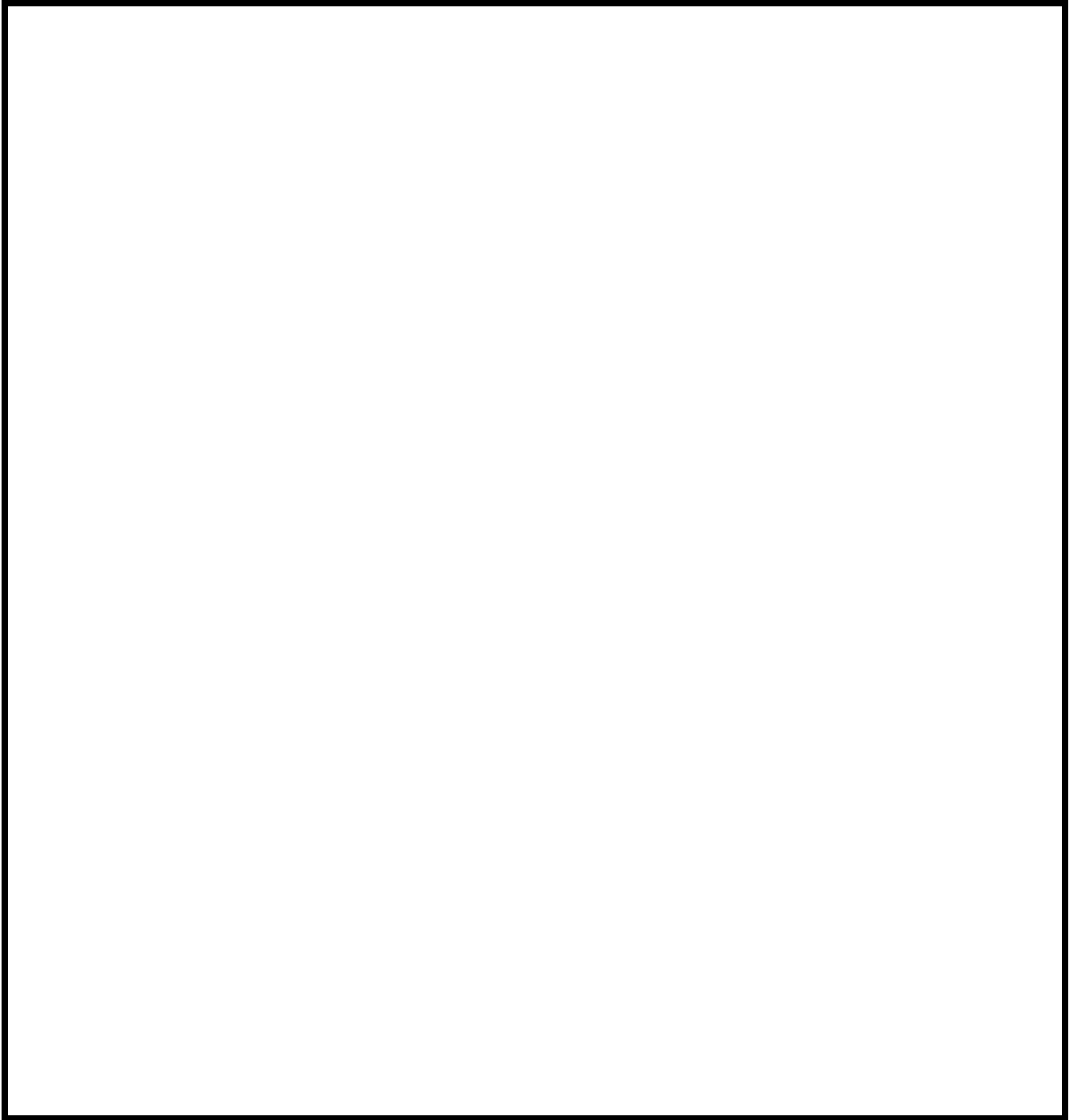




CITY OF MILWAUKIE

PUBLIC WORKS STANDARDS

**Adopted Res. 32-2007 May 15, 2007
Last revised March 1, 2021**



If you find errors in this document, or would like to submit comments, please use this form and mail, fax, or email to the City of Milwaukie Engineering Department, at:

engineering@milwaukieoregon.gov or 503-786-7606
6101 SE Johnson Creek Blvd
Milwaukie OR 97206

PUBLIC WORKS STANDARDS

REVISIONS LIST (as of March 1, 2021)

DIVISION/SECTION	LAST REVISED
CONSTRUCTION STANDARDS	
DIVISION 1—GENERAL REQUIREMENTS	November 28, 2018
DESIGN STANDARDS	
SECTION 1—GENERAL REQUIREMENTS	November 28, 2018
SECTION 2—STORMWATER DESIGN STANDARDS	October 1, 2019
SECTION 3—SANITARY SEWER DESIGN STANDARDS	October 1, 2019
SECTION 4—WATER DESIGN STANDARDS	October 1, 2019
SECTION 5—STREET DESIGN STANDARDS	October 1, 2019
STANDARD DRAWINGS	
STORM: 200-212	March 1, 2021
SANITARY: 300-305	March 1, 2021
WATER: 400-406	March 1, 2021
STREETS: 500-526	March 1, 2021

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CONSTRUCTION STANDARDS

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101 DEFINITIONS AND ABBREVIATIONS

Unless otherwise defined in the contract documents, the following definitions and abbreviations shall apply wherever used.

The words "directed, required, permitted, ordered, requested, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory," or words of like import, refer to actions, expressions, and prerogatives of the City Engineer.

Command type sentences are used, but are not exclusive of other directives, throughout these Standard Specifications. In all cases, the command expressed or implied is directed to the Contractor.

The specifications contained herein are divided into categories: (1) Division; (2) Section; and (3) Subsection, and are designated as in the following example:

Division: DIVISION 3—SANITARY SEWER CONSTRUCTION STANDARDS

Section: 302 MANHOLES AND CONCRETE STRUCTURES

Subsections: 302.03 CONSTRUCTION

302.03.01 General

A. Excavation and Backfill

1. (as needed)

a. (as needed)

101.01 DEFINITIONS

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.

Attorney

The City Attorney of the City of Milwaukie, Oregon.

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.

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.

City Engineer

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

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 into a Contract with the City for a particular project. In the case of work being done under permit issued by the City, the permittee shall be construed to be the Contractor.

Day

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

Easement

The right to use a defined area of property for specific purpose or purposes as set forth in the specifications.

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."

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.

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, Oregon, acting either directly or through authorized representatives.

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.

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.

Plans

The official Plans, profiles, cross sections, elevations, details, and other working, supplementary, and detail drawings, or reproductions thereof, signed by the City Engineer, which show the location, character, dimensions, and details of the work to be performed. Plans may either be bound in the same book as the balance of the contract documents or bound in separate sets, and are a part of the contract documents, regardless of the method of binding.

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.

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.

Right-of-way

A general term denoting public land, property, or interest therein, acquired for or devoted to a public street, public access, or public use.

Roadway

The portion of a street and its appurtenances between curbs, gutters, or ditches, primarily used for vehicular traffic.

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.

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 plans or drawings

Details of structures, devices, or instructions adopted by the City as a standard and referred to in the Contract.

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.

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.

Subcontractor

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

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.

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.

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.

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.

101.02 ABBREVIATIONS

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
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
UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
USASI	United States of America Standards Institute
WWPA	Western Wood Products Association

102 INSTRUCTIONS TO BIDDERS

See City of Milwaukie's Public Contracting Rules Chapter 30 at:
<https://www.milwaukieoregon.gov/finance/purchasing>

103 AWARD AND EXECUTION OF CONTRACT

See City of Milwaukie's Public Contracting Rules Chapter 40 at:
<https://www.milwaukieoregon.gov/finance/purchasing>

104 SCOPE OF WORK

104.01 PLANS AND SPECIFICATIONS

The contract documents and/or conditions of approval will govern the work to be done. Anything mentioned in the Specifications and not shown on the Plans and detailed drawings, or shown on the Plans and detailed drawings and not mentioned in the Specifications, shall be of like effect as though shown or mentioned in both. Specifications and Plans referred to in any of the contract documents and/or conditions of approval shall be considered as being included in the document in which such reference is made. When a particular standard plan or Specification is referred to, such reference shall be to the standard plan or Specification which is in force at the time of advertising for bids. The phrases, "Contractor shall", "Contractor will", etc., may not always be specifically stated in all paragraphs but is considered understood where not specifically stated otherwise.

104.02 PRECEDENCE OF CONTRACT DOCUMENTS

In case of conflict, the order of precedence of the following documents in controlling the work shall be:

1. Contract
2. Addenda
3. Bid
4. Permits from outside agencies required by law
5. Special Specifications (Provisions)
6. Plans
7. Standard plans and standard details
8. Standard/Technical Specifications

Change orders, supplemental agreements, and approved revisions to Plans and Specifications will take precedence over contract documents listed above.

104.03 SHOP DRAWINGS AND OTHER SUBMITTALS

Plans furnished and included with Specifications indicate the work proposed and the intended results.

By approving and submitting shop drawings, product data, and samples, the Contractor represents that they have determined and verified all materials, field measurements, and field construction criteria related thereto, and that they have checked and coordinated the information contained within such submittals with the requirements of the work and of the contract documents and/or conditions of approval and that they have checked and coordinated the information contained within such submittals with the requirements of the work and of the contract documents and/or conditions of approval.

All required shop drawings, product data, and samples shall be furnished to the City Engineer for their review and any required testing before any of the work or related work is performed or products or material ordered prior to the City Engineer's review and completion of any testing will be at the Contractor's risk.

The City Engineer will review all shop drawings, product data, and samples and conduct such tests as are required by the contract documents and/or conditions of approval within a reasonable time but in no event will the City Engineer be required to complete such review or conduct such tests in less than 14 days after submission. The Development Review Engineer will mail a letter stating one of the following:

1. Make corrections/additions noted: make the necessary changes and resubmit 1 set for review.
2. Set is ready for approval: send 6 drawing sets and 2 shall be returned to the Design Engineer.

The review by the City Engineer of any shop drawings, product data, samples, construction methods, and equipment or other submittals is only for conformance with the general design concept of the project and does not extend to consideration of structural integrity, safety, detailed compliance with contract requirements, or any other obligation of the Contractor. Any action shown is subject to the requirements of the plans and specifications. The Contractor is responsible for confirming and correlating all dimensions; fabricating and construction techniques; and coordinating their entire work in strict accordance with the contract documents and/or conditions of approval. The review does not relieve the Contractor from their obligation fully to perform all Contract requirements, nor shall such review give rise to any right of action or suit in favor of the Contractor or third persons, against the City.

104.04 CHANGES IN THE WORK

Without invalidating the agreement and without notice to a surety, the City may, at any time, order additions, deletions, or revisions in the work: these will be authorized by a written amendment, a change order, or a work directive change.

Upon receipt of any such document, Contractor shall promptly proceed with the work involved that will be performed under the applicable conditions of the contract documents (except as otherwise specifically provided).

104.05 FORCE ACCOUNT WORK

The Contractor shall perform work on a force account basis upon written notice by the City Engineer. If the City Engineer determines that the work increases the amount due under the Contract, payment will be made pursuant as force account work.

The Contractor must maintain records in such a manner as to provide a clear distinction between direct cost of work performed on force account basis and costs of all other operations performed in connection with the Contract.

Daily, furnish to the City Engineer signed reports itemizing materials used and setting forth the cost of labor and charges for equipment rental, delineating whether said equipment is Contractor or Subcontractor owned. Provide names, identifications, and classifications of workmen, the hourly rate of pay and hours worked, and the size, type, and identification number of equipment and hours of equipment operation.

Substantiate material charges by vendor's invoices, submit such invoices with the reports; or, if not available, submit with subsequent reports. In the event said vendor's invoices are not submitted within 30 days after completion of the force account work the City reserves the right to establish the cost of such materials.

The City Engineer will compare their records with the reports furnished by the Contractor, make any necessary adjustments, compile the costs of work paid for on a force account basis, and issue a change order covering the work.

104.06 SALVAGE

When shown or specified, carefully salvage and stockpile within the construction area all castings, pipe, and any discarded facilities, to be disposed of by the Contractor.

105 CONTROL OF WORK

105.01 AUTHORITY OF THE CITY ENGINEER

The City Engineer will decide all questions which may arise as to quantity, quality, and acceptability of materials furnished and work performed, the rate of progress of the work; interpretation of the Plans and Specifications; the measurement of all quantities; and the acceptable fulfillment of the Contract on the part of the Contractor. The City Engineer's estimates, decisions, and approval signify favorable opinion and qualified consent; it does not carry with it certification or assurance of completeness, quality, or accuracy concerning details. Such approval does not relieve Contractor from responsibility for errors, improper fabrication, improper construction methods, nonconformance to requirements, or for deficiencies within their control.

It is further understood that all work to be done under the Contract will not be considered completed until it has passed final inspection by the City Engineer and is accepted by the City. It is further understood that the authority of the City Engineer is such that the Contractor shall at all times carry out and fulfill the instructions and directions of the City Engineer insofar as they concern the work to be done under the Contract.

The City Engineer shall have the authority to order unacceptable work to be corrected, removed, or replaced, and unauthorized work to be removed and, pending completion of such order, to deduct the estimated cost thereof from any monies due, or to become due to the Contractor including retainage. This authority shall take precedence over any and all requirements of the specifications for payment set forth elsewhere in the specifications.

At the City Engineer's sole discretion, minor defects in the work may be accepted subject to a reasonable deduction from the Contract price or other credits to the City. Such determination by the City Engineer shall be final.

The City Engineer is not authorized to waive any written notice required of the Contractor by the Contract.

105.02 AUTHORITY AND DUTIES OF INSPECTORS

The City Engineer may appoint assistants to inspect all materials used and all work done. Such inspection may extend to any or all parts of the work and to the preparation or manufacture of materials to be used. Inspectors will not be authorized to revoke, alter, enlarge, or relax the provisions of the Contract. An Inspector is placed on the work to keep the City Engineer informed of progress of the work and the manner in which it is being done. In addition, the Inspector shall call to the attention of the Contractor any deviation from the Plans or Specifications.

An Inspector will not be authorized to approve or accept any portion of the work or to issue instructions contrary to the Plans and Specifications under this Contract. Furthermore, the Inspector is not authorized to waive any written notices required by the Contract. The Inspector will have authority to reject defective material and to suspend any work that is being improperly done, subject to final decision by the City Engineer.

105.03 RESPONSIBILITY OF CONTRACTOR

Do all work and furnish all labor, materials, equipment, tools, and machines necessary for the performance and completion of the project in accordance with the Contract. Be obligated to determine and be responsible for the method of construction.

Contractor shall be solely liable for any accident, loss, or damage happening to work referred to in the Contract prior to completion and acceptance thereof.

105.04 NOTIFICATION OF UTILITIES AND AGENCIES

Obtain prior approval from the City Engineer for closing or partial closing of any street. Give at least 2 working days advance notice of such closure to all agencies providing emergency services, including without limitation police, fire, and ambulance services. Notification shall include, but not be limited to, the time of commencement and completion of work, names of streets or location of alleys to be closed or partially closed, schedule of operations, and routes of detours where applicable.

When performing work in streets and easements, whether inside or outside the city's legal boundaries, notify all of the affected utilities and local agencies about the operations so as to properly coordinate and expedite the work in such a manner as to cause the least amount of conflict and interference between the operations and those of other agencies.

The Contractor and its Subcontractors must comply with all provisions of ORS 757.541 to 757.562 and 757.993 including notification of all owners of underground facilities at least 48 business day hours but not more than 10 business days before beginning work. Notify the following utilities and agencies in writing at least 2 working days before commencing any work on the project.

1. City of Milwaukie Public Works Operations
2. Northwest Natural Gas
3. Oregon Department of Transportation
4. Portland General Electric
5. Comcast
6. Century Link
7. Water Environment Services of Clackamas County

The City shall relocate or cause to be relocated all privately- or publicly-owned utility conduits, lines, poles, mains, pipes, and such other facilities within the jurisdiction and control of the City where such relocation is necessary in order to conform said utility and other facilities with the plans and ultimate requirements of the project. If desirable for specific reasons, or for convenience of field operations, contact the above listed utilities.

105.05 UTILITIES AND EXISTING IMPROVEMENTS

Information shown as to location of existing water courses, drains, sewer lines, or utility lines is provided for the Contractor's information and convenience and is not, in any way, warranted to be accurate by the City. Contractor shall verify all such information and shall deal with varying conditions at its own expense.

Operation of water valves and hydrants by unauthorized personnel is strictly prohibited. Obtain written permission from and pay any fee required from the Water Authority in whose jurisdiction the work is being performed prior to using hydrant water.

Provide for the flow of sewers, drains, or water courses interrupted during the progress of the work, and restore such drains or water courses as approved by the City Engineer, at no additional cost to the City.

Be responsible for all costs for the repair of any and all damage to any utility, whether previously known or disclosed during the work, as may be caused by the work. Maintain in place utilities not shown on the drawings to be relocated or altered by others. If the Contractor requires temporary relocation, for their convenience or because of their method of construction or as a result of site conditions, the Contractor

shall bear all costs for said temporary relocation. Maintain utilities which have been relocated by others in their relocated positions in order to avoid interference with structures which cross the project work.

Make excavations and borings ahead of work, as necessary, to determine the exact location of interfering utilities or underground structures. When this is not feasible or practical or the need for such work was not foreseen, the utility owners or the City shall have the right to enter upon the right-of-way and upon any structure therein for the purpose of making new installations, changes, or repairs. Conduct operations so as to provide the time needed for such work to be accomplished during the progress of the improvement, at no additional cost to the City.

It is understood that there will be interfering utilities, service laterals, and other underground pipes, drains, or structures encountered on underground projects that are not shown or are shown incorrectly on the plans and/or have not been previously discovered in the field. Contractor agrees this is a normal and usual occurrence in the construction of underground improvements. Furthermore, bidders understand and agree that work in some cases must be done in close proximity to said utilities and underground pipes, drains, and structures not shown or shown incorrectly on the plans which may require a change in operations and may cause sloughing of the trench, additional traffic control, additional pavement and backfill costs, and time; the Contractor agrees that a reasonable number of these occurrences are usual and ordinary on underground projects and are reflected in the bid and plan of operation.

The City Engineer will require a reasonable amount of time to perform design changes necessitated by directly conflicting utilities and/or the utility owners will require a reasonable amount of time to make necessary utility relocations.

The Contractor agree to provide for these conflicts and interferences and agree to provide for a reasonable amount of time for design changes and/or utility relocations due to said interference in the Contract and understand that no additional compensation for interruption of schedule, extended overhead, delay or any other impact claim or ripple effect or any other costs whatsoever or additional time will be made for these conflicts or interferences.

105.06 SURVEY SERVICE

Give notice to the City Engineer not less than 3 working days in advance of when survey services will be required in connection with the laying out of any portion of the work.

The City Engineer will furnish appropriate offset lines and grades as they deem necessary for all projects involving trenching operations. Contractor will be responsible for the transfer of the offset lines or grades into the ditch, to batter boards, or any other point within the work. Work done without lines and grades having been established by the City Engineer or work done beyond the lines and grades will be considered as unauthorized and will not be paid for and may be ordered removed, replaced, or corrected at no expense to the City.

105.07 PROTECTION OF SURVEY MARKERS

105.07.01 Permanent Survey Markers

Notify the City Engineer not less than 3 working days prior to starting work in order that the City Engineer may take necessary measures to ensure the preservation of survey monuments, stakes, lot stakes, and bench marks. Do not disturb permanent survey monuments, stakes, lot stakes, or bench marks without the consent of the City Engineer, and notify the City Engineer and bear the expense of replacing any that may be disturbed.

When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, preserve the monument, and adjust the monument cover to the new grade at no expense to City.

105.07.02 Construction and Survey Markers

Preserve construction survey stakes and marks for the duration of their usefulness during construction. If any construction survey stakes are lost or disturbed through negligence of the

Contractor, and in the judgment of the City Engineer need to be replaced, such replacement shall be by the City Engineer at the expense of the Contractor. The cost of replacement shall be charged against, and shall be deducted from payments for Contract work.

105.08 PROTECTION OF PROPERTY

Protect all public and private property, insofar as it may be endangered by operations and take every reasonable precaution to avoid damage to such property.

Restore and bear the cost of any public or private improvement, facility, structure, or land and landscaping within the right-of-way or easement which is damaged or injured directly or indirectly by or on account of an act, omission, or neglect in the execution of the work. Restore to a condition substantially equivalent to that existing before such damage or injury occurred, by repairing, rebuilding, or otherwise effecting restoration thereof, or if this is not feasible, make a suitable settlement with the City of the damaged property.

Give reasonable notice to occupants of buildings on property adjacent to the work to permit the occupants to remove vehicles, trailers, and other possessions as well as salvage or relocate plants, trees, fences, sprinkler systems, or other improvements in the right-of-way which are designated for removal or which might be destroyed or damaged by work operations.

Protect all designated trees, lawns, and planted areas within the right-of-way or easements. Restore all on-surface disturbed areas by methods as set forth in the technical specifications. If conditions are such that the method specified cannot be done, provide erosion control surface covering of such quality and quantity as will prevent erosion from occurring, without adverse impacts to the environment, if required by conditions existing at the site, at no additional cost to the City.

Review with the City Engineer the location, limits, and methods to be used prior to clearing work. Clearing and grubbing shall be performed in strict compliance with all local, State and federal laws and requirements pertaining to clearing and burning, and particularly in conformity with the provisions of ORS Chapter 477, and all subsequent amendments, which require, among other things, filing with the State Forester a general description of the right-of-way to be cleared before the start of clearing operations. Obtain the required permit from the State Forester and the City and perform clearing work in conformance thereto.

105.09 USE OF WORK DURING CONSTRUCTION

The City shall have the right to take possession of and use any completed or partially completed portions of the work. Such use shall not be considered as final acceptance of the work or portions thereof.

Such action by the City will not relieve the Contractor of responsibility for injury or damage to said completed portions of the work resulting from use by public traffic, action of the elements, Contractor's operations, defective work, or negligence, or from any other cause, except for injury or damage resulting from the City's negligence. Contractor will not be required to again clean up such portions of the work prior to final acceptance, excepting for such clean up as results from the Contractor's operations or defective work. Use of any completed or partially completed portions of the work does not relieve the Contractor from the warranty responsibility nor shall the warranty period commence to run until final completion and acceptance of the work.

105.10 FURNISHING TEMPORARY SERVICES AND FACILITIES

Install, furnish, and maintain temporary light, power, water, and any temporary services or facilities complete with connecting piping, wiring, lamps, and similar equipment during construction of the work, including testing and start up. Remove temporary facilities upon completion of work. Obtain all permits and bear all costs in connection with temporary services and facilities. Conform to applicable statutes, rules, codes, and other requirements in the use of these facilities.

105.11 VERBAL AGREEMENTS OR REPRESENTATIONS

No verbal agreement or conversation by or with any officer, agent, or employee of the City, either before or after execution of the Contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract. Any such verbal agreement or conversation is in no way binding upon the City.

105.12 WATER AND AIR POLLUTION CONTROL

During the term of the Contract, the Contractor's operations shall conform to applicable laws and regulations of the Oregon DEQ, and other agencies of the State and Federal Government, City of Milwaukie Erosion Control Plans, as well as other local ordinances and resolutions designed to prevent, control, and abate water and air pollution.

During all phases of the work, or when directed, protect work sites, storage, and disposal areas from washout and erosion, and take precautions to control or abate dust nuisance and air pollution by cleaning up, sweeping, sprinkling, covering, enclosing, or sheltering work areas and stockpiles, and by promptly removing from paved streets earth or other material which may become airborne or may be washed into waterways or drainage systems.

105.13 NOISE

Conform and comply with applicable noise regulations as established in the City of Milwaukie Municipal Code (MMC) 8.08. Work hours are restricted to the hours of 7:00 a.m. to 7:00 p.m. during the weekdays and 8:00 a.m. to 5:00 p.m. on the weekends.

105.14 ACCESS TO THE WORK

Provide access to the work for representatives of the City, the State of Oregon, the Federal Government, and other entities having jurisdiction in the area.

Allow access to the City Engineer or their representatives to all parts of the work and to plants of manufacturers at all times. Furnish them with every reasonable facility for ascertaining if the work meets requirements and intent of the Contract.

105.15 DEFECTIVE OR UNAUTHORIZED WORK

All work which does not conform to the requirements of the Contract shall be considered as unacceptable.

Upon discovery, immediately remove unacceptable and defective work and replace by work and materials which conform to the Contract. This provision shall have full effect regardless of the fact that the unacceptable work may have been done or the defective materials used with the full knowledge of the Inspector.

106 CONTROL OF MATERIALS

106.01 PREFERENCE FOR USE OF OREGON PRODUCTS

Preference may be given to services, articles, or materials produced or manufactured in Oregon, if price, fitness, availability, and quality are otherwise equal. These provisions do not apply to contracts on projects financed wholly or in part by federal funds.

106.02 QUALITY OF WORK

Materials, parts, products, and equipment which are to be incorporated into the work shall be new and shall conform to the contract documents.

106.03 SAMPLING AND TESTING

Tests of the work may be made by the City at any time during construction of the work or during the production, fabrication, preparation, and use of materials, parts, products, and equipment.

City reserves the right to require samples and to test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer.

When such tests of the work are necessary, as determined by the City Engineer, such tests will be made by and at the expense of City unless otherwise specified. Provide such facilities and cooperate as required for collecting and forwarding samples and do not incorporate into the work until tests have been made and found acceptable. In all cases furnish the required samples without charge and in ample time to permit testing prior to use. Provide safety measures and devices to protect those who take the samples.

In the absence of any reference Specification, it shall be understood that materials shall meet the Specifications and requirements of ASTM or AASHTO, as directed by the City Engineer. When there is no pertinent coverage under ASTM or AASHTO, the material concerned shall meet Specifications and requirements of applicable commercial standards of the Commodity Standards Division of the U.S. Department of Commerce. Lacking such coverage, materials shall meet requirements established by reputable industry for a high-quality product of the kind involved.

All testing shall be performed by the testing laboratory, the City Engineer, or as directed by the City Engineer.

In the event the City Engineer requests tests and the work fails, the Contractor shall bear all costs for this test and all subsequent testing necessary to meet specified requirements.

106.04 CERTIFICATION

The City Engineer may, at their sole discretion and in lieu of any other required sampling and testing, accept from the Contractor 2 copies of the manufacturer's certification with respect to the product involved, under conditions set forth as follows:

1. Certification shall state that the named product conforms to the City's requirements and that representative samples thereof have been sampled and tested as specified.
2. Certification shall either be accompanied by a certified copy of test results or certify that such test results are on file with the manufacturer and will be furnished to the City Engineer upon request.
3. Certification shall give the name and address of the manufacturer and the testing agency and the date of tests; and shall set forth the means of identification which will permit field determination of the product delivered to the project as being the product covered by the certification.
4. Contractor shall not be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.

106.05 INSPECTION BY OTHERS

Inspection of work by persons other than representatives of the City will not constitute inspection by the City.

106.06 STORAGE AND PROTECTION OF ITEMS OF WORK

Store items to be incorporated into the work to assure the preservation of their quality and fitness for the work. Stored items, even though approved before storage, may be reinspected and are subject to rejection prior to being incorporated into the work. Stored items shall be located so as to facilitate their prompt inspection.

106.07 TRADE NAMES, EQUALS, OR SUBSTITUTIONS

In order to establish a basis of quality, certain processes, types of machinery or equipment, or kinds of materials may be specified—either by description of process, by designating a manufacturer by name and referring to their brand or product designation, or by specifying a kind of material. It is not the intent of these specifications to exclude other processes, equipment, or materials of equal value, utility, or merit.

Whenever a process is designated, a manufacturer's name, brand, or item designation is given, or a process or material covered by patent is designated or described, it shall be understood that the words "or equal" follow such name, designation, or description, whether in fact they do so or not. This "or equal" clause is not a warrantee, either expressed or implied, by the City that an equal exists.

Contractor may offer to furnish materials or equipment of equal or better quality and performance than that specified as a substitute after the Contract is executed. If the offer necessitates changes to, or coordination with, any other portion of the work, the data submitted shall include drawings and details showing all such changes. Contractor agrees to perform these changes as part of the substitution of material or equipment. Acceptance by the City Engineer shall not relieve the Contractor from full responsibility for the efficiency, sufficiency, quality, and performance of the substituted material or equipment in the same manner and degree as the material and equipment specified by name. Any cost differential associated with a substitution shall be reflected in the Contract price and the Contract shall be appropriately modified by change order.

If the bid includes a list of equipment, materials, or articles for which the Contractor must name the manufacturer at time of submission of the bid, no substitutions therefore will be permitted.

All materials or equipment of equal or better quality offered by the Contractor for substituting shall be approved by the City Engineer prior to incorporation into the project.

107 LEGAL RELATIONS AND RESPONSIBILITIES

107.01 LAWS AND REGULATIONS

Comply with all Federal and State laws; all local laws, ordinances, and regulations; and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of work. Observe and comply with all such laws, ordinances, regulations, orders, and decrees. Protect and indemnify the City and their representatives against any claim or liability arising from, or based on, the violation of any such law, ordinance, regulation, order, or decree—whether by the Contractor, their Subcontractors, suppliers of materials or services, or others engaged by the Contractor or their employees.

In addition to those set forth herein, the City's Public Contracting rules and the Statutes of the State of Oregon for public works contracts, ORS Chapters 279A and 279C, are incorporated by reference into the Contract.

107.02 SUBCONTRACTORS

After Contract award and notice of Contractor/Subcontractor agreements have been submitted, work shall not be transferred or subcontracted without prior consent of the City.

Use of subcontractors, material suppliers, or equipment suppliers shall in no way release the Contractor from any obligations of contract with the City.

Contractor will provide in all subcontract agreements that the Subcontractor, material supplier and equipment supplier will be bound by the terms and conditions of the Contract to the extent that they relate to the Subcontractor's work, material, or equipment. All Subcontractor agreements will also provide that they are assignable to the City at the City's option, in the event this agreement is terminated for default of the Contractor.

107.03 NO WAIVER OF LEGAL RIGHTS

The City shall not be precluded by any measurement, estimate, or certificate made either before or after completion and acceptance of work or payment therefore, from showing the true amount and character of work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is untrue or incorrectly made, or that work or materials do not conform in fact to the Contract. The City shall not be precluded, notwithstanding any such measurement, estimate, certificate, or payment in accordance therewith, from recovering from the Contractor and their sureties such damages as it may sustain by reason of their failure to comply with terms of the Contract, or from enforcing compliance with the Contract. Neither acceptance by the City, or by any representative or agent of the City, of the whole or any part of the work, nor any extension of time, nor any possession taken by the City, nor any payment for all or any part of the project, shall operate as a waiver of any portion of the Contract or of any power herein reserved, or any right to damages herein provided. A waiver of any breach of the Contract shall not be held to be a waiver of any other breach.

107.04 OTHER CONTRACTS

The City reserves the right to award other contracts or issue permits for work that may require coordination with the work to be performed under the Contract.

When separate contracts or permits are awarded or issued for different portions of the Project, "the Contractor" in the contract documents in each case shall be the contractor who signs each separate contract.

Mutual Responsibility of Contractors: The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate their work with theirs.

If any part of the Contractor's work depends for proper execution or results upon the work of any other separate Contractor, the Contractor shall inspect and promptly report to the City Engineer any apparent discrepancies or defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to inspect and report shall constitute an acceptance of the other Contractor's work as fit proper to receive the work, except as to defects which may develop in the other separate contractor's work after the execution of the Contractor's work.

Should the Contractor cause damage to the work or property of any separate contractor which results in a claim against the City, and if the claim is not satisfied by the Contractor and the separate contractor sues the City or initiates an arbitration proceeding on account of any damage alleged to have been so sustained, the City shall notify the Contractor who shall defend if requested such proceedings at the Contractor's expense, and if any judgment or award against the City arises therefrom the Contractor shall pay or satisfy it and shall reimburse the City for all attorney's fees and court or arbitration costs which the City has incurred.

The Contractor shall be responsible for any cutting, fitting, and patching that may be required to complete the work except as otherwise specifically provided in the Contract. The Contractor shall not endanger any work of any other contractors by cutting, excavating or otherwise altering any work and shall not cut or alter the work of any other contractor. Any costs caused by defective or ill-timed work shall be borne by the party responsible therefore.

If a dispute arises between the separate contractors as to their responsibility for cleaning up, the City may clean up and charge the cost thereof to the several contractors as the City Engineer shall determine to be just.

107.05 LIABILITY AND INDEMNIFICATION

The Contractor shall assume all responsibility for the work and shall bear all losses and damages directly or indirectly resulting to the Contractor, to the City, to the City Engineer, and to their officers, agents, and employees on account of (a) the character or performance of the work, (b) unforeseen difficulties, (c) accidents, or (d) any other cause whatsoever.

The Contractor shall defend, indemnify, and hold harmless the City, the Design Engineer, and their officers, agents, and employees from all claims, loss, damage, and injury of every kind directly or indirectly arising out of the Contract. The Contractor shall assume this responsibility even if (a) fault is the basis of the claim, and (b) any act, omission or conduct of the City connected with the Contract is a condition or contributory cause of the claim, loss, damage, or injury.

The Contractor shall not be liable for, nor be required to defend, or indemnify the City or the Design Engineer relative to any claim, loss, damage, or injury resulting solely from acts or omissions by the City, the Design Engineer, or their officers, agents, or employees. The Contractor shall not be liable for, not be required to defend, or indemnify the City or the Design Engineer relating to any claim loss, damage, or injury arising from the use of any maps, drawings, reports, surveys, designs, or specifications furnished by the City, the Design Engineer, or their officers, agents, or employees.

Any specific duty or liability imposed or assumed by the Contractor, as may be otherwise set forth in the contract documents, shall not be construed as a limitation or restriction of the general liability or duty imposed upon the Contractor by this section.

The Contractor shall assume all responsibility for the work.

107.06 INSURANCE

107.06.01 General

The Contractor shall provide and maintain during the life of the Contract the insurance coverage designated hereafter. All costs for such insurance shall be borne by the Contractor and shall be included in the Contract price.

Prior to execution by the City and before commencing work under the Contract, the Contractor shall furnish the City Engineer with certificates of insurance specified herein showing the name of the insurance carrier, coverage, type, amount (or limits), policy numbers, effective and expiration dates, description of operations covered, and containing substantially the following cancellation provision:

"The insurance covered by this certificate will not be canceled or materially reduced, except after 30 days written notice has been received by the City."

In case of the breach of any provision of this Article, the City, at its option, may take out and maintain, at the expense of the Contractor, such insurance as the City may deem proper. The City may deduct the cost of such insurance from any monies which may be due or become due to the Contractor under the Contract.

107.06.02 Review and Approval of Insurance

The Contractor shall not commence work under the Contract nor allow any subcontractor to commence work on a subcontract until the Contractor has obtained all the insurance required hereunder and such insurance has been approved by the City Attorney. All policies or insurance and certificates of insurance shall be satisfactory to the City. Approval of the insurance shall not relieve or decrease the liability of the Contractor hereunder.

107.06.03 Workers' Compensation, the Federal Longshoremens' and Harborworkers' Act, and the Federal Jones Act

The Contractor shall provide and shall require all subcontractors to provide workers' compensation coverage for all persons employed under the Contract including the Contractors' partners and any individual regardless of relation to the Contractor's partners and any individual regardless of relation to the Contractor or to the partners who provide work under the Contract. The Contractor shall be required to assure that subject workers will receive the compensation for compensable injuries provided in ORS Chapter 656 either by:

1. a carrier-insured employer; or
2. a self-insured employer as provided by ORS 656.407.

In addition to the statutory benefits outlined above, the Contractor and all Subcontractors shall provide employers' liability insurance with limits of not less than:

1. \$2,000,000 each occurrence
2. \$2,000,000 disease each employee
3. \$2,000,000 disease—policy

Evidence of such coverage, including the guaranty or warrant period, shall be filed with the City and maintained for the duration of the Contract.

The Contractor shall defend, indemnify, and hold harmless, the City and the City's officers, agents, and employees against any liability that may be imposed upon them by reason of the Contractor's or Subcontractor's failure to provide workers' compensation and employers liability coverage.

Where work under the Contract is subject to the Federal Longshoremen's and Harborworkers' Act or the Federal Jones Act, the Contractor shall provide coverage for such exposure.

107.06.04 General Liability and Automobile Liability

The Contractor shall provide a general liability policy that provides coverage for bodily injury including personal injury and property damage liability insurance and automobile liability insurance. Such insurance must protect the Contractor, the City, and their officers and employees from all things or damage which may arise out of the Contract or in connection therewith, including all operations of Subcontractors. Such insurance shall provide coverage for not less than the amounts for which public bodies are responsible as set forth in ORS Chapter 30.260 - 30.300, Tort Actions against public bodies, but in no event less than the following limits of liability:

Commercial General Liability Insurance

1. \$2,000,000 each occurrence limit
2. \$3,000,000 general aggregate
3. \$3,000,000 products/completed operations aggregate
4. \$3,000,000 personal and advertising injury
5. \$2,000,000 limited job site pollution occurrence sublimit

Comprehensive Automobile Liability Insurance Including Coverage for all Owned, Hired, And Nonowned Vehicles.

1. \$2,000,000 each occurrence combined single limit
2. \$3,000,000 aggregate bodily injury and property damage
or
\$2,000,000 each person bodily injury
3. \$2,000,000 each occurrence bodily injury
4. \$2,000,000 each occurrence property damage
5. \$2,000,000 each occurrence pollution occurrence sublimit

The insurance shall be written on a comprehensive form which includes broad form property damage on an occurrence basis. Unless excluded by Special Specification, the general liability policy shall include, without deductible, coverage for premises operations, explosion and collapse hazard, underground hazard, products, completed operations, contractual insurance, and independent contractors. Such insurance shall be maintained until the expiration of the guaranty period required by the Contract. Failure to maintain liability insurance as provided above shall, at the City's option, be cause for immediate termination of the Contract.

The policy shall contain an endorsement that the aggregate applies separately to the Contract.

The Contractor shall provide a letter from the insurance company which states that such insurance shall be without prejudice to coverage otherwise existing.

The City, its officers, agents, and employees, shall be named additional insureds in the Contractor's General Liability Insurance policy by attaching ISO Endorsement number CG 20 09 11 85 Additional Insured - Owners, Lessees, or Contractors (Form A) or its equivalent.

The policy shall also provide for a Cross Liability Endorsement or Separation of Insureds Endorsement.

The policy shall be endorsed to provide an Amendment - Aggregate Limits of Insurance (per project) specifying that a separate aggregate limit of liability applies to the Contract.

If there are insufficient insurance proceeds and assets of the Contractor to fully indemnify the City, its officers, employees, agents, and the City Engineer, then the City, its officers, employees, and agents would be indemnified first with any remaining insurance proceeds and assets to be used to indemnify the City Engineer.

If set forth in the Special Specifications, additional insureds may be the City Engineer, other governmental bodies with jurisdiction in the area involved in the project, and their officers and employees and such agents as may be specified.

107.06.05 Claims on Project

The Contractor, when notified of a claim by an affected party shall:

1. Refer claim to the Contractor's insurance carrier or claims administrator.
2. Contractor's insurer will copy the City on acknowledgment of claim.
3. Contractor's insurer will copy the City on notice to claimant of disposition of claim.

107.06.06 Builders Risk Insurance

During construction, the Contractor shall obtain and maintain for the benefit of the parties to the Contract as their interest may appear, all-risk builder's risk insurance to the extent of 100% of the value of the project. Coverage shall also include: (1) formwork in place; (2) form lumber on site; (3) temporary structures; (4) equipment; and (5) supplies related to the work while at the site. Such insurance shall be endorsed to require 30 days' written notice to the City prior to cancellation or change of the policy. One copy of the policy and 2 certificates of such insurance shall be delivered to the City before commencing work and shall be subject to review and approval by the City. The City may temporarily waive delivery of the copy of the policy. In the event the Contractor fails to maintain such insurance, the City may arrange therefore; and any premium incurred shall be to the account of the Contractor.

107.06.07 Insurance for Work in Railroad Rights-of-Way

During construction in railroad rights-of-way, the Contractor shall obtain and maintain insurance as required by the individual railroads.

107.07 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees required to perform the work. Defend and indemnify the City, from all loss or damage that may result from the Contractor's wrongful or unauthorized use of any patented article or process.

107.08 PERMITS

The Contractor shall obtain all Municipal, County, State, Federal, or other permits or licenses necessary or incident to performance of the work under the Contract. Work within the railroad right-of-way requires permit by the rail authority and railroad operators in addition to the above. Comply with all permit requirements pertaining to the project.

107.09 COMPLIANCE WITH ORS CHAPTER 279A, B, AND C (PUBLIC CONTRACTING CODE)

Comply, and require all Subcontractors to comply, with the City's Public Contracting Rules, the requirements of the applicable State statutes, and be subject to the applicable liabilities provided in ORS Chapter 279A, B and C, such as, but not limited to, the statutes that are numbered and referenced, and incorporated herein by an abbreviated subject matter, and listed below and the statutes required to be set forth as conditions in public contracts, which follows.

1. ORS 279C.375 Award of contract; Bond; Waiver of bond in case of emergency.
2. ORS 279C.540 Maximum hours of labor on public contracts; holidays; exceptions.
3. ORS 279C.840 Workers on public works to be paid not less than prevailing rate of wage.
4. ORS 279C.845 Certification of rate of wage by Contractor or Subcontractor.
5. ORS 279C.850 Inspection to determine whether prevailing rate of wage being paid; proceedings to require payment of prevailing rate of overtime.
6. ORS 279C.855 Liability of Violations.

107.10 LABOR

Upon notification in writing from the City Engineer, remove immediately from the job for its duration any laborer, workman, mechanic, foreman, superintendent, or other person employed who is found to be incompetent, intemperate, troublesome, disorderly, or otherwise objectionable, or who fails or refuses to perform their work properly or acceptably.

Comply with provisions of the City's Equal Opportunity Policy and to ORS Chapter 659 relative to unlawful employment practices and discrimination by employers against any employee or applicant for employment because of race, religion, color, sex, gender, sexual orientation, or national origin. Particular reference is made to ORS 659.030, which states that it is unlawful employment practice for any employer, because of the race, religion, color, sex, or national origin of any individual, to refuse to hire or employ or to bar or discharge from employment such individual or to discriminate against such individual in compensation or in terms, conditions, or privileges of employment.

107.11 OVERTIME

In addition to the requirements set forth in Specification 107.09, the Contractor shall notify the City Engineer of any overtime operations as soon as possible. The Contractor must provide documentation to the City Engineer's satisfaction justifying the overtime work (ORS 279C.520).

In the event that the Contractor wishes to proceed with an overtime operation, the Contractor must first notify and obtain approval from the City Engineer to do so, prior to commencing such work.

For overtime work requested by the Contractor, the Contractor shall pay the applicable wage rate for the City Engineer's Inspector, engineering and operations personnel, and other staff required at the project during the overtime hours.

This section does not apply to labor performed in the manufacture or fabrication of any material ordered by the Contractor or manufactured or fabricated in any plant or place other than the place where the main Contract is to be performed.

107.12 SAFETY

107.12.01 Employee Safety

The Contractor shall at all times be responsible for the safety of their employees and their Subcontractor's employees. The Contractor shall maintain the job site and perform the work in a

manner which meets the City's responsibility under statutory and common law for the provision of a safe place to work and which complies with the City's written safety regulations, if any.

Conduct the project with proper regard for the safety and convenience of the public. When the project involves use of public ways, provide necessary flag persons and install and maintain means of reasonable access to all fire hydrants, service stations, warehouses, stores, houses, garages, and other property. Private residential driveways shall be closed only with approval of the City Engineer or specific permission of the property owner. Do not interfere with normal operation of public transit vehicles unless otherwise authorized. Do not obstruct or interfere with travel over any public street or sidewalk without approval. At all times provide open trenches and excavations with secured and adequate barricades or fences of an approved type which can be seen from a reasonable distance. Close up or plate all open excavations at the end of each working day in all street areas unless approved otherwise by the City Engineer and in all other areas when it is reasonably required for public safety or as directed by the City Engineer. At night, mark all open work and obstructions by lights. Install and maintain all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges, and facilities. Observe all safety instructions received from the City Engineer or governmental authorities, but following of such instructions shall not relieve the Contractor from its responsibility or liability for accidents to workmen or damage or injury to person or property.

107.12.02 Public Safety and Convenience

The Contractor shall at all times conduct their work so as to insure the least possible obstruction to traffic and convenience to the general public and residents in the vicinity of the work and to insure the protection of persons and property. No road or street shall be closed to the public except with the permission of the City Engineer and proper governmental authority. Fire hydrants on or adjacent to the work shall be kept accessible to firefighting equipment at all times. Temporary provisions shall be made by the Contractor to insure the use of sidewalks, private and public driveways and proper functioning of all gutters, sewer inlets, drainage ditches, and culverts, irrigation ditches and natural water courses. The Contractor will minimize inconvenience to others due to mud and dust.

107.12.03 Safety Program

The Contractor shall adopt a written safety program complying with the requirements of employee and public safety set forth hereinabove and as described in the Special Conditions. The safety program shall also comply with OAR Chapter 437, Division 3, regarding general safety and health provisions.

107.13 RIGHTS-OF-WAY, EASEMENTS, AND PREMISES

Confine construction activities within property lines, right-of-way, limits of easements and limits of construction permits as shown or specified in the contract documents unless arrangements are made with owner(s) of adjacent private property. If additional space or property is needed to accommodate Contractor's method for construction of the work or for the convenience of the Contractor, Contractor shall bear all related costs and responsibilities. Prior to the use of any private property outside the specified boundaries, file with the City Engineer written permission from the property owner(s).

Do not unreasonably encumber the specified work areas with materials and equipment. Obtain and bear the costs of permits for special occupancy and use of the specified work areas from the proper agencies. Comply with all requirements regarding signs, advertisements, fires, and smoking.

107.14 12-MONTH MAINTENANCE AND WARRANTY

In addition to and not in lieu of any other warranties required under the Contract make all necessary repairs and replacements to remedy, in a manner satisfactory to the City Engineer and at no cost to the City, any and all defects, breaks, or failures of the work occurring within 12 months following the date of substantial completion due to faulty or inadequate materials or workmanship. Repair damage or disturbances to other improvements under, within, or adjacent to the work, whether or not caused by

settling, washing, or slipping, when such damage or disturbance is caused, in whole or in part, from activities of the Contractor in performing their duties and obligations under the Contract when such defects or damage occur within the warranty period. The 12-month maintenance period required shall, with relation to such required repair, be extended 1 year from the date of completion of such repair.

If the Contractor, after written notice, fails within 10 days to proceed to comply with the terms of this section, the City may have the defects corrected, and the Contractor and Contractor's surety shall be liable for all expense incurred. In case of an emergency where, in the opinion of the City Engineer, delay would cause serious loss or damage, repairs may be made without notice being given to the Contractor and Contractor's surety shall pay the cost of repairs. Failure of the City Engineer to act in case of an emergency shall not relieve Contractor or Contractor's surety from liability and payment of all such costs.

In addition to the above provisions, City of Milwaukie waterline facilities installed by the Contractor under the Contract that require repair or replacement during the 12-month maintenance period shall be repaired by the City or under the direction of the City and the Contractor and Contractor's surety shall be liable for all expenses incurred.

108 PROSECUTION AND PROGRESS OF WORK

108.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

Within 30 days of Contract award or 1 week in advance of starting work, whichever is earlier, submit for written approval a proposed construction schedule to the City Engineer. Contractor may not commence work until construction schedule is approved by the City Engineer.

If it is desirable to carry on operations in more than one location simultaneously, submit a schedule for each location at least 1 week in advance of beginning such operations. In the event that the Contractor's proposed construction schedule does not meet the necessary construction program schedule as determined by the City, immediately resubmit a schedule that conforms as approved. Contractor shall not commence work until schedule is approved by the City Engineer.

The schedule shall show the proposed order of work and indicate the time required for completion of the major items of work. This working schedule shall take into account the passage and handling of traffic with the least practicable interference therewith and the orderly, timely, and efficient prosecution of work. It will also be used as an indication of the sequence of the major construction operations and as a check on the progress of work.

108.02 PRECONSTRUCTION CONFERENCE

Attend a preconstruction conference, if requested, at a time, prior to start of work, designated by the City Engineer. Comply with information and instructions provided at the preconstruction conference as recorded in the minutes of the meeting.

108.03 NOTICE TO PROCEED

Unless stated otherwise in the Special Specifications, written Notice to Proceed will be given by the City Engineer within 30 days after the performance and payment bond and all required insurances have been filed with and approved by the City and the Contract has been executed. Do not commence work under the Contract until such written notice has been given.

Notice to Proceed may be delayed up to an additional 30 days (for a total of 60 days) from date of the Contract by the City Engineer if, in the City Engineer's opinion, necessary easements or permits have not been obtained, or required utility relocation, construction, or reconstruction has not been completed or has not progressed to a degree that will allow initial contract work to commence.

Commence work within 10 working days after the date of the Notice to Proceed, or such other date as may be fixed by the Notice to Proceed, which date shall establish the date for commencement of the Contract time. Notify the City Engineer 48 hours in advance of the time and place work will be started.

108.04 CONTRACT TIME

Time shall be considered the essence of the Contract.

Upon commencement of work, the Contractor shall provide adequate labor, materials, and equipment, and work shall be performed vigorously and continuously in accordance with a schedule which will ensure completion within the specified time limit. Failure to diligently pursue the work may jeopardize additional contract time.

108.05 SUSPENSION OF WORK

If the work is suspended for convenience: Temporarily suspend work on the Project wholly or in part for convenience of the City as directed by the City Engineer. In the event of such suspension, the City Engineer shall, except in emergency, and except as hereinafter provided, give the Contractor 3 days' notice. Work shall be resumed within 5 days after notice has been given by the City Engineer to the Contractor to do so. The City Engineer shall allow the Contractor an extension of time for completion corresponding to the total period of temporary suspension, and shall reimburse the Contractor for necessary rental of unused equipment, services of watch persons, and other unavoidable expenses accruing by reason of the suspension, as stipulated in Subsection 108.06, Delays and Extensions of Time.

If work is suspended by the City Engineer: Immediately suspend work on the project, wholly or in part, as directed by the City Engineer, for reasonable periods of time as the City Engineer may deem necessary, when conditions are unsuitable for satisfactory performance of the work. The City shall allow the Contractor an extension of time for completion corresponding to the total period of suspension, but the Contractor shall not be entitled to reimbursement for any costs or damages arising under this clause.

If work is suspended for cause: Immediately suspend work on the Project wholly or in part as directed by the City Engineer for such periods as the City Engineer may deem necessary due to: (1) failure to correct unsafe conditions for working personnel, the general public, or City employees, (2) failure to immediately correct defective and unacceptable work in accordance with Subsection 105.15, (3) failure to carry out provisions of the contract documents and/or conditions of approval, or (4) failure to carry out orders or directives.

Voluntary suspension by the Contractor: There shall be no voluntary suspension or slowing of operations without the prior written approval of the City Engineer and such approval shall not relieve the Contractor from the responsibility to complete the Contract work within the prescribed Contract time. Should operations be discontinued, the Contractor shall notify, in writing, the City Engineer at least 24 hours in advance of resuming operations.

Responsibilities of Contractor:

1. At the commencement of and during any suspension of work, protect all work performed to prevent any damage or deterioration of the work. Provide temporary protection devices to warn, safeguard, protect, guide, and inform traffic during suspension, the same as though the work had been continuous and without interferences.
2. Bear all costs for providing suitable provisions for traffic control and for maintenance and protection of the work during suspension unless the suspension was for convenience.

In all cases of suspension, except voluntary suspension by the Contractor, work will be resumed only upon written order of the City Engineer or the City.

108.06 DELAYS AND EXTENSIONS OF TIME

If the Contractor is significantly delayed due to court orders enjoining the prosecution of the Project, unavoidable strikes, acts of God, unusual and extraordinary action of the elements that are of such severity to stop all progress of the work, or act or neglect of the City not authorized by the Contract, the Contractor shall, within 48 hours of the start of the occurrence, give notice to the City Engineer of the cause of the potential delay and estimate the possible time extension involved. Within 10 days after the

cause of the delay has been remedied, the Contractor shall give notice to the City Engineer of any actual time extension requested as a result of the aforementioned occurrence.

No extension of time will be considered for weather conditions normal to the area and time of year in which the work is being performed. Delays in delivery of equipment or material purchased by the Contractor or their Subcontractors (including City-selected equipment) shall not be considered as a just cause for delay, when timely ordering would have made the equipment available. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery, and installation of all equipment and materials. Extensions of time will be considered for delayed delivery of the City specified equipment "without equal."

Within a reasonable period after the Contractor submits to the City Engineer a written request for an extension of time the City Engineer will make the decision on each request with City Manager approval.

An adjustment of the Contract time as herein provided shall be the Contractor's sole remedy for any delay in completion of the project arising from causes beyond the control of the Contractor, except for unreasonable delay caused by acts or omissions of the City or persons acting therefor. In no event shall the Contractor be entitled to collect or recover any damages, loss or expense incurred by reason of such delay, except for an unreasonable delay caused by acts or omissions of the City or persons acting therefor. However, if the Contractor is delayed due solely to a breach by the City, the Contractor will be entitled to recover damages limited to reimbursement for necessary rental of unused equipment, services of watch persons, documented direct overhead costs, documented direct unavoidable expenses accruing by reason of the suspension, plus 15% of the foregoing damages to cover normal Contractor profit. The Contractor shall not be entitled to indirect costs or any other damages arising out of the delay, including but not limited to, interruption of schedules, or any other impact claim or ripple effect. If a delay is caused by the City and Contractor (joint delay), the Contractor shall be entitled to a time extension only, by reason of such joint delay.

108.07 LIQUIDATED DAMAGES

Time shall be considered the essence of the Contract. If the Contractor fails to complete the project or to deliver the supplies or perform the services within the time specified in the Contract or any extension thereof by the City, the actual damage to the City for the delay will be substantial but will be difficult or impractical to determine.

It is therefore agreed that the Contractor will pay to the City, not as a penalty but as liquidated damages, the per diem amount, as set forth in the following given Schedule of Liquidated Damages or modification thereof as given in the Special Provisions for each and every calendar day elapsed in excess of the Contract time or the final adjusted Contract time applicable to the work required under the Contract.

SCHEDULE OF LIQUIDATED DAMAGES			
Original Amount of Contract		Per Diem Amount of Liquidated Damages	
For More Than	To and Including	Calendar Day*	Working Day
\$ 0	\$ 25,000	\$ 40	\$ 55
25,000	50,000	65	85
50,000	100,000	110	150
100,000	500,000	150	210
500,000	1,000,000	225	315
1,000,000	2,000,000	300	420
2,000,000	5,000,000	450	630

*Calendar day amounts are applicable when the contract time is expressed on the calendar day, calendar workday, or fixed date basis.

Permitting the Contractor to continue and finish the work or any part thereof after the Contract time or adjusted Contract time, as pertinent, has expired shall in no way operate as a waiver on the part of the City or any of its rights under the Contract.

Payment of liquidated damages shall not release the Contractor from obligations in respect to the fulfillment of the entire Contract, nor shall the payment of such liquidated damages constitute a waiver of the City's right to collect any additional damages which may be sustained by failure of the Contractor to carry out the terms of the Contract, it being the intent of the parties that said liquidated damages be full and complete payment only for failure of the Contractor to complete the work on time.

108.08 CONTRACTOR'S REPRESENTATIVE

Designate, in writing before starting work, an authorized representative who shall have complete authority to represent and to act for the Contractor, in all directions given by the City Engineer. The Contractor, or its authorized representative, shall supervise the work and shall be present on site continually during its progress.

If the Contractor or its authorized representative is not present, directions may be given by the City Engineer or their authorized representative to the workmen and such order shall be received and followed. Any direction will be confirmed in writing upon request from the Contractor.

Keep a complete copy of the Plans and Specifications on or near the site at all time.

108.09 CONFLICTS, ERRORS, OMISSIONS, AND ADDITIONAL DRAWINGS

Check and compare all Plans and Specifications prior to construction and notify the City Engineer of any discrepancies or omissions in order to permit correction by the City Engineer. Coordination of Plans and Specifications is intended. Furnish labor and materials as required for the work. Should any work or materials be reasonably required or intended for carrying the project to completion which are omitted on the Plans and Specifications, furnish same as fully as if particularly delineated or described. The intent of the Plans and Specifications is to show and describe a complete project within the limits stated. Dimensions shown on the Plans shall be followed, rather than scale measurements. Whenever it appears that the Plans are not sufficiently detailed or explicit, the City Engineer may furnish additional detail drawings or written instructions and the Contractor shall perform the work in accordance with the additional details or instructions.

108.10 CITY'S RIGHT TO DO WORK

Failure or refusal to comply with any of the terms or conditions of the Contract will permit the City to supply or correct any deficiency or defect or take other appropriate action without prejudice to any other remedy. Such action by the City shall be taken only after 7-days' notice by the City Engineer to the Contractor and their surety, unless in the judgment of the City Engineer an emergency or danger to the work or to the public exists, in which event action of the City as set forth above may be taken without any notice whatsoever. The cost of such action by the City shall be deducted from the payment then or thereafter due Contractor. Pay the City any costs in excess of such payment due.

108.11 TERMINATION FOR DEFAULT

If the Contractor should be adjudged bankrupt, or if they should make a general assignment for the benefit of their creditors, or if a receiver should be appointed on account of insolvency, or if they should refuse to or fail to supply enough properly skilled workmen or proper materials for the efficient prosecution of the Project, disregard laws, ordinances, or the instructions of the City Engineer, or otherwise be in violation of any provision of the Contract, the City may, without prejudice to any other right or remedy and after giving the Contractor and its surety 7 days' written notice, terminate the services of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon as well as all other materials whether on the premises or not, on which the Contractor has received partial payment and finish the work by whatever method it may deem expedient.

In the event action as above indicated is taken by the City, the Contractor, or its surety, shall provide the City Engineer with immediate and peaceful possession of all of the materials, tools and appliances located on the premises as well as all other materials whether on the premises or not, on which the Contractor has received any progress payment. Upon termination, in the event that the surety does not complete the Contract, at the election of the City, the Contractor shall assign any and all Subcontractors and material contracts to the City or City's designee. Further, the Contractor shall not be entitled to receive any further payment until the work is completed. On completion of the work, determination shall be made by the City Engineer of the total amount the Contractor would have been entitled to receive for the work, under the terms of the Contract, had the Contractor completed the work. If the difference between said total amount and the sum of all amounts previously paid to the Contractor, which difference will hereinafter be called the "unpaid balance," exceeds the expense incurred by the City in completing the work, including expense for additional managerial and administrative services, such excess will be paid to the Contractor, with the consent of the Contractor's surety. If, instead, the expense incurred by the City exceeds the unpaid balance, the amount of the excess shall be paid to the City by the Contractor or Contractor's surety. The expense incurred by the City as herein provided, and the damage incurred through the Contractor's default, shall be as determined and certified by the City Engineer.

In addition to and apart from the above-mentioned right of the City to terminate the employment of the Contractor, the Contract may be canceled at the election of the City for any willful failure or refusal on the part of the Contractor to faithfully perform the Contract according to all of its terms and conditions; provided, however, that in the event the City should cancel the Contract, neither the Contractor nor Contractor's surety shall be relieved from damages or losses suffered by the City on account of the Contractor's breach of Contract.

The City may, at its discretion, avail itself of any or all of the above rights or remedies and its invoking of any one of the above rights or remedies will not prejudice or preclude the City from subsequently invoking any other right or remedy set forth above or elsewhere in the Contract.

None of the foregoing provisions shall be construed to require the City to complete the work, not to waive or in any way limit or modify the provisions of the Contract relating to the fixed and liquidated damages suffered by the City on account of failure to complete the Project within the time prescribed.

108.12 TERMINATION IN THE PUBLIC INTEREST

It is hereby agreed that the City has the right to terminate the Contract in whole or in part when it is considered to be in the public interest.

In the event the Contract is terminated as being in the public interest, the Contractor shall be entitled to a reasonable amount of compensation for preparatory work and for all costs and expenses arising out of the termination excluding lost profits.

The amount to be paid to the Contractor:

1. Shall be determined on the basis of the Contract price in the case of any fully completed separate item or portion of the work for which there is a separate or unit Contract price; and
2. In respect to any other work, the Contractor will be paid a percent of the Contract price equal to the percentage of the work completed.

END OF DIVISION

SECTION 1—GENERAL REQUIREMENTS DESIGN 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. For additional downtown requirements not included in these standards, please refer to the Milwaukie Downtown and Riverfront Plan Public Area Requirements. 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, this Ordinance, other ordinances, and other City policies adopted by the City Council or the City Engineer. No street, bridge, or utility construction shall commence prior to the City approval of the construction plans. Designs submitted shall be stamped by a Registered Professional Engineer licensed to practice by the State of Oregon.

The purpose of these Design 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 contract and public improvements under private contract designated herein.

These Design 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 Design 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 Design 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 ENGINEERING POLICY

It shall be the policy of the City of Milwaukie to require compliance with ORS 672 for professional engineers.

All engineering plans, reports, or documents shall be prepared by a registered professional engineer, or by a subordinate employee under the engineer's direction, and shall be signed by the engineer and stamped with the engineer's seal to indicate the engineer's responsibility for them. This engineer is designated by these Standards to be the Design Engineer. It shall 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 shall 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 Design Standards shall 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 Design Standards conflict with other applicable codes, the more restrictive code shall prevail.

1.0050 STANDARD SPECIFICATIONS

All construction design detail, workmanship, and materials shall be in accordance with the current edition of the City of Milwaukie Public Works Standards. All work which these Design Standards do not discuss but for which they apply shall 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 shall make an application in writing. Approval of any major deviation from these Design 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 Design Standards.

The written application shall 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 shall be reviewed on a case-by-case basis and approved by the City Engineer. When requested by the City, full design calculations shall be submitted for review with the request for approval.

1.0070 SPECIAL DESIGN PROBLEMS

Special applications not covered in these Design 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	Water Distribution Pump Stations
Relining of Existing Sewers	Relining of Existing Water Mains
Internal Sealing of Existing Sewers	Water Pressure Regulating Devices
Sewer Regulatory Devices	Energy Dissipaters
Sewage Pump Stations	Water Reservoirs
Sewer Siphons	Water Treatment Plants
Sewage Treatment Plants	Water Flow Measurement/Monitoring/Telemetry Devices
Sewer Flow Measurement/Monitoring Devices	Storm Sewer

1.0080 REVISIONS TO DESIGN STANDARDS

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

1.0090 DEFINITIONS

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.

AASHTO

American Association of State Highway and Transportation Officials.

ADA

Americans with Disabilities Act of 1990

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 shall 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 Master 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.

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 shall 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

City

The City of Milwaukie, Oregon.

City Engineer

The City Engineer, or Engineering Director, 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.

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.

CFS

Cubic feet per second.

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 stationings, 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.

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 shall be understood to mean the direction, requirement, permission, or order of designation of the City Engineer. Similarly, the words "approved", "acceptable", or "satisfactory", shall 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.

(Private) Easement

An area on a parcel that benefits other parcel(s) by granting special uses.

ECTGH

Erosion Prevention and Sediment Control Plans, Technical Guidance Handbook

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, in order to prevent and/or control eroded material and sediment from leaving the construction site and entering the City storm 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.

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.

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.

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.

Manager

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

Milwaukie Downtown and Riverfront Plan Public Area Requirements

Planning document that provides requirements for improvements in the public right-of-way in downtown Milwaukie.

MMC

Milwaukie Municipal Code.

MS4

Municipal Separate Storm Sewer System.

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.

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.

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.

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 wastes.

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.

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.

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 close 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 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.

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.

Standard Drawings

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

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 a build-up and loss of sediment.

Streets or roads

Any public highway, road, street, avenue, alley, way, easement, or right-of-way used or to be used for motorized vehicles.

Structures

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

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.

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.

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".

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.

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 shall 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.

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 shall 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 shall be shown on the design plans.

1.1020 PLAN PREPARATION

Construction plans and specifications shall 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 shall be clearly and legibly drawn in ink on 22 x 34 inch or 24 x 36 inch size sheets. Sheets shall 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 shall be as follows:

Horizontal scales shall be 1" = 10', 20', 30', 40', or 50', vertical scales shall be 1" = 2', 4', 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. If more than one scale is necessary, the difference should be large enough to be noticeable (e.g. 1" = 20' & 1" = 50').

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

Architectural scales (e.g., 1/4" = 1'0") are not permitted unless approved.

Letter size shall not be smaller than 0.10 inch.

1.1030 REQUIRED SHEETS

Construction plan submittals shall 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 shall appear on each sheet of the plan set and shall 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 shall 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 shall appear on each sheet as well as the Design Engineer's phone number.

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

1.1031 Title Sheet

All subdivision projects and multiple sheet improvement projects shall have a title sheet as the first page of the construction plans. This sheet shall 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 shall 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 shall show the location of the project in respect to the nearest major street intersection.
3. Index of sheets.
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 shall 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 number for all affected utility companies.
11. Show tax lot numbers or lot and block designations.
12. Conditions of approval.

1.1032 Plan Sheet

The plan view of each sheet shall 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, 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 shall 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 shall be numbered and stationed. Stationing shall tie to existing street monuments, property corners, or manholes. Each separate line shall be separately designated (e.g., sewer line 'A', storm line 'A', etc.).
5. On street plans, horizontal stationing shall show points of tangency and curvature for centerline; curve data shall show tangent length, radius distance, centerline curve length, and delta angle. Centerline intersection stationing, in both directions, shall be shown.
6. Where streets are being widened, edge of pavement elevations shall 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 stubouts and blockouts for future developments.

1.1033 Profile Sheet

Profiles for construction plans shall be the same horizontal scale as the plan sheet. Where profiles are drawn on the same sheet as the plan view, the profile shall be immediately below the plan view. The following minimum information shall 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 shall 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 shall extend a minimum of 200 ft beyond the project, both upstream and downstream. Typical cross sections at 50-ft intervals shall 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 shall 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 shall 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 shall be shown on the plans. When appropriate, due to required detail complexity, a separate detail sheet shall be drawn. When City or OSSC standard drawing appurtenances or construction installations are to be used, a reference to the specific standard drawing number shall be made on the title sheet.

1.1040 SUPPORTING INFORMATION

The Design Engineer shall submit sufficient supporting information to justify the proposed design. Such information shall 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 shall be submitted with the construction plans when required by the City Engineer. This plan shall be used to identify and analyze the proposed extension of facilities. The topographic plan shall show all upstream and tributary areas within no less than 200 ft of the proposed development.

The plan shall 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 shall address the measures as required by the Erosion Prevention and Sediment Control Plans, Technical Guidance Handbook (ECTGH) (Clackamas County Department of Utilities, Current Edition). Construction projects beginning prior to May 1 or those projects anticipating construction activity between October 1 and April 30 will be required to submit a plan addressing "wet weather" measures as outlined in the ECTGH. Construction activity is assumed as "active" until all permanent vegetation and/or erosion protection is established.

The plan shall 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—shall 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 shall 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 shall 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 shall be submitted for the 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 shall 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 shall 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 shall meet the requirements of Subsections 1.1020 (Plan Preparation), 1.1030 (Required Streets), and 1.1060 (As-Built Plan Requirements) and shall be of archival quality. At a minimum, the drawings shall be 3 mil Mylar. Original inked mylars or photographic mylars may be submitted.

Electronic as-built drawings including one full set of AutoCAD compatible files and a PDF copy of the final plat, shall be submitted on flash drive, CD-ROM, or other electronic method acceptable to the City Engineer. As-built drawings shall include all field changes.

The Design Engineer shall 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" shall 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 complete report of all test results shall be provided to the City Engineer.

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

1.1061 Street

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

1. Station of wye or tee into main line. Tie 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 shall be shown as appropriate at a manhole.
3. Other changes altering the approved plans.

1.1063 Sanitary Sewer

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

1. Station of wye or tee into main line. Tie 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 shall 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 shall 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 shall 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 shall be shown on plan with annotated reason 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 shall 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 change altering the approved plans.

END OF SECTION

SECTION 2—STORMWATER DESIGN STANDARDS

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2.0000 STORM DRAINS

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 adopted Stormwater Master Plans 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, shall 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 shall be collected and conveyed in an approved manner to an approved point of disposal.
2. Surface water entering the subject property shall be received at the naturally-occurring locations and surface water exiting the subject property shall 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 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 shall 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 Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit Post Construction Site Runoff and Hydromodification 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 Post Construction Site Runoff and Hydromodification conditions
7. Permanent stormwater quality control facilities will be required for all new developments.
8. Drainage from roofs, footings, and downspouts shall drain to a private stormwater management system. Systems other than residential drywells shall be designed by an engineer and reviewed by City Engineering staff for approval.
9. Vegetation shall be established on areas disturbed by/or on areas of construction, as necessary, to minimize erosion in accordance with Chapter 16 of the Milwaukie Municipal Code.
10. All storm drain system designs shall make adequate provisions for collecting all stormwater runoff. The system shall accommodate all runoff from upstream tributary areas whether or not such areas are within the proposed development. The amount of runoff to be accommodated shall be based upon ultimate development of all upstream tributary areas. Proposed storm drain systems shall not discharge flows into inadequate downstream systems unless approved by the City Engineer.
11. Public storm lines shall 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. Applicant must obtain all necessary permits (Division of State Lands, Army Corps of Engineers, Oregon Department of Fish and Wildlife, etc.).

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 detail for proposed improvements will 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 shall 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 shall 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 shall 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 discharging 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 reserve requirements. Replacement of culverts or water crossing structures would trigger conveyance requirements through review of the proposed channel encroachment.
- Standalone projects that consist solely of safety improvements or to meet Americans with Disability Act (ADA) standards 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 as long as the cumulative impact to the receiving system remains the same following project completion.

2.0012 Pipe Materials and Size

All public storm drains shall 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 shall 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.

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

All public storm drain main lines shall be a minimum of 12 inches in diameter. All lateral lines to catch basins and other inlet structures shall be a minimum of 10 inches in diameter. Storm drain lines, 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 pipe shall 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 shall identify practical future replacement options for the pipe under rail lines. All pipes shall 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 shall 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 shall be required using the Unit Hydrograph Method. Storms to be evaluated shall 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 shall be that of the predevelopment discharge rate. An outfall structure such as a "V-Notch" weir or a single or multiple orifice structure shall be designed to control the release rate for the above events. No flow control orifice smaller than 1 inch shall 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. Water Quality Facility

All water quality facilities shall meet the design requirements of the current City of Portland, Stormwater Management Manual, as amended and adopted by the City of Milwaukie and the requirements of Subsection 2.0050 (Water Quality Facilities) of this manual.

C. Conveyance Piping

1. Time of Concentration

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

2. Velocity and Slope

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

3. Velocity in Natural Channels

Control of discharge from developed areas to natural channels shall 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 shall use the Manning pipe friction formula.

5. Pipe Coefficient

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

2.0014 Culverts

Culverts at road crossings in natural, perennial channels shall 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.

2.0015 Bridges

New and replacement bridges over natural, perennial channels shall 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 shall 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 shall generally be located 5 ft (south and east) from right-of-way centerline. All changes in direction of pipe shall be made at an approved structure.

2.0022 Curvature

Storm drain lines shall not be curved between structures.

2.0023 Minimum Cover

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

Minimum cover shall 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 shall be required. The minimum cover at rail crossings is 5 ft.

In areas of relatively flat terrain, the Design Engineer shall 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 shall be centered in the easement. All storm drain easements shall be exclusive and shall 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 shall have a minimum width of 15 ft. All pipelines greater than 18 inches in diameter shall 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 shall 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 shall 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 shall 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.

Minimum width of an access easement from an existing public road to a drainage facility shall be 15 ft.

Easements shall 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 shall enter a creek or drainage channel at 90 degrees or less to the direction of flow. The outlet outfall shall not be submerged during normal flows of the receiving stream. The outlet shall 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 shall 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 shall not exceed 4 ft.

Manhole spacing shall 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 shall 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 shall not be lower than the crown of the downstream pipe.

Manholes shall 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 shall typically be used.

Manholes connected to drywells or other underground injection control (UIC) devices shall have 2-hole lids. Manholes connected to storm systems that outfall to surface waters shall have the City of Milwaukie "Fish" lid. "Fish" lids shall be obtained from the City of Milwaukie Public Works Department. Tamper proof lids will be required on manholes outside vehicle or pedestrian travel ways. Rims shall 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 shall be located in streets at the curblines 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 shall 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 curblines do not exceed 3 ft in width (measured from the curb face) or 3 inches in depth (measured at the curb face), whichever is less.

Curb inlets or catch basins shall have a depressed gutter at opening and shall 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 those private storm drain lines to which a private building storm drain connects.

The minimum inside diameter of a storm drain service lateral shall be 4 inches and shall be equal to or greater than the building storm drain diameter. Service laterals shall be built to the same construction standards and of the same materials as the storm drain mainline. Service laterals shall have an oil and debris trap outlet cover that will act as an oil/debris/water separator. This cover will include a 4-inch minimum diameter trapdoor access point. Service laterals in general shall 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 90° (45° minimum) may be approved for special conditions such as cul-de-sac lots. Service line connections may be made at manholes (90° 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 shall 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 shall be 100% (45° or 1 ft per foot). Deep connection risers (see Standard Drawing 210) or drop connections to manholes must be used where service line slopes would exceed 100%.

Tees for service laterals shall be installed at 100% slope, and ¼₁₆ or ⅛ bends installed to provide proper grade for service lateral. Service laterals shall 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 shall be installed in end of the lateral and a 2x4-inch wood marker shall be placed at lateral end from pipe invert to at least 36 inches above the finish grade. The 2x4-inch top shall 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, shall be shown where it occurs within the development. Floodplain limits shall 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 shall be used by the Design Engineer.

2.0043 Emergency Overflow

The Design Engineer shall 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 shall be designed such that overflows do not cause inundation of neighboring properties. Potential overflow routes shall be adequately protected from erosion.

If surface detention (e.g., pond) is used, an overflow system shall 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 shall assume failure of the normal outlet control structure. An emergency spillway shall 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 340-040-0001 and OAR 340-044-0005. 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 a permit from the Building Department 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. The City shall 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, shall be tested prior to paving in order to determine their in-place capacity. Testing of both new and existing drywells shall follow the procedure outlined below. **The City must be notified at least 24 hours prior to conducting the above test.** Only clean water shall be delivered to the sump or sedimentation manhole for testing. The introduction of silts, sediments, gravels, or any other foreign material shall 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 shall 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, following analysis of the test data, the tested capacity of the drywell is less than the design capacity, inform the City immediately.

2.0050 WATER QUALITY FACILITIES

2.0051 Criteria for Requiring Construction of a Water Quality Facility

A water quality facility shall be constructed unless, in the judgment of the City Engineer, any of the following conditions exists:

1. The site topography or soils makes it impractical or ineffective to construct an onsite facility.
2. The site is small compared to the development plan, and the loss of area for the onsite facility would preclude the effective development.
3. There is a more efficient and effective regional site within the sub-basin that was designed to incorporate the development.
4. The development is for the construction of 1-or 2-family (duplex) dwellings on existing lots of record.

If construction of an onsite facility is not required, then the City Engineer may require that development to construct an offsite treatment facility that will treat an equal or greater volume of stormwater elsewhere within the city. It is the developer's responsibility to acquire the land necessary offsite to construct the proposed facility and to provide proof to the City Engineer that land has been acquired prior to the Land Use Application being deemed complete by the City. If the City is not furnished with adequate proof of ownership, then the application will not be deemed complete.

In lieu of constructing a new facility, the City Engineer may permit a development to upgrade an existing public facility at their discretion.

2.0052 Plan Requirements

When construction of water quality facilities is required:

1. The application shall include a set of construction plans prepared by the Design Engineer that certifies the proposed water quality facilities have been designed in accordance with the criteria required in Subsection 2.0013 (Minimum Design Criteria).

2. A financial assurance, meeting the requirements of the MMC shall be provided for the construction of the water quality facility.
3. An operation and maintenance plan shall be prepared showing how the water quality facility is to be maintained.
4. A landscape plan shall be prepared for the proposed facility.
5. A list of recommendations by a Geotechnical Engineer may be required at the discretion of the City Engineer.

2.0053 Facility Design

All water quality facilities shall meet the design requirements of the current City of Portland, Stormwater Management Manual, as amended and adopted by the City of Milwaukie.

2.0060 EROSION CONTROL

All development shall provide erosion prevention measures and sediment control practices during all phases of construction to prevent and restrict the discharge of sediments in accordance with MMC Title 16 and OAR 340-041-0345

2.0070 PRIVATE DRAINAGE SYSTEMS

2.0071 Subdivisions

When subdivision lots drain to the rear, it may be necessary to provide a private drainage system in private easements. This system shall be for collection of roof drains, footing drains, and surface runoff. This system shall be designed to meet the Uniform Plumbing Code requirements.

2.0072 Subsurface Drainage

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

1. Where existing springs and field tile 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—SANITARY SEWER DESIGN STANDARDS

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3.0000 SANITARY SEWERS

3.0010 GENERAL DESIGN REQUIREMENTS

Performance Standards: Sanitary sewer system design shall meet the policies and guidelines of the adopted City of Milwaukie Wastewater Master Plan (WWMP) and its updates.

Sanitary sewer systems shall be designed to provide gravity service to all areas of development unless approved by the City Engineer as stated below.

Sanitary sewer system capacity shall be designed for ultimate development density of the tributary area. The system shall allow for future system extension and for future development.

Sanitary sewers shall 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, shall not be discharged into the sanitary sewer system but shall be removed by a system of storm drains or by some other method separate from the sanitary sewer system.

Unpolluted or noncontact cooling waters shall not be discharged into sanitary sewers. The overflow drains and filter backwash lines of swimming pools and hot tubs shall drain into a sanitary sewer.

In general, sewer systems shall be designed to allow for future loads and for ultimate development of the specific drainage area or basin concerned.

As a condition of sewer service, all developments will be required to provide public sewers to adjacent upstream parcels in order to provide for an orderly development of the drainage area. This shall include the extension of sewer mains in easements across the property to adjoining properties, and across the street frontage of the property to adjoining properties when the main is located in the street right-of-way. This shall include trunk sewers that are oversized to provide capacity for upstream development.

All sewer mainlines shall be located within the public right-of-way or public easement as directed by the City Engineer. These lines are placed in the public streets and 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.

Design shall 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).

City Engineer approval will be required for any sanitary lift or pump stations.

3.0011 Pipe Materials and Size

All public sanitary sewers shall be constructed with PVC pipe as specified in OSSC Section 00445. Where required for added strength, Class 50 ductile-iron pipe will be used. HDPE pipe may be used with authorization from the City Engineer.

Private sanitary sewers shall meet the appropriate sections of the Uniform Plumbing Code.

All sanitary sewer main lines shall be a minimum diameter of 8 inches.

New and reconstructed light rail and freight rail construction may require improvements to the sanitary sewer system at utility crossing locations. All existing pipes or pipes on the second half of useful life within the rail zones shall 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 sewer pipe under rails in case of future failure of utility. All pipes shall

be sized for full build-out and future flows. This sizing includes allowance for trenchless technologies. Where lining is anticipated, pipe size shall account for future lining thickness.

3.0012 Minimum Design Criteria

In general, sewer systems should be designed to care for 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. Velocity

All sanitary sewers shall 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 shall be made to protect against displacement by erosion and shock. 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

In general, slopes greater than those shown above are desirable and are particularly recommended on the upper ends of lateral sewers.

B. Manning Equation

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

C. Pipe Coefficient

The minimum pipe roughness coefficient for sanitary sewers shall be 0.013.

3.0020 ALIGNMENT AND COVER

3.0021 Right-of-Way Location

Sanitary sewer lines shall be located in the street right-of-way, 5 ft north and west of centerline whenever possible. All changes in direction of pipe shall be made at a manhole.

Sewers shall be located in the street right-of-way. If streets have curved alignments, the center of the manhole shall 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.

Curved alignments will not be permitted.

3.0022 Minimum Cover

All sanitary sewers shall 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 shall 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 shall be placed in the street at a depth sufficient to drain building sewers on the low side of the street.

Sanitary sewers in residential areas shall 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 shallow (5 ft or less) the minimum cover shall 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. Minimum cover for rail crossings is 5 ft.

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').

3.0023 Separation with Waterlines

Water mains shall be installed a minimum clear distance of 10 ft horizontally from sanitary sewers and shall be installed to go over the top of such sewers with a minimum of 1.5 ft of clearance at intersections of these pipes (in accordance with the requirements of OAR Chapter 333 Division 61, Public Water Systems). Exceptions shall first be approved by the City Engineer. In all instances, the distances shall be measured edge to edge. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, excepting sanitary sewers, shall be 3 ft horizontally when the standard utility location cannot be maintained.

Where water mains are being designed for installation parallel with other water mains, utility pipe, or conduit lines, the vertical location shall 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 shall be 6 inches.

3.0024 Easements

Sewers placed in easements along a property line shall have the easement centered on the property line and the sewer shall be offset 18 inches from the property lines. For sewers placed in easements located other than along a property line, the sewer shall be placed in the center of the easement. The conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for sewer main purposes. Under no circumstances shall a building or structure be placed over a sanitary sewer main or sewer easement. This shall include overhanging structures with footings located outside the easement.

Easements for sewers less than 12 inches in diameter shall have a minimum width of 15 ft. Sewers greater than 12 inches in diameter shall 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 PUD, apartment complex, or commercial/industrial development shall 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 shall 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.

3.0025 Relation to Watercourses

Generally, the top of all sanitary sewers entering, crossing, or adjacent to streams shall 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. In paved channels, the top of the sewer line shall be placed at least 6 inches below finish grade of the bottom of the channel, except as provided above.

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

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

Pipe material shall be ductile iron with an 18-ft length of pipe centered on the stream or drainage channel centerline. The ductile-iron pipe shall extend to a point where a 1-to-1 slope begins at the top of the bank and slopes down from the bank away from the channel centerline and intersects the top of the pipe.

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

3.0026 Vicinity of Rail Lines

At a utility crossing of a rail line, center pipe sections to avoid joints underneath the rail line. 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.

3.0030 STRUCTURES

3.0031 Manholes

Manholes shall conform to ASTM C-478-15a.

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

Manhole spacing shall not be greater than 400 ft. Spacing may be increased in special circumstances with City Engineer approval.

Manholes outside of vehicle or pedestrian travelways shall have a tamperproof lid.

3.0032 Cleanouts

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.

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 shall be encased by a 2-inch A/C pad of pavement in a 4-ft diameter circle centered on the lid.

3.0040 STRUCTURE DESIGN

3.0041 Manholes

Manholes shall be located at all changes in slope, alignment, and pipe size; and at all pipe junctions with present or future sanitary lines. Designs for manholes are shown in the Oregon standard drawings. They are suitable for most conditions. Manhole steps are not required, and ladders shall be used to access manhole.

All sanitary manholes shall be of watertight construction. If ground water or surface drainage can be expected, watertight covers shall 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:

1. 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.
2. Watertight manhole frames and covers are to be used if floodwaters are expected to cover the manhole top or if the manhole must be located in the street gutter. Such conditions should be avoided wherever feasible.
3. 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 shall 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 crowns of incoming sewers shall be at least as high as the crown of the outgoing sewer.
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 shall 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 shall 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 on the construction drawings. The diameter of the drop connection shall 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. Outside drop assemblies only, will be permitted, 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.

3.0050 SERVICE LATERAL

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

Each individual building site shall be connected by a separate, private, building-sewer-service line connected to the public sewer. Each individual property shall have an individual lateral.

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 inside diameter of a sewer service lateral shall be 4 inches and shall be equal to or greater than the building sewer diameter. Service laterals shall be built to the same construction standards and of the same materials as the sewer mainline. Service laterals in general shall be placed at 90° 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 90° (45° minimum) may be approved for special conditions such as cul-de-sac lots. Service line connections may be made at manholes (90° to sewer mainline) if such placement would not interfere with other present or future connections to the manhole.

The minimum slope of sewer service lines shall 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 shall be 100% (45° or 1 ft per foot). Deep connection risers or drop connections to manholes must be used where service line slopes would exceed 100%.

Tees for service laterals shall be installed at 100% slope, and ¼₁₆ or ⅛ bends installed to provide proper grade for service lateral. Service laterals shall be installed to end beyond the street right-of-way line or easement line where sewer is installed in easement. A watertight plug shall be installed in end of lateral and a 2x4-inch wood marker shall be placed at lateral end from pipe invert to at least 36 inches above the finish grade. The 2x4-inch top shall be painted green and marked with the depth of the lateral measured from ground to invert of pipe. In new subdivisions, at the time the curbs are poured, an "S" shall be stamped in the top of the curb at each point where a lateral crosses beneath the curbline.

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.

3.0060 CONNECTION TO EXISTING SEWERS

Connections to, and extensions of, existing sewers will occur to facilitate new development. Certain requirements will be placed on the Design Engineer as to permitted methods and/or locations.

Connections to existing manholes shall be made with the following guidelines.

1. Where the invert of the connecting pipe is more than 2 ft above the manhole shelf, the Contractor will be required to construct an outside drop with the inlet pipe invert being located at the manhole shelf. The sewage entering the manhole will follow a smooth concrete channel transition from the inlet pipe into the main channel.
2. Where the invert is required to enter below the shelf of the manhole, 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.
3. No pipe will enter an existing manhole where the angle between the incoming flow and the outgoing flow is greater than 90°.

When sewers are extended from cleanouts, the entire cleanout assembly, including the wye, shall be removed.

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

When tees do not exist on the Public Sanitary Sewer System, the new lateral sewer will enter the collection system through a "cored" opening with an approved connector. This connection shall be done in conformance with Standard Drawing 304

New and reconstructed light rail and freight rail construction may require improvements to the existing sanitary sewer system at utility crossing locations. All existing clay pipes or pipes on the second half of useful life within the rail zones must be replaced to current standards. Existing metallic or conductive pipe materials are not approved pipe materials at rail crossings and must be replaced to current standards.

3.1000 SEWAGE PUMP STATION DESIGN STANDARDS

3.1010 GENERAL

The pump station shall be a submersible pump type facility.

Station shall include: submersible pumps, wet well, valve vault, associated piping and valves, electrical controls, instrumentation, telemetry, backup generation, access road, fencing, landscaping, potable water supply, and shall generally conform to the City of Milwaukie conceptual pump station.

Pump station shall 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.

3.1020 DESIGN

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

Design shall be by registered engineer experienced in design of such facilities.

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

Wet well shall be designed to provide 4 hours of storage above high water alarm.

3.1030 MATERIALS

3.1031 Pumps

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

Pumps shall be submersible pumps manufactured by PumpTech Inc (or equal), explosion-proof, suitable for hazardous location, and shall be UL or FM listed.

3.1032 Piping and Valves

Piping and fittings shall be ductile iron.

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

Pressure gages on pump discharge piping shall be provided.

3.1033 Electrical

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

3.1034 Controls

Controls may be mechanical relays or programmable logic controllers.

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

Bubbler shall control pump start/stop.

Float activated alarm shall indicate high water level.

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

3.1035 Alarms and Telemetry

Alarms shall be telemetered to the City of Milwaukie Public Works Open Complex radio. Alarms include:

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

3.1036 Landscaping and Fencing

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

3.1037 Additional Features

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

Provide positive ventilation in valve vault.

Odor control as required.

3.1038 Force Main

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

3.1040 CONSTRUCTION

3.1041 Design Codes

Pump station and related facilities will be constructed to Electrical and Building Codes.

3.1042 Steel Fabrications

Steel fabrications shall be hot dipped galvanized; painting required on valves, piping, and pipe fittings.

3.1043 Operating and Maintenance Data

Compile product data and related information appropriate for City's maintenance and operation of products furnished under the Contract.

Prepare operating and maintenance manual.

Instruct City's personnel in the maintenance of products and in the operation of equipment and systems.

3.1044 Spare Parts

Supply 2 sets each of all gaskets, bearings, and mechanical seals for rotating equipment.

END OF SECTION

SECTION 4—WATER DESIGN STANDARDS

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4.0000 WATER MAINS

4.0010 GENERAL DESIGN REQUIREMENTS

Performance Standards: Water distribution systems shall be designed to meet State Water Administrative Rules, AWWA Standards, and guidelines of these Design Standards.

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

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

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

All waterlines shall 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 shall maintain separation from public or private sewer or septic systems.

4.0011 Pipe Materials and Size

All public water distribution systems shall be constructed with ductile-iron pipe. All such pipe shall 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 shall be pressure rated for 250 or 350 PSI. All fittings shall 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 shall 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 shall be connected to a looped minimum 6-inch main. Fire hydrants are not permitted on 4-inch lines. All 4-inch lines shall terminate with a standard 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 shall not be permanently dead-ended. Looping of the distribution grid shall 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 shall be designed not to exceed 5 FPS. Velocity in service lines, as defined in Subsection 4.0050 (Water Service Lines), shall 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 shall be looped at all possible locations. All developments will be required to extend mains across existing or proposed streets for future extensions of other developments within the city. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended. 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 shall be provided with a properly-sized blowoff (see Oregon Standard Drawing RD262).

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

4.0014 Restrained Joints

Restrained joints shall 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 shall 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 shall be in the public right-of-way.

Curved alignment for waterlines or mains is permitted and shall follow the street centerline when practical. The minimum allowed radius shall 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 shall be 36 inches from finish grade.

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

"Finish grade" shall 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" shall mean final ground elevation at the water main alignment.

4.0023 Separation with Sewer Lines

Water mains shall be installed a minimum clear distance of 10 ft horizontally from sanitary sewers and shall 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 shall 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 shall first be approved by the City Engineer. In all instances, the distances shall be measured edge to edge. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, except sanitary sewers, shall 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 shall 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 shall be 6 inches.

4.0024 Easements

Mains placed in easements along a property line, shall have easements centered on the property line and shall be offset 18 inches from the property line. Mains placed in easements along a right-of-way line shall be offset a minimum 3 ft from the right-of-way line and within a minimum 10-ft-wide easement. For mains placed in easements located other than along a property or right-of-way line, the main shall be placed in the center of the easement. Easements, when required, shall be exclusive and a minimum of 15 ft in width. The conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for water main purposes. Under no circumstances shall 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 shall 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 shall be marked with permanent posts and metal signs at all angle points and line or sight of joints. In addition, such posts and signs shall 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 shall be an acceptable alternative to the sign. The City shall provide wording for the sign/monument.

All easements must be furnished to the City Engineer for review and approval prior to recording. Easements shall 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 shall be engineered to provide support, anchorage, and protection from freezing and damage, yet shall 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 shall be designed to cross as nearly perpendicular to the channel as possible. Mains shall be in a carrier pipe for underwater crossings.
2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. The valve nearest to the supply source shall be in a manhole. Permanent taps shall 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 shall 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 shall be concrete, 6-inch thick over and under the pipe and 6-ft wide; reinforced with #4 rebars with 12-inch grid spacing; and shall 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 shall be the same size as the mains in which they are installed. Valve types and materials shall conform to the Oregon Standard Specifications for Construction.

Distribution system valves shall be located at the tee or cross fitting. There shall 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 shall be such that the length of any one shutdown in commercial or industrial areas shall not exceed 500 ft nor 800 ft in other areas.

Valves shall be installed at each cross, tee, or any tap 2 inches or greater in diameter connected to the main line. In general, intersections shall be valved in at least 2 branches and cross-intersections shall be valved at all branches. Transmission water mains shall have valves at not more than 1,000-ft spacings. Hazardous crossings such as creeks, railroad, and freeway crossings, shall 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 shall be designed to provide adequate flow as required. The distribution system shall be designed in commercial/industrial areas to accommodate fire flows up to 1,500 GPM. Minimum fire flow in single-family residential areas shall be 1,000 GPM.

The distribution of hydrants shall be based upon the required average fire flow for the area served. Design coverage shall 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 shall be available within 1,000 ft of a building in commercial/industrial areas to provide its required fire flow.

Residential hydrants shall 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 shall 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 shall 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 shall be placed as to not 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 shall be installed within 5 ft of any existing aboveground utility and there shall not be any utility facilities installed closer than 5 ft from an existing hydrant.

Hydrant installation shall conform to Oregon Standard Drawing RD254. 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 shall have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supplying to the hydrant. Such auxiliary valves shall be resilient wedge gate valves. The auxiliary valve shall have mechanical joint-flange joint ends as referenced in the Oregon Standard Drawing RD254. The valve shall be connected directly to the water main using a flange joint tee, tie rods, or megalug.

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

Guard posts, a minimum of 3 ft high, shall be required for protection from vehicles when necessary. Such protection shall 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, shall 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, shall be valved on both sides of the crossing. Casing of railroad or freeway crossings shall be as noted in the permit from the respective agency and as approved by the City. Waterlines and casing materials shall be designed to minimize the cathodic protection required. All accessible structures shall 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 shall 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 shall 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 shall not be greater in size than the distribution main.

For services 2-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 shall 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 (Standards 401 and 402). Meter to be provided and installed by City. Meter boxes are to be provided by the developer. In general, individual service connections shall terminate in front of the property to be served and shall be located 18 inches 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 shall 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 shall 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) shall be individually pressure tested, chlorinated, and tested for bacteria. All testing shall be performed in accordance with Section 01140 – Potable Water Pipe and Fittings of the Oregon Standards for Construction 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 DESIGN STANDARDS

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5.0000 STREETS

5.0010 GENERAL DESIGN REQUIREMENTS

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

Streets shall be designed to meet or exceed minimum guidelines. These guidelines are set forth in the AASHTO Policy on Geometric Design of Highways and Streets (latest edition). Traffic Control Devices shall conform to the Manual on Uniform Traffic Control Devices for Streets and Highways, Federal Highway Administration, with Oregon Supplements, Oregon Department of Transportation (latest edition). Streets located within downtown Milwaukie shall be designed in accordance with the Milwaukie Downtown and Riverfront Plan Public Area Requirements (latest edition) and these Public Works Standards.

All vertical and horizontal curves shall meet the guidelines of the AASHTO Policy on Geometric Design of Highways and Streets and the design speed for each street classification. Where practical, the Design Engineer shall provide the decision stopping sight distance set forth in the AASHTO policy. But in no case shall 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 shall be as set forth in other sections of these Design Standards.

5.0012 Access

All development shall be provided public street access. Access roads (public and/or private), driveways, and easements shall be as set forth in other sections of these Design 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, shall 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 shall be subject to City TIS fees and deposits in accordance with the adopted fee schedule. The City Engineer shall 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 shall 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 study intersection level 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 shall 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 shall be carried in each direction away from the intersection.

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

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

Streets shall 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 shall 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			
Street Class	Intersection Spacing (ft)		Block Perimeter (ft)
	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 shall the pavement width required be less than that necessary to provide 2 lanes of traffic to pass at a safe distance.

A development on an unimproved street shall 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 shall be classified as designated in the TSP. The classification for any street not listed shall be that determined by the City Engineer.

5.0017 Design Speed

Design speeds for each street classification shall 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 shall be used for design purposes.

5.0020 HORIZONTAL/VERTICAL CURVES, AND GRADES

5.0021 Horizontal Curves

Horizontal curve alignments shall 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 shall 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 by AASHTO Policy 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 shall be based on AASHTO Policy design criteria which includes design speed, crest vertical curve, and sag vertical curve. Stopping sight distance for crest and sag vertical curves shall be based on sight distance and headlight sight distance, respectively.

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

5.0023 Grades

Maximum grades for each street classification shall 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%

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

5.0030 STREET DESIGN STANDARDS

Street design elements and dimensional standards for street cross sections by functional classification shall 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. Minimum 10-ft travel lane width shall 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 shall be provided. Where a travel lane is located between curbs, an additional 2 ft of travel lane width shall be provided.
3. Where shared lanes or bicycle boulevards are planned, up to an additional 6 ft of travel lane width shall 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 shall have a minimum width of 8 ft.
7. On-street parking in commercial zones shall have a minimum width of 7 ft.
8. On-street parking in residential zones shall 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 shall be measured from back of curb to front of sidewalk.
11. Where landscape strips are required, street trees shall be provided a minimum of every 40 ft in accordance with these standards and the appropriate Street Tree Planting List in Section 5.0093 of these standards and Street Tree Planting Guidelines:
<https://www.milwaukieoregon.gov/planning/street-tree-planting-guidelines>.
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 shall be required between a property line and the street element that abuts it; e.g., sidewalk or landscape strip.

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 shall 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 shall be constructed with asphaltic concrete; however, Portland Cement Concrete streets are permitted as approved by the City Engineer.

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

The Design Engineer shall 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.

5.0050 CONCRETE CURB

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

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

Control joint spacing in curbs shall 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 shall 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 required are as follows:

Minimum Curb Radii	
Intersection	Radius (ft)
Transit Route—Arterial or Collector	35
Arterial—Arterial	35
Collector/Arterial—Collector	25
Arterial—Neighborhood Route or Local Street	25
Neighborhood/Local/Collector—Neighborhood Route or Local Street	25
Neighborhood Route—Neighborhood Route	25
Local Street—Local Street	25

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 shall 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 shall be typically separated 5 ft from the

face of the curb by a planter strip. If 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 shall be 4:1.

Sidewalks shall 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 shall be provided.

Sidewalks shall have a maximum slope 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 shall be provided.

All above-ground structures in the sidewalk area shall be located to provide a maximum clear sidewalk width for pedestrians. The minimum unobstructed clear width allowed shall 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 shall be placed behind the sidewalk. Where cluster mailboxes or other objects larger than single mailboxes are within the sidewalk area, the walk shall 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 shall be maintained.

5.0061 Sidewalk Ramps

All intersections shall contain sidewalk ramps (for access) located within the curb return (Oregon Standard Drawings RD755, RD 757, RD759 and Standard Drawing 501). Sidewalk ramps shall be located with regard to stormwater flows, street grades, utility or light pole locations, and existing opposing ramps. Sidewalk ramps shall meet all applicable ADA guidelines and the Public Right-of-way Accessibility Guidelines (PROWAG).

5.0070 BIKEWAYS

The need for bikeways shall 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) shall 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 shall be provided at locations identified by the City's TSP.

5.0072 Design Criteria

In general, bikeway design shall 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 shall 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 shall 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 shall be designed to protect the bicyclist from the grate or opening.

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

5.0073 Construction

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

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

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

5.0080 ACCESSWAYS

Access to private property shall be permitted with the use of driveway curb cuts. The access points with the street shall be the minimum necessary to provide access while not inhibiting the safe circulation and carrying capacity of the street. Driveways shall meet all applicable ADA guidelines.

New accessways and the modification of existing accessways shall 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 shall 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 curb, 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 shall 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 shall 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 shall be at least 7½ 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 shall be maintained. Where an intersecting street does not have a curb, the distance shall be measured from the nearest intersecting street 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 shall 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 shall be minimized whenever possible through the use of shared accessways and coordinated onsite circulation patterns. Shared accessways or internal access between uses shall 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 shall 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 shall 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 shall meet all applicable standards of the ADA.

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 shall 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 shall 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 Standards
Single-family (attached and detached)	9	20	
Multifamily (3 dwellings)	16	20	
Multifamily (4-7 dwellings)	20	24	
Multifamily (8 or more dwellings)	24	36	With off-street parking areas with 16 or more spaces
Commercial, offices, or institutional	12	36	
Industrial	15	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 shall be the responsibility of the development. All streets fronting the property shall be provided 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 shall 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 lights shall 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 street lights shall be acquired through Portland General Electric (PGE) under the Option "B" plan (City-owned equipment, maintenance and energy from PGE). Fixtures shall be on PGE's approved list and approved by the City Engineer.

Nonstandard fixtures approved for installation shall be acquired through PGE under the Option "C" plan (Customer-owned equipment and maintenance, energy from PGE) and an agreement for maintenance responsibility shall 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	1.7 footcandles	3 to 1
	Intermediate	1.3 footcandles	
	Residential	0.9 footcandles	
Collector	Commercial	1.2 footcandles	4 to 1
	Intermediate	0.9 footcandles	
	Residential	0.6 footcandles	
Neighborhood Route Local Cul-de-sac	Commercial	0.9 footcandles	6 to 1
	Intermediate	0.7 footcandles	
	Residential	0.4 footcandles	

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. The development shall pay for all street name and traffic control signage prior to the signing of the final plat or map by the City. All new signage and pavement markings in the public right-of-way will be installed by the City in new developments.

5.0093 Street Planting

1. The standards contained in this section apply to all landscaping placed within the public ROW. Replacement trees shall also adhere to these standards.
2. The standards contained in this section may be superseded for projects with City Engineer/Public Works Director approval
3. A Right-of-Way Permit is required prior to planting in the public ROW. Within a development, the property owner or their landscape contractor shall schedule a pre-planting inspection of the holes and trees with the City Inspector. Upon completion of the tree planting, they shall notify the City Inspector in order to schedule a final inspection.
4. No person shall remove or replace a street tree or permitted shrub without first obtaining a permit from the City, specifically authorizing the removal or replacement.

5. Trees planted in the public ROW shall 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'

6. Trees should be selected based on the *Guideline Specifications for Nursery Tree Quality, 2009 revision* created by the Urban Tree Foundation.
7. Tree species shall be selected in accordance with Tables below. Non-approved trees may be removed and replaced at the owner's expense.
- Planter space is measured as the inside planting width between the street curb and the sidewalk edge.
 - Species designated for the downtown area are in the column marked DT.
 - Species with an asterisk (*) are Climate Forward species: plants which are adapted to long, hot, dry summers.
 - Watering categories of Regular, Occasional, and Summer Dry are meant to compare species at maturity within this list, not as a defined watering regime. All species require regular watering for an establishment period.
8. Street shrubs are intended for use in planter spaces less than 3 ft. Most street shrubs will require pruning; adjacent property owner is responsible for compliance with MMC 12.24 and 16.32.
9. Street shrubs may be used in addition to trees, but not in replacement of trees, except as approved by the City Engineer.
10. Street trees shall be located 10 ft from a fire hydrant, and 5 ft measured horizontally from an underground utility.

Street Trees							
Botanic Name	Common Name	Planter Space (ft)				Watering	Notes
		3-3.9	4-5.9	6-8+	DT		
<i>Acer circinatum</i>	Vine maple	X				Regular	Utility friendly, native, fall color
<i>Acer palmatum</i> cultivars	Japanese maple	X				Regular	Mature height 15' minimum
<i>Carpinus betulus</i> Frans Fontaine	Frans Fontain Hornbeam	X			X	Regular	Columnar tree
<i>Carpinus japonicus</i>	Japanese hornbeam	X				Regular	Tolerates full sun and heavy shade
<i>Cercis canadensis</i> cultivars	Eastern redbud	X				Regular	Avoid very hot, dry areas
<i>Cercis occidentalis</i> *	Western redbud *	X				Occasional	Purple flowers emerge before leaves
<i>Chamaecyparis obtusa</i> cultivars	Hinoki cypress	X				Regular	Evergreen, mature height 15' minimum
<i>Chamaecyparis pisifera</i> cultivars	Sawara cypress	X				Occasional	Evergreen, mature height 15' minimum
<i>Chionanthus virginicus</i>	White fringetree	X				Regular	Utility friendly, fragrant white flowers
<i>Eucommia ulmoides</i> 'Empozam'	Emerald Point hardy rubber tree	o			X	Regular	Columnar tree
<i>Lagerstroemia spp.</i>	Crepe myrtle	X				Regular	Vase-shaped, large flowers
<i>Laurus nobilis</i> *	Bay laurel *	X			X	Summer dry	Evergreen, slow growing, fragrant leaves
<i>Maackia amurensis</i>	Amur maackia	X			X	Regular	Utility friendly
<i>Magnolia grandiflora</i> 'Little Gem'	Magnolia	o			X	Regular	Evergreen, slow growing, compact form
<i>Nyssa sinensis</i>	Chinese tupelo	o			X	Occasional	Fall color, good for difficult sites
<i>Pistacia chinensis</i>	Chinese pistache	X			X	Regular	Fall color, drought tolerant
<i>Quercus dumosa</i> *	Scrub oak *	X				Summer dry	Evergreen, needs well-drained soil

<i>Quercus frainetto</i>	Hungarian oak	o			X	Occasional	Attractive shade tree
<i>Quercus turbinella</i> *	Turbinella oak *	X				Summer dry	Evergreen, greyish-green leaves
<i>Styrax japonicus</i>	Japanese snowbell	X			o	Regular	Fragrant white flowers in spring
<i>Styrax obassia</i>	Big leaf snowbell	X			o	Regular	Clusters of fragrant white flowers
<i>Syringa reticulata</i>	Japanese tree lilac	X			o	Regular	Flowers attract birds and butterflies
<i>Vitex agnus-castus</i>	Chaste tree	X				Occasional	Broad crown, multi-trunk, flowers attract butterflies
<i>Zelkova serrata</i> 'City Sprite' or 'Wireless'	Zelkova	X				Occasional	Utility friendly
<i>Carpinus betulus</i> 'Fastigata'	Columnar hornbeam				X	Regular	Columnar tree
<i>Cupressus sempervirens</i> 'Stricta' *	Columnar cypress *	X				Summer dry	Columnar tree, evergreen
<i>Ginkgo biloba</i> 'Princeton Sentry' or 'Fastigiata'	Columnar ginkgo		X		X	Regular	Columnar tree
<i>Quercus robur x alba</i>	Columnar oak				X	Regular	Columnar tree
<i>Sciadopitys verticillata</i> 'Joe Kozey'	Umbrella pine	X	X			Regular	Columnar tree, evergreen
<i>Zelkova serrata</i> 'Musashino'	Columnar zelkova		X		X	Regular	Columnar tree
<i>Arbutus menziesii</i> *	Madrone *		X	o		Summer dry	Native, evergreen, attractive red bark
<i>Arbutus unedo</i> *	Strawberry tree *		X	o	X	Summer dry	Evergreen, fruit and flowers provide habitat
<i>Arctostaphylos manzanita</i> *	Common manzanita *	o	X			Summer dry	Native, evergreen, attractive bark and branches
<i>Chionanthus retusus</i>	Chinese fringetree		X			Regular	Utility friendly
<i>Cornus kousa</i> and cultivars	Kousa dogwood	X	X		o	Regular	Utility friendly

<i>Cryptomeria japonica</i> and cultivars	Japanese cedar		X			Regular	Evergreen, mature height 20' minimum
<i>Cunninghamia lanceolata</i>	China fir		X	o		Occasional	Evergreen, cone-shaped crown
<i>Cupressus sempervirens</i> *	Mediterranean cypress *		X			Summer dry	Evergreen, narrow pyramid form
<i>Ginkgo biloba</i> cultivars	Ginkgo		X		X	Regular	Male plants only
<i>Juniperus scopulorum</i> and cultivars *	Rocky Mountain juniper *		X			Summer dry	Evergreen, mature height 20' minimum
<i>Magnolia grandiflora</i> 'Edith Bogue' or 'D.D. Blanchard'	Southern magnolia		X		X	Regular	Evergreen, pyramidal to rounded form, large flowers
<i>Magnolia virginiana</i> 'Jim Wilson'	Moonglow magnolia		X		X	Regular	Evergreen, tolerates wet and clay soils
<i>Osmanthus fragrans</i>	Sweet olive		X			Occasional	Utility friendly, evergreen
<i>Ostrya virginiana</i>	American hophornbeam		X			Regular	Fruit resembles the hop flower
<i>Parrotia persica</i>	Persian parrotia		X			Occasional	Fall color, rounded form
<i>Phellodendron amurense</i>	Amur cork tree		X			Regular	Spreading branch habit
<i>Platycladus (Thuja) orientalis</i>	Oriental thuja		X			Occasional	Evergreen, dense form
<i>Podocarpus macrophyllus</i>	Big leaf podocarp		X			Regular	Evergreen, slow growing, leathery leaves
<i>Quercus hypoleucoides</i> *	Silver leaf oak *		X		X	Occasional	Evergreen, silver to white under leaves
<i>Celtis occidentalis</i>	Hackberry			X	o	Occasional	Tolerates tough conditions
<i>Cupressus arizonica</i> *	Arizona cypress *			X		Summer dry	Evergreen, drought tolerant, pyramidal form
<i>Cupressus bakeri</i> *	Baker cypress *			X		Summer dry	Native, evergreen, does not tolerate shade
<i>Cupressus lusitanica</i> *	Cedar-of-Goa *			X		Summer dry	Evergreen, broad pyramidal form

<i>Davidia involucrata</i>	Dove tree			X		Regular	Large, white, flower-like bracts
<i>Eucommia ulmoides</i>	Hardy rubber tree			X		Regular	Avoid wet soils
<i>Fagus sylvatica</i>	European beech			X		Regular	Pyramidal to oval form
<i>Gymnocladus dioica</i>	Kentucky coffee tree			X		Regular	Drought tolerant, males are seedless
<i>Juniperus occidentalis</i> *	Western juniper *		o	X		Summer dry	Evergreen, drought tolerant, long-lived
<i>Nyssa sylvatica</i>	Black tupelo			X		Regular	Fall color, good for difficult sites
<i>Pinus bungeana</i>	Lacebark pine			X		Occasional	Evergreen, slow growing, colorful bark
<i>Pinus ponderosa</i> Willamette Valley source *	Ponderosa pine *			X		Summer dry	Native, evergreen, pyramid to columnar form
<i>Pseudotsuga menziesii</i> *	Douglas-fir *			X		Summer dry	Native, evergreen, Oregon state tree
<i>Quercus chrysolepis</i> *	Canyon live oak *			X	o	Summer dry	Native, evergreen, short trunk with broad crown
<i>Quercus garryana</i> *	Oregon oak *			X		Occasional	Native, dry soil in summer after established
<i>Quercus ilex</i> *	Holly oak *			X		Summer dry	Evergreen, tall, dense, rounded form
<i>Quercus phellos</i>	Willow oak			X		Occasional	Willow-like leaves, yellow to red fall color
<i>Quercus shumardii</i>	Shumard oak			X		Occasional	Tolerates many soil types and conditions
<i>Quercus suber</i> *	Cork oak *			X		Summer dry	Evergreen, avoid poorly drained soils
<i>Quercus wislizeni</i> *	Interior live oak *			X	o	Summer dry	Evergreen, short trunk with broad crown
<i>Thuja plicata x standishii</i>	Green Giant thuja		X	X		Occasional	Evergreen, fast growing, narrow, dense form
<i>Torreya californica</i> *	California nutmeg *			X		Occasional	Evergreen, shade tolerant
<i>Zelkova serrata</i> 'Green Vase' or 'Village Green'	Zelkova			X	X	Regular	Vase-shaped with variable fall color

Street Shrubs				
Botanic Name	Common Name	Mature size	Watering	Notes
<i>Arbutus unedo</i> 'Compacta' *	Compact strawberry tree *	6'x6'	Summer dry	Small, light pink flowers. Round, orange-red fruits
<i>Arctostaphylos spp.</i> and cultivars *	Manzanita *	1'-10'x3'-10'	Summer dry	Native, smooth orange-red bark, flowers winter-spring
<i>Aucuba japonica</i> and cultivars	Japanese laurel	8'x5'	Regular – Occasional	Shade tolerant, full foliage evergreen
<i>Baccharis pilularis</i> and cultivars *	Coyote brush *	6'x6'	Summer dry	Native, drought tolerant, small white flowers
<i>Ceanothus spp.</i> and cultivars *	Ceanothus *	1'-15'x3'-10'	Occasional – Summer dry	Native, showy flowers attract pollinators
<i>Cephalotaxus harringtonia</i> and cultivars	Japanese plum-yew	2'-10'x3'-10'	Regular	Sun to shade conifer with unusual fruit-like cones
<i>Choisya ternata</i> and cultivars	Mexican orange	5'-8'x5'-8'	Regular	Fragrant white flowers in spring
<i>Cistus spp.</i> and cultivars *	Rockrose *	1'-6'x2'-8'	Occasional	For sunny, well-drained sites, showy flowers, tolerates neglect
<i>Euonymus japonicus</i> 'Microphyllus'	Box-leaf euonymus	1'–3'x2'-3'	Occasional	Small, dark-green leaves, tolerates hedging
<i>Garrya elliptica</i> *	Coast silktassel *	8'-10'x8'-10'	Regular - Occasional	Shiny, leathery leaves, white flowers hang in tassels
<i>Garrya fremontii</i> *	Fremont silktassel *	5'-15'x5'-8'	Summer dry	Similar to <i>G. elliptica</i> , more tolerant of heat, cold, drought
<i>Heteromeles arbutifolium</i> *	Toyon *	6'-8'x4'-5'	Summer dry	White flowers in summer, bright red berries in winter
<i>Juniperus sabina</i> and cultivars *	Savin juniper *	1'-3'x3'-10'	Occasional	Common spreading shrub, needs well-drained soil
<i>Mahonia repens</i> *	Creeping oregon grape *	2'x4'-8'	Occasional	Yellow flowers, blue-green leaves, no hedging
<i>Morella californica</i>	Wax myrtle	6'-10'x6'-10'	Occasional	Often used for natural or sheared hedge
<i>Nandina domestica</i> cultivars *	Heavenly bamboo *	1'-6'x2'-3'	Occasional	Green and red leaves, bright red berries
<i>Pinus mugo</i> varieties	Mugo pine	1'-4'x3'-6'	Regular - Occasional	Common pine shrub, does not hedge

<i>Podocarpus lawrencei</i> and cultivars	Mountain plum-pine	4'x8'	Regular - Occasional	Soft-needled conifer, prunes easily, berry-like cones
<i>Podocarpus nivalis</i> and cultivars	Alpine totara	3'x6'	Regular - Occasional	Adaptable, prunes easy, bright red berry-like cones
<i>Quercus durata</i> *	Leather oak *	3'-10'x3'-10'	Summer dry	Creeping shrub to small tree, drought/heat tolerant
<i>Quercus sadleriana</i> *	Sadler's oak *	3'x3'	Occasional – Summer dry	Slow growing, unusual oak, needs part shade
<i>Quercus vaccinifolia</i> *	Huckleberry oak *	2'x4'	Summer dry	Slow growing, drought/heat tolerant
<i>Rosmarinus officinalis</i> and cultivars *	Rosemary *	2'-6'x3'-6'	Summer dry	Aromatic leaves, blue flowers
<i>Sarcococca hookerana humilis</i>	Dwarf sweet box	2'x4'	Regular	Part to full shade, prunes/hedges easily
<i>Sarcococca ruscifolia</i>	Sweet box	4'x3'	Regular - Occasional	Part to full shade, prunes/hedges easily, red berries
<i>Taxus spp.</i> cultivars	Yew	1'-10'x2'-6'	Regular	Variable size/shape, adaptable, prunes/hedges easily
<i>Vaccinium ovatum</i>	Evergreen huckleberry	6'x6'	Regular	Prunes easily, edible black berries

5.0100 DEAD-END STREETS AND CUL-DE-SACS

Permanent turnarounds shall be provided when no opportunity exists for creating a through street connection. Turnarounds shall 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 shall 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 shall 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 shall be dedicated to the City. Standard alleyway dimensions shall be a 12-ft wide paved surface inside a 16-ft wide right-of-way.

Design for alleyways shall meet the same criteria as other public streets. The exception to those criteria may be centerline radius and design speed. Generally, alleyways shall 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 shall conform to the latest adopted TSP.

5.0112 Private Residential Accessways

1. In general, private residential streets and accessways shall be provided for multifamily developments such as condominiums and apartments. Interior design for private accessways in a manufactured home park shall meet the standards of the community development code. The standards for private residential accessways include:
 2. Dead-end accessways which exceed 150 ft in length shall be provided with an approved turnaround.
 3. "PRIVATE STREET" signage and driveway approach shall be placed at the intersection with the public street to clearly identify the private accessway.
 4. Private maintenance of the private streets/accessways shall be provided by a Homeowner's Association or other appropriate entity. Maintenance shall ensure continual emergency accessibility at all times.
 5. Location of private accessways shall 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 shall 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 shall 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 shall 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. 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 shall 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 shall be sufficient to provide illumination of the median.
3. Objects such as trees, shrubs, signs, light poles, etc., shall 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.

- Medians in the public right-of-way are maintained by the Public Works Department. Planting and irrigation plans for medians shall be submitted to the Public Works Department for review. Inspections of planting and irrigation systems shall be coordinated directly with the Public Works Department. Irrigation of medians shall be designed to water lawn areas and shrub areas separately.

5.0140 GUARDRAILS

The decision of whether to install guardrails shall be based on the information found in the AASHTO Roadside Design Guide, current edition. Guardrails shall 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 shall be designed with a 3:1 taper. Delineators, as approved by the City Engineer, shall 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 shall be determined as follows:

$$L = S \times W \quad \text{for } S = 45 \text{ MPH or greater}$$

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

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. Maximum spacing of delineators shall 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 shall comply with the community development code as well as special overlay zones where applicable. Fences within the right-of-way in the downtown area shall 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 shall 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 shall 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 shall be provided.

Resurfacing to the longitudinal street grades shall meet City standards for longitudinal grades.

The downtown area or other special overlay zones may have different requirements. The City Engineer shall make the final determination on which requirement shall 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 shall 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, shall have pedestrian facilities separated from the vehicular facility.

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

All metal pipes or conductive materials crossing rail lines shall 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 specific street section 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 shall 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 granite 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.

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 shall be 20 ft.

- Bus/truck routes without bike lanes shall be 35 ft.

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

C. Landscape Requirements

Street trees shall be installed per standard and street specific details. Details show soil, irrigation, drainage, and plant size requirements. Original root ball wrap to be removed.

Refer to the street cross section drawings for tree types, spacing, and size on each block. Irrigation systems are required. Tree wells require a drip system and planters need a sprinkler head system.

All shrubs and ground cover shall be irrigated. They shall be low-maintenance and provide color and interest. They shall be low in height to avoid obstructing views, to comply with clear vision standards, or spreading. Ground cover shall tolerate foot traffic. Use native materials when possible.

D. Street lights

The fixture types shall 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 shall 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 street lights shall be staggered along each block and aligned at each corner. Street lights shall 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 shall include benches, trash receptacles, bollards, fountains, etc. This section shall 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. The following is approved for use in the downtown area:

Fairweather Site Furnishings & Accessories Model TD-3 with IPE wood.

Trash receptacles shall be flared steel trash receptacles with an optional ash trap. The following is approved for use in the downtown area:

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

Bollards shall be ornamental bollard, black (Standard Drawing 515). Bollards are to be set 5 ft on-center. Use bollards where specified per standard details.

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

Other elements shall be as approved by the City Engineer.

F. Bicycle Facility Details

Bike racks shall be tubular steel, black in color. Bike racks shall be grouped in front of public facilities. In addition, bike racks shall 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.

Low Volume Street (two curb)—includes a sidewalk to provide for a physical separation of pedestrians from vehicle traffic. The standard requires a sidewalk on one side of the street. The other side would feature load-bearing gravel to facilitate emergency vehicles and an area beyond for water quality facilities. This standard is compatible for use on designated pedestrian routes.

Low Volume Street (single curb)—depicts a shared street where pedestrians, cyclists, and autos occupy the same space. This standard is not compatible for use on designated pedestrian routes.

Low Volume Street Cross Section Standards			
Roadway Section	Pavement Width	Shoulder	Sidewalk
Two Curb	20'	a. 12" low profile mountable curb b. 2.5'-wide gravel, load-bearing with water quality area	5' separated sidewalk on one side
Single Curb	20'	a. 12" low profile mountable curb b. 2.5-3'-wide gravel, load-bearing with water quality area	NA

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 shall comply with MMC Subsection 19.904.11.

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 shall be mounted on existing poles.

Facilities that may be granted licenses as a small cell site shall 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, shall be no more than 28 cu ft. Ground mounted equipment shall comply with the following:
 - a. The volume shall 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 shall 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 shall meet the requirements of:
 - a. The pole owner
 - b. National Electric Safety Code (NESC) and National Electric Code (NEC) standards

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

5.0212 Site Selection

No equipment shall 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 shall comply with ADA standards, 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 shall be provided by the franchised power company. Small cell facilities shall 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, shall be provided at no cost to the City within 30 days.
 - b. The small cell facility shall, to the maximum extent feasible, match or compliment the material or color of the pole and shall be non-reflective.
 - c. The base of all cabinets or equipment attached to poles shall 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 shall be installed no less than 15.5 ft above the bicycle facility and/or street.
2. In addition, replacement poles shall be located as close as possible to the existing pole, and the replaced pole shall 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 shall:
 - i. To the maximum extent possible, have no surface mounted conduit or exposed wiring will be allowed.
 - ii. New poles shall match design, height, width, and color or material of the original or adjacent poles.
 - iii. New poles and accessory equipment shall meet NESC and NEC safety requirements. New installations shall comply with OAR 437-002-0047 and 437-002-2316.

5.0213 Antennas

The small cell antenna shall, 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 shall not exceed the diameter of the pole, unless technically required and then shall not be more than 50% greater than the diameter of the pole.
2. Skirts or shrouds shall be utilized on the sides and bottoms of antennas in order to conceal mounting hardware, create a cleaner appearance, and minimize the visual impact of the antennas. Skirts and shrouds shall 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 shall comply with City standards in effect at time of work to install, modify, upgrade, etc.

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

5.0216 Signage

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

5.0217 Radio Frequency, Noise, and Light Pollution

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

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

These provisions shall 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.

5.0218 Conflicting Design Requirements

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

5.0219 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 ADA requirements.

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

END OF SECTION

STANDARD DRAWINGS

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STORM

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202	G-2 Trapped Catchbasin
203	G-2 Catchbasin Flow Through
204	G-2 Catchbasin Grate
205	G-2 Catchbasin Frame
206	Sedimentation Manhole Drywell
207	Drywell - Right-of-Way
208	Storm Manhole Frame and Lid
209	Storm Manhole Tamperproof Lid
210	Storm Lateral Connection
211	Storm Lateral Cleanout
212	Sedimentation Forebay

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302	Waterproof and Tamperproof Frame and Cover
303	Manhole Adjustment Ring
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404	Wet Tap 2.5 Inch and Larger
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406	Fire Hydrant Installation

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502	Mid-Block Curb Extension
503	Intersection Curb Extension
504	Street Cross Sections
505	Low Volume Street Cross Sections
506A-B	Downtown Street Cross Sections
507	Cul De Sac
508	Constrained Right-of-Way Cul De Sac
509	Utility Placement

510	Trench Patch
511	Asphalt Repair for Newly Paved Road
512	Street Tree Grate
513	Street Tree Planting
514	Decorative Fence
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517	Downtown Curb
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521	Downtown Intersection Curb Extension
522	Asphalt Driveway Approach
523	Asphalt Concrete Pavement Placement
524	Tree Protection Fencing
525	Set Back Driveway Approach
526	Curb Tight Driveway Approach

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
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
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:

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




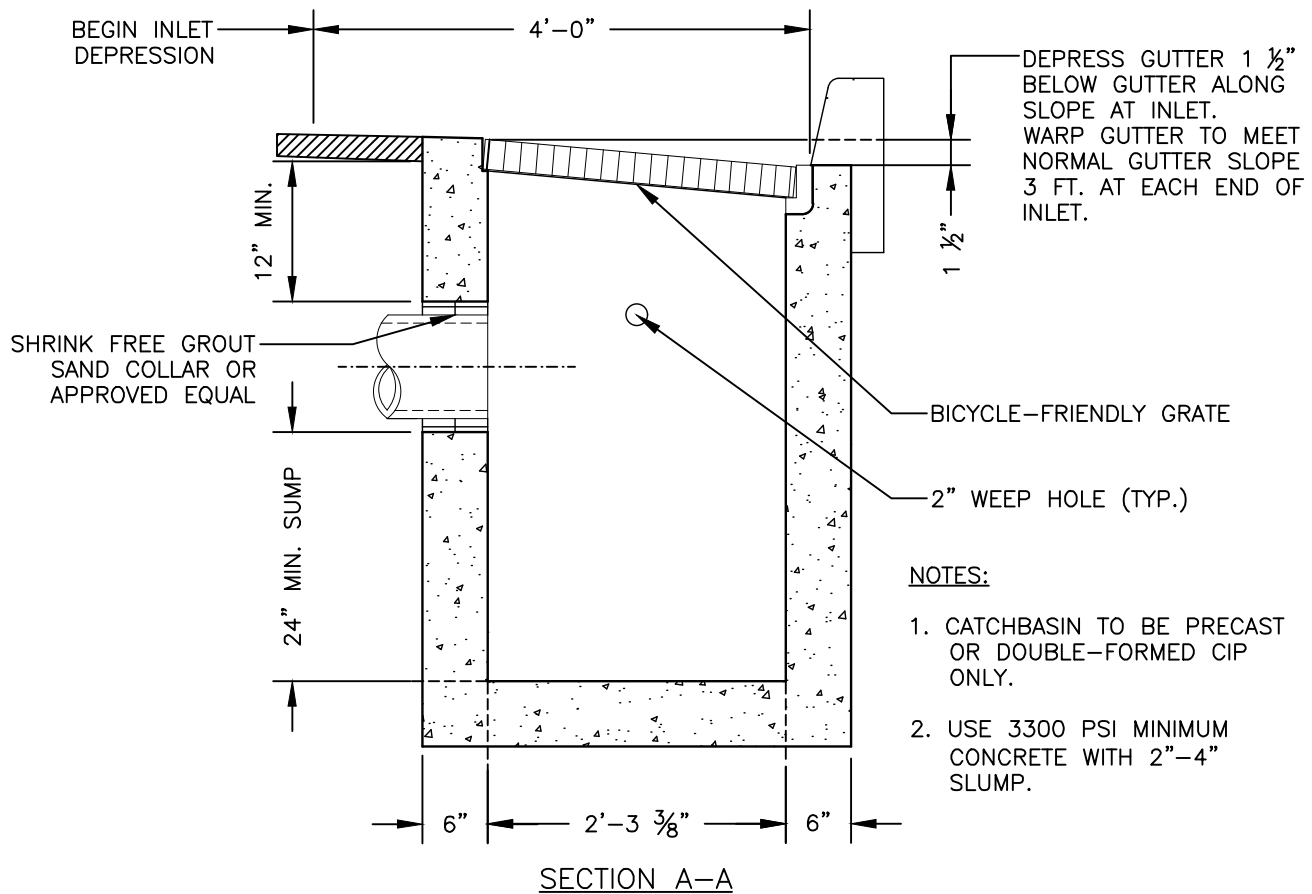
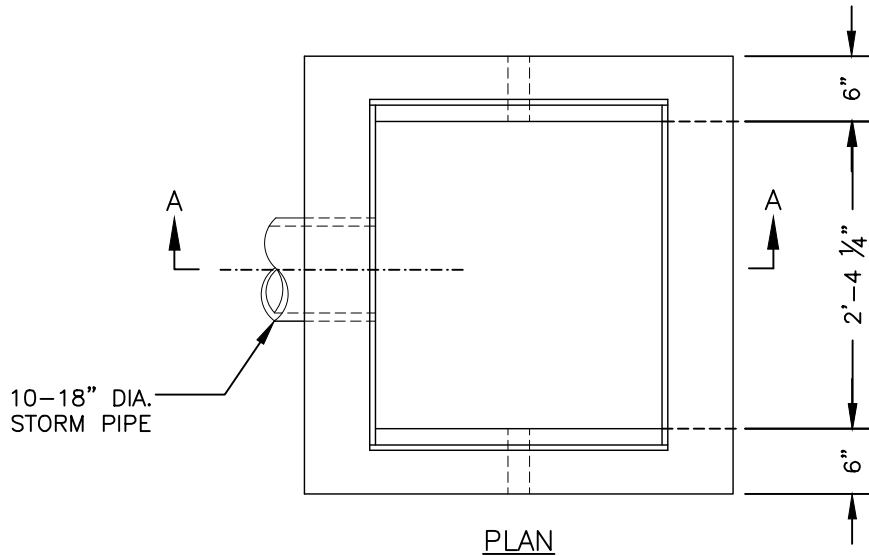
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

OSSC ACCEPTABLE STORM STANDARD DRAWINGS

DRAWING NO.

200

APPROVED 	NO.	REVISIONS	DATE	BY
	1	NEW DRAWING	11/18	TAP
	2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP
CITY ENGINEER	DATE	01/2021		



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Catchbasin

DRAWING NO.

201

APPROVED

Steve R. Adams
01/2021

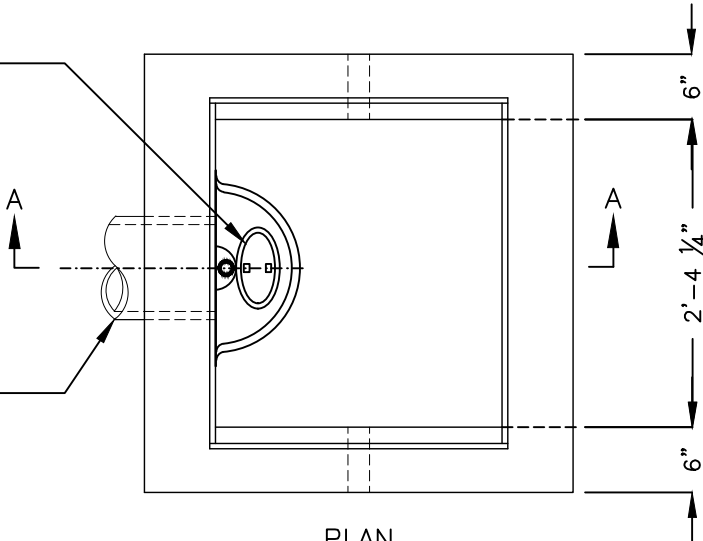
CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
1	ADJUST MIN. PIPE SIZE, FORMATTING	12/10	MCP
2	RENUMBERED DRAWING	11/18	TAP
3	RENUMBERED DRAWING	08/19	TAP

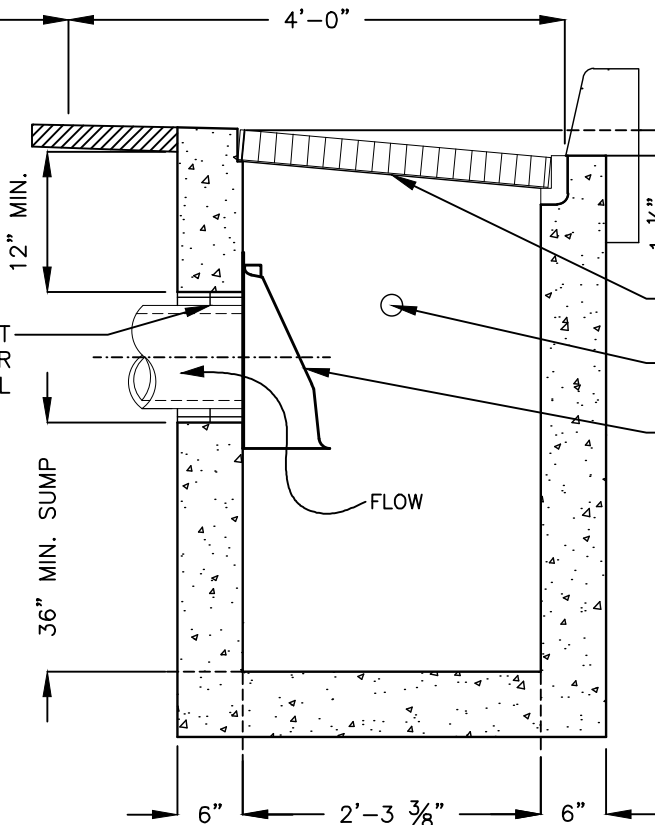
4" MIN. DIA.
TRAPDOOR ACCESS
POINT FOR STORM
PIPE MAINTENANCE

10-18" DIA.
STORM PIPE



BEGIN INLET
DEPRESSION

12" MIN.
SHRINK FREE GROUT
SAND COLLAR OR
APPROVED EQUAL



DEPRESS GUTTER 1 1/2"
BELOW GUTTER ALONG
SLOPE AT INLET.
WARP GUTTER TO MEET
NORMAL GUTTER SLOPE
3 FT. AT EACH END OF
INLET.

BICYCLE-FRIENDLY GRATE
2" WEEP HOLE (TYP.)
OIL AND DEBRIS TRAP

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 TRAFFIC AREAS INCLUDING PARKING LOTS. MIN. 4" DIA. TRAPDOOR ACCESS REQUIRED



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Trapped Catchbasin

DRAWING NO.

202

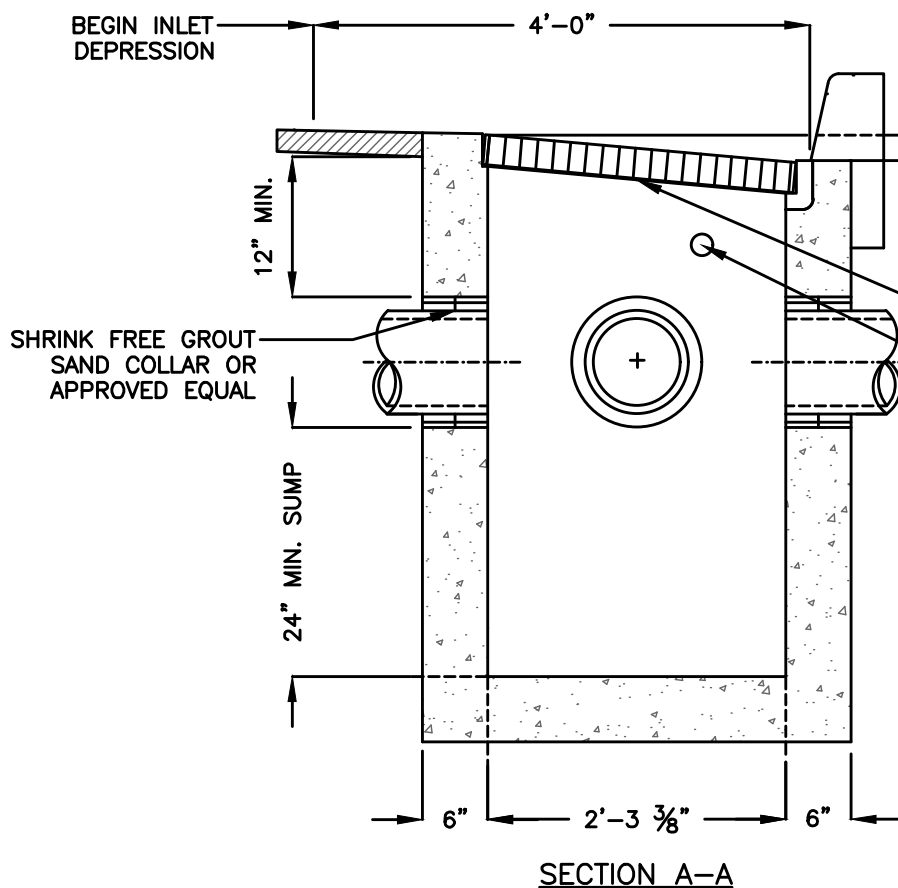
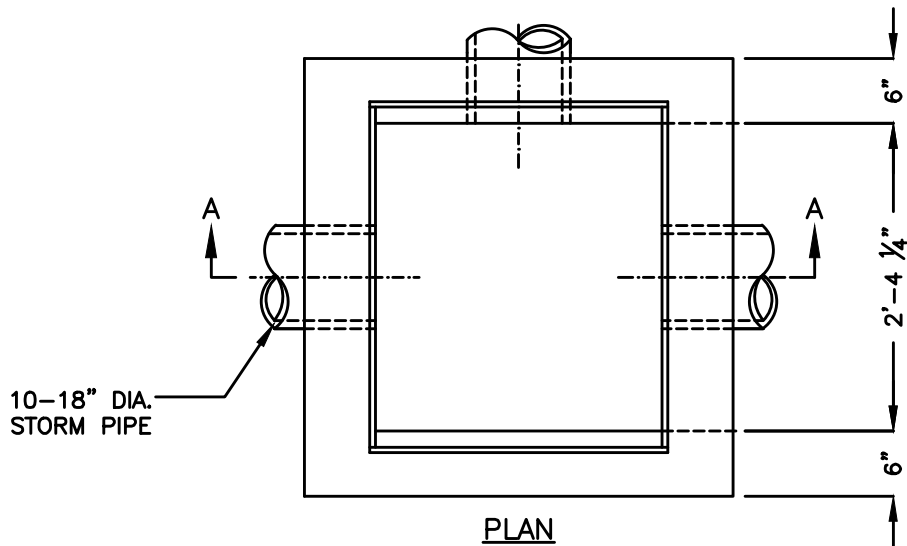
APPROVED

Steve R. Adams
01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
1	ADJUST MIN. PIPE SIZE, FORMATTING	12/10	MCP
2	RENUMBERED DRAWING, ADDED NOTE	11/18	TAP
3	RENUMBERED DRAWING	08/19	TAP



DEPRESS GUTTER 1 1/2" BELOW GUTTER ALONG SLOPE AT INLET. WARP GUTTER TO MEET NORMAL GUTTER SLOPE 3 FT. AT EACH END OF INLET.

BICYCLE-FRIENDLY GRATE
2" WEEP HOLE (TYP.)

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 OIL/WATER SEPARATOR 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

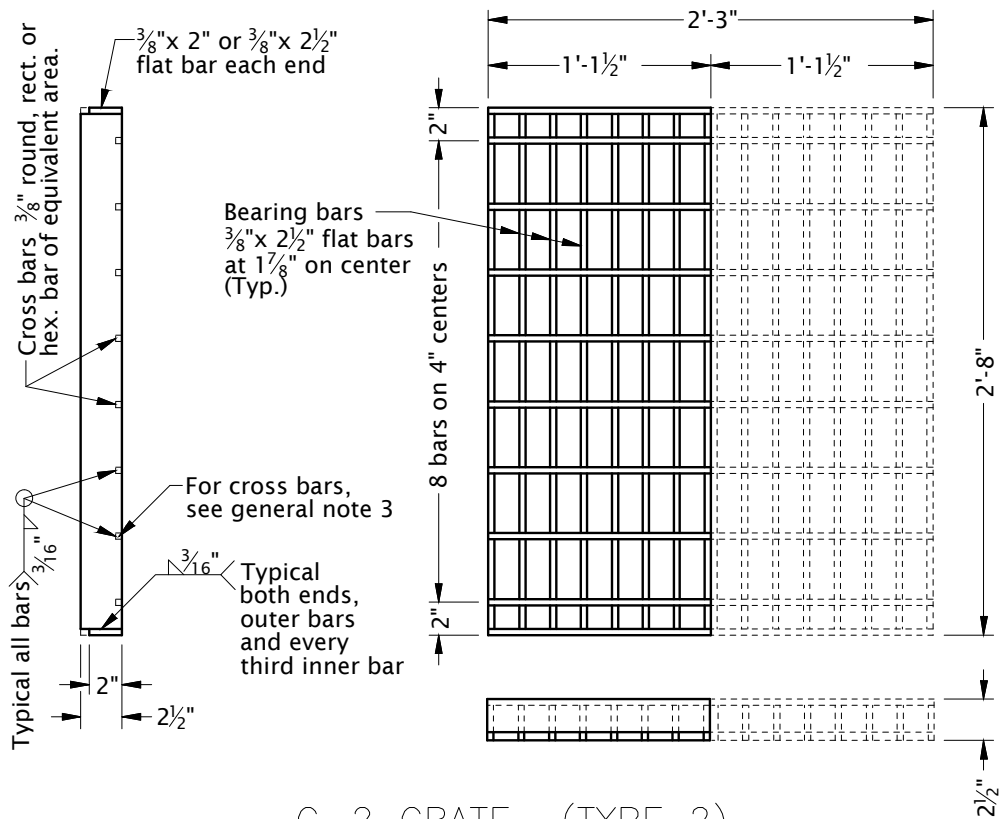
DRAWING NO.

203

APPROVED *[Signature]*
CITY ENGINEER

01/2021
DATE

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



G-2 GRATE (TYPE 2)

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

NOTES:

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STANDARD DRAWING (S).
2. $\frac{3}{8}$ " 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

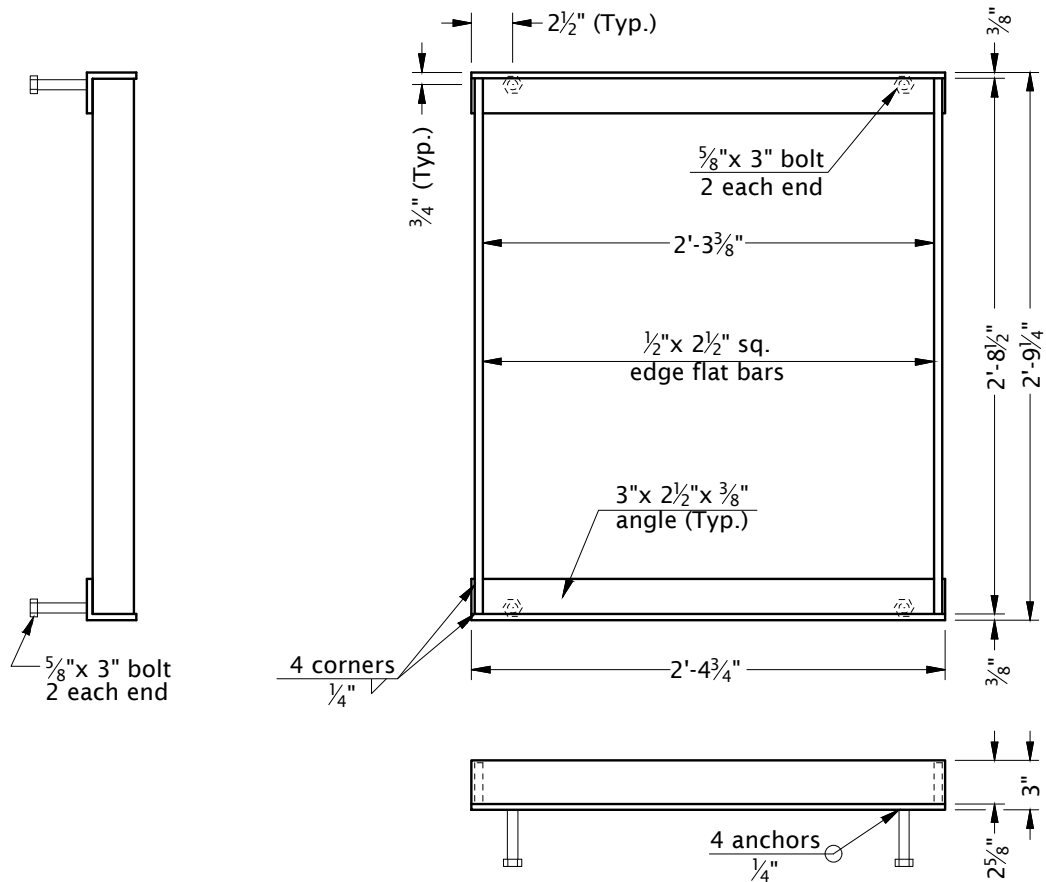
APPROVED

01/2021

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



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.



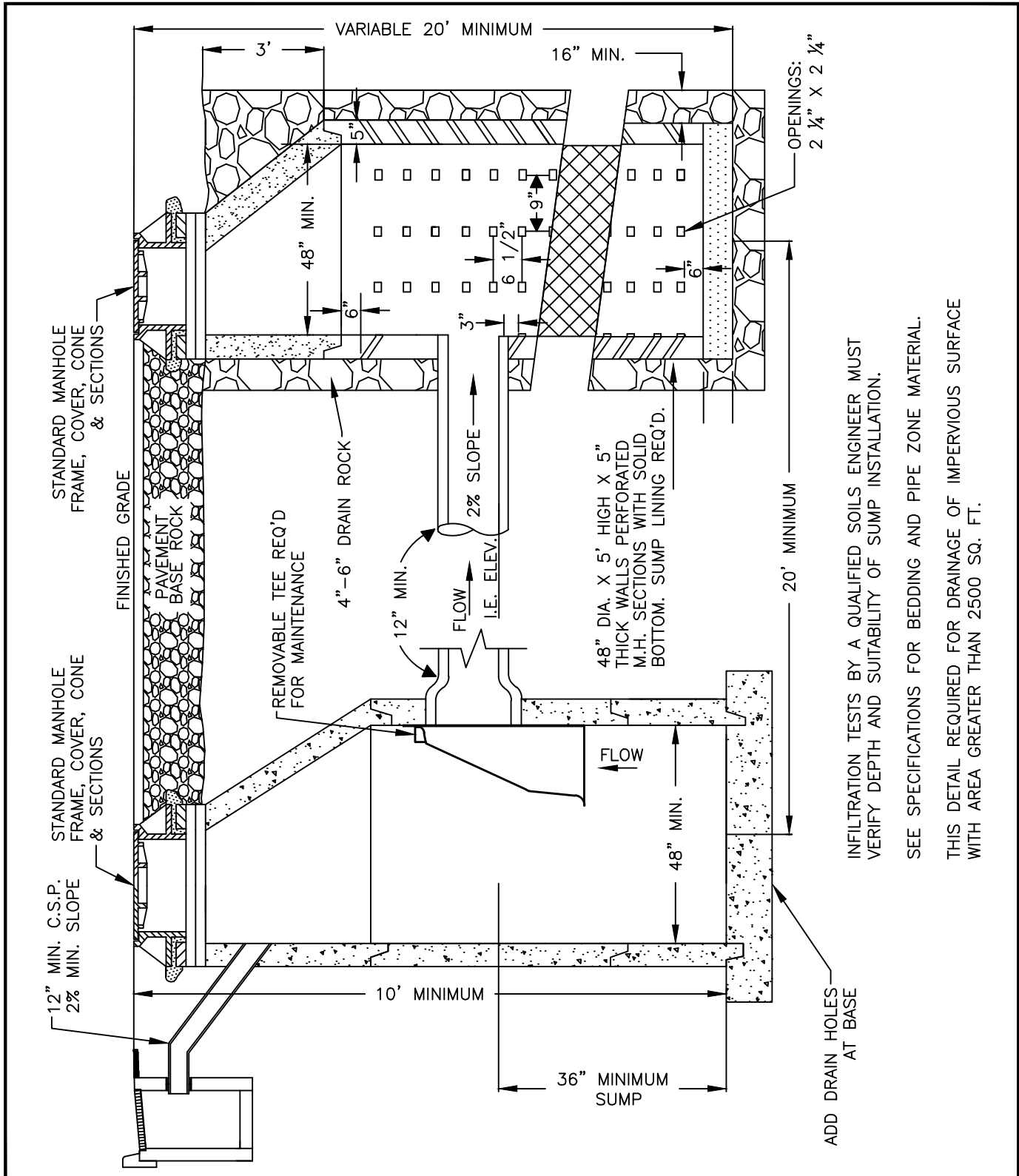
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G-2 Catchbasin Frame

DRAWING NO.

205

APPROVED	<i>Steve R. Adams</i>	NO.	REVISIONS	DATE	BY
		1	RECREATED DRAWING	12/10	MCP
		2	DRAWING RENUMBERED	11/18	TAP
		3	DRAWING RENUMBERED, NOTE CHANGED	08/19	TAP
CITY ENGINEER	DATE				



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

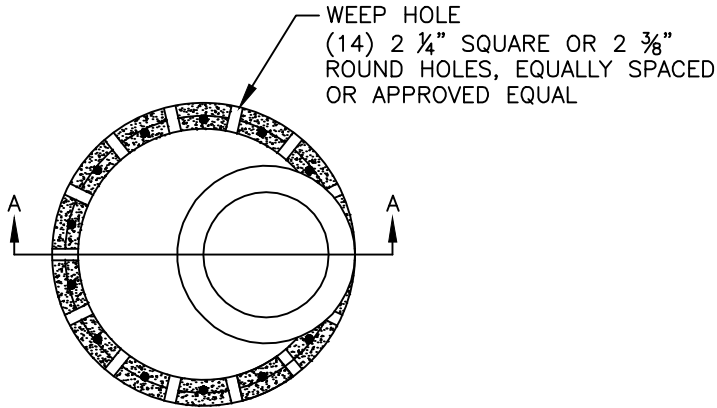
Steve R. Adair

01/2021

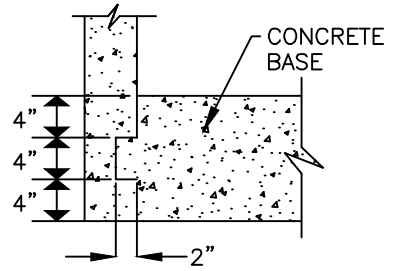
CITY ENGINEER

DATE

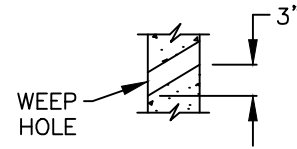
NO.	REVISIONS	DATE	BY
3	REVISED DRAWING	12/12	MTC
4	ADDED NOTE REGARDING DRAIN HOLE	11/18	TAP
5	RENUMBERED DRAWING, NOTE UPDATED	08/19	TAP



PLAN



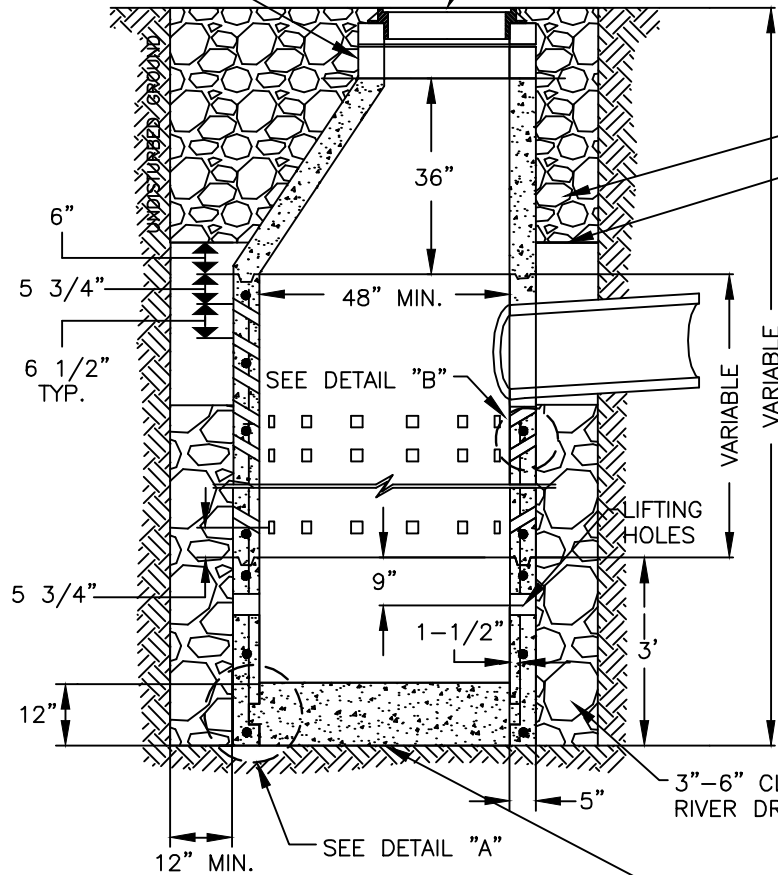
DETAIL "A"



DETAIL "B"

GRADE RINGS
MINIMUM 3"
MAXIMUM 12"

STANDARD MANHOLE
FRAME AND COVER
SEE DRAWING #208



1"-0" OR 3/4"-0" CRUSHED ROCK
GEOTEXTILE FABRIC - AMOCO NONWOVEN
GEOTEXTILE NO. 4545, OR APPROVED EQUAL

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.

ADD DRAIN HOLES AT BASE

SECTION A-A



CITY OF MILWAUKIE, OREGON - PUBLIC WORKS DEPT.

Drywell - Right-of-Way

DRAWING NO.

207

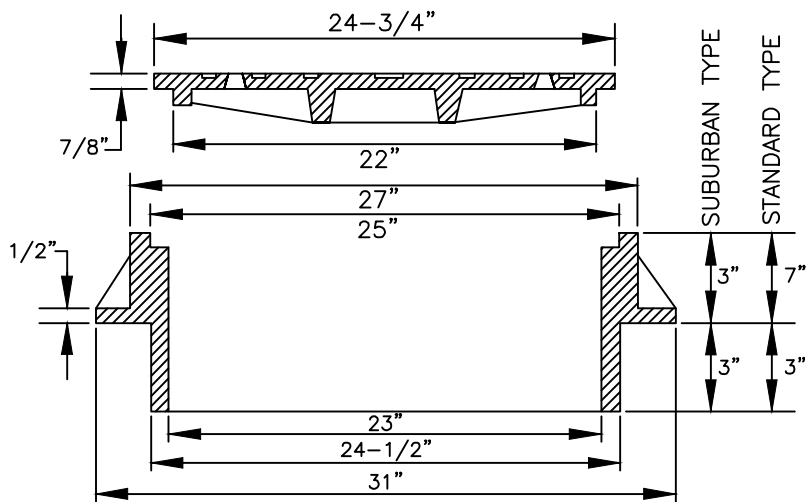
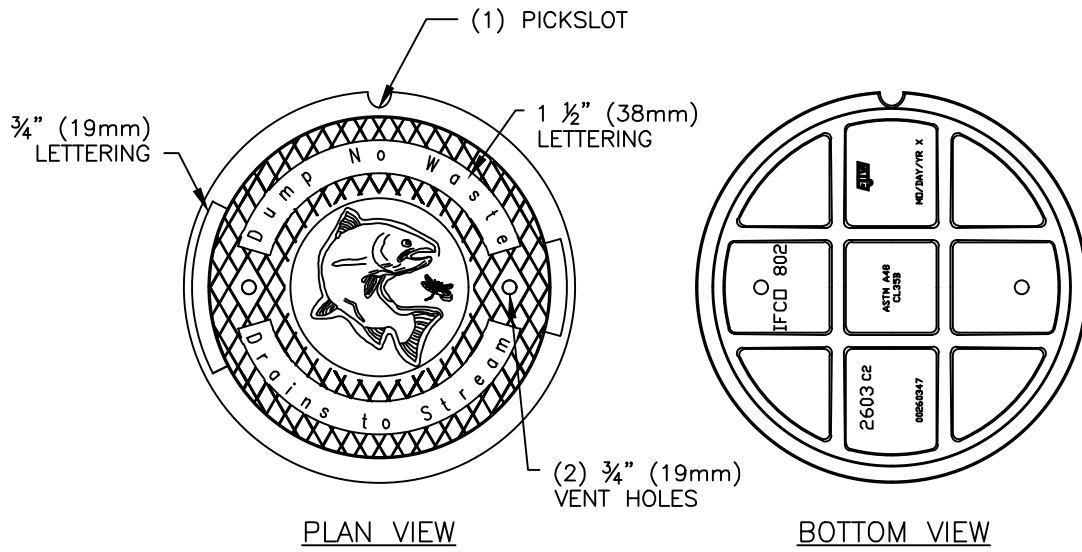
APPROVED

Steve R. Adams
01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
4	DRAWING NUMBER CHANGED	12/14	AJR
5	DRAWING NUMBER CHANGED, ADDED NOTE	11/18	TAP
6	RENUMBERED DRAWING, UPDATED NOTES	08/19	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 LID FOR LIFTING HOOK.

LIDS MAY BE PURCHASED FROM THE CITY OR THE MANUFACTURER



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Storm Manhole Frame and Lid

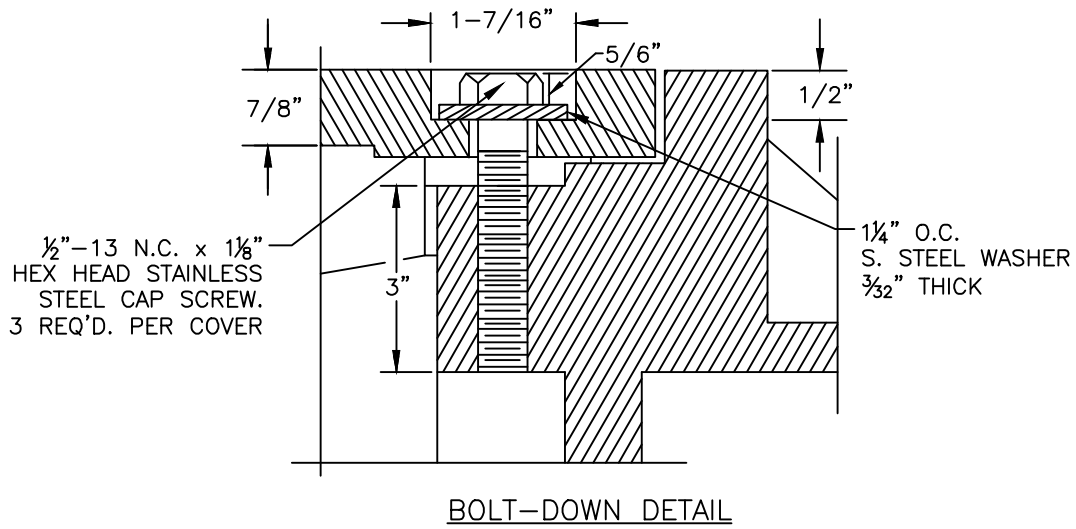
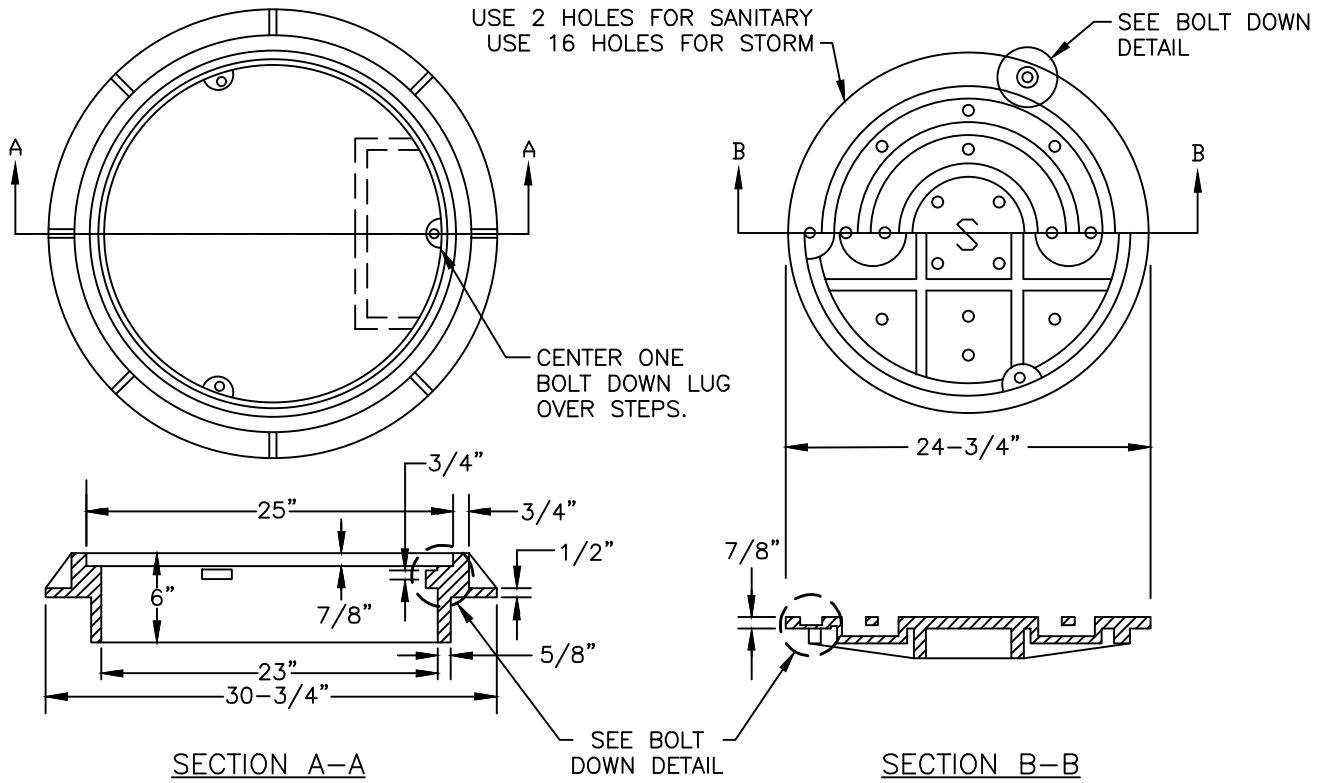
DRAWING NO.

208

APPROVED	<i>[Signature]</i>	NO.	REVISIONS	DATE	BY
		3	CHANGED LID DETAIL	12/12	MTC
		4	CHANGED DRAWING NUMBER	11/18	TAP
CITY ENGINEER	DATE	5	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP

TAMPERPROOF MANHOLE RING

3-BOLT DOWN COVER



NOTE: COVER AND FRAME TO BE GRAY CAST IRON ASTM A-48 CLASS 30.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Storm Manhole Tamperproof Lid

DRAWING NO.

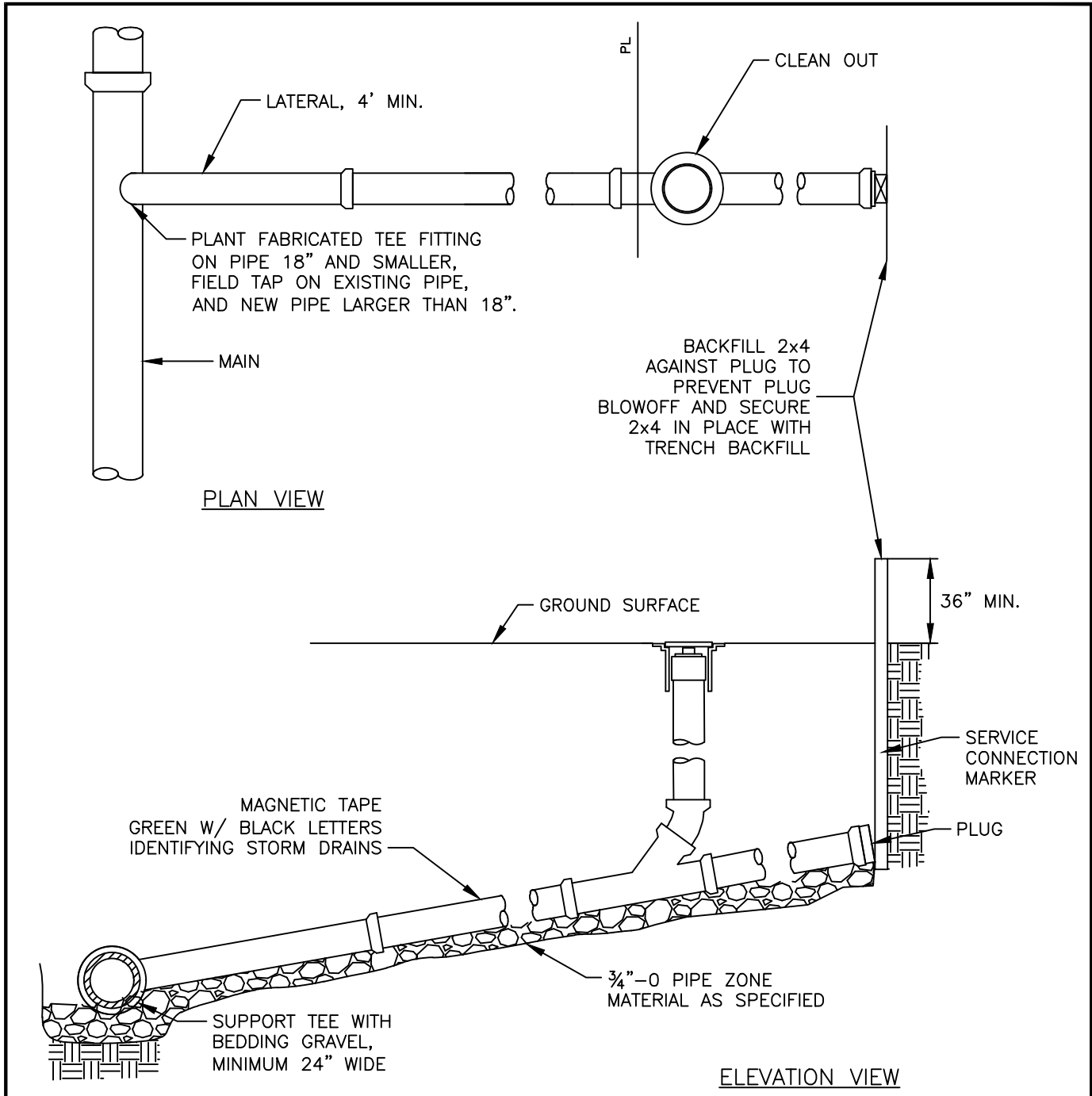
209

APPROVED *Steve R. Adair*
CITY ENGINEER



NO.	REVISIONS	DATE	BY
1	CHANGED DRAWING NUMBER	12/12	MTC
2	CHANGED DRAWING NUMBER	11/18	TAP
3	TITLE AND NOTE CHANGE, RENUMBERED	08/19	TAP

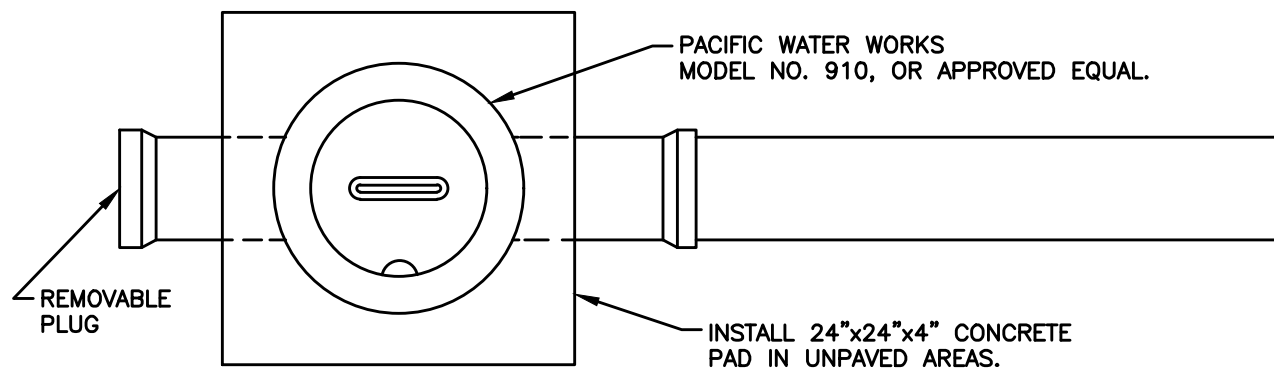
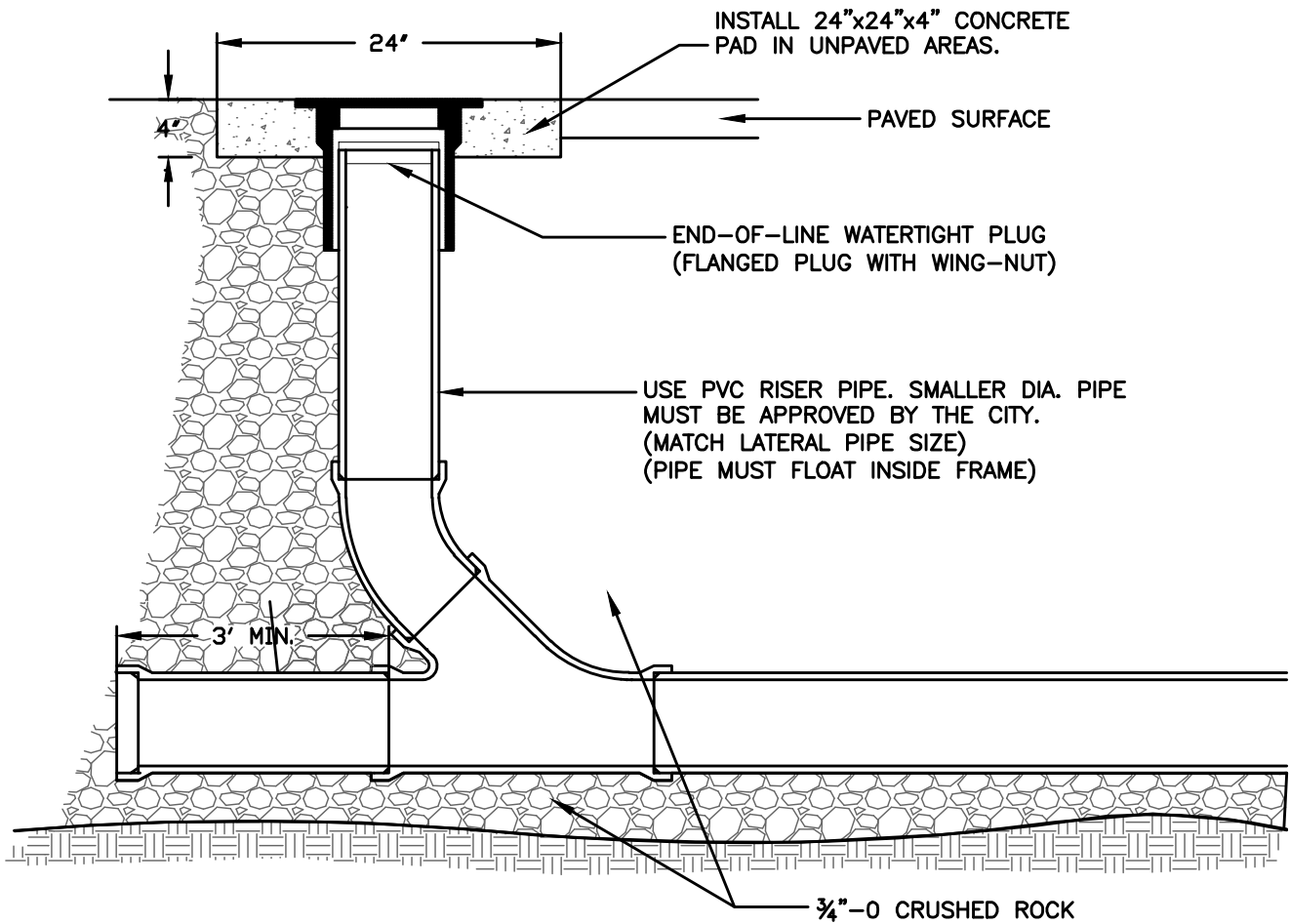
01/2021

DATE



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.				DRAWING NO. 210
	Storm Lateral Connection				
	APPROVED	 01/2021	NO.	REVISIONS	
CITY ENGINEER	DATE	4	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Storm Lateral Cleanout

DRAWING NO.

211

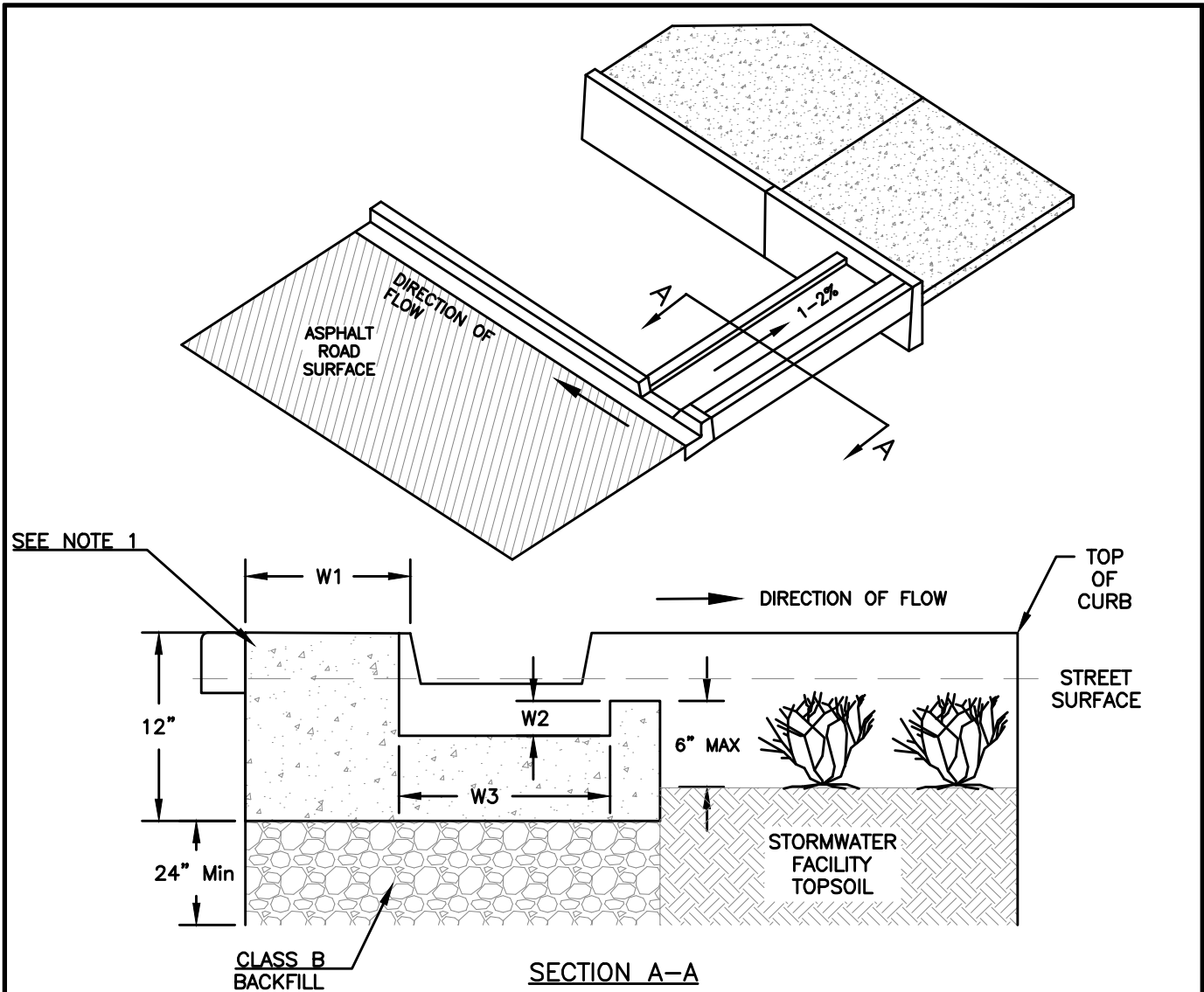
APPROVED

01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
1	CHANGED DRAWING NUMBER	12/12	MTC
2	CHANGED DRAWING NUMBER	11/18	TAP
3	RENUMBERED DRAWING	08/19	TAP



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 *[Signature]*
 CITY ENGINEER DATE 01/2021

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:

- 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.

**OSSC ACCEPTABLE SANITARY SEWER
 STANDARD DRAWINGS**

DRAWING NO.

300

APPROVED

01/2021

CITY ENGINEER

DATE

NO.

REVISIONS

DATE

BY

1

NEW DRAWING

11/18

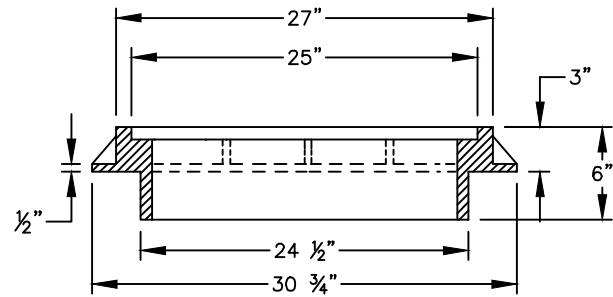
TAP

2

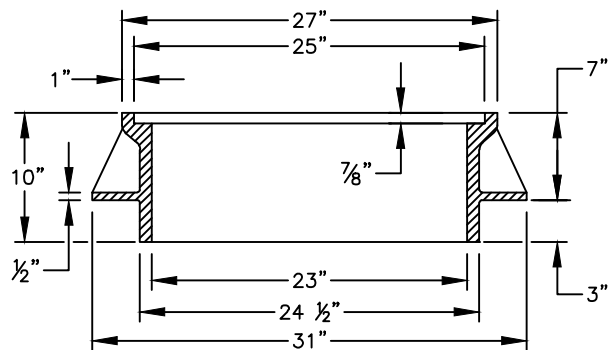
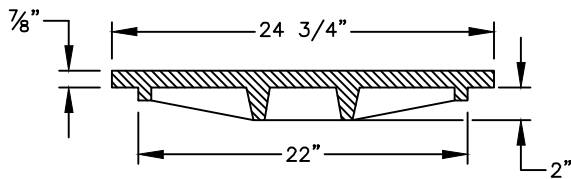
NOTE CHANGED

08/19

TAP



CAST IRON SUBURBAN
APPROX. WT. - 305 LBS



CAST IRON STANDARD
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.

Sanitary Sewer Manhole Frame and Cover

DRAWING NO.

301

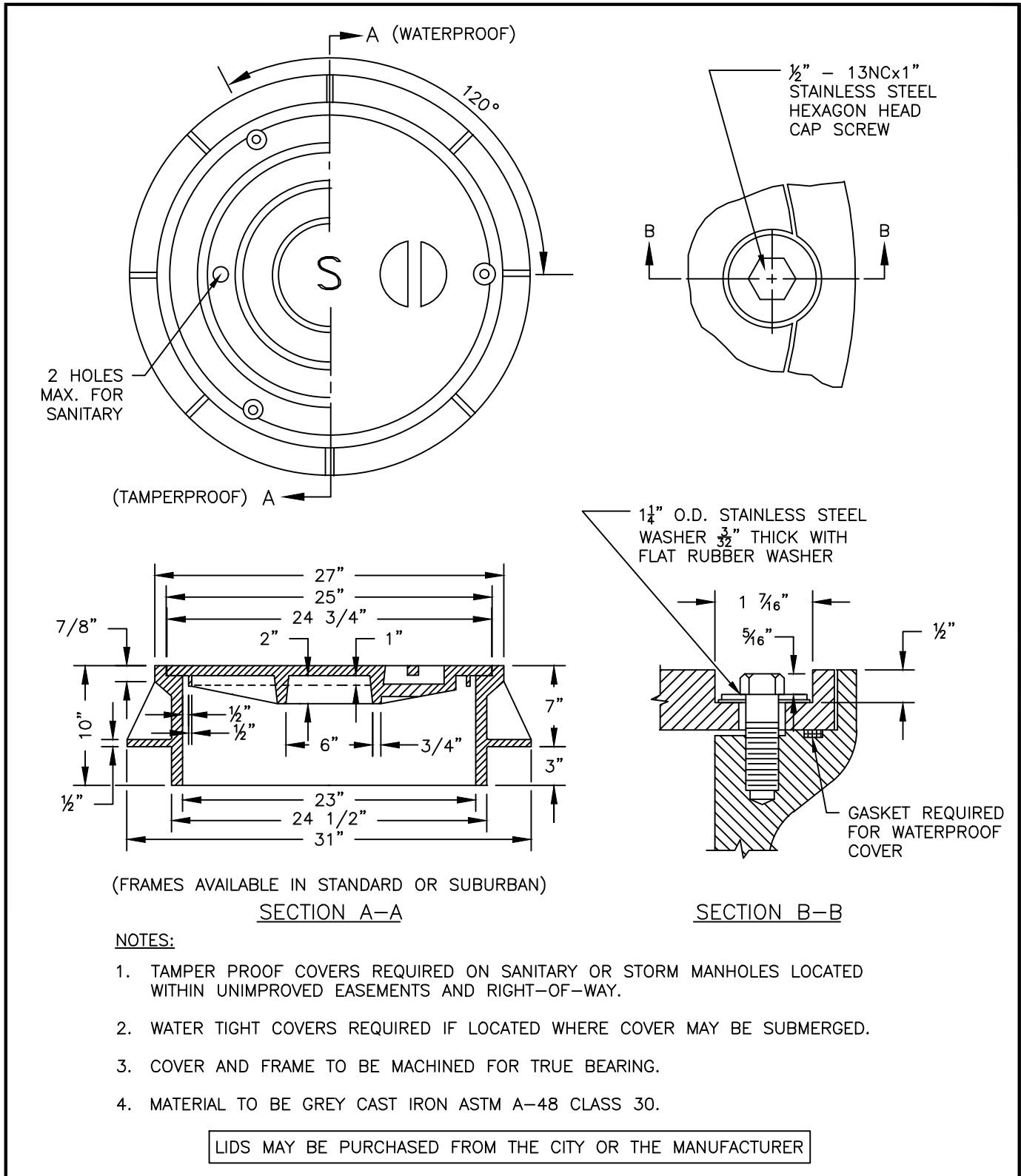
APPROVED



01/2021

CITY ENGINEER

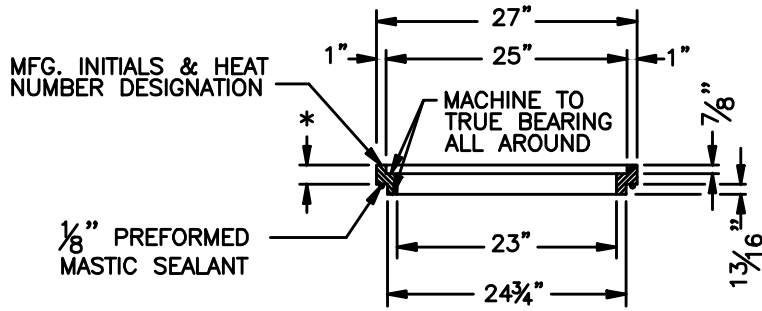
DATE

NO.	REVISIONS	DATE	BY
3	DRAWING NO. CHANGE, PURCHASING NOTE	12/12	MCP
4	DRAWING NO. CHANGE	11/18	TAP
5	NOTE CHANGED	08/19	TAP

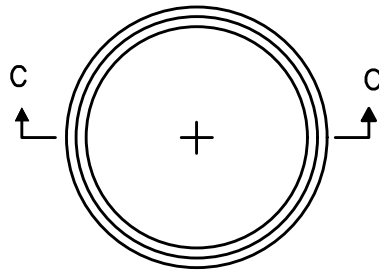


	CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.				DRAWING NO. 302
	Waterproof and Tamperproof Frame and Cover				
	APPROVED	DATE	NO.	REVISIONS	
 CITY ENGINEER	01/2021 DATE	3	DRAWING NO. CHANGE, PURCHASING NOTE	12/12	MCP
		4	DRAWING NO. CHANGE	11/18	TAP
		5	NOTE CHANGED	08/19	TAP

* STD. DEPTHS 1½", 2", 2½" & 3"
 MATL. TO BE GREY CAST IRON ASTM A 48,
 CLASS 35B. TOLERANCE ON NON-MACHINED
 SURFACES TO BE +/-0.06"



SECTION C-C



MANHOLE ADJUSTMENT RING
 FOR USE WITH STANDARD MANHOLE FRAME



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

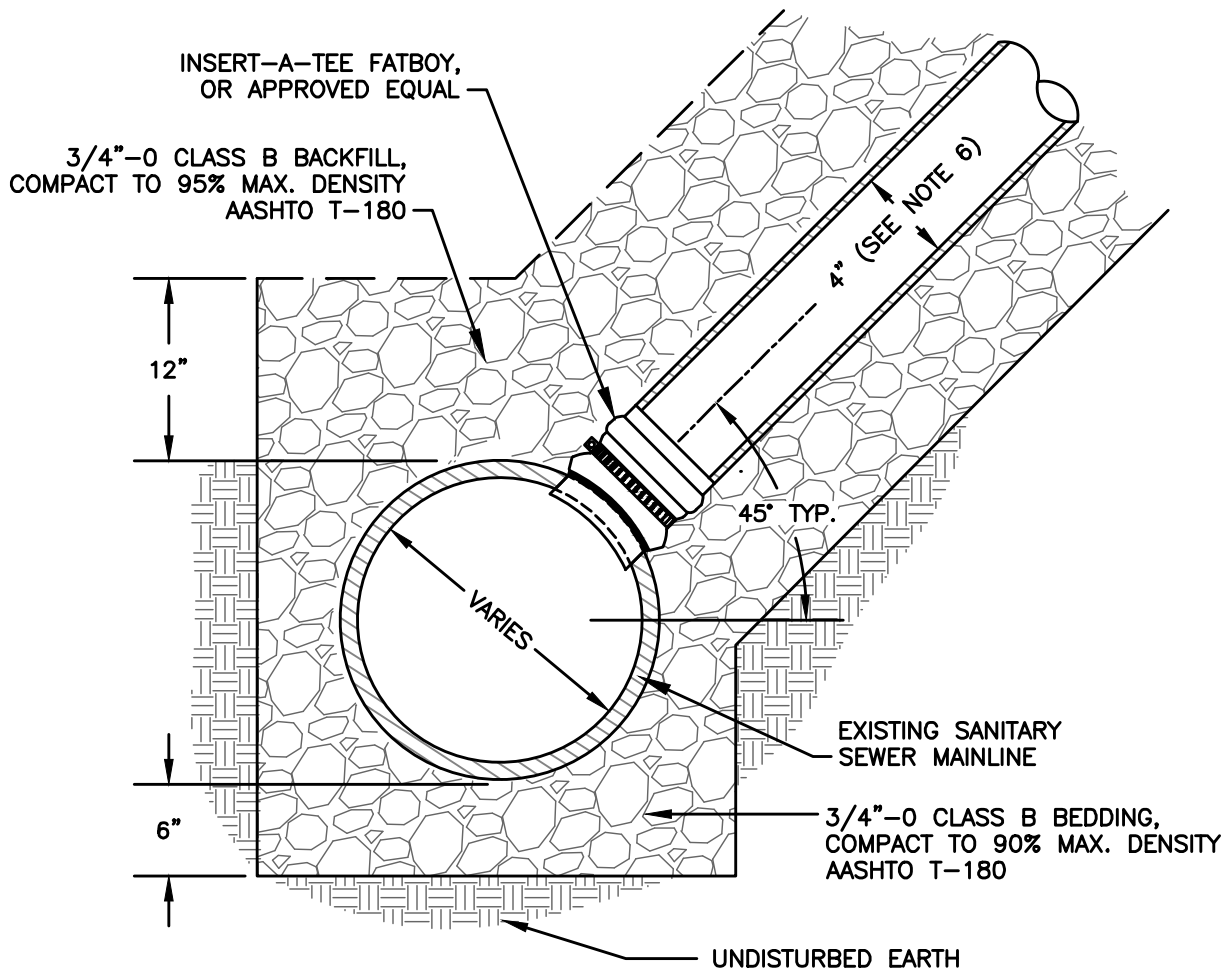
Manhole Adjustment Ring

DRAWING NO.

303

APPROVED *[Signature]* 01/2021
 CITY ENGINEER DATE

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



NOTES:

1. THE SEWER 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 SANITARY SEWER MAINLINES.
4. SEWER 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.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Sanitary Sewer Connection

DRAWING NO.

304

APPROVED

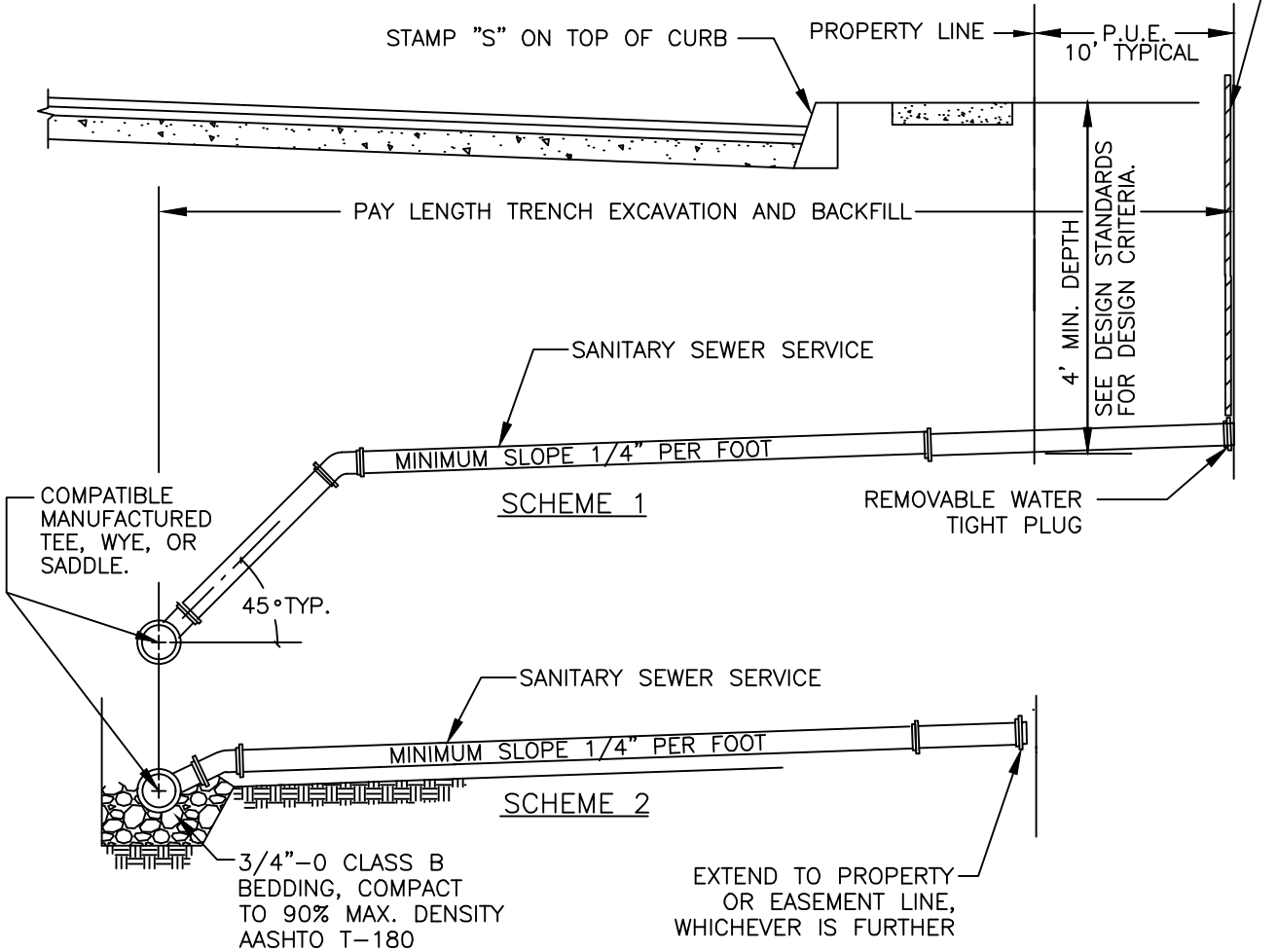
Steve R. Adams
01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
4	ADDED INSERT-A-TEE, ADDED HDPE NOTES	12/12	MCP
5	DRAWING NO. CHANGE	11/18	TAP
6	TITLE AND NOTE CHANGED	08/19	TAP

2" x 4" TREATED STAKE FROM INVERT TO 3' ABOVE FINISH GRADE. STAKE SHALL BE CONTINUOUS AND REMAIN VERTICAL AFTER BACKFILLING. END TO BE PAINTED GREEN. (TYPICAL AT ALL SERVICES.)



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.

Sanitary Sewer Service Branch

DRAWING NO.

305

APPROVED

Steve R. Adams
01/2021

CITY ENGINEER

DATE



NO.	REVISIONS	DATE	BY
3	CHANGED WORDING ON NOTES	12/12	MCP
4	DRAWING NO. CHANGE	11/18	TAP
5	TITLE CHANGE, NOTES CHANGED	08/19	TAP

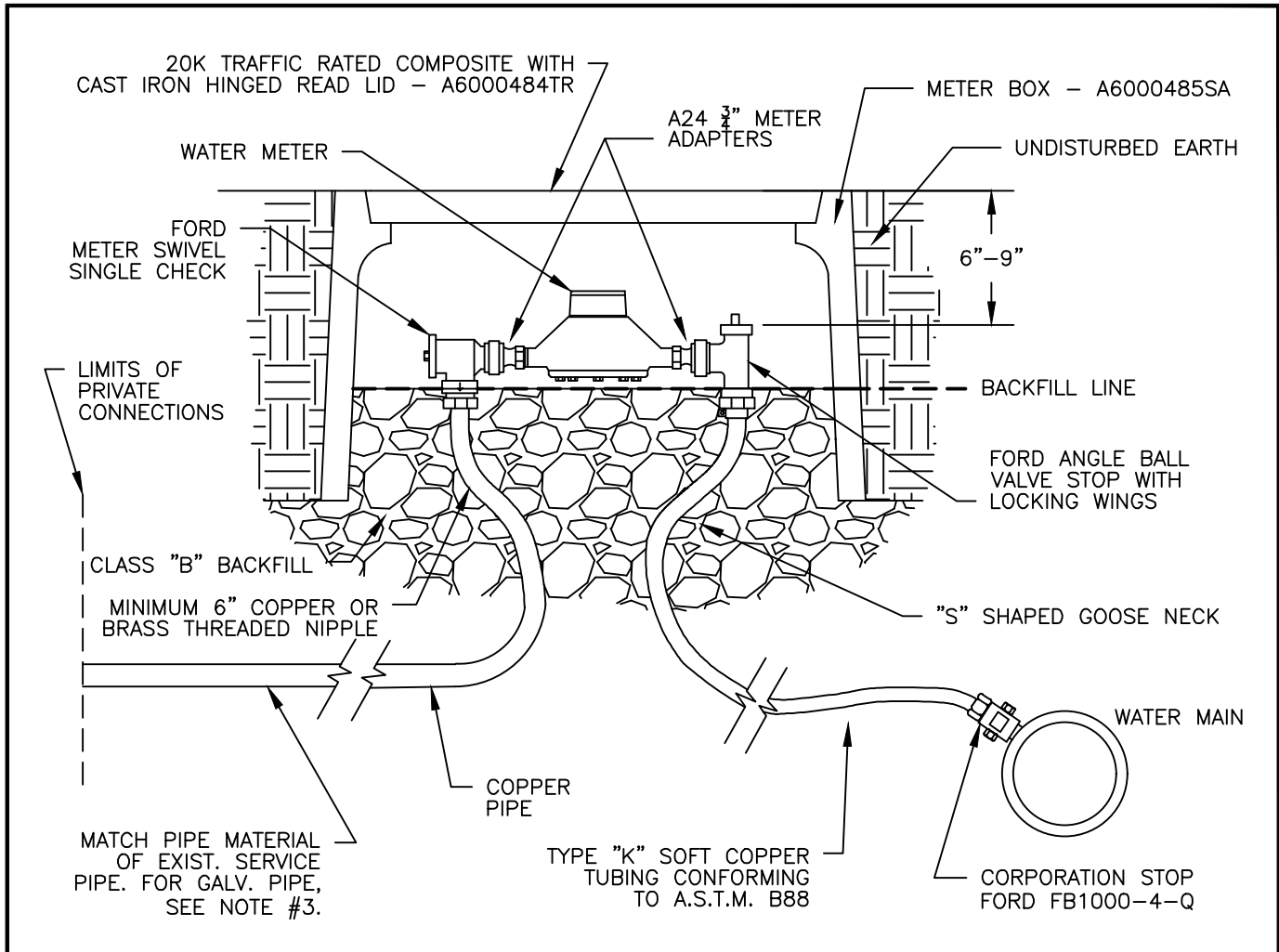
THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS
PUBLISHED BY APWA/ODOT TO BE USED AS A CITY OF MILWAUKIE
STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OSSC STANDARD DRAWING NUMBER	OSSC STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
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

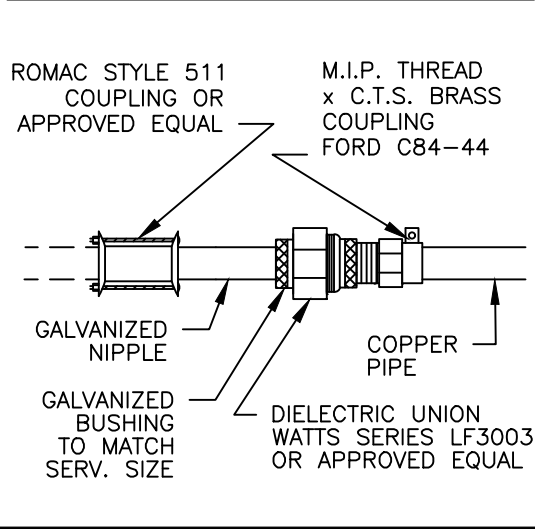
NOTES:

- 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.				DRAWING NO. 400		
	OSSC ACCEPTABLE WATER STANDARD DRAWINGS						
	APPROVED	 01/2021	NO.	REVISIONS		DATE	BY
	CITY ENGINEER	DATE	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.

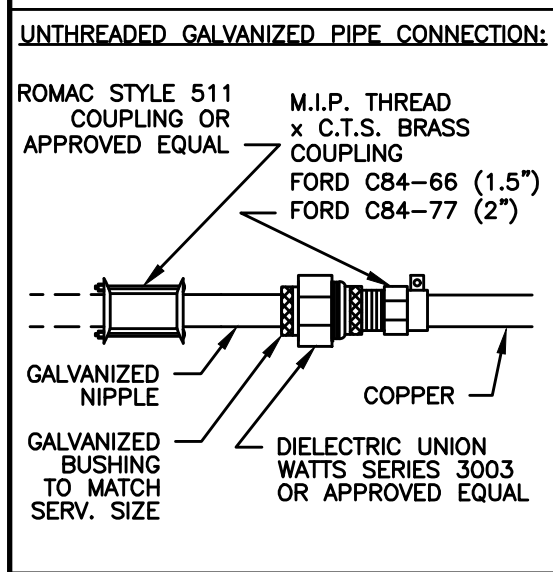
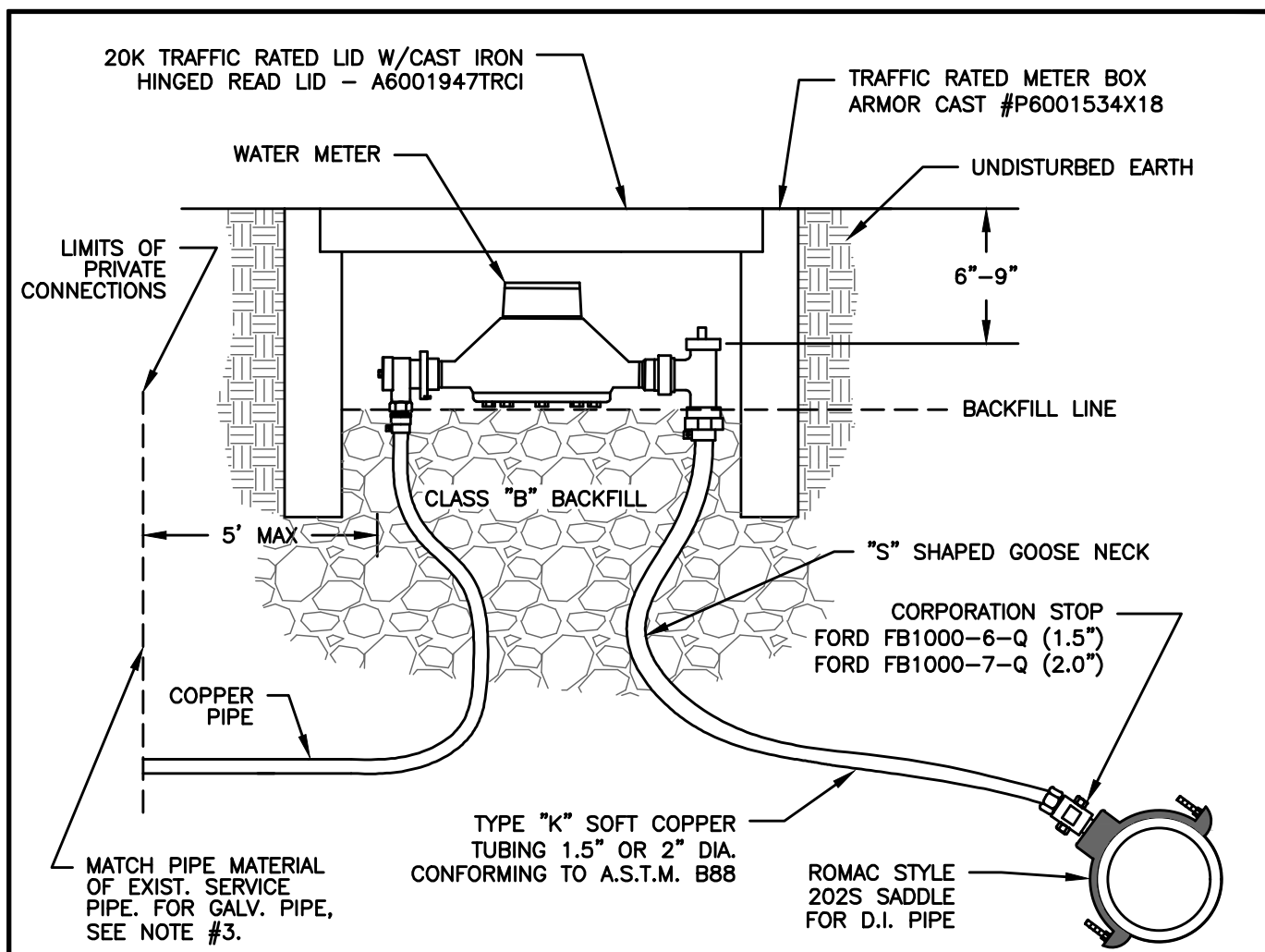
3/4 to 1 Inch Water Service

DRAWING NO.

401

APPROVED *[Signature]* 01/2021
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
5	ADDED DIELECTRIC UNION NOTE	12/14	AJR
6	ADDED 3/4" WATER SERVICE	11/18	TAP
7	TITLE CHANGE	08/19	TAP



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.

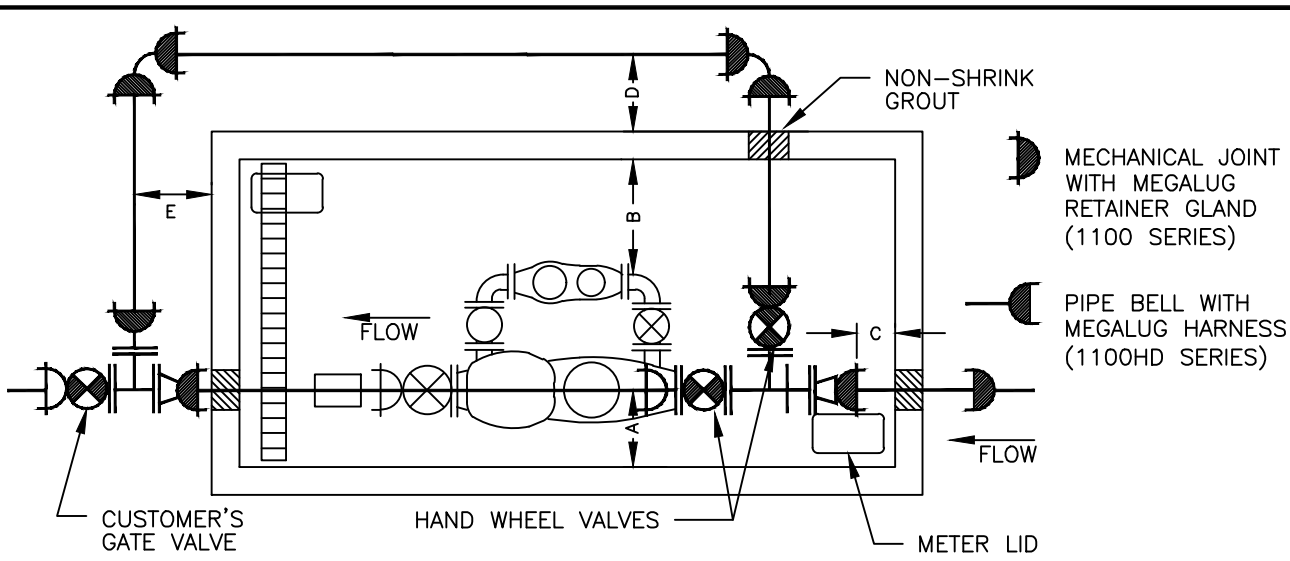
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

1.5 – 2 Inch Water Service

DRAWING NO.

402

<p>APPROVED <i>[Signature]</i></p> <p>CITY ENGINEER</p>	<p>DATE</p> <p>01/2021</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">NO.</th> <th style="width: 70%;">REVISIONS</th> <th style="width: 10%;">DATE</th> <th style="width: 15%;">BY</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>REMOVED COPPERSETTER</td> <td>12/13</td> <td>AJR</td> </tr> <tr> <td>6</td> <td>ADDED DIELECTRIC UNION NOTE</td> <td>12/14</td> <td>AJR</td> </tr> <tr> <td>7</td> <td>TITLE CHANGED</td> <td>08/18</td> <td>TAP</td> </tr> </tbody> </table>	NO.	REVISIONS	DATE	BY	5	REMOVED COPPERSETTER	12/13	AJR	6	ADDED DIELECTRIC UNION NOTE	12/14	AJR	7	TITLE CHANGED	08/18	TAP
NO.	REVISIONS	DATE	BY															
5	REMOVED COPPERSETTER	12/13	AJR															
6	ADDED DIELECTRIC UNION NOTE	12/14	AJR															
7	TITLE CHANGED	08/18	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 SPECIFICATIONS. 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

Steve R. Adams
01/2021

CITY ENGINEER

DATE

NO.

REVISIONS

DATE

BY

1 DRAWING NUMBER AND TITLE CHANGED

11/13

AJR

2 NOTES ADDED TO SHEET

11/18

TAP

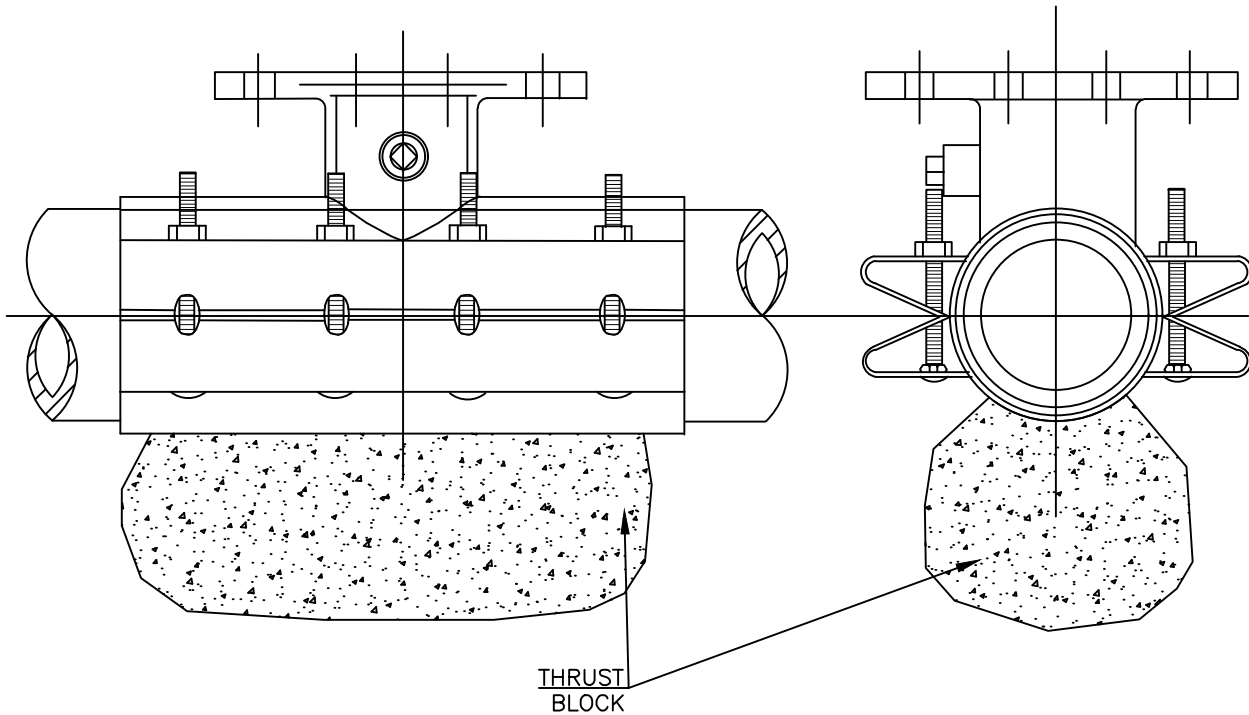
3 NOTES CHANGED

08/19

TAP

FRONT VIEW

SIDE VIEW



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

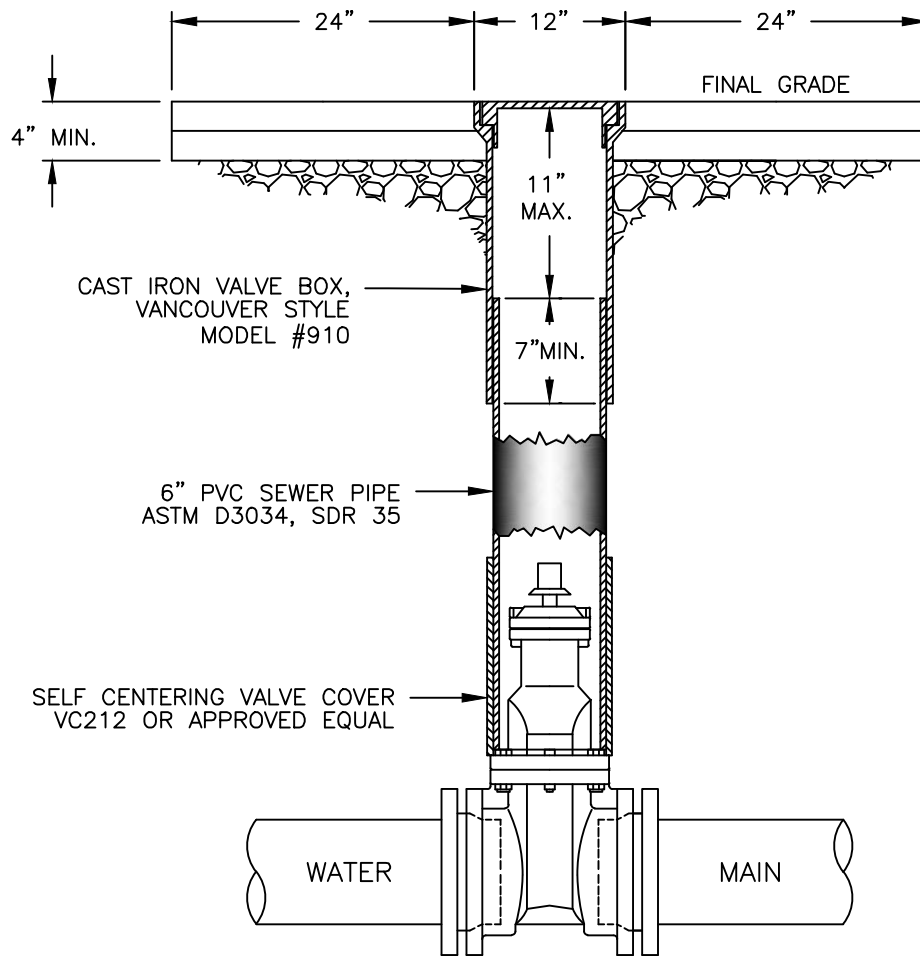
APPROVED

[Signature] 01/2021

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



CAST IRON VALVE BOX,
VANCOUVER STYLE
MODEL #910

6" PVC SEWER PIPE
ASTM D3034, SDR 35

SELF CENTERING VALVE COVER
VC212 OR APPROVED EQUAL

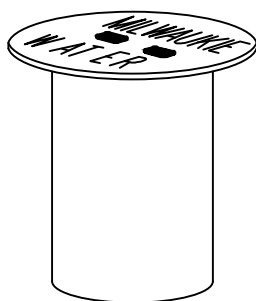
WATER

MAIN

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.

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



18" TALL VALVE BOX

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Valve Box

DRAWING NO.

405

APPROVED

Steve R. Adams

01/2021

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

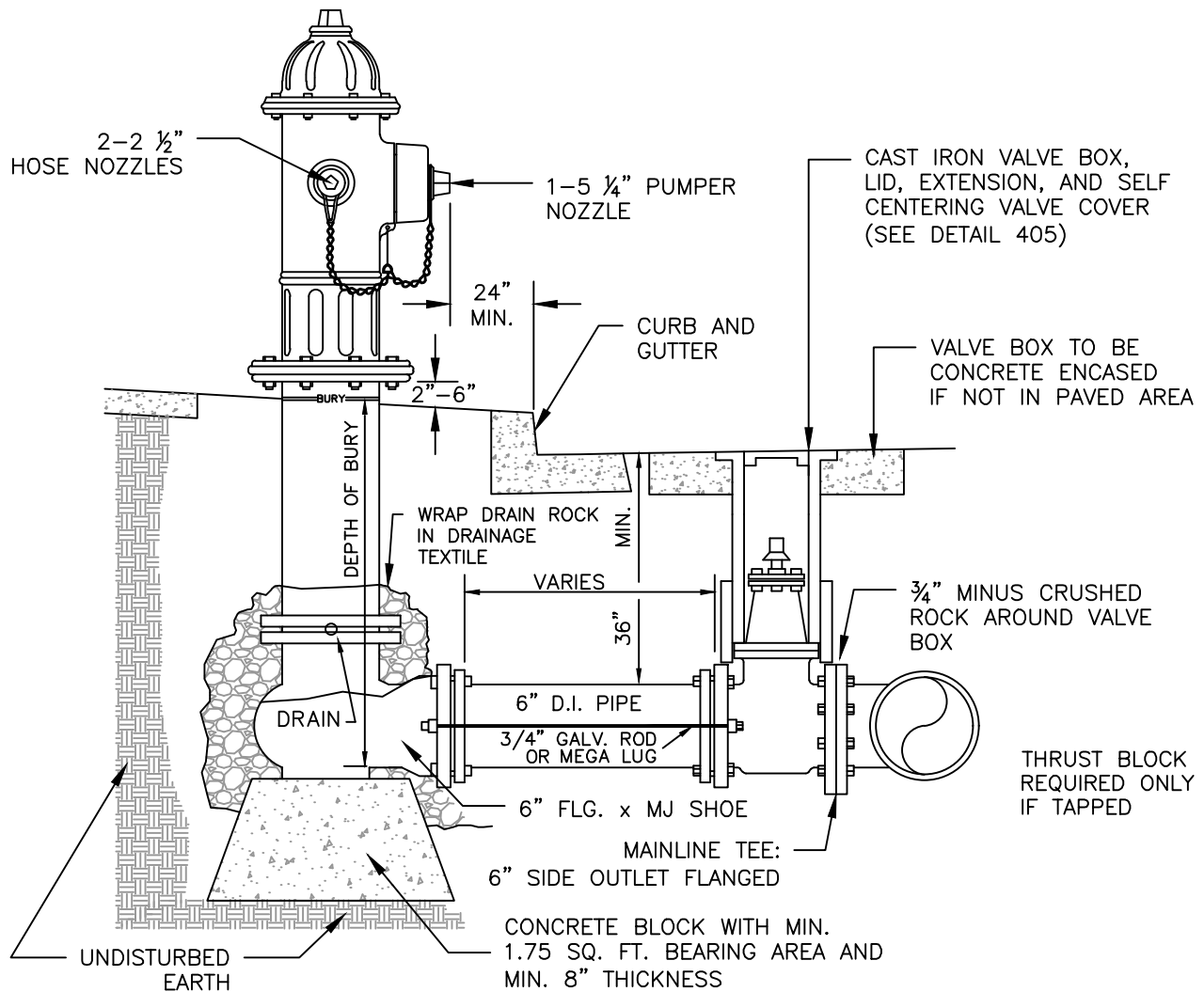
08/19

TAP



NOTES:

1. HYDRANTS TO BE WATEROUS WB67, MUELLER CENTURION A423, M&H 929 RELIANT, OR CLOW MEDALLION F2545 WITH 1 1/2" OPERATING NUTS.
2. HYDRANT COLOR TO BE MILLER EQUIP. ENAMEL OE 40 (SAFETY YELLOW).
3. JOINTS TO BE RESTRAINED BY 3/4" 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.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Fire Hydrant Installation

DRAWING NO.

406

APPROVED *[Signature]*
CITY ENGINEER

01/2021
DATE



NO.	REVISIONS	DATE	BY
2	ADDED DIMENSIONS	12/12	MTC
3	REMOVED THRUST BLOCKS	12/14	AJR
4	RENUMBERED DRAWING, NOTE CHANGED	08/19	TAP

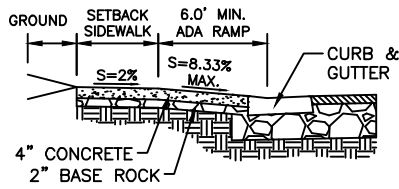
THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT TO BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OSSC STANDARD DRAWING NUMBER	OSSC STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD115	MONUMENT BOX	NO EXCEPTION TAKEN
RD300	TRENCH BACKFILL, BEDDING PIPE ZONE AND MULTIPLE INSTALLATIONS	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.	NO EXCEPTION TAKEN
RD745	CURB LINE SIDEWALK DRIVEWAYS OR ALLEYS (OPTIONS K & L) LOCAL JUR.	NO EXCEPTION TAKEN
RD750	CURB LINE SIDEWALK DRIVEWAYS OR ALLEYS (OPTIONS M & N) LOCAL JUR.	NO EXCEPTION TAKEN
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	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
TM688	PERFORATED STEEL SQUARE TUBE (PSST) SLIP BASE FOUNDATION	NO EXCEPTION TAKEN

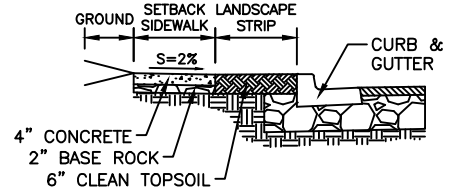
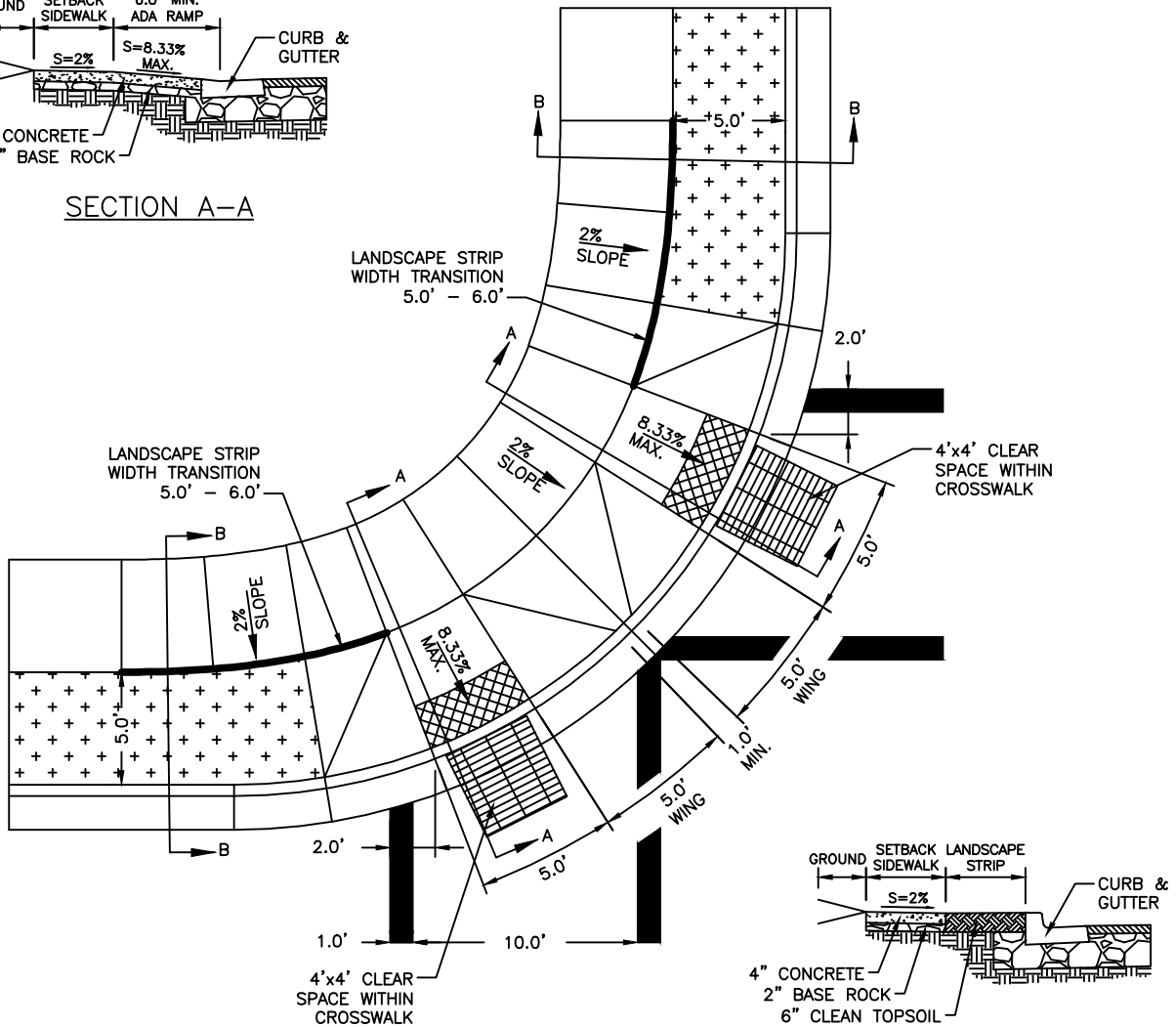
NOTES:

- 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.				DRAWING NO. 500	
	OSSC ACCEPTABLE STREET STANDARD DRAWINGS					
	APPROVED	NO.	REVISIONS	DATE		BY
	 CITY ENGINEER	01/2021	1 NEW DRAWING	11/18		TAP
		2 NOTE CHANGED	08/19	TAP		
		3 LIST UPDATED	01/21	TAP		



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.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

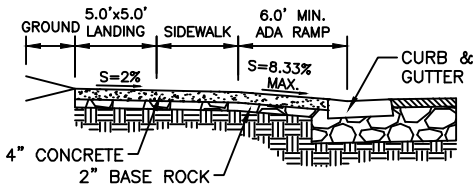
Setback Sidewalk Intersection Ramps

DRAWING NO.

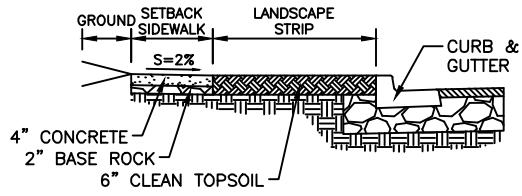
501

APPROVED *[Signature]* 01/2021
CITY ENGINEER DATE

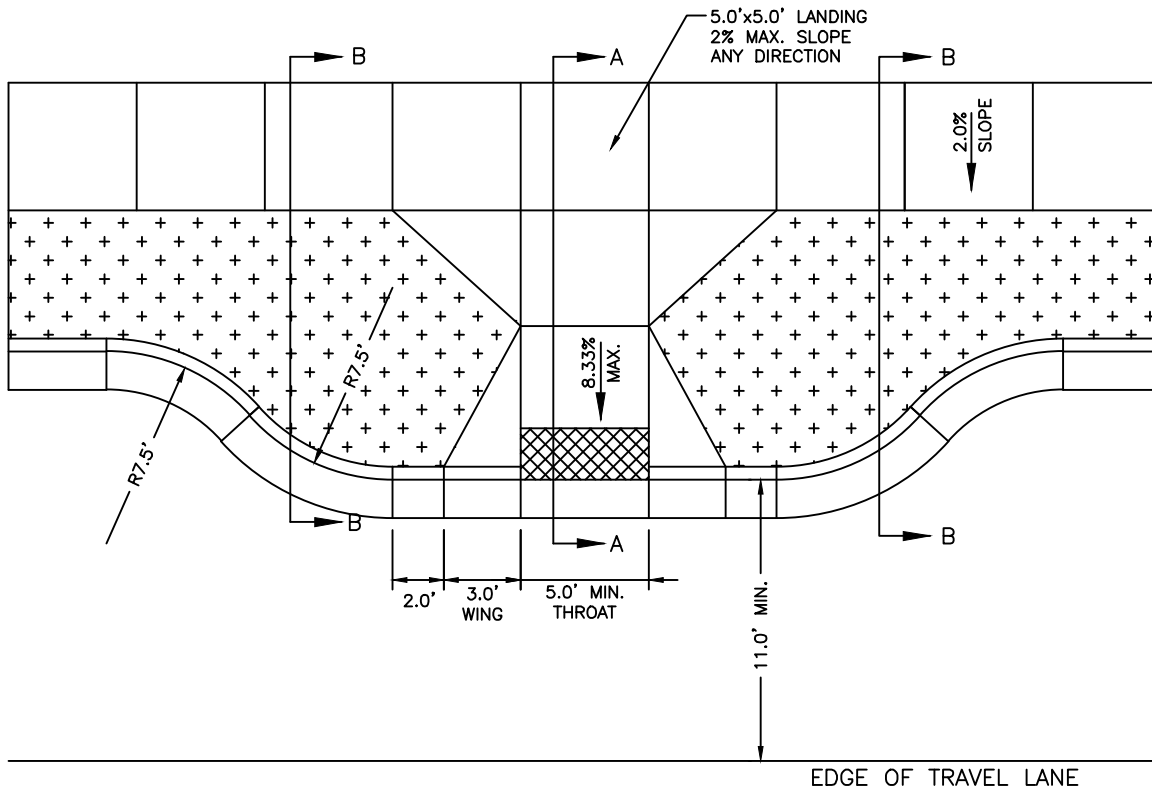
NO.	REVISIONS	DATE	BY
3	DRAWING NUMBER CHANGED	11/18	TAP
4	NOTES CHANGED	08/19	TAP
5	NOTES CHANGED	01/21	TAP



SECTION A-A



SECTION B-B



EDGE OF TRAVEL LANE

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.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

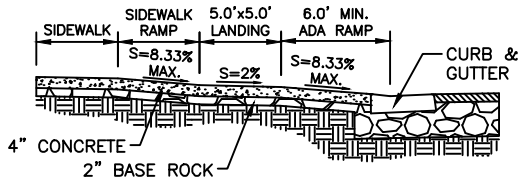
Mid-Block Curb Extension

DRAWING NO.

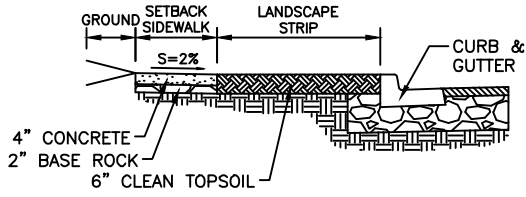
502

APPROVED *[Signature]* 01/2021
CITY ENGINEER DATE

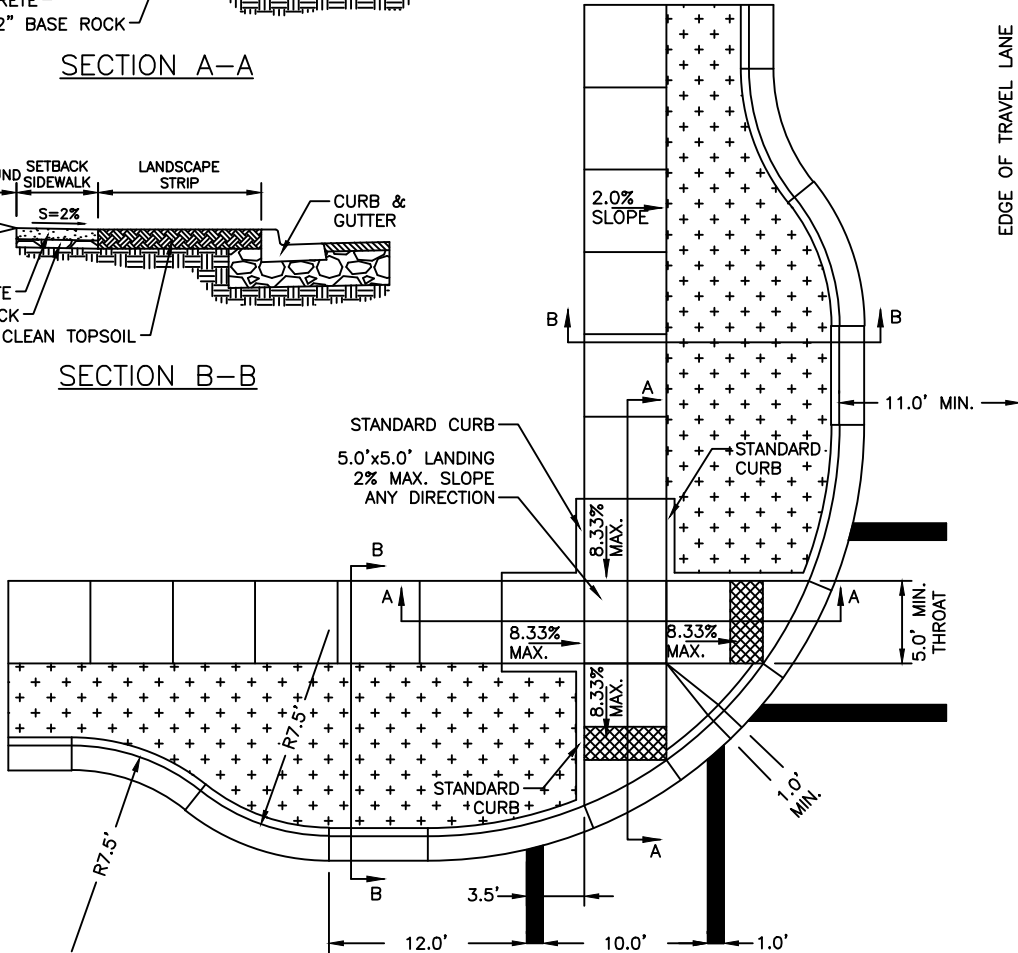
NO.	REVISIONS	DATE	BY
3	DRAWING NUMBER CHANGED	11/18	TAP
4	NOTES CHANGED	08/19	TAP
5	NOTES CHANGED	01/21	TAP



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.
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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.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

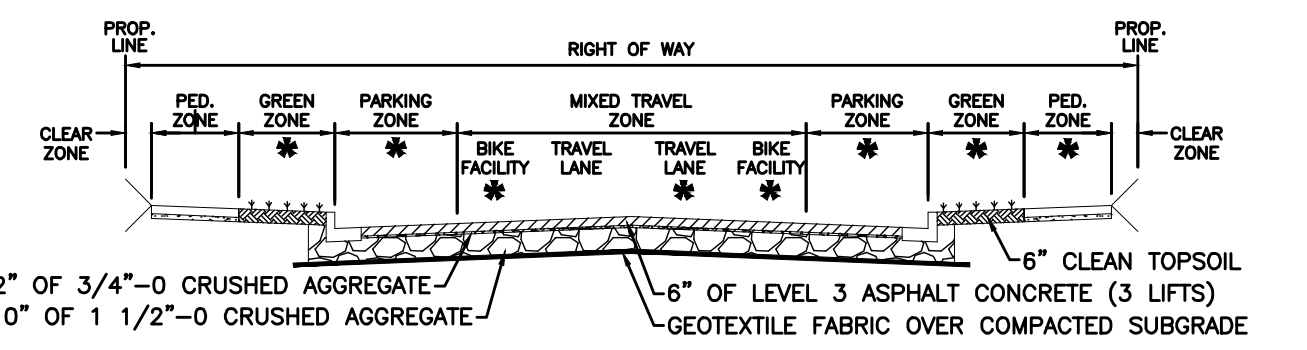
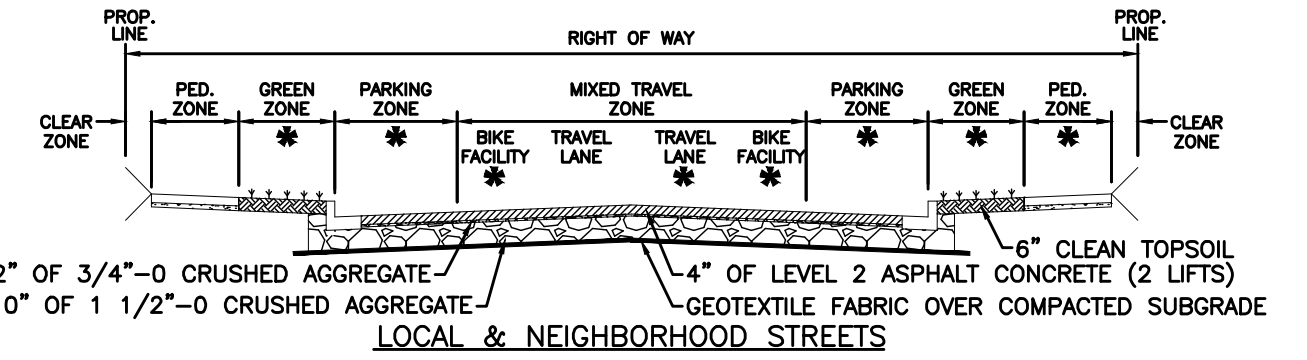
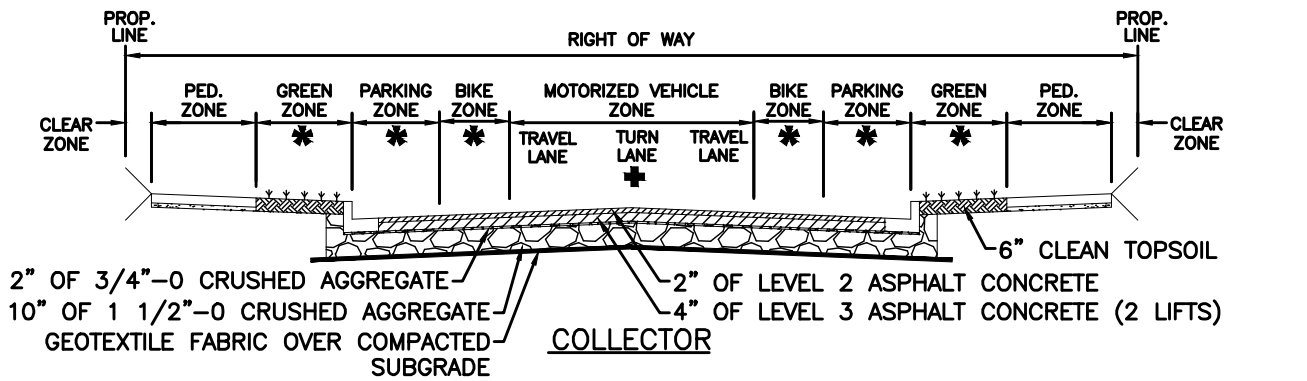
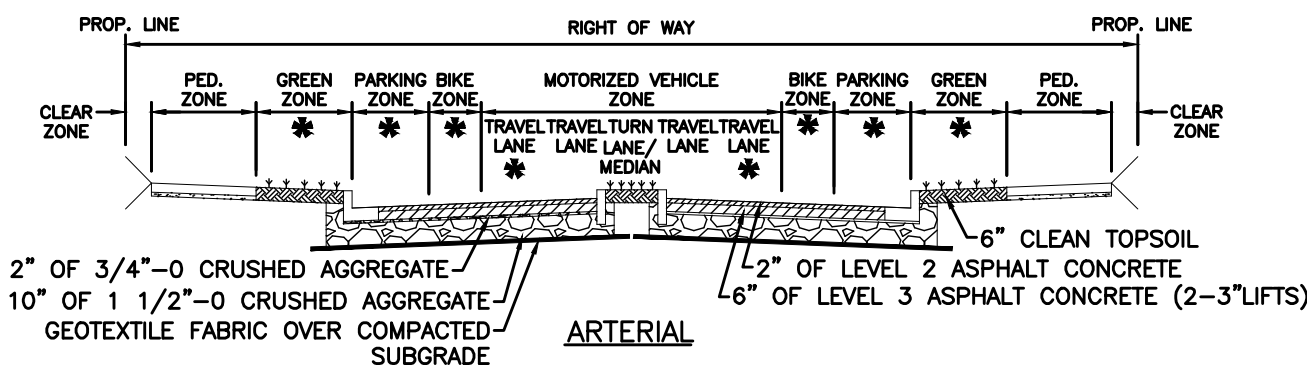
Intersection Curb Extension

DRAWING NO.

503

APPROVED *Steve R. Adams* 01/2021
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
3	DRAWING NUMBER CHANGED	11/18	TAP
4	NOTES CHANGED	08/19	TAP
5	NOTES CHANGED	01/21	TAP



* CONSTRAINED RIGHT-OF-WAY
 OPTIONAL ELEMENT
 + WHERE WARRANTED

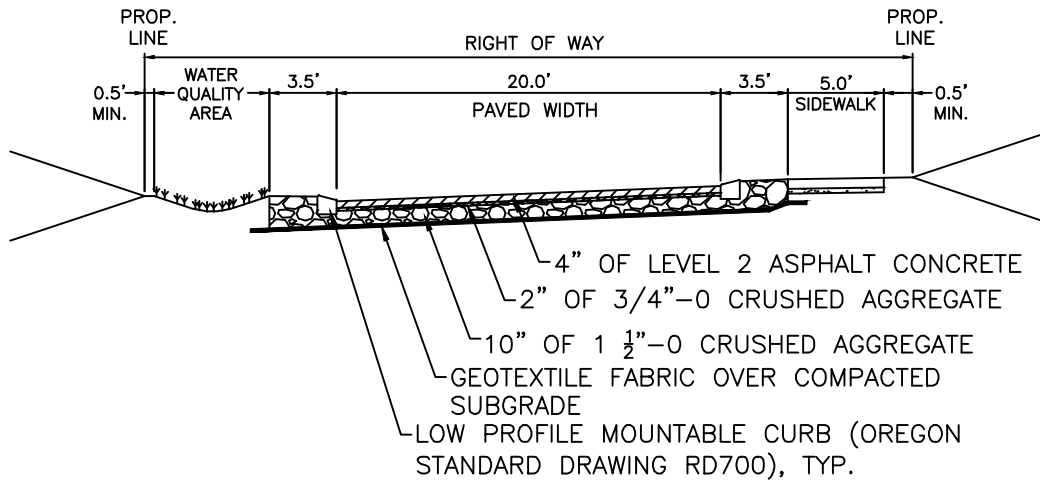
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Street Cross Sections

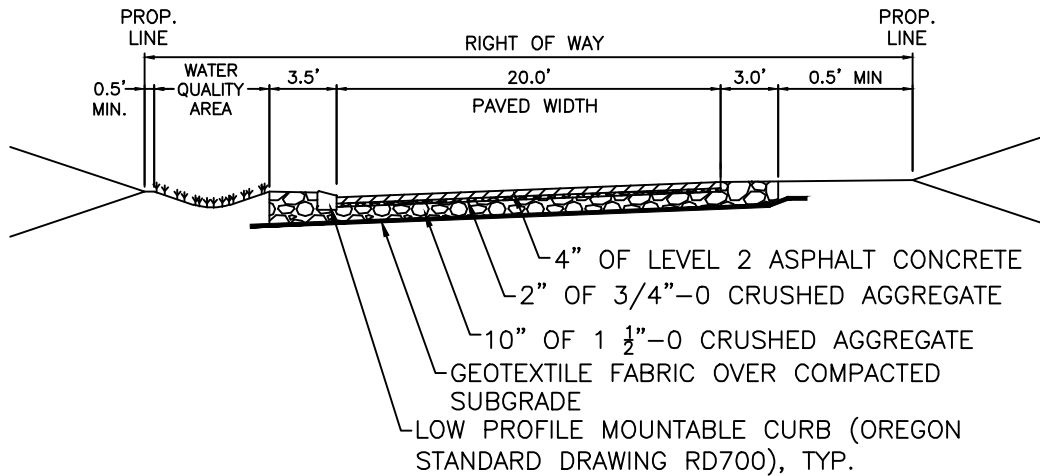
DRAWING NO.

504

APPROVED CITY ENGINEER	DATE 01/2021	NO. REVISIONS 3 DRAWING NUMBER CHANGED 4 ASPHALT AND BASE REVISED 5 ARTERIAL AND COLLECTOR ASPHALT REVISED	DATE 11/18 08/19 01/21	BY TAP TAP TAP
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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

Steve R. Adair

CITY ENGINEER

01/2021

DATE

NO.

REVISIONS

DATE

BY

2

DRAWING REVISED

01/19

TAP

3

ASPHALT AND BASE REVISED

08/19

TAP

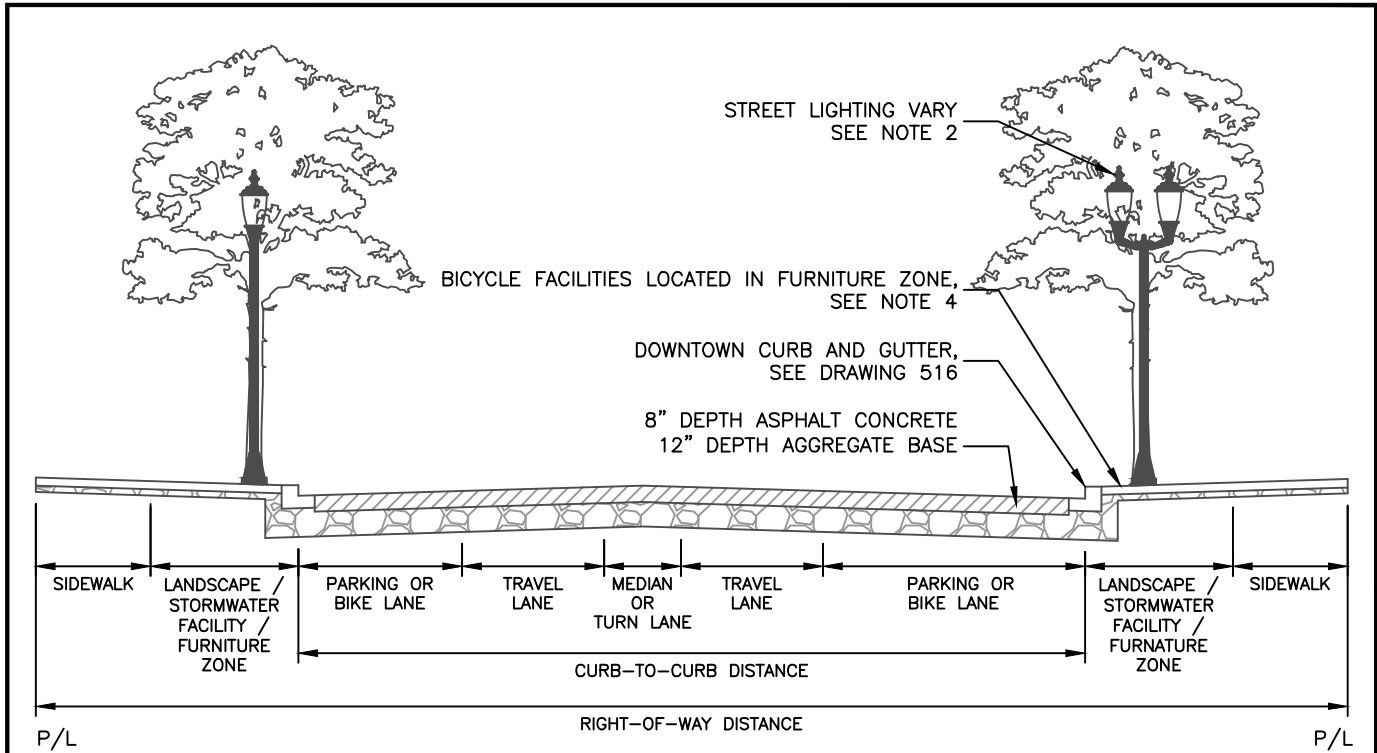
4

GEOTEXTILE NOTE ADDED

01/21

TAP





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 OF THE MILWAUKIE PUBLIC WORK STANDARDS.
3. FOR STREET FURNITURE, SEE SECTION 5.0191 (E) OF THE MILWAUKIE PUBLIC WORK STANDARDS.
4. FOR BICYCLE FACILITIES SEE SECTION 5.0191 (F) OF THE MILWAUKIE PUBLIC WORK STANDARDS.
5. FOR STREET TREES, SEE SECTION 5.0193 OF THE MILWAUKIE PUBLIC WORK STANDARDS.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Street Cross Sections

DRAWING NO.

506A

APPROVED

[Signature]
01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	08/19	TAP



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

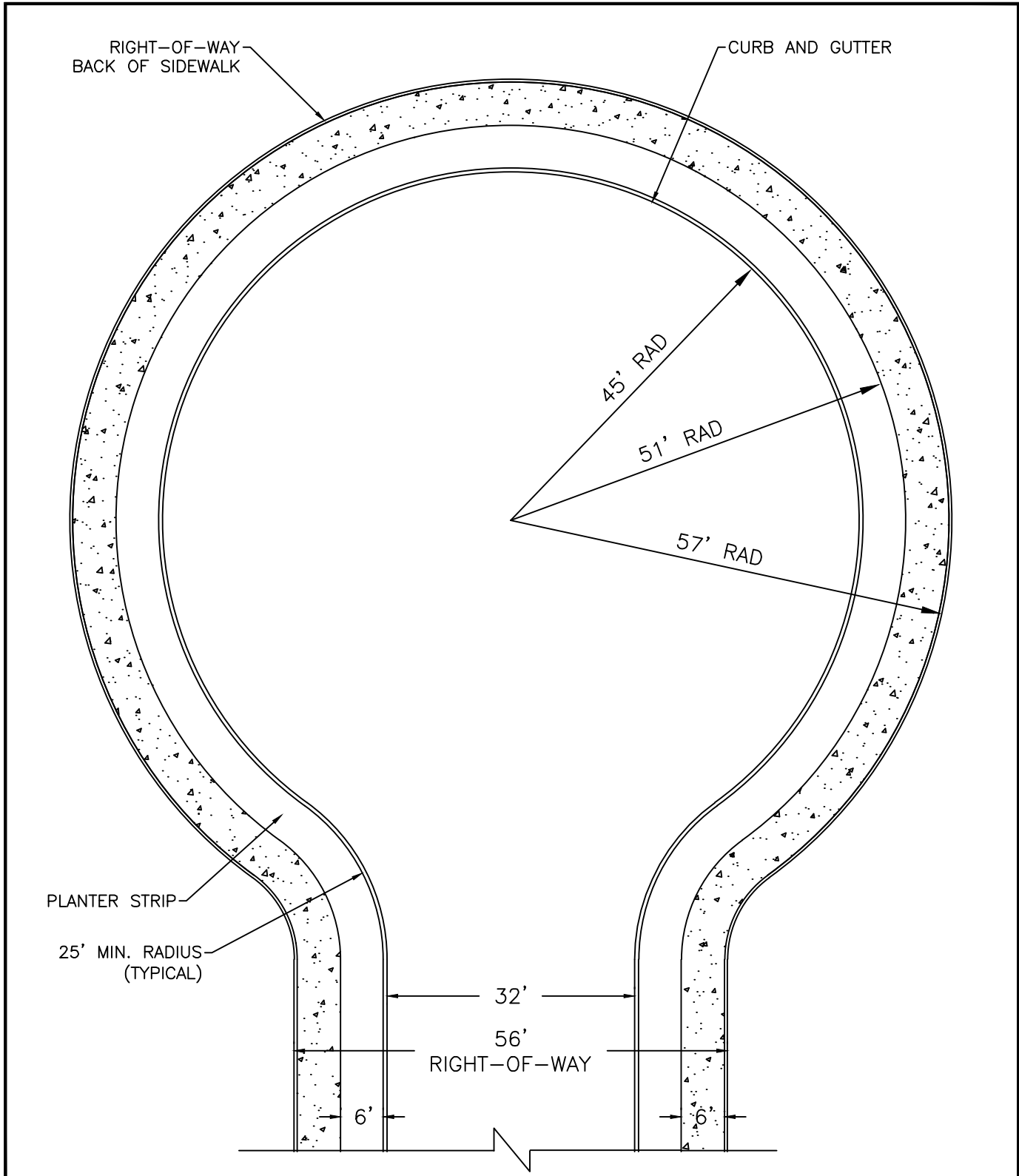
Downtown Street Cross Sections

DRAWING NO.

506B

APPROVED *Steve R. Adair* 01/2021
 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

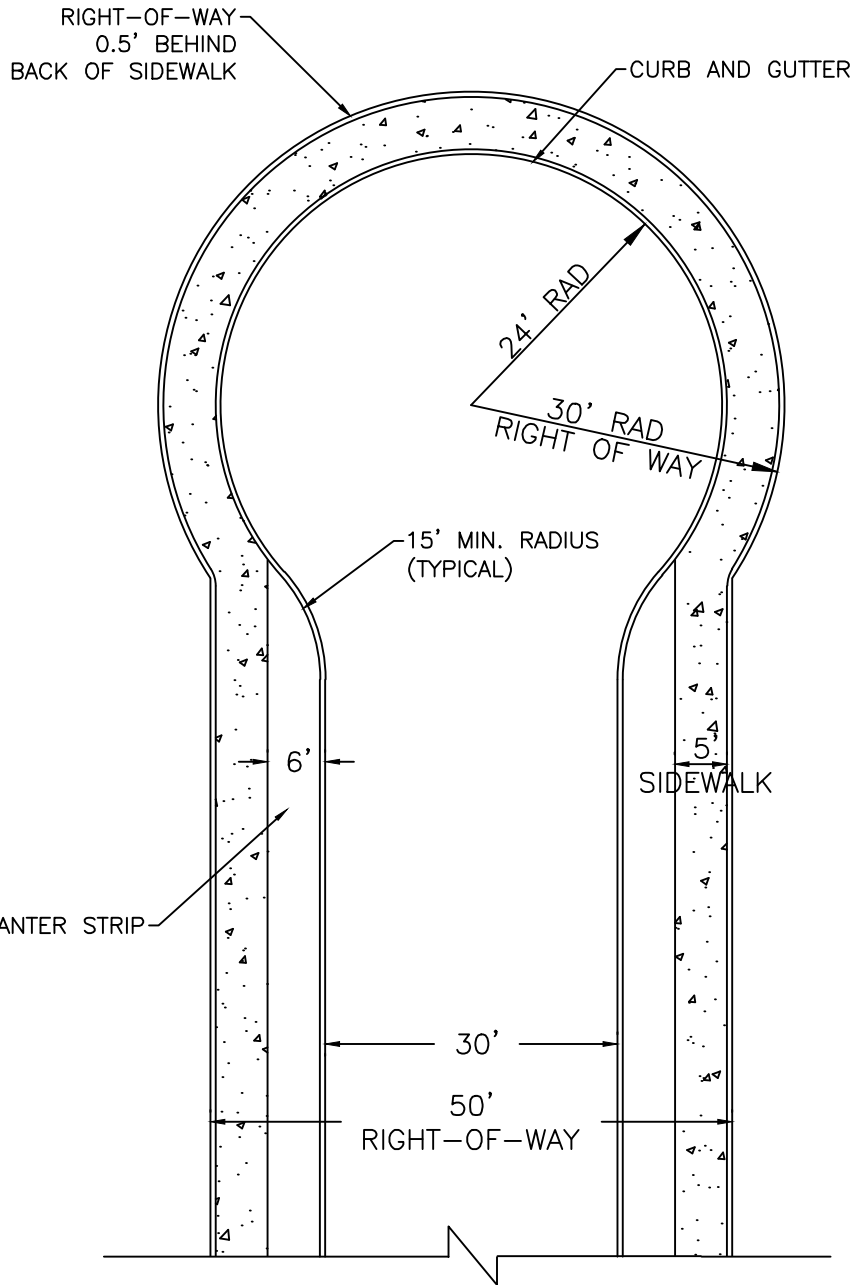
APPROVED

01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
1	DRAWING NUMBER CHANGED	12/10	MCP
2	DRAWING NUMBER CHANGED	11/18	TAP
3	DRAWING NUMBER CHANGED	08/19	TAP



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Constrained Right-of-Way Cul-De-Sac

DRAWING NO.

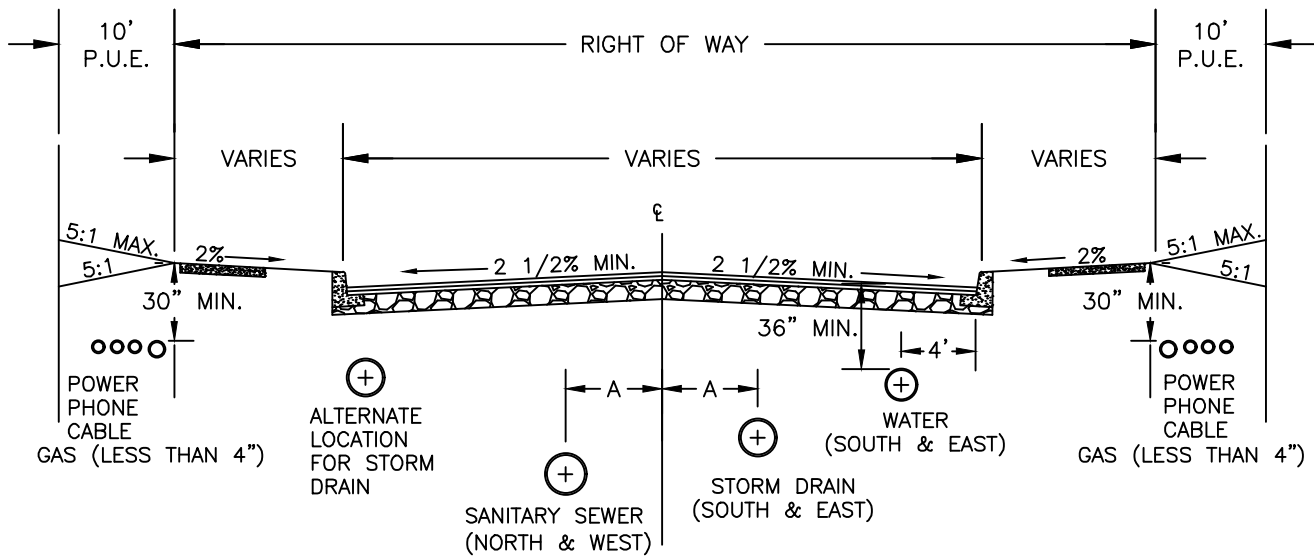
508

APPROVED

01/2021
DATE

CITY ENGINEER

NO.	REVISIONS	DATE	BY
1	DRAWING CREATED	11/18	TAP
2	DRAWING RENUMBERED	08/19	TAP



NOTE: STREET TREES, LIGHT POLES, AND FIRE HYDRANTS MUST BE LOCATED BETWEEN THE SIDEWALK AND THE CURB.

STREET TYPE	RIGHT OF WAY (FT.)	NO. OF LANES	DISTANCE FROM CENTER
			"A"
LOCAL	40 FT	2	6 FT
LOCAL	50 FT	2	6 FT
COLLECTOR	60 FT	2	6 FT
COLLECTOR	70 FT	3	13 FT
ARTERIAL	80 FT	3	13 FT
COMMERCIAL & INDUSTRIAL	60 FT	2	6 FT
COMMERCIAL & INDUSTRIAL	60 FT	3	13 FT
COMMERCIAL & INDUSTRIAL	70 FT	3	13 FT
COMMERCIAL & INDUSTRIAL	70 FT	4	7 & 19 FT



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Utility Placement

DRAWING NO.

509

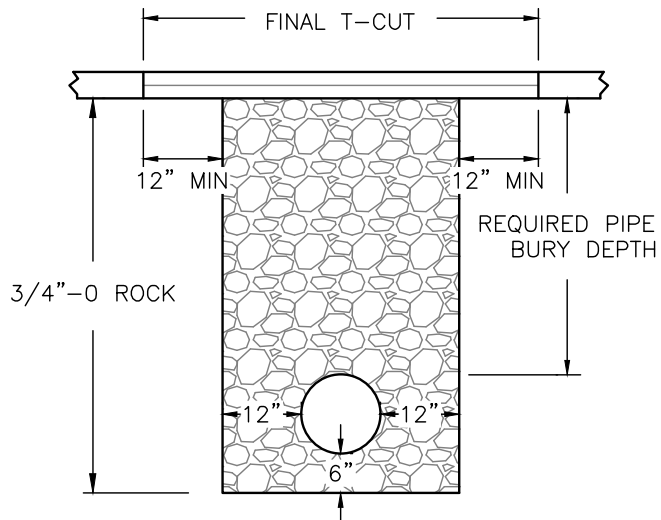
APPROVED

Steve R. Adams 01/2021

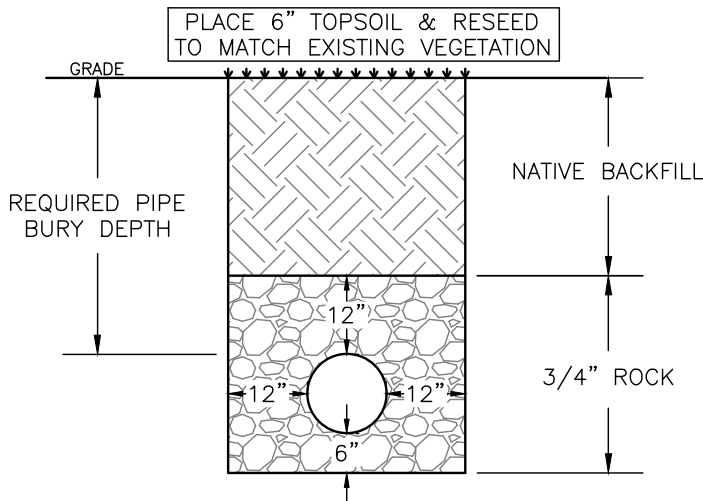
CITY ENGINEER

DATE

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



TRENCH WITHIN PAVED AREAS



TRENCH OUTSIDE OF PAVED AREAS

ASPHALT REPLACEMENT DEPTH	
CLASSIFICATION	DEPTH (IN.) WHICHEVER IS GREATER
ARTERIAL/INDUSTRIAL	8 OR EXISTING
COLLECTOR	6 OR EXISTING
LOCAL	4 OR EXISTING

NOTES:

- ADDITIONAL REPAIR IS REQUIRED FOR STREETS PAVED WITHIN THE LAST 5 YEARS. SEE STANDARD DETAIL NO. 511.
- FINAL SAWCUTS MUST BE 6" WIDER THAN THE WIDTH OF THE ROLLER USED FOR COMPACTION
- 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".
- INFRARED ASPHALT REPAIRS MAY BE REQUIRED AT THE DISCRETION OF THE CITY ENGINEER.
- UNDERMINED, BROKEN OR CRACKED PAVEMENT EDGES MUST BE SAWCUT AND REMOVED AT THE DISCRETION OF THE CITY ENGINEER.
- CONTROL DENSITY FILL (CDF) MAY BE REQUIRED AT CITY ENGINEER'S DISCRETION.
- ALL ROCK AND BACKFILL TO BE COMPACTED TO 95% MAX. DENSITY AASHTO T-180.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Trench Patch

DRAWING NO.

510

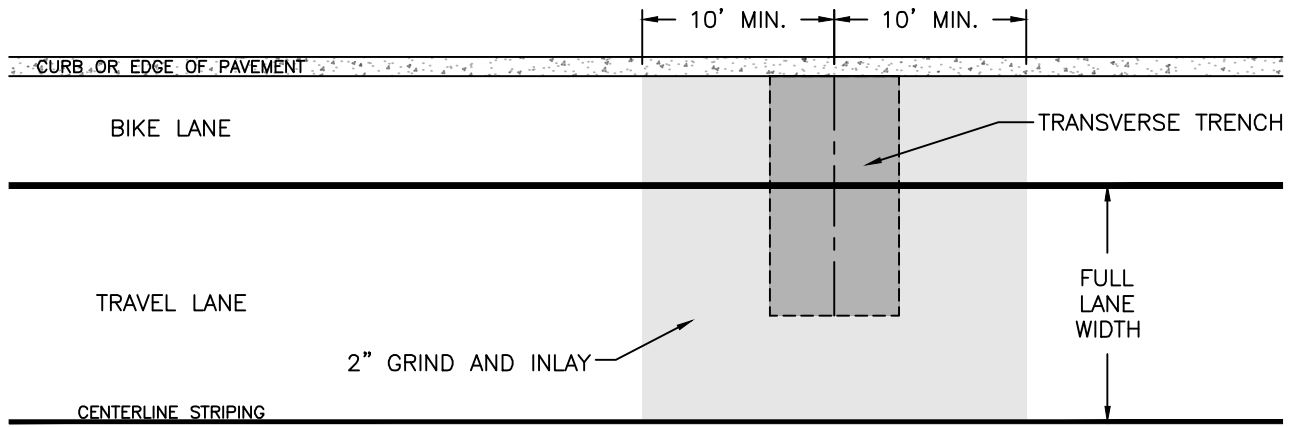
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CITY ENGINEER

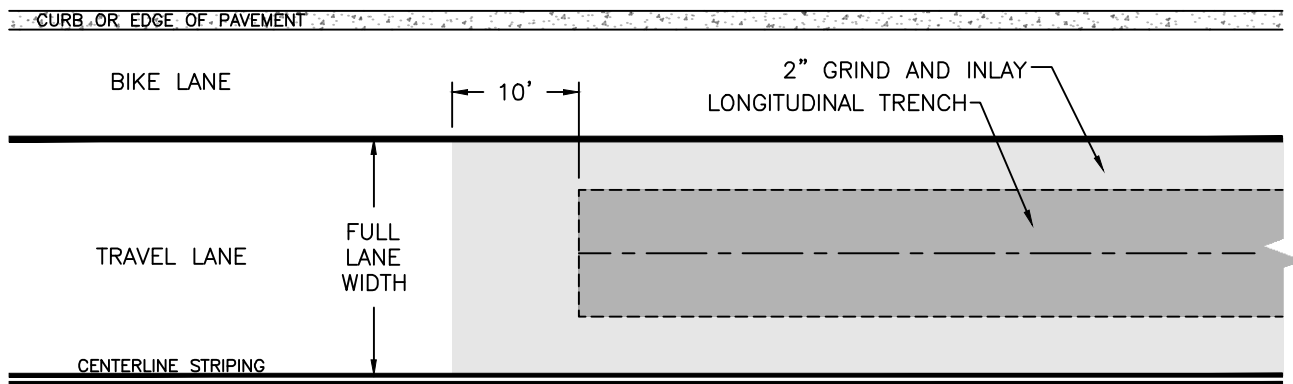
01/2021

DATE

NO.	REVISIONS	DATE	BY
3	ADDED T-CUT LANGUAGE	12/14	AJR
4	DRAWING NUMBER CHANGED	11/18	TAP
5	UPDATED NOTES, DRAWING NUMBER CHANGE	08/19	TAP



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).



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Asphalt Repair for Newly Paved Road

DRAWING NO.

511

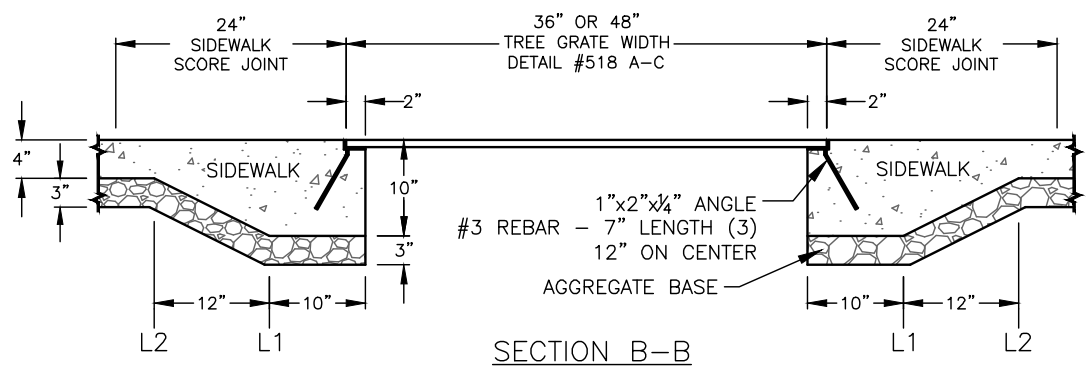
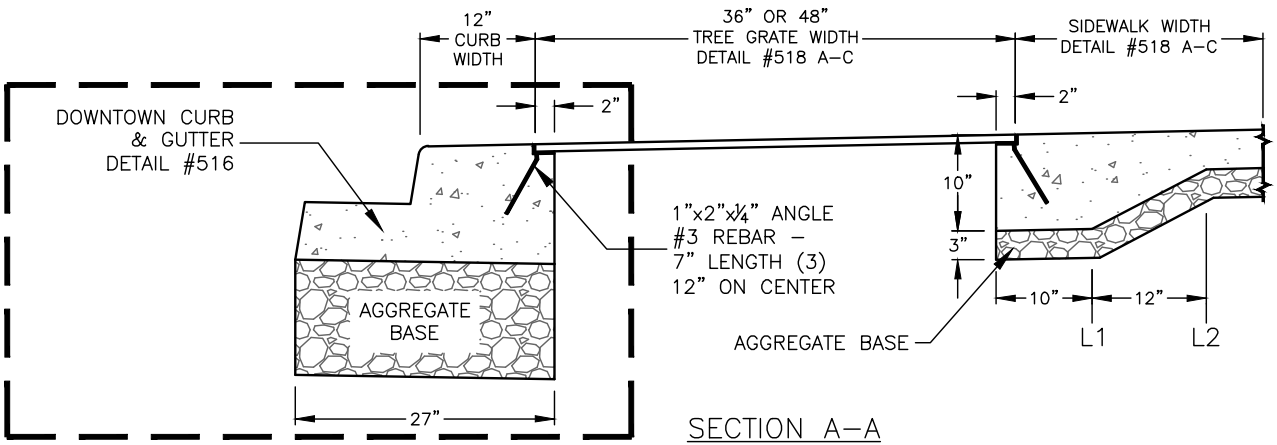
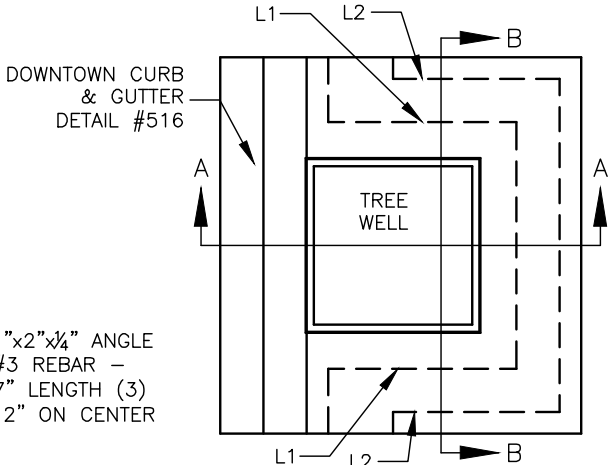
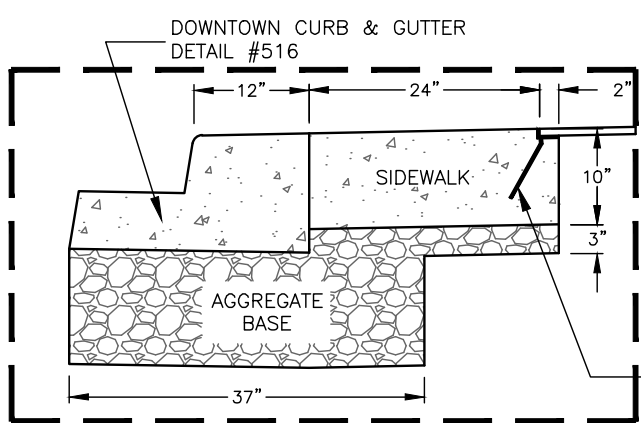
APPROVED

Steve R. Adkins
01/2021

CITY ENGINEER

DATE

NO.	REVISIONS	DATE	BY
3	CLARIFIED DIMENSIONS	12/14	AJR
4	DRAWING NUMBER CHANGED	11/18	TAP
5	DRAWING NUMBER CHANGED	08/19	TAP



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.

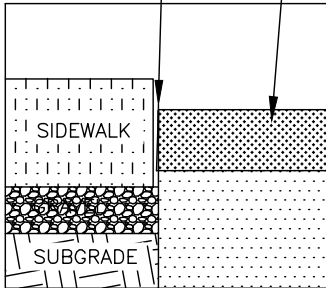
512

APPROVED *[Signature]*
CITY ENGINEER
01/2021
DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	CHANGED DRAWING NUMBER	12/13	AJR
3	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP

BARK DUST OR APPROVED
EQUAL APPLIED 1/2" BELOW
ROOT BARRIER

ROOT BARRIER
SEE NOTE 4



ROOT BALL SHALL SIT
1 INCH HIGHER THAN
SURROUNDING SOIL

VARIES
SEE NOTE 2

FINISHED
GRADE

TILLED NATIVE SOIL BACKFILL
ALL SOIL SMALLER THAN 2"

24" ROOT BARRIER
SEE NOTE 4

SET ROOT BALL DIRECTLY
ON NATIVE UNDISTURBED SOIL

1' TYP

1' TYP

PLANTING NOTES

1. TREE SIZE – 2 INCH CALIPER MINIMUM MEASURED 6 INCHES UP FROM ROOT BALL.
2. PLANTER DIMENSION (4'–8') VARIES BY LOCATION AS DETERMINED BY PLANS. DIG HOLE 2–3 TIMES ROOT BALL WIDTH.
3. TREE ROOT BALLS MUST BE AT LEAST 5' DISTANCE FROM ANY UNDERGROUND UTILITIES.
4. ROOT BARRIER TO BE 24" DEEP, 2MM (.08") THICK, 1/2" ABOVE THE SOIL ELEVATION, WITH JOINTS OVERLAPPING 6". ROOT BARRIER MUST BE INSTALLED ON ALL SIDES OF PLANTER.
5. FOR APPROVED TREE SPECIES SEE SECTION 5.0093.
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

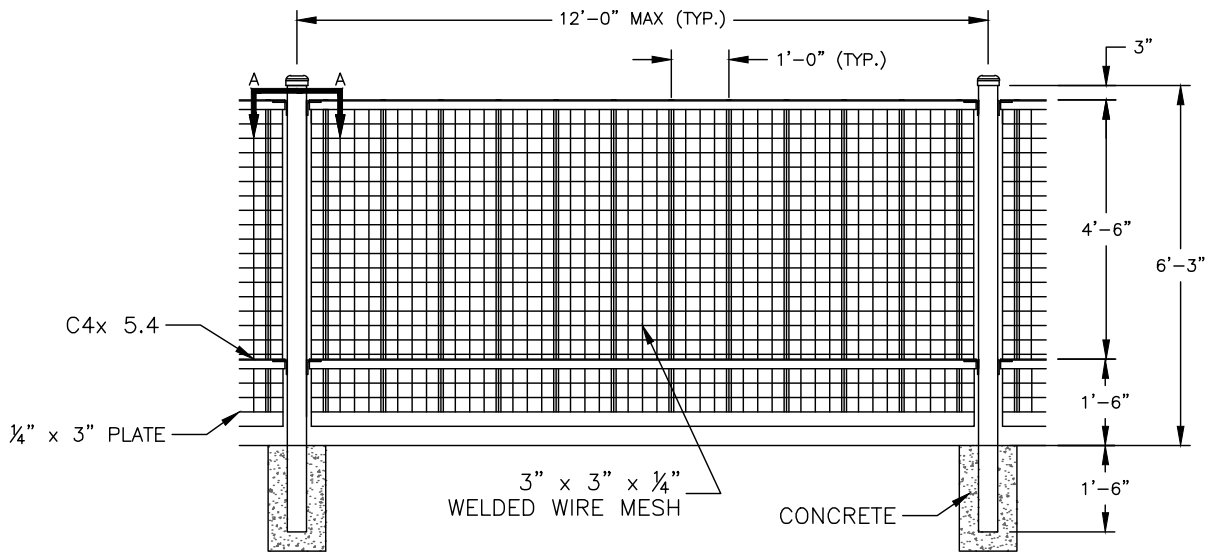
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CITY ENGINEER

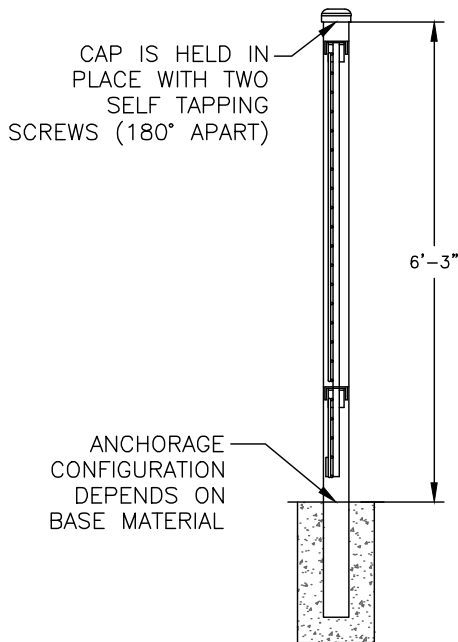
01/2021

DATE

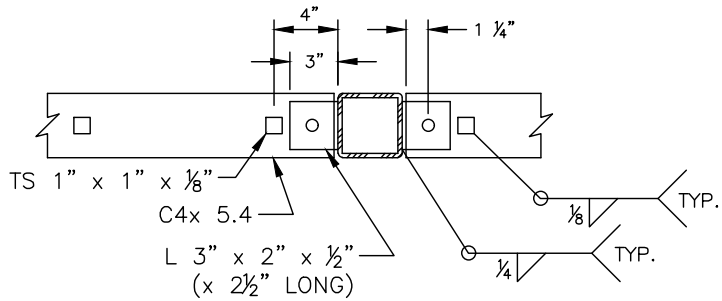
NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/13	AJR
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



ELEVATION
TYPICAL ORNAMENTAL PANEL



SECTION



SECTION A-A

NOTES:

1. SLOPE OF PANELS MAY VARY. PROVIDE $\frac{3}{16}$ " 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 $\frac{1}{4}$ ".
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

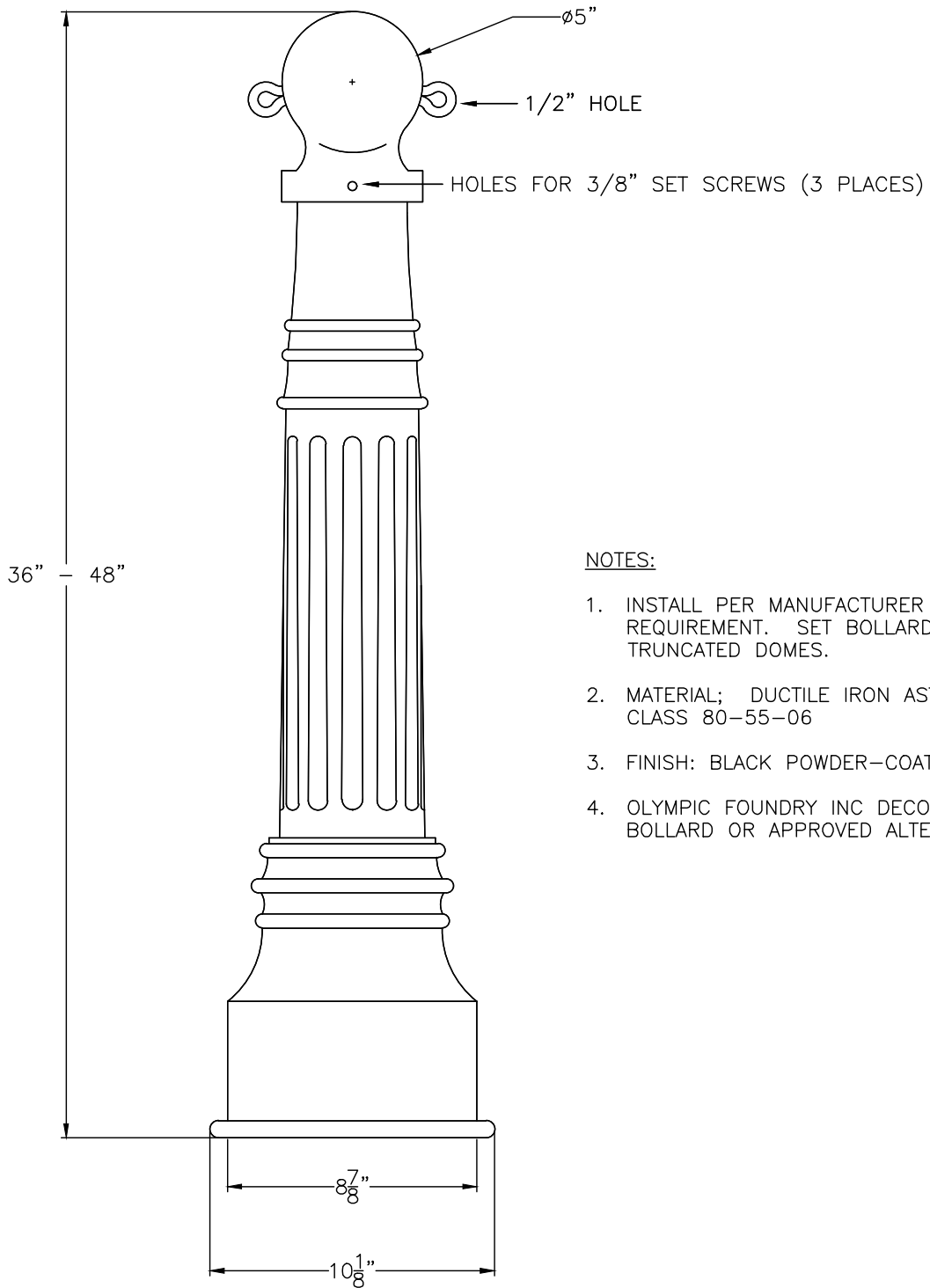
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01/2021

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

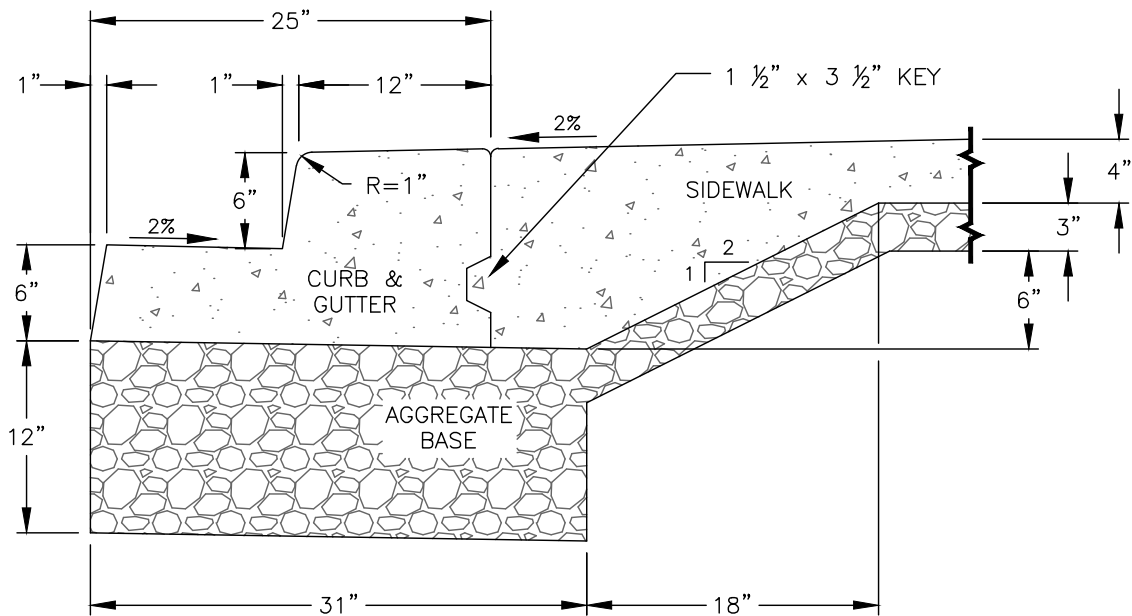
APPROVED

Steve R. Adkins
01/2021

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 $\frac{1}{3}$ 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 $\frac{1}{2}$ " RADIUS JOINT.
6. ALL SURFACES TO BE STEEL TROWELED.
7. WHERE EXISTING CURB IS TO BE 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

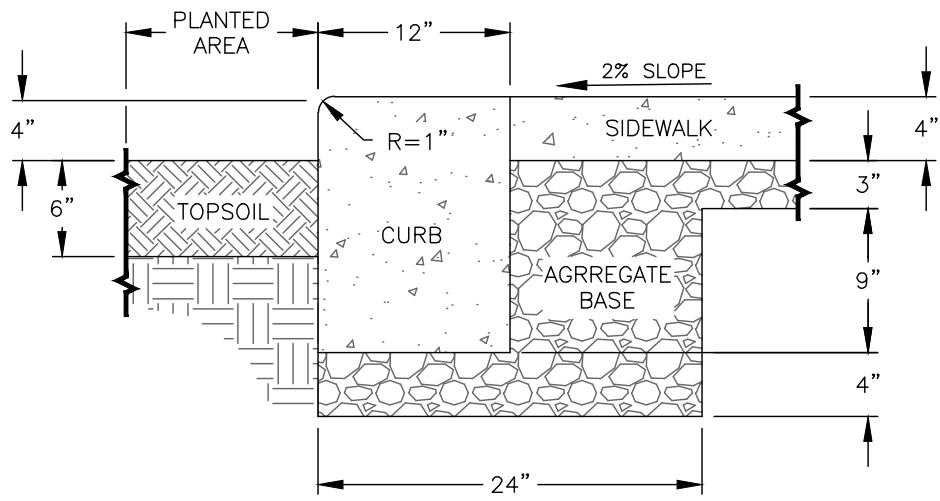
APPROVED

01/2021

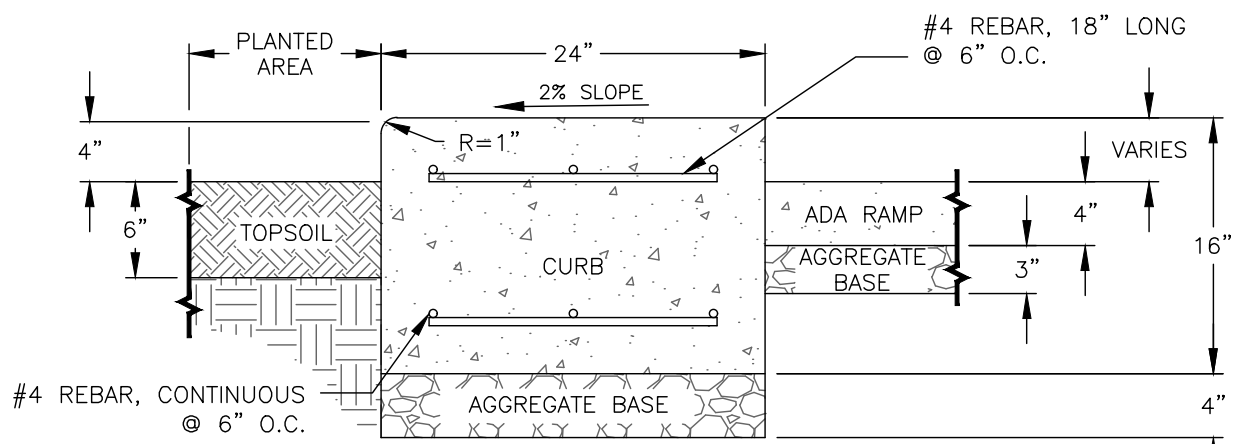
CITY ENGINEER

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 1/3 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 1/2" RADIUS JOINT.
7. ALL SURFACES TO BE STEEL TROWELED.
8. WHERE EXISTING CURB IS TO BE 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.

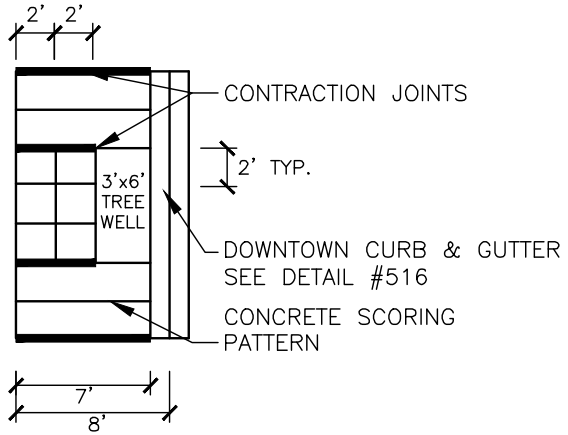
Downtown Curb

DRAWING NO.

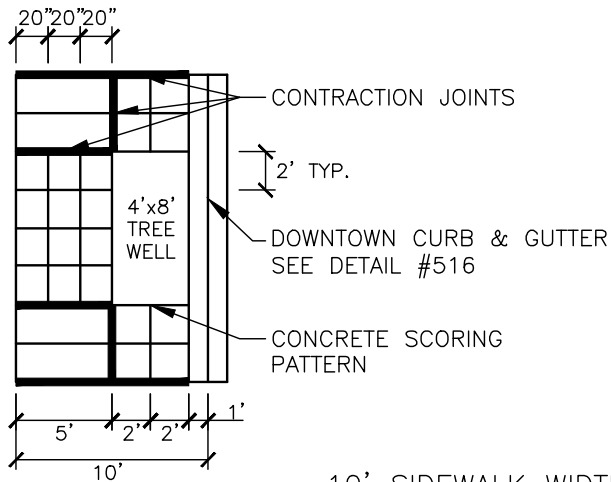
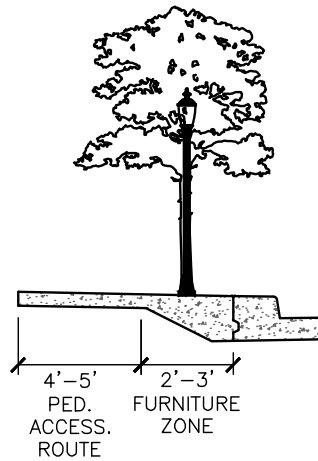
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APPROVED *[Signature]*
CITY ENGINEER
DATE 01/2021

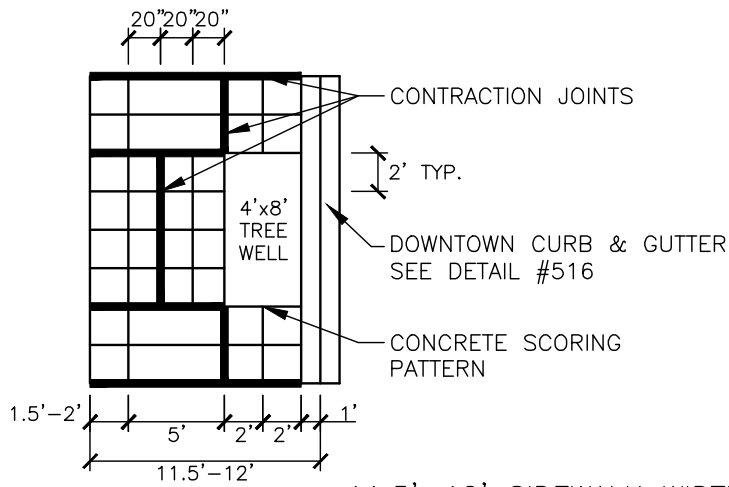
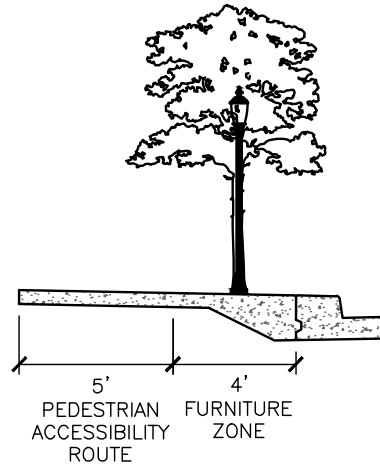
NO.	REVISIONS	DATE	BY
1	NEW DRAWING	10/09	ZJW
2	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



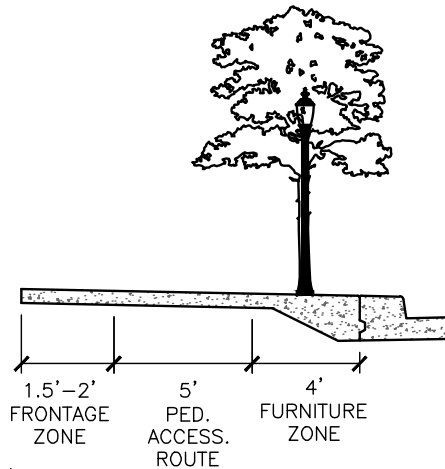
8' SIDEWALK WIDTH



10' SIDEWALK WIDTH



11.5'-12' SIDEWALK WIDTH



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Downtown Sidewalk

DRAWING NO.

518A

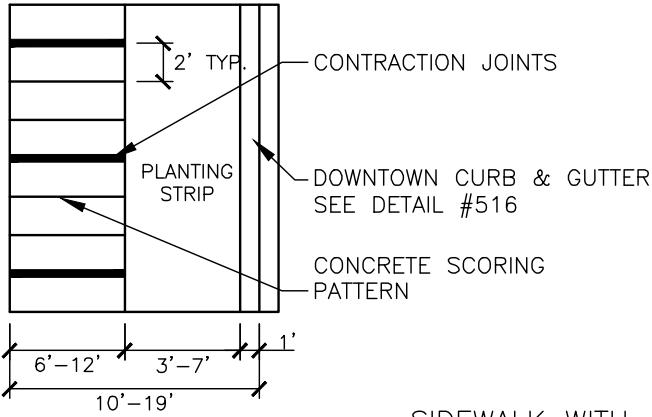
APPROVED

01/2021

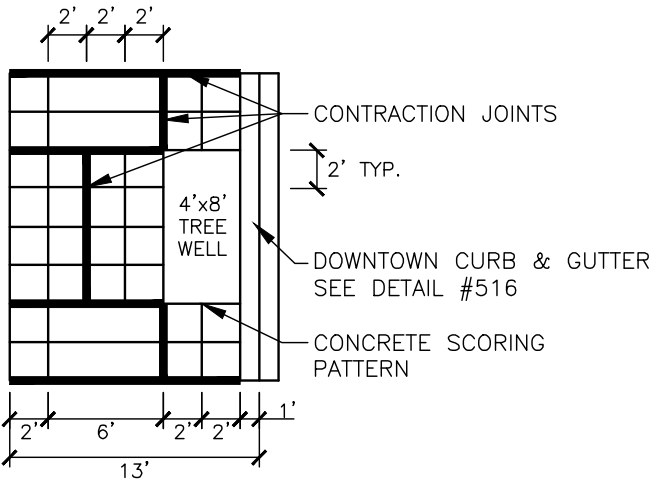
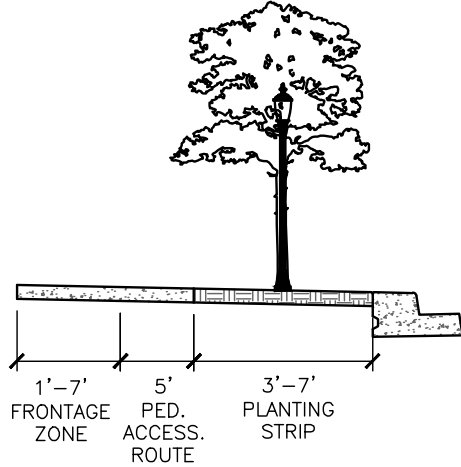
CITY ENGINEER

DATE

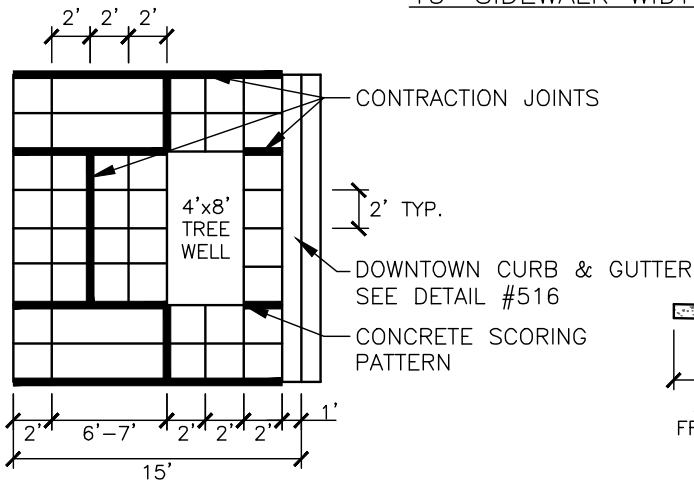
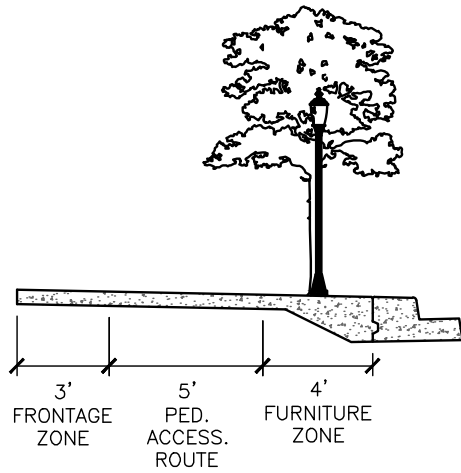
NO.	REVISIONS	DATE	BY
2	REVISED SCORING PATTERN & NOW A-C	12/13	AJR
3	REVISED DIMENSIONS & PARTITION NAMES	08/16	LMO
4	RENUMBERED DRAWING, UPDATED NOTES	08/19	TAP



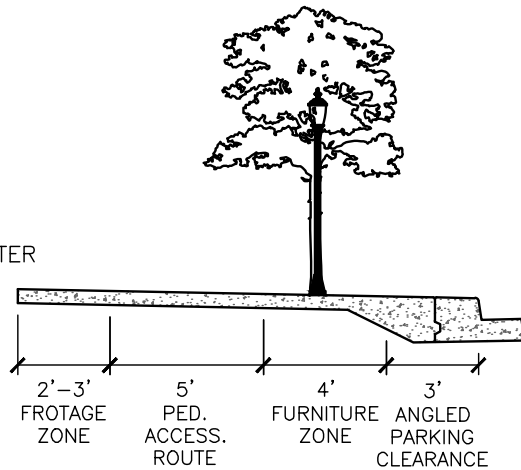
SIDEWALK WITH PLANTING STRIP



13' SIDEWALK WIDTH



15'-16' SIDEWALK WIDTH



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

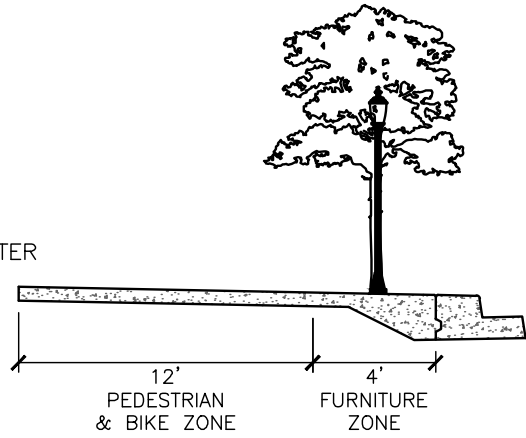
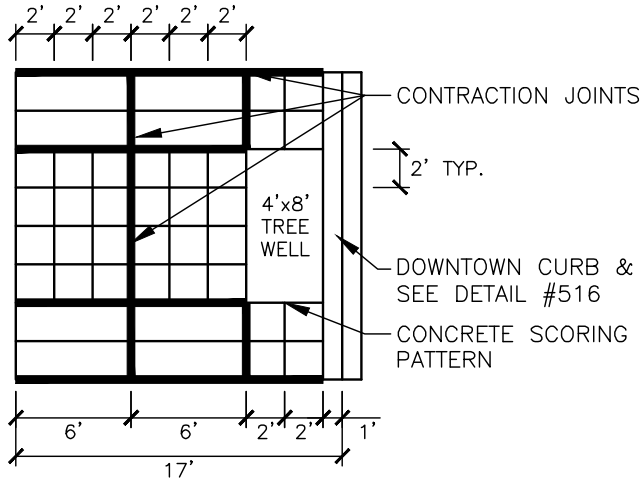
Downtown Sidewalk

DRAWING NO.

518B

APPROVED *[Signature]*
CITY ENGINEER DATE 01/2021

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

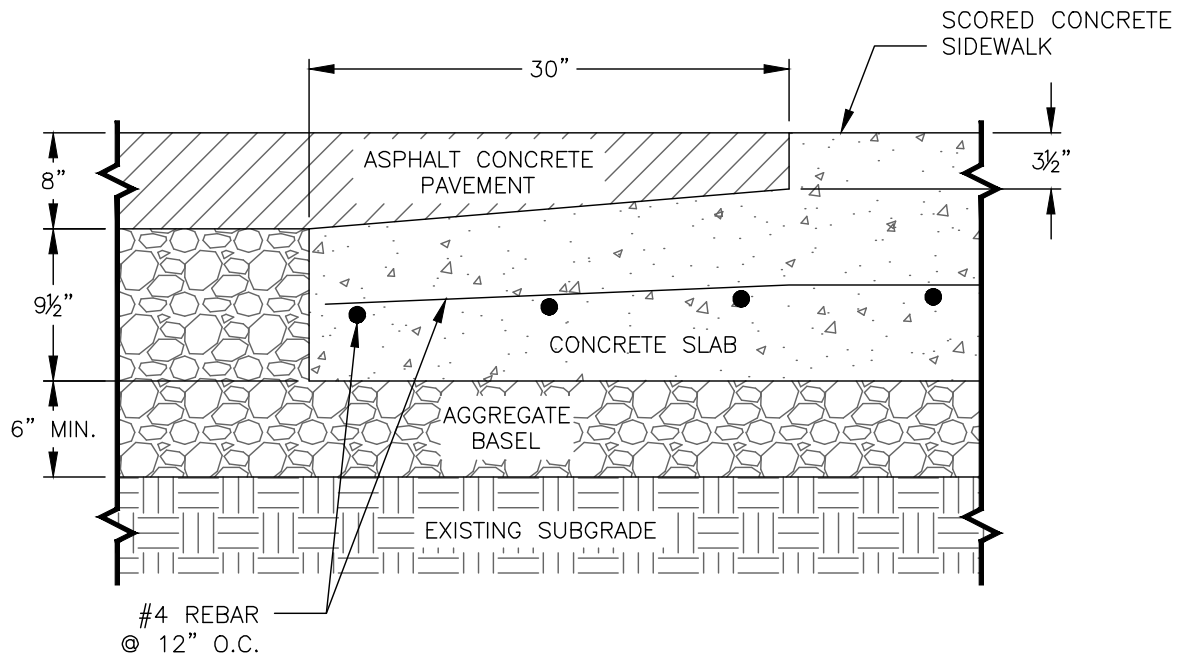
APPROVED

01/2021

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

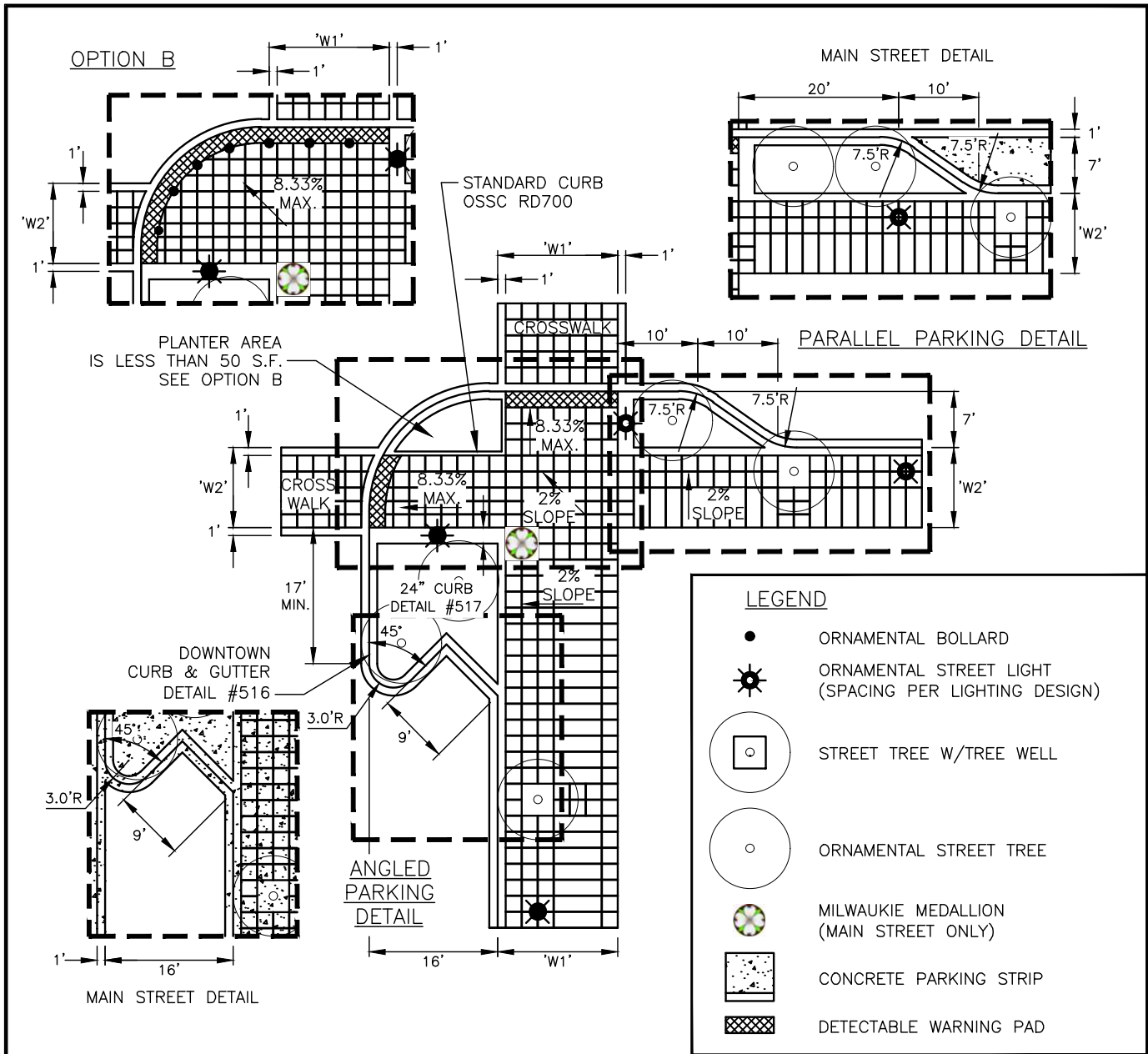
APPROVED

01/2021

CITY ENGINEER

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

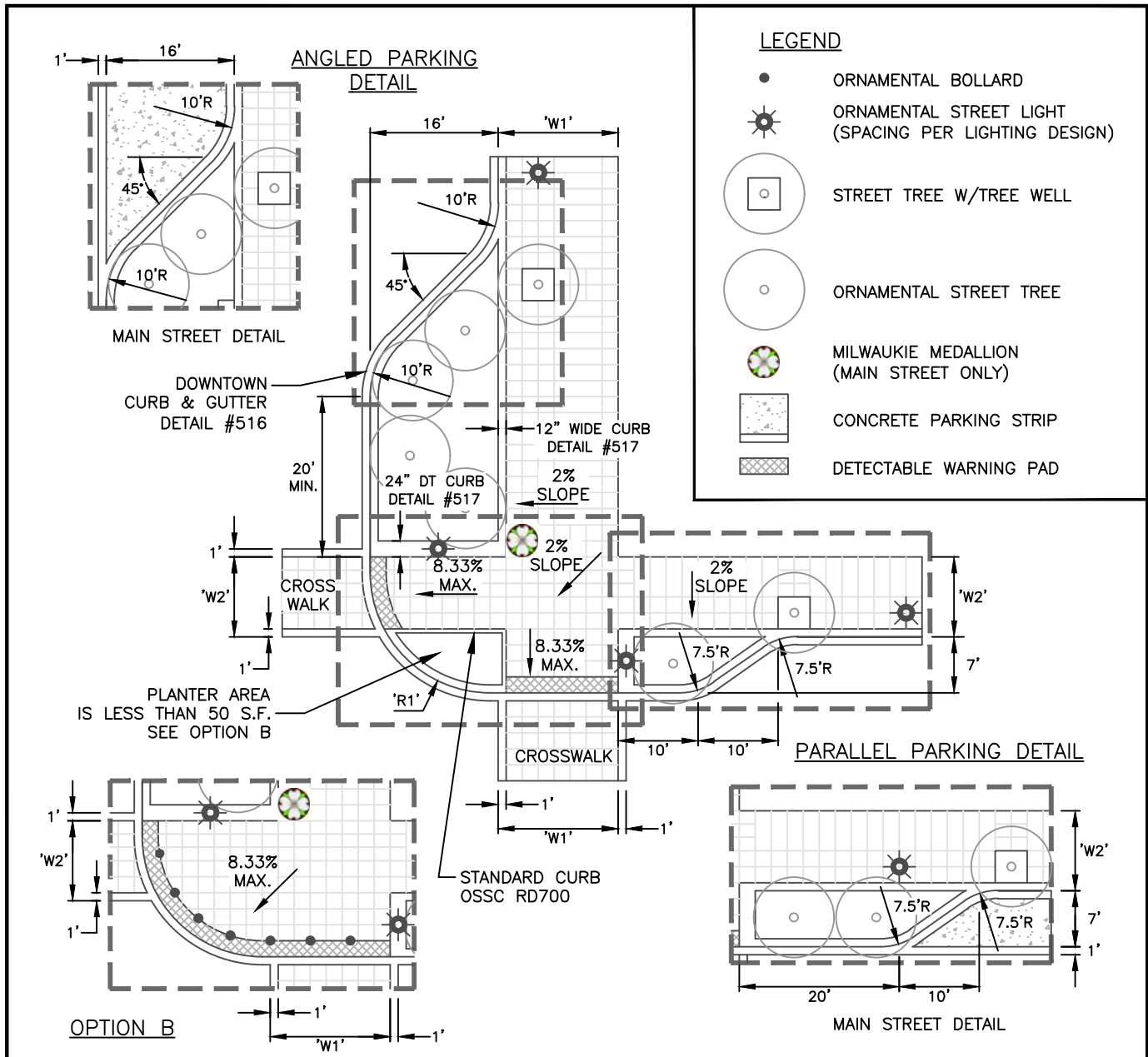
APPROVED

Steve R. Adams
01/2021

CITY ENGINEER

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

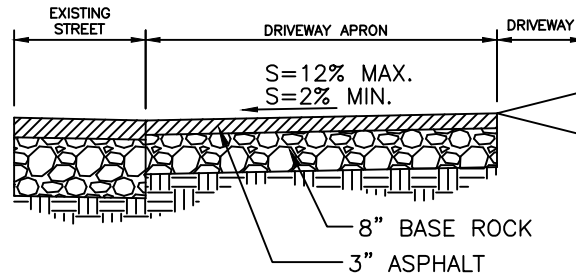
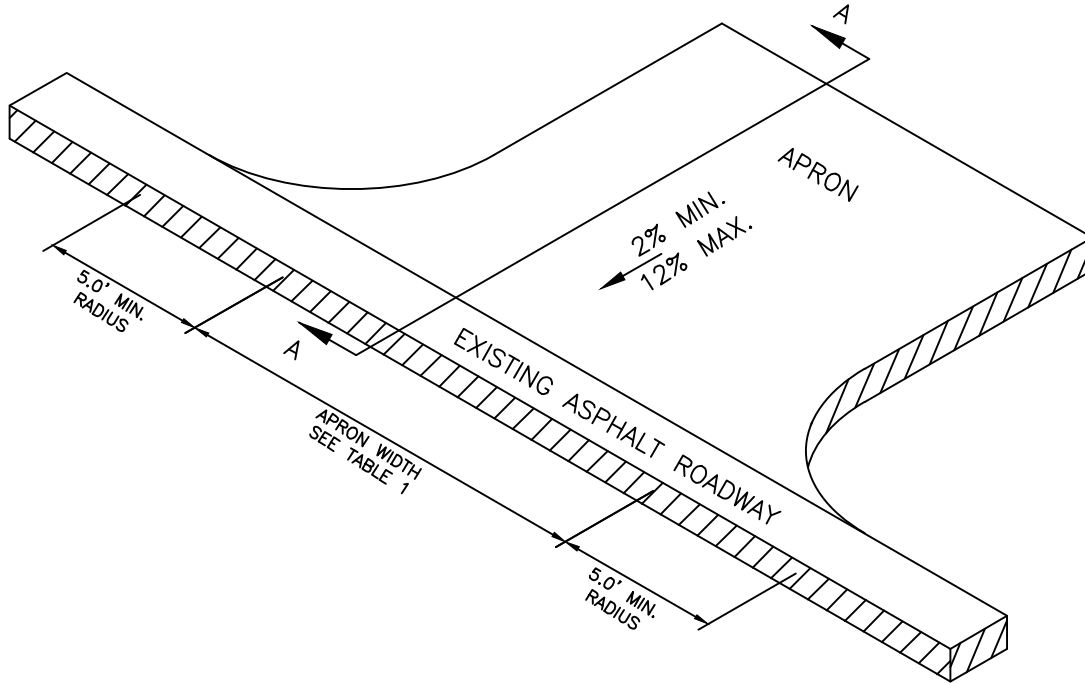
APPROVED

Steve R. Adams
01/2021

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
1-2 RESIDENTIAL DWELLING UNITS	9.0'	20.0'
3 RESIDENTIAL DWELLING UNITS	16.0'	20.0'
4-7 RESIDENTIAL DWELLING UNITS	20.0'	24.0'
8 OR MORE RESIDENTIAL DWELLING UNITS	24.0'	36.0'
COMMERCIAL, OFFICES, OR INSTITUTIONAL	12.0'	36.0'
INDUSTRIAL	15.0'	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

Steve R. Adams
01/2021

CITY ENGINEER

DATE

NO.

REVISIONS

DATE

BY

3

CHANGED NOTE 3

12/14

AJR

4

RENUMBERED DRAWING, UPDATED NOTES

08/19

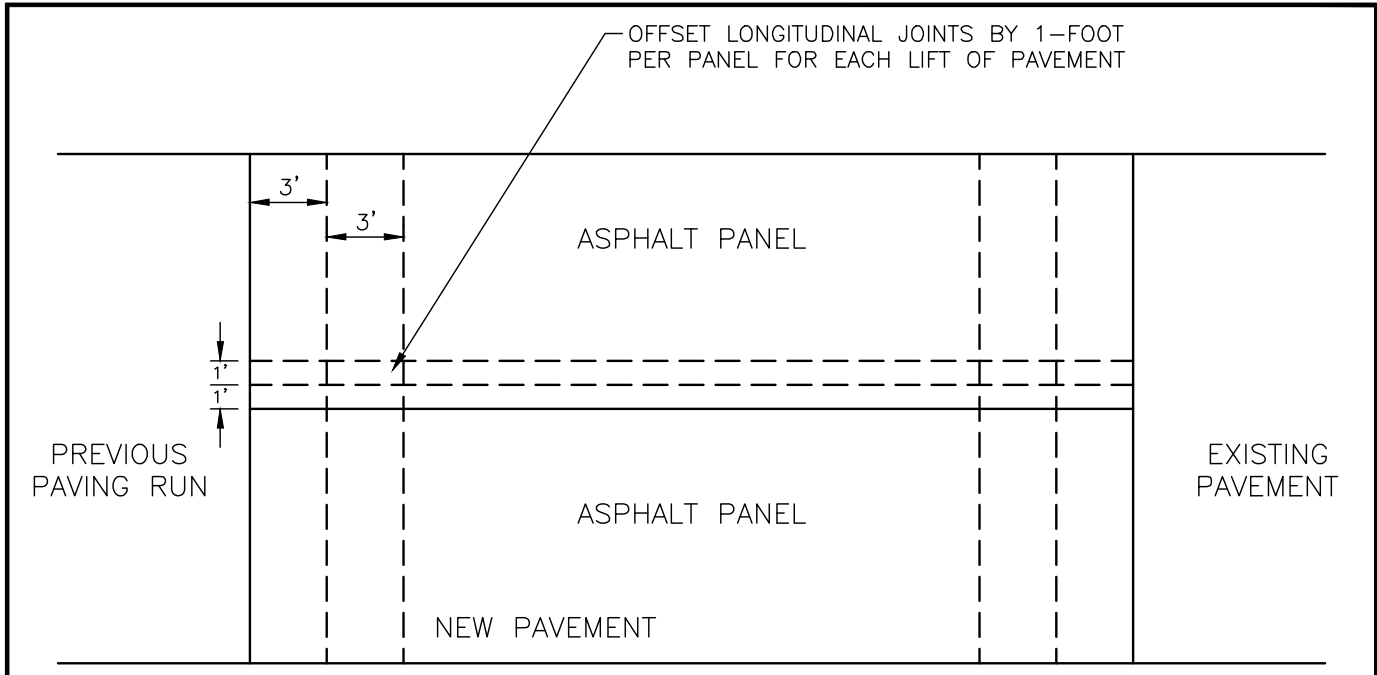
TAP

5

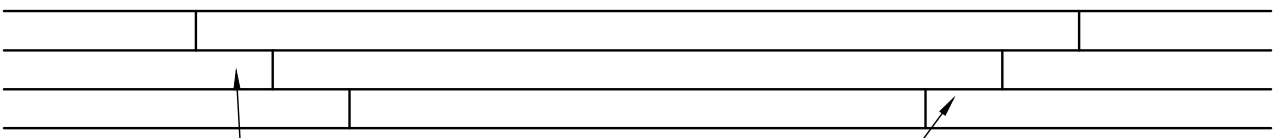
UPDATED TABLE

01/21

TAP



PLAN VIEW



OFFSET END OF PAVING RUN BY 3 FEET FOR EACH LIFT OF PAVEMENT

MILL EXISTING PAVEMENT TO PROVIDE 3-FOOT LONG OVERLAP FOR EACH LIFT OF PAVEMENT

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.

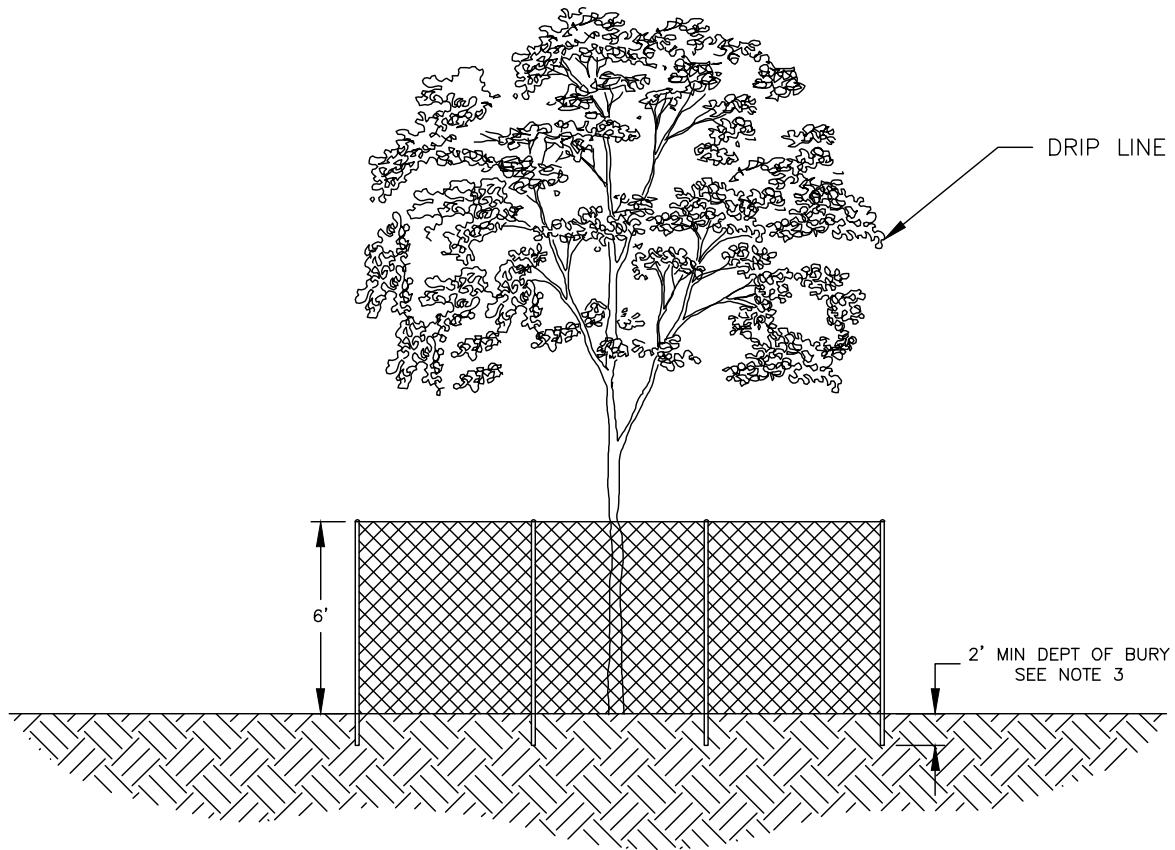
Asphalt Concrete Pavement Placement

DRAWING NO.

523

APPROVED *[Signature]* 01/2021
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.
3. POST TO BE SET TO A DEPTH OF NO LESS THAN 2 FEET IN NATIVE SOIL.
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.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Tree Protection Fencing

DRAWING NO.

524

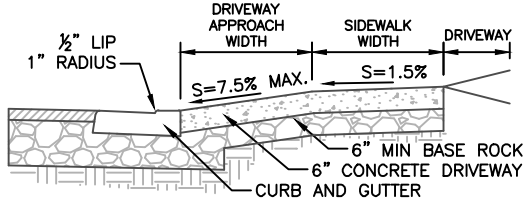
APPROVED

01/2021

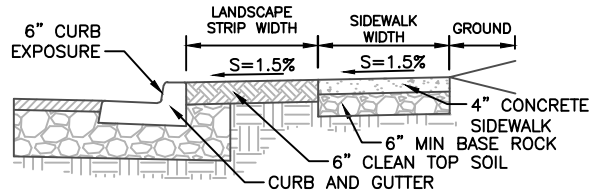
CITY ENGINEER

DATE

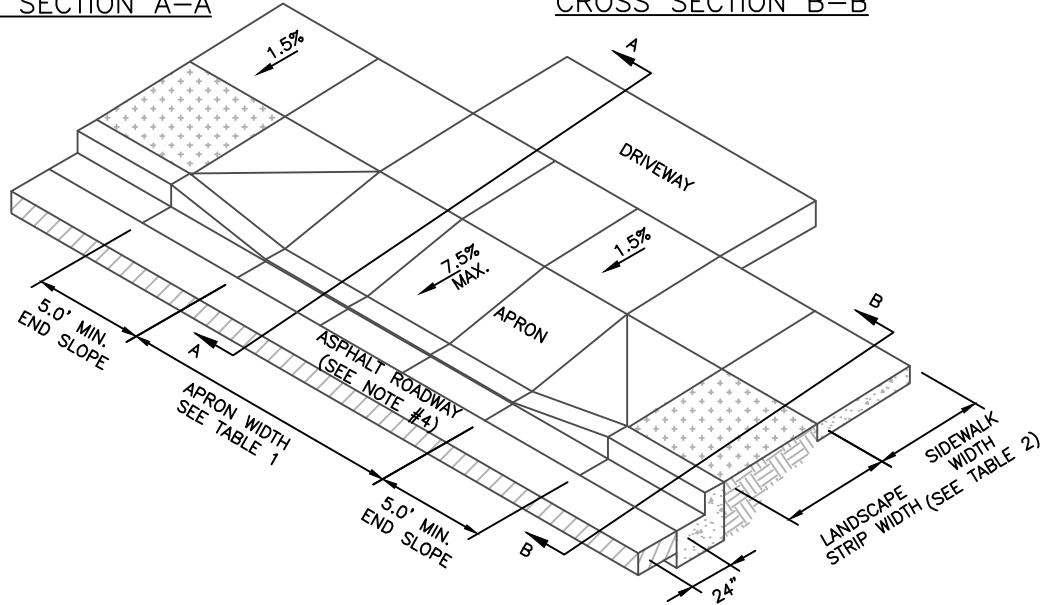
NO.	REVISIONS	DATE	BY
1	NEW DRAWING	08/19	TAP



CROSS SECTION A-A



CROSS SECTION B-B



CLASSIFICATION	MIN. WIDTH	MAX. WIDTH
1-2 RESIDENTIAL DWELLING UNITS	9.0'	20.0'
3 RESIDENTIAL DWELLING UNITS	16.0'	20.0'
4-7 RESIDENTIAL DWELLING UNITS	20.0'	24.0'
8 OR MORE RESIDENTIAL DWELLING UNITS	24.0'	36.0'
COMMERCIAL, OFFICES, OR INSTITUTIONAL	12.0'	36.0'
INDUSTRIAL	15.0'	45.0'

CLASSIFICATION	SETBACK	CURB TIGHT
LOCAL STREET	5.0'	6.0'
NEIGHBORHOOD ROUTE	5.0'	6.0'
COLLECTOR ROAD	6.0' MIN	8.0'
ARTERIAL ROUTE	6.0' MIN	10.0'

- CONTRACTION JOINTS SHALL BE 1/8" TO 1/4" WIDE. DEPTH OF THE JOINT SHALL BE A MINIMUM OF 1/3 THE THICKNESS OF THE CONCRETE. DRIVEWAY JOINTS SHALL ALIGN WITH CURB JOINTS WHERE POSSIBLE.
- ALL SURFACES SHALL BE LIGHTLY BROOMED. ALL EDGES SHALL BE TOOL ROUNDED AND SHINED 3" AFTER BROOMING.
- SAW CUT EXISTING CURBS THAT ARE TO BE REMOVED TO THE NEAREST JOINT.
- EXISTING ASPHALT CONCRETE IN FRONT OF THE APPROACH SHALL BE SAW CUT ALONG A LINE PARALLEL TO THE CURB AT A MINIMUM DISTANCE OF 24" AWAY FROM THE FACE OF THE CURB AND REPLACED WITH HOT MIX ASPHALT CONCRETE WITH MINIMUM THICKNESS OF 4" OR MATCH EXISTING, WHICHEVER IS GREATER. USE RUBBERIZED SEALANT AT ALL ASPHALT JOINTS
- CONCRETE SHALL BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
- CURB JOINT SHALL BE A TROWLED JOINT WITH A MINIMUM 1/2" RADIUS ALONG THE BACK OF CURB.
- CONCRETE PANELS SHOULD BE SQUARE (4'X4', 5'X5', 6'X6'). IN NO CASE SHALL THE LENGTH OF A CONCRETE PANEL BE GREATER THAN 1.5 TIMES THE WIDTH AND VICE VERSA.
- COMMERCIAL, INDUSTRIAL, AND PUBLIC USE DRIVEWAY APRONS AND ADJACENT SIDEWALK REQUIRE #4 REBAR, 12" ON-CENTER IN EACH DIRECTION. THE APRON REBAR SHALL BE ADEQUATELY TIED TO THE CURB REBAR.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Set Back Driveway Approach

DRAWING NO.

525

APPROVED

Steve R. Adams 01/2021

CITY ENGINEER

DATE

NO.

REVISIONS

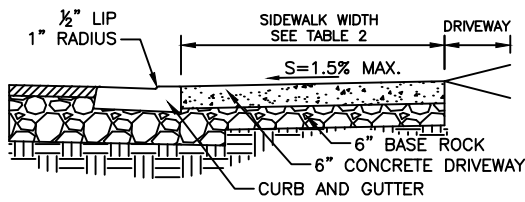
DATE

BY

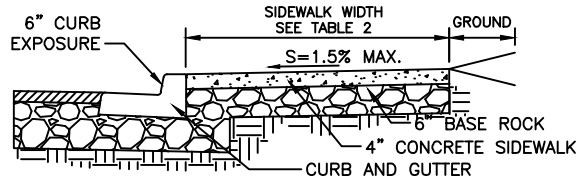
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2

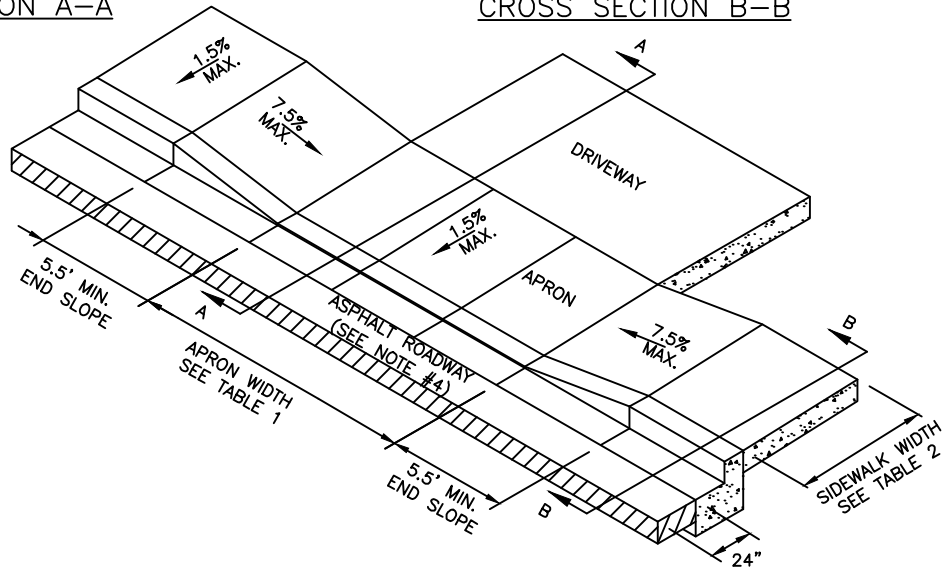
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CROSS SECTION A-A



CROSS SECTION B-B



CLASSIFICATION	MIN. WIDTH	MAX. WIDTH
1-2 RESIDENTIAL DWELLING UNITS	9.0'	20.0'
3 RESIDENTIAL DWELLING UNITS	16.0'	20.0'
4-7 RESIDENTIAL DWELLING UNITS	20.0'	24.0'
8 OR MORE RESIDENTIAL DWELLING UNITS	24.0'	36.0'
COMMERCIAL, OFFICES, OR INSTITUTIONAL	12.0'	36.0'
INDUSTRIAL	15.0'	45.0'

CLASSIFICATION	SETBACK	CURB TIGHT
LOCAL STREET	5.0'	6.0'
NEIGHBORHOOD ROUTE	5.0'	6.0'
COLLECTOR ROAD	6.0'	8.0'
ARTERIAL ROUTE	6.0'	10.0'

- CONTRACTION JOINTS SHALL BE 1/8" TO 1/4" WIDE. DEPTH OF THE JOINT SHALL BE A MINIMUM OF 1/3 THE THICKNESS OF THE CONCRETE. DRIVEWAY JOINTS SHALL ALIGN WITH CURB JOINTS WHERE POSSIBLE.
- ALL SURFACES SHALL BE LIGHTLY BROOMED. ALL EDGES SHALL BE TOOL ROUNDED AND SHINED 3" AFTER BROOMING.
- SAW CUT EXISTING CURBS THAT ARE TO BE REMOVED TO THE NEAREST JOINT.
- EXISTING ASPHALT CONCRETE IN FRONT OF THE APPROACH SHALL BE SAW CUT ALONG A LINE PARALLEL TO THE CURB AT A MINIMUM DISTANCE OF 24" AWAY FROM THE FACE OF THE CURB AND REPLACED WITH HOT MIX ASPHALT CONCRETE WITH MINIMUM THICKNESS OF 4" OR MATCH EXISTING, WHICHEVER IS GREATER. USE RUBBERIZED SEALANT AT ALL ASPHALT JOINTS
- CONCRETE SHALL BE 3300 PSI AT 28 DAYS WITH A SLUMP RANGE OF 2" TO 4".
- CURB JOINT SHALL BE A TROWLED JOINT WITH A MINIMUM 1/2" RADIUS ALONG THE BACK OF CURB.
- CONCRETE PANELS SHOULD BE SQUARE (4'X4', 5'X5', 6'X6'). IN NO CASE SHALL THE LENGTH OF A CONCRETE PANEL BE GREATER THAN 1.5 TIMES THE WIDTH AND VICE VERSA.
- COMMERCIAL, INDUSTRIAL, AND PUBLIC USE DRIVEWAY APRONS AND ADJACENT SIDEWALK REQUIRE #4 REBAR, 12" ON-CENTER IN EACH DIRECTION. THE APRON REBAR SHALL BE ADEQUATELY TIED TO THE CURB REBAR.



CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Curb Tight Driveway Approach

DRAWING NO.

526

APPROVED

Steve R. Adams 01/2021

CITY ENGINEER

DATE

NO.

REVISIONS

DATE

BY

1

2

3