhole. Curved alignments will not be permitted.

If streets have curved alignments, the center of the manhole will not be less than 6 ft from the curb face on the outside of the curve, nor the sewer centerline less than 6 ft from the curb face on the inside of the curve.

A. Separation with Other Utilities

Water mains will have a minimum horizontal clearance of 10 ft from wastewater pipes and will have a vertical clearance over the top of such sewers of 1.5 ft at intersections of these pipes per OAR Chapter 333 Division 61, Public Water Systems.

Where crossing of utilities other than water mains is required, the minimum vertical clearance will be 6 inches.

In all instances, the distances will be measured edge to edge. Exceptions will first be approved by the City Engineer.

3.0013 Minimum Cover

All wastewater pipes will be laid at a depth sufficient to drain building sewers, to protect against damage by frost or traffic, and to drain basement sewers, where practical. Sufficient depth will mean the minimum cover from the top of the pipe to finish grade at the sewer alignment. In new residential hillside subdivisions, mainline and lateral sewers will be placed in the street at a depth sufficient to drain building sewers on the low side of the street.

Wastewater pipes in residential areas will be placed in the street with the following minimum cover.

Building service lateral:	6 ft
Trunk and collector sewer:	
in the roadway:	8 ft
in easements:	8 ft

Where the topography is relatively flat and existing sewers are willow (5 ft or less) the minimum cover will be 3 ft. Where required for additional strength when cover is minimal, ductile-iron pipe and/or CDF backfill meeting the requirements of these Milwaukie Public Works Standards may be required by the City Engineer.

Deviation from the above standards will be considered on a case-by-case basis when one of the following circumstances exists.

1. Underlying rock strata—required: A request in writing to the City Engineer, together with submittal of a soils report, with a plan and profile certifying that bed rock exists 3 ft below the undisturbed ground surface at all investigated alignments.
2. A ditch or stream must be crossed—required: A plan and profile (horizontal scale 1" = 20', vertical scale 1" = 2').

3.0014 Pipe Materials and Size

All public wastewater pipes will be constructed with D3034 PVC pipe as specified in the current Oregon Standard Specifications for Construction (OSSC). Where required for added strength, Class 50 ductile-iron pipe will be used. HDPE pipe may be used with authorization from the City Engineer.

All public wastewater system mainlines will have a minimum diameter of 8 inches.

Private wastewater systems will meet the appropriate sections of the current Oregon Plumbing Specialty Code (OPSC) found in the State of Oregon's Building Code Division's webpage: oregon.gov/bcd/.

3.0015 Minimum Slope and Velocity

Wastewater systems will be designed with the capacity of future loads which may reasonably be expected within a period of 30 to 50 years, and for ultimate development of the specific drainage area concerned.

A. Manning Equation

When calculating minimum pipe slopes and velocities, the Design Engineer will use the Manning pipe friction formula. The minimum pipe roughness coefficient for 3034 PVC wastewater systems will be 0.013.

B. Velocity

All wastewater pipes will be designed on a grade which produces a mean velocity, when flowing half-full or full, of no less than 2.5 ft per second (FPS). Where velocities greater than 15 FPS are attained, special provisions will be made to protect against displacement by erosion and shock.

C. Slope

The minimum grades for the various sizes of pipe are as follows.

Minimum Grades per Pipe Size	
Inside Pipe Diameter (inches)	**Grade (feet per 100 ft)**
8	0.53
10	0.39
12	0.31
15	0.23
18	0.18
21	0.15
24	0.13
27	0.11
30	0.09
36	0.07

Slopes greater than those shown above are desirable and are particularly recommended on the upper ends of lateral sewers.

3.0016 Relation to Watercourses

Sewers located along streams will be located outside of the streambed and sufficiently removed therefrom to provide for future, possible stream channel widening. All manhole covers will be watertight at or below the 100-year flood elevation.

Generally, the top of all wastewater lines entering, crossing, or adjacent to streams will be at a sufficient depth below the natural bottom of the streambed to protect the sewer line. Where the sewer is in rock, 1 foot of cover is required; 3 feet of cover is required in other materials.

Sewers crossing streams or drainage channels will be designed to cross the stream as nearly perpendicular to the stream channel as possible and will be free from change of grade. The minimum cover will be 36 inches from the bottom of the streambed or drainage channel.

Concrete encasement will be required when the above cover requirements cannot be met. Each deviation from the above requirements will be reviewed by City Engineer on a case-by-case basis.

3.0017 Relation to Rail Lines

New and reconstructed rail construction may require improvements to the existing wastewater system at utility crossing locations. All existing pipes or pipes in the second half of their useful life within the rail zones will be replaced to current standards. Metallic or conductive pipe materials are not approved pipe materials at rail crossings. Pipes are to be centered under rail tracks to avoid joints underneath rail lines. All new pipe installations must identify practical future replacement options for the wastewater pipe under rails in case of future failure of utility. All pipes will be sized for full build-out and future flows. This sizing includes allowance for trenchless technologies. Where lining is anticipated, pipe size will account for future lining thickness.

All accessible structures must be located a minimum of 15 ft from the gate arms outside of the rail crossings. No service laterals are allowed within this described area.

The minimum cover for rail crossings is 5 ft.

3.0020 STRUCTURE DESIGN

3.0021 Manholes

Manholes will be located at all changes in slope, alignment, and pipe size; and at all pipe junctions with present or future wastewater lines. Manhole spacing will not be greater than 400 ft. Spacing may be increased in special circumstances with City Engineer approval.

Designs for manholes are shown in the Oregon standard drawings as outlined in the City of Milwaukie Standard Drawing 300. Manhole steps are not required.

Designs for manhole frames and covers are shown in City of Milwaukie Standard Drawing 301. When needed, waterproof and tamperproof frames and covers are shown in City of Milwaukie Standard Drawing 302. Manhole adjustments will utilize RimRiser™ adjustment technology or approved equal for new municipal castings.

All wastewater manholes will be of watertight construction. If ground water or surface drainage can be expected, watertight covers will be used.

New designs or revisions should not be shown on the construction drawings unless the standard designs are not suitable. New or revised designs may be necessary if:

1. One or more of the sewers to be connected to the manhole is over 36 inches in diameter (smaller diameters may require a special design if the manhole is at an alignment change.)
2. Several sewers will be connected to the manhole.
3. There is less than 90° between the incoming and outgoing sewer.
4. The manhole will be subject to unusual structural loads.
5. Diversion or other flow control measures are required.

Where one or more of conditions 1., 2., or 3. are encountered, a drawing of the manhole base should be made to determine if it is feasible to use designs shown in the standard drawings. It may be necessary to restrict the options to a specific standard drawing specified by a note on the construction drawings. If a special design is required for any reason, it will be necessary to show the details on the construction drawings and to provide structural calculations as needed.

Some alternate manhole features are shown in the standard drawings. Where these features are required, they must be specified by a note on the construction drawings. Some examples are:

- Slab tops must be used in lieu of cones where there will be less than 4 ft between the manhole shelf and the top of the manhole lid.
- Watertight manhole frames and covers are to be used if floodwaters are expected to cover the manhole top or if the manhole must be in the street gutter. Such conditions should be avoided wherever feasible.
- Tamperproof manhole frames (7-inch depth) and covers are required in all areas outside the paved public right-of-way or pedestrian travel ways. Rims will be 1 ft above the finished grade if not in a paved way.

Standards for elevation differences at manholes have been established to compensate for normal energy losses and to prevent surcharging of a sewer by a larger sewer. For purposes of slope calculation and for establishing elevation differences, the elevations are given at the intersection of the sewer centerlines (usually the center of the manhole). The rules for elevation differences at manholes are:

1) The inlet pipe will not enter below a point where the crown of the new inlet pipe is below the crown of the outlet pipe. The base of the manhole will be rebuilt if damaged in this process. The sewage will enter the main flow in a smooth channel transitioning from the inlet pipe to the main channel.

2) If the incoming and outgoing sewers are of equal size and are passing straight through the manhole, no added elevation change is required.

3) If sewers intersect or the alignment changes at the manhole, the invert elevation difference will be at least 0.10 ft for 0°-45° of horizontal deflection angle, and 0.20 ft for over 45° of horizontal deflection angle.

4) The slope of a sewer within a manhole will be no less than the slope of the same sewer outside of the manhole.

5) Drop connections are required when the vertical distance between flow lines exceeds 2 ft. The diameter of the drop connection must be specified in the construction drawings. The diameter of the drop connection will not be more than 1 pipe size smaller than the diameter of the incoming sewer. Smooth flow lines with vertical distances of less than 1 ft must be provided wherever feasible. The Contractor will be required to construct an outside drop with the inlet pipe invert being located at the manhole shelf, see the Oregon Standard Drawing RD352.

6) All connections must enter the manhole through a channel in the base. This includes drop connections and connections to existing manholes.

Where conditions make compliance with these rules impractical, exceptions will be permitted. It will be necessary, however, for the Design Engineer to provide a complete analysis of the need for such designs.

3.0022 Cleanouts

Cleanouts are permitted at the end of a nonextendable sewer line that does not exceed 150 ft in length nor serve more than 8 lots.

Cleanouts located outside of vehicle or pedestrian travel ways will be encased by a 2-inch A/C pad of pavement in a 4-ft diameter circle centered on the lid. Cleanouts will not be approved as substitutes for manholes on public sewer lines. Cleanouts are permitted at the upper end of a sewer that will be extended during a future construction phase. If future extension requires a change in sewer alignment or grade, a manhole will be required at the cleanout location.

3.0023 SEWAGE PUMP STATION DESIGN STANDARDS

A. GENERAL

The pump station will be a submersible pump type facility.

The pump station will include submersible pumps, a wet well, a valve vault, associated piping and valves, electrical controls, instrumentation, telemetry, backup generation, an access road, fencing, landscaping, potable water supply.

Pump stations will be designed to pump the peak wastewater flow from the service area. When the service area is not built out, staging of pump station capacity will be allowed.

Where the flow is substantial or where environmental damage may occur due to power failure, the City Engineer may require permanent standby power.

Wet well-mounted or wet well/dry well stations will not be allowed.

B. DESIGN

Pump stations will be designed to meet the minimum requirements and guidelines standards of DEQ, OAR Chapter 340, Division 52.

Designs will be made by a registered engineer experienced in the design of such facilities.

Service area, peak flow, and pump station calculations will be submitted to the City Engineer.

Wet wells will be designed to provide 4 hours of storage above high water alarm.

1) Pumps:

   A minimum of 2 pumps will be supplied. Each pump will be capable of pumping the peak wastewater flow. Where more than 2 pumps are used, the station will be able to pump peak wastewater flow when the largest pump is out of service.

   Pumps will be submersible pumps that are explosion-proof, suitable for hazardous locations, and will be UL or FM listed.

2) Piping and Valves:

   Piping and fittings will be ductile iron.

   Valves will be metal, suitable for wastewater use. Valves will be designed for wastewater service.

   Pressure gages on pump discharge piping will be provided.

3) Electrical:

   Electrical controls will be located above ground, mounted in a waterproof enclosure. Electrical panels will be UL listed. The pump station wet well will be considered a hazardous location.

4) Controls:

Controls may be mechanical relays or programmable logic controllers.

Pumps will alternate lead-lag position with each pumping cycle.

Transducer/sonar will control pump start/stop.

Float activated alarm will indicate high water level.

An auxiliary power connector and manual transfer switch will be provided.

a) Alarms and Telemetry

Alarms will be telemetered to the City of Milwaukie Public Works alert system. Alarms include:

- Pump failure
- Power failure
- Telemetry failure
- High water level
- Bypass

b) Landscaping and Fencing

A 6-ft chain link fence with 3 strands of barbed wire and slats will surround the pump station. Access for easy maintenance will be incorporated into the design.

c) Additional Features

Provide 1-inch hose bib at valve vault. Potable water will be provided by reduced pressure backflow preventer.

Provide positive ventilation in valve vault.

Odor control as required.

d) Force Main

Force main will be designed for a nominal flow velocity in the range of 3 to 5 FPS.

C. CONSTRUCTION

1) Design Codes - Pump station and related facilities will be constructed to the current Oregon Plumbing Specialty Code (OPSC), Oregon Electrical Specialty Code (OESC), and Oregon Structural Specialty Code (OSSC) found in the State of Oregon's Building Code Division's webpage: oregon.gov/bcd/.

2) Steel Fabrications - Steel fabrications will be hot dipped galvanized; painting required on valves, piping, and pipe fittings.

3) Operating and Maintenance Data:

- Prepare operating and maintenance manual.
- Instruct City's personnel in the maintenance of products and in the operation of equipment and systems.

4) Spare Parts - Supply 2 sets each of all gaskets, bearings, and mechanical seals for rotating equipment.

3.0030 SERVICE LATERAL

Service laterals are those private sewer lines to which a private building sewer connects.

Each individual developed parcel will have an individual lateral. Tees for service laterals will be installed per City of Milwaukie Standard Drawing 304.

Service laterals will be built to the same construction standards and of the same materials as the sewer mainline. Service laterals in general will be placed at 90º to the main sewer line to avoid excessive exposure to other utilities during excavation for construction or maintenance of the service lines. Angles other than 90º (45º minimum) may be approved for special conditions such as cul-de-sac lots.

Service line connections may be made at manholes (90º to sewer mainline) if such placement would not interfere with other present or future connections to the manhole. Where the invert of the lateral is 1 ft or less above the manhole shelf, formed channel will be constructed utilizing Portland Cement Concrete. The sewage entering the manhole will follow a smooth concrete channel transitioning evenly from the invert of the inlet pipe into main channel. Sewage will not be allowed to fall freely to the manhole base.

The minimum slope of sewer service lines will be 2% (¼ inch per foot), except for unusual conditions, when a slope of 1% (⅛ inch per foot) may be approved. It will be necessary, however, for the Design Engineer to provide a complete analysis of the need for any sewer service lateral slope less than 2%. The maximum slope will be 100% (45º or 1 ft per foot). Deep connection risers or drop connections to manholes must be used where service line slopes would exceed 100%.

The City may require a cleanout on a private sewer lateral when circumstances justify its use; specifically, if the lateral is under a major street or highway, under a light rail or other rail track, or adjacent to a major utility that limits using a conventional open-cut excavation method.

New building service laterals will be made at existing tees where possible.

When tees do not exist on the public wastewater system, the new lateral sewer will enter the collection system through a "cored" opening with an approved connector. This connection will be made in conformance with City of Milwaukie Standard Drawing 303.

END OF SECTION

SECTION 4—WATER STANDARDS

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4.0000 WATER SYSTEM

4.0010 GENERAL DESIGN REQUIREMENTS

Performance Standards: Potable water systems will be designed to meet State Water Administrative Rules, AWWA Standards, and these Public Works Standards.

Water system design will provide adequate flow for fire protection and maximum water usage and consumption. Required water system demands will be met by maintaining the minimum operating pressures required by the City. For single-family residential areas, the minimum static pressure will be 35 PSI, and the minimum fire flow will be 1,000 GPM. For all other developments, the required fire flow will be as determined by the Fire Chief.

Water system design will meet distribution needs for maximum water usage and consumption within a given pressure zone. New water systems will allow for future extensions beyond present development. Water mains will be looped so as to avoid dead ends.

When water systems are designed where velocities are greater than 5 FPS, special provisions will be made to protect against displacement by erosion and shock.

All waterlines will be located within the public right-of-way or as directed by the City Engineer. These lines are placed in the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to permit required replacement and/or repair. The City Engineer, under special conditions, may allow a public waterline to be located within a public water easement as referenced in Subsection 4.0024 (Easements). Waterlines will maintain separation from public or private sewer or septic systems.

4.0011 Pipe Materials and Size

All public water distribution systems will be constructed with ductile-iron pipe. All such pipe will be cement mortar-lined pipe with push-on or mechanical type joints. When a corrosive potential 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 pipe design/material/installation practice may be required by the City Engineer.

All pipe, valves, and fittings will be pressure rated for 250 or 350 PSI. All fittings will be factory cement lined and coated (domestic fittings only). Pipe constructed per Subsection 4.0025 (Relation to Watercourses) will require the use of restrained pipe joints or ball and socket river pipe.

Water distribution main sizes will generally conform to the following.

4-inch: May only be used with approval of the City Engineer in residential zones on dead-end streets with a center line distance of less than 250 ft measured from the center of the intersecting street to the radius point of the cul-de-sac; with service to not more than 12 residences; and will be connected to a looped minimum 6-inch main. Fire hydrants are not permitted on 4-inch lines. All 4-inch lines will terminate with a standard blowoff (Oregon Standard Drawing RD262).

6-inch: Minimum size residential subdivision distribution water main for the grid (looped) system, not to exceed an unsupported length of 600 ft and will not be permanently dead-ended. Looping of the distribution grid will be at least every 600 ft.

8-inch: Minimum size for permanently dead-ended mains supplying fire hydrants with a fire flow less than 1,500 GPM and for primary feeder mains in residential subdivisions.

10 inches and Up: As required for primary feeder lines in subdivisions, industrial, and commercial areas.

Velocity in distribution mains will be designed not to exceed 5 FPS. Velocity in service lines, as defined in Subsection 4.0050 (Water Service Lines), will not exceed 10 FPS. Standard trench patch section (Standard Drawing 510) will be utilized for all water pipe installed.

New construction and reconstruction of light rail and freight rail may require improvements to the water system at utility crossing locations. Existing pipes in the second half of their useful life within the rail zones must be replaced to current standards. Metallic or conductive pipe materials are not approved pipe materials at rail crossings.

All waterlines are to be encased through rail line crossings. Each casing pipe segment is to be positioned under rail tracks to avoid joints underneath rail lines. Metallic or conductive pipe materials are not approved at rail crossings which includes pipes used as encasement conduit.

4.0012 Grid System

The distribution system mains will 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 within the city. All terminations will be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended. The installation of permanent dead-end mains greater than 250 ft, upon which fire protection depends and the dependence of relatively large areas on single mains, will not be permitted.

4.0013 Dead-End Mains

Dead-end mains which will be extended in the future will be provided with a properly sized blowoff (see Oregon Standard Drawing RD262).

Permanent dead-end mains will terminate with a standard blowoff assembly (see Oregon Standard Drawing RD262).

4.0014 Restrained Joints

Restrained joints will be required for transmission pipelines which cross unstable land, railroad tracks, freeways, watercourses, or other locations which could either result in unusual ground movements or could result in significant damage to property or life should a leak occur.

4.0020 ALIGNMENT AND COVER

4.0021 Right-of-Way Location

Water systems will be located south and east from the right-of-way centerline or as directed by the City Engineer. Generally, the waterline will be located 4 ft from curbline or edge of pavement. Except as provided in Subsection 4.0024 (Easements), all waterlines will be in the public right-of-way.

Curved alignment for waterlines or mains is permitted and will follow the street centerline when practical. The minimum allowed radius will be based on allowable pipe deflection for the pipe diameter and the pipe laying length, but not to exceed 3° joint deflection.

4.0022 Minimum Cover

The standard minimum cover over buried water mains within the street right-of-way will be 36 inches from finish grade.

The minimum cover for mains in easements across private property will be 48 inches from the finish grade.

"Finish grade" will normally mean the existing or proposed pavement elevation. Where the main is located in the cut or fill side slope or where mains are located in easements, "finish grade" will mean final ground elevation at the water main alignment.

4.0023 Separation with Sewer Lines

Water mains will be installed a minimum clear distance of 10 ft horizontally from sanitary sewers and will be installed to go over the top of such sewers with a minimum of 18 inches of clearance at intersections of these pipes. When physical conditions render this spacing impossible or impractical, then cast-iron water pipe with watertight joints or concrete encasements is required for the sewer line. Wherever it is necessary for sewer and water lines to cross each other, the crossing should be at an angle of approximately 90° and the sewer will either be located 18 inches or more below the water line or be constructed of cast-iron water pipe with watertight joints for a distance of 9 ft on both sides of the water line. Exceptions will first be approved by the City Engineer. In all instances, the distances will be measured edge to edge. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, except sanitary sewers, will be 3 ft horizontally when the standard utility location cannot be maintained (Refer to OAR 333-061-0050 Figure 1).

Where water mains are being designed for installation parallel with other water mains, utility pipe, or conduit lines, the vertical separation will be 12 inches below or in such a manner which will permit future side connections of mains, hydrants, or services, and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the above mentioned main, hydrant, or service. Where crossing of utilities is required, the minimum vertical clearance will be 6 inches.

4.0024 Easements

Mains placed in easements along a property line, will have easements centered on the property line and will be offset 18 inches from the property line. Mains placed in easements along a right-of-way line will be offset a minimum 3 ft from the right-of-way line and within a minimum 15-ft-wide easement. For mains placed in easements located other than along a property or right-of-way line, the main will be placed in the center of the easement. Easements, when required, will be exclusive and a minimum of 15 ft in width for pipe depth less than 15 ft; 20 ft in width for pipe depth 15 ft to 20 ft, or 25 ft in width for pipe depth greater than 20 ft. The conditions of the easement will be such that the easement will not be used for any purpose which would interfere with the unrestricted use for water main purposes. Under no circumstances will a building or structure be placed over a water main or water main easement. This includes overhanging structures with footings located outside the easement.

Easement locations for public mains serving a PUD, apartment complex, or commercial/industrial development will be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance by City personnel.

Any water main placed within a water main easement will be marked with permanent posts and metal signs at all angle points and line or sight of joints. In addition, such posts and signs will be placed where the waterline intersects the public right-of-way at the easement location. A monument cap set in the pavement of parking lots will be an acceptable alternative to the sign. The City will provide wording for the sign/monument.

All easements must be furnished to the City Engineer for review and approval prior to recording. Easements will state that the City will not in any way be responsible for replacing landscaping including any shrubs or trees, fencing, or other structures that may exist or have been placed in the easement.

4.0025 Relation to Watercourses

New water mains may cross over or under existing streams, ponds, rivers, or other bodies of water.

A. Above Water Crossings

The pipe will be engineered to provide support, anchorage, and protection from freezing and damage, yet will remain accessible for repair and maintenance. All above water crossings will require review and approval by the City Engineer.

B. Underwater Crossings

1. Mains crossing stream or drainage channels will be designed to cross as nearly perpendicular to the channel as possible. The mains will be in a carrier pipe for underwater crossings.

2. Valves will be provided at both ends of the water crossing so that the section can be isolated for testing or repair. The valves will be easily accessible and not subject to flooding. The valve nearest to the supply source will be in a manhole. Permanent taps will be made on each side of the valve within the manhole to allow insertion of a small meter for testing, to determine leakage, and for sampling.

3. The following surface water crossings will be treated on a case-by-case basis:

    a. Stream or drainage channel crossing for pipes 12 inches inside diameter and greater.

    b. River or creek crossings requiring special approval from the Division of State Lands.

4. The minimum cover from the bottom of the streambed or drainage channel to the top of pipe will be 36 inches.

5. A scour pad centered on the waterline will be required for mains less than 12 inches inside diameter when the cover from the top of the pipe to the bottom of the streambed or drainage channel is 30 inches or less. The scour pad will be concrete, 6-inch thick over and under the pipe and 6-ft wide; reinforced with #4 rebars with 12-inch grid spacing; and will extend to a point where a 1:1 slope begins at the top of the bank and slopes down from the bank away from channel centerline and intersects the top of the pipe.

4.0030 APPURTENANCES

4.0031 Valves

In general, valves will be the same size as the mains in which they are installed. Valve types and materials will conform to the Oregon Standard Specifications for Construction. All valves will be flanged (FL) x mechanical joint (MJ). All tees and cross fitting will be flanged.

Distribution system valves will be located at the tee or cross fitting. There will be a sufficient number of valves located such that not more than 4, and preferably 3 valves, must be operated to affect any one particular shutdown. The spacing of valves will be such that the length of any one shutdown in commercial or industrial areas will not exceed 500 ft nor 800 ft in other areas.

Valves will be installed at each cross, tee, or any tap 2 inches or greater in diameter connected to the main line. In general, intersections will be valved in at least 2 branches and cross-intersections will be valved at all branches. Transmission water mains will have valves at not more than 1,000-ft spacings. Hazardous crossings such as creeks, railroad, and freeway crossings, will be valved on each side.

Distribution tees and crosses for future branch lines on transmission mains may be required at the direction of the City Engineer.

4.0032 Fire Hydrants

The public fire hydrant system will be designed to provide adequate flow as required. The distribution system will be designed in commercial/industrial areas to accommodate fire flows up to 1,500 GPM. Minimum fire flow in single-family residential areas will be 1,000 GPM.

The distribution of hydrants will be based upon the required average fire flow for the area served. Design coverage will result in hydrant spacing of approximately 400 ft in residential areas, approximately 300 ft in commercial or industrial subdivisions, or as approved by the Fire Chief and City Engineer. In addition, sufficient hydrants will be available within 1,000 ft of a building in commercial/industrial areas to provide its required fire flow.

Residential hydrants will be located as nearly as possible to the corner of street intersections and not more than 400 ft from any cul-de-sac radius point.

No fire hydrant will be installed on a main of less than 8 inches inside diameter unless it is in a looped system of 6-inch mains. The hydrant lead will be a minimum 6 inches inside diameter.

All fire hydrants will be located behind the existing or proposed sidewalk or in the planter strip. Hydrants will be placed so as not to interfere with driveways and curb ramps. If any public hydrant encroaches on private property, an easement will be provided as directed by the City Engineer.

No hydrant will be installed within 5 ft of any existing aboveground utility and there will not be any utility facilities installed closer than 5 ft from an existing hydrant.

Hydrant installation will conform to Drawing 406. Full-depth hydrants will be required in all installations. Installation of hydrant extensions will not be allowed, unless approved by the City Engineer.

Each fire hydrant will have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supply to the hydrant. Such auxiliary valves will be resilient wedge gate valves. The valve will be connected directly to the water main using a flange joint tee.

Hydrants will not be located within 20 ft of any building and will not be blocked by parking. The large hydrant port should face the road or travelway.

Guard posts, a minimum of 3 ft high, will be required for protection from vehicles when necessary. Such protection will consist of 4-inch diameter steel pipes, 6 ft long, filled with concrete, and buried a minimum of 3 ft deep in concrete, and located at the corners of a 6-ft square with the hydrant located in the center. Use of posts other than at the four corners may be approved by the City Engineer.

4.0033 Pressure-Reducing and Air Release Valves

The City's water distribution system is divided into several pressure zones. Where water systems cross these zone lines, a pressure-reducing valve station will be required. The specific design and location for such valves will be reviewed and approved by the City Engineer.

When designated by the City Engineer, air release valves, per Oregon Standard Drawing RD270, will be installed. Such valves will be required on large diameter lines at all high points in grade.

4.0034 Railroad or Freeway Crossings

All such crossings defined above, or as determined by the City to be of a hazardous nature, will have valves on both sides of the crossing. Casing of railroad or freeway crossings will be as noted in the permit from the respective agency and as approved by the City. Waterlines and casing materials will be designed to minimize the cathodic protection required. All accessible structures will be located a minimum of 15 ft from railroad crossing gate arms outside of the rail area, at least 25 ft from a light rail track centerline, and 50 ft from the rail track centerline for freight and higher speed trains. Pipes will be sized per Water Master Plan and full build-out requirements at all rail crossings. Materials to be approved by City Engineer.

4.0040 BACKFLOW PREVENTION

Backflow prevention devices will be required on all water services supplying 3-story buildings and taller.

4.0050 WATER SERVICE LINES

The sizes of water service lines which may be used are 1, 2, 4, 6, 8, 10, and 12 inches. Water service lines will be reviewed for effects on the distribution system and will not be greater in size than the distribution main.

For services 1.5-inch and greater, a design drawing must be submitted showing the vault and fitting requirements with the expected flow (normal and maximum day flow) requirements and proposed usage.

Domestic service lines 1-inch through 2-inch will normally extend from the main to behind the curb, with a meter curb stop and meter box located at the termination of the service connection (Standard Drawings 401 and 402). ¾" x 5/8" and 1-inch meter to be provided and installed by City. 1.5-inch or larger meter are to be Badger water meter with remote read if applicable. Meters will measure usage as cubic feet. Meter boxes are to be provided by the developer. In general, individual service connections will terminate in front of the property to be served and will be located 18 inches on each side of a common side property line.

When a corrosive potential condition is encountered and the copper service passes over or under an active cathodic protection system, the service will be installed in a Schedule 40 PVC conduit for a distance of 10 ft on each side of the active system. All conduit placements will be as-built. PEX water service lines are approved to be used in areas where copper service lines fail prematurely.

4.0051 Fire Service

There are four categories of private fire services:

1. Hydrants,
2. Fire sprinkler lines,
3. Combination hydrant and fire sprinkler lines, and
4. Combination plumbing and fire sprinkler heads.

The water fire service line will normally extend from the main to the property line and end with a vault metering device and valves. An approved backflow prevention device will be required of the property being served.

4.0052 Fire Vaults

A vault will be required when a development provides fire sprinklers. The vault drawing will be included on construction drawings submitted to the City Engineer. The vault will contain all valves, fittings, meters, and appurtenances required for fire service to the development.

4.0060 SYSTEM TESTING

All new water systems (lines, valves, hydrants, and services) will be individually pressure tested, chlorinated, and tested for bacteria. All testing will be performed in accordance with Section 01140 – Potable Water Pipe and Fittings of the Oregon Standard Specifications for Construction (OSSC) and in the presence of a City Inspector. Sampling test charges are the responsibility of the developer.

4.0070 WATER QUALITY SAMPLING STATIONS

Water sampling stations will be required as directed by the City Engineer. Approved station is Kupferle Eclipse #88-SS with "City of Milwaukie" logo cast into the access door at no additional charge.

END OF SECTION

SECTION 5—STREET STANDARDS

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5.0000 STREETS

5.0010 GENERAL DESIGN REQUIREMENTS

Performance Standards: All street designs will provide for safe and efficient travel of the public. Streets will be designed to carry the recommended traffic volumes identified for each street classification.

Streets will be designed to meet or exceed minimum guidelines set forth in the American Association of State Highway and Transportation Officials' (AASHTO) latest edition of A Policy on Geometric Design of Highways and Streets. Traffic Control Devices will conform to the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) by the Federal Highway Administration, with Oregon Supplements, by Oregon Department of Transportation (ODOT) and these Public Works Standards.

All vertical and horizontal curves will meet the guidelines of AASHTO's A Policy on Geometric Design of Highways and Streets and the design speed for each street classification. Where practical, the Design Engineer will provide the decision stopping sight distance set forth in AASHTO's A Policy on Geometric Design of Highways and Streets. But in no case will less than the minimum stopping sight distance given be permitted.

5.0011 Right-of-Way and Pavement Width

Right-of-way and pavement width for each street classification will be as set forth in other sections of these Public Works Standards.

5.0012 Access

All development will be provided public street access. Access roads (public and/or private), driveways, and easements will be as set forth in other sections of these Public Works Standards.

5.0013 Transportation Impact Study

A Transportation Impact Study (TIS) documents the adequacy of the transportation system to serve the multiple modes of travel including vehicular, bike, pedestrian, bus, rail, freight, etc. When a TIS determines that the transportation system is deficient, improvements are identified to bring the transportation system to an adequate level of service.

The TIS guidelines establish uniform guidelines for conducting transportation impact. These guidelines are used to ensure consistent and proper planning and engineering practices necessary to provide an adequate transportation system.

A. Determining When a Transportation Impact Study is Required

The City Engineer will determine when a TIS is required and will consider the following when making that determination.

1. Changes in land use designation, zoning designation, or development standard.
2. Changes in use or intensity of use.
3. Projected increase in trip generation.
4. Potential impacts to residential areas and local streets.
5. Potential impacts to priority pedestrian and bicycle routes, including, but not limited to, school routes, and multimodal street improvements identified in the Transportation System Plan (TSP).
6. Potential impacts to intersection level of service.

Determination that a TIS is required is not a land use action and may not be appealed.

B. Transportation Impact Study General Provisions

All TISs, including neighborhood through trip and access studies, will be prepared and certified by a registered Traffic or Civil Engineer in the State of Oregon.

TISs required by the City Engineer that are not subject to MMC Section 19.704 will be subject to City TIS fees and deposits in accordance with the adopted fee schedule. The City Engineer will determine when TIS fees and deposits are applied to TISs.

The City Engineer may require a TIS review conference with the Traffic Engineer.

C. Transportation Impact Study Requirements

1. TIS Scope

The City Engineer will provide a TIS scope that will identify the study area, study intersections, trip rates, traffic distribution, and required content of the TIS.

2. TIS Content

The TIS will include all of the following elements, unless waived by the City Engineer:

a. Introduction and Summary

This section should include existing and projected trip generation including vehicular trips and mitigation of approved development not built to date; existing level and proposed level of service standard for City and County streets and volume to capacity for State roads; project build year and average growth in traffic between traffic count year and build year; and summary of transportation operations, proposed mitigation(s), and traffic queuing and delays at study area intersections.

b. Existing Conditions

This section should include a study area description, including existing intersections' existing levels of service.

c. Impacts

This section should include a site plan, an evaluation of the proposed site plan, and a project-related trip analysis (a figure showing the assumed future year roadway network).

d. Mitigation

This section should include proposed site and areawide specific mitigation measures.

e. Appendix

This section should include traffic counts, capacity calculations, warrant analysis, and any information necessary to convey a complete understanding of the technical adequacy of the TIS.

D. Transportation Impact Study Mitigation

The following measures may be used to meet mitigation requirements identified by a TIS:

1. Construct mitigation per TIS recommendation.
2. On- and offsite improvements beyond required frontage improvements.
3. Development of a transportation demand management program.

4. Payment of a fee in lieu of construction.
5. Correction of offsite transportation deficiencies within the study area that are not substantially related to impacts.
6. Construction of transportation facilities that exceed minimum required standards and that have a transportation benefit to the public.

5.0014 Intersections

Connecting street intersections will be located to provide for traffic flow, safety, and turning movements, as conditions warrant.

At intersecting centerlines, a tangent section of a minimum of 25 ft will be carried in each direction away from the intersection.

Arterial Intersections: Exclusive left and right turn lanes will be provided; bus turnouts will be provided if traffic flow and safety conditions warrant; designated crosswalks will be provided at controlled locations; and street alignments across intersections will be continuous.

Collector, Neighborhood Routes, and Local Street Intersections: Street and intersection alignments will facilitate local circulation and discourage nonlocal, through traffic.

Streets will be aligned so as to intersect at right angles (90°). Angles of 75° and lower must be approved by the City Engineer for special intersection design. Intersection of more than 2 streets at 1 point will not be permitted.

New streets will intersect with existing street intersections so that centerlines are not offset, except as provided below. Where existing streets adjacent to a proposed development do not align properly, conditions may be required of the development to provide for proper alignment.

For intersections which are not directly aligned with street centerlines, the centerline spacing must meet the following:

Centerline Spacing			
	Intersection Spacing (ft)		Block Perimeter (ft)
Street Class	Minimum	Maximum	Maximum
Arterial	530	1000	2600
Collector	300	600	1800
Neighborhood Route	150	530	1650
Local	100	530	1650

5.0015 Half-Street Plus Travel Lane Construction

Half-streets will only be approved when the abutting or opposite frontage property is undeveloped, and the full improvement will be provided with development of the abutting or opposite (upon right-of-way dedication) frontage property. Where such a street is justified, the right-of-way and pavement width will be determined by the City Engineer. In no case will the pavement width required be less than that necessary to provide 2 lanes of traffic to pass at a safe distance.

Development on an unimproved street will be responsible for constructing a continuous, City-standard street connection to the nearest developed (publicly maintained) street.

5.0016 Street Classification

All streets within the city will be classified as designated in the TSP. The classification for any street not listed will be determined by the City Engineer.

5.0017 Design Speed

Design speeds for each street classification will be as follows.

Design Speeds	
Street Class	**Speed**
Arterial	35 - 45 MPH
Collector	25 - 35 MPH
Neighborhood Route/Local/Cul-de-sac	25 MPH or based on minimum 150-200 ft stopping sight distance.

Where existing traffic conditions identify speeds in excess of design speeds listed, then the higher speed will be used for design purposes.

5.0020 HORIZONTAL/VERTICAL CURVES, AND GRADES

5.0021 Horizontal Curves

Horizontal curve alignments will meet the minimum radius requirements shown in the following tables.

Minimum Radius Requirements Arterial and Collector Streets							
Design Speed (MPH)	**Friction Factor (F)**	**E= -4%**	**-2.5%**	**0%**	**2.5%**	**4.0%**	**6.0%**
		Centerline radius (ft)					
25	0.165	333	298	252	219	203	185
30	0.160	500	444	375	324	300	273
35	0.155	710	628	527	454	419	380
40	0.150	970	853	711	609	561	508
45	0.145	1286	1125	931	794	730	658
50	0.140	1667	1449	1190	1010	926	833
55	0.130	2241	1921	1551	1301	1186	1061

Neighborhood Routes, Local Streets, and Cul-de-sacs							
Design Speed (MPH)	**Friction Factor (F)**	**E= -4%**	**-2.5%**	**0%**	**2.5%**	**4.0%**	**6.0%**
		Centerline radius (ft)					
25	0.252	196	184	165	150	143	134
30	0.221	332	306	272	244	230	214

Where superelevation is used, street curves will be designed as determined/approved by the City Engineer for maximum superelevation rate of 0.04. If terrain dictates sharp curvature, a maximum superelevation rate of 0.06 is justified if the curve is long enough according to AASHTO's A Policy on Geometric Design of Highways and Streets to provide an adequate superelevation transition.

Request for design speeds less than 25 MPH will be determined/approved by the City Engineer based on topography, right-of-way, or geographic conditions for the applicant. Request must show that a reduction in centerline radius will not compromise safety.

f = friction factor
e = superelevation, in feet
R = centerline radius, in feet
V = design speed, in MPH

$$R = \frac{V^2}{15(e + f)}$$

5.0022 Vertical Curves

Vertical curve length will be based on guidance design criteria in AASHTO's A Policy on Geometric Design of Highways and Streets which includes design speed, crest vertical curve, and sag vertical curve. Stopping sight distance for crest and sag vertical curves will be based on sight distance and headlight sight distance, respectively.

All vertical curves will be parabolic and the length will meet the minimum length required for each location.

5.0023 Grades

Maximum grades for each street classification will be as follows except as approved by the City Engineer:

Street Class	Maximum Grade
Arterial	8%
Collector	10%
Neighborhood Route / Local / Cul-de-sac	15%

The minimum grade for all streets will be 0.0075 ft per foot (0.75%); however, in all cases street grades will allow for proper and adequate drainage. Cul-de-sac "bulbs" will have a minimum slope of 0.0075 ft per foot (0.75%). Any grade change of more than 1% will be accomplished with vertical curves.

5.0030 STREET DESIGN STANDARDS

Street design elements and dimensional standards for street cross sections by functional classification will be as follows:

Street Design Elements and Standards							
Street Classification	Full-Width Right-of-Way Dimension	Individual Street Elements					
		Travel Lane (Center Lane)	Bike Lane	On-Street Parking	Landscape Strips	Sidewalk Curb Tight	Sidewalk Setback
Arterial	54'-89'	11'-12' (12'-13')	5'-6'	6'-8'	3'-5'	8'-10'	6'
Collector	40'-74'	10'-11'	5'-6'	6'-8'	3'-5'	8'	6'
Neighborhood	20'-68'	10'	5'	6'-8'	3'-5'	6'	5'
Local	20'-68'	8' or 10'	5'	6'-8'	3'-5'	6'	5'
Truck Route	34'-89'	11'-12' (12'-13')	5'-6'	6'-8'	3'-5'	8'-10'	Per Street Classification
Transit Route	30'-89'	10'-12' (12'-13')	5'-6'	6'-8'	3'-5'	Per Street Classification	Per Street Classification

The following standards augment the dimensional standards contained in the table above and may increase the width of an individual street element and/or full-width right-of-way dimension.

1. A minimum 10-ft travel lane width will be provided on local streets with no on-street parking.
2. Where travel lanes are next to a curb line, an additional 1 ft of travel lane width will be provided. Where a travel lane is located between curbs, an additional 2 ft of travel lane width will be provided.
3. Where shared lanes or bicycle boulevards are planned, up to an additional 6 ft of travel lane width will be provided.
4. Bike lane widths may be reduced to a minimum of 4 ft where unusual circumstances exist, as determined by the City Engineer, and where such a reduction would not result in a safety hazard.
5. Center turn lanes are not required for truck and bus routes on street classifications other than arterial roads.
6. On-street parking in industrial zones will have a minimum width of 8 ft.
7. On-street parking in commercial zones will have a minimum width of 7 ft.
8. On-street parking in residential zones will have a minimum width of 6 ft.
9. Sidewalk widths may be reduced to a minimum of 4 ft for short distances for the purpose of avoiding obstacles within the public right-of-way including, but not limited to, trees and power poles.
10. Landscape strip widths will be measured from the back of curb to the front of sidewalk.
11. Where landscape strips are required, street trees will be provided a minimum of every 40 ft in accordance with Section 5.0093 of these standards, selected from the approved street tree list on the city's website, and planted according to the City of Milwaukie Standard Drawing 513.
12. Where water quality treatment is provided within the public right-of-way, the landscape strip width may be increased to accommodate the required treatment area.
13. A minimum of 6 inches will be required between a property line and the street element that abuts it; e.g., sidewalk or landscape strip.
14. An 8' wide multiuse sidepath can be substituted for the bike lane and setback sidewalk. A 10' wide multiuse sidepath can be substituted for the bike lane and curb tight sidewalk.

The City Engineer will determine the full-width cross section for a specific street segment based on functional classification using the dimensions and standards stated above. The full-width cross section is the sum total of the widest dimension of all individual street elements. If the City Engineer determines that a full-width cross section is not appropriate or feasible, the City Engineer may first reduce individual street elements to the minimum dimensions and standards stated above. If necessary to further reduce the street cross section width, the City Engineer may eliminate individual street elements on one or both sides of the street in accordance with Figure 10-1 of the TSP. When making a street design determination that varies from the full-width cross section, the City Engineer will consider the following:

1. Options and/or needs for environmentally beneficial and/or green street designs.
2. Multimodal street improvements identified in the TSP.
3. Street design alternative preferences identified in Chapter 10 of the TSP, specifically regarding sidewalk and landscape strip improvements.
4. Existing development pattern and proximity of existing structures to the right-of-way.
5. Existing right-of-way dimensions and topography.

5.0040 PAVEMENT DESIGN

In general, all streets will be constructed with asphaltic concrete with a heat-applied rubberized sealant; however, Portland Cement Concrete streets are permitted as approved by the City Engineer.

Typical flexible pavement thickness for neighborhood routes, local streets, and alleys will be as shown in the standard drawings.

The Design Engineer will provide a street structural design section for all roadways classified collector and higher, and for all streets, including local streets, in industrial zones.

Asphalt pavement may be designed using any nationally recognized procedure. The procedures contained in the following references are preferred.

AASHTO Guide for Design of Pavement Structures, Current Issue.

Thickness Design – Asphalt Pavements for Highways and Streets. The Asphalt Institute, Current Issue.

Concrete pavement may be designed using any nationally recognized procedure. The procedures contained in the following references are preferred.

AASHTO Guide for Design of Pavement Structures, Current Issue.

Thickness Design for Concrete Highway and Street Pavements. Portland Cement Association, Current Issue.

Heat-applied rubberized sealant will conform to ASTM D6690 Type I.

5.0050 CONCRETE CURB

Concrete curbs are typically required on street improvements for all new development projects.

The top of curb elevation and centerline elevations will be equal in standard street cross sections, unless otherwise approved by the City Engineer. In nonstandard street cross sections, the minimum cross-slope will be 2% and the maximum cross-slope will be 3.5%.

Control joint spacing in curbs will be at a 15-ft maximum at all curb return points and at driveway curb-drop transition points.

5.0051 Curb Return Radius

Curb return radius at street intersections will be designed to accommodate all expected traffic. Curb extensions and/or special crosswalk/sidewalk features designed to enhance pedestrian safety may be required to encourage pedestrian usage. Minimum curb radii are 35 ft on all intersections with transit routes and where arterial roads intersect each other. All other intersections have a minimum curb radius of 25 ft.

Larger curb radii may be required on streets serving commercial/industrial properties for vehicle movements.

5.0060 SIDEWALKS

In general, new sidewalks with curbs are required for any development requiring a development permit. The location of the sidewalk within a development will be determined in the development review process.

Sidewalks will be a minimum 5 ft wide for neighborhood route and local and 6ft for collectors and arterials, unless otherwise approved by the City Engineer and will be typically separated 5 ft from the face of the curb by a planter strip. If there is no planter strip, then minimum sidewalk width is 6 ft for local and neighborhood routes, 8 ft for collectors, and 10 ft for arterials. The maximum permitted slope across the planter strip will be 4:1.

Sidewalks will be within the dedicated right-of-way, unless specifically approved by the City Engineer. Where sidewalks are approved outside of the dedicated right-of-way, a public sidewalk easement will be provided.

Sidewalks will have a maximum slope of 1:12 and a cross slope of 1:50. Where steeply sloped roadways and constrained right-of-way preclude a running slope of 1:12, the least possible running slope will be provided.

All above-ground structures in the sidewalk area will be located to provide a maximum clear sidewalk width for pedestrians. The minimum unobstructed clear width allowed will be 48 inches unless otherwise approved by the City Engineer. In cases where a clear width of 48 inches cannot be attained, the proposed structure will be placed behind the sidewalk. Where cluster mailboxes or other objects larger than single mailboxes are within the sidewalk area, the walk will be widened to provide adequate clearance, or be aligned to go around any obstacles. Alternate alignments and widths must be approved by the City Engineer. An 8-ft vertical clearance above the sidewalk will be maintained.

5.0061 Sidewalk Ramps

All intersections will contain sidewalk ramps (for access) located within the curb return (Oregon Standard Drawings RD910, RD912, RD913, RD916, RD920, RD922, RD930, RD932, RD938, RD940, RD950, RD952, RD960 and Standard Drawings 500, 501, 502, 503). Sidewalk ramps will be located with regard to stormwater flows, street grades, utility or light pole locations, and existing opposing ramps. Sidewalk ramps will follow the Public Right-of-way Accessibility Guidelines (PROWAG).

5.0070 BIKEWAYS

The need for bikeways will be determined by the City's TSP. On-street bikeway facilities (shared roadways and neighborhood greenways) and off-street facilities (multiuse paths and cycle tracks) will meet the requirements of the following documents.

1. AASHTO Guide for the Development of Bicycle Facilities, latest edition
2. ODOT Oregon Bicycle & Pedestrian Plan, latest edition
3. Manual on Uniform Traffic Control Devices with Oregon supplements by Oregon Transportation Commission
4. Milwaukie TSP Chapter 6.

5.0071 Bikeway Facilities Required

Bikeway facilities will be provided at locations identified by the City's TSP.

5.0072 Design Criteria

In general, bikeway design will meet the adopted standards referred to in Subsection 5.0070 (Bikeways).

Bikeway curvature will be based on a minimum design speed of 20 MPH. Bikeway or bike lane will follow slope of roadway.

Bikeway grades will be limited to a maximum of 5%. Where topography dictates, grades over 5% are acceptable when a higher design speed is used and additional width is provided.

All design will conform to the minimum requirements of ODOT's Oregon Bike and Pedestrian standards.

When a stormwater structure (manhole, catch basin, or curb inlet) is located within a bikeway, all inlet grates will be designed to protect the bicyclist from the grate or opening.

Bike paths will have a minimum right-of-way width of 15 ft and a minimum improved surface width of 10 ft.

5.0073 Construction

Bikeways will be either asphalt or concrete surfaced. Pervious concrete will be allowed with approval from the City Engineer.

When drainage such as side ditches is required parallel with the bikeway, the ditch centerline will be at least 5 ft from the edge of the pavement. The ditch side slope adjacent to the bikeway will be no steeper than 2:1 when measuring the horizontal distance to the vertical distance.

When culverts cross bikeways, the ends of the pipe will be no closer than 5 ft from the edge of the bikeway.

5.0080 ACCESSWAYS

Access to private property will be permitted with the use of driveway curb cuts. The access points with the street will be the minimum necessary to provide access while not inhibiting the safe circulation and carrying capacity of the street. Driveways will follow the Public Right-of-Way Accessibility Guidelines (PROWAG).

New accessways and the modification of existing accessways will comply with this section.

Where accessway requirements and standards cannot be met due to the location or configuration of an existing building or structure, the existing accessways will be brought into conformance with this section to the greatest extent feasible as determined by the City Engineer.

5.0081 Accessway Spacing

Spacing between accessways is measured between the closest edges of driveway aprons where they abut the roadway. Spacing between accessways and street intersections is measured between the nearest edge of driveway apron and the nearest face of curb on the intersecting street. Where intersecting streets do not have curbs, the spacing is measured from the nearest edge of pavement.

Access spacing on arterial streets is a minimum of 600 ft.

Access spacing on collector streets is a minimum of 300 ft.

Access spacing may be modified with submission of an access study prepared and certified by a registered professional Traffic Engineer in the State of Oregon. The access study will include the following:

1. Review of site access spacing and design.
2. Evaluation of traffic impacts adjacent to the site within a distance equal to the required access spacing distance from the project site.
3. Review of all modes of transportation to the site.

4. Mitigation measures where access spacing standards are not met include, but are not limited to:

    a. Placement of medians.

    b. Consolidation of accessways.

    c. Shared accessways.

    d. Temporary access.

    e. Provision of future consolidated accessways.

    f. Other measures that would be acceptable to the City Engineer.

5.0082 Accessway Location

For lots with more than one frontage on a street, access will be provided first from the street with the lowest classification.

Individual access to single-family residential lots from arterial and collector streets is prohibited. An individual accessway may be approved by the City Engineer when the following conditions are met:

1. There is no practicable alternative to access the site, as determined by the City Engineer.
2. Shared access is provided by easement with adjacent properties.
3. The accessway is designed to contain all vehicle backing movements on the site.
4. Shared access is provided with adjacent properties.

The nearest edge of a driveway apron will be at least 5 feet from the side property line in residential districts and at least 10 feet from the side property line in all other districts. This standard does not apply to accessways shared between 2 or more properties.

The following distance from the nearest intersecting street face of curb to the nearest edge of driveway apron will be maintained. Where an intersecting street does not have a curb, the distance will be measured from the nearest intersecting street's edge of pavement.

1. At least 45 ft for single-family residential properties accessing local and neighborhood streets. Where the distance cannot be met on existing lots, the driveway apron will be located as far from the nearest intersection street face of curb as practicable.
2. At least 100 ft for multifamily residential properties and all other uses accessing local and neighborhood streets.
3. At least 300 ft for collectors, or beyond the end of the queue of traffic during peak hour conditions, whichever is greater.
4. At least 600 ft for arterials, or beyond the end of queue of traffic during peak hour conditions, whichever is greater.

5.0083 Number of Accessway Locations

The number of accessways on collector and arterial streets will be minimized whenever possible through the use of shared accessways and coordinated onsite circulation patterns. Shared accessways or internal access between uses will be established by means of common access easements.

One accessway per property is allowed for single-family residential use.

1. For lots with more than one street frontage on a local street and/or neighborhood route, an additional accessway may be granted. Under such circumstances, a street frontage will have no more than 1 driveway approach per lot.

2. For lots with one street frontage on a local street and/or neighborhood route, 1 additional accessway may be granted where the driveway approaches can be spaced 50 ft apart, upon review and approval by the City Engineer. The spacing is measured between the nearest edges of the driveway aprons.

3. No additional accessways will be granted on collector or arterial streets.

The number of accessways for uses other than single-family residential is subject to the following provisions:

1. Access onto arterial and collector streets is subject to the access spacing requirements of Subsection 5.0081 (Accessway Spacing).

2. One accessway is allowed on local streets and neighborhood routes. One additional accessway is allowed per frontage where the driveway approaches, including adjacent property accessways, can be spaced 150 ft apart. The spacing is measured between the nearest edges of the driveway aprons.

5.0084 Accessway Design

Driveway approaches will follow the Public Right-of-Way Accessibility Guidelines (PROWAG).

The City Engineer may restrict the location of accessways on streets and require that accessways be placed on adjacent streets upon finding that the proposed access would:

1. Cause or increase existing hazardous traffic conditions;

2. Provide inadequate access for emergency vehicles; or

3. Cause hazardous conditions that would constitute a clear and present danger to the public health, safety, and general welfare.

Accessways will be designed to contain all vehicle backing movements on the site, except for detached or attached single-family residential uses on local streets and neighborhood routes.

5.0085 Accessway Size

Accessways will be the minimum width necessary to provide the required number of vehicle travel lanes. Vehicle turning templates may be required to verify that an accessway is appropriately sized for the intended use.

Accessway Size			
Use	**Minimum Width (ft)**	**Maximum Width (ft)**	**Additional Notes**
Single-family (attached and detached)	12	20	
Multifamily (up to 4 dwellings)	12	20	See MMC 12.16.040.E.3
Multifamily (5-8 dwellings)	16	24	See MMC 12.16.040.E.4
Multifamily (8 or more dwellings)	20	30	See MMC 12.16.040.E.5
Commercial, offices, or institutional	16	36	
Industrial	24	45	

Maximum driveway apron widths for commercial and industrial uses may be increased if the City Engineer determines that more than 2 lanes are required based on the number of trips generated or the need for on-site turning lanes.

5.0090 STREET LIGHTING, NAMES, SIGNAGE, AND LANDSCAPE

5.0091 Street Lighting

A complete street lighting system will be the responsibility of the development. All streets fronting the property will be provided with adequate lighting as determined by the City Engineer. For lighting requirements, all developments will be required to submit a lighting plan to the City Engineer. The lighting plan will conform to Illuminating Engineering Society (IES) Standards except as modified by the City.

For new subdivisions or land use actions requiring street light installation, all plans for street lighting will be submitted with the construction plan submittal. Approvals for street light plans will be issued as part of the construction plan package.

See Section 5.0191.D for additional street lighting requirements in the downtown area. Required streetlights will be acquired through Portland General Electric (PGE) under the Option "B" plan (City-owned equipment, maintenance and energy from PGE). Fixtures will be on PGE's approved list and approved by the City Engineer.

Nonstandard fixtures approved for installation will be acquired through PGE under the Option "C" plan (Customer-owned equipment and maintenance, energy from PGE) and an agreement for maintenance responsibility will be in place prior to street light installation.

It is the policy of the City to light streets to the IES Standards listed below.

Street Lighting Standards			
Street Classification	**Area Classification**	**Average Maintained Illumination**	**Uniformity Average to Minimum**
Arterials	Commercial Intermediate Residential	1.7 footcandles 1.3 footcandles 0.9 footcandles	3 to 1
Collector	Commercial Intermediate Residential	1.2 footcandles 0.9 footcandles 0.6 footcandles	4 to 1
Neighborhood Route Local Cul-de-sac	Commercial Intermediate Residential	0.9 footcandles 0.7 footcandles 0.4 footcandles	6 to 1

Commercial: A business area of the city where ordinarily there are many pedestrians during night hours. This definition applies to densely developed business areas outside, as well as within, the central part of the city. The area contains land use which attracts a relatively heavy volume of nighttime vehicular and/or pedestrian traffic on a frequent basis.

Residential: A residential development, or a mixture of residential and small commercial establishments, with few pedestrians at night.

5.0092 Street Names, Traffic Control Signage, and Pavement Markings

Street names for all new development will be approved by the City prior to recording of any maps or plats.

All new signage and pavement markings in the public right-of-way will be installed per MUTCD.

Street name signs will be installed as follows:

1. Sign poles will be Telespar 2” - 12-gauge perforated steel square tube (PSST) posts or approved equal.
2. Sign mounting hardware will be 2” Cap with 12” receiver Flat and 90-degree crosspiece.
3. Street name signs for roads running east/west will be installed above and street name signs for roads running north/south will be installed below.
4. Street abbreviations are as followed: St, Av, Dr, Cir, Blvd, Ln, Ct.
5. Street names signs will be two sided with no border on all street name signs.
6. Street signs sizes are as follows: 24”x8”, 30”x8”, and 36”x8”.

All signs will be installed to face traffic except No Parking signs and hourly parking signs which will be installed at a 45-degree angle to the travel lane,

All curb on bulb outs, medians, and pedestrian refuge islands will be painted yellow with 4”x4” 2-way yellow reflective pavement markers on top of curb.

5.0093 Street Planting

1. The standards contained in this section apply to all landscaping placed within the public ROW. Replacement of street trees will also adhere to these standards.
2. A Right-of-Way Permit is required prior to planting in the public ROW. Within a development, the property owner or their landscape contractor will schedule a pre-planting inspection of the

holes and trees with the City Urban Forester. Upon completion of the tree planting, they will notify the City Urban Forester in order to schedule a final inspection. Plant holes will be dug a minimum of two (2) times the root ball diameter.

3. No person will remove or replace a street tree without first obtaining a permit from the City, specifically authorizing the removal or replacement.

4. Trees planted in the public ROW will be of the minimum size at planting from the table below:

Tree size at planting	
Tree type	**Size**
Downtown trees	Broadleaf – 2' caliper Conifer – 6' tall
Broadleaf trees	1.5' caliper
Conifer trees	5' tall

Tree spacing and height		
Planter width	**Standard spacing**	**Minimum mature height**
Small, 3' – 3.9'	15'	15'
Medium, 4' – 5.9'	20'	20'
Large, 6' – 8'+	30'	30'
Street shrubs	8'	2.5'

5. Trees should be selected based on the *Guideline Specifications for Nursery Tree Quality, 2009 revision* created by the Urban Tree Foundation.

6. Tree species will be selected in accordance with the City of Milwaukie Approved Street Tree List. Non-approved trees may be removed and replaced at the owner's expense.

7. Street trees will be located 10 ft from a fire hydrant, 5 ft measured horizontally from an underground utility, 10 ft from a streetlight, 15 ft from a storm catch basin, and 25 ft from a street corner as measured from the point of nearest intersection curbs or curb lines.

8. Street trees will be planted mid-way between the back of curb and the street-edge of sidewalk, if one exists. If no sidewalk exists, street shrubs will be 3 ft away from the street edge and street trees 5 ft from the street edge.

5.0100 DEAD-END STREETS AND CUL-DE-SACS

Permanent turnarounds will be provided when no opportunity exists for creating a through street connection. Turnarounds will have a maximum length of 400 ft, measured from the cross-street right-of-way to the farthest point of the right-of-way containing the turnaround.

Temporary turnarounds will be provided for street stubs in excess of 150 ft in length, measured from the cross-street right-of-way to the farthest point of the right-of-way containing the turnaround.

Turnarounds will be designed in accordance with the latest edition of the Oregon Fire Code. In the event the Oregon Fire Code does not apply, the City Engineer will specify the design vehicle that the turnaround must accommodate.

5.0110 PRIVATE STREETS/ALLEYS

5.0111 Alleys

A. Commercial and Industrial

Alleyways may be provided in commercial and industrial developments with approval by the City Engineer. When approved, alleyways will be dedicated to the City. Standard alleyway dimensions will be a 12-ft wide paved surface inside a 16-ft wide right-of-way.

The design for alleyways will meet the same criteria as other public streets. The exception to those criteria may be centerline radius and design speed. Generally, alleyways will be designed for one-way operation.

B. Residential Districts

To serve development, alleys allow for efficient lot use, support front yard pedestrian orientation and landscape spaces, and reduce lot coverage by driveways. Alleys serve as a common driveway for access, utilities, and deliveries. Alley design will conform to the latest adopted TSP.

5.0112 Private Residential Accessways

1. In general, private residential streets and accessways will be provided for multifamily developments such as condominiums and apartments. Interior design for private accessways in a manufactured home park will meet the requirements of City of Milwaukie Municipal Code. The standards for private residential accessways include:
2. Dead-end accessways which exceed 150 ft in length will be provided with an approved turnaround.
3. "PRIVATE STREET" signage and driveway approach will be placed at the intersection with the public street to clearly identify the private accessway.
4. Private maintenance of the private streets/accessways will be provided by a Homeowner's Association or other appropriate entity. Maintenance will ensure continual emergency accessibility at all times.
5. The location of private accessways will meet the Oregon Fire Code and meet the minimum pavement section of local residential streets.
6. Private residential accessways will be allowed in manufactured home parks but will not be allowed in manufactured home subdivisions.

5.0120 LOCAL STREET DESIGN FOR ADVERSE TOPOGRAPHY

In standard local street design, the top of curb elevations will equal the finished centerline elevations, except in situations of adverse topography. The Design Engineer may utilize an "offset" or unequal crown section when the existing ground slope exceeds 8% across the roadway section.

The offset crown design will meet the following conditions.

1. Minimum distance from "crown" to 1 face of curb is 10 ft.
2. Maximum cross-slope of pavement is 5%.
3. The maximum differential in top of curb elevation from one side to the other is 1 ft.

The existing ground "side-slope" criteria is based on the relationship of the slope of the ground to the transverse slope of the roadway profile. This relationship will be met for the entire length of the roadway alignment utilizing an offset crown.

5.0130 MEDIANS

Raised medians are allowed on certain streets but must be approved by the City Engineer. If medians are allowed, the following criteria must be met.

1. The median must be set back at least 1 ft from the travel lane on both sides.
2. Street lighting will be sufficient to provide illumination of the median.
3. Objects such as trees, shrubs, signs, light poles, etc., will not physically or visually interfere with vehicle or pedestrian traffic or traveled way. Medians and objects within the median can be site specific and will be subject to City Engineer approval.
4. Medians in the public right-of-way are maintained by the Public Works Department. Planting and irrigation plans for medians will be submitted to the Public Works Department for review. Inspections of planting and irrigation systems will be coordinated directly with the Public Works Department. Irrigation of medians will be designed to water lawn areas and shrub areas separately.

5.0140 GUARDRAILS

The decision of whether to install guardrails will be based on the information found in the AASHTO Roadside Design Guide, current edition. Guardrails will be designed and constructed per ODOT's standard drawings for design and construction.

5.0150 PAVEMENT TRANSITIONS

In the direction of vehicular traffic, street width transitions from a narrower width to a wider width will be designed with a 3:1 taper. Delineators, as approved by the City Engineer, will be installed to define the configurations.

In the direction of vehicular traffic, street width transitions from a wider width to a narrower width and the length of transition taper will be determined as follows:

$L = S \times W$ for S = 45 MPH or greater

$L = \frac{S^2 \times W}{60}$ for S less than 45 MPH

Where L = minimum length of taper (ft)
S = Design speed (MPH)
W = EP to EP offset width
EP= Edge of pavement to center line

Delineators, as approved by the City Engineer, may be installed to define the configuration. The maximum spacing of delineators will be the numerical value of the design speed, in feet (e.g., 35-ft spacing for 35 MPH).

5.0160 FENCES

Fences in the right-of-way will comply with the City of Milwaukie Municipal Code as well as special overlay zones where applicable. Fences within the right-of-way in the downtown area will be per Standard Drawing 514.

5.0170 RAIL CROSSINGS

5.0171 Regulations

The maintenance and repair of railroad crossings are the responsibility of rail companies for commercial rail lines, regulated by the Public Utility Commission, and TriMet for light rail.

All work undertaken and all alterations to the streets near a railroad crossing will comply with the Federal Train Horn Rule for Quiet Zones as regulated by the Federal Rail Administration. New crossing orders may also be required by ODOT Rail Division.

Signage required at each crossing must meet current MUTCD standards.

New structural requirements will be consistent with current AASHTO requirements and not less than concrete track section or concrete panels on roadway and sidewalk section. Road and rail needs will be provided.

Resurfacing to the longitudinal street grades will meet Section 5.0020 of these standards.

The downtown area or other special overlay zones may have different requirements. The City Engineer will make the final determination on which requirement will be used.

Where other regulations conflict with the City's, bring to the attention of the City Engineer.

5.0172 Design Requirements

Permits and special rail flaggers are required when working within the railroad zone. Check with railroad operator and authority regarding limits of work and necessary permits. New and reconstructed light rail and freight rail construction may require improvements to the public utility systems at each utility crossing. Electrified rail lines may exist at these street crossings.

All accessible structures must be located a minimum of 15 ft from the gate arms outside of the rail crossings, 50 ft from the freight and high(er) speed rail track centerlines, or 25 ft from light rail track centerlines, whichever is greater. City maintenance crews will not be required to access structures where rail flagging or traffic flagging across a rail line would be needed.

All public rail crossings, and those used as public, will have pedestrian facilities separated from the vehicular facility.

Additional road surface treatments will be used to enhance the safety of bicycle rail crossings. The City Engineer will approve the method.

All metal pipes or conductive materials crossing rail lines will be removed as part of demolition to reduce the possibility of electrification of public utilities and surface features.

5.0180 TRAFFIC CALMING

Traffic calming elements may be used, with the concurrence of the City Engineer, to address known traffic issues. The City's TSP provides a list of acceptable measures.

5.0190 DOWNTOWN STREETS

Refer to Standard Drawing 506A for dimensions, parking, sidewalk, trees, lighting, and landscape strips.

Modifications to typical dimensions may be required due to other constraints. Final construction design will be consistent with the design details and dimensions to the greatest extent practicable. Sidewalks are to be scored concrete or brick. See the street section details. Use City of Milwaukie logo medallion, for Main St only, where specified (Standard Drawing 520 and 521).

5.0191 Downtown Street Design

All utilities in the downtown area must be underground.

Where a conflict exists, it is the responsibility of the Design Engineer to bring it to the City Engineer's attention.

A. Mid-Block Parking Lot/Structure Access

Entrances into off-street surface or structured parking areas should be through driveways located approximately at midblock and a minimum of 50 ft from the corner of the right-of-way line.

The maximum driveway width is 24 ft.

Driveways are encouraged on east-west cross streets, such as Harrison, Jefferson, Jackson, Washington, and Monroe Streets. Access study requirements are applicable.

B. Corner Radii

The standard radius is 15 ft for typical street corners.

Exceptions:

- Bus/truck routes with bike lanes will be 20 ft.
- Bus/truck routes without bike lanes will be 35 ft.

Refer to the TSP for locations of bus and truck routes.

C. Landscape Requirements

Tree wells require a drip system and planters need a sprinkler head system.

All shrubs and ground cover will be irrigated. They will be low-maintenance and provide color and interest. They will be low in height to avoid obstructing views, to comply with City of Milwaukie Municipal Code, or spreading. Ground cover will tolerate foot traffic. Use native materials when possible.

D. Streetlights

The fixture types will be twin historic ornamental, single historic ornamental, and cobra head ornamental (Dark Sky). See specific street section standard drawings for required street lighting fixture type. Fixtures will be on PGE's approved list and approved by the City Engineer. In addition to meeting the street lighting requirements of Section 5.0091, the streetlights will be staggered along each block and aligned at each corner. Streetlights will be located near pedestrian crossings and combined with traffic pedestrian crossing signals where applicable. See Standard Drawings 520 and 521 for street light placement at corners.

E. Street furniture elements

This section will include benches, trash receptacles, bollards, fountains, etc. This section will only apply to these street furniture elements within the public right-of-way. These elements are required to be installed with street improvement projects.

Benches are to be Victorian-era styled benches made of wood with black, powder-coated, cast-iron end frames to be approved by City Engineer.

Trash receptacles will be flared steel trash receptacles with an optional dome lid. The following is approved for use in the downtown area:

> Huntco "Wenatchee" 32-gallon, black, powder-coated, latching door, lid top, black removable liner.

Bollards will be ornamental bollard, black (Standard Drawing 515). Bollards are to be set 5 ft on-center.

Fountains are to be ornamental water fountain with continuous flowing bubbler or other as approved.

Other elements will be as approved by the City Engineer.

F. Bicycle Facility Details

Bike racks will be tubular steel, black in color. Bike racks will be grouped in front of public facilities. In addition, bike racks will be placed 4 per block on Main St and 2 per block on all other downtown streets. The following is approved for use in the downtown area:

Pilot Rock Park Products Model HRP/G "Hitchin' Post", powder-coated, black.

Where bike racks are covered by awnings, canopies, or shelters, the minimum vertical clearance is 8 ft with horizontal clearance from a building of 3 ft and 5 ft between racks under shelters.

5.0200 LOW VOLUME STREETS

The Low Volume Street (LVS) standard is not intended to be used in lieu of the City's 28-ft standard where development of the local street standard is practicable. The standard is intended to facilitate infill development in situations where development to the assigned standard would likely preclude such development. Additional criteria may be required depending on application. Traffic volumes and speeds should be considerably lower than the standards that allow 20 MPH streets. Thresholds include, but are not limited to:

1. 85th percentile speed at 15 MPH or less
2. Average Daily Trips expected to be 150 or fewer
3. Service to no more than 15 housing units
4. No existing sidewalks

Two cross sections have been developed to represent options for applying the LVS design (Standard Drawing 505). Each option is based on a 20-ft pavement width, load-bearing gravel shoulder, and a flexible zone that would have space for water quality treatment and other uses such as parking or furnishings.

5.0210 SMALL CELL / DISTRIBUTED ANTENNA SYSTEMS

Small cell deployment includes small cell facilities, microcells, and small cell networks. The following provisions establish design standards for small cell facilities and, in appropriate situations, criteria for the establishment of standards for small cell deployments subject to a concealment element plan.

All wireless facilities will comply with MMC Subsection19.904.10.

5.0211 Preferred Design Criteria

Where the majority of electric utilities, cable, and/or telecommunications facilities are located on existing poles, proposed small cell or distributed antenna systems (DAS) antennas will be mounted on existing poles.

Facilities that may be granted licenses as a small cell site will meet the following requirements:

1. The proposed facilities meet one of the following parameters:
    a. do not extend existing structures on which they are located to a height of more than 45 ft or by more than 10%, whichever is greater, or;
    b. mounted on structures no more than 10% taller than other adjacent structures.
2. The antenna associated with the deployment, excluding associated antenna equipment and shrouding is no more than 3 cu ft in volume.

3. All small cell associated with the site, including the antenna, pre-existing equipment associated with the site and metering requirements of the electric service provider, will be no more than 28 cu ft. Ground mounted equipment will comply with the following:

    a. The volume will be no more than 28 cu ft less the volume of the pole mounted equipment;

    b. All ground facilities enclosed in a single cabinet;

    c. The equipment cabinet for small cell facilities will be the smallest amount of cabinet enclosure necessary to enclose the facilities.

    d. Disconnect switches may be located outside of the primary equipment cabinet.

4. Proposed antenna and related equipment will meet the requirements of:

    a. The pole owner

    b. National Electric Safety Code (NESC) and National Electric Code (NEC)

Any site plans proposed that do not follow the preferred design criteria will include documentation of the variance necessity. In addition, a concealment plan must be proposed. Such proposals will be given due consideration and will be approved or denied at the city's sole discretion.

5.0212 Site Selection

No equipment will be installed in the public right-of-way in a manner that obstructs, impedes, or hinders:

1. Vehicle, bicycle, or pedestrian traffic.
2. The legal use of the public right-of-way by other users.
3. Any operations of the City's infrastructure or systems, including but not limited to street light equipment, traffic signal equipment, smart city equipment, water and wastewater systems.

The location of equipment including pole mounted equipment, cabinets, street furniture, replacement poles and/or any new poles will comply with the Public Right-of-Way Accessibility Guidelines (PROWAG), City construction standards, State and Federal regulations, and any other applicable law or requirements hereto or hereafter adopted in effect at the time of installation of equipment.

Electrical service to the site will be provided by the franchised power company. Small cell facilities will not receive power through any third party's electric supply. Electrical permits are required for the installation of any electrical service.

Small cell antennas and related equipment may be attached to existing or replacement utility poles or street light poles if the antennas and related equipment meet the following requirements:

1. Existing or replacement wood poles:

    a. All installations of small cell facilities must have permission from the pole/structure owner to install facilities on such structure. Proof of permission, if requested, will be provided at no cost to the City within 30 days.

    b. The small cell facility will, to the maximum extent feasible, match or compliment the material or color of the pole and will be non-reflective.

    c. The base of all cabinets or equipment attached to poles will be installed at least 9.5 ft above the ground, and if a cabinet attachment is oriented toward the street and/or bicycle facilities, for the safety and protection of the public and vehicular traffic, the base of the attachment will be installed no less than 15.5 ft above the bicycle facility and/or street.

2. In addition, replacement poles will be located as close as possible to the existing pole, and the replaced pole will be removed.

3. New Poles. The installation of a new pole for the purpose of locating small cell facilities may be permitted only when the applicant establishes that:

    a. The small cell facility cannot be located on a site outside of the public right-of-way such as a public park, public property, or in or on a building whether by roof or wall mount or separate structure;

    b. The small cell facility cannot be located on an existing pole within the public right-of-way; and,

    c. The facility proposal includes a concealment element plan that is approved by the City Engineer. The new pole will:

        i. To the maximum extent possible, have no surface mounted conduit or exposed wiring will be allowed.

        ii. New poles will match design, height, width, and color or material of the original or adjacent poles.

        iii. New poles and accessory equipment will meet NESC and NEC safety requirements. New installations will comply with OAR 437-002-0047 and OAR 437-002-2316.

5.0213 Antennas

The small cell antenna will, to the full extent permitted under the NESC and the pole owner's requirements, be flush-mounted on the subject pole, which means mounting directly to the pole with little to no gap other than that which may be required for the screws/bolts or located at the top of the pole.

1. Canisters attached to the top of a pole will not exceed the diameter of the pole, unless technically required and then will not be more than 50% greater than the diameter of the pole.

2. Skirts or shrouds will be utilized on the sides and bottoms of antennas to conceal mounting hardware, create a cleaner appearance, and minimize the visual impact of the antennas. Skirts and shrouds will be the smallest size possible and are excluded from volume limitations.

3. Cabling and wiring must be concealed to the maximum extent possible.

4. Panel antennas are not permitted except where deemed acceptable at the sole discretion of the City Engineer.

5.0214 Ground-Mounted Equipment

The location of vault, cabinets, street furniture, replacement poles, and/or any new poles will comply with City standards in effect at time of work to install, modify, upgrade, etc.

Whenever possible, equipment that cannot be pole-mounted will be undergrounded in a vault and will comply with all City standards.

5.0215 Signage

A sign will be placed on the pole at eye level, unless the pole owner requires an alternate location. The sign will be of the smallest size needed to comply with pole owner requirements and State and Federal law. It will display the following information:

1. Name of the equipment owner of the site,

2. An emergency phone number, and

3. A radio Frequency Advisory.

The pole owner may require additional radio frequency (RF) signage at the antenna placement. No other signage is allowed.

5.0216 Radio Frequency, Noise, and Light Pollution

Small cell facilities will not be illuminated unless required by State or Federal regulation.

Equipment related features will not exceed 50 decibels during the day and 40 decibels at night. Generators are not permitted.

These provisions will be interpreted and applied in order to comply with the provisions of Federal law. By way of illustration and not limitation, any small cell facility which has been certified as compliant with all FCC and other government regulations regarding the human exposure to radio frequency emissions will not be denied on the basis of RF radiation concerns.

5.0217 Conflicting Design Requirements

In circumstances where the design requirements of the pole owner and the City are different, the more stringent of the two will prevail.

5.0218 Maintenance

Any work required after the initial installation, inspection, and approval by the City Engineer will be subject to the City's requirements for work proposed in the public right-of-way.

5.0220 ENCROACHMENTS IN THE PUBLIC RIGHT-OF-WAY

Encroachments within the Public Right-of-Way cannot be constructed, erected, modified, or relocated without obtaining a revocable permit from the Engineering Department. The Engineering Department will review each application for an encroachment permit to determine if it complies with all applicable standards and requirements.

5.0221 Encroachment Categories

Right-of-Way Encroachments are classified into four categories:

1. Major Encroachments
    a. Encroachments that require some degree of engineering review or present a public safety or liability are categorized as Major Encroachments.
    b. Examples: fences and walls greater than 30 inches in height, stairs, building projections or extensions, encroachments that interfere with the pedestrian zone, and structural driveways.
2. Minor Encroachments
    a. Encroachments that may interfere with the movement of vehicles, the pedestrian access route, or the pedestrian zone are categorized as Minor Encroachments. This typically includes any obstruction placed in the furniture zone.
    b. Examples: fences and walls greater than 9 inches but less than 30 inches in height, planter boxes, low-growing vegetation, bike racks, benches, and any other encroachment that may obstruct the motion of a motor vehicle.

3. Special Encroachments

    a. Encroachments that may or may not interfere with vehicles and/or pedestrians but have been identified as requiring a permit to occupy the public Right-of-Way are categorized as Special Encroachments.

    b. Examples: painted intersections, parklets, and sidewalk cafes.

4. Exempt Encroachments

    a. Encroachments that would have a minor impact on the present or planned use of the public right-of-way, easement, or public property are categorized as Exempt Encroachments.

    b. Examples: mailboxes and their enclosing structures (subject to post office regulations), planter boxes in the frontage zone no greater than eight feet in length and three inches in height, irrigation and low voltage illumination, temporary signs and banners, lawns and plants that do not obstruct movement or visibility for pedestrians, bicyclists, and motorists.

    c. These encroachments are not exempt if they create a line-of-sight traffic hazard or conflict with the Public Right-of-Way Accessibility Guidelines (PROWAG).

The City Engineer will determine the appropriate category for all proposed encroachments not listed above.

END OF SECTION

STANDARD DRAWINGS

TABLE OF CONTENTS

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT TO BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OREGON STANDARD DRAWING NUMBER	OREGON STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD317	CULVERT EMBANKMENT PROTECTION AND RIPRAP PADS	NO EXCEPTION TAKEN
RD335	STANDARD STORM SEWER MANHOLE	NO MANHOLE STEPS
RD339	PIPE TO STRUCTURE CONNECTIONS	NO EXCEPTION TAKEN
RD340	STORM SEWER POLLUTION CONTROL MANHOLE	NO MANHOLE STEPS
RD344	STANDARD MANHOLE BASE SECTION	NO EXCEPTION TAKEN
RD345	PIPE TO MANHOLE CONNECTIONS	NO EXCEPTION TAKEN
RD360	MANHOLE FRAME ADJUSTMENT	CIRCULAR CUT
RD363	GUTTER TRANSITION AT INLET	NO EXCEPTION TAKEN
RD366	CONCRETE INLETS TYPE CG-1, CG-2	UNLESS OTHERWISE SHOWN ON PLANS, SUMP REQUIRED ON ALL INLETS
RD370	DITCH INLET TYPE D	NO EXCEPTION TAKEN
RD372	CONCRETE INLET TOP, OPTION 1 TYPE CG-3	NO EXCEPTION TAKEN
DET1300	SEDIMENTATION MANHOLE	NO EXCEPTION TAKEN
DET1302	POLLUTION CONTROL MANHOLE	NO EXCEPTION TAKEN

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED MUST NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

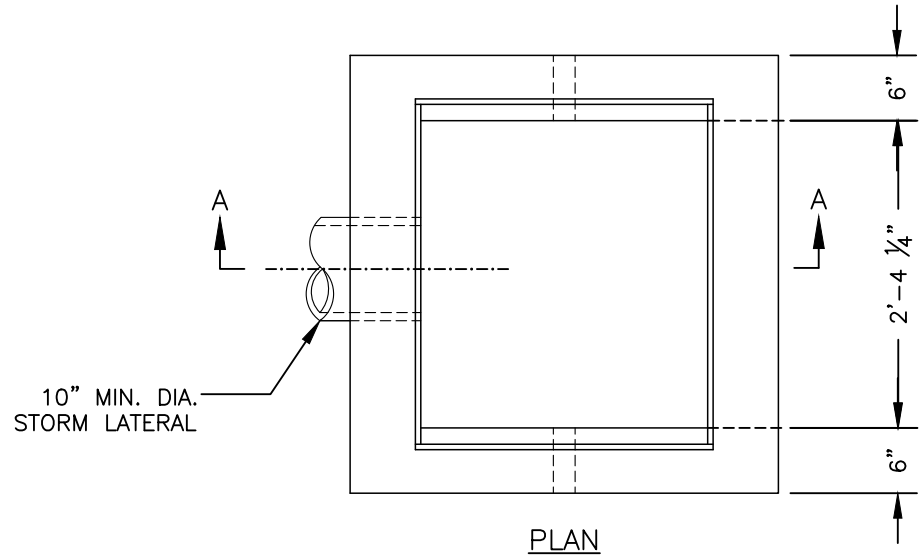
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

ACCEPTABLE OREGON STANDARD DRAWINGS, STORM

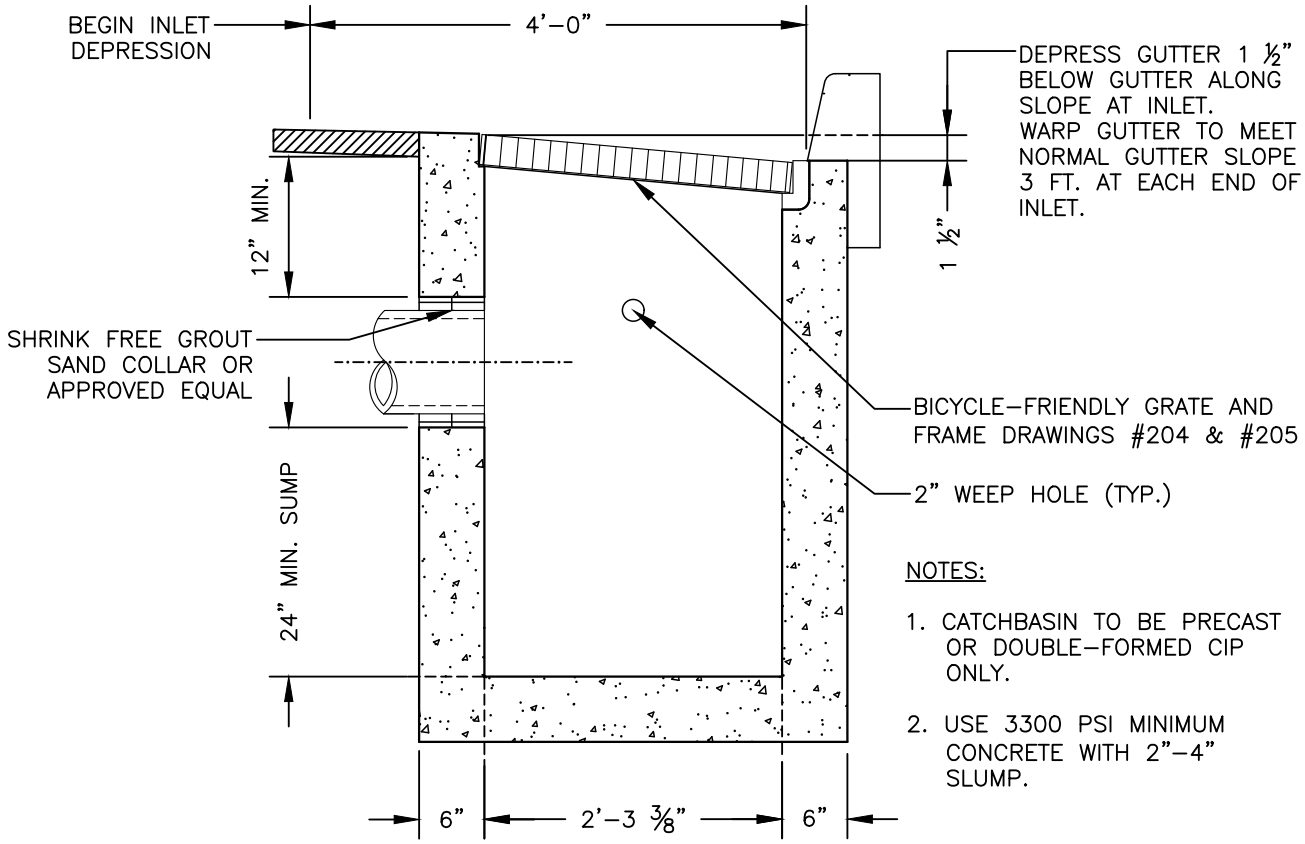
DRAWING NO. 200

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/18	TAP
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
3	ADDED RD 366	11/23	BB



PLAN



SECTION A–A

NOTES:

1. CATCHBASIN TO BE PRECAST OR DOUBLE–FORMED CIP ONLY.
2. USE 3300 PSI MINIMUM CONCRETE WITH 2"–4" SLUMP.

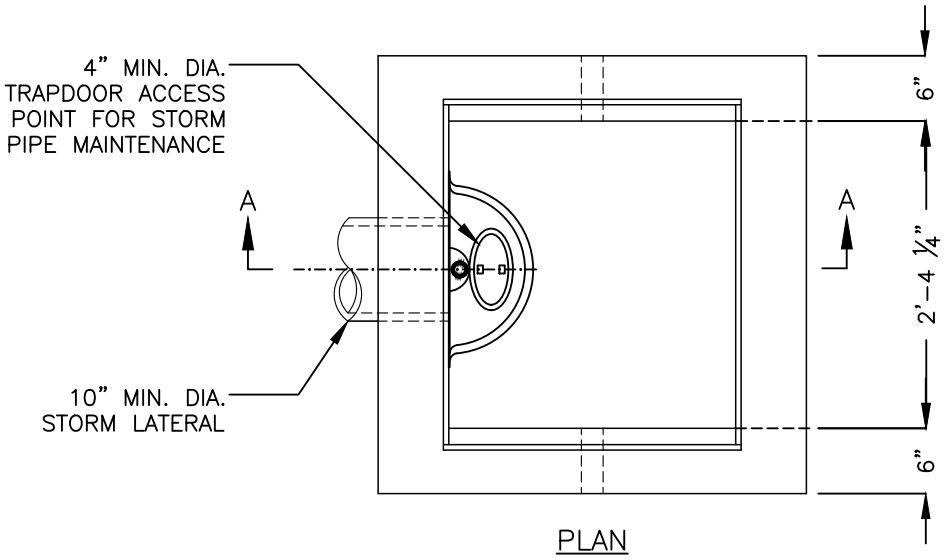
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G–2 Catchbasin

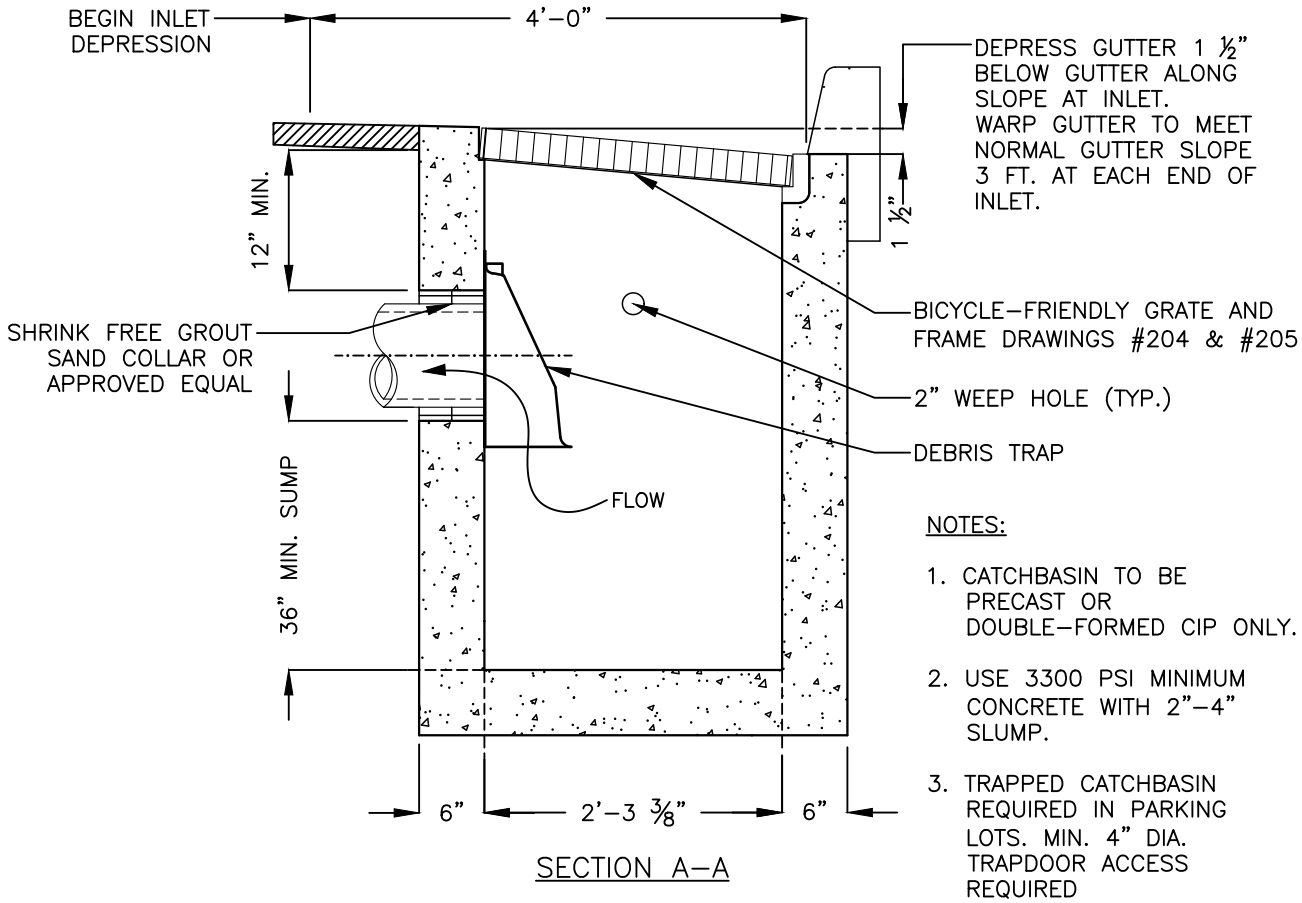
DRAWING NO. 201

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	RENUMBERED DRAWING	11/18	TAP
3	RENUMBERED DRAWING	08/19	TAP
4	NOTE CHANGES	11/23	BB



PLAN



SECTION A-A

NOTES:

1. CATCHBASIN TO BE PRECAST OR DOUBLE-FORMED CIP ONLY.
2. USE 3300 PSI MINIMUM CONCRETE WITH 2"-4" SLUMP.
3. TRAPPED CATCHBASIN REQUIRED IN PARKING LOTS. MIN. 4" DIA. TRAPDOOR ACCESS REQUIRED

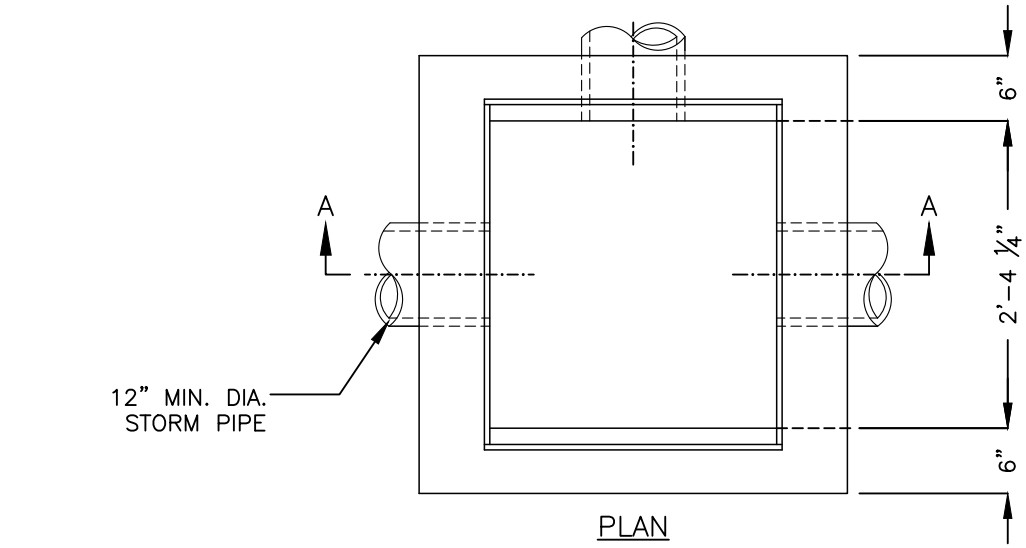
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Trapped Catchbasin

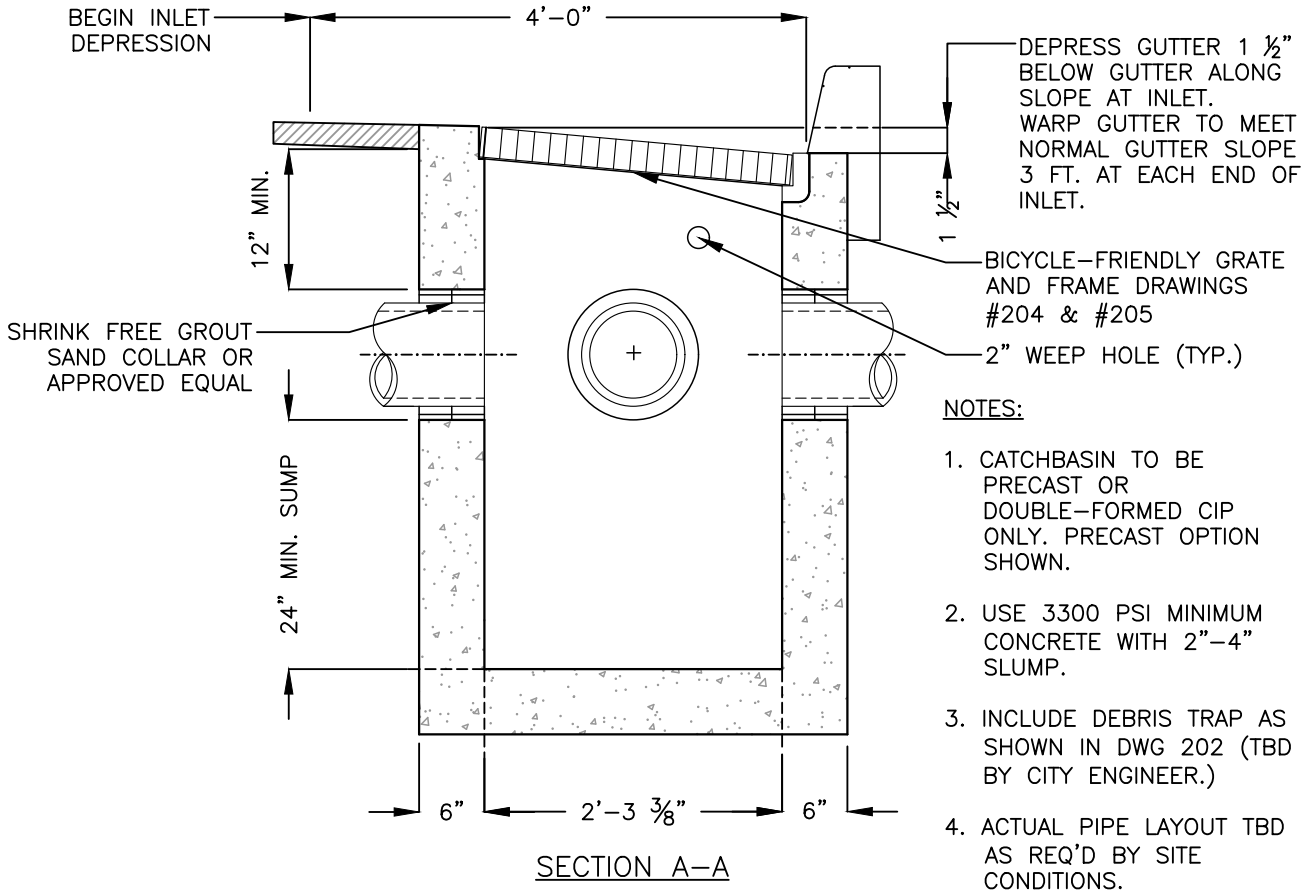
DRAWING NO. 202

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	RENUMBERED DRAWING, ADDED NOTE	11/18	TAP
3	RENUMBERED DRAWING	08/19	TAP
4	NOTE CHANGES	11/23	BB



PLAN



SECTION A-A

NOTES:

1. CATCHBASIN TO BE PRECAST OR DOUBLE-FORMED CIP ONLY. PRECAST OPTION SHOWN.
2. USE 3300 PSI MINIMUM CONCRETE WITH 2"-4" SLUMP.
3. INCLUDE DEBRIS TRAP AS SHOWN IN DWG 202 (TBD BY CITY ENGINEER.)
4. ACTUAL PIPE LAYOUT TBD AS REQ'D BY SITE CONDITIONS.

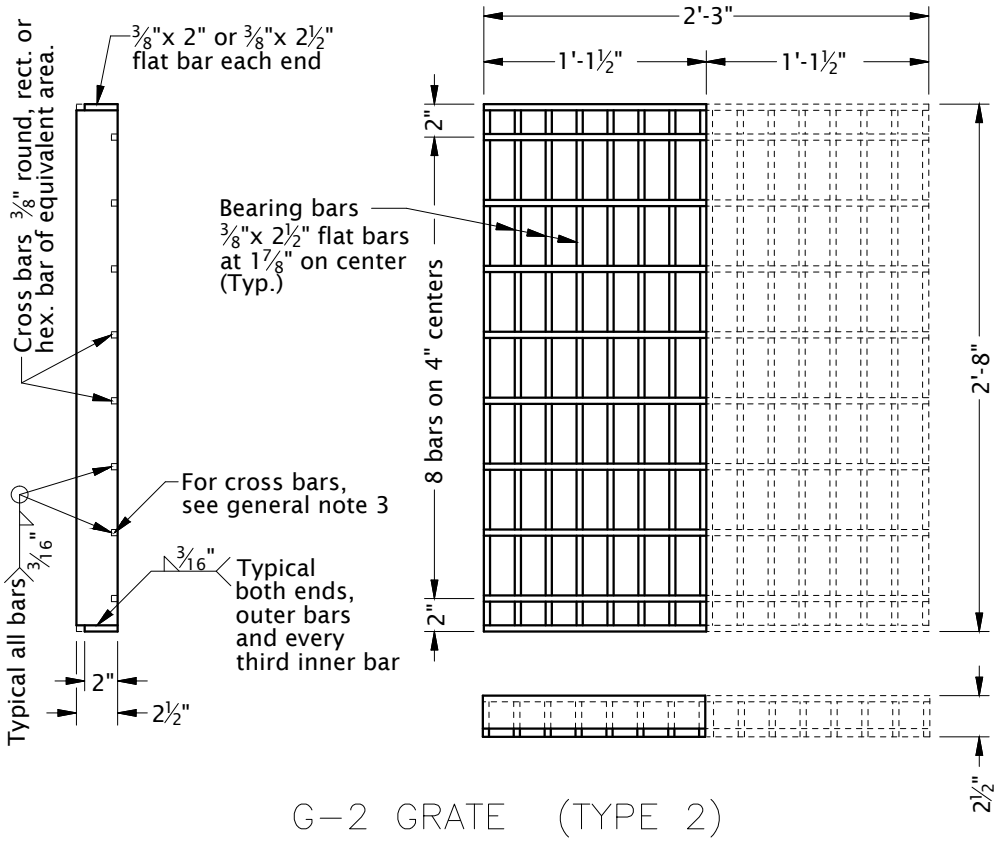
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Catchbasin Flow Through

DRAWING NO. 203

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	ADJUST MIN. PIPE SIZE, FORMATTING	12/10	MCP
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
3	NOTES CHANGED	11/23	BB



G-2 GRATE (TYPE 2)

(Bicycle-friendly)
(2 grates required per inlet, as shown)

NOTES:

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STANDARD DRAWING (S).
2. 3/8" CROSS BARS MUST BE FLUSH WITH THE TOP OF GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
3. HOT DIP GALVANIZE AFTER FABRICATION.

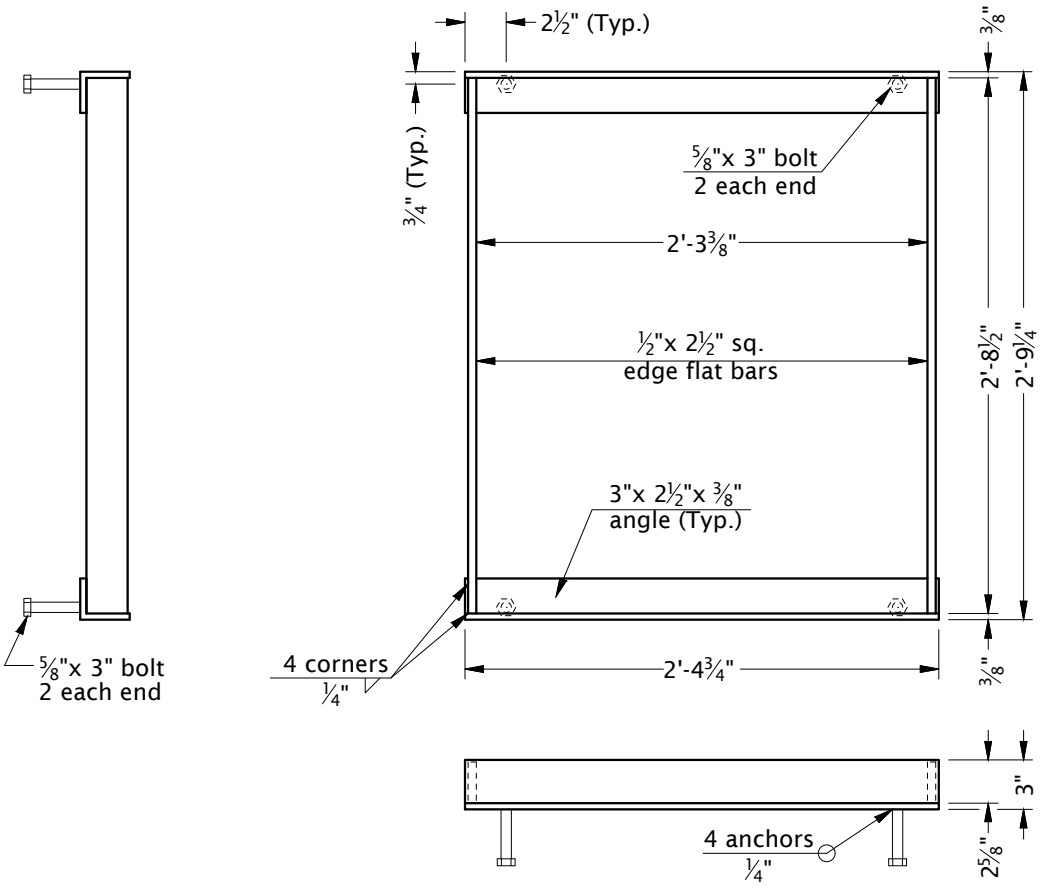
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Catchbasin Grate

DRAWING NO. 204

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	DRAWING RENUMBERED	11/18	TAP
3	DRAWING RENUMBERED, NOTE CHANGED	08/19	TAP
4	NOTE CHANGED	11/23	BB



G-2 FRAME

NOTES:

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STANDARD DRAWING (S).
2. 3/8" CROSS BARS MUST BE FLUSH WITH THE TOP OF GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
3. HOT DIP GALVANIZE AFTER FABRICATION.

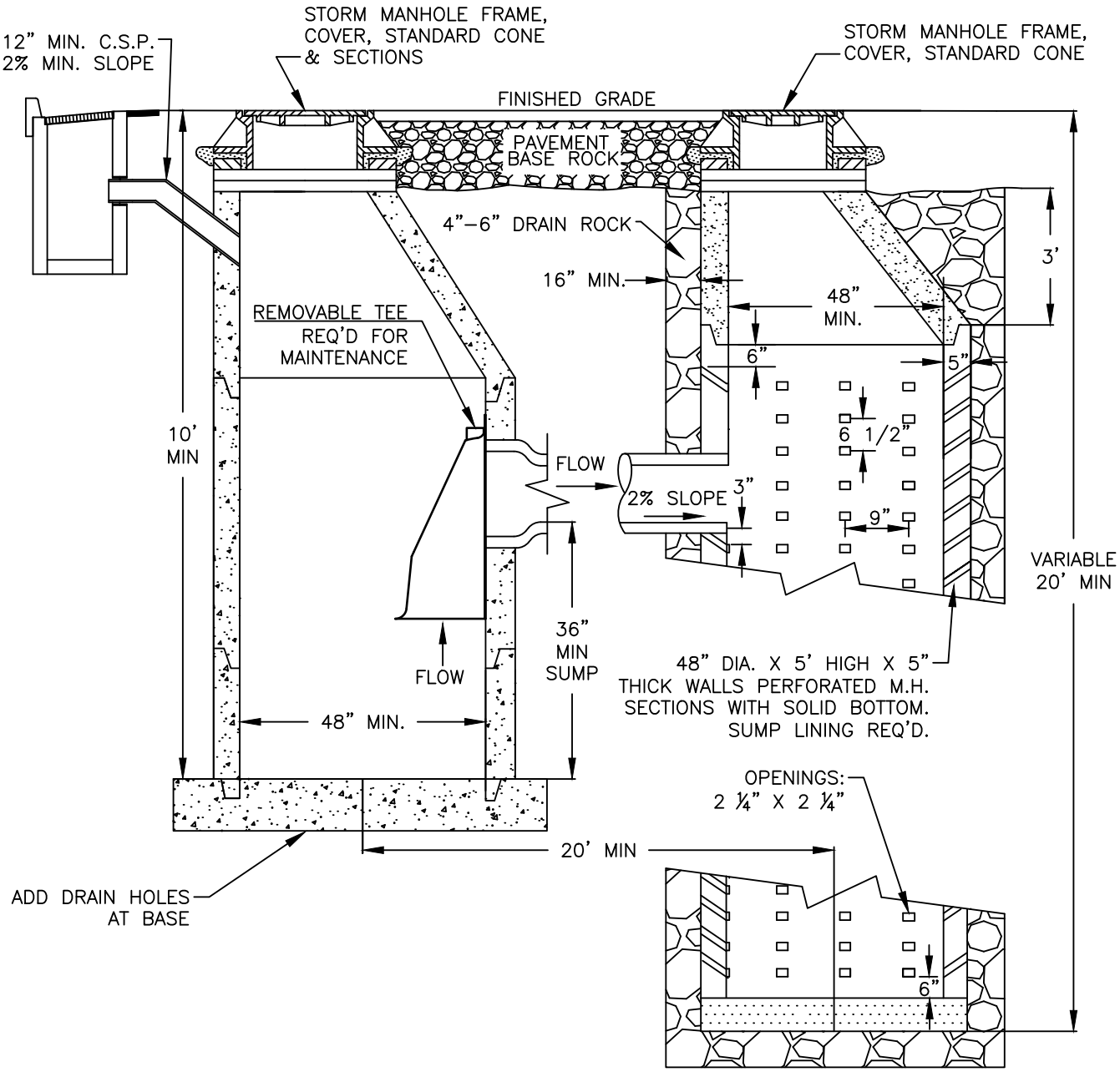
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Catchbasin Frame

DRAWING NO. 205

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	RECREATED DRAWING	12/10	MCP
2	DRAWING RENUMBERED	11/18	TAP
3	DRAWING RENUMBERED, NOTE CHANGED	08/19	TAP



INFILTRATION TESTS BY A QUALIFIED SOILS ENGINEER MUST VERIFY DEPTH AND SUITABILITY OF SUMP INSTALLATION.

SEE SPECIFICATIONS FOR BEDDING AND PIPE ZONE MATERIAL.

THIS DETAIL REQUIRED FOR DRAINAGE OF IMPERVIOUS SURFACE WITH AREA GREATER THAN 2500 SQ. FT.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

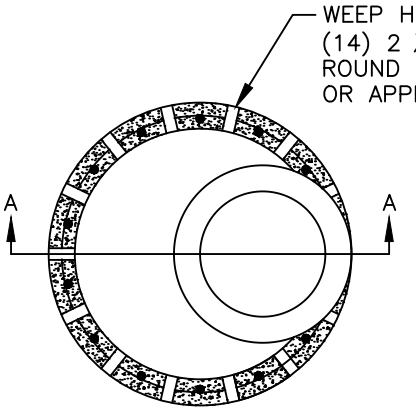
Sedimentation Manhole Drywell

DRAWING NO. 206

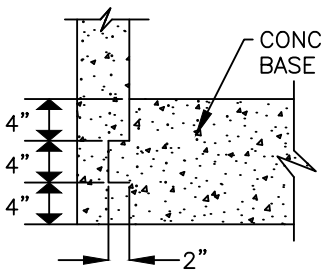
APPROVED 03/2024

CITY ENGINEER DATE

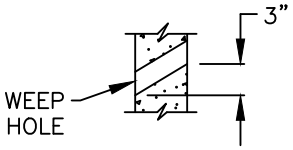
NO.	REVISIONS	DATE	BY
4	ADDED NOTE REGARDING DRAIN HOLE	11/18	TAP
5	RENUMBERED DRAWING, NOTE UPDATED	08/19	TAP
6	CHANGED DRAWING ORIENTATION	11/23	TAP



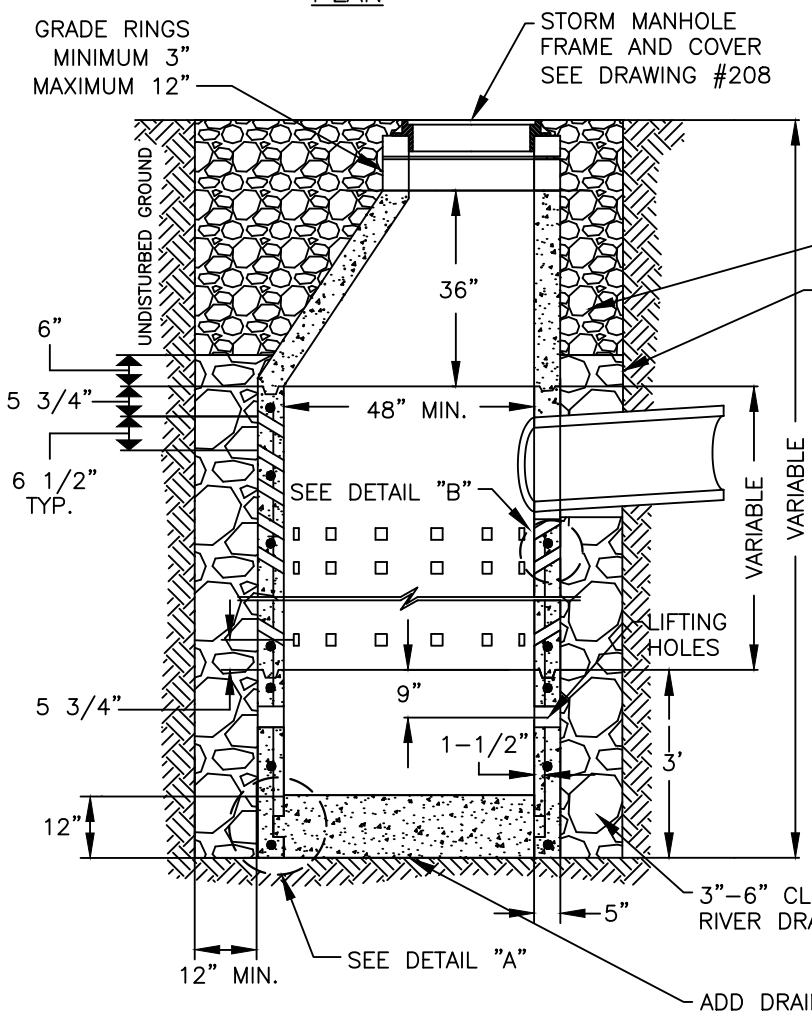
PLAN



DETAIL "A"



DETAIL "B"



SECTION A-A

NOTES:

1. ALL PRECAST SECTIONS MUST CONFORM TO REQUIREMENTS OF ASTM C 478.

2. INVERT MUST BE LEVEL AND SMOOTH.

3. PROVIDE A MIN. OF 6" OF 1"-0" OR 3/4"-0" CLEAN CRUSHED ROCK UNDER ALL PIPES.

4. USE OF THIS SUMP TO INCLUDE TRAPPED CATCH BASIN AND REQUIRES CITY APPROVAL.

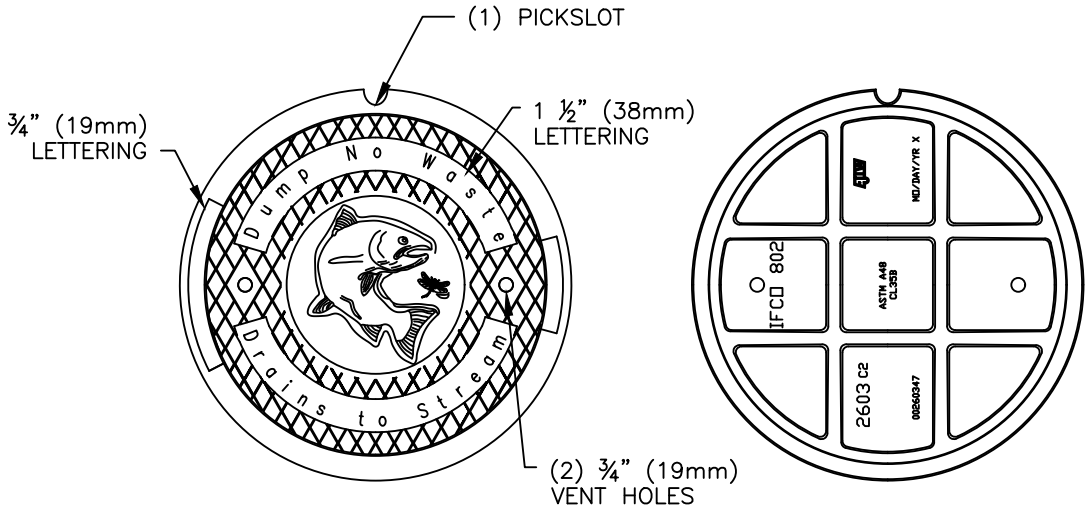
CITY OF MILWAUKIE, OREGON - PUBLIC WORKS DEPT.

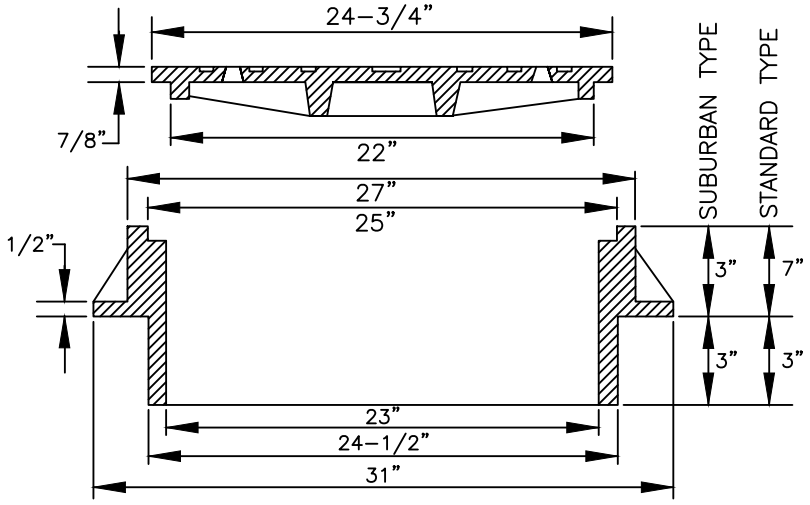
Drywell - Right-of-Way

DRAWING NO. 207

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
5	DRAWING NUMBER CHANGED, ADDED NOTE	11/18	TAP
6	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
7	UPDATED NOTES	11/23	TAP





NOTES:

1. USE SUBURBAN TYPE ONLY IN NON–TRAFFIC AREAS, AND ONLY WITH APPROVAL BY THE CITY.
2. COVER AND FRAME TO BE GRAY CAST IRON ASTM A–48 CLASS 30.
3. COVER AND FRAME TO BE MACHINED TO A TRUE BEARING ALL AROUND.
4. NOTCH COVER FOR LIFTING HOOK.

COVER MAY BE PURCHASED FROM THE CITY'S MANUFACTURER, OLYMIC FOUNDERY.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

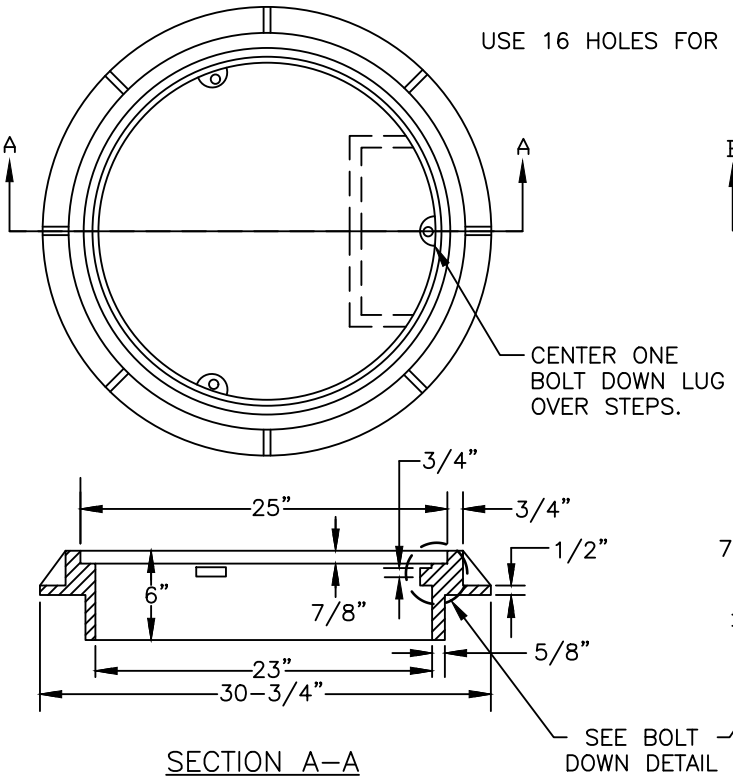
Storm Manhole Frame and Cover

DRAWING NO. 208

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

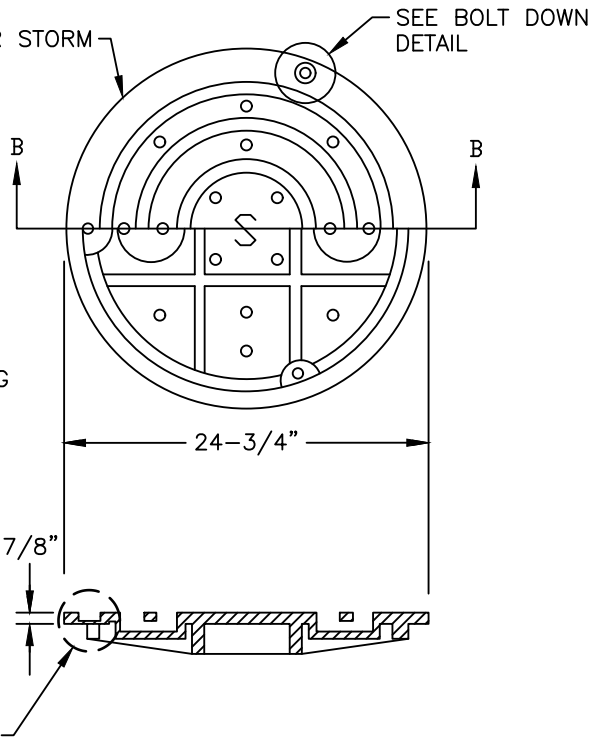
NO.	REVISIONS	DATE	BY
4	CHANGED DRAWING NUMBER	11/18	TAP
5	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP
6	NOTES CHANGED	11/23	BB

TAMPERPROOF MANHOLE RING

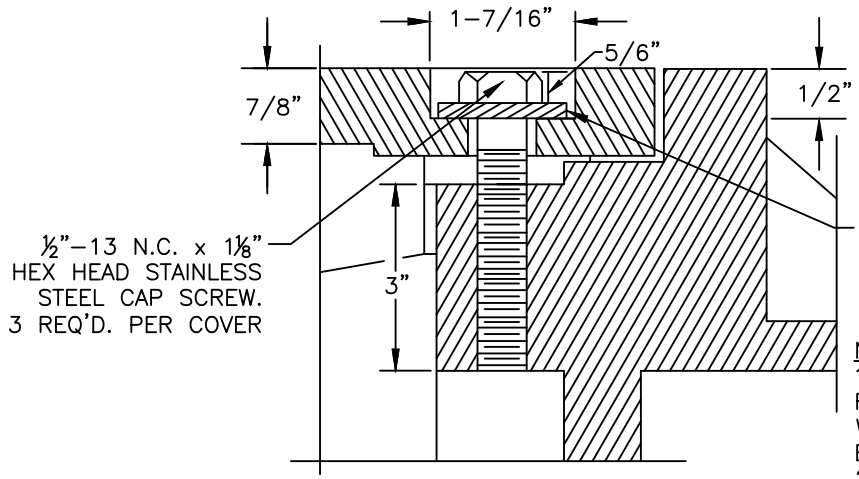


SECTION A–A

3–BOLT DOWN COVER



SECTION B–B



BOLT–DOWN DETAIL

NOTES:
1. TAMPER PROOF COVER REQUIRED ON STORM MANHOLES WITHIN UNINCORPORATED EASEMENTS AND RIGHTS–OF–WAY.
2. COVER AND FRAME TO BE MACHINED FOR TRUE BEARING.
3. MATERIAL TO BE GREAT CAST IRON ASTM A–48 CLASS 30.

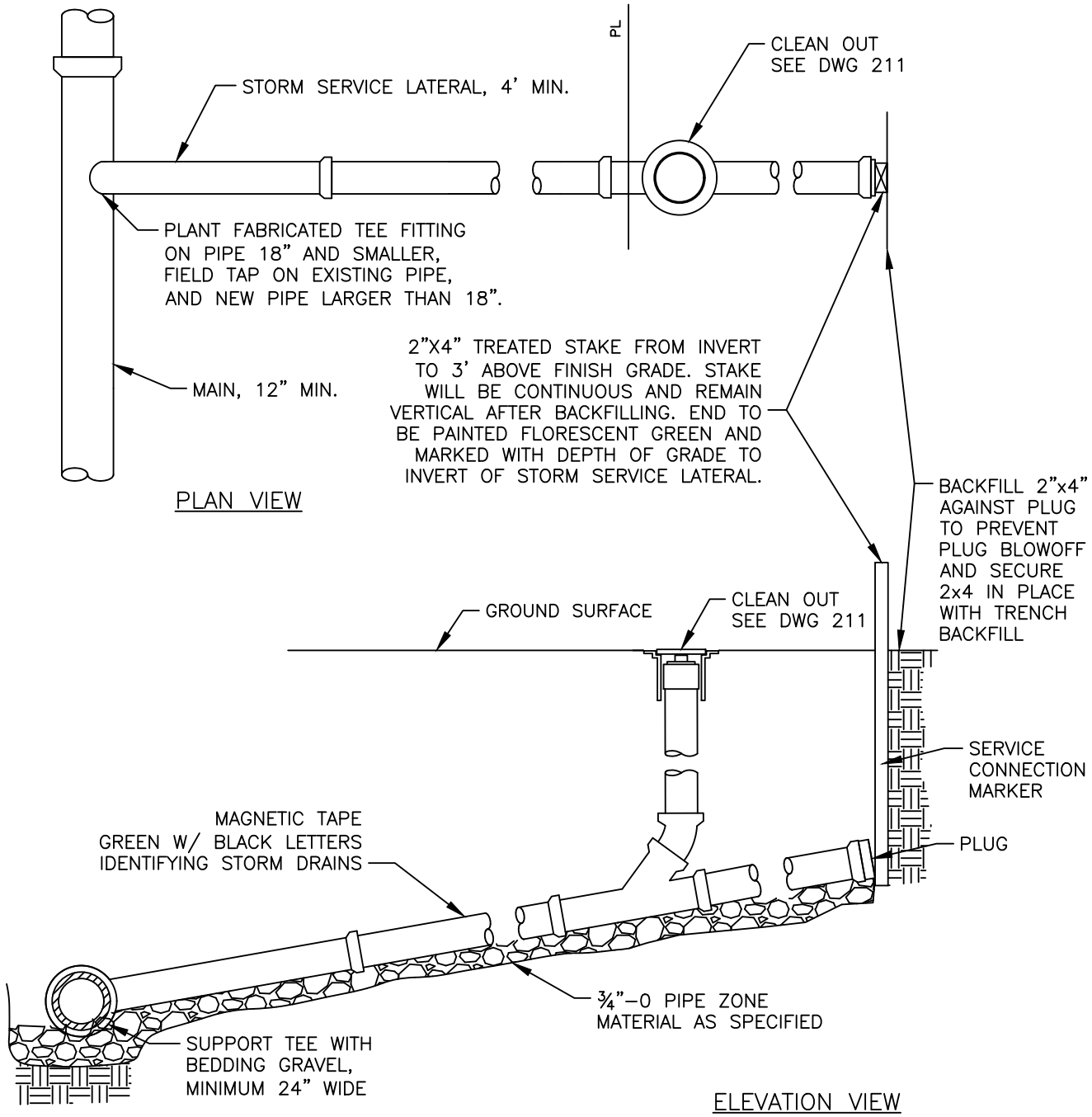
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Storm Manhole Tamperproof Cover

DRAWING NO. 209

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	CHANGED DRAWING NUMBER	11/18	TAP
3	TITLE AND NOTE CHANGE, RENUMBERED	08/19	TAP
4	TITLE CHANGE, ADDED NOTES	11/23	BB



NOTE: HOUSE SERVICE LATERALS MAY BE CONNECTED TO MAIN TRUNK ONLY IF TRUNK LINE OUTFALLS TO A REGIONAL WATER QUALITY FACILITY. THE CONNECTION WILL BE REVIEWED AND APPROVED BY THE CITY ENGINEER.

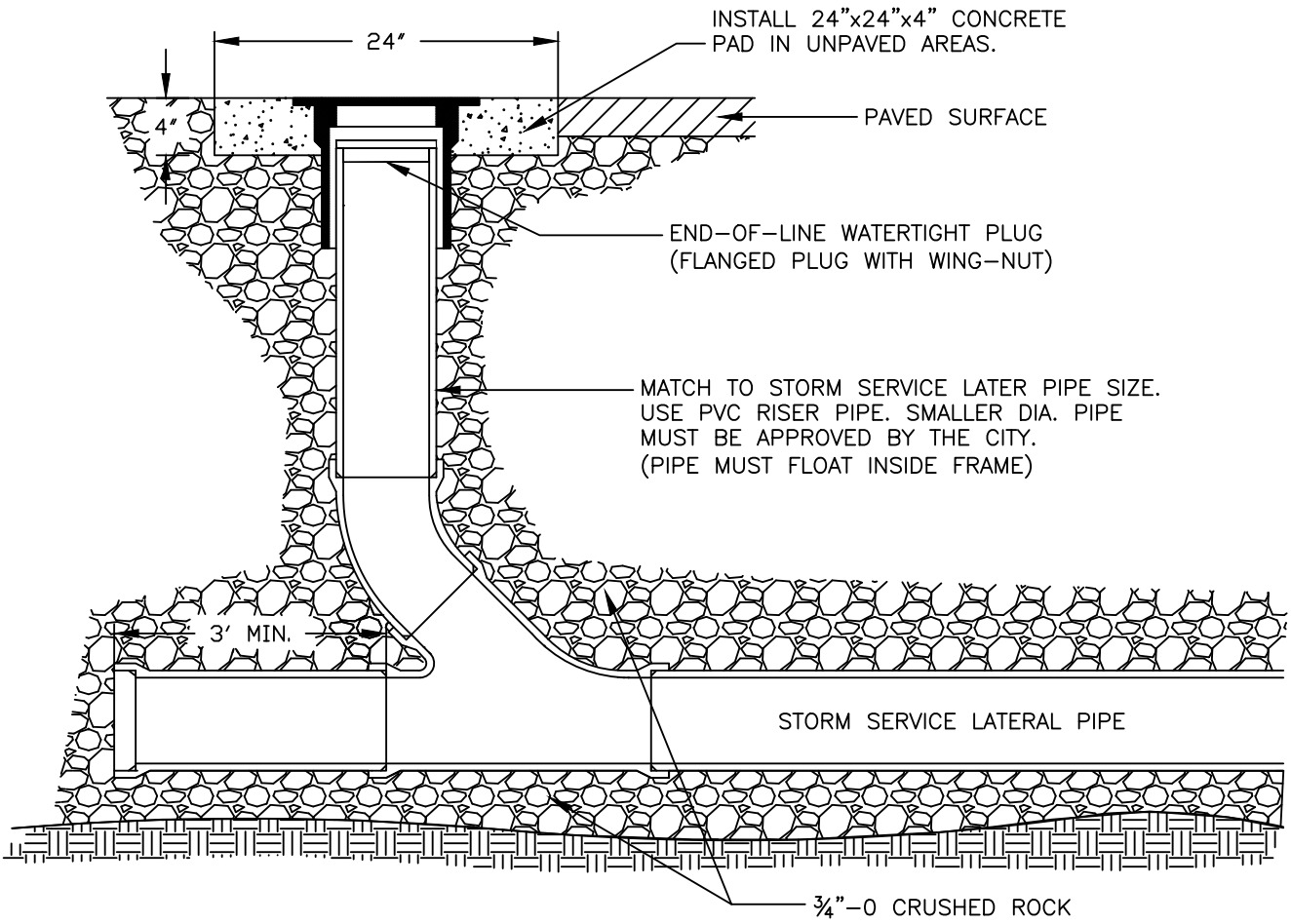
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

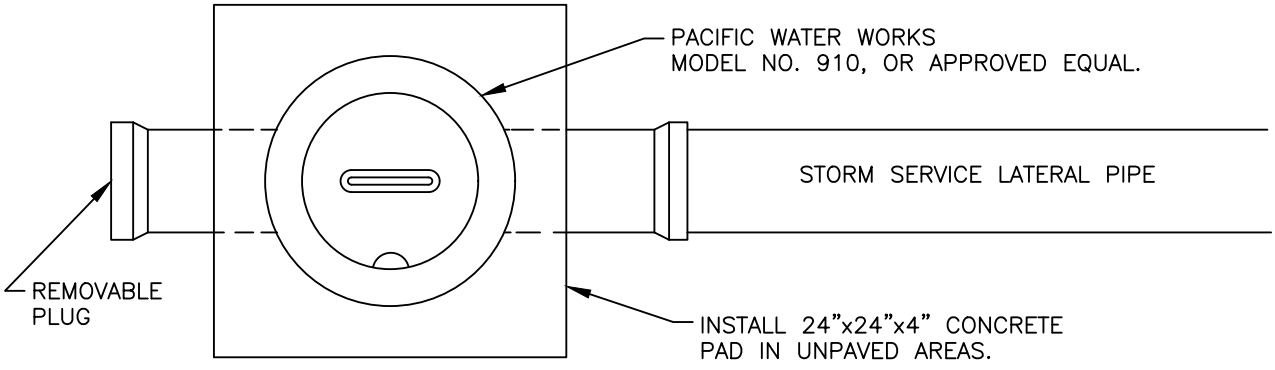
Storm Lateral Connection

DRAWING NO. 210

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	CHANGED DRAWING NUMBER	11/18	TAP
4	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP
5	ADDED AND CLARIFIED NOTES	11/23	BB





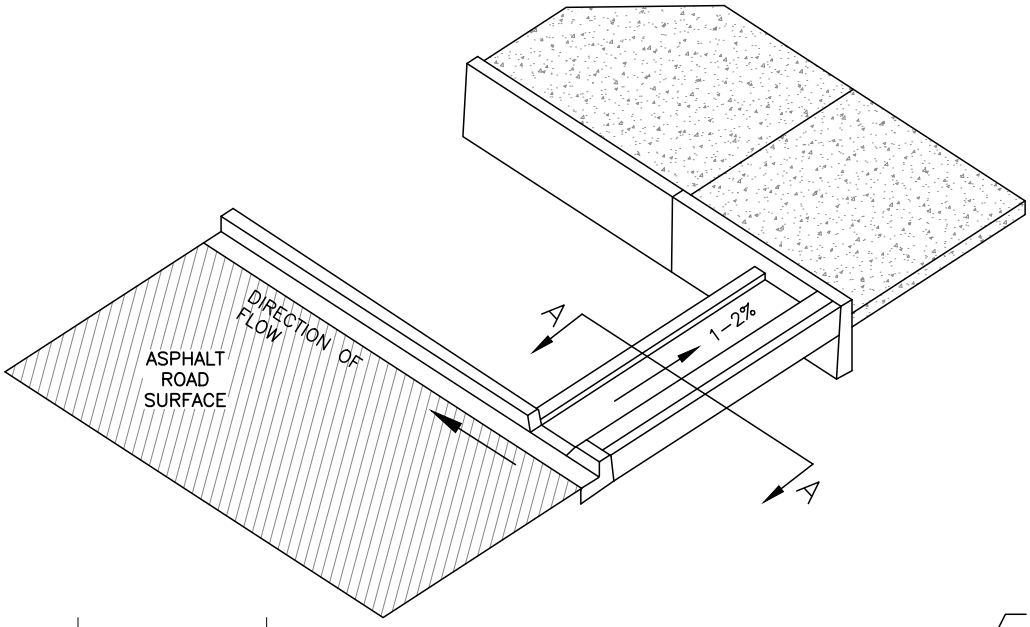
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

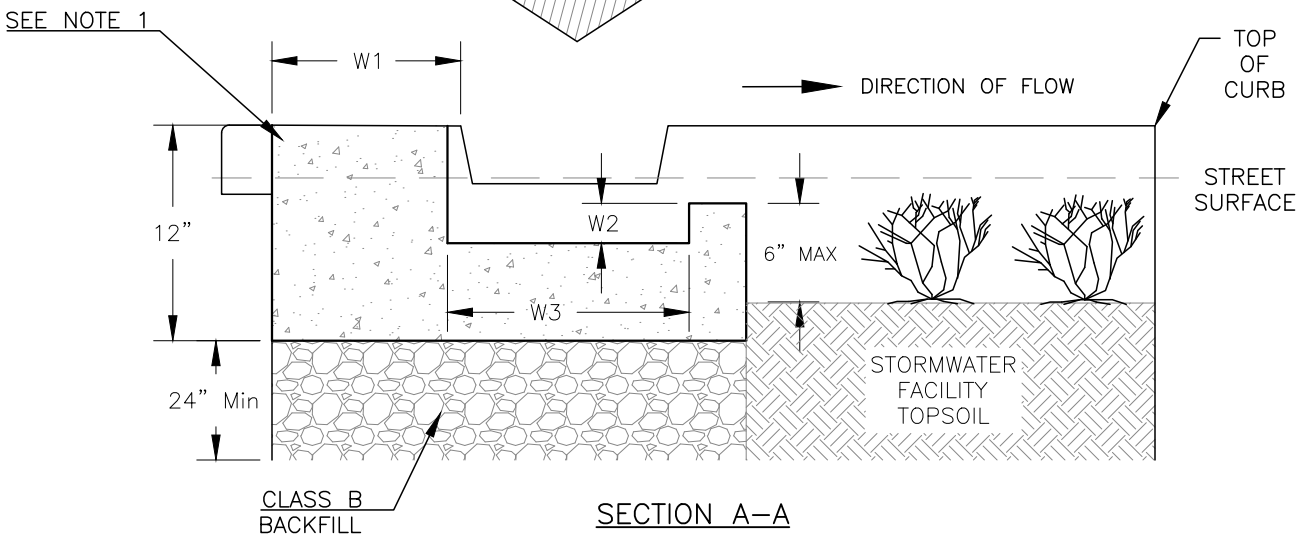
Storm Lateral Cleanout

DRAWING NO. 211

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	CHANGED DRAWING NUMBER	11/18	TAP
3	RENUMBERED DRAWING	08/19	TAP
4	CHANGED NOTES	11/23	BB





SECTION A–A

NOTES:

1. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
2. DIMENSION (W1) IS DISTANCE BETWEEN START OF THE PLANTER AND THE CURB OPENING. IF VALUE IS 3 FEET OR GREATER, THEN FOREBAY WILL NOT BE CONNECTED TO THE UPSTREAM END OF THE PLANTER.
3. DIMENSIONS (W3) WILL BE 6" WIDER THAN THE WIDTH OF THE CURB OPENING.
4. W2 WILL BE 2" ON ROADS WITH DEVELOPED CURBLINE, AND 4" ON ROADS WITH UNDEVELOPED ROAD SHOULDER.
5. IN RETROFIT APPLICATIONS FOREBAY WILL BE ATTACHED TO RAIN GARDEN WALLS WITH EPOXY SECURED #4 REBAR.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Sedimentation Forebay

DRAWING NO. 212

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	12/14	AJR
2	DRAWING NUMBER CHANGED	11/18	TAP
3	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT TO BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OSSC STANDARD DRAWING NUMBER	OSSC STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD338	STANDARD SANITARY SEWER MANHOLE	NO MANHOLE STEPS
RD342	SHALLOW MANHOLES	NO MANHOLE STEPS
RD344	STANDARD MANHOLE BASE SECTION	NO EXCEPTION TAKEN
RD352	OUTSIDE DROP MANHOLES	NO EXCEPTION TAKEN
RD362	SANITARY CLEANOUT	NO EXCEPTION TAKEN

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED MUST NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

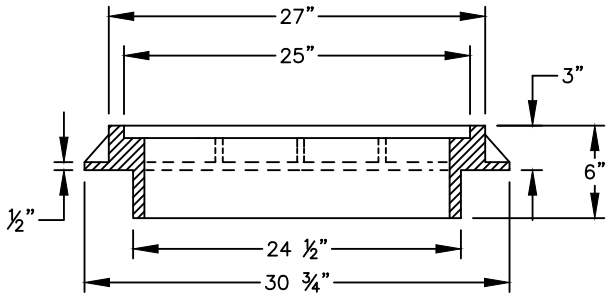
ACCEPTABLE OREGON STANDARD DRAWINGS, WASTEWATER

DRAWING NO. **300**

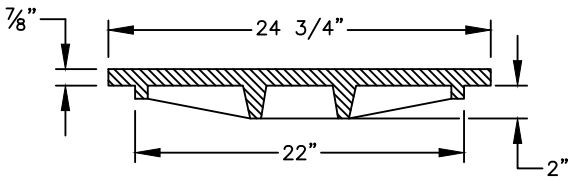
APPROVED Jennifer Garbely 03/2024

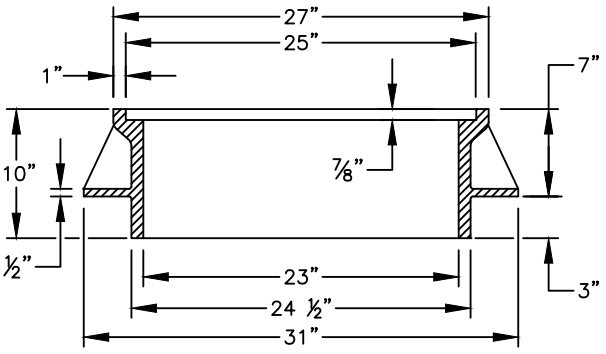
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/18	TAP
2	NOTE CHANGED	08/19	TAP



CAST IRON SUBURBAN FRAME
APPROX. WT. – 305 LBS





CAST IRON STANDARD FRAME
APPROX. WT. – 387 LBS

NOTES:

1. COVER AND FRAME TO BE MACHINED FOR TRUE BEARING.
2. MATERIAL TO BE GREY CAST IRON ASTM A–48 CLASS 30.
3. SUBURBAN FRAMES ARE ONLY AUTHORIZED TO BE USED IN NON–VEHICULAR AREAS.

LIDS MAY BE PURCHASED FROM THE CITY OR THE MANUFACTURER

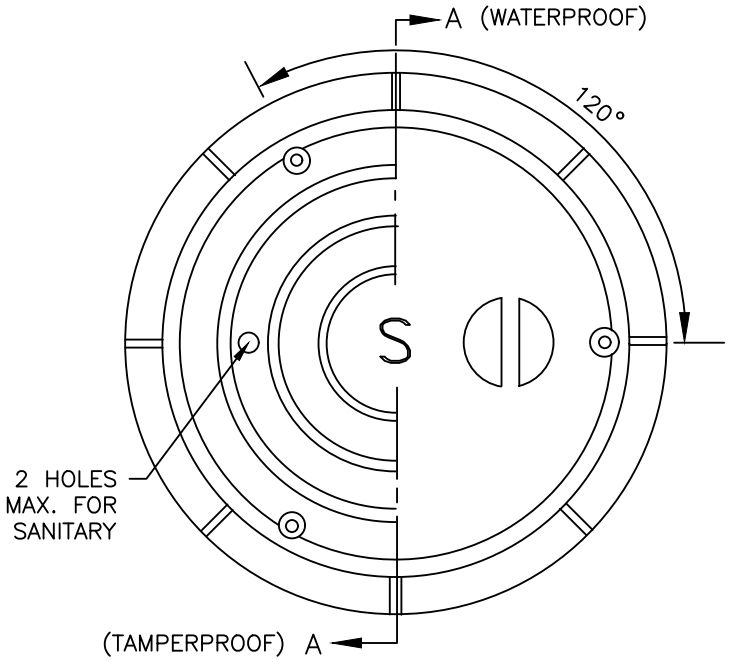
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

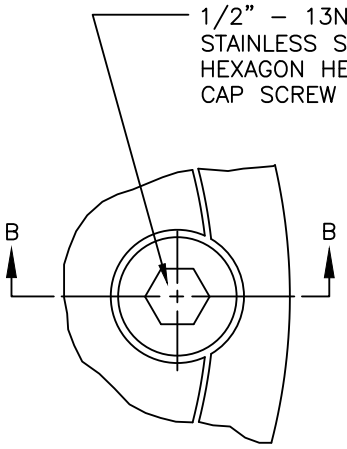
Wastewater Manhole Frame and Cover

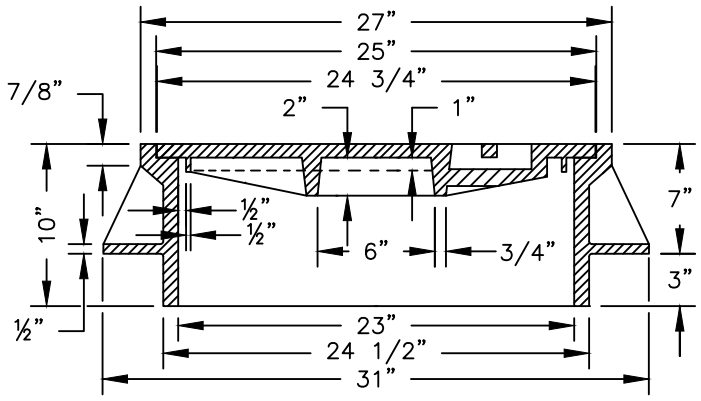
DRAWING NO. 301

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
4	DRAWING NO. CHANGE	11/18	TAP
5	NOTE CHANGED	08/19	TAP
6	TITLES CHANGED	11/23	TAP

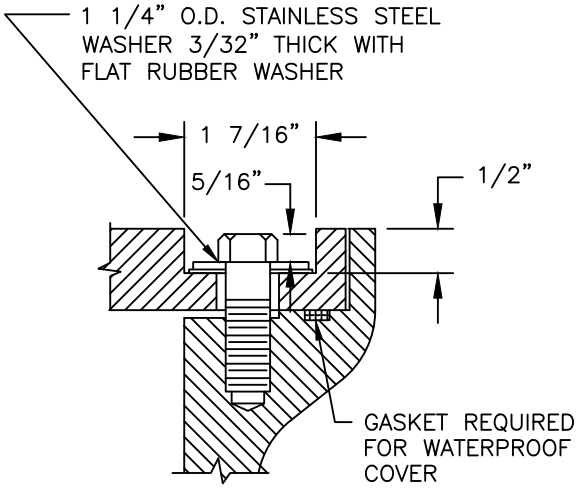






(FRAMES AVAILABLE IN STANDARD OR SUBURBAN)

SECTION A–A



SECTION B–B

NOTES:

1. TAMPER PROOF COVERS REQUIRED ON WASTEWATER MANHOLES LOCATED WITHIN UNIMPROVED EASEMENTS AND RIGHT–OF–WAY.
2. WATER TIGHT COVERS REQUIRED IF LOCATED WHERE COVER MAY BE SUBMERGED.
3. COVER AND FRAME TO BE MACHINED FOR TRUE BEARING.
4. MATERIAL TO BE GREY CAST IRON ASTM A–48 CLASS 30.

LIDS MAY BE PURCHASED FROM THE CITY OR THE MANUFACTURER

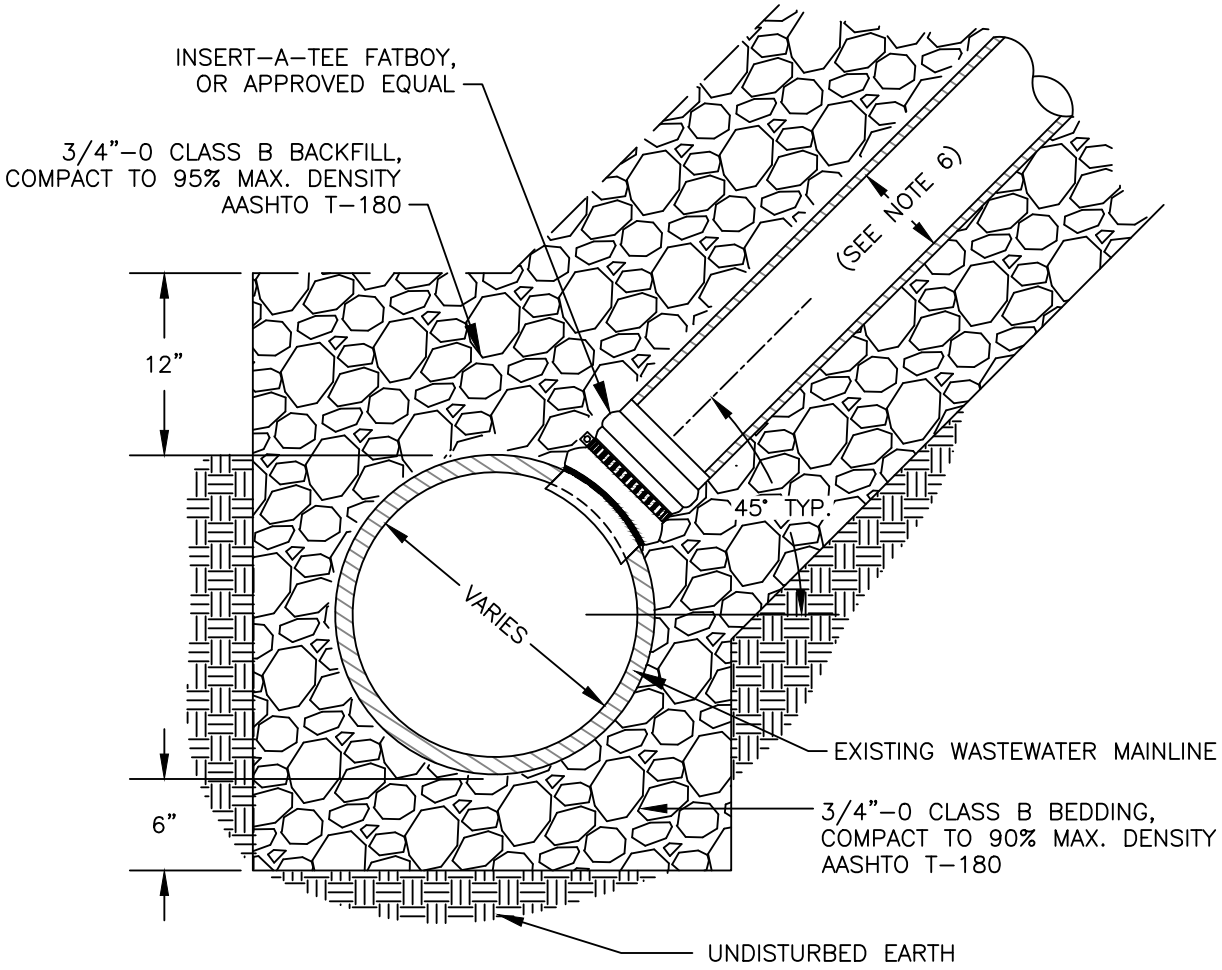
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Waterproof and Tamperproof Frame and Cover

DRAWING NO. 302

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
4	DRAWING NO. CHANGE	11/18	TAP
5	NOTE CHANGED	08/19	TAP
6	NOTES CHANGED	11/23	TAP



NOTES:

1. THE WASTEWATER TAP MUST NOT BE MADE EXCEPT IN THE PRESENCE OF A CITY INSPECTOR NOR SHALL ANY CONNECTION BE MADE WITHOUT CITY APPROVAL.
2. HOLE IN MAIN TO BE MACHINE DRILLED AND CORED.
3. AN INSERT–A–TEE FATBOY OR APPROVED EQUAL TO BE USED. HDPE ELECTROFUSION TEE OR WYE IS REQUIRED ON HDPE WASTEWATER MAINLINES.
4. WASTEWATER TAP TO BE ABOVE SPRINGLINE.
5. 4" MAXIMUM TAP FOR 8" MAIN WITH APPROVED COUPLERS (CUT–IN TEE TO BE USED FOR 6" HOUSE BRANCH ON 8" MAIN)
6. 4" HOUSE BRANCH MAY BE USED FOR SINGLE FAMILY LOTS ONLY. MINIMUM INSIDE DIAMETER MUST BE EQUAL TO THE BUILDING'S SEWER DIAMETER.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Wastewater Connection

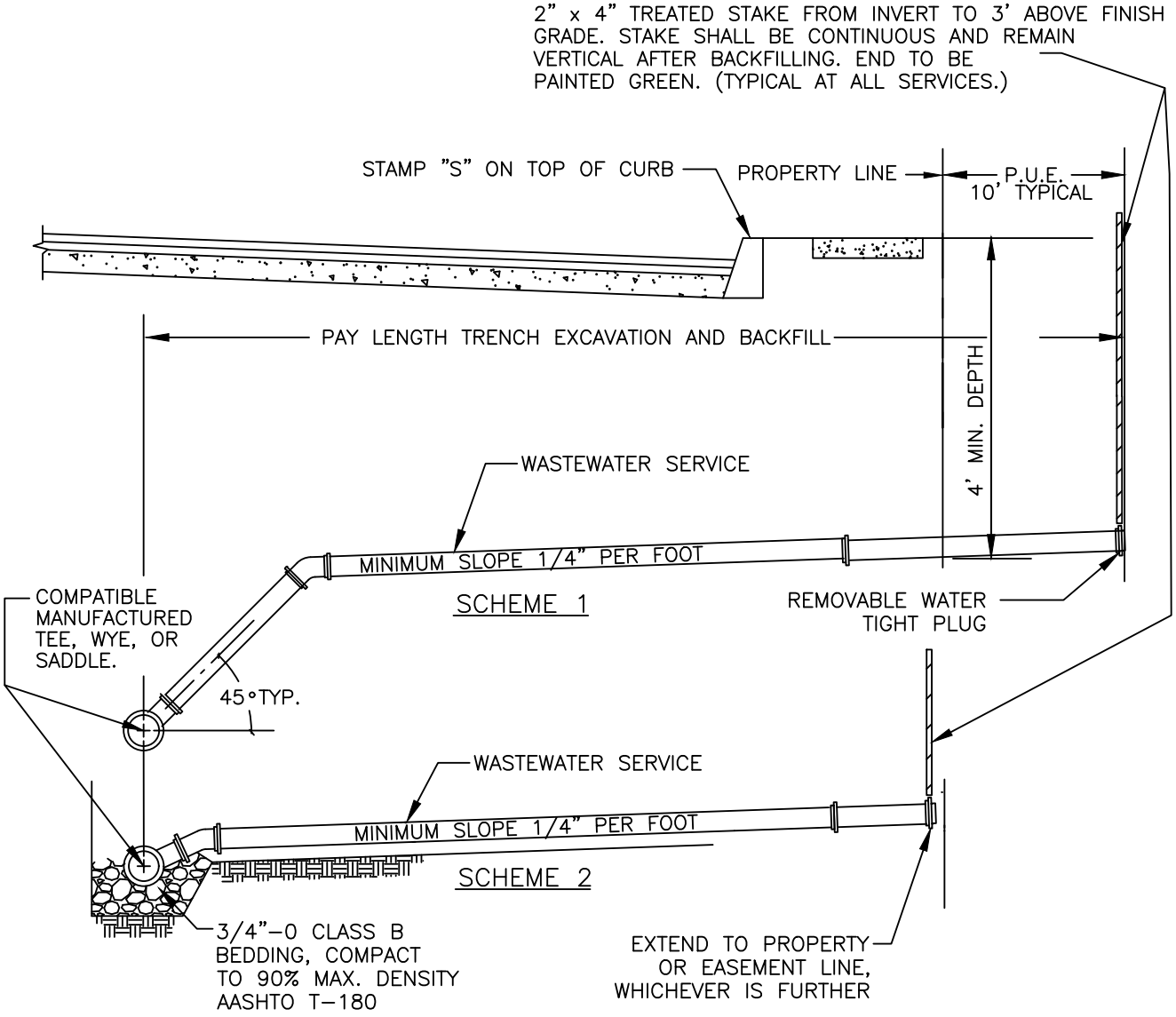
DRAWING NO. 303

APPROVED

CITY ENGINEER

03/2024
DATE

NO.	REVISIONS	DATE	BY
5	DRAWING NO. CHANGE	11/18	TAP
6	TITLE AND NOTE CHANGED	08/19	TAP
7	TITLE, NUMBER AND NOTE CHANGED	11/23	TAP



NOTES:

1. SCHEME AND DEPTH FOR HOUSE SERVICE TO BE DETERMINED IN THE FIELD BY ENGINEER.
2. SERVICE MUST NOT BE BACKFILLED PRIOR TO INSPECTION.
3. INSTALL TRACER WIRE (GREEN, 18 GAUGE, INSULATED COPPER) FROM MAINLINE TO SURFACE AT 2" x 4" STAKE.
4. ALL FITTINGS TO BE PRE-FORMED AND GASKETED.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Wastewater Service Branch

DRAWING NO. **304**

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
4	DRAWING NO. CHANGE	11/18	TAP
5	TITLE CHANGE, NOTES CHANGED	08/19	TAP
6	TITLE, NUMBER AND NOTES CHANGED	11/23	TAP

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT TO BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OREGON STANDARD DRAWING NUMBER	OREGON STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD250	THRUST BLOCKING	NO EXCEPTION TAKEN
RD262	TYPICAL MAIN DEAD–END BLOWOFF ASSEMBLY	MEGALUG RESTRAINED JOINT
RD270	COMBINATION AIR RELEASE AIR VACUUM VALVE ASSEMBLY (2" AND SMALLER)	NO EXCEPTION TAKEN
RD282	WATER SAMPLING STATION	KUPFERLE ECLIPSE 88–SS WITH "CITY OF MILWAUKIE" LOGO CAST INTO ACCESS DOOR

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED MUST NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

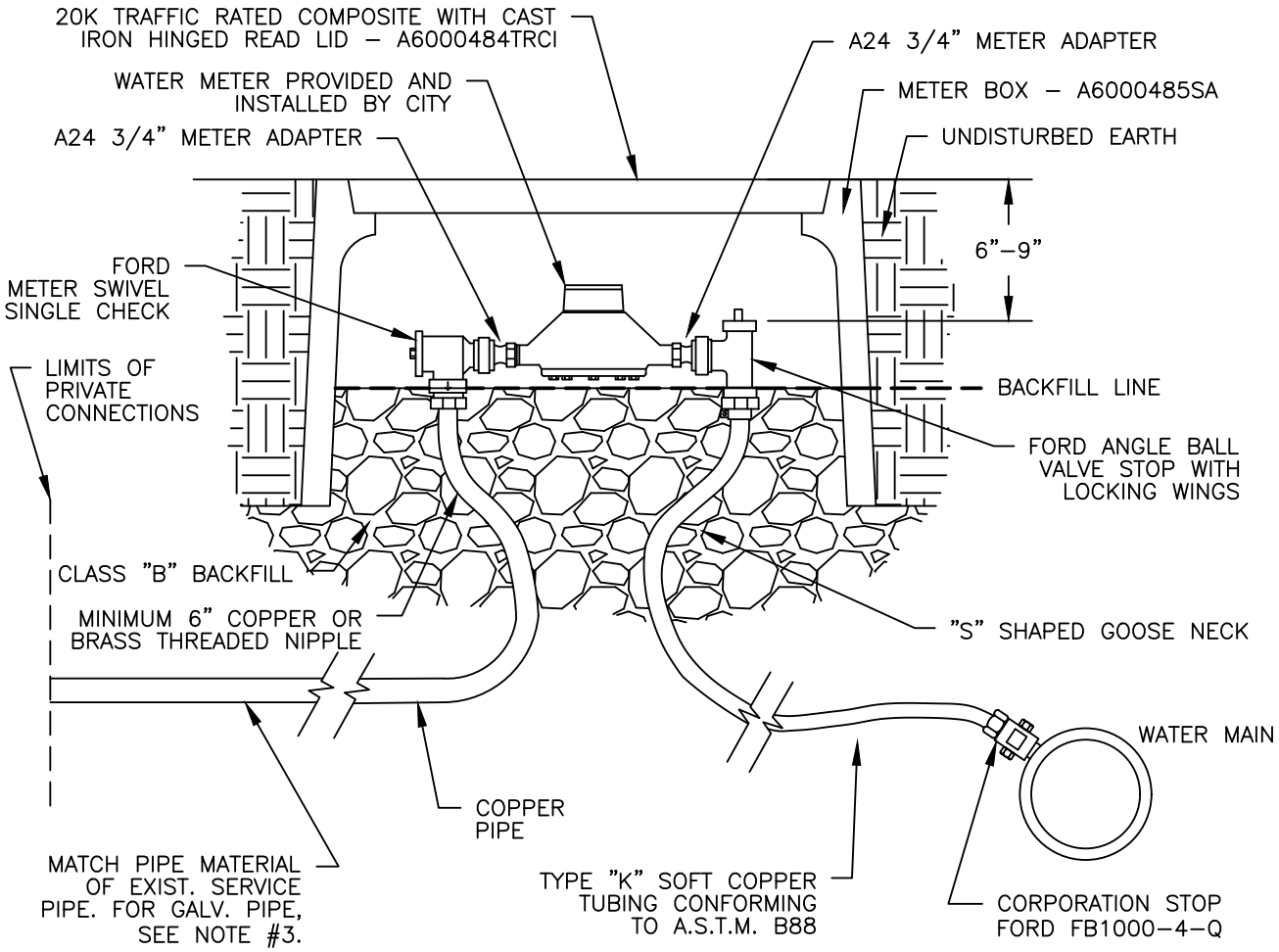
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

ACCEPTABLE OREGON STANDARD DRAWINGS, WATER

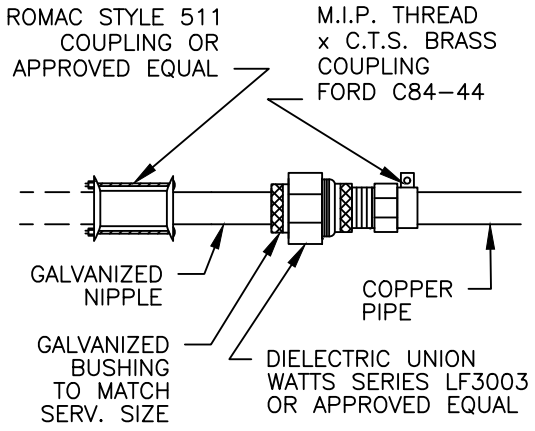
DRAWING NO. 400

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/18	TAP
2	NOTE CHANGED	08/19	TAP



UNTHREADED GALVANIZED PIPE CONNECTION:



NOTES:

1. IF COPPER TUBING CROSSES CATHODICALLY PROTECTED LINE, ENCASE COPPER IN POLYETHYLENE TUBING FOR 24" (CENTERED AT THE CROSSING LINE) AND FASTEN WITH 2" WIDE ADHESIVE TAPE THAT IS COMPATIBLE WITH POLYETHYLENE.
2. PLACE METER BOXES (1) LOCATED BEHIND THE SIDEWALK WHERE THERE IS SUFFICIENT RIGHT–OF–WAY, (2) WITHIN THE PLANTER STRIP, EXCLUDING WATER QUALITY FACILITIES, (3) WITHIN THE SIDEWALK WITH THE BACK OF THE METER BOX AT THE BACK EDGE OF THE SIDEWALK.
3. CONNECT GALVANIZED SERVICE PIPE; (1) AT EXISTING THREADED FITTING WITHIN 5 FEET OF WATER METER; (2) RETHREAD EXISTING GALVANIZED SERVICE PIPE; (3) IF EXISTING PIPE IS IN POOR CONDITION AND CANNOT BE RETHREADED, USE UNTHREADED GALVANIZED PIPE CONNECTION DETAIL.
4. IF METER BOX IS LOCATED IN THE SIDEWALK, DIELECTRIC UNION WILL BE INSTALLED (1) 6" FROM BACK OF METER INSIDE OF METER BOX, (2) BEHIND BACK OF SIDEWALK.

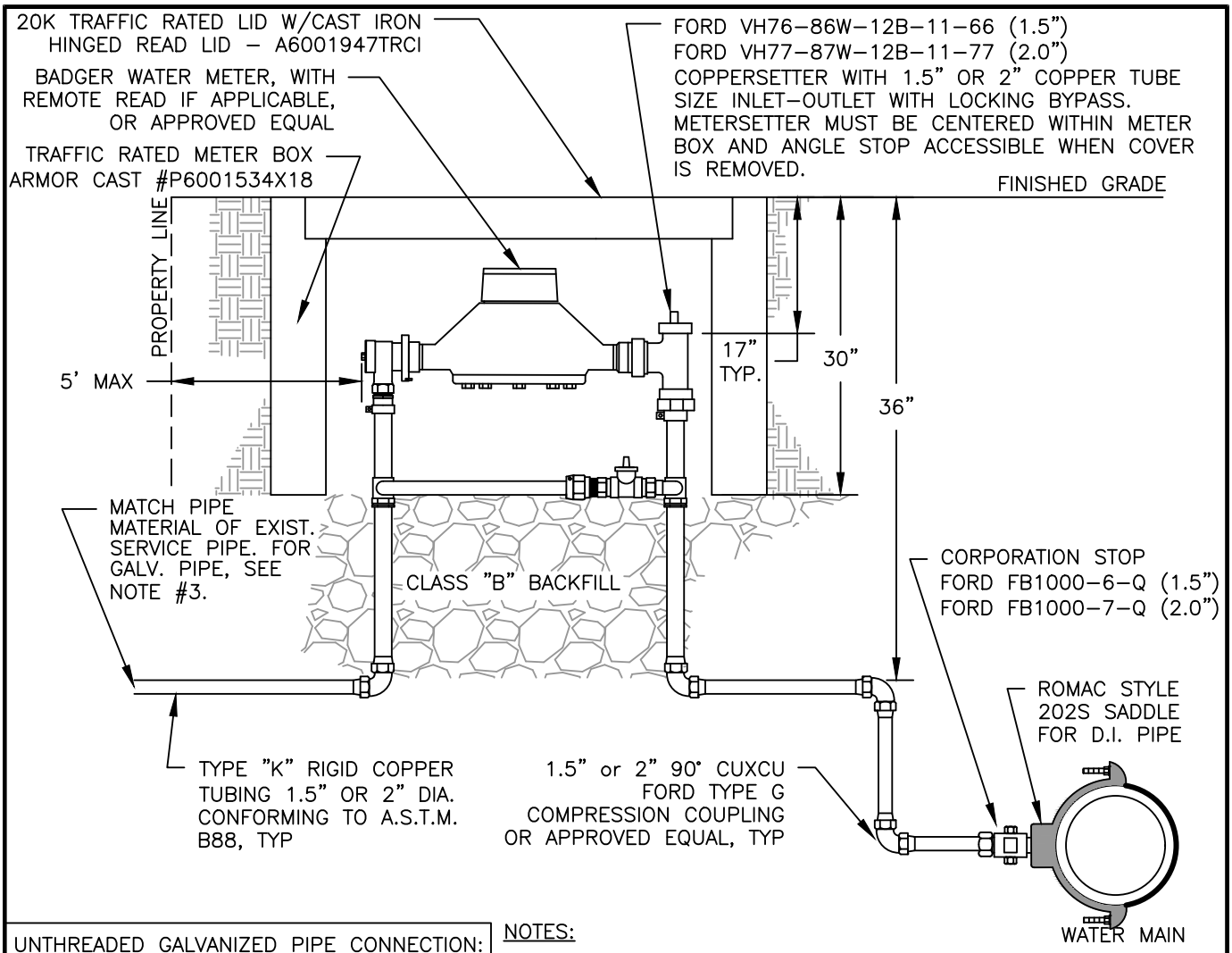
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

3/4 to 1 Inch Water Service

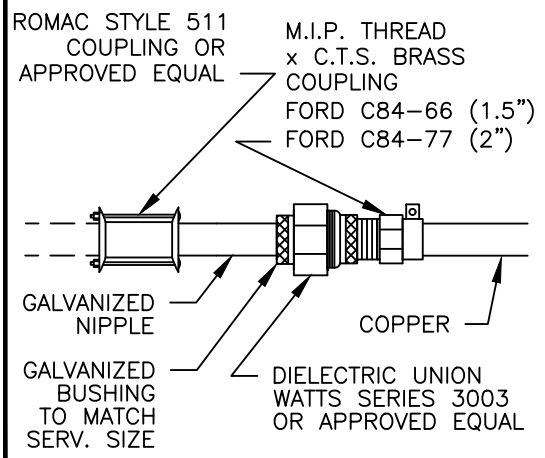
DRAWING NO. 401

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
6	ADDED 3/4" WATER SERVICE	11/18	TAP
7	TITLE CHANGE	08/19	TAP
8	NOTE CHANGE	11/23	TAP



UNTHREADED GALVANIZED PIPE CONNECTION:



NOTES:

1. IF COPPER TUBING CROSSES CATHODICALLY PROTECTED LINE, ENCASE COPPER IN POLYETHYLENE TUBING FOR 24" (CENTERED AT THE CROSSING LINE) AND FASTEN WITH 2" WIDE ADHESIVE TAPE THAT IS COMPATIBLE WITH POLYETHYLENE.
2. PLACE METER BOXES (1) IN LINE WITH THE PROPERTY LINE BEHIND THE SIDEWALK WHERE THERE IS SUFFICIENT RIGHT–OF–WAY, (2) WITHIN THE SIDEWALK WITH THE BACK OF THE METER BOX AT THE BACK EDGE OF THE SIDEWALK (3) WITHIN THE PLANTER STRIP, EXCLUDING WATER QUALITY FACILITIES.
3. CONNECT GALVANIZED SERVICE PIPE; (1) AT EXISTING THREADED FITTING WITHIN 5 FEET OF WATER METER; (2) RETHREAD EXISTING GALVANIZED SERVICE PIPE; (3) IF EXISTING PIPE IS IN POOR CONDITION AND CANNOT BE RETHREADED, USE UNTHREADED GALVANIZED PIPE CONNECTION DETAIL.
4. IF METER BOX IS LOCATED IN THE SIDEWALK, DIELECTRIC UNION WILL BE INSTALLED (1) 6" FROM BACK OF METER INSIDE OF METER BOX, (2) BEHIND BACK OF SIDEWALK.

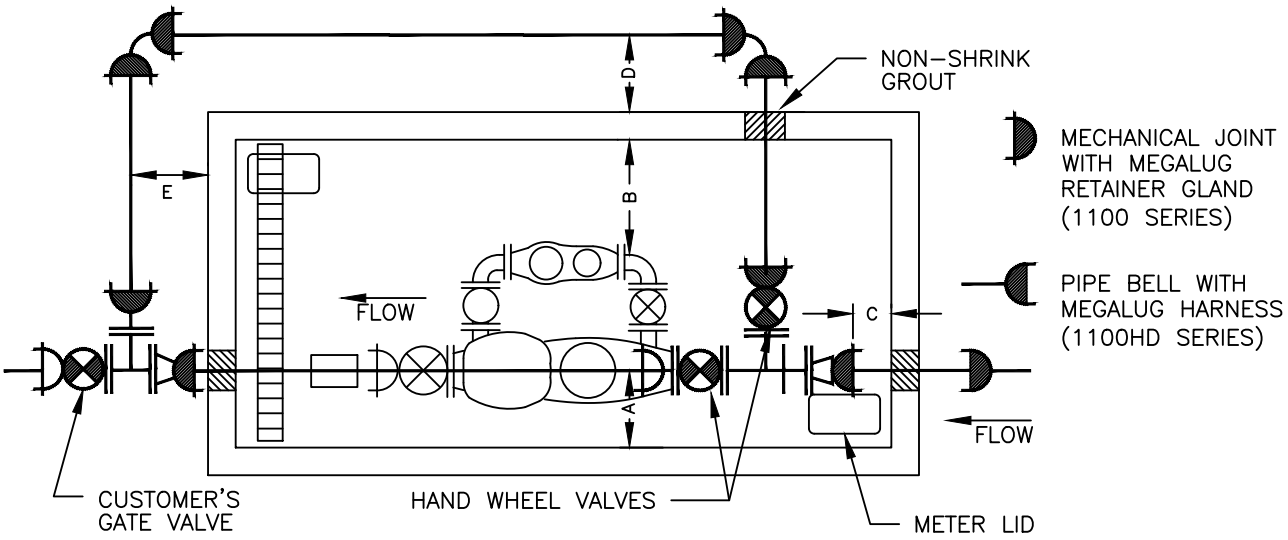
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

1.5 – 2 Inch Water Service

DRAWING NO. 402

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
6	ADDED DIELECTRIC UNION NOTE	12/14	AJR
7	TITLE CHANGED	08/19	TAP
8	DRAWING & NOTES REVISED	11/23	TAP



METER	INCOMING LINE SIZE	BYPASS LINE SIZE	UTILITY VAULT NUMBER	A*	B*	C*	D*	E*
4 x 2	6"	4"	810–LA	24"	36"	12"	24"	24"
6 X 3	8"	4"	712–LA	18"	36"	12"	24"	28"
8 X 4	10"	6"	816–LA	18"	36"	12"	26"	30"
3' COMPOUND	4"	2" CU	687–LA	24"	24"	12"	24"	24"

* MEASUREMENTS A–E ARE MINIMUMS AND MUST BE MET FOR APPROVAL.

NOTES:
ALL SERVICE PIPING WILL BE CHLORINATED AND TESTED TO CITY SPECIFICIATIONS. METER TO BE PROVIDED AND INSTALLED BY THE CONTRACTOR AFTER PIPING IN VAULT HAS PASSED ALL TESTS. METER TO BE COMPOUND BADGER METERS. 3" AND ABOVE MAY ALSO BE SENSUS COMPOUND AND TURBO METERS. REMOTE METERS MUST BE VISIBLE FROM LID HATCH.

1. ALL VAULT WALL OPENINGS TO BE SEALED WITH NON–SHRINK GROUT. TOP OF VAULT SHALL BE 1" ABOVE PROPOSED GRADE WITH 2% SLOPE AWAY FROM VAULT. VAULT MUST BE CLEAN AND FREE OF DEBRIS PRIOR TO METER INSTALLATION. INSTALL A MINIMUM OF 3 PIPE SUPPORTS IN VAULT, GRINNELL NO. 264 OR ELCEN NO. 50. INSTALL 4" DRAIN FROM VAULT TO DAYLIGHT OR APPROVED DRYWELL OR STORM DRAIN WITH A BACKWATER CHECK VALVE ACCESSIBLE FROM VAULT. COORDINATE DRAINAGE SYSTEM WITH BACKFLOW DEVICE VAULT INSTALLATION. ALL VAULT DOORS TO BE UTILITY VAULT NO. 3–332P WITH 2 METER LID OPENINGS. VAULT TO BE EQUIPPED WITH AN APPROVED LADDER. IF VAULT DEPTH IS GREATER THAN 6 FT., AN APPROVED EXTENSION LADDER MUST BE INSTALLED.

2. SERVICE LINE INTO VAULT MUST HAVE A MINIMUM OF 40 FEET OF RESTRAINED JOINT PIPE BETWEEN DISTRIBUTION WATERLINE AND VAULT. SERVICE LINE INTO VAULT TO BE COMPLETELY BACKFILLED WITH SELECT BACKFILL BETWEEN DISTRIBUTION LINE AND VAULT. PIPE TO BE A MINIMUM OF 12" AND A MAXIMUM OF 48" ABOVE THE FLOOR OF THE VAULT.

3. ALL MECHANICAL JOINTS WITH MEGALUG RESTRAINER GLANDS AS SHOWN. PIPE BETWEEN THE TWO TEES MUST BE ONE CONTINUOUS PIECE – NO JOINTS.

4. ONLY APPROVED RESILIENT SEAT GATE VALVES ARE ALLOWED. ALL VALVES INSIDE VAULTS MUST HAVE HAND WHEELS.

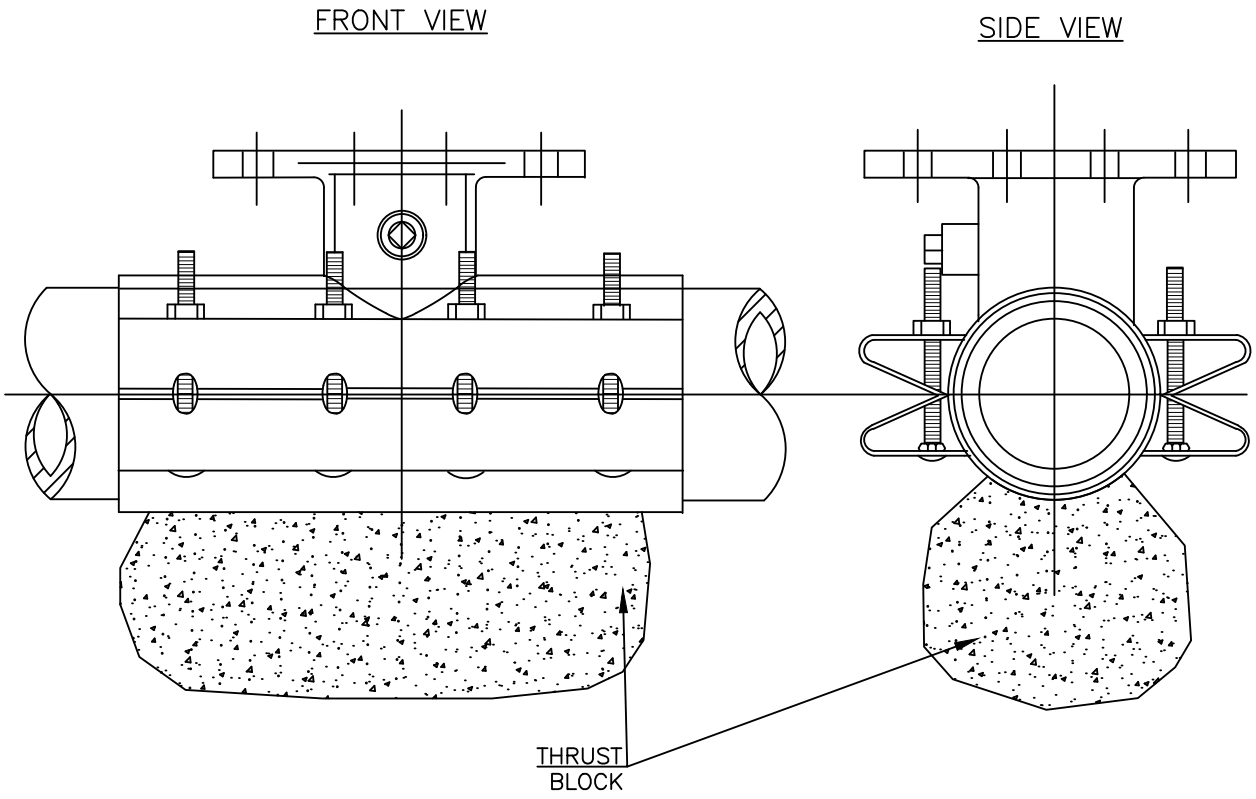
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Water Meter > 2"

DRAWING NO. 403

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	DRAWING NUMBER AND TITLE CHANGED	11/13	AJR
2	NOTES ADDED TO SHEET	11/18	TAP
3	NOTES CHANGED	08/19	TAP



NOTES:

1. WATER MAIN MUST BE CLEANED BEFORE ATTACHING SLEEVE.
2. SLEEVE AND VALVE MUST BE PRESSURE TESTED BEFORE MAKING TAP. PRESSURE TEST AND TAP TO BE MADE IN THE PRESENCE OF AN AUTHORIZED CITY REPRESENTATIVE. PROPER TAPPING MACHINE MUST BE USED TO MAKE TAP AND TAP TO BE MADE NO CLOSER THAN 18 INCHES FROM THE NEAREST JOINT.
3. THRUST BLOCKING REQUIREMENTS TO BE DETERMINED BY OSSC DRAWING RD250.
4. SLEEVE AND VALVE TO BE WRAPPED IN 8 MIL PLASTIC.
5. SLEEVES TO BE USED ARE JCM OR MUELLER STAINLESS STEEL TAPPING SLEEVES. SLEEVE TO BE AS LEVEL AS POSSIBLE.
6. ALL NUTS AND BOLTS TO BE STAINLESS STEEL. ALL BOLTS TO HAVE NEVER–SEIZE ON THREADS.
7. FOR TAPS SMALLER THAN 2.5", SEE MILWAUKIE STANDARD DETAILS 401 AND 402.

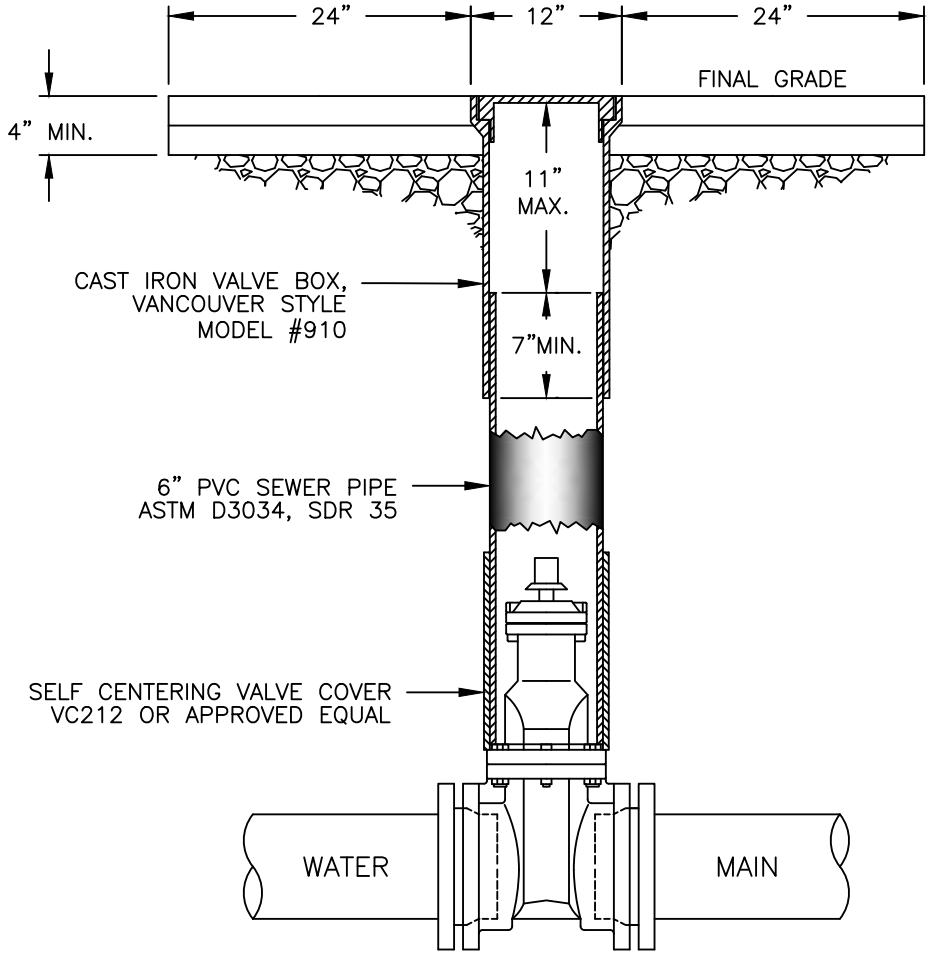
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Wet Tap 2.5 Inch and Larger

DRAWING NO. 404

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	ADDED THRUST BLOCK	12/14	AJR
4	DRAWING NUMBER CHANGED, NOTES REVISED	11/18	TAP
5	TITLE AND NOTE CHANGED	08/19	TAP



"MILWAUKIE WATER" STANDARD LID BY EAST JORDAN FOUNDRY OR APPROVED EQUAL

18" TALL VALVE BOX

NOTES:

1. VALVE BOXES MUST BE CENTERED DIRECTLY OVER THE VALVE NUT IN A VERTICAL POSITION.
2. VALVE BOX TOP TO BE ADJUSTED TO MEET FINISHED GRADE.
3. PVC MUST BE ONE CONTINUOUS PIECE – NO BELLS OR COUPLERS.
4. VALVE NUT EXTENSIONS TO BE USED TO BRING VALVE NUT WITHIN 4 FEET OF FINAL GRADE.
5. VALVE CAN MUST BE ENCASED IN 2'x2' PAD IN UNIMPROVED AREAS. REPAIRS WITHIN PAVED STREET REQUIRE A MINIMUM 5'x5' ASPHALT PATCH.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Valve Box

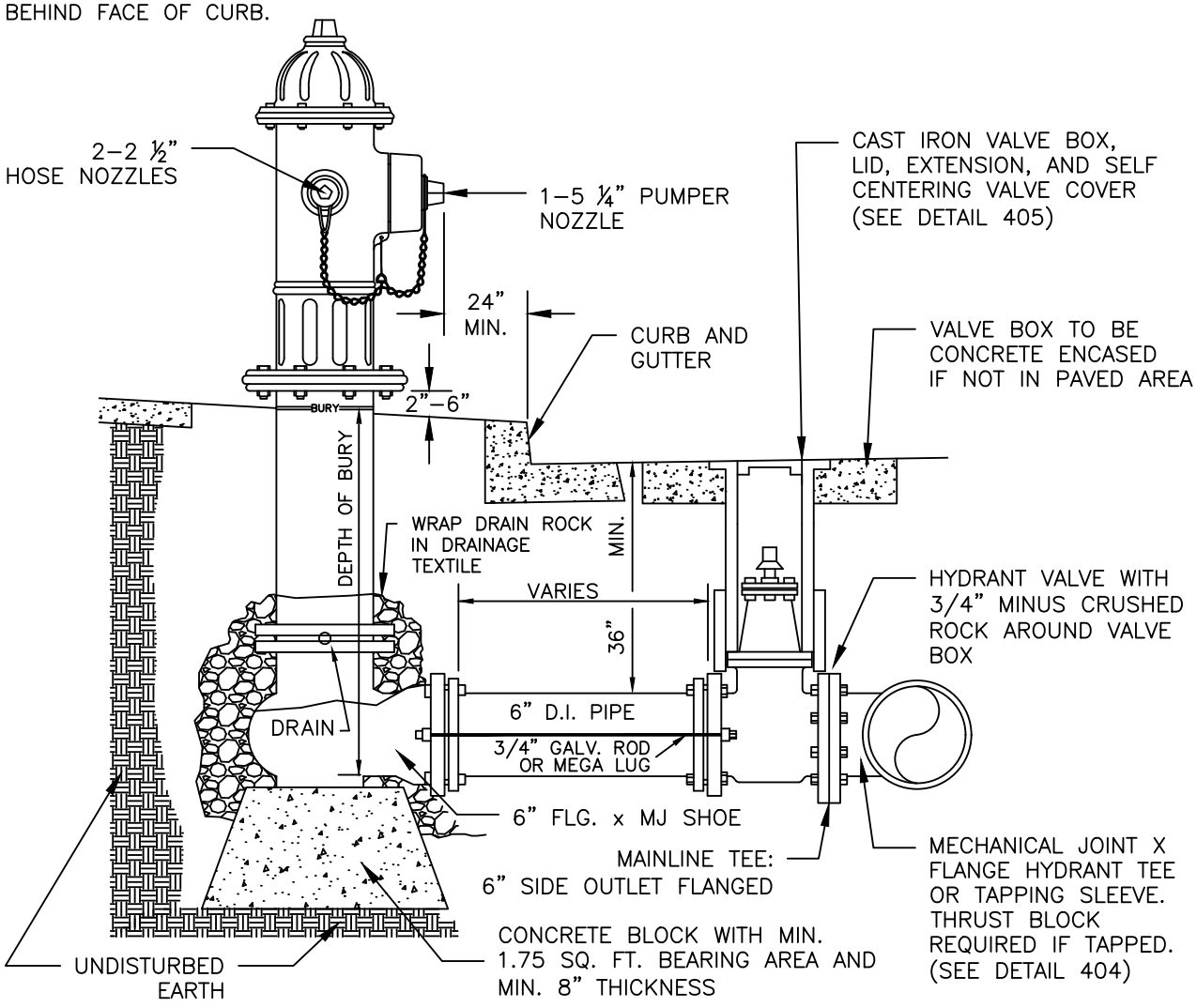
DRAWING NO. 405

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	DRAWING NUMBER CHANGED	12/13	AJR
4	DRAWING NUMBER CHANGED	11/18	TAP
5	TITLE AND NOTE CHANGED	08/19	TAP

NOTES:

1. HYDRANTS TO BE WATEROUS WB67, MUELLER CENTURION A423, M&H 929 RELIANT, OR CLOW MEDALLION F2545 WITH 1 ½" OPERATING NUTS.
2. HYDRANT COLOR TO BE MILLER EQUIP. ENAMEL OE 40 (SAFETY YELLOW).
3. JOINTS TO BE RESTRAINED BY ¾" DIA. GALVANIZED STEEL RODS OR MEGA LUGS.
4. ALL FITTINGS IN CONTACT W/ CONCRETE TO BE WRAPPED IN PLASTIC. HYDRANT DRAIN HOLES TO REMAIN OPEN TO DRAIN ROCK AND OPERATIONAL.
5. MIN. 4 CU. FT. OF 2"–1" CLEAN DRAIN ROCK MUST BE PLACED AROUND SHOE UP TO A MIN. OF 6" ABOVE DRAIN OUTLETS.
6. WHERE PLASTIC STRIP EXISTS, HYDRANT TO BE PLACED SO FRONT PORT IS A MINIMUM OF 24" BEHIND FACE OF CURB.
7. WHERE INTEGRAL SIDEWALK AND CURB EXISTS, HYDRANT TO BE PLACED AT BACK OF SIDEWALK, OR AS DIRECTED BY ENGINEER.
8. BURY OF HYDRANT TO BE MEASURED FROM FINISHED GRADE TO BOTTOM OF CONNECTING PIPE.
9. HYDRANT VALVE TO BE AMERICAN FLOW CONTROL SERIES 2500 OR APPROVED EQUAL.
10. WHERE NO SIDEWALK EXISTS, PLACE A 5'x5'x4" THICK CONCRETE APRON AROUND HYDRANT.
11. NO VERTICAL EXTENSIONS ALLOWED WITHOUT APPROVAL.
12. NO UTILITY FACILITIES SHALL BE CLOSER THAN 5' TO THE HYDRANT.
13. WHEN NECESSARY, GUARD POSTS WILL BE REQUIRED FOR PROTECTION FROM VEHICLES.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Fire Hydrant Installation

DRAWING NO. 406

APPROVED 03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	REMOVED THRUST BLOCKS	12/14	AJR
4	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP
5	NOTES CHANGED	11/23	TAP

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT TO BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OREGON STANDARD DRAWING NUMBER	OREGON STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD115	MONUMENT BOX	NO EXCEPTION TAKEN
RD700	CURBS	NO EXCEPTION TAKEN
RD705	ISLAND	NO EXCEPTION TAKEN
RD715	APPROACHES AND NON-SIDEWALK DRIVEWAYS	TWO FOOT (2') ASPHALT REPAIR REQUIRED IN FRONT OF NEW CURB FOR DRIVEWAYS
RD720	CURB LINE SIDEWALKS	NO EXCEPTION TAKEN
RD721	SEPARATED SIDEWALKS	NO EXCEPTION TAKEN
RD740	SEPARATED SIDEWALK DRIVEWAYS OR ALLEYS (OPTIONS H, I & J) LOCAL JUR.	OPTIONS I & J ONLY. ATWO FOOT (2') ASPHALT REPAIR REQUIRED IN FRONT OF NEW CURB FOR DRIVEWAYS
RD745	CURB LINE SIDEWALK DRIVEWAYS OR ALLEYS (OPTIONS K & L) LOCAL JUR.	TWO FOOT (2') ASPHALT REPAIR REQUIRED IN FRONT OF NEW CURB FOR DRIVEWAYS
RD750	CURB LINE SIDEWALK DRIVEWAYS OR ALLEYS (OPTIONS M & N) LOCAL JUR.	TWO FOOT (2') ASPHALT REPAIR REQUIRED IN FRONT OF NEW CURB FOR DRIVEWAYS
RD902	DETECTABLE WARNING SURFACE DETAILS	NO EXCEPTION TAKEN
RD904	DETECTABLE WARNING SURFACE PLACEMENT FOR CURB RAMPS	NO EXCEPTION TAKEN
RD905	DETECTABLE WARNING SURFACE PLACEMENT FOR DIRECTIONAL CURBS	NO EXCEPTION TAKEN
RD906	DETECTABLE WARNING SURFACE PLACEMENT FOR ACCESSIBLE ROUTE ISLAND	NO EXCEPTION TAKEN
RD908	DETECTABLE WARNING SURFACE PLACEMENT FOR RAIL	NO EXCEPTION TAKEN
RD910 & RD912	PERPENDICULAR CURB RAMP	NO EXCEPTION TAKEN
RD913	PERPENDICULAR CURB RAMP WITH CLOSURE	NO EXCEPTION TAKEN
RD916	PERPENDICULAR CURB RAMP SINGLE RAMP	NO EXCEPTION TAKEN
RD920	PARALLEL CURB RAMP	NO EXCEPTION TAKEN
RD922	PARALLEL CURB RAMP SINGLE RAMP	NO EXCEPTION TAKEN
RD930 & RD932	COMBINATION CURB RAMP	NO EXCEPTION TAKEN
RD938	COMBINATION CURB RAMP SINGLE RAMP	NO EXCEPTION TAKEN
RD940	BLENDED TRANSITION CURB RAMP SINGLE RAMP	NO EXCEPTION TAKEN
RD950 & RD952	END OF WALK CURB RAMP	NO EXCEPTION TAKEN
RD960	UNIQUE CURB RAMP	NO EXCEPTION TAKEN
TM500, TM501, TM502, TM503 & TM504	PAVEMENT MARKING STANDARD DETAIL BLOCKS	NO EXCEPTION TAKEN
TM505	RAIL CROSSING PAVEMENT MARKINGS	NO EXCEPTION TAKEN
TM530	INTERSECTION PAVEMENT MARKINGS (CROSSWALK, STOP BAR & BIKE LANE STENCIL)	NO EXCEPTION TAKEN
TM531	TURN ARROW MARKING DETAILS	NO EXCEPTION TAKEN
TM561	ALIGNMENT LAYOUT: LEFT TURN LANE, CENTERLINE & MEDIANS	NO EXCEPTION TAKEN
TM681	PERFORATED STEEL SQUARE TUBE (PSST) SIGN SUPPORT INSTALLATION	NO EXCEPTION TAKEN
TM687	PERFORATED STEEL SQUARE TUBE (PSST) ANCHOR FOUNDATION	NO EXCEPTION TAKEN

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED MUST NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

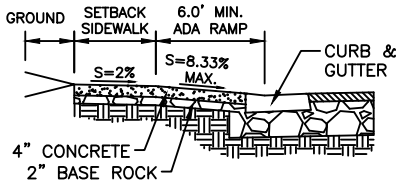
ACCEPTABLE OREGON STANDARD DRAWINGS, STREETS

DRAWING NO. 500

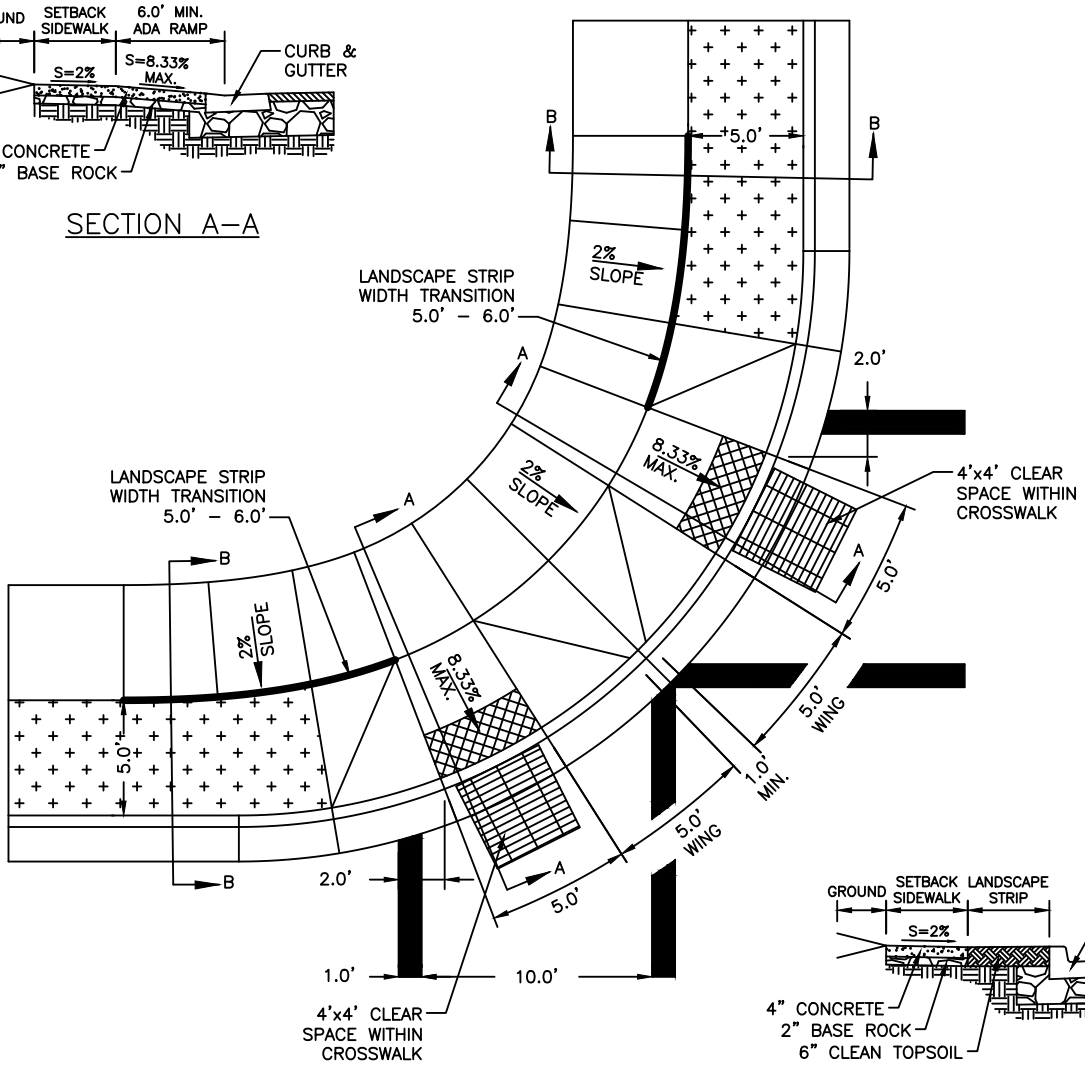
APPROVED Jennifer Garbely 03/2024

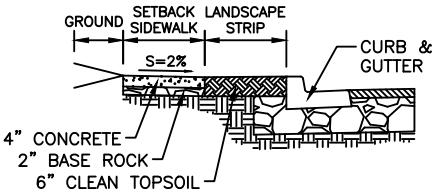
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	NOTE CHANGED	08/19	TAP
3	LIST UPDATED	01/21	TAP
4	LIST UPDATED	10/23	HGB



SECTION A–A





SECTION B–B

NOTES

1. SIDEWALK RAMPS MUST MEET ADA STANDARDS.
2. ALL SURFACES TO BE LIGHTLY BROOMED. ALL EDGES TO BE TOOL ROUNDED AND SHINED 3" AFTER BROOMING.
3. SAW CUT EXISTING RAMP, CURB, AND SIDEWALK THAT ARE TO BE REMOVED TO THE NEAREST JOINT.
4. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
5. SIDEWALK PANELS SHOULD BE SQUARE (4'X4', 5'X5', 6'X6'). IN NO CASE WILL THE LENGTH OF A SIDEWALK PANEL BE GREATER THAN 1.5 TIMES THE WIDTH AND VICE VERSA.
6. BASE ROCK TO BE 3/4"–0 OR 1"–0 CRUSHED AGGREGATE ROCK COMPACTED TO 95% MAXIMUM DENSITY OF AASHTO T–180.
7. CURB JOINT FOR CURB TIGHT SIDEWALK TO BE A TROWLED JOINT WITH A 1/2" RADIUS ALONG THE BACK OF CURB.
8. LANDINGS MUST BE PLACED AT THE TOP OF EACH RAMP. LANDING SLOPES NOT TO EXCEED 20:1 IN ANY DIRECTION AND WILL HAVE MINIMUM DIMENSIONS OF 5' X 5'.
9. DETECTABLE WARNING PAD TO BE 24" LONG IN THE DIRECTION OF TRAVEL AND INSTALLED ALONG THE FULL WIDTH OF THE BOTTOM OF THE SIDEWALK RAMP. ADA SOLUTIONS ADA CAST–IN–PLACE REPLACEABLE TACTILE UNITS OR APPROVED EQUAL.
10. SETBACK SIDEWALK RAMPS: THE MAXIMUM SLOPE MUST FIRST BE PROVIDED IN THE RAMP ADJACENT TO THE STREET. ANY ADDITIONAL ELEVATION GAIN TO BE PROVIDED IN THE SIDEWALK RAMP SLOPES.
11. PLACE AN INLET AT UPSTREAM SIDE OF CURB RAMP OR PERFORM OTHER APPROVED STORMWATER MITIGATION.

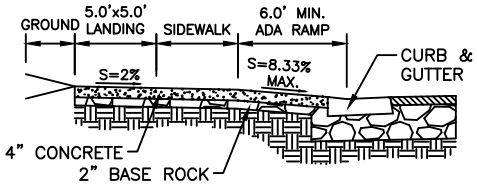
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Setback Sidewalk Intersection Ramps

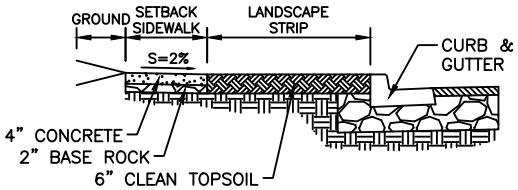
DRAWING NO. 501

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

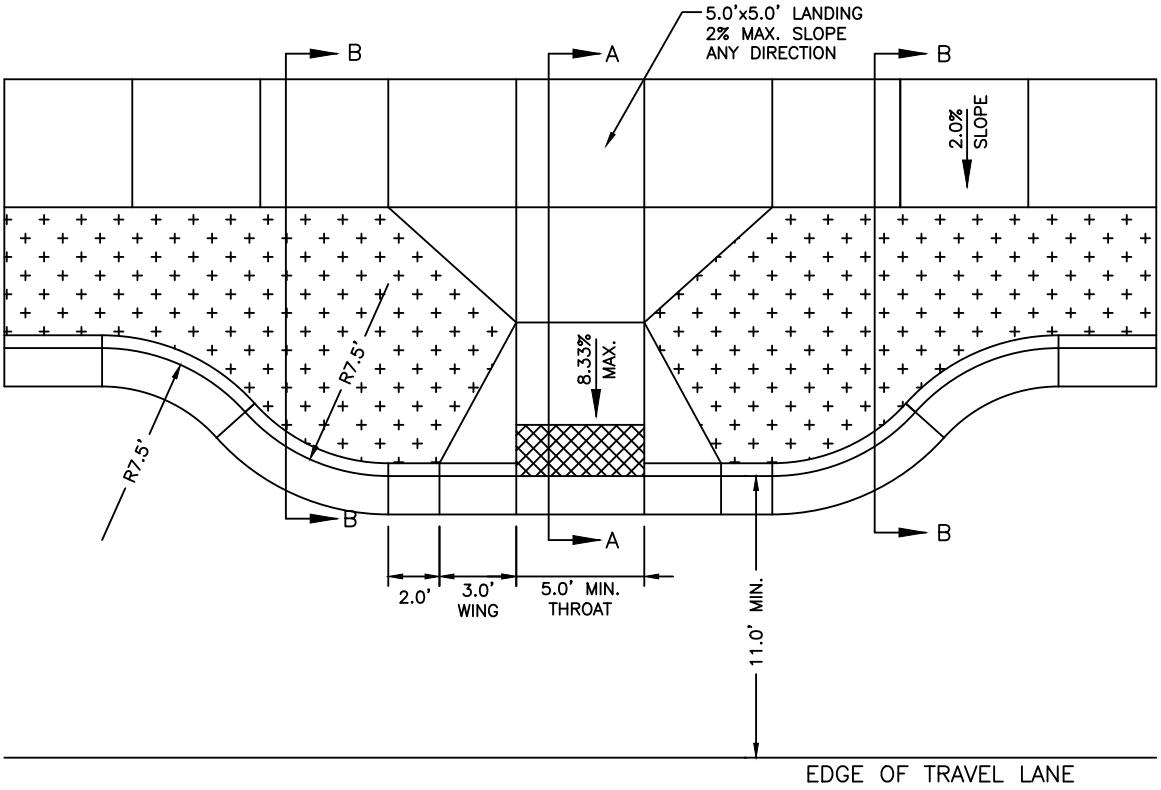
NO.	REVISIONS	DATE	BY
4	NOTES CHANGED	08/19	TAP
5	NOTES CHANGED	01/21	TAP
6	NOTES CHANGED	10/23	HGB



SECTION A–A



SECTION B–B



NOTES

1. SIDEWALK RAMPS MUST MEET ADA STANDARDS.
2. ALL SURFACES TO BE LIGHTLY BROOMED. ALL EDGES TO BE TOOL ROUNDED AND SHINED 3" AFTER BROOMING.
3. SAW CUT EXISTING RAMP, CURB, AND SIDEWALK THAT ARE TO BE REMOVED TO THE NEAREST JOINT.
4. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
5. SIDEWALK PANELS SHOULD BE SQUARE (4'X4', 5'X5', 6'X6'). IN NO CASE WILL THE LENGTH OF A SIDEWALK PANEL BE GREATER THAN 1.5 TIMES THE WIDTH AND VICE VERSA.
6. BASE ROCK TO BE 3/4"–0 OR 1"–0 CRUSHED AGGREGATE ROCK COMPACTED TO 95% MAXIMUM DENSITY OF AASHTO T–180.
7. CURB JOINT FOR CURB TIGHT SIDEWALK TO BE A TROWLED JOINT WITH A 1/2" RADIUS ALONG THE BACK OF CURB.
8. LANDINGS MUST BE PLACED AT THE TOP OF EACH RAMP. LANDING SLOPES NOT TO EXCEED 20:1 IN ANY DIRECTION AND WILL HAVE MINIMUM DIMENSIONS OF 5' X 5'.
9. DETECTABLE WARNING PAD TO BE 24" LONG IN THE DIRECTION OF TRAVEL AND INSTALLED ALONG THE FULL WIDTH OF THE BOTTOM OF THE SIDEWALK RAMP. ADA SOLUTIONS ADA CAST–IN–PLACE REPLACEABLE TACTILE UNITS OR APPROVED EQUAL.
10. SETBACK SIDEWALK RAMPS: THE MAXIMUM SLOPE MUST FIRST BE PROVIDED IN THE RAMP ADJACENT TO THE STREET. ANY ADDITIONAL ELEVATION GAIN TO BE PROVIDED IN THE SIDEWALK RAMP SLOPES.
11. PLACE AN INLET AT UPSTREAM OF CURB RAMP OR PERFORM OTHER APPROVED STORMWATER MITIGATION.

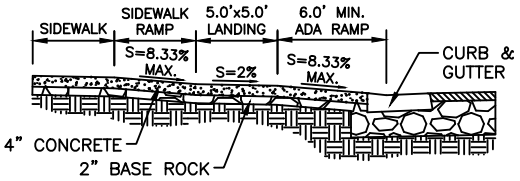
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Mid–Block Curb Extension

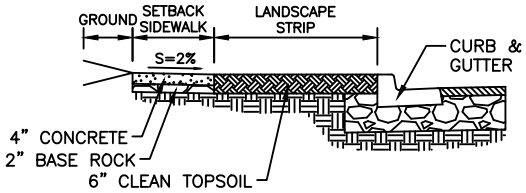
DRAWING NO. 502

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

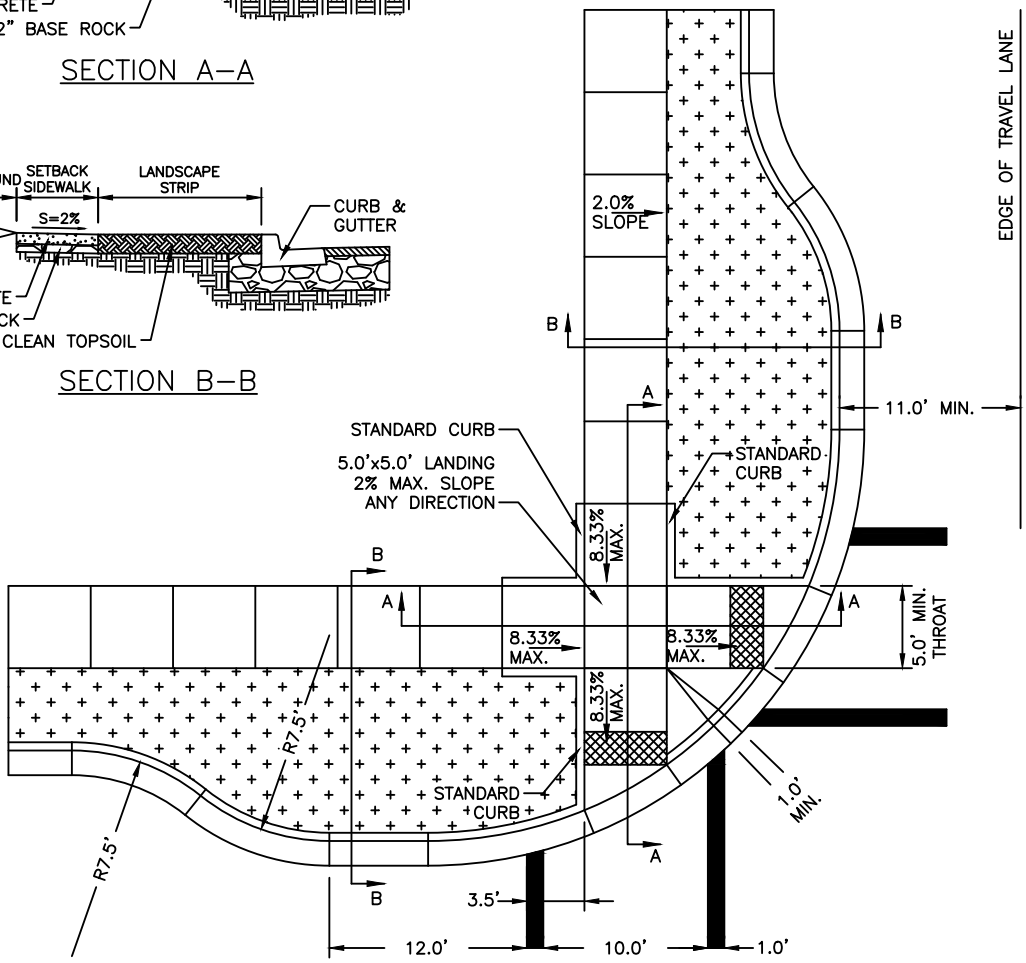
NO.	REVISIONS	DATE	BY
4	NOTES CHANGED	08/19	TAP
5	NOTES CHANGED	01/21	TAP
6	NOTES CHANGED	10/23	HGB



SECTION A–A



SECTION B–B



NOTES

1. SIDEWALK RAMPS MUST MEET ADA STANDARDS.
2. ALL SURFACES TO BE LIGHTLY BROOMED. ALL EDGES TO BE TOOL ROUNDED AND SHINED 3" AFTER BROOMING.
3. SAW CUT EXISTING RAMP, CURB, AND SIDEWALK THAT ARE TO BE REMOVED TO THE NEAREST JOINT.
4. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
5. SIDEWALK PANELS SHOULD BE SQUARE (4'X4', 5'X5', 6'X6'). IN NO CASE WILL THE LENGTH OF A SIDEWALK PANEL BE GREATER THAN 1.5 TIMES THE WIDTH AND VICE VERSA.
6. BASE ROCK TO BE 3/4"–0 OR 1"–0 CRUSHED AGGREGATE ROCK COMPACTED TO 95% MAXIMUM DENSITY OF AASHTO T–180.
7. CURB JOINT FOR CURB TIGHT SIDEWALK TO BE A TROWLED JOINT WITH A 1/2" RADIUS ALONG THE BACK OF CURB.
8. LANDINGS MUST BE PLACED AT THE TOP OF EACH RAMP. LANDING SLOPES NOT TO EXCEED 20:1 IN ANY DIRECTION AND WILL HAVE MINIMUM DIMENSIONS OF 5' X 5'.
9. DETECTABLE WARNING PAD TO BE 24" LONG IN THE DIRECTION OF TRAVEL AND INSTALLED ALONG THE FULL WIDTH OF THE BOTTOM OF THE SIDEWALK RAMP. ADA SOLUTIONS ADA CAST–IN–PLACE REPLACEABLE TACTILE UNITS OR APPROVED EQUAL.
10. SETBACK SIDEWALK RAMPS: THE MAXIMUM SLOPE MUST FIRST BE PROVIDED IN THE RAMP ADJACENT TO THE STREET. ANY ADDITIONAL ELEVATION GAIN TO BE PROVIDED IN THE SIDEWALK RAMP SLOPES.
11. PLACE AN INLET AT UPSTREAM OF CURB RAMP OR PERFORM OTHER APPROVED STORMWATER MITIGATION.

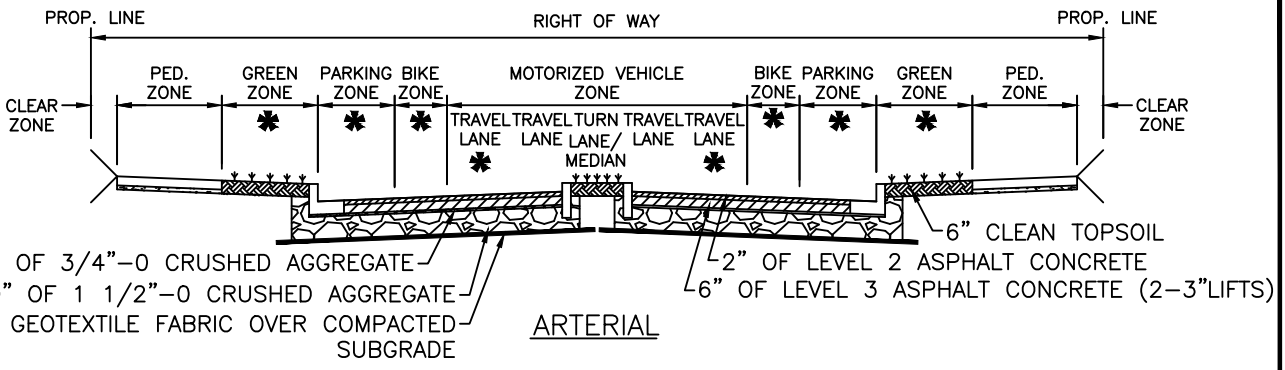
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Intersection Curb Extension

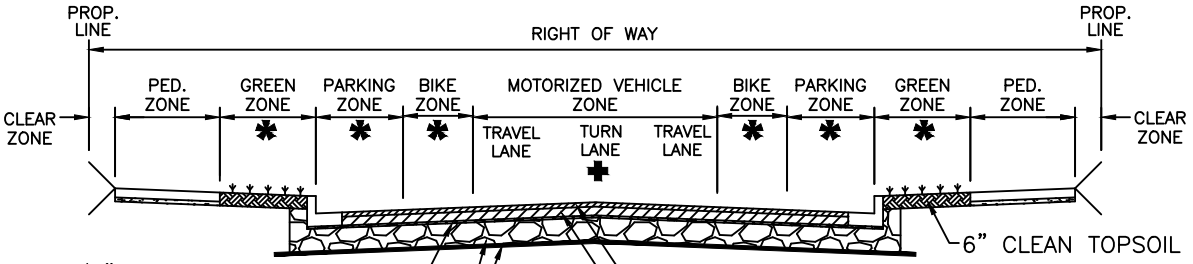
DRAWING NO. 503

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

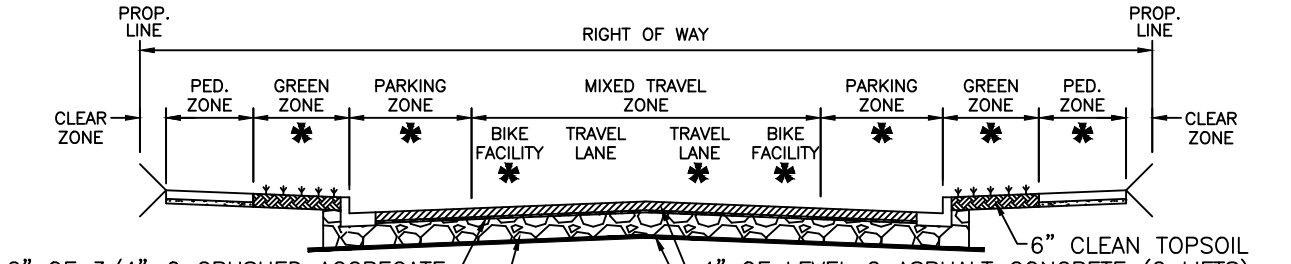
NO.	REVISIONS	DATE	BY
4	NOTES CHANGED	08/19	TAP
5	NOTES CHANGED	01/21	TAP
6	NOTES CHANGED	10/23	HGB



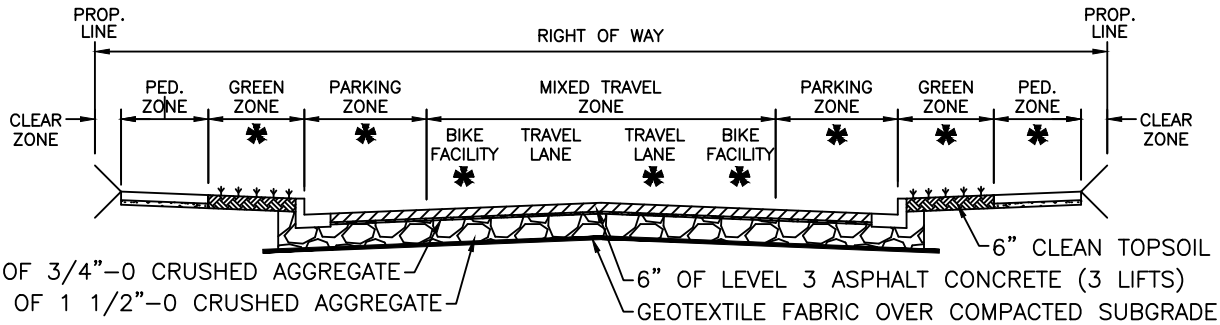
ARTERIAL



COLLECTOR



LOCAL & NEIGHBORHOOD STREETS



LOCAL COMMERCIAL/INDUSTRIAL

✱ CONSTRAINED RIGHT-OF-WAY OPTIONAL ELEMENT

✚ WHERE WARRANTED

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

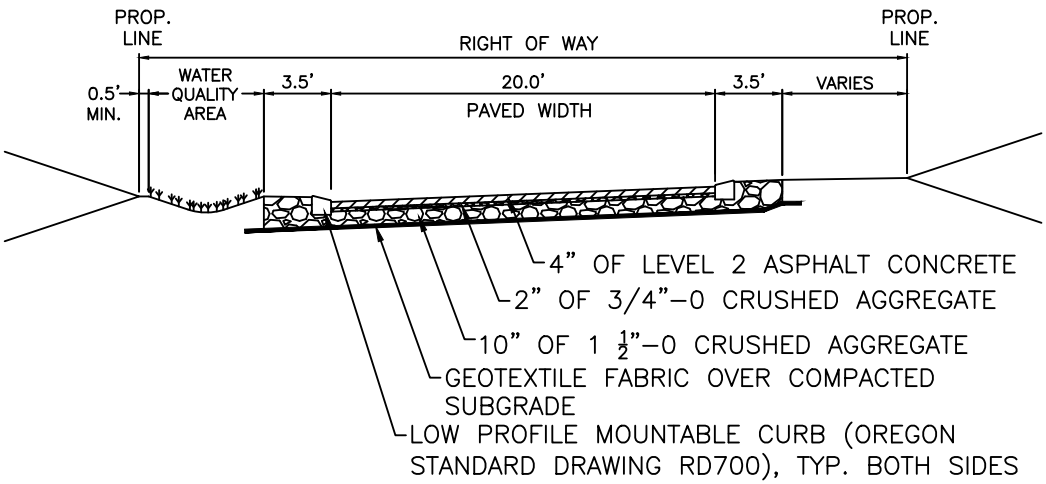
Street Cross Sections

DRAWING NO. 504

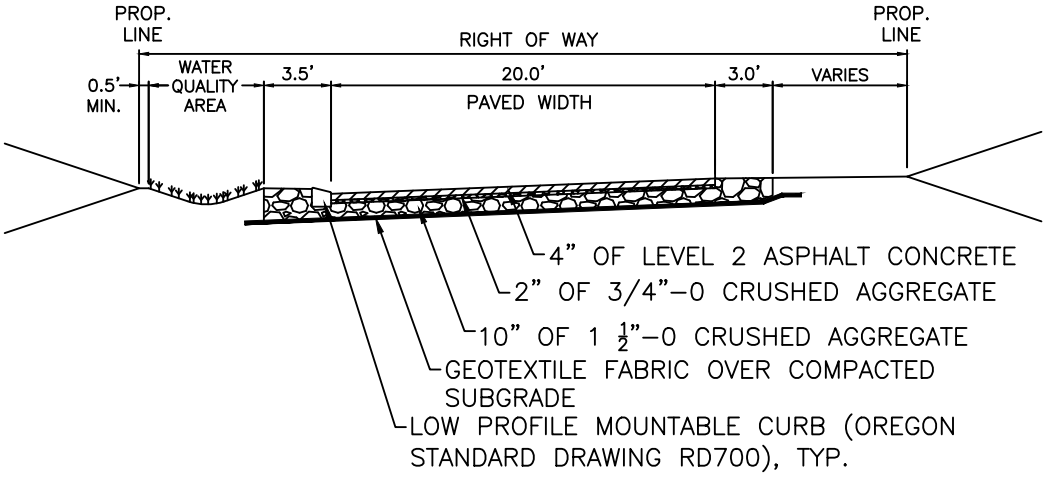
APPROVED Jennifer Garbely 03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	DRAWING NUMBER CHANGED	11/18	TAP
4	ASPHALT AND BASE REVISED	08/19	TAP
5	ARTERIAL AND COLLECTOR ASPHALT REVISED	01/21	TAP



LOW VOLUME STREET – TWO CURB



LOW VOLUME STREET – SINGLE CURB

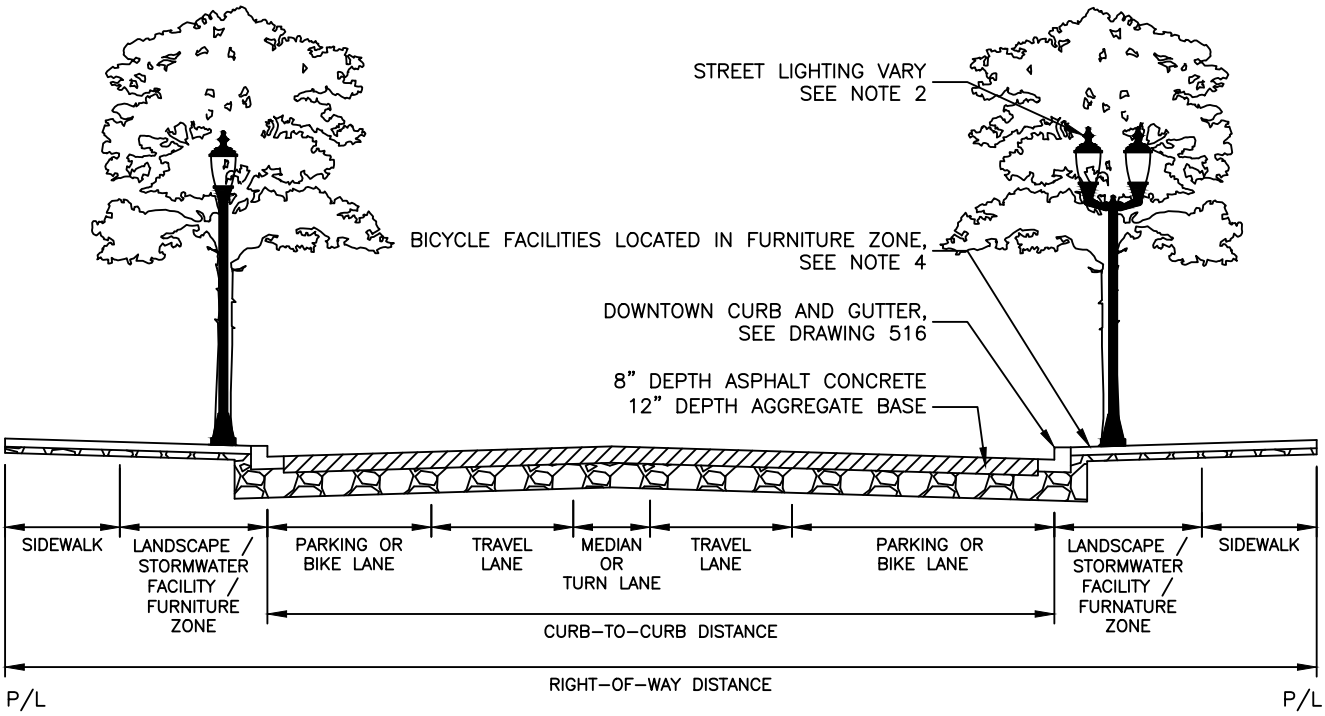
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Low Volume Street Cross Sections

DRAWING NO. 505

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	ASPHALT AND BASE REVISED	08/19	TAP
4	GEOTEXTILE NOTE ADDED	01/21	TAP
5	NOTE CHANGE	10/23	HGB



DOWNTOWN STREET SECTIONS

STREET NAME	RIGHT–OF–WAY	CURB–TO–CURB	SIDEWALK	LANDSCAPE	PARKING*	BIKE LANE	TRAVEL LANE	MEDIAN OR TURN LANE
McLOUGHLIN BLVD.	100'	74'	6'	6' TO 8'	0	6'	12' (4 TOTAL)	14' LANE
MAIN STREET	60' TO 80'	22' TO 54'	12' TO 16'	0 TO 7'	0 TO 7'	0	11' TO 14'	NONE
21ST AVENUE	60'	27' TO 36'	10' TO 17'	0 TO 6'	0 TO 7'	0	11' TO 14'	0 TO 1' MEDIAN
HARRISON STREET	60' TO 68'	40' TO 48'	10'	0 TO 5'	0 TO 8'	4.5' TO 5'	11' TO 13.5'	NONE
JACKSON STREET	80'	52' TO 56'	10' TO 18'	0 TO 5'	0 TO 16'	0	12' TO 17'	NONE
MONROE STREET	40' TO 70'	28' TO 48'	8' TO 12'	0 TO 7'	0 TO 19'	0	11' TO 14'	0 TO 12' LANE
JEFFERSON STREET	70'	46'	12'	0 TO 5'	7' TO 16'	0	11' TO 12'	NONE
WASHINGTON ST.	60'	36' TO 40'	10' TO 12'	0 TO 5'	0 TO 7'	0	11'	0 TO 11' LANE
ADAMS STREET	50'	30'	8'	0	7'	0	11' TO 12'	NONE
OCHOCO STREET	45' TO 54'	24' TO 36'	5'	4' TO 5.5'	0	0	12'	12' LANE
MAILWELL DRIVE	60'	32'	6' TO 14'	0 TO 6'	0 TO 8'	0	12'	NONE
STUBB STREET	55'	32'	5' TO 8'	0 TO 8'	0 TO 8'	0	12'	NONE

*PARKING WIDTH OVER 10' IS ANGLED PARKING

CONSTRUCTION NOTES

1. UNDERGROUND ALL UTILITIES.
2. FOR STREET LIGHTING SEE SECTION 5.0091 AND 5.019 (D) OF THE MILWAUKIE PUBLIC WORK STANDARDS.
3. FOR STREET FURNITURE ELEMENTS, SEE SECTION 5.0191 (E) OF THE MILWAUKIE PUBLIC WORK STANDARDS.
4. FOR BICYCLE FACILITIES DETAILS SEE SECTION 5.0191 (F) OF THE MILWAUKIE PUBLIC WORK STANDARDS.
5. FOR STREET PLANTING, SEE SECTION 5.0093 AND 5.0191 (C) OF THE MILWAUKIE PUBLIC WORK STANDARDS.

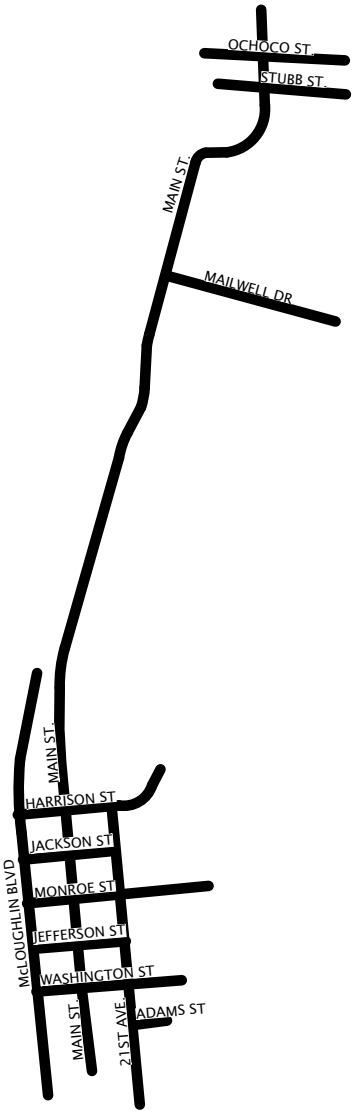
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Street Cross Sections

DRAWING NO. 506A

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	08/19	TAP
2	NOTE CHANGED	10/23	HGB



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Street Cross Sections

DRAWING NO.

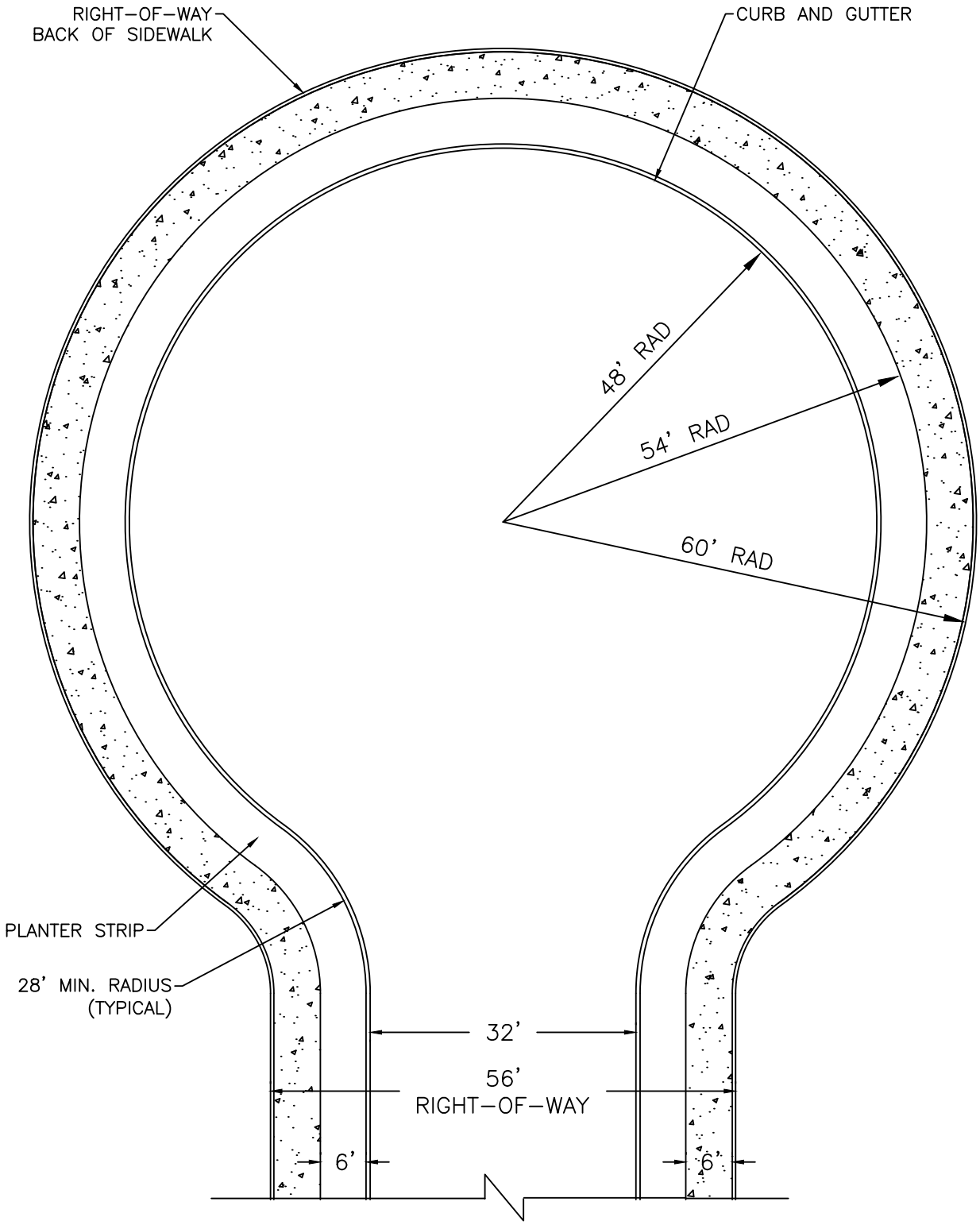
506B

APPROVED

03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	08/19	TAP



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Cul–De–Sac

DRAWING NO. 507

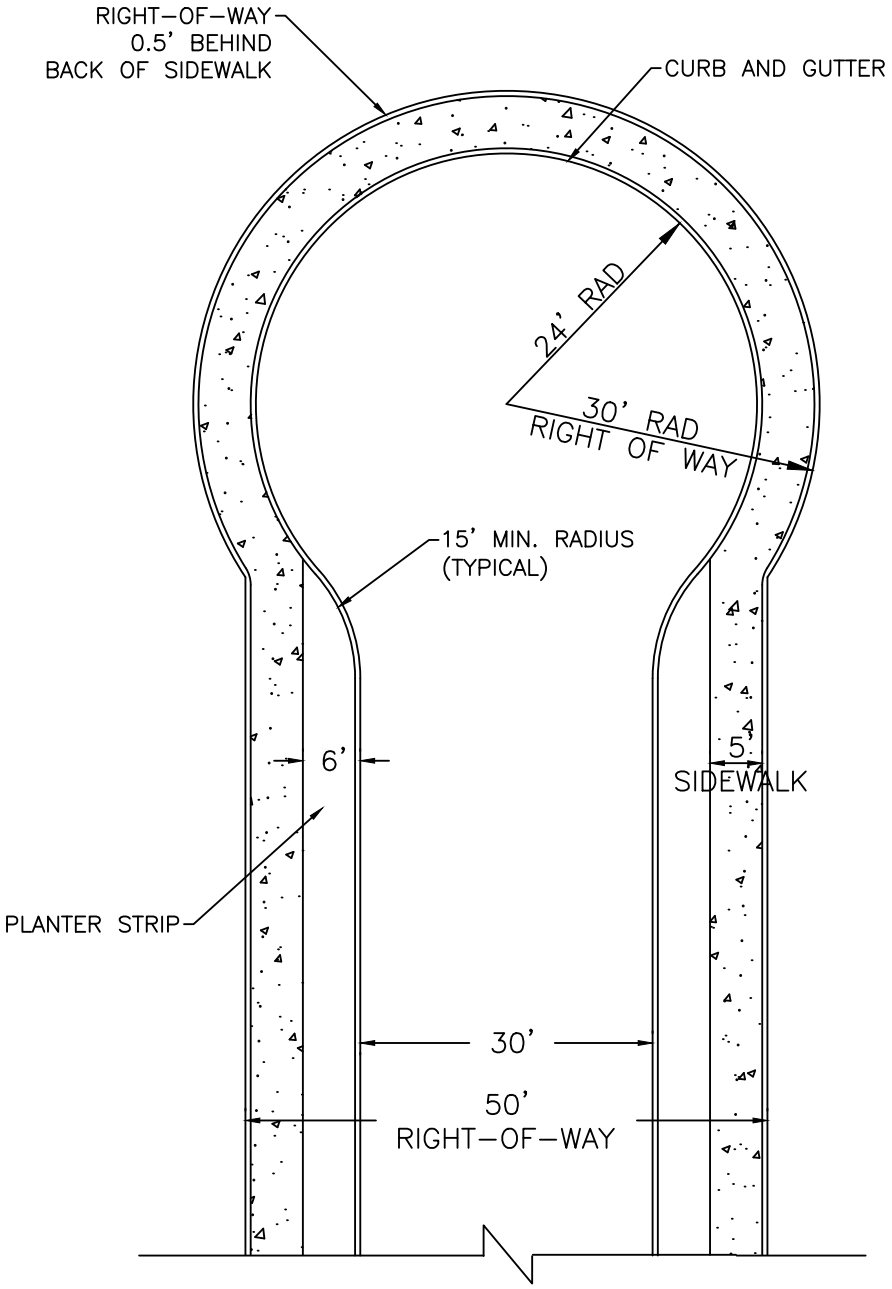
APPROVED

03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	DRAWING NUMBER CHANGED	11/18	TAP
3	DRAWING NUMBER CHANGED	08/19	TAP
4	NOTE CHANGED	10/23	HGB

FOR STREETS LESS THAN 150 FT IN LENGTH



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

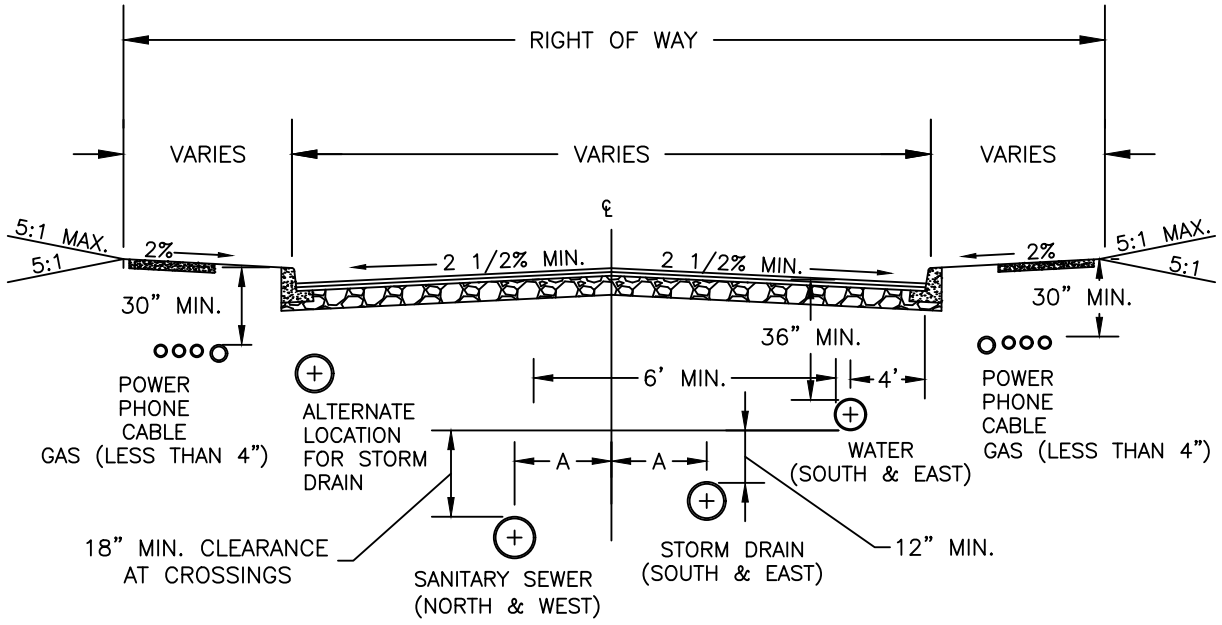
Constrained Right–of–Way Cul–De–Sac

DRAWING NO. 508

APPROVED 03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	DRAWING CREATED	11/18	TAP
2	DRAWING RENUMBERED	08/19	TAP
3	NOTE CHANGED	10/23	HGB



NOTE: STREET TREES, LIGHT POLES, AND FIRE HYDRANTS MUST BE LOCATED BETWEEN THE SIDEWALK AND THE CURB FOR CURB SEPARATED SIDEWALKS.

STREET TYPE	RIGHT OF WAY (FT.)	NO. OF LANES	DISTANCE FROM CENTER "A"
LOCAL	20–68 FT	2	6 FT
COLLECTOR	40–69 FT	2	6 FT
COLLECTOR	70–74 FT	3	13 FT
ARTERIAL	54–89 FT	3	13 FT
COMMERCIAL & INDUSTRIAL	30–60 FT	2	6 FT
COMMERCIAL & INDUSTRIAL	30–60 FT	3	13 FT
COMMERCIAL & INDUSTRIAL	61–89 FT	3	13 FT
COMMERCIAL & INDUSTRIAL	61–89 FT	4	7 & 19 FT

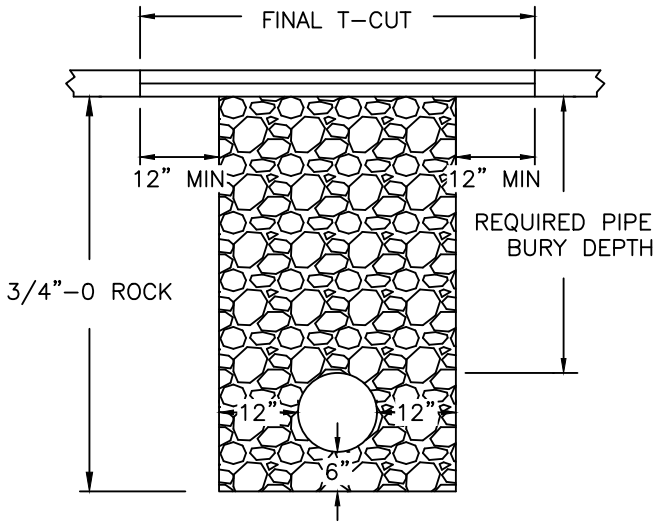
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Utility Placement

DRAWING NO. 509

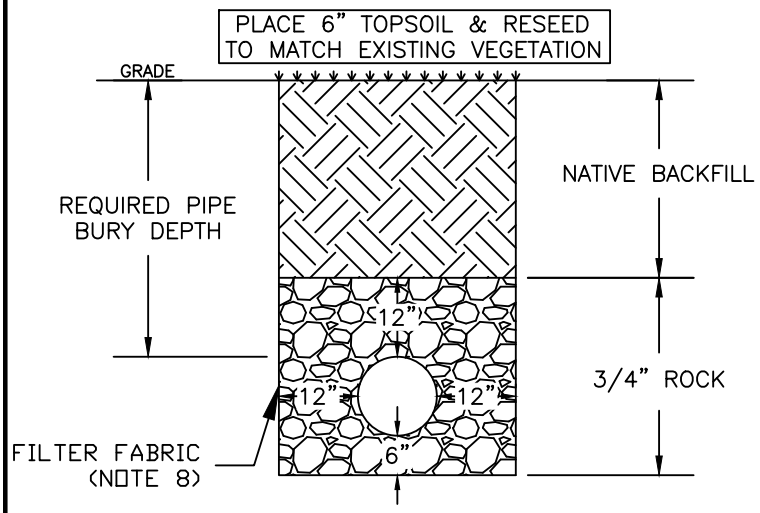
APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	DRAWING NUMBER CHANGED	11/18	TAP
3	DRAWING NUMBER AND NOTE CHANGED	08/19	TAP
4	NOTE CHANGED	10/23	HGB



TRENCH WITHIN PAVED AREAS

ASPHALT REPLACEMENT DEPTH	
CLASSIFICATION	DEPTH (IN.) WHICHEVER IS GREATER
ARTERIAL/INDUSTRIAL	8 OR EXISTING
COLLECTOR	6 OR EXISTING
LOCAL	4 OR EXISTING



TRENCH OUTSIDE OF PAVED AREAS

NOTES:

1. ADDITIONAL REPAIR IS REQUIRED FOR STREETS PAVED WITHIN THE LAST 5 YEARS. SEE STANDARD DETAIL NO. 511.
2. FINAL SAWCUTS MUST BE 6" WIDER THAN THE WIDTH OF THE ROLLER USED FOR COMPACTION
3. PAVING TO CONSIST OF LEVEL 3 ASPHALT CONCRETE AND BE PLACED IN LIFTS. EACH LIFT MUST HAVE A MAXIMUM DEPTH OF 3" & MINIMUM DEPTH OF 2".
4. INFRARED ASPHALT REPAIRS MAY BE REQUIRED AT THE DISCRETION OF THE CITY ENGINEER.
5. UNDERMINED, BROKEN OR CRACKED PAVEMENT EDGES MUST BE SAWCUT AND REMOVED AT THE DISCRETION OF THE CITY ENGINEER.
6. CONTROL DENSITY FILL (CDF) MAY BE REQUIRED AT CITY ENGINEER'S DISCRETION.
7. ALL ROCK AND BACKFILL TO BE COMPACTED TO 95% MAX. DENSITY AASHTO T-180.
8. WRAP BACKFILL IN PIPE ZONE ($\frac{3}{4}$" ROCK) IN FILTER FABRIC WITH 12" OVERLAP

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

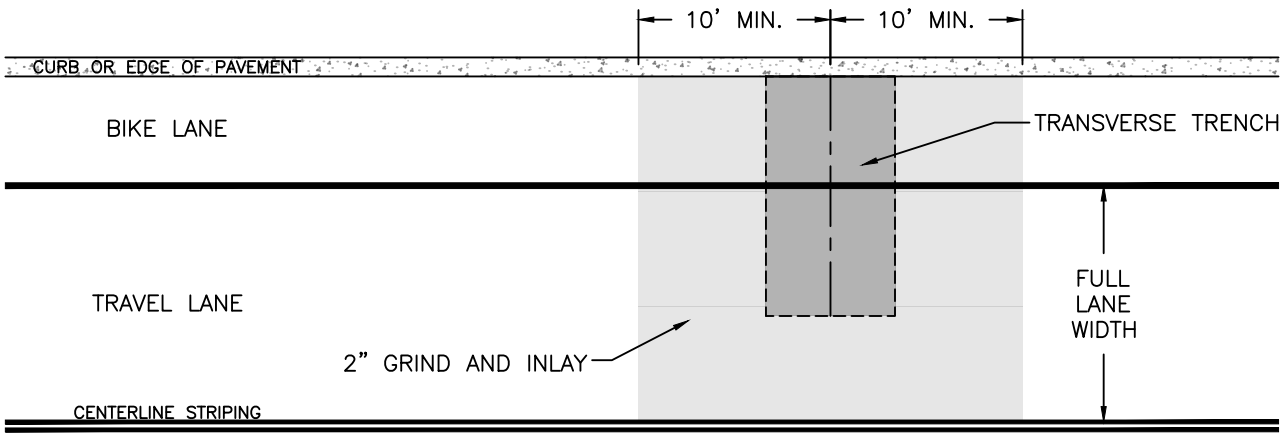
Trench Patch

DRAWING NO. 510

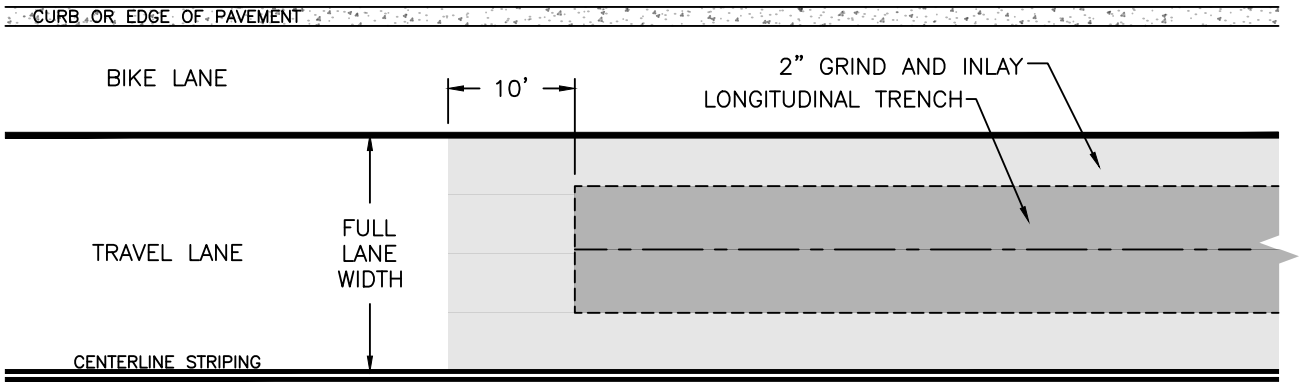
APPROVED 03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
4	DRAWING NUMBER CHANGED	11/18	TAP
5	UPDATED NOTES, DRAWING NUMBER CHANGE	08/19	TAP
6	NOTE CHANGED	10/23	HGB



TRANSVERSE TRENCH



LONGITUDINAL TRENCH

NOTES:

1. CALL FOR INSPECTION PRIOR TO PAVING TRENCH TO DISCUSS PREP–WORK WITH INSPECTOR.
2. ASPHALT WITHIN TRENCH AREA IS TO BE REPLACED IN 2" LIFTS BACK TO PREVIOUS GRADE. SEE DETAIL 510 FOR TRENCH REPAIR STANDARDS.
3. LIMITS OF GRIND DESCRIBED ABOVE MUST AT LEAST 2" DEEP FOR ENTIRE AREA. ONCE THIS IS COMPLETE, THE FINAL LIFT MAY BE APPLIED AFTER INSPECTION.
4. ANY TRANSVERSE CUT INTO A LANE REQUIRES A FULL LANE WIDTH, 2" GRIND AND INLAY REPLACEMENT (EXAMPLE: IF THE BIKE LANE IS CUT INTO BUT NOT THE TRAVEL LANE, ONLY THE BIKE LANE WILL REQUIRE A FULL WIDTH 2" GRIND AND INLAY AS SHOWN).
5. STREET OPENING SURCHARGE BASED ON SQUARE FOOT AREA OF TRANSVERSE OR LONGITUDINAL TRENCH.

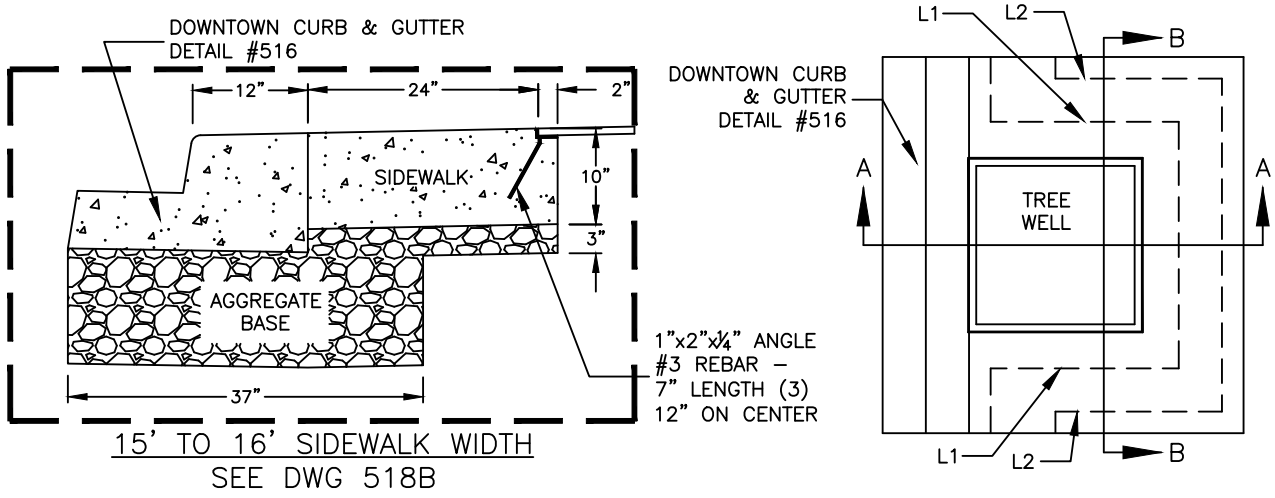
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Asphalt Repair for Newly Paved Road

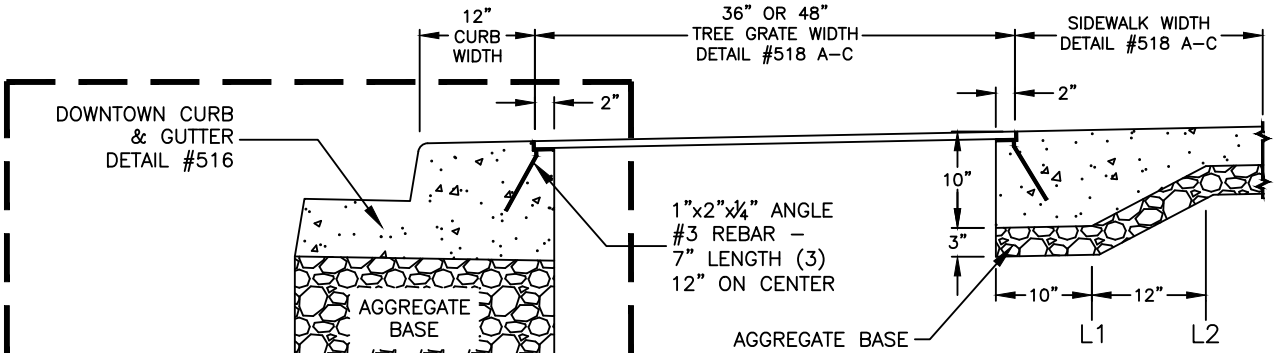
DRAWING NO. 511

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
4	DRAWING NUMBER CHANGED	11/18	TAP
5	DRAWING NUMBER CHANGED	08/19	TAP
6	NOTE ADDED	10/23	HGB

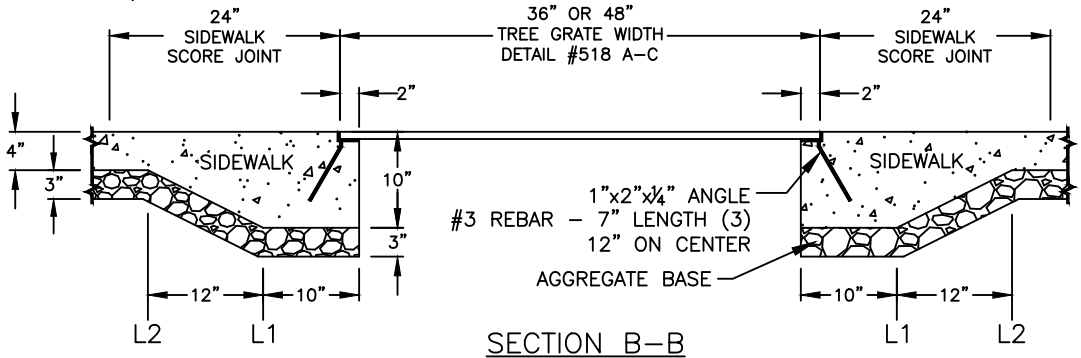


15' TO 16' SIDEWALK WIDTH
SEE DWG 518B



8' TO 13' SIDEWALK WIDTH
SEE DWGS 518A, 518B & 518C

SECTION A–A



SECTION B–B

CONSTRUCTION NOTES

1. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
2. AGGREGATE BASE TO BE COMPACTED TO 95% MAXIMUM DENSITY PER AASHTO T–180.
3. ALL CONCRETE SURFACES TO BE LIGHTLY BROOMED.

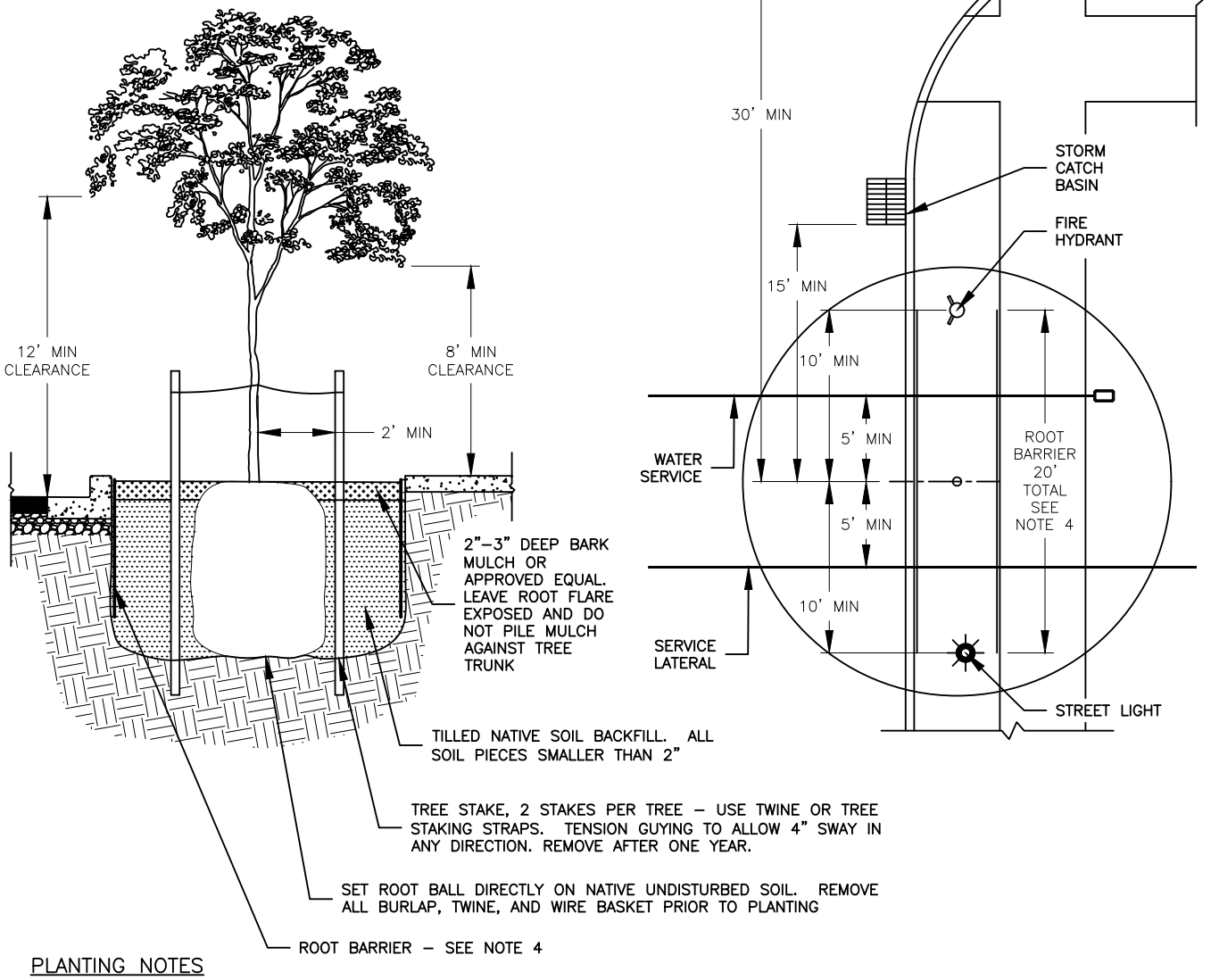
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Street Tree Grate

DRAWING NO. 512

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	CHANGED DRAWING NUMBER	12/13	AJR
3	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
4	NOTE CHANGED	10/23	HGB



PLANTING NOTES

1. PLANTER AND TREE WELL DIMENSION VARIES BY LOCATION AS DETERMINED BY PLANS. DIG HOLE 2–3 TIMES THE ROOT BALL DIAMETER, MINIMUM.
2. TREE ROOT BALLS MUST BE AT LEAST 5' DISTANCE FROM ANY UNDERGROUND UTILITIES OR LATERALS.
3. TREES IN PLANTERS MUST BE CENTERED BETWEEN CURB AND SIDEWALK.
4. ROOT BARRIER TO BE USED FOR ALL STREET TREES LOCATED WITHIN 8 FEET OF ALL CURBS, EDGE OF ASPHALT AND SIDEWALK. ROOT BARRIER TO BE 24" DEEP, 2MM (.08") THICK, 1/2" ABOVE THE SOIL ELEVATION, WITH JOINTS OVERLAPPING 6". ROOT BARRIER TO EXTEND 20 FEET CENTERED WITH THE TREE TRUNK. ROOT BARRIER MUST BE INSTALLED ON ALL SIDES OF PLANTER OR TREE WELL THAT ARE WITHIN 10' OF TREE TRUNK.
5. SEE SECTION 5.0093 FOR APPROVED TREE SPECIES AND SIZE.
6. DO NOT USE TREE TRUNK TO LIFT TREE. IF THE INSPECTOR DETERMINES THAT THE TREE'S ABILITY TO SURVIVE HAS BEEN COMPROMISED, THAT TREE WILL BE REJECTED PRIOR TO PLANTING.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Street Tree Planting

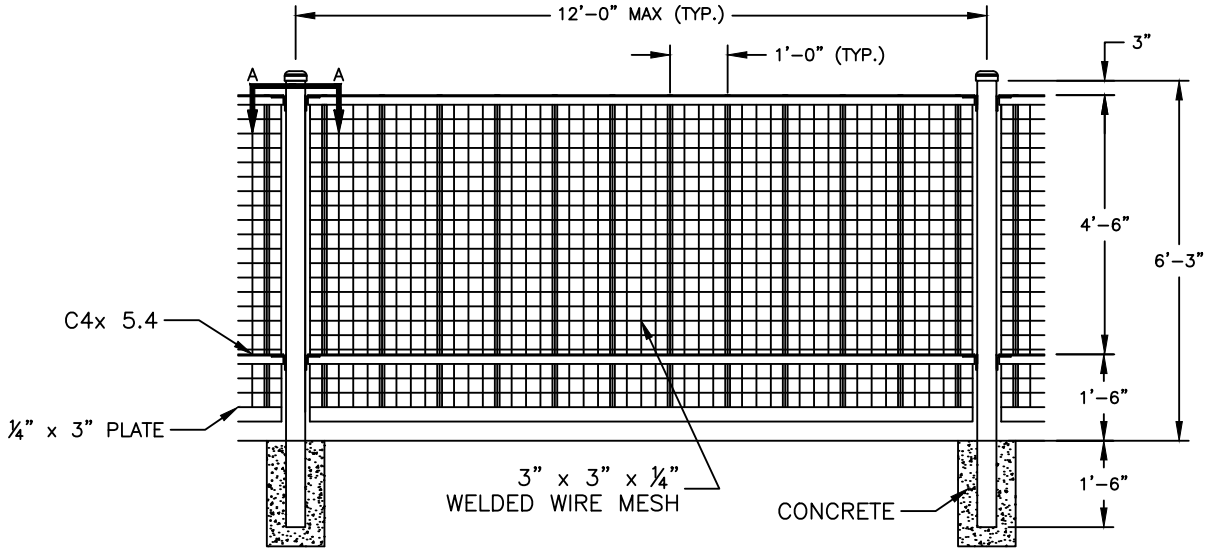
DRAWING NO. 513

APPROVED

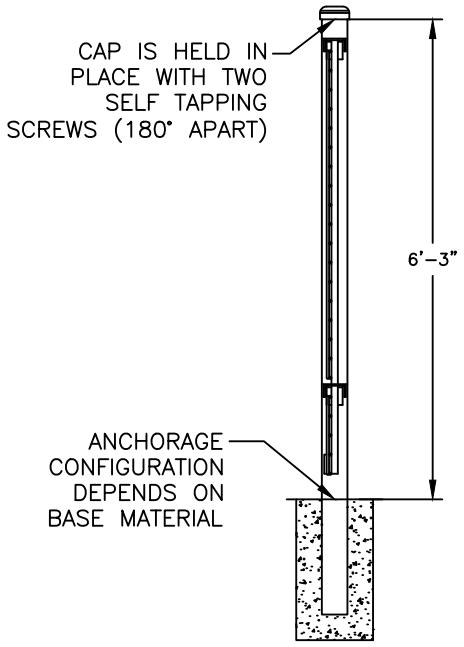
Jennifer Garbely 03/2024

CITY ENGINEER DATE

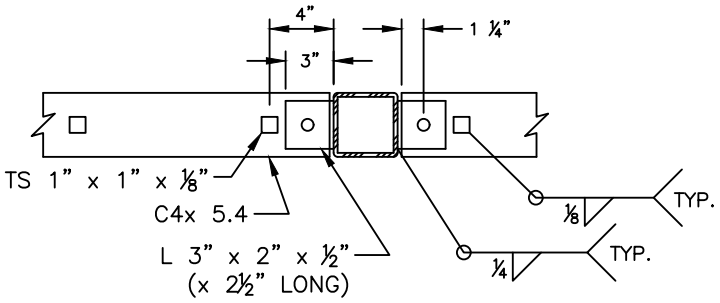
NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/13	AJR
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
3	ADDED CLEARANCE NOTES	10/21	TAP



ELEVATION
TYPICAL ORNAMENTAL PANEL



SECTION



SECTION A–A

NOTES:

1. SLOPE OF PANELS MAY VARY. PROVIDE 3/16" LONG FLARE BEVEL GROOVE WELDS @ 2'–0" EACH WAY TO 1" SQUARE TUBES.
2. PROVIDE MINIMUM OF 2 WELDS IN MESH BELOW BOTTOM C4 x 5.4.
3. WIRE MESH TO BE PARALLEL WITH VERTICAL BARS. PLACE THE WELD WIRE MESH ON THE OUTSIDE FACE OF THE FENCE.
4. MAXIMUM GAP BETWEEN WIRE MESH AND EDGE MEMBERS NOT TO EXCEED ¼".
5. FENCE MATERIAL, POSTS, AND BRACKETS TO BE POWDER COATED BLACK PRIOR TO FINAL INSTALLATION ON–SITE.

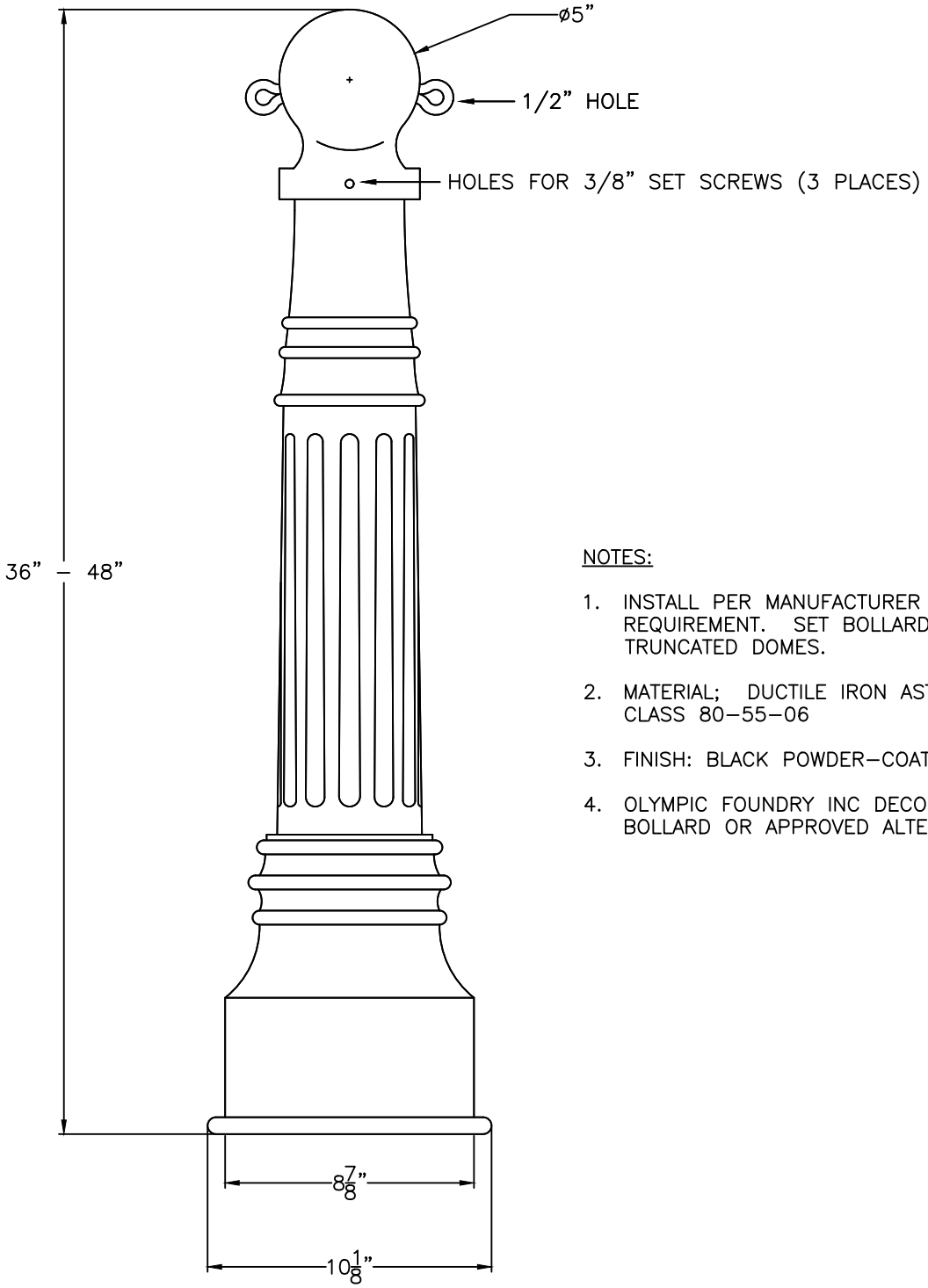
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Decorative Fence

DRAWING NO. 514

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	RENUMBERED DRAWING, NOTES CHANGED	08/19	TAP



NOTES:

1. INSTALL PER MANUFACTURER REQUIREMENT. SET BOLLARD BEHIND TRUNCATED DOMES.
2. MATERIAL; DUCTILE IRON ASTM A536, CLASS 80–55–06
3. FINISH: BLACK POWDER–COATED
4. OLYMPIC FOUNDRY INC DECORATIVE BOLLARD OR APPROVED ALTERNATE

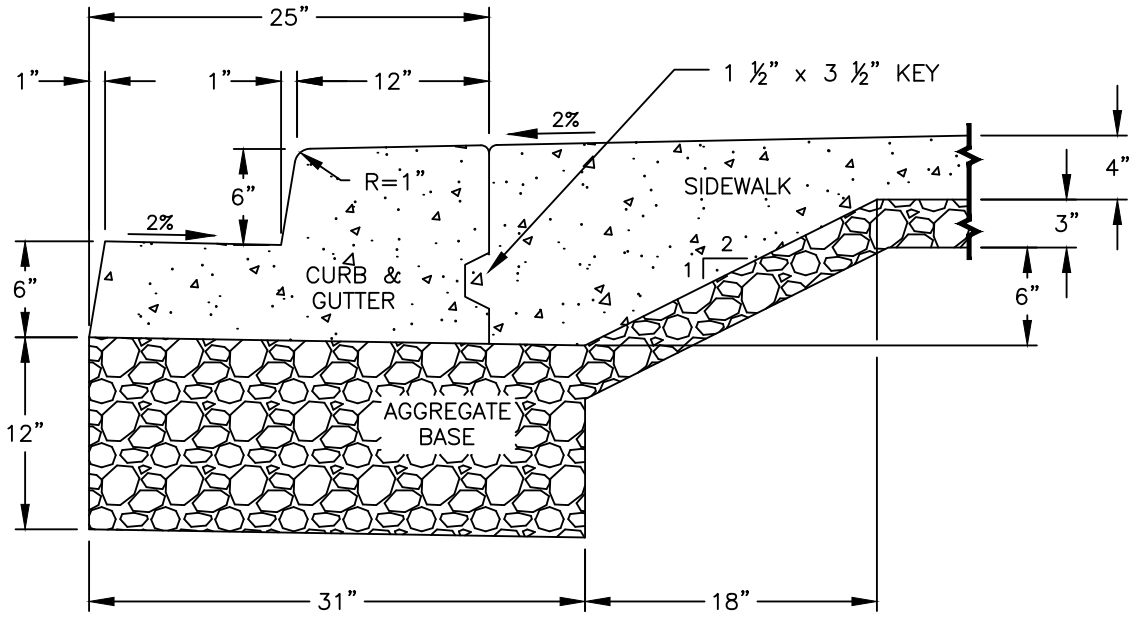
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Decorative Bollard

DRAWING NO. 515

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	DRAWING CREATED	11/18	TAP
2	RENUMBERED DRAWING	08/19	TAP



NOTES:

1. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
2. AGGREGATE BASE TO BE COMPACTED TO 95% MAXIMUM DENSITY PER AASHTO T-180.
3. CURB & GUTTER AND SIDEWALK TO BE CONSTRUCTED IN SEPARATE POURS.
4. CONTRACTION JOINTS DEPTH MUST BE A MINIMUM ⅓ OF THE CONCRETE THICKNESS. CONTRACTION JOINTS ARE REQUIRED AT EACH POINT OF TANGENCY AND EVERY 10 FEET OF CURB LENGTH. CONTRACTION JOINTS MUST ALIGN WITH SIDEWALK JOINTS. SIDEWALK CONTRACTION JOINTS TO BE INSTALLED PER DETAIL #518 A-C.
5. THE BACK OF CURB TO BE TROWLED WITH A ½" RADIUS JOINT.
6. ALL SURFACES TO BE STEEL TROWELED.
7. WHERE EXISTING CURB IS TO REMOVED OR REPLACED, THE CURB MUST BE SAWCUT AND REMOVED AT A JOINT.

ATTENTION: ALL CONCRETE WORK WITHIN THE PUBLIC RIGHT-OF-WAY REQUIRES A RIGHT-OF-WAY PERMIT IN ADDITION TO SUB-GRADE, BASE ROCK, AND CONCRETE FORM INSPECTION AND APPROVAL BY THE CITY INSPECTOR PRIOR TO POURING CONCRETE.

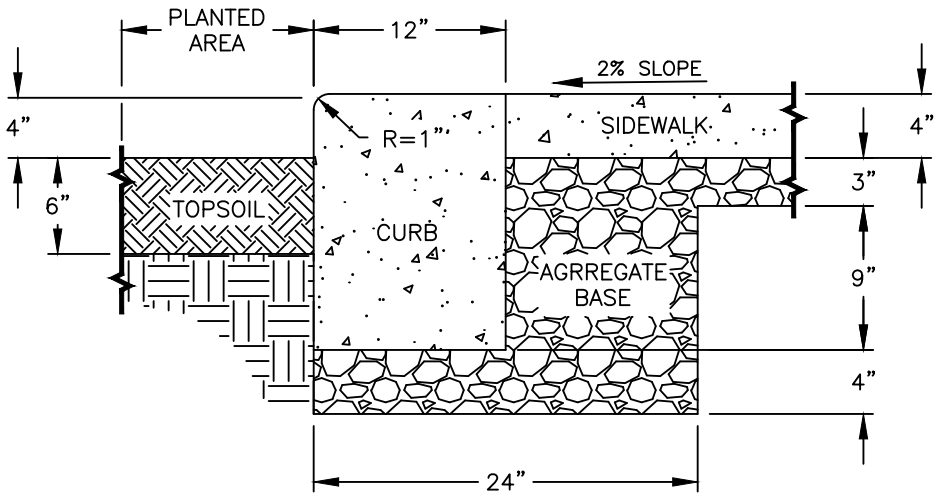
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Curb & Gutter

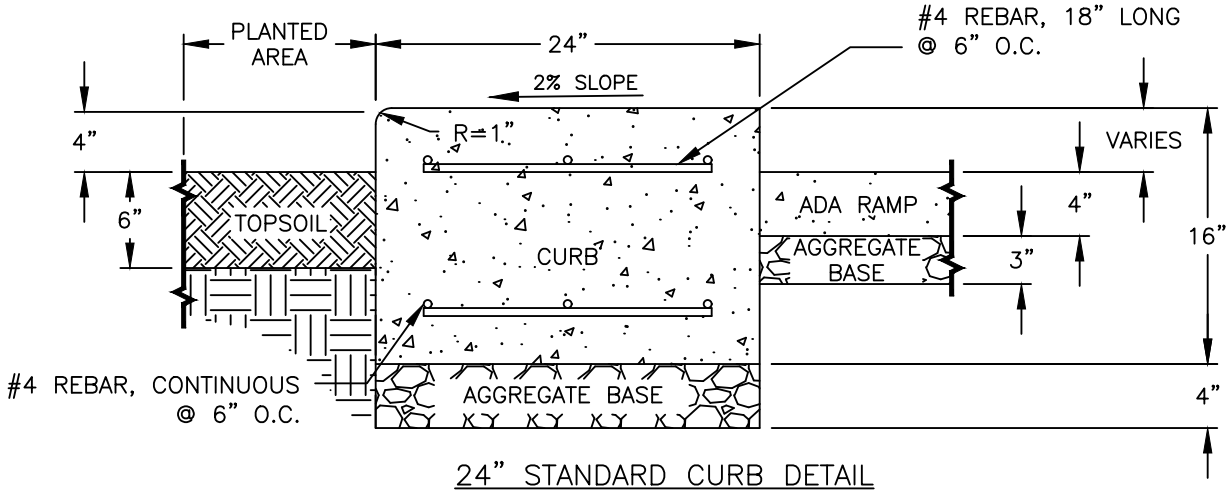
DRAWING NO. 516

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



12" STANDARD CURB DETAIL



24" STANDARD CURB DETAIL

NOTES:

1. CONCRETE MUST BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
2. AGGREGATE BASE TO BE COMPACTED TO 95% MAXIMUM DENSITY OF AASHTO T-180.
3. REBAR TO BE INSTALLED WITH A 3" CLEARANCE FROM ALL CONCRETE SURFACES.
4. CURB AND SIDEWALK TO BE CONSTRUCTED IN SEPARATE POURS.
5. CONTRACTION JOINTS DEPTH MUST BE A MINIMUM ⅓ OF THE CONCRETE THICKNESS. CONTRACTION JOINTS ARE REQUIRED AT EACH POINT OF TANGENCY AND EVERY 10 FEET OF CURB LENGTH. CONTRACTION JOINTS MUST ALIGN WITH SIDEWALK JOINTS. SIDEWALK CONTRACTION JOINTS TO BE INSTALLED PER DRAWING NO. #518 A-C.
6. THE BACK OF CURB TO BE TROWELED WITH A ½" RADIUS JOINT.
7. ALL SURFACES TO BE STEEL TROWELED.
8. WHERE EXISTING CURB IS TO REMOVED OR REPLACED, THE CURB MUST BE SAWCUT AND REMOVED AT A JOINT.

ATTENTION: ALL CONCRETE WORK WITHIN THE PUBLIC RIGHT-OF-WAY REQUIRES A RIGHT-OF-WAY PERMIT IN ADDITION TO SUB-GRADE, BASE ROCK, AND CONCRETE FORM INSPECTION AND APPROVAL BY THE CITY INSPECTOR PRIOR TO POURING CONCRETE.

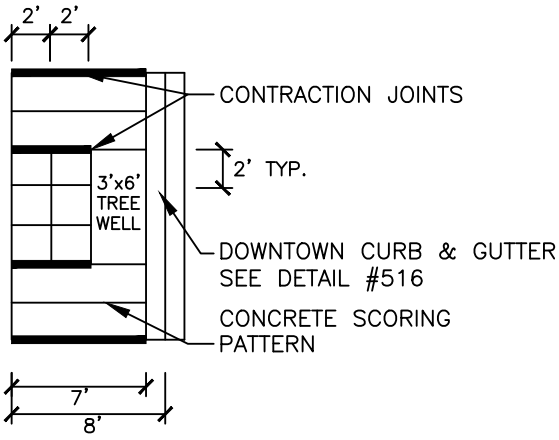
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Curb

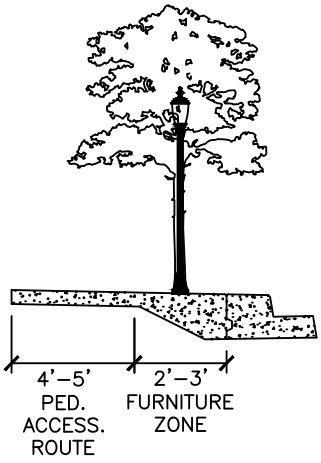
DRAWING NO. 517

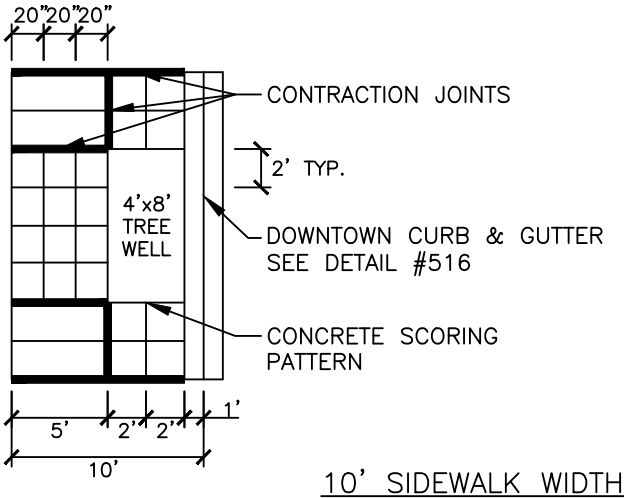
APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP

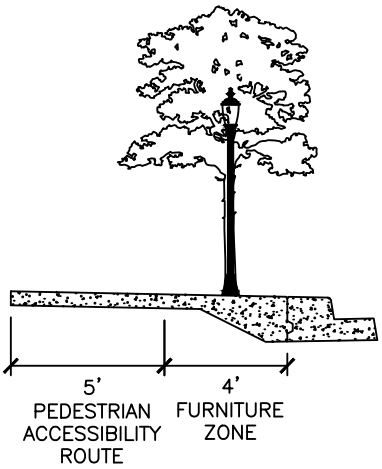


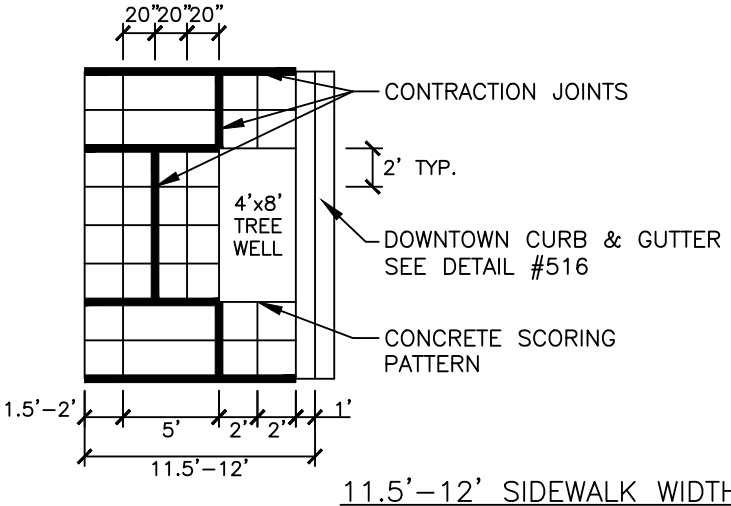
8' SIDEWALK WIDTH



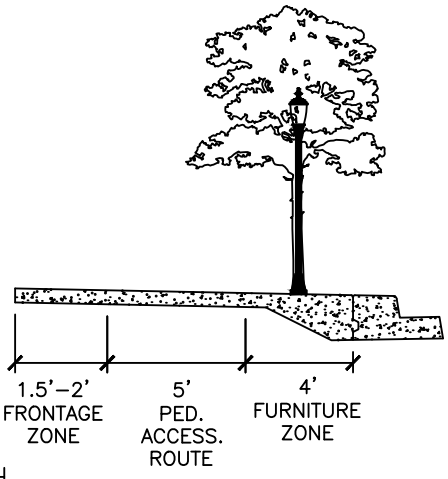


10' SIDEWALK WIDTH





11.5'–12' SIDEWALK WIDTH



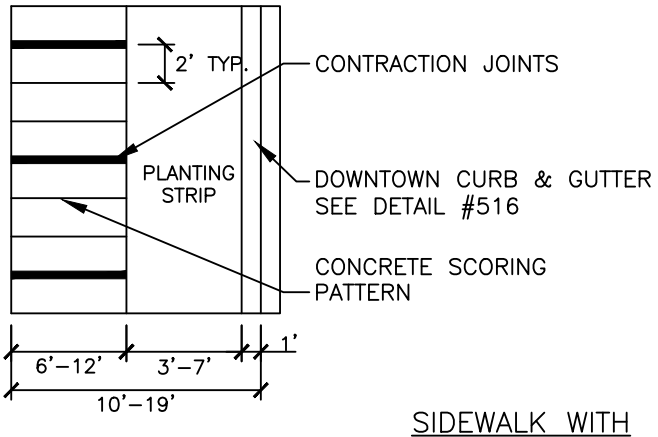
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

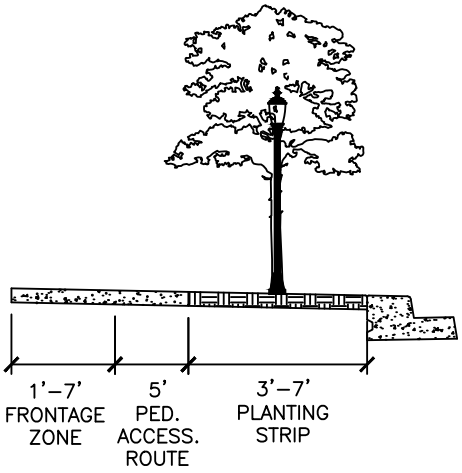
Downtown Sidewalk

DRAWING NO. 518A

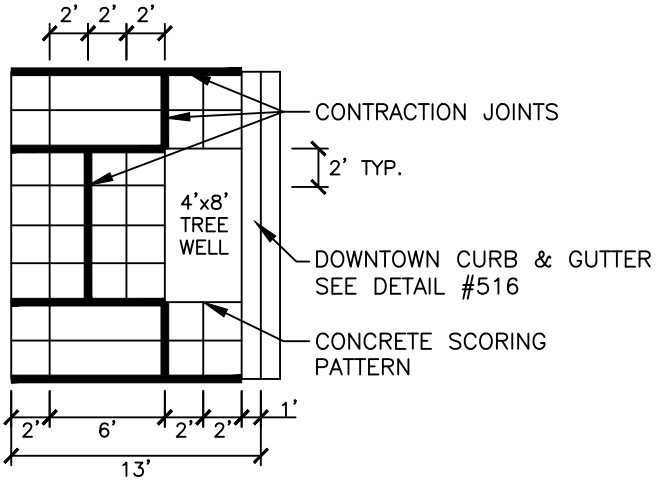
APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

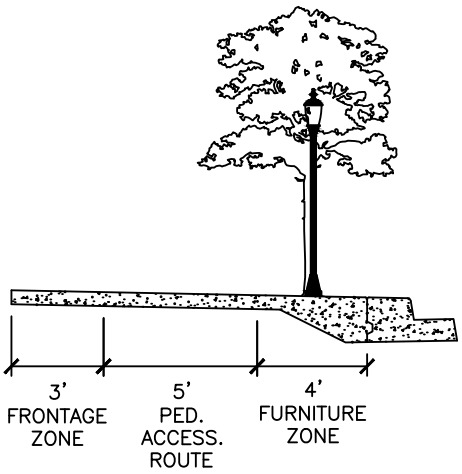
NO.	REVISIONS	DATE	BY
2	REVISED SCORING PATTERN & NOW A–C	12/13	AJR
3	REVISED DIMENSIONS & PARTITION NAMES	08/16	LMO
4	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



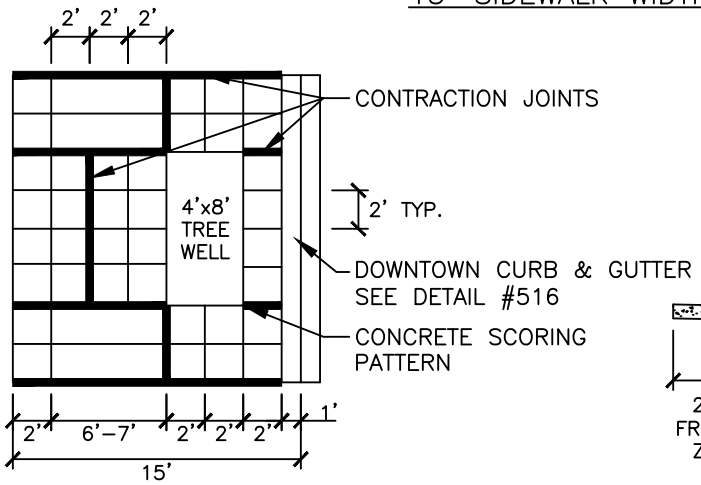


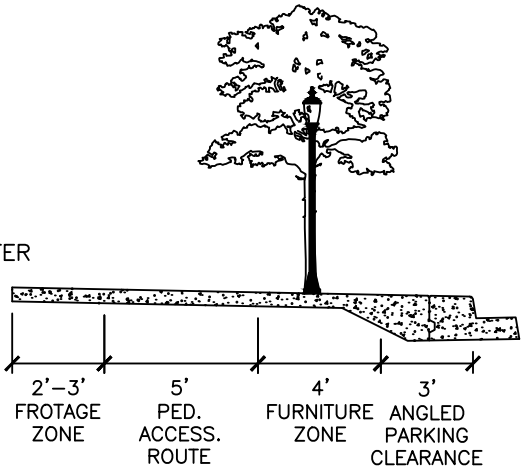
SIDEWALK WITH PLANTING STRIP





13' SIDEWALK WIDTH





15'–16' SIDEWALK WIDTH

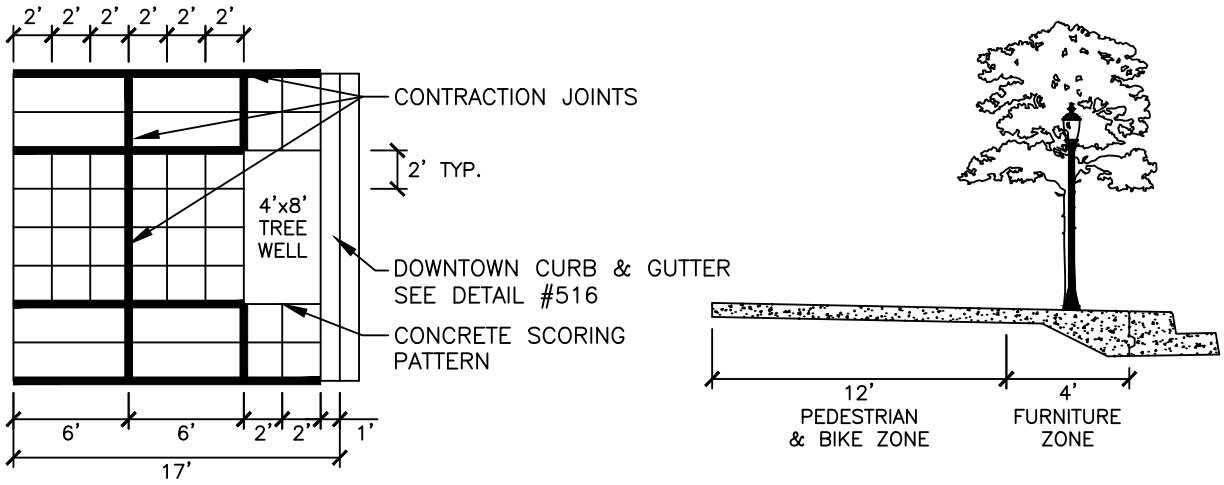
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Sidewalk

DRAWING NO. 518B

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	REVISED SCORING PATTERN & NOW A–C	12/13	AJR
3	REVISED DIMENSIONS & PARTITION NAMES	08/16	LMO
4	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



17' MULTI–USE PATH

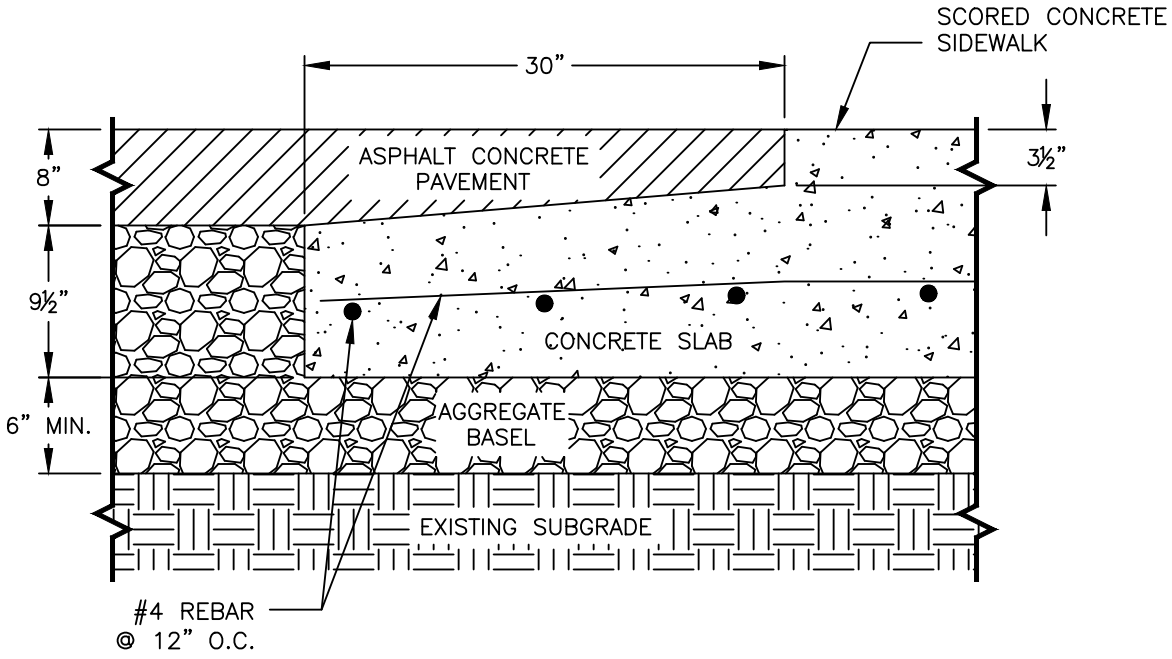
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Sidewalk

DRAWING NO. 518C

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	ADDED 17' MULTI–USE PATH	12/11	ZJW
2	REVISED SCORING PATTERN & NOW A–C	12/13	AJR
3	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



NOTES:

1. CONCRETE MUST BE 4000 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
2. AGGREGATE BASE TO BE COMPACTED TO 95% MAXIMUM DENSITY PER AASHTO T-180.
3. ALL EXPOSED SURFACES TO BE LIGHTLY BROOMED.

ATTENTION: ALL CONCRETE WORK WITHIN THE PUBLIC RIGHT-OF-WAY REQUIRES A RIGHT-OF-WAY PERMIT IN ADDITION TO SUB-GRADE, BASE ROCK, AND CONCRETE FORM INSPECTION AND APPROVAL BY THE CITY INSPECTOR PRIOR TO POURING CONCRETE.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Crosswalk Transition

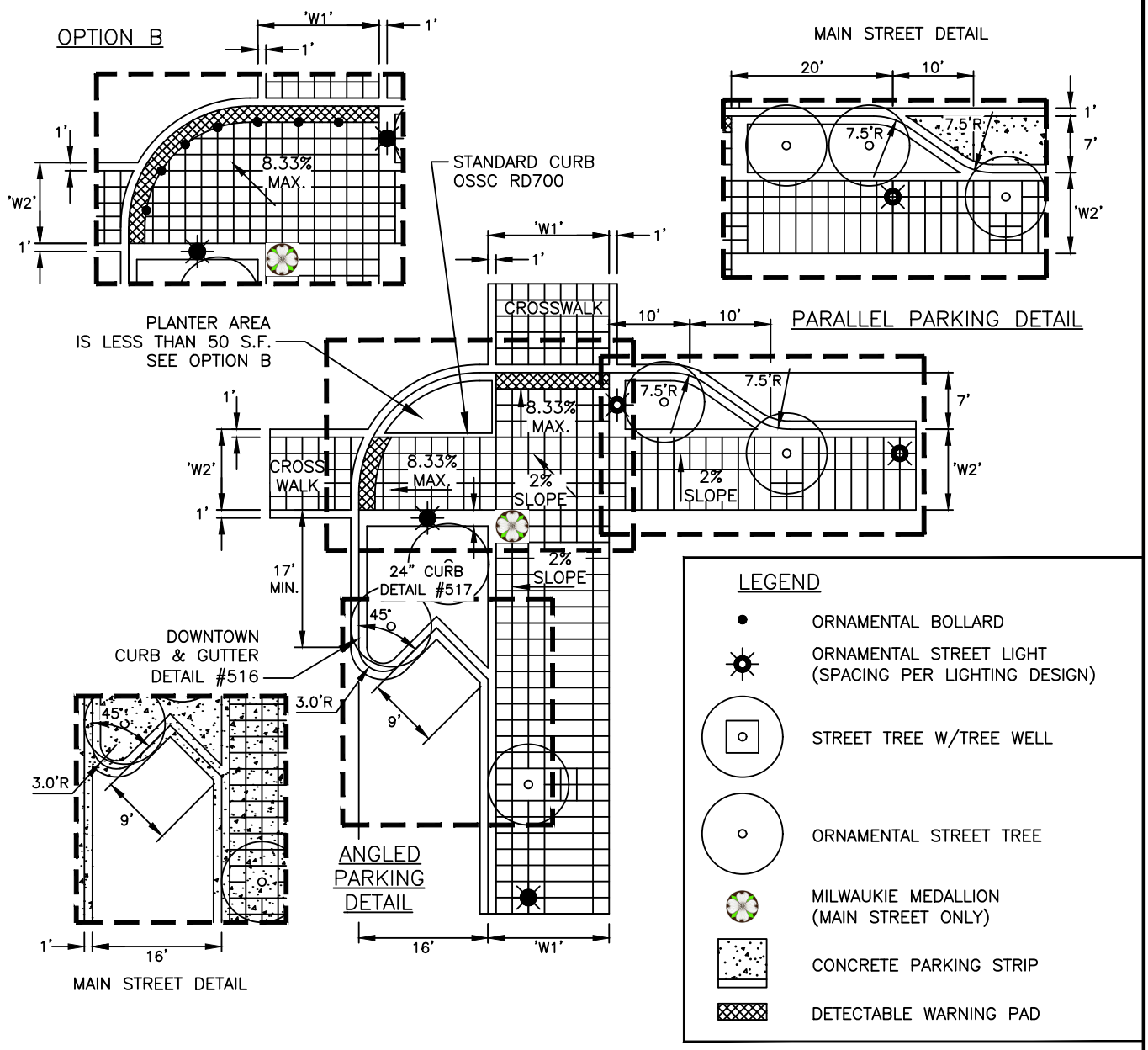
DRAWING NO. 519

APPROVED

CITY ENGINEER

03/2024
DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



CONSTRUCTION NOTES

1. SIDEWALK WIDTH, DIMENSION 'W1' AND 'W2', PER STREET CROSS-SECTION DETAIL FOR STREETS BEING DESIGNED.
2. PROVIDE 35' CURB RADIUS, DIMENSION "R1", FOR ALL STREET CORNERS WITH RIGHT-TURNING TRANSIT MOVEMENTS. PROVIDE 15' CURB RADIUS FOR ALL OTHER STREET CORNERS.
3. CROSSWALK SCORING MUST MATCH ADJACENT SIDEWALK, MAXIMUM 2'x2' SQUARES. SEE DETAIL #519 FOR CROSSWALK TO STREET PAVEMENT TRANSITION DETAIL.
4. CONCRETE PARKING AREAS FOR MAIN STREET TO BE 4000 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4". MINIMUM 10" DEPTH OF CONCRETE WITH 10" DEPTH OF AGGREGATE BASE.
5. DETECTABLE WARNING PAD TO BE 24" LONG IN DIRECTION OF TRAVEL AND INSTALLED ALONG THE FULL WIDTH OF THE BOTTOM OF THE SIDEWALK RAMP. PADS TO BE CUT TO FIT ALONG CURB RADIUS THROUGH, APPROVAL BY CITY ENGINEER. ADA SOLUTIONS ADA CAST-IN-PLACE REPLACEABLE TACTILE UNITS OR APPROVED EQUAL.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Intersection Curb Extension

DRAWING NO. 520

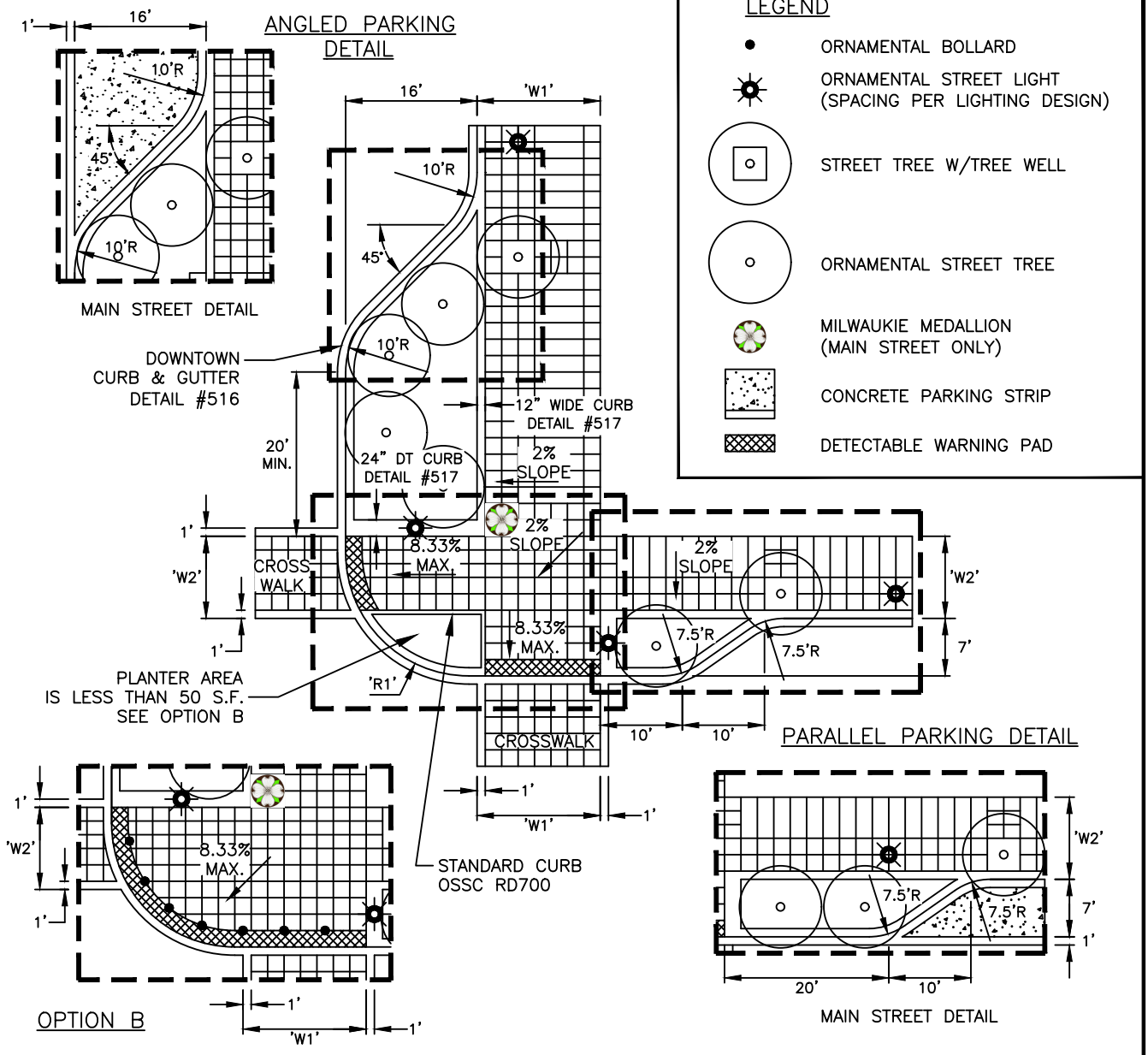
APPROVED

CITY ENGINEER

03/2024

DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
3	UPDATED NOTES	01/21	TAP



CONSTRUCTION NOTES

1. SIDEWALK WIDTH, DIMENSION 'W1' AND 'W2', PER STREET CROSS-SECTION DETAIL FOR STREETS BEING DESIGNED.
2. PROVIDE 35' CURB RADIUS, DIMENSION "R1", FOR ALL STREET CORNERS WITH RIGHT-TURNING TRANSIT MOVEMENTS. PROVIDE 15' CURB RADIUS FOR ALL OTHER STREET CORNERS.
3. CROSSWALK SCORING MUST MATCH ADJACENT SIDEWALK, MAXIMUM 2'x2' SQUARES. SEE DETAIL #519 FOR CROSSWALK TO STREET PAVEMENT TRANSITION DETAIL.
4. CONCRETE PARKING AREAS FOR MAIN STREET TO BE 4000 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4". MINIMUM 10" DEPTH OF CONCRETE WITH 10" DEPTH OF AGGREGATE BASE.
5. DETECTABLE WARNING PAD TO BE 24" LONG IN DIRECTION OF TRAVEL AND INSTALLED ALONG THE FULL WIDTH OF THE BOTTOM OF THE SIDEWALK RAMP. PADS TO BE CUT TO FIT ALONG CURB RADIUS, THROUGH APPROVAL BY CITY ENGINEER. ADA SOLUTIONS ADA CAST-IN-PLACE REPLACEABLE TACTILE UNITS OR APPROVED EQUAL.

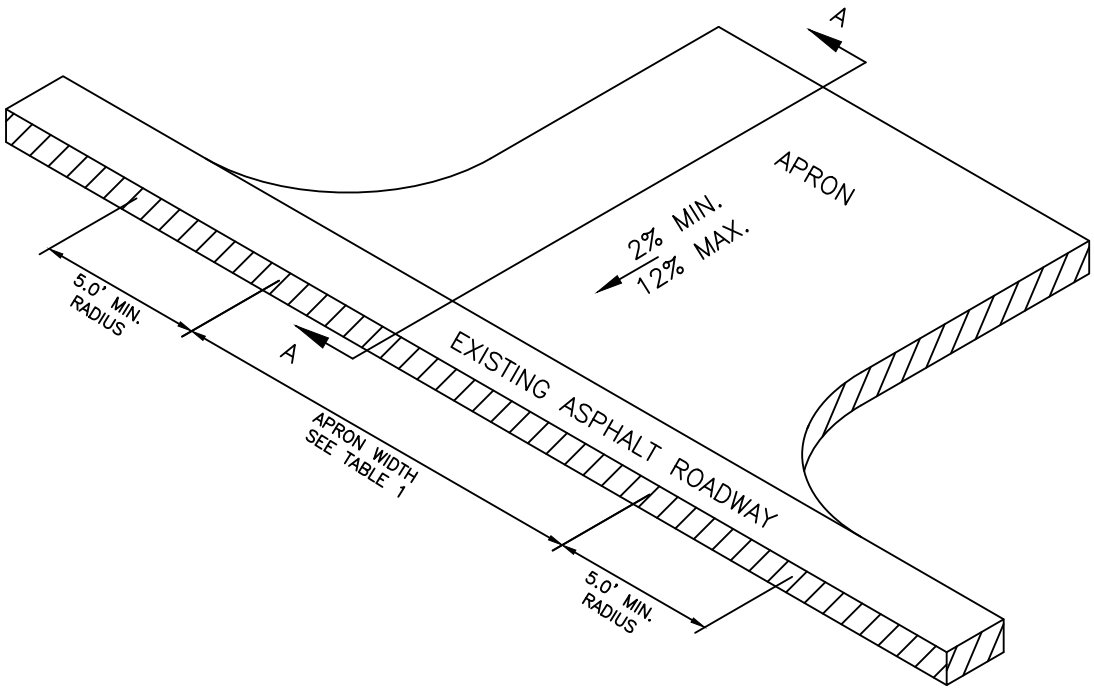
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

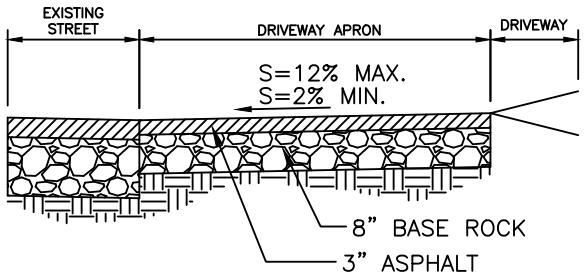
Downtown Intersection Curb Extension

DRAWING NO. 521

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	CHANGED DRAWING NUMBER	12/13	AJR
3	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
4	UPDATED NOTES	01/21	TAP





CROSS SECTION A–A

TABLE 1 – DRIVEWAY APPROACH WIDTH		
CLASSIFICATION	MIN. WIDTH	MAX. WIDTH
1–4 DWELLING UNITS – LOCAL STREET	12.0'	20.0'
1–4 DWELLING UNITS – COLLECTOR STREET	16.0'	20.0'
5–8 DWELLING UNITS – LOCAL STREET	16.0'	24.0'
5–8 DWELLING UNITS – COLLECTOR STREET	20.0'	24.0'
MORE THAN 8 DWELLING UNITS – LOCAL STREET	20.0'	30.0'
MORE THAN 8 DWELLING UNITS – LOCAL STREET	24.0'	30.0'
COMMERCIAL, OFFICES, OR INSTITUTIONAL	16.0'	36.0'
INDUSTRIAL	24.0'	45.0'

1. ALL PAVEMENT INSTALLATION TO BE HOT LEVEL 2 ASPHALT CONCRETE.
2. EXISTING ASPHALT CONCRETE IN FRONT OF THE DRIVEWAY APRON MUST BE SAW CUT ALONG A LINE PARALLEL TO THE FRONTING PROPERTY LINE TO PROVIDE A CLEAN SURFACE FOR THE DRIVEWAY APPROACH TO TIE INTO.
3. SEAL ALL JOINTS WITH A HEAT APPLIED RUBBERIZED SEALANT. SEALANT TO CONFORM TO ASTM D6690 TYPE 1, OR APPROVED EQUAL.

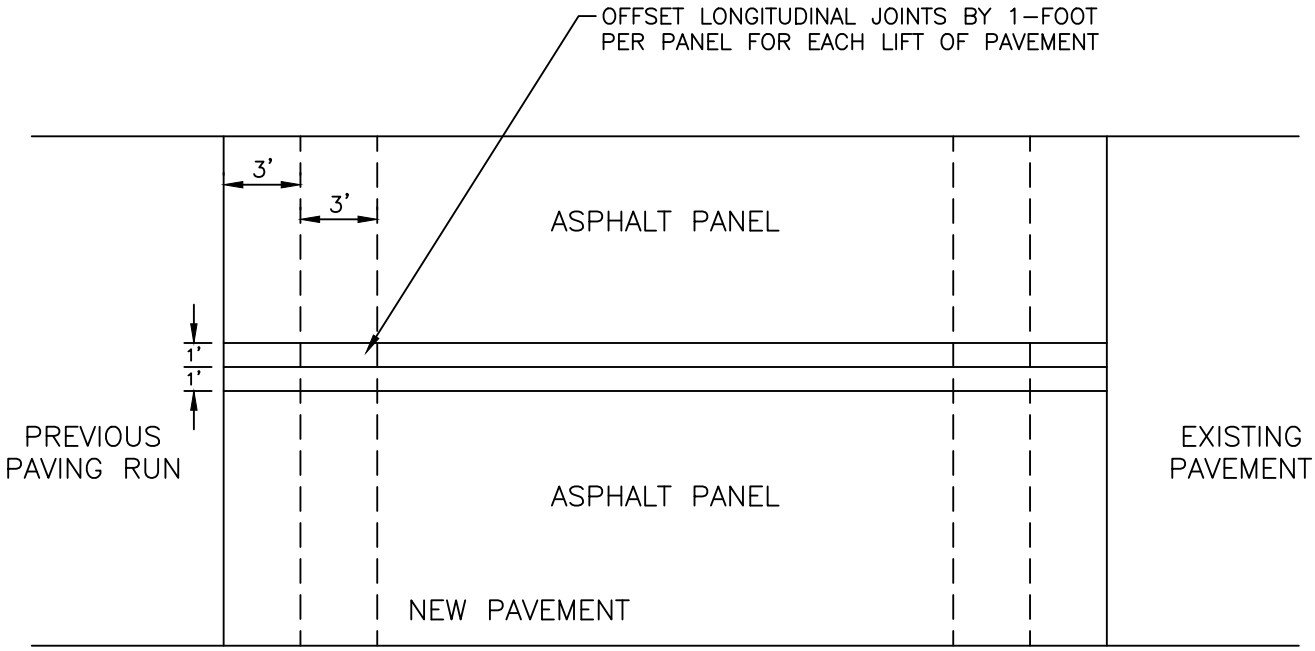
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Asphalt Driveway Approach

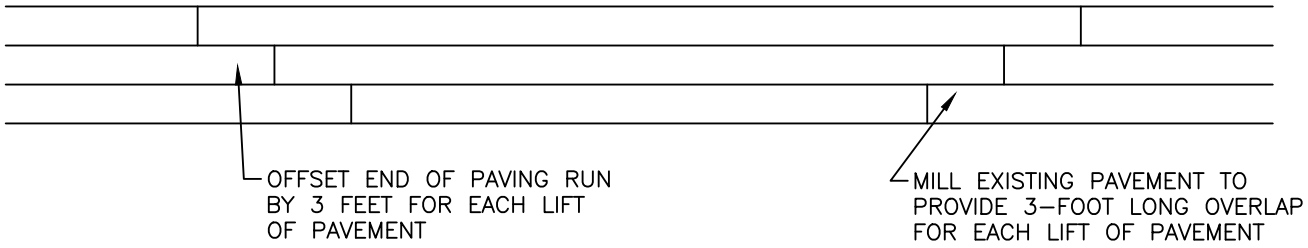
DRAWING NO. 522

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	CHANGED NOTE 3	12/14	AJR
4	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
5	UPDATED TABLE	11/23	TAP



PLAN VIEW



SECTION VIEW

NOTES:

1. PRIOR TO PLACING NEW PAVEMENT, ASPHALT COLD JOINTS MUST BE SAWCUT TO A STRAIGHT LINE, CREATING A SMOOTH, SOUND EDGE FOR JOINING NEW PAVEMENT

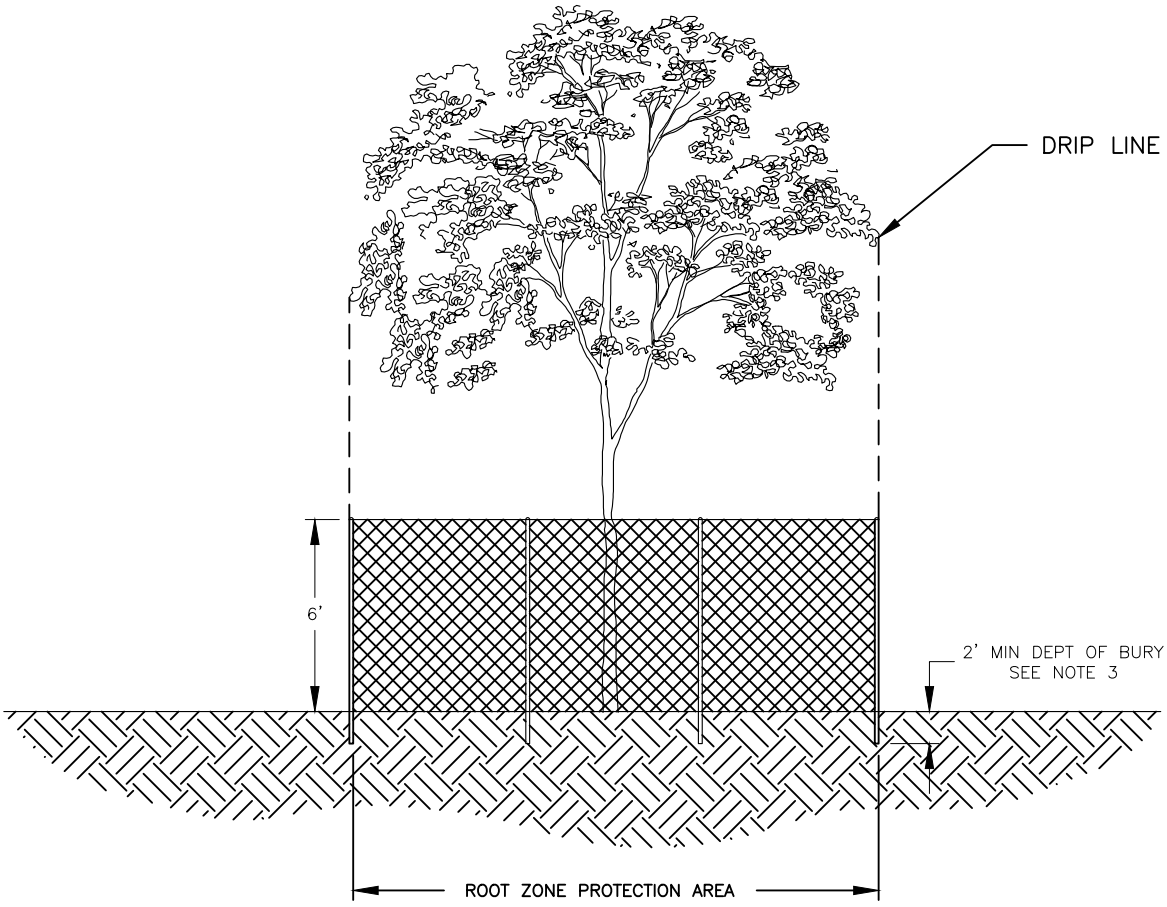
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Asphalt Concrete Pavement Placement

DRAWING NO. 523

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	08/19	TAP



NOTES

1. FENCE MUST BE 6 FEET IN HEIGHT AND SET AT THE TREE DRIP LINE.
2. FENCE MATERIALS TO CONSIST OF 2" MESH CHAIN LINKS SECURED TO A MINIMUM 1–1/2" DIA. STEEL OR ALUMINUM POST, OR APPROVED ALTERNATE.
3. POST TO BE SET TO A DEPTH OF NO LESS THAN 2 FEET IN NATIVE SOIL. AVOID DAMAGING TREE ROOTS WHEN SETTING POSTS.
4. TREE PROTECTION FENCING MUST BE INSTALLED, INSPECTED AND APPROVED BY THE CITY'S AUTHORIZED REPRESENTATIVE PRIOR TO ANY EROSION CONTROL FENCING BEING INSTALLED OR ANY GRADING ACTIVITIES OCCUR.
5. FENCE MUST REMAIN IN PLACE UNTIL THE COMPLETION OF CONSTRUCTION ACTIVITIES. MOVEMENT OR REMOVAL OF FENCE REQUIRES APPROVAL BY CITY'S AUTHORIZED REPRESENTATIVE.
6. ENCROACHMENT SHALL BE NO CLOSER THAN HALF OF THE REQUIRED ROOT ZONE PROTECTION RADIUS.
7. ENCROACHMENT NOT TO ENCROACH ON MORE THAN 25% OF THE ROOT ZONE PROTECTION AREA ZONE.
8. SIGN SHALL BE PLACED ON FENCE NOTING THE FENCE IS TO DELINEATE THE TREE ROOT ZONE PROTECTION AREA.
9. TREE PROTECTION ZONE SIGNAGE MUST BE POSTED ON FENCE AND INCLUDE A POINT OF CONTACT WITH NAME/NUMBER IN CASE ENTRY INTO AREA IS NEEDED. SIGNAGE MUST BE HIGHLY VISIBLE AND STURDY TO DISCOURAGE ENTRY INTO THE AREA.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Tree Protection Fencing

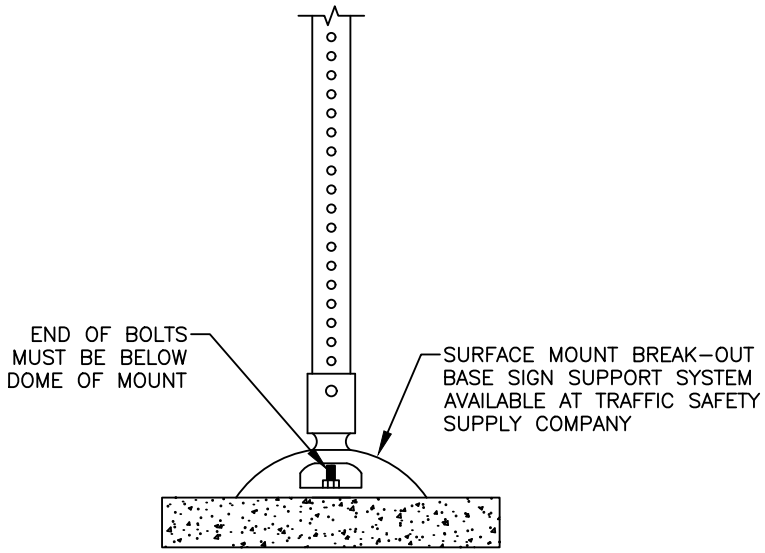
DRAWING NO. 524

APPROVED

03/2024

CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	08/19	TAP
2	NOTE CHANGED	10/23	HGB



CONCRETE SURFACE MOUNT

NOTES:

1. SIGN COMBINATION AND MINIMUM SIGN MOUNTING HEIGHT SHALL DETERMINE POST LENGTH. A 10' (MIN.) POST SHALL BE USED. A COMBINATION OF SIGNS GREATER THAN 36" IN HEIGHT SHALL REQUIRE A 12' (MIN.) POST.

2. SIGN POST SIZING SHALL BE BASED ON OREGON STANDARD DRAWING TM682 (85 MPH SQUARE TUBE SIGN SUPPORT SIZING CHART). THE MINIMUM POST SIZE SHALL BE 2" X 2" 12 GA. SQUARE TUBE. IF THE SIGN PANEL AREA IS GREATER THAN THAT ALLOWED BY A 2" X 2" POST, THEN A 2 $\frac{1}{2}$" X 2 $\frac{1}{2}$" 12 GA. POST SHALL BE USED. IF A LARGER SUPPORT IS REQUIRED, THEN WOOD SIGN SUPPORTS SHALL BE USED AS PER OREGON STANDARD DRAWING TM670.

3. NYLON SPACERS SHALL BE USED TO PREVENT CONTACT BETWEEN GLAVANIZED STEEL AND ALUMINUM MATERIAL SURFACES.

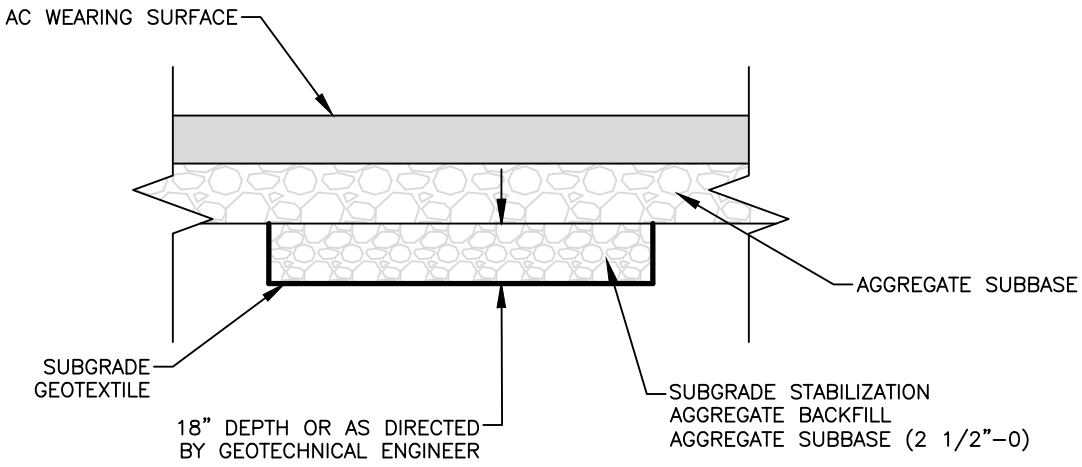
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Steel Street Sign Mounting

DRAWING NO. 525

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/2023	HGB



SUBGRADE STABILIZATION

NOTES:

1. FOR SURFACING DETAILS NOT SHOWN, SEE TYPICAL SECTIONS.
2. LOCATIONS AS DIRECTED

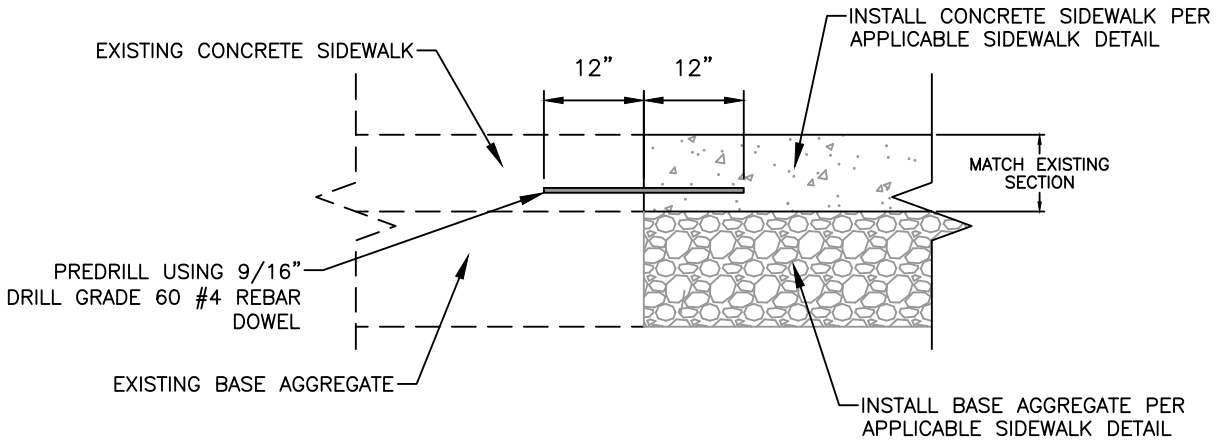
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Subgrade Stabilization

DRAWING NO. 526

APPROVED Jennifer Garbely 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/2023	HGB



SIDEWALK REPLACEMENT/REPAIR

NOTES:

1. EXISTING SLAB SHALL BE DRILLED USING APPROPRIATE MASONRY DRILL BIT.
2. DOWELS SHALL BE PLACED AT 24" O.C.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

PCC SIDEWALK REPLACEMENT/REPAIR

DRAWING NO. 527

APPROVED 03/2024
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/2023	HGB